Moragahakanda Development Project (Sri Lanka)

List of Documents on Environmental and Social Considerations

1. **Executive Summaries of EIA Report and its addenda** (PDF/ 7.0MB)
(compiled by Mahaweli Authority of Sri Lanka (MASL))

2. **EIA Report and its addenda** (final draft version as at 01/October/2010) (*)
1) **EIA Report** (PDF/ 19.0MB) (compiled by TEAMS (Pvt)Ltd., submitted in October 1998)
2) **Addenda to EIA Report**
   i) **Biodiversity Assessment Study Report** (PDF/ 5.2MB)
   (compiled by the World Conservation Union (IUCN) Sri Lanka, submitted in June 2007)
   ii) **Comprehensive Watershed Protection Management Plan (WMP)** (PDF/ 11.3MB)
   (compiled by University of Sri Jayewardenepura, Sri Lanka, submitted in June 2007)
   iii) **Geological Study Report** (PDF/ 18.2MB)
   (compiled by National Building Reserch Organization (NBRO), Sri lanka, submitted in November 2008)
   iv) **Agriculture Development Plan** (PDF/ 150KB)
   (compiled by MASL, submitted in September 2007)
   v) **Archaeological Impact Assessment Report (AIA)** (**) (PDF/ 5.9MB)
   (compiled by Central Cultural Fund, Sri Lanka, submitted in May 2010)
   vi) **Resettlement Implementation Plan (RIP)**(***)(PDF/ 36.6MB), including summary of public consultation meetings held on 17/July/2010
   (compiled by MASL, submitted in July 2007)
   vii) **Social and Environmental Management Plan (SEMP)** (PDF/ 1.2MB)
   (compiled by EML Consultants Pvt Limited, Sri Lanka, submitted in May 2010)
   viii) **Social and Environmental Monitoring Plan (SEMoP)** (PDF/ 3.9MB)
   (compiled by EML Consultants Pvt Limited, Sri Lanka, submitted in June 2010)

3. **EIA Approval Letters** (PDF/ 1.0MB)

4. **Minutes of public consultation meetings held on 17/July/2010 - Full text** (****) (PDF/ 373KB) (compiled by MASL)

5. **EMoP progress up to July 2010** (PDF/ 215KB) (compiled by MASL)

6. **Description of the impact assessment** (PDF/ 55KB)
(compiled by Preparatory Survey Team for Moragahakanda Development Project, submitted in July 2010)

7. **JBIC environmental checklist** (PDF/ 141KB)
(compiled by Preparatory Survey Team for Moragahakanda Development Project, submitted in July 2010)

Notes:

* Validity period for present EIA approval is up to 25/October/2010. Application for the extension of validity period has been made, and is currently under review in accordance with domestic procedures in Sri Lanka. It is expected that the set of EIA report and its addenda will be approved as a whole.

** Original language is Sinhalese (summary available in Japanese).

*** RIP is equivalent to RAP.

**** For summary, please refer to Annexure 11 of RIP.

<u>Executive Summary</u> explaining Environment Impact Assessment (EIA) Report of the Moragahakanda Agricultural Development Project with its attachments namely Comprehensive Watershed Management Plan and Mitigation Plan, Biodiversity Assessment Report, Agriculture Development Plan, Geological Study Report, Archeological Impact Assessment Report and Resettlement Implementation Plan

The TAMS Environmental assessment Report – (TIPPETTS – ABBETT – Mc.CARTHY – STRATTON) an Environmental study was conducted for the whole of the Accelerated Mahaweli Development Programme (AMDP) including the Moragahakanda Agricultural Development Project (MADP) in 1980.

A supplemental environmental report concerning the MADP based on a request made by the Central Environmental Authority (CEA) was conducted by the TEAMS Consultants in 1988 for the Mahaweli Authority of Sri Lanka (MASL). The resulting report (October 1998 was subsequently accepted by the PAA, the Ministry of Agriculture, Forestry, Food and Co-operative Development as EIA for MADP. The EIA report is in 03 volumes, namely Volume I, Main report, Volume II – Maps and Volume III photographs.

When PAA granted approval for EIA on 26th October 2001, it included number of conditions and then applied further conditions each time the environmental clearance is extended first on 16th March 2006 and then again 2nd extension on 20.12.2007. The 2nd extension is valid from 26.10.2007 till 25th October 2010.

The attachments (Reports) mentioned in the above caption were prepared to fulfill the conditions of the EIA approval as explained below:

(1) Final report (Vol. I & Vol. II) Moragahakanda Agriculture Development Project – Comprehensive Watershed Protection Management Plan (Vol. I) and Mitigation Plan (Vol II) – University of Sri Jayawardenepura – June 2007.

Vol. I & Vol. II of this report is prepared to fulfill the conditions 4.1, 4.2, 4.4 and 5.1, 5.3, 5.4, 5.6, 5.7, 5.8 of the EIA approval respectively.

The relevant conditions of the EIA approval letter are given below for easy reference.

- <u>Condition 4.1</u> MASL shall develop a comprehensive Watershed protection and Management Plan covering the catchment and command areas including those aspects identified in the Section 5.9 of the EIA Report.

- <u>Condition 4.2</u> Conservation measures necessary to minimize soil loss within the catchment area and prevent excessive erosion from command areas due to construction and operation of

channel flows should be built into the construction plans by the MASL.

- Condition 4.4 — All the measures mentioned in the Section 3.1 of the proposed environment management action plan with respect to the upstream catchments protection shall strictly be implemented by MASL and further improvements for the same, when necessary shall be included in order to minimize habitat loss, water pollution and forest exploitation due to catchment encroachments once the dam is constructed and the reservoir is built. Reservation for Ambanganga and Bowatenna reservoir shall not be limited to 100 m. and it shall maintain more than 100 m. as much as possible.

- Condition 5.1 — A detailed mitigatory plan shall be developed by MASL for mitigation of Adverse Impacts on fauna, flora and habitats in line with the mitigatory measures identified in Section 5.4 and 5.5, but not limited to those already identified. The development of this plan will be supported by a detailed Biodiversity study proposed to be undertaken by MASL.

- Condition 5.3 — Mitigation shall contain measures to minimize adverse impacts on the elephant population by establishing elephant corridors and permanent extensions to protected areas by MASL in consultation with Dept. of Wild life.

- Condition 5.4 — Habitat enrichment and a comprehensive protected area management system shall be developed by MASL, be covering wildlife reserves, buffer zones, forest reserves and elephant corridors in consultation with Dept. of Wildlife and Dept. of Forest.

- Condition 5.6 — Identifications and declarations of wildlife, forest and protected areas in line with current laws and regulations of relevant authorities shall be carried out by MASL.

- Condition 5.7 — A detailed mitigatory plan and the Biodiversity study proposed to be undertaken by MASL as stated in Section 5.1 of the environmental approval granted on 26.10.2001 shall be complemented with the needful for clearing of forest area for resettlement.

- Condition 5.8 — In order to mitigate the loss of flora and possible threat to fauna, all the recommendations highlighted in Section 3.2 of the Environment Management Action Plan (feasibility study MADP Appendix P) shall be implemented by MASL..

(2) Biodiversity Assessment of the Moragahakanda Agriculture Development Project - IUCN Sri Lanka - June 2007 is prepared to fulfill conditions mainly 5.1, 5.7, 5.5 and 10.1 of the EIA approval.

The relevant conditions of the EIA approval letter is given below for easy reference :

- Conditions 5.1 and 5.7. These conditions are indicated under Item I.

- Condition 5.5 — A detailed survey to inventories the endangered medicinal plants and flora shall be completed and nurseries established for conservation purposes by MASL. Reservation and conservation of forest areas shall be utilized for planting of endangered medicinal and other flora.

- Condition 10.1 — The proposed Environment Management Action Plan shall be reviewed by MASL and submitted to PAA for approval with detailed investigation and suitable mitigarory measures on effect of reservoir construction on ground water table and its quality / salinity, reverine species, downstream riverine habitats and fish migration and spawning due to discontinuation of the upper reaches and lower reaches of the stream.

(3) Moragahakanda Agriculture Development Plan – MASL (submitted on 13.09.2007)

This report is prepared to fulfill the Condition No. 13.1 of the EIA approval. The relevant condition of the EIA approval letter, is given below for easy reference.

- Condition No. 13.1 — MASL shall develop a detailed Agriculture Development Plan as recommended by EIAR. This shall also be included with suitable mitigatory measures to minimize possible threats to human and aquatic life to water pollution and soil salinization.

(4) Geological Study Report with respect to land suitability of the Moragahaikanda Agriculture Development Project. National Building Research Organization (NBRO) Nov. 2008

The relevant condition of the EIA approval is given below for easy reference. This report is prepared to fulfill the Condition No. 4.7 of the EIA approval.

- Condition 4.7 — A detailed geological study shall be carried out in consultation with the National Building Research Organization (NBRO) with respect to land stability of the project areas by MASL.

(5) Moragahakanda Development Project - Archeological Impact Assessment Report 2007 prepared by Central Cultural Fund for Dept. of Archeology.

This report is prepared to fulfill the Condition No. 9.1 of the EIA approval.

The relevant condition of the EIA approval is given below for easy reference.

- Condition 9.1 — Final project design and construction activities shall be carried out by MASL in such a way that any damage or inferences to the sites of archeological religious or cultural importance is avoided and adequate measures shall be taken to reserve places of such importance. MASL shall consult Dept. of Archeology and other relevant authorities in this regard.

(6) Moragahakanda Development Project – Updated final resettlement – Implementation Plan 2010 – MASL

This report is prepared to fulfill the Conditions No. 7.2, 7.3, 7.4, 7.5, 7.6 and 7.7

The relevant conditions of the EIA approval are given below for easy reference.

- Condition 7.2 — A comprehensive Resettlement Action Plan/Programme including detail map that shows the proposed resettlement sties, infrastructure, natural resources, compensation package, inventory of loss & asserts shall be prepared by MASL in compliance with the National Involuntary Resettlement Policy in consultation with the relevant authorities.

- Condition 7.3 — Since many established home gardens provide a part of household food and other requirements and income, the compensation package shall contain, in addition to compensation of land income loss from such avenues for at least three years.

- Condition 7.4 — The MASL shall decide the cutoff date for encroachment in consultation with the Ministry of Lands and Land Development as it is indicated in the National Involuntary Resettlement Policy.

- Condition 7.5 — The payment of compensation shall not be delayed for a long period of time. At least 50% of the compensation package should be paid prior to moving into the alternative land.

- Condition 7.6 — The MASL shall implement the recommendations given in the sub section 5.10 of the EIAR.

- Condition 7.7 — The MASL shall adhere to the National Involuntary Resettlement Policy (NIRP) adopted in May 2001. Accordingly, Resettlement Action Plan should be prepared for all the families to be displaced by this project and the MASL shall take all efforts to select Resettlement sites within the present settlement areas.

The Executive Summaries of the above mentioned reports are included below for easy reference. It should be noted that the executive summaries for Agriculture Development Plan and Archeological Impact Assessment Report are not available.

1. Environment Impact Assessment (EIA) Report of Moragahakanda Agricultural Development Project

EXECUTIVE SUMMARY

Background

The Moragahakanda Agricultural Development Project (MADP) is one of the five major components of the Accelerated Mahaweli Development Programme. The project was planned to augment irrigation water supplies to 67,900 ha in systems H, 1H, MH, G, D1 and Kaudulla Scheme.

Environmental Impact Assessment (EIA) of development projects is a pre requisite for project approval. As specified by the National Environmental Act an EIA was conducted on the AMDP as a whole in 1980 including the Moragahakanda area. Since the MADP is to be implemented 16 years after the EIA, the Central Environmental Authority (CEA) has advised Mahaweli Authority of Sri Lanka (MASL) to prepare a separate Supplemental Environmental Report for Moragahakanda. The present study is undertaken to satisfy this requirement.

The Project Approving Agency (PAA) has mentioned that the Supplemental Environmental Report submitted by MASL meets the requirements stipulated for an Environmental Impact Assessment (EIA) and requested that the Report to be treated as Moragahakanda Agricultural Development Project, Environmental Impact Assessment Report.

Scope and Approach of the Study

The consultants conducted a scoping exercise based on the TOR designed by CEA and submitted by MASL. The under mentioned areas were identified as areas of possible environmental impacts.

Wild life, forest cover, geology and hydrogeology, quality of water and soil, human settlement, downstream water users.

Temporary effects were identified as resulting from construction activities and influx of labour force. The scope of work, and reporting formats were finalised in consultation with the MASL and the CEA. A library survey of all available data was carried which helped to identify additional information needed for the study. Based on these requirements a work plan for the study was prepared, methodology defined and the work schedule of individual consultants was determined. The impacts and mitigatory measures proposed by the consultants have been discussed and a monitoring plan was then developed to ensure that the mitigatory measures would be adopted by the executing agency. The collective inputs have been brought together in the agreed format as the Environmental Impact Assessment Report.

The Moragahakanda Agricultural Development Project Environmental Impact Assessment Report is in three Volumes, Volume 1 the main report, Volume II - Maps, Volume III - Photographs.

Aim, Objectives and Scope of the Project

The Project aims to maximize the potential agricultural benefits through the efficient use of land and water resources.

The objectives of the Project are;

- to increase and stabilise yield and production in major irrigation schemes served by the Project through a regular water supply and proper irrigation and drainage management,
- to increase agricultural production by expanding new agricultural land and augmenting irrigation water supplies,
- to create employment opportunities in the command and resettlement areas through agricultural development,
- to settle displaced farmers in the newly reclaimed areas, and
- to improve the living standards of the affected people through increased agricultural production, income and the employment.

This is to be achieved by constructing a dam 61M (maximum height) across the Ambanganga a major tributary of Mahaweli Ganga at a narrow gorge approximately 2km upstream of the Elahera anicut. The net storage capacity of the reservoir is expected to be 500 MCM.

Dam and Reservoir

The reservoir proposed under the JICA study was designed to store 686 MCM of water at a 71m head. Storage comprised of 782 km^2 catchment runoff and the diversion from Polgolla of 57.5 M/Sec (2000 cusec) via the tunnel.

Nedeco Study of 1979 has set a limit of 875 MCM per year as possible diversion from Polgolla based on long term average flows as the balance water was designed to go to Victoria Randenigala and Rantambe for power generation at a rated heads of 190m, 78m and 31.5m respectively.

Originally Polgolla diversion was kept at 1538 mcm to give Moragahakanda a storage of 902.8 MCM as per the JICA proposal.

The present proposal envisages a reservoir of 500 MCM with a 61m dam.

A reduced storage will indicate a dam below 61 m in height and consequently a lower full supply level and therefore a reduced area covered by reservoir from the 28 Sq km defined.

Since the reservoir bed in the 1989 JICA proposal will be reduced the number of families to be displaced will be also less and the possible water losses from the reservoir bed will drop.

Capital costs of the headwork and infrastructure, road diversions and re-settlement of evacuees will be reduced as well the duration planned for such construction.

Construction Phase

The main construction activities which have a direct impact on the environment are:

- clearing and site preparation
- dam construction, main and saddle dames
- spillway construction
- erecting buildings
- construction of roadways
- establishing the irrigation net works

Jungle clearing will be confined to small extents at the dam sites. More extensive environmental effects will be in borrowing earth and excaving rock. About 2.4 m^3 of coarse aggregate has to be prepared for their construction of the concrete gravity spillway and other appurtenant structures. This will need large quantities of rock, heavy drilling, rock blasting and movement of vehicles.

Settlement Area Development in System D1 - Kaudulla

Construction work will include earth moving for canal and road construction using heavy equipment. Land levelling in any form would disturb the top soil to prevent erosion during the first rains the resettlers must be placed in their new locations to start a limited cultivation in the cleared lands.

There will be extensive earth work involved in canal and road construction. The canal bund slopes will be turfed the new roads however will be subjected to erosion and may have to be graded until stabilised.

Operation Phase and Management System

The proposed Moragahakanda Reservoir will be maintained by the Director, Head Works stationed at Digana, through his field officers. The operational policy decisions are made by the Water Management Panel (WMP). The WMP is advised by the Water Management Secretariat (WMS) which is a technically specialised body.

At systems level H and G Water Management is by MASL. While systems I.H and D1 are managed by the Irrigation Department.

Description of the Affected Environment

The Moragahakanda Project Area has been a centre of an ancient hydrological network. Four villages, Radawela (Rajawela) Kumarakanda, Nawanaliya and Kambarawa affected by inundation have direct historic links. Yet, there are no worthwhile edifices or monuments of archeological value that require special attention.

Kumarakanda has been identified as an important source of medicinal plants containing 79 varieties of rare medicinal plants. This area needs conservation but is outside the inundation area.

Physical Features

The project area is characterized by a tropical monsoonal climate, with little temperature variation through out the year. The mean annual relative humidity is about 80 percent which vary from 70-88 percent. The daily maximum velocities range from 5.5 km/hr. in November to 16.4 km/hr. in June.

The area receives rainfall from both monsoons with 75 percent falling within the North East monsoon. The average annual rainfall is 1594 mm.

Topography

The Moragahakanda Reservoir bed is in gently sloping terrain while the catchment area in its upstream reach is mountainous terrain surrounding Matale and Naula.

Drainage

No special drainage channels are constructed in the Mahaweli areas such as System H and G, nor are such drainage systems designed and installed for System IH or D1. System IH is a collection of tanks in Anuradhapura and each tank utilises the existing natural stream for drainage. Similarly in System D1, each major tank utilises the existing natural drainage system.

In Systems H and D1, too, the existing oyas and streams are used for drainage. No artificial improvements are done to these streams.

In System H, the Kalawewa basin drains into Rajangane wewa.

Soils

Reddish brown earths (RBE) is the predominent soil in systems D and G. Low humic gleys (LHG) occupy valley bottoms. LHG soils develop over the low lying old alluvium in systems D and G and are found in association with RBE soils in a cantenary sequence. Solonetz are found in system D together with lithosols in rock knob plains (RKP) and mountains.

The LHG soils are imperfect/poorly drained alluvium suitable for rice cultivation. RBE soils are mostly well drained or poor drained depending on the location. Solonetz are not suitable for irrigated farming.

Geology

One of the main features of the Dam site area is the occurrence of relatively large bands of marble/crystalline limestone, interlain with garnetiferous gneisses. These are on the left limb of a folded structure (The Teligam antiform) (Map 3.2.7a).

Generally the dam site area - main dam, saddle 1, saddle 2, is criss crossed by fractures. These are aligned in north east-south west and north west-south east directions (Map 3.2.7c).

The area to the north east direction of the dam and saddles shows little or no drainage. The north western slopes of the north west abutment of saddle 2 is highly karstic.

The western edge of the reservoir is traversed by two conjugate shear planes. The above indicate structural weakness of the area geologically. (Map 3.2.7a)

Mineral Resources

The Project Area is rich in Minerals. Mica, Silica Quartz and Fledspar are mined for commercial purposes. The extraction of these minerals have not received sufficient attention from governing authorities or agencies, the result being unsystematic mining and under utilization leading to derelict land. Most of these resource areas, broadly are, within the 200 m contour level and will readily be submerged under the estimated high flood level of 186 m elevation (above m.s.l). The Kambarawa mineral resources mainly Mica and Silica Quartz are located in hills generally above the 300 m elevation and therefore would not be subject to inundation by the proposed reservoir water.

Gemstones

Gemstones belonging to corundum and garnet families are found in-situ at shallow depths, mostly within 1-2 m. The contact zone between underlain marble and other rocks, particularly pegmatites appears to be rich in gemstones. Another in-situ type gem occurrence was noticed about 01 Kilometer north-east of Diganakanda

Brick and Tile Clay

A reddish clayey soil suitable for brick industry is available at Kumbiyangaha -Ela at Kongahawela. There is a potential to expand the local brick industry.

Graphite

There is evidence for graphite mineralization. The area is suitable for further geological and geophysical exploration.

Flora

The natural vegetation types in the affected area cover an area of approximately 5450 hectares. This includes natural plant communities in dense forests, sparse and open forests and grasslands. Based on the climatic conditions of the area five major natural vegetation types have been identified. These are as follows;

a. Moist Monsoon Forests:
   Annual rainfall 1800 m.m. - 2500 m.m.
   canopy density over 70%
b. Dry Monsoon Forests:
   Annual rainfall 1000 m.m. - 1800 m.m.,
   canopy density over 70%
c. Sparse and Open Forests
   Not a natural vegetation type,
   canopy density/less than 70%
d. Grass Lands - Damana and Villu Grass Lands:
   Annual rainfall less than 1800 m.m.

Moist Monsoon Forests are generally found in the Reseroivr Area while dry monsoon forests sparse and open forests and grass lands found in the command area.

Monsoon forests are characteristics of the intermediate zone where the annual rainfall range is 1800 mm to 2500 mm at the eleviation less than 1000m. About 70 percent of the proposed Moragahakanda reservoir area is covered with this type.

There are a number of endemic plants in the reservoir area.
There are about 30 ha of Eucalyptus plantation in the Reservoir area.

Floral diversity, endemic, endangered/threatened plant species in the affected area

Moist monsoon forest types found in the reservoir area are relatively rich in floral diversity in comparison with the natural forests found in the command area. A total of 92 plants species have been recorded of the area. This includes 5 species of creepers, 14 species of herbs, 29 species of shrubs and 44 species of trees. A total of 8 endemic plant species including one creeper, 2 herbs, 2 shrubs and 3 trees have been recorded. None of the species recorded from the reservoir area falls under the category of endangered or threatened species.

Command Area

Dry monsoon forest type found in the command area are less in floral diversity than in the reservoir area. Total of 71 plant species have been recorded in the Dry Monsoon Forests found in the command area. This includes 8 species of creepers, 4 species of herbs 13 species of shrubs and 46 species of trees. Total of 8 endemic plants species were found in this forest type. This includes one creeper, one herb, and 6 tree species. Two threatened plant species have been recorded from this area.

A total of 60 plant species were recorded in the sparse and open forests found in the command area. This included 5 species of creepers, 4 species of herbs, 25 species of shrubs and 26 species of trees. Only 2 endemic plant species were found in these forests. Two threatened plant species were also recorded from the sparse and open forests in the command area.

Around 47% of the plants recorded in the forests within the proposed reservoir area have some form of economic importance such as medicinal plants, food, timber or trees used for agricultural implements. In addition, all the woody plants in these forests have some economic value at least as fuel wood which is not discussed in this report. According to the recent survey carried out by the Forest Department, in the intermediate zone and dry zone forests 'food collection rates by the people living in the vicinity of forest areas are relatively high. Around 60-65 percent of households collect some form of food plants from the forest. But the data collected from the survey of the forests in the reservoir area does not confirm this. Few species of food plants have been identified from the area.

Fauna

According to the field investigations there are 5 endangered species and two threatened species (IUCN Red Data Book) within the Moragahakanda Area. This area provides the habitat for a number of important species such as Puntius ceylanensis, Calotis ceylonensis, Red faced malkoha.

Elephant Population in the Project Area

The elephant is now in the category of "endangered species" (IUCN Red Data Book). It has been reported that approximately 800 elephants inhabit the Mahaweli areas (TAMS 1981). But field observation and other information support the argument that the elephant population is much higher than the estimated number (800 heads).

Ground surveys confirm high elephant activity in the area. The elephant population is estimate 100 animals.

Species Diversity in the Project Area

The Morahakanda Project area and its environment still harbours 100 - 125 elephants (*Elephas maximus*) (Wildlife Officials communication). Other animals include a fair number of Sambar (*Cervus unicolor unicolor*), Spotted deer (*Axis axis*), Mouse deer (*Tragulus meeminna*), Wild boar (*Sus scrofa*), Grey langur (*Presbytis entollus*), Toque monkey (*Macaca sinica*), Porcupine (*Hystrix indica indica*), Grey mongoose (*H. edwardii Lanka*), Ruddy mongoose (*H. smithii zeylanicus*), Civet cat (*Veverricula indica mayori*), Black naped hare (*Lepus nigricollis*), a few Leopards (*Panthera pardus fusca*), and Indian Pangolin (*Manis crassicaudata*) as well. This area is an important habitat for birds too.

Migratory routes

This area forms a part of the corridor through which the elephants travel from Wasgomuwa to Minneriya Giritale Nature reserve. Ground information reveal that unlike in the other areas this project area provide fodder for elephants throughout the year and hence migration of elephants to this area, especially during the dry months is the norm. There is some disagreement regarding the exact size and nature of the herds, but there seems to be a semi-permanent herd of 30 to 40 elephants within the proposed nature reserve. The migratory herds, consisting of several herds, do considerable damage to crops and threaten human lives in adjoining areas.

Human Elephant Conflict

Following areas were identified as more sensitive areas for human elephant conflict as those areas are located adjecent to the elephant activity areas.
Kambarawa, Elahara, Kiri oya, Pubbiliya, and Kongahawela Talagoda.

Human Settlement

Affected People

People most affected by the Project will be residents living within the proposed reservoir area. Their economy and social life will be totally disrupted. Under the low dam option 1064 families in 951 households (including encroachments) are likely to be resettled.

Affected economic and social infrastructure

A total of 432.1 ha of paddy land and 497.4 ha of upland will be lost. According to both local and official views these include some of the most fertile land. A list of land owners and lands lost are shown in Appendix 2. The lands are located in 12 DN Divisions. More than the economic loss farmers show a strong attachment to their lands for historic reasons. Paddy cultivation is a special way of life which accounts for people cultivating paddy despite the low economic return of their harvest.

Farmers use, cattle and buffaloes as farm power. It has not been possible to ascertain whether farmers will sell their animals or take them into the resettlement areas. A percentage of animals will be sold, which means that new sources of farm power will be needed in the resettlement areas.

Construction of the reservoir will affect the established irrigation network of the area, causing loss to cultivated land in a number of villages. There is the likelihood of the anicut across Kambarawe ganga being submerged affecting 104.8ha land cultivated under both banks of the river, while another 76 ha irrigated from Ambanganga will be lost. The Palagoda Amuna off Ambanganga and the Kongahawela anicut from Kalugal Oya too will be affected.

As the settlements are very old, a number of well established social institutions are serving the population in the area. They are shown in Table 4.6.2 and 4.6.3. They will be affected in whole or in part due to inundation of the area.

MASL will develop an area of about 2000 ha or more in D1 which will be sufficient to meet the requirements of the 1064 families of 951 house holds. MASL will provide the necessary infrastructure facilities needed by settlers.

Impact of Construction Activities

Both positive and negative impacts can be expected from construction activities. The main features of construction will be the establishment of borrow areas, rock quarries, transportation, and generation of sediment.

The identified borrow for impervious material lies between 700m and 1700 m from the dam axis in the scrub jungle areas on the left bank of Elahera-Minneriya-Yoda Ela close to the 20th mile post on the Pallegama – Naula Road. This area lies in the proposed extension of the Minneriya, Giritale, Sanctuary.

The quantity of impervious material required for the core zone will be small, about 400,000 m^3 while another 200,000 m^3 of selected earth is required in the up stream earth zone and a further quantity is needed for coffer dams.

There are no settlements in the proposed borrow areas.

Two rock quarries have been identified, one on the northern slopes of a hillock 1000m. upstream of the dam axis. The second quarry will be located on the lift bank of Amban ganga on the southern slope of the Moragahakanda hill. Both quarries are covered with forest. There are houses about 600m way from quarry number 2, but they will be subsequently submerged.

The proposed borrow for filter and material and fine aggregate is on the right bank of Amban-ganga.

This area will be subsequently inundated, the overall the impact due to borrowing or quarrying have minimal effect on people and property. During the construction period, the life will be disturbed, but proper landscaping including reforestry will be planned to minimize the negative effects.

Transport of Material

Distances to be traveled in transporting material is about 1.5km as the 'crow flies'. The operational area in which major construction activities will take place is about 3.5 km x 3.2 km. in extent. There are between 12-15 houses on the 22nd mile on the Naula – Pallegama road which will feel the impact of dust and noise. However these houses will be inundated once the reservoir is completed and the effect is therefore temporary.

A number of road crossings and at least one river crossing will be involved in transporting material. The regular vehicular traffic on the Pallegama – Naula main road will be some what affected.

The haul road will be watered to keep down the dust.

The haul road used for transport of borrows material and quarry material has to specially constructed using compact base course materials to withstand the type of hauling equipment.

Generation of Sediment

Sediments will be generated at the dam base haul roads and borrow areas, due to erosion by rain. Coffer dams would be formed upstream and down stream of the dam site obviating the erosion material reaching the Elahera anicut downstream.

Dam Site

Available drilling and adit data indicate that the area is underlain with limestone, block faulting is also specifically stated.

These may promote serious leakage problems if a substantial storage reservoir is built. Solution cavities already reported will increase and storage water will enter underground acquifers.

Grouting test result plan from 6 holes drilled near dam axis show that lugeon values vary from 169.7 to 167.5 indicating porosity.

The survey to carry out drill holes was made presumably in 1958-68 period. The position has changed since then with the reservoir area being exploited for gems, feldspar and mica. These operations may have punched through the impervious zones of lugeon values of less than 1.

These activities will have to be stopped when construction work begins. The people engaged in these activities will lose their employment unless alternate sites are opened.

Beneficial Impact of Construction Activities.

Substantial employment opportunities will be created. It is estimated that about 2000 persons will be employed during peak period. Many services will be established to serve the construction population.

The reservoir will contribute to enhance habitat and bio-diversity. The peripheral forest areas will have more water. This will attract more bird life and support a larger population of wildlife.

Significance of environmental impacts are summarised in the adjoining table, 4.6.4.

Impact and Mitigation

The significant impacts and suggested mitigatory measures are summarized in the accompanying Fig: 5.3.

Monitoring Plan

The monitoring plan includes monitoring of water quality and levels; watershed monitoring and monitoring the implementation of mitigatory action to minimize impact on flora and fauna.

Further, monitoring of construction activities and resettlement is also included in the plan.

Conclusion

The study team has concluded that the Moragahakanda Agriculture Development Project could be implemented with minimal adverse environmental effects, if the suggested mitigation and recommendations are adopted.

Recommendations

* Updated feasibility study including further geological investigations.
* Preparation of a mineral extraction plan
* Forest clearing to be conducted following the given guidelines
* Enrichment of habitats
* Conducting a biodiversity study
* Conducting a public awareness programme
* Implement resettlement according to the given guidelines.

SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

Table 4.6.4.

Possible Impacts	SIGNIFICANCE				
	Adverse				Beneficial
	Minor	Moderate	Major	Critical	
Physical Environment					
Rainfall & Evaporation	☐				
Wind	☐				
Water Quality	☐				
Sedimentation		☐			
Soil Erosion			☐		
Water Uses		☐			
Vicinity of the Reservoir					☐
System H, IH, MH, G & D1					☐
Reservoir Bed				☐	
Borrow Area		☐			
Catchment		☐			
Dry Weather Flow	☐				
Mineral Resources			☐		
Land Use		☐			
Biotic Environment					
Flora		☐			
Fauna			☐		
Human Settlement					
Population			☐		
Land Inundation		☐			
Farm Animals			☐		
Cultivation			☐		
Housing			☐		☐
Infrastructure	☐				
Construction Activities					
Borrow Area for Impervious Material			☐		
Rock Quarries	☐				
Borrow of Filter Material and Fine Aggregates					
Transport of Materials	☐	☐			
Generation of Sediments		☐			
Dam Site				☐	
Employability					☐
Post Project					
Irrigation		☐			☐
Agriculture		☐			☐
Area Development - Elahera	☐				☐
- Roads		☐			☐
- Government Building		☐			☐
- Services	☐				☐
- Urban Development		☐			☐

Figure 5.3 Summary of Impacts and Mitigation

SIGNIFICANT IMPACTS	MITIGATION
Soil erosion in the catchment and reservoir sedimentation	Formulate and implement water shed management plan
Loss of storage due to unsatisfactory water tightness in reservoir bed	Detailed investigation to establish extent of grouting
Exposure of permeable zones due to borrow pits in the reservoir bed	Investigate reservoir bed prior to borrowing
Loss of storage water from foundation	Investigation and grout curtaining
Generation of sediments from construction activities	Minimize production of sediments
Loss of a small area of wild life reserve by inundation	Declare adjacent area of similar acreage as wild life reserve
Loss of wild life habitat	Enrich and enhance the carrying capacity of wild life habitats in the area.
Loss of elephant pathways	Allocate land for corridor.
Loss of Human settlements	Establish settlements in D1 Area
Loss of Agriculture land	Provide land in D1 Area
Break down of social life	Social development programmes by MASL
Loss of public building	Provide new buildings in resettlement areas
Loss of other infrastructure	Provide infrastructure in resettlement areas

2. Final Report (Vol. I & II) of Comprehensive Watershed Management Plan (Vol. I) and Mitigation Plan (Vol. II) – University of Sri Jayawardenepura – June 2007

Executive Summary

The Moragahakanda project

The proposed Moragahakanda Development Project comprises a dam and appurtenant works, including a hydropower station. Proposed dam site is located on the Amban Ganga; a major tributary of the Mahaweli Ganga, about 190 km north-east of Colombo, about 2 km upstream of the ancient Elahera anicut, which feeds the Elahera-Minneriya Yoda Ela (EMYE) canal, and about 20 km downstream of Bowatenna dam and power plant.

The study area

The study area of the present consultancy assignment consist of catchments of three reservoirs namely Nalanda reservoir, Bowatenna reservoir & the proposed Moragahakanda reservoir & proposed settlement area at Medirigiriya. In this report it is expected to study impacts of the proposed project on the existing environment. Particularly due to catchment activities within proposed Moragahakanda reservoir the soil erosion may become a significant catchment issue in the future. Therefore it is expected to address this issue in the present report in detail.

Environmental clearance and approvals for the project

Ministry of Agriculture Development, the Project Approving Agency (PAA) of the Moragahakanda Agriculture Development Project issued a project approval letter with conditions in October 2001 and also issued an extension to the project approval with conditions in March 2006). The PAA has granted the above approval for the Moragahakanda Agricultural Development Project (MADP) based on the environmental studies carried out by TEAMS Consultants for MASL (TEAMS, October 1998) & the environment component in the Feasibility Study conducted by LAHMEYER (2001) with some conditions to be fulfilled. Conditions 4.1, 4.2 and 4.4 of the approval letter indicated the details regarding the preparation of comprehensive watershed protection and management plan and Conditions 5.1 to 5.7 indicated the details regarding preparation of detail mitigatory plan to mitigate Adverse Impacts. (Project area including resettlement plan).

The Objectives

The specific objectives of the present consultancy awarded to USJP were to prepare a Comprehensive Watershed Protection Management Plan (CWPMP) and a detail Mitigatory Plan (MP) for the mitigation of Adverse Impacts (Project Area including the settlement area). It is

expected to fulfill the above requirement by addressing the conditions on which the approval was granted for the above project. The Volume one of this report; focuses on the comprehensive watershed protection Management Plan and following activities were conducted under the present consultancy:

(i) Formulating an Overall Watershed Protection Management Plan - Identify the components, the specific & individual activities including location, features, extent etc.
(ii) Developing an implementation plan for the above activities
(iii) Computing the cost estimate for each activity
(iv) Preparing a monitoring plan.
(v) Preparing a Mitigatory Plan focusing on mitigating adverse impacts of the above activities

The reports

Under the present consultancy two volumes were produced to meet the conditions mentioned in TOR to fulfill the requirements mentioned in section 1.2 above. The two volumes of the reports are:

1. Comprehensive watershed Management plan
2. Mitigatory action plan

In the preparation of the two volumes of the final report all the existing information on the project site and the study area were screened & major impacts were identified. The two reports were based on the major impacts & how to overcome or mitigate such impacts.

In the preparation of the reports a series of maps were prepared to indicate the location of the impacts & activities. The activities to mitigate the impacts were clearly discussed with the necessary cost estimates according to the TOR. For easy reference the activity chart, cost & time frames were presented in a tabulated form

The watershed management report consist of an overall literature survey for both study components in the form of a synopsis (as mentioned in TOR) to summarize the studies carried out by the previous workers. A photographic survey also was conducted in the study area in order to get the required information on landuse planning process & it was used in the landuse planning process.

The characteristics of the study area and catchment issues

The watershed consists of natural & manmade characteristics. The natural form of the catchment could be changed through human interventions. However the anthropogenic activities could cause environmentally sensitive changes such as soil erosion, pollution of stagnant & running water resources of the watershed. Therefore in order to develop comprehensive watershed management plan, the existing natural characteristics of the watershed should be taken in to account in order to use such information together with different landuse activities to develop comprehensive watershed management plan in an integrated manner.

Catchment characteristics

The elevation of the Moragahakanda catchment varies approximately from 200 msl to 1600 msl, the higher elevation being in the Knucles range. However, the majority of the catchment (nearly 70%) is falling within the elevation range of 200 – 600 msl. Higher variability of elevation has made the catchment highly diverse in its floristic composition.

The slope of the catchment is an essential piece of information for conservation planning. Thus, slope map for the catchment area was derived and reclassified into 7 classes to facilitate conservation planning. However, nearly 65 % of the catchment area is under 30 % slope, hence there is a potential of using the catchment for agricultural activities provided with adequate soil conservation. Nearly 19% of the catchment is within 30 – 60 % while the rest is above 60%.

The spatial distribution of mean annual rainfall over the catchment area varies between 1500 mm to 3500mm. Approximately 50% of the land area of the catchment receives rainfalls of less than 2000 mm per annum. The higher rainfall area coincides with relatively higher elevation range. However, the amount of rainfall is not well distributed over the year and in most of the areas the temporal rainfall variation shows less prominent bimodal distribution pattern.

The soils of Sri Lanka have been classified at great group level for the whole country and series level for some parts. The mapping has been done mainly at great group level. Fourteen great soil groups have been described. Soil map for the catchment area which was extracted from the generalized soil map of Sri Lanka illustrates the major soil groups which are falling in the catchment area and in the proposed settlement area.

The general trend of rock strata of the project site is South to North with minor variations due to geological structures. In contrast, Marble beds are intruded to / interlayered with host rock Garnet Biotite gneiss, which is associated with a major shear zone. There are number of shear

zones, faults, folds and lineaments recognizable in the regional scale published geological maps. However in the field it was hard to recognize the boundaries of such features.

Presence of pegmatite, mineral deposits (iron ore, feldspar, vein quartz, phlogopite (mica), fluorite, and iron with copper, Topaz deposits) indicate some pre-historic tectonic activities associated in the area. The boundary of Vijayan complex and Highland complex is close to the western and North western side to the project area.

It was observed that, especially along Sudu Ganga, more marble beds are associated with a shear zone. Underground solution caverns are rich in this area. Especially from Ukuwela to Nagolla, Bowathenna there were some ground subsidence and sink holes. With the fluctuation of groundwater levels of this area, such phenomenon can be expected. As a result of that, most of the houses in this region are severely cracked.

Major part of the catchment area lies within the intermediate zone while the higher elevations towards the central highlands fall within the mid country wet zone. The areas under the intermediate zone of the catchment consist of five ecological subzones (Agro-ecological regions of Sri Lanka, Natural Resources Management Centre, Department of Agriculture, 2003); namely IU1, IM3a, IM3b, IL2 and IL3 while the area falling into mid country wet zone, consist of only one ecological sub zone, namely the WM3b.

In Moragahakanda catchment area the population and housing density will increase with the construction of the reservoir & the infrastructure development of the area. Improper waste disposal have caused water pollution of the reservoirs in many regions of the country. Therefore proper waste management practices are essential to protect Moragahakanda reservoir from eutrophication & pollution & this aspect will be addressed in the watershed management plan..

The catchment of the Morgahakanda consist of several landuses such as forest, homesteads, poorly & moderately managed tea, coconut and other mixed trees, upland crops, scrubs, non-agricultural lands, grasslands, paddy and negligible extent of bare lands.

Soil erosion

Prioritization of erosion prone areas is a prerequisite for conservation planning. Therefore, spatial representation of soil erosion prone areas is an important management tool for watershed based conservation planning. Therefore, soil erosion hazard within the catchment areas was prepared using inputs such as existing landuse, rainfall amount & erosivity, soil erodibility and slope of the land mentioned above in section 1.5.1. The prepared map was field validated and corrected to represent a more realistic field situation. Three classes were identified based on susceptibility for soil erosion and map depicts the relative soil erosion hazard of the Moragahakanda catchment and it highlights the key areas for implementation of soil

conservation programs. In addition it emphasizes the areas that can be considered for landuse changes.

Majority of High hazard class for land slides fall in to Tea cultivated lands. That may be basically due to negligence of maintaining tea lands in the recent past. Anyhow that has to be verified at the field. Majority of moderately hazard class fall into Forest plantation and majority of low hazard also fall in to Tea plantations. As the base data are in 1:50,000 scale, some generalization can be expected. These results were verified with the field visit.

Comprehensive Watershed management plan

The Watershed Development & Management is important as it is of nationally high priority at present. Gradual degradation have affected, irrigation systems, social & agricultural aspects in various ways. The construction of a large number of infrastructure, unsystematic farming activities and the occurrence of natural disasters have caused the deterioration of the limited precious natural resources such as water, soil, flora & fauna quantitatively and qualitatively.

Major Components

Preparation of an Overall Watershed protection Management Plan for Moragahakanda includes the following activities;

(i) To demarcate 100 m reservation (sensitive area/ buffer zone) from the Full Supply Level (FSL) of the reservoir and implement a forest conservation program.

(ii) To develop a process to declare the watershed boundary of the Moragahakanda reservoir.

(iii) To establish conservation measures to minimize soil erosion including reforestation, crop diversification, engineering works etc.

(iv) To establish nurseries to grow plants (timber, fruits and medicinal verities) in the barren lands and homesteads in the watershed area.

(v) To establish mechanism for tree plantation program along stream embankments, river banks, road reservations to improve aesthetic and environmental conditions.

(vi) Preserve the currently available forest cover in the watershed and formulate a program to plant a forest cover in barren land.

The forest cover & conservation activities

The watershed of Moragahakanda reservoir and its command area are situated in the floristic regions twelve, three and two- Knuckles, northern and intermediate lowlands and the dry lowlands, respectively. Agroecologically this area belong to the intermediate lowlands, midlands and uplands and the dry lowlands. Two major natural vegetation formations in the proposed project area are moist monsoon forest and the dry-mixed evergreen forests. Moist monsoon forests are found in the project area lies in the intermediate zone (Matale district) having annual rainfall 1400-2000 mm and dry season of three to six months. This forest formation is characterized by canopy tree species such as *Chloroxylon swietenia* (Burutha), *Berrya cordifolia* (Halmilla), *Vitex altissima* (Milla), *Schleichera oleosa* (Kon) and Syzygium *cumini* (Damba). The proportion of species such as *Haldina cordifolia* (Kolon) *Holoptelia integrifolia* (Godakirilla) *Berrya cordifolioa* (Halmilla) *Mitragyna parvifolia* (Helamba), *Madhuca longifolia* (Mee), *Mangifera zeylanica* (Etamba), *Filicium decipiens* (Pihimbiya), *Phyllanthus* (Karaw) and *Alseodaphne semecarpifolia* (Wewarana), increases in moist places whereas near the water courses there exists a riparian vegetation comprising *Terminalia arjuna* (Kumbuk), *Hydnocarpus* (Makulla), *Myristica dactyloides* (Malaboda) etc.

The downstream area of the proposed project lies mainly in Pollonnaruwa district and the natural forest type found in the region is dry-mixed evergreen forest which is the typical dry zone forest dominated by species such as Palu (*Manilkara hexandra*), Wira (*Drypetes sepiaria*, and Burutha (*Chloroxylon swietenia*). The canopy consists of trees such as – *Manilkara* (Palu), *Drypetes* (Wira), *Chloroxylon* (Burutha), *Alseodaphne* (Wewarana), *Berrya* (Halmilla), and *Diospyros* (Kaluwara). *Drypetes* (Wira) forms the sub-canopy of these forests.

The dense forest cover in the catchment should be preserved by the managing agencies, Forest Department or Wildlife Department, to avoid further degradation of the habitats so that these areas would act as wildlife refuge and conservation area for all micro habitats which are required by both fauna and flora. Savanna, scrubland and grasslands are also natural vegetation formations of the area.

Riverine vegetation & fire breaks

The typical riverine vegetation is found on the banks of Amban ganga, Sudu ganga, Kambarawa ganga and other rivers and also small streams in Moragahakanda catchment. The most common tree species found on the river banks are *Terminalia arjuna* (Kumbuk) *Mangifera zeylanica* (Etamba) *Polyalthia longifolia* (Owila), *Madhuca longifolia* (Mee), *Diospyros malabaricum* (Timbiri), *Nauclea orientalis* (Bakmi), *Pongamia pinnata* (Karanda), *Hydnocarpus venenata* (Makulla).

Fires spreading from nearby areas can be controlled to some extent by fire breaks. These are strips kept free of inflammable vegetation or planted with fire resistant plants (e.g. Hemp, *Agave americana*). For maximum effectiveness, a width of 10 m or more is usually recommended. This is usually done by removing the top layer of vegetation. After a few years, maintenance can be done by way of cultivation, screening or herbicides. Fire resistant plants are those that do not ignite from a flame or other ignition sources.

Conservation of 100m sensitive area

Total sensitive area (100m area around the reservoir) is 5.8 km^2. This area needs to be surveyed and demarcated on the ground. To protect the area, concrete posts should be fixed at a distance of 50 m. It is proposed that 100 m strip from the full supply level of Moragahakande reservoir to be preserved as a reservation and kept under the natural vegetation cover.

It is also recommended that the areas within 100 m reservation that are under different successional stages e.g. scrublands with shrubs, not to be cleared for planting and allow the natural regeneration and succession to take place. However, enrichment planting could be done in the openings or gaps in the site.

Soil conservation

Soil management is the nucleus of the watershed development program. It involves soil restoration, soil improvement, measures to minimize soil degradation. Soil erosion is greatly affected by the amount of intensity of rainfall, topographic features, geological features, properties of soil, ground surface condition, vegetation condition etc

Soil conservation activities in a particular micro-watershed can be categorized as on-farm soil conservation and off-farm soil conservation. Ideally, off-farm conservation should initiate first, but most of the occasions practical difficulties arises mainly social factors. At the inception, it is somewhat difficult to organize and direct dwellers for a common purpose, but easier to start with activities related to their own farmlands. To overcome those difficulties, both on-farm and off-farm can be initiated simultaneously, and as the activities progresses decisions can be made.
Teak plantation is mostly preferred compared to other plantation species in the area and reforestation of government lands could be done under the participatory forestry programmes conducted by the Forest Department.

The methods for preventing water erosion include farming methods adopted by farm households themselves and Civil Engineering methods adopted in community participation.

Experience shows that villagers who have acquired secure tenure are ready to make long-term investments. Also, the villagers will help to protect and manage state forests when they have an incentive to do so. Forest management plans can be formulated jointly by the forest officers and the village representatives paying attention in both production and protection requirements.

Landuse planning

Field observations revealed that there are number of landuses which are managed in hazardous manner, such as cultivation of annual crops in steep lands, use of extra amounts of pesticides, unsystematic extraction of soils near reservoir for brick making, cultivation of Cardamom in protected areas, uncontrolled felling of trees for timber and for firewood and gemming.. These activities are happening mainly due to lack of any other employment which is leading to poverty. Therefore, in an integrated approach of watershed management a planner must explore the means and ways either to reduce the pressure on land through introduction of other income generating activities, or to provide guidelines which will reduce the hazardous situations.

At present there are 525 families who live on cardamom cultivation in suburban villages without adequate income. However at present Cardamom cultivation is at a decreasing trend, thus restrictions should be continued. Frequent vigilance over the issue is a must. However, farmers who are involved in such cultivation should be introduced to other income generating ventures

Woodlots for firewood can be established to minimize the problem. Moreover, efficient burners which utilize lesser volumes of fuel-wood also can be introduced.

Sub watersheds

The area of the Moragahakanda watershed is 259 sq. km. The total number of Grama Niladari (GN) Divisions in the Moragahakanda watershed area is 40 which can be grouped into 8 sub watersheds for the convenience of planning process in this study.

The sub watersheds were identified based on the following factors;

(i) The total watershed area was categorized into four sub sectors - Inundation area, Lower Catchment area, Middle area and Upper Catchment Area

(ii) Then Sub Watersheds (SW) were identified based on their location, the hydrological & social factors. SW-1 is located in the inundation area. SW 2, 3 & 5 are located in the lower catchment and in the buffer zone. SW 4 & SW -6 are located in middle catchment and SW-7 & SW-8 are located in upper catchment area.

Adoption of conservation techniques in a watershed could enhance the productivity and minimize the rate of watershed degradation. However, policy reforms, institutional adjustments, long term financing for watershed management, is required to encourage and sustain such enhanced productivity in the long run. In the watershed management planning process, it was focused on sub watershed units for convienience & efficiency.

Watershed Management Unit (WMU), structure & responsibilities

It is recommended to form a watershed management unit for Moragahakanda area at MASL office Naula under the River Basin Management Division.

The following are the main responsibilities of the unit;

(i) Study the existing policies and regulations and formulate concepts, strategies, policies and legislations for integrated watershed management activities.
(ii) Ensure coordination among agencies at central, middle and field level. Take leadership in coordination and implementation activities.
(iii) Resolve watershed management problems and issues at various levels on various aspects – technical, social, legal, financial, administrative etc.
(iv) Increase the capacity of line agencies including training and guiding activities.

VOLUME 2 : MITIGATORY ACTION PLAN

The Existing environment – Moragahakanda catchment

Floral diversity

The watershed of Moragahakande reservoir and its command area are situated in the floristic regions twelve, three and two- Knuckles, northern and intermediate lowlands and the dry lowlands, respectively. Agroecologically this area belong to the intermediate lowlands, midlands and uplands and the dry lowlands. Two major natural vegetation formations in the proposed project area are moist monsoon forest and the dry-mixed evergreen forests. **Table 5.1** illustrates the tree species found in Moragahakanada catchment area. Most of the forest patches in the project area is degraded due to the forest clearance for chena and vegetable cultivation.

The downstream area of the proposed project lies mainly in Pollonnaruwa district and the natural forest type found in the region is dry-mixed evergreen forest which is the typical dry zone forest dominated by species such as Palu (Manilkara hexandra), Wira (Drypetes sepiaria, and Burutha (Chloroxylon swietenia).

There are narrow strips of tall forests found along the banks of Amban Ganga, Kambarawa ganga and other streams. *Terminalia arjuna* (Kumbuk) is the most common riverine species. Other species such as *Polyalthia longifolia*, *Madhuca longifolia, Diospyros malabaricum* (Timbiri), *Nauclea orientalis*, *Mangifera zeylanica* (Etamba), *Garcinia spicata*, *Diospyros ferrea*, *Homonoia riparia*, *Pongamia pinnata* (Karanda), *Hydnocarpus venenata* (Makulla), and *Vitex leucoxylon* (Nebada), are found in these forests.

Tree savanna or Damana grassland dominated by grass cover and scattered trees is characteristic vegetation formation found in south-east of Moragahakanda upper catchment.

Faunal Diversity

Faunal diversity within the project area is fairly high. This is to be expected as project sites encompases undisturbed forest, scublands and reverine vegetation and abandoned chena land in the area. In addition this area fringe with Knuckles Conservation Area. Aquatic environment is home for a total of 16 fish species including six endemic fish 4 endangered species (Puntius bimaculatus (E), Puntius srilankensis, (E. Puntius martenstyn (E)and. Schistura notostigma (E). Reptilean fauna includes 13 species three endemic and three endangered species. Catotes varsicolor Catotes ceylonensis Hemidactylus spp Five species of Amphibians and 41 species of butterfly fauna can be encountered.. Birds found to be the most abundant vertebrate taxa within the area it provide home for at least 77 avifaunal species and wide array of mammal specie

The major threat coming to biodiversity from the reduction of these forest areas would be from associated habitats for wildlife. The areas especially located in slopes that extend up to Knuckles Range is home for wide variety of species. The southern end of the project is more vulnerable as it links with Knuckles Conservation Area.

Protected areas

Apart from that, project area is surrounded by a number of important protected areas anmely, Knuckles Conservation area, Wasgomuwa, Minneriya Giritale sanctuary and Elahara Sanctaury (Corridor). All

these protected areas have been established with Environmental Impact targets and serves as habitats for displaced wildlife under the Accelarated Mahaweli Ganga Development Project. Some of these areas are likely to be effected due to the implementation of the present project. There are number of different categories of protected areas are located just adjacent to the project.

The water requirements

Lahmeyer report documented that the current and possible future needs for **irrigation water** in the Systems H, I/H, M/H, D1, D2 and G in the northern area of the country fed by diversions from the Amban Ganga at Bowatenna, Elahera and Angamedilla. These investigations showed that overall cropping intensity in these areas averages around 155%, varying significantly from year to year, depending upon the availability of water.

In addition to this annual variability, it was found that shortages in water supplies to Systems H, I/H and M/H. It was also noted that there was some potential scope for improvement in use of the currently available water through modification of planting schedules, increase in irrigation efficiencies and greater crop diversification.

At the stage of Lahmeyer (2001) study, it was considered to settle the displaced people from the inundating area of the proposed project & 41 families within the elephant corridore located at the northern part of the project site (**Fig 1.7**) at the proposed settlement area at Medirigiriya. At that initial stage about 756 displaced personal have given their consent to settle at Medirigiriya. However during the progress of this consultancy assignment this situation changed due to new circumstances in the Medirigiriya area as described below:

- Due to CRF problems at Medirigiriya
- Human elephant conflicts
- The proposed settlement location is closer to LTTE area & security problems in the area

GOSL & MASL considered these situations & now it is decided to settle the displaced inhabitants of the project site at Kaluganga left & right banks.

The flora at Medirigiriya area

The settlement areas in Medirigiriyia consist of scrublands, teak plantations, secondary forest near Etambe oya police post, Patolakotuwa, and Gemunupura area. Secondary forest and scrubland near teak plantation (225464 E, 332443 N, 51 m altitude) towards Ambagaswewa

(227679 E, 332539 N) showed the typical dry zone species found in secondary forests such as Wira, Ehela, Boradaminya, Katupila, Seru, Keliya, Bolpana, Kuratiya, Maila, Burutha, Palu, Kon, Karamba, and in moist areas Helamba, Dunumadala, Kolon, Lolu, Kohomba and Hulanhik. This forest patch extends towards Hurulu forest reserve. During the field visits it was revealed that some areas identified for resettlements of families, already occupied by people some years ago and they have constructed the permanent houses.

Wild life

Somawathi Extension National park was established under the accelerated Mahaweli Environmental Project to provide adequate home for displaced wildlife, especially for elephants and also to regulate the floor of the down stream areas. Thus present location at Medirigiriya North will have a tremendous impact on wildlife. It is evident that elephant problems are acute in the said area and it can aggravate the problem.

Kaluganga Left bank and right bank project have impacts on the areas of biodiversity especially on elaphnats. We take measures assuming that there is no severe impact on the region. However, these activities tend to increase the regional conflict and loss of biodiversity in many fold. All the migratory roots and other areas to have a free movement between Moragahakanda catchments and Wasgomuwa lie along the area ear marked for Kalu ganga .This will have serious consequences on Wildlife.

Water issues

The proposed resettlement area is located within the water scarecity area predicted by IWMI (Anon 2000). They have no access to surface water during most period of the year & they depend on the ground water resources. Currently water supply to Pubudugama and Ambagasweva are mainly from ground water sources. **Possible water sources**

Some physical, chemical and microbiological water quality parameters were measured in some selected drinking water wells, tube wells and irrigation tanks. Tested chemical parameters of samples indicated that WHO water quality standards and faecal coliform numbers exceeded the WHO drinking water quality standardsTotal coliform number should be zero for WHO drinking water standard. Thus, it is conceivable that unsafe drinking- water is consumed by the inhabitant of the area..

CRF at Medirigiriya (2006)

It has been found that the sudden increasing tendency of renal diseases in the Medigiriya electorate during 2006 compare to 2003 and 2004. Forty three patients in 2004, 98 patients in 2005 and 322 patients in 2006 have been recorded (Medirigiriya base Hospital data 2006). **Fig. 7.6** illustrates the CRF patients in Medirigiriya.

The causative agent or reasons to increase the number of chronic renal failure patients are not well understood at present and there were no definitive causative factor but believed to be due to some form of toxin. In north central province also, the possible initial event could be a toxin mediated renal damage. At present there are no adequate studies to prove this hypothesis.

Impacts

Moragahakanda Agricultural Development Project activities will take away 29.5 **km^2** of undeveloped, partially developed and developed lands and a few villages with agriculture, to inundation, infrastructure development and for other project related activities & settlement activities. During construction period the displaced villagers has to be settled in proposed settlement areas; in the left or right banks of Kaluganga as suggested by MASL. As a consequence there will be a concomitant loss of biodiversity of those areas and surrounding lands mainly on wildlife and their habitats creating impacts on the environment and the inhabitants.

The Mitigatory action plan

This report addresses selected impacts of the project to fulfill the requirement of the conditions laid down by the project approval letter as mentioned in TOR. Mitigatory activities for the following impacts will be discussed in the present report.

- Controlled felling in settlements areas.
- Small blocks of forests should be left unclear; this will help to maintain favorable microclimatic conditions in the area.
- Roadside, stream bank and avenue planting in the development areas. Suitable tree species will be planted in these areas to provide shade, improve aesthetic value and amelioration of the environment. Timber, fuel wood and fruit tree species will be planted in homesteads.
- Establishing both fuel wood plantations and conservation forest plantations near settlement.
- Establishment of bank conservation along the Elahera-Minneriya Canal wherever needed, using Bamboo spp. and other species suitable for the task.
- Water quality study in Medirigiriya – the proposed resettlement area

Reservoir. Main and Saddle Dams

- Establishment of a 100 m reservation around the perimeter of the reservoir and enrichment with plants found in the neighborhood;

- Establishment of a nursery for the supply of these plants;

- Resettlement of the 41 families in the proposed elephant corridor and dedication of this corridor to elephant migration. (In order to enrich this habitat which has already been used by

humans to a certain extent, the following steps could be taken: planting of grass wherever necessary, eradication of weeds, especially invasive types,

- Enrichment of the habitats in the Wasgamuwa National Park and the Minneriya -Giritale Nature Reserve (should be enriched by way of following activities:
- resettlement of encroachments where necessary and dedication of all other land to forest/wilderness,

- rehabilitation of some abandoned reservoirs and other water courses,

- eradication of invasive weeds,

- planting of grass, i.e. *Panicum maximum*, etc., where necessary).

Activities to mitigate the effect of the project on the elephant population :

- Establishing of elephant corridor between Wasgamuwa, Minneriya, Giritale Nature Reserves Providing extensions to protected areas.
- measures to minimize adverse impacts on the elephant population by establishing elephant corridors and permanent extensions to protected areas.
- Suitable buffer zones will be set up in the peripheral area under protected areas development programme.
- Relocation of house-hold in the elephant corridor.
- A habitat enrichment programme.
- Declaration of the catchment of the Moragahakanda reservoir.
- The flow of the Amban ganga will be regulated to provide adequate water to maintain the ecological balances of the wetlands in down stream areas.

Habitat enrichment and a comprehensive protected area management system

(should be developed covering wild life reserves, buffer zones, forest reserves and elephant corridors in consultation with the Department of Wild Life Conservation and Department of Forestry).

Identification and declaration of wild life and forest reserves and protected areas (should be completed before the commencement of project activities.)

Downstream Areas (IUCN study)

- The downstream areas should be kept undisturbed as it is a good elephant country. Any development in this area should await a comprehensive study of biodiversity.
- The flow of Amban Ganga should be regulated to provide adequate water to maintain the ecological balance of the wetlands in downstream areas.
- Wherever the vegetation cover is not present adequately the stream bank planting programme

proposed for the upper watershed catchment should be carried out.

Mitigatory measures for Soil conservation

Effectiveness of catchment management plan in terms soil erosion control of the Moragahakanda catchment should be studied from the very inception. This type of studies not only identifies the adequacy or inadequacy of the catchment management approach, but also helps to predict the rate of sedimentation of the reservoir, thus forecast storage losses.

Land use recommendations for Morgahakanda catchment were developed by considering long term sustainability of the land and water resources while providing optimum opportunities for the dwellers to utilize the land without degrading the resource potential. Land use options considered were cultivation of other field crops (annual cropping), paddy, tea, export crops, coconut, natural and plantation forestry, horticultural crops and fodder crops. On the other hand, non agricultural uses such as potential areas for urbanization, wild life and other reserves were also considered.

2. Biodiversity Assessment Report of the Moragahakanda Agriculture Development Project – IUCN Sri Lanka, - June 2007

EXECUTIVE SUMMARY

Moragahakanda area and Amban Ganga basins were a part of our ancient irrigation civilization. For example, the Elahera anicut and the Yoda Ela were first built by King Mahasena (275-301 AD) and later renovated in the early 1940's.

The Moragahakanda Agricultural Development Project (MADP) project site is located near Elahera in the Matale district of the Central Province. The Project constitutes the final stage of the Master Plan to fully harness the water resources of the Mahaweli Ganga, Sri Lanka's largest river basin. The main goal of the MADP is to provide increased water supplies to drought-prone irrigation schemes in the North Central and Eastern Provinces of Sri Lanka.

Moragahakanda project involves the construction of a dam, about 65 m high, and two saddle dams with a total crest length of around 1,200 m on the Amban Ganga tributary, creating a reservoir with a storage capacity of some 570 million cubic metres. In addition to irrigation, provision has been made for water supplies to major towns in the region, and a 20 MW hydropower station.

In detailed field surveys, 406 flowering plant species, belonging to 93 plant families, were recorded in the project area. Among them were 29 endemic species, 14 nationally threatened species and 247 medicinal plant species. Six major vegetation types were identified in the project area with the tropical moist evergreen forests being the dominant vegetation type.

Vertebrate fauna totalling 272 species, belonging to 84 families, were recorded in various habitat and vegetation types in the project area. There were 47 endemic and 42 nationally threatened species among them.

The Project area is located at an elevation between 170 and 500 m above mean sea level and is mostly composed of metamorphic rock. The average annual rainfall is about 1900 mm received during the monsoons.
The main surface water body of the area is Amban Ganga and Kabarawa Oya, its main tributary. Rainfall, run off, land use, and evapo-transpiration are the most important factors that affect the availability of surface water in the project area.

Some water bearing alluvial deposits (sandy and gravely deposits) are present along the Amban Ganga. Data indicates that the average yearly fluctuation of groundwater level is approximately 3 to 6 meters. The groundwater recharge mainly depends on the infiltration from the surface water bodies of the project area. Dug wells located in such areas have a reasonably high yield.

Water samples from tube wells, dug wells and streams have been taken into consideration, and they are reasonably free of hazardous conditions. The geochemical maps of Calcium (Ca) and Sodium (Na) are more or less similar, and the ions are more concentrated within the Kongahawela area. The total hardness ranges from 208-373 ppm and the alkalinity from 250-364 ppm. The electrical conductivity (EC) is high at 787µS/cm. The fluoride concentration values in the project area are scattered and falls within a narrow range 0.25-1.02 ppm. Major threats to the biodiversity of MADP can be identified as habitat degradation, deterioration, modification, direct exploitation of flora and fauna and spread of invasive species. Declaration of the catchment of MADP, and the wider landscape linking Knuckles and Minneriya-Giritale Nature Reserve as a National Park will help to mitigate major threats to the biodiversity of the project area. Erecting electric fence on the perimeter of Western and Eastern boundary of the proposed park will help to decrease the potential human elephant conflict due to the development activities. Introduction of appropriate local area development policies for likely industries can also minimize impact on biodiversity.

3. **Detailed geological study with respect to the land stability of Moragahakanda Agricultural Development Project - National Building Research Organization (NBRO) Nov.2008**

EXECUTIVE SUMMARY

According to the condition 4.7 of the second extension to the environment clearance for the proposed Moragahakanda Development Project, the Mahaweli Authority of Sri Lanka (MASL), requested NBRO to perform a detailed geological study with respect to the land stability of the project area.

The objectives are to study the landslide potential of the area, preparation of landslide hazard zonation map along with the development guidelines, and propose mitigation methods, if necessary, to implement the Moragahakanda Development project assuring the safety of its project components and their surroundings against land stability.

The total study area is 115 sq km and the duration of the study was twelve weeks. MASL provided a contour map indicating locations of the project components and a certain amount of geological and data which they have already collected in the past. In addition, NBRO utilized 1:10000 scale topographic maps generated by the Survey Department and 1:100000 scale geology maps generated by the Geological Survey and Mines Bureau and conducted a field survey for collecting additional data.

NBRO's methodology on evaluation of landslide hazard potential is based on the predominance of Bedrock Geology, Surface Deposits, Hydrology and Drainage, Slope Angle Range, Land Use and Land Forms towards initiating or progressing a landslide.

The Project area is predominantly underlain by Quartz, Quartzo-feldspathic gneisses, Khondalite (Garnet Sillimanite), Marble (crystalline limestone), Charnockite/Charnockitic gneisses, and Granitic Gneiss. Most of the ridges found within the study area are almost parallel to the strike and both dip slopes and scarp slopes were observed. A prominent fold was recognized along the Eastern boundary of the catchment. Activated fault fractures and highly weathered lineaments which are commonly associated with large destructive landslides were not observed within the project area.

The project area consists of residual soil only and the presence of colluvium was not observed during the field study. The depth of overburden deposits of the area underlain by and adjacent to the proposed reservoir is about 2 – 3 meters. The surrounding mountains consists residual soil deposits that are less than 2 meters deep.

The average annual rainfall of the study area is 1500 mm to 3500 mm. The drainage characteristics of the sub catchments of the study area indicate low to moderate potential for slope instability.

Slopes within the study area are not steeper than 40^0. More than half of the study area belongs to a flatter terrain and majority among the rest of the slopes also are not steeper than 17^0.

About 63% of the land in the study area is covered by forest. Only about 8% of the land is used for human settlements and home gardens. At a few locations of the study area mica mines and old feldspar mines were also observed. Observations indicate that the human intervention within this project area is very low at present.

The study area is an undulating plane which contributes less towards slope failures. The rest of the land belongs to complex and dissected hilly mountains which has medium contribution towards landslide potential.

No past landslides or any form of unstable features other than surface erosion on modified slopes were observed within the study area during the time of investigation. No visible signs of subsidence such as cracked walls and floors of houses, sink holes and depressed ground surfaces were found within the project area during the time of field investigation. The analysis of data indicates that, about 56% of the project area is safe from landslides and about 43% of the project area consist low hazard potential. Most part of this area will be inundated when the reservoir is filled. About 1% of the area is with medium landslide potential and recommendations have been given in this report for mitigating such areas.

A few karstic features which are shallow and with limited lateral extent were present on the surface of observed marble bands. With the filling of reservoir and the increased water pressure, the extent of these cavities could be increased and close observations are necessary during the maintenance stage of the project.

Planting a tree species with broad leaves and deep roots and protecting all the slope cuts that are higher than 1.5 m along the stretch of the road with a suitable retaining structure, or by reducing the slope gradient are recommended as mitigating measures. The foundation of the dam that crosses the Marble bands and any solution cavities found or identify during the construction work should be grouted. When the reservoir is filled, the periphery of the reservoir should be kept as development or construction free area. Slopes surrounding the project area should be declared as a sanctuary or a forest reservation to further maintain the slope stability potential.

4. Updated Final Resettlement Implementation Plan 2010 - Moragahakanda Agricultural Development Project

i. Executive Summary.

1. Background of the Project and Goals & Objectives

a. Background

This Project which was a project identified under the survey of Irrigation & Hydro Power Potentials of the Mahaweli Ganga & the Adjoining River Basins during the 04 year period of 1965- 1968 by a UNDP/FAO team with Sri Lankan counterparts is yet to be completed. This is a key project in the "*Mahinda Chinthana Policy"* of year 2005 and hence the government decided to commence work on this project in year 2007.The Project is located in the Naula Divisional Secretary's division of Matale district of Central Province. The proposed reservoir will be constructed across Amban Ganga at a place called Moragahakanda with a water storage capacity of 570 MCM. At present, the construction work of the deviated road and Saddle dam No. 2 has begun.

With the construction of this reservoir & other peripheral works, around 1581 nos of families & fair extent of developed lands will be directly affected. In order to resettle these Affected Persons (APS) and to compensate their losses and also to fulfill the Part 4C of the National Environment Act No 72/22, a Resettlement Implementation Plan (RIP) is formulated with a view to minimize the adverse effects of resettlement and restoration & upliftment of livelihood of the APS.

The RIP deals with acquisition & compensation, relocation/resettlements and economic rehabilitation processes of the APS of the Moragahakanda Project, inclusive of other entitlements. The policy frame work of the RIP is based on National Involuntary Resettlement Policy (NIRP) and related enactments on land acquisition and land alienation. In addition, MASL has incorporated certain other provisions in terms of the powers & functions vested by the Mahaweli Authority Act of Sri Lanka No.23 of 1979. Besides, the land alienation and compensation policies adopted by MASL during the period of Accelerated Mahaweli Development Program were also taken into consideration for the preparation of RIP. The data contained in the RIP are based on the findings of the socio economic surveys carried out by MASL in the years 2006 & 2008 and from the Acquisition Surveys (under Section 2 of Land Acquisition Act) done by the Survey Department in the year 2009. The RIP was compiled by the officials of MASL with the assistance of a Resettlement Consultant who had closely associated with the resettlement activities of the Accelerated Mahaweli Development Program.

The main stakeholders of the project namely, Divisional Secretaries of Naula/ Elahera/Laggala Pallegama/ Medirigiriya, District Secretaries of Matale/ Polonnaruwa, officials of Ministry of Lands and Land Development, Land Commissioner General, Chief Valuer, respective Grama Niladaris (GNs) in the Project area , other relevant officials of the affected institutions , Buddhist priests and community leaders of the affected area were also consulted during the preparation of RIP.

b. Goals & Objectives.

The principle aim of the RIP is to address the social impacts and ensure the successful restoration and improvement of the living standards, income earning capacity and production levels of project affected households.

The main objective of the RIP is to mitigate the Socio-economic impacts of the Project.

2. Resettlement Impacts.

Out of several Socio Economic Surveys, 1581 nos of families have been identified from Tank-Bed Area, Road deviation, elephant corridor, Electricity Transmission line and Branch channel Trace of Kaudulla LB Extension Area.
As the majority of the APS are occupied in the Agriculture Sector, it will be most appropriate to involve them in the same sector, even in the resettlement areas. This would be the best means of restoration of their livelihood as land is an income resource to them.
The extent of the affected area is of 4153ha.(including Tank Bed, Road Deviation, Elephant Corridor, Electricity Transmission line & Branch Channel trace of Medirigiriya) of which the percentage of developed extent is 31% whereas only 29% is under the tenure ship and the balance constitutes state lands.
There are 1679 nos of structures affected by the project. Out of 1581 nos of families, 161 nos are vulnerable families who need special assistance. There are few social infrastructure facilities which will be affected by the project, which are currently being serving both affected & non affected persons.

3. Legal Frame Work for Land Acquisition and Resettlement

The Land Acquisition Act of 1950 with amendments is a the statutory law which empowers the GOSL to acquire private land required for public purposes. The projects under the Accelerated Mahaweli Development Programme also made use the same provisions of this Act to take over the private lands for the developments. The compensation paid for APS of those projects was not attractive as depreciated value was paid for the structures. However, the Circular No 4/2008 issued by the Ministry of Lands and Land Development has additional provisions to pay enhanced benefits to the APS of

this nature. Further, the NIRP guidelines which were effective from year 2002, have been applied in the resettlement planning of this project. The land alienation policy will be in line with the Land Development Ordinance & the Crown Land Ordinance. Furthermore, MASL has fixed a cut-off date of 2008.01.20 for the entitlement criteria of lands.
Based on the above policies / guidelines, following assistance schemes will be introduced for the income restoration and livelihood improvements of the APS.

- Training
- Employment opportunities in the Project
- Special assistance to vulnerable families
- Job restoration grants
- Business grants to owners of business establishments
- Ex-gratia payment for households opted for System 'D'

In addition, a Revolving Fund will be established for micro-financing facilities for needy people.

An Entitlement Matrix has been prepared for different categories of APS incorporating all above benefits.

4. Relocation Options

The lands in System 'F' &'D' have been identified for the re-settlement of the APS. The System 'F' is located in Matale District close to the Moragahakanda Reservoir and System 'D' is located in Polonnaruwa District under the Kaudulla LB Extension Area. Generally 80% of the APS have opted to System 'F' whereas 20% have given the choice to System 'D'. Only 03 households requested lands at Ambana Area Centre which is close to the Moragahakanda Reservoir. In the host area of System 'F', there are 358 HH living at present whereas 628 HH live in Kaudulla Extension Area.

The HH occupying the homestead & farmstead areas in the new settlement area will be accommodated to the same individuals as much as possible with less disturbances to them.

5. Economic Rehabilitation & Income Restoration.

For the long-term sustainability and economic rehabilitation of the APS, the following new ventures will be introduced / encouraged:-

i) Off-farm activities, like fish farming, gem mining
ii) Establishment of small scale agro based industries.
iii) Market oriented crop diversification.
iv) Hi-tech agriculture.
v) Involvement in other income generating activities during off seasons
vi) Establishment of service provider entities.

6. Consultation & Grievance Redress Mechanism

The Consultations and awareness programs have been conducted amongst the project affected people during last 02 years. This process will be continued until the APS are resettled in new settlement areas. After the resettlement in the new areas, the respective Resident Project Manager will continue these programs during the balance part of Resettlement process through the several types of Committees proposed in the RIP.

7. Institutional Arrangement for Implementation of RIP.

Basically, MASL as the Executing Agency is responsible for the implementation of the Land Acquisition & Resettlement. A Project Director's (PD) Office has been established at the field for efficient implementation of the programme. The Acquisition and Resettlement Division (A&R Division) of this office will carry out the acquisition and initial functions of the resettlement activities.

Gradually, these resettlement activities will be handed over to respective RPMS and A & R Division will confine only to the acquisition process until its completion. Several Community Consultative Groups (CCGs) will be established at the project for the facilitation of proper implementation of A & R activities.

The land acquisition and resettlement will be monitored both internally by MASL and externally by an independent body with the objective of receiving feed back to the project management on the implementation and identifying problems, failures & successes.

8. Implementation Schedule.

The dam construction will span over a period of 5 1/2 years and the resettlement activities will be completed one year before the dam construction is over. Hence, acquisition & compensation process will be completed prior to the commencement of resettlement activities.

9. Investment Budget.

The total Investment Budget for Land Acquisition and Resettlement covers following components:

i) Cost of Compensation
ii) Cost of Electricity supply restoration for isolated villages.
iii) Cost of Resettlement and relocation.

iv) Cost of Training and Income restoration
v) Cost of Agriculture Extension.
vi) Cost of Monitoring and Evaluation
vii) Cost of Institutional Development

As a total, the total budget of resettlement and compensation is expected Rs. M 3283.102.

10. Issues Partly Covered or Not Covered at all.

There may be few issues either partly covered or not covered al all in this RIP. Such issues will be dealt on individual basis when they are confronted during the implementation of the RIP.

Summary of Recommendations

1. Owners of acquired land and properties will be entitled for compensation package under Circular No. 4/2008 issued by the Ministry of Lands and Land Development.

2. The sizes of farmsteads & homesteads will be 0.6 ha. & 0.2 ha. respectively in System 'F' or 'D'.

3. The Households and sub families occupying the affected area prior to the cut off date (20.01.2008), will be entitled for farmsteads & homestead in System 'F or 'D'.

4. The business community running the establishments prior to the cut off date (20.01.2008), will be entitled for business premises in new service centers of System 'F', 'D' or Ambana.

5. The affected temples will be provided 0.8 ha of highland for re-establishment of such temples in System 'F' or 'D'. All affected temples will be entitled for a farmstead. If the extent of paddy land acquired is above 0.8 ha, such temples will be entitled for an additional farmstead. All affected temples will be entitled for materials worth of Rs. 200,000 for reconstruction of temples.

6. The Ande owners above 0.2 ha extent of paddy land will be entitled for a farmstead & homestead in System 'F' or 'D'. Owners of such acquired paddy land above 0.4 ha will be entitled for farmsteads & homesteads in System 'F' or 'D'. The Ande owners whose extent of land is below 0.2 ha will be entitled for a compensation payment for the loss of Ande right plus an additional 2/3 of the compensation payment.

7. The salvage materials and trees (except in 100m buffer zone) of acquired properties will be released to the households free of charge.

8. The households who will opt to System 'D' are entitled for an ex-gratia payment of Rs. 50,000/=.

9. A paddy land owner whose extent of land is 0.4 ha or a highland agricultural land owner whose land extent is above 0.8 ha and who is living outside the project area will be entitled for a farmstead & a homestead in System 'F' or 'D' or compensation payment plus an additional 2/3 of the compensation payment maximum up to Rs. 2 million.

10. The resettler families in new settlements will be entitled for a shifting allowance of Rs. 10,000/=, housing allowance of Rs. 20,000/= and latrine allowance of Rs. 5000/=.

11. Each main family and a sub family will be entitled to two lorry loads & one lorry load of transport facilities respectively.

12. The persons who lose their jobs due to the project activities will be entitled for Rs. 3000/= per month upto a maximum period of 06 months.

13. All Vulnerable HH numbering 161, will be entitled for Rs. 25,000/= each as a income restoration grants. The Vulnerable HH (elderly & disabled) numbering 14 (out of the above 161 nos), will be entitled for a living allowance of Rs. 3000/= per month over a maximum period of 18 months.

14. A Revolving Fund valuing Rs. 25 million will be established for micro financing of the small scale businessmen and entrepreneurs.

15. All informal businessmen will be paid Rs. 10,000/= each as an ex-gratia payment.

16. Special training programmes will be conducted for the APS

17. Priority will be given to the APS in employing for project construction activities.

18. Affected public utilities will be re-established as necessary.

19. Special assistance schemes have been accommodated for encroachers, rented households and households occupying houses in leased lands.

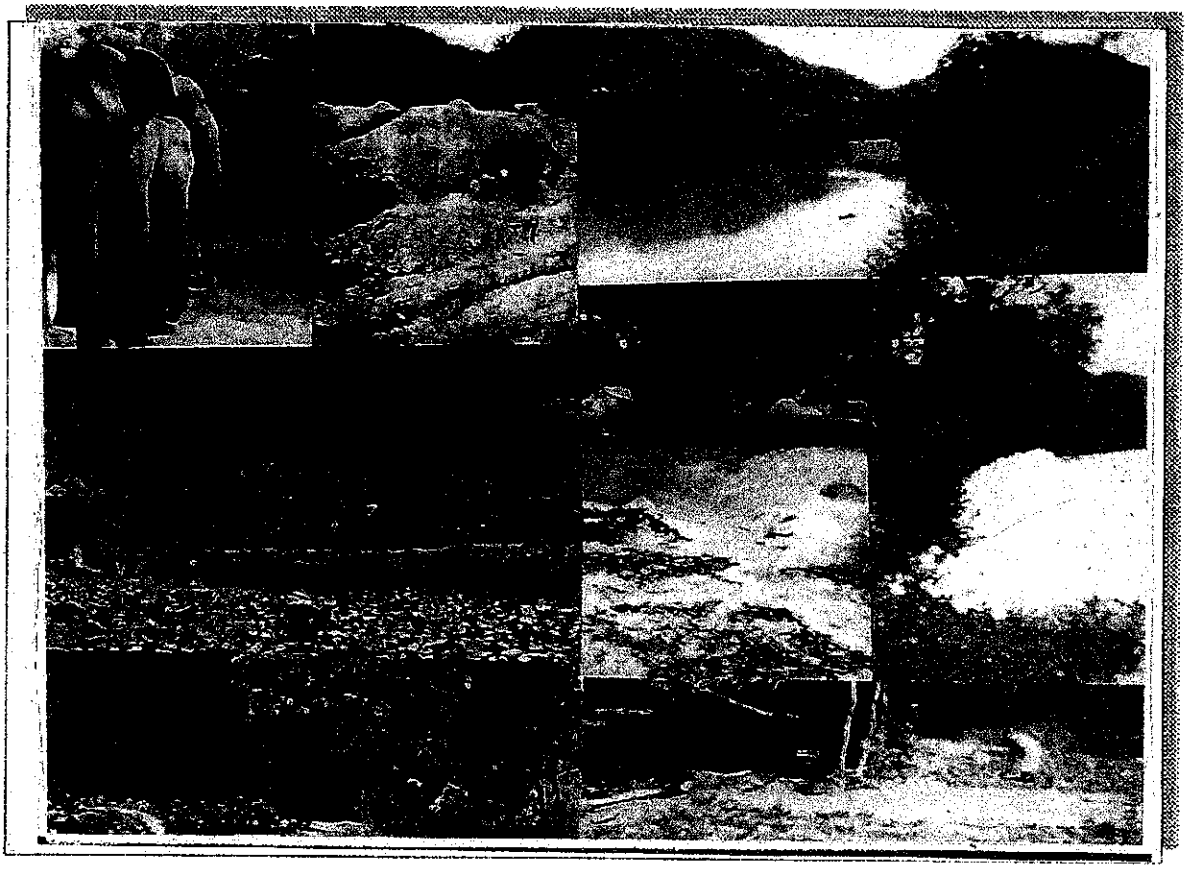
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FINAL REPORT

(Volume I – Main Report)

on

MORAGAHAKANDA AGRICULTURAL DEVELOPMENT PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT



Submitted to

MAHAWELI AUTHORITY OF SRI LANKA
MINISTRY OF MAHAWELI DEVELOPMENT

by

TEAMS
Consultants in Development
(Technology, Engineering, Agriculture & Management Specialists)

TEAMS (Pvt) Ltd. P. O. Box 262 Colombo, Sri Lanka **October 1998**

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EXECUTIVE SUMMARY

Background

The Moragahakanda Agricultural Development Project (MADP) is one of the five major components of the Accelerated Mahaweli Development Programme. The project was planned to augment irrigation water supplies to 67,900 ha in systems H, 1H, MH, G, D1 and Kaudulla Scheme.

Environmental Impact Assessment (EIA) of development projects is a pre requisite for project approval. As specified by the National Environmental Act an EIA was conducted on the AMDP as a whole in 1980 including the Moragahakanda area. Since the MADP is to be implemented 16 years after the EIA, the Central Environmental Authority (CEA) has advised Mahaweli Authority of Sri Lanka (MASL) to prepare a separate Supplemental Environmental Report for Moragahakanda. The present study is undertaken to satisfy this requirement.

The Project Approving Agency (PAA) has mentioned that the Supplemental Environmental Report submitted by MASL meets the requirements stipulated for an Environmental Impact Assessment (EIA) and requested that the Report to be treated as Moragahakanda Agricultural Development Project, Environmental Impact Assessment Report.

Scope and Approach of the Study

The consultants conducted a scoping exercise based on the TOR designed by CEA and submitted by MASL. The under mentioned areas were identified as areas of possible environmental impacts.

Wild life, forest cover, geology and hydrogeology, quality of water and soil, human settlement, downstream water users.

Temporary effects were identified as resulting from construction activities and influx of labour force. The scope of work, and reporting formats were finalised in consultation with the MASL and the CEA. A library survey of all available data was carried which helped to identify additional information needed for the study. Based on these requirements a work plan for the study was prepared, methodology defined and the work schedule of individual consultants was determined. The impacts and mitigatory measures proposed by the consultants have been discussed and a monitoring plan was then developed to ensure that the mitigatory measures would be adopted by the executing agency. The collective inputs have been brought together in the agreed format as the Environmental Impact Assessment Report.

The Moragahakanda Agricultural Development Project Environmental Impact Assessment Report is in three Volumes, Volume 1 the main report, Volume II - Maps, Volume III - Photographs.

Aim, Objectives and Scope of the Project

The Project aims to maximize the potential agricultural benefits through the efficient use of land and water resources.

The objectives of the Project are;

- to increase and stabilise yield and production in major irrigation schemes served by the Project through a regular water supply and proper irrigation and drainage management,
- to increase agricultural production by expanding new agricultural land and augmenting irrigation water supplies,
- to create employment opportunities in the command and resettlement areas through agricultural development,
- to settle displaced farmers in the newly reclaimed areas, and
- to improve the living standards of the affected people through increased agricultural production, income and the employment.

This is to be achieved by constructing a dam 61M (maximum height) across the Ambanganga a major tributary of Mahaweli Ganga at a narrow gorge approximately 2km upstream of the Elahera anicut. The net storage capacity of the reservoir is expected to be 500 MCM.

Dam and Reservoir

The reservoir proposed under the JICA study was designed to store 686 MCM of water at a 71m head. Storage comprised of 782 km^2 catchment runoff and the diversion from Polgolla of 57.5 M/Sec (2000 cusec) via the tunnel.

Nedeco Study of 1979 has set a limit of 875 MCM per year as possible diversion from Polgolla based on long term average flows as the balance water was designed to go to Victoria Randenigala and Rantambe for power generation at a rated heads of 190m, 78m and 31.5m respectively.

Originally Polgolla diversion was kept at 1538 mcm to give Moragahakanda a storage of 902.8 MCM as per the JICA proposal.

The present proposal envisages a reservoir of 500 MCM with a 61m dam.

A reduced storage will indicate a dam below 61 m in height and consequently a lower full supply level and therefore a reduced area covered by reservoir from the 28 Sq km defined.

Since the reservoir bed in the 1989 JICA proposal will be reduced the number of families to be displaced will be also less and the possible water losses from the reservoir bed will drop.

Capital costs of the headwork and infrastructure, road diversions and re-settlement of evacuees will be reduced as well the duration planned for such construction.

Construction Phase

The main construction activities which have a direct impact on the environment are:

- clearing and site preparation
- dam construction, main and saddle dames
- spillway construction
- erecting buildings
- construction of roadways
- establishing the irrigation net works

Jungle clearing will be confined to small extents at the dam sites. More extensive environmental effects will be in borrowing earth and excaving rock. About 2.4 m^3 of coarse aggregate has to be prepared for their construction of the concrete gravity spillway and other appurtenant structures. This will need large quantities of rock, heavy drilling, rock blasting and movement of vehicles.

Settlement Area Development in System D1 - Kaudulla

Construction work will include earth moving for canal and road construction using heavy equipment. Land levelling in any form would disturb the top soil to prevent erosion during the first rains the resettlers must be placed in their new locations to start a limited cultivation in the cleared lands.

There will be extensive earth work involved in canal and road construction. The canal bund slopes will be turfed the new roads however will be subjected to erosion and may have to be graded until stabilised.

Operation Phase and Management System

The proposed Moragahakanda Reservoir will be maintained by the Director, Head Works stationed at Digana, through his field officers. The operational policy decisions are made by the Water Management Panel (WMP). The WMP is advised by the Water Management Secretariat (WMS) which is a technically specialised body.

At systems level H and G Water Management is by MASL. While systems I.H and D1 are managed by the Irrigation Department.

Description of the Affected Environment

The Moragahakanda Project Area has been a centre of an ancient hydrological network. Four villages, Radawela (Rajawela) Kumarakanda, Nawanaliya and Kambarawa affected by inundation have direct historic links. Yet, there are no worthwhile edifices or monuments of archeological value that require special attention.

Kumarakanda has been identified as an important source of medicinal plants containing 79 varieties of rare medicinal plants. This area needs conservation but is outside the inundation area.

Physical Features

The project area is characterized by a tropical monsoonal climate, with little temperature variation through out the year. The mean annual relative humidity is about 80 percent which vary from 70-88 percent. The daily maximum velocities range from 5.5 km/hr. in November to 16.4 km/hr. in June.

The area receives rainfall from both monsoons with 75 percent falling within the North East monsoon. The average annual rainfall is 1594 mm.

Topography

The Moragahakanda Reservoir bed is in gently sloping terrain while the catchment area in its upstream reach is mountainous terrain surrounding Matale and Naula.

Drainage

No special drainage channels are constructed in the Mahaweli areas such as System H and G, nor are such drainage systems designed and installed for System IH or D1. System IH is a collection of tanks in Anuradhapura and each tank utilises the existing natural stream for drainage. Similarly in System D1, each major tank utilises the existing natural drainage system.

In Systems H and D1, too, the existing oyas and streams are used for drainage. No artificial improvements are done to these streams.

In System H, the Kalawewa basin drains into Rajangane wewa.

Soils

Reddish brown earths (RBE) is the predominent soil in systems D and G. Low humic gleys (LHG) occupy valley bottoms. LHG soils develop over the low lying old alluvium in systems D and G and are found in association with RBE soils in a cantenary sequence. Solonetz are found in system D together with lithosols in rock knob plains (RKP) and mountains.

The LHG soils are imperfect/poorly drained alluvium suitable for rice cultivation. RBE soils are mostly well drained or poor drained depending on the location. Solonetz are not suitable for irrigated farming.

Geology

One of the main features of the Dam site area is the occurrence of relatively large bands of marble/crystalline limestone, interlain with garnetiferous gneisses. These are on the left limb of a folded structure (The Teligam antiform) (Map 3.2.7a).

Generally the dam site area - main dam, saddle 1, saddle 2, is criss crossed by fractures. These are aligned in north east-south west and north west-south east directions (Map 3.2.7c).

The area to the north east direction of the dam and saddles shows little or no drainage. The north western slopes of the north west abutment of saddle 2 is highly karstic.

The western edge of the reservoir is traversed by two conjugate shear planes. The above indicate structural weakness of the area geologically. (Map 3.2.7a)

Mineral Resources

The Project Area is rich in Minerals. Mica, Silica Quartz and Fledspar are mined for commercial purposes. The extraction of these minerals have not received sufficient attention from governing authorities or agencies, the result being unsystematic mining and under utilization leading to derelict land. Most of these resource areas, broadly are, within the 200 m contour level and will readily be submerged under the estimated high flood level of 186 m elevation (above m.s.l). The Kambarawa mineral resources mainly Mica and Silica Quartz are located in hills generally above the 300 m elevation and therefore would not be subject to inundation by the proposed reservoir water.

Gemstones

Gemstones belonging to corundum and garnet families are found in-situ at shallow depths, mostly within 1-2 m. The contact zone between underlain marble and other rocks, particularly pegmatites appears to be rich in gemstones. Another in-situ type gem occurrence was noticed about 01 Kilometer north-east of Diganakanda

Brick and Tile Clay

A reddish clayey soil suitable for brick industry is available at Kumbiyangaha -Ela at Kongahawela. There is a potential to expand the local brick industry.

Graphite

There is evidence for graphite mineralization. The area is suitable for further geological and geophysical exploration.

Flora

The natural vegetation types in the affected area cover an area of approximately 5450 hectares. This includes natural plant communities in dense forests, sparse and open forests and grasslands. Based on the climatic conditions of the area five major natural vegetation types have been identified. These are as follows;

a. Moist Monsoon Forests:
   Annual rainfall 1800 m.m. - 2500 m.m.
   canopy density over 70%
b. Dry Monsoon Forests:
   Annual rainfall 1000 m.m. - 1800 m.m.,
   canopy density over 70%
c. Sparse and Open Forests
   Not a natural vegetation type,
   canopy density/less than 70%
d. Grass Lands - Damana and Villu Grass Lands:
   Annual rainfall less than 1800 m.m.

Moist Monsoon Forests are generally found in the Reseroivr Area while dry monsoon forests sparse and open forests and grass lands found in the command area.

Monsoon forests are characteristics of the intermediate zone where the annual rainfall range is 1800 mm to 2500 mm at the eleviation less than 1000m. About 70 percent of the proposed Moragahakanda reservoir area is covered with this type.

There are a number of endemic plants in the reservoir area.
There are about 30 ha of Eucalyptus plantation in the Reservoir area.

Floral diversity, endemic, endangered/threatened plant species in the affected area

Moist monsoon forest types found in the reservoir area are relatively rich in floral diversity in comparison with the natural forests found in the command area. A total of 92 plants species have been recorded of the area. This includes 5 species of creepers, 14 species of herbs, 29 species of shrubs and 44 species of trees. A total of 8 endemic plant species including one creeper, 2 herbs, 2 shrubs and 3 trees have been recorded. None of the species recorded from the reservoir area falls under the category of endangered or threatened species.

Command Area

Dry monsoon forest type found in the command area are less in floral diversity than in the reservoir area. Total of 71 plant species have been recorded in the Dry Monsoon Forests found in the command area. This includes 8 species of creepers, 4 species of herbs 13 species of shrubs and 46 species of trees. Total of 8 endemic plants species were found in this forest type. This includes one creeper, one herb, and 6 tree species. Two threatened plant species have been recorded from this area.

A total of 60 plant species were recorded in the sparse and open forests found in the command area. This included 5 species of creepers, 4 species of herbs, 25 species of shrubs and 26 species of trees. Only 2 endemic plant species were found in these forests. Two threatened plant species were also recorded from the sparse and open forests in the command area.

Around 47% of the plants recorded in the forests within the proposed reservoir area have some form of economic importance such as medicinal plants, food, timber or trees used for agricultural implements. In addition, all the woody plants in these forests have some economic value at least as fuel wood which is not discussed in this report. According to the recent survey carried out by the Forest Department, in the intermediate zone and dry zone forests food collection rates by the people living in the vicinity of forest areas are relatively high. Around 60-65 percent of households collect some form of food plants from the forest. But the data collected from the survey of the forests in the reservoir area does not confirm this. Few species of food plants have been identified from the area.

Fauna

According to the field investigations there are 5 endangered species and two threatened species (IUCN Red Data Book) within the Moragahakanda Area. This area provides the habitat for a number of important species such as Puntius ceylanensis, Calotis ceylonensis, Red faced malkoha.

Elephant Population in the Project Area

The elephant is now in the category of "endangered species" (IUCN Red Data Book). It has been reported that approximately 800 elephants inhabit the Mahaweli areas (TAMS 1981). But field observation and other information support the argument that the elephant population is much higher than the estimated number (800 heads).

Ground surveys confirm high elephant activity in the area. The elephant population is estimate 100 animals.

Species Diversity in the Project Area

The Morahakanda Project area and its environment still harbours 100 - 125 elephants (*Elephas maximus*) (Wildlife Officials communication). Other animals include a fair number of Sambar (*Cervus unicolor unicolor*), Spotted deer (*Axis axis*), Mouse deer (*Tragulus meeminna*), Wild boar (*Sus scrofa*), Grey langur (*Presbytis entollus*), Toque monkey (*Macaca sinica*), Porcupine (*Hystrix indica indica*), Grey mongoose (*H. edwardii Lanka*), Ruddy mongoose (*H. smithii zeylanicus*), Civet cat (*Veverricula indica mayori*), Black naped hare (*Lepus nigricollis*), a few Leopards (*Panthera pardus fusca*), and Indian Pangolin (*Manis crassicaudata*) as well. This area is an important habitat for birds too.

Migratory routes

This area forms a part of the corridor through which the elephants travel from Wasgomuwa to Minneriya Giritale Nature reserve. Ground information reveal that unlike in the other areas this project area provide fodder for elephants throughout the year and hence migration of elephants to this area, especially during the dry months is the norm. There is some disagreement regarding the exact size and nature of the herds, but there seems to be a semi-permanent herd of 30 to 40 elephants within the proposed nature reserve. The migratory herds, consisting of several herds, do considerable damage to crops and threaten human lives in adjoining areas.

Human Elephant Conflict

Following areas were identified as more sensitive areas for human elephant conflict as those areas are located adjecent to the elephant activity areas.
Kambarawa, Elahara, Kiri oya, Pubbiliya, and Kongahawela Talagoda.

Human Settlement

Affected People

People most affected by the Project will be residents living within the proposed reservoir area. Their economy and social life will be totally disrupted. Under the low dam option 1064 families in 951 households (including encroachments) are likely to be resettled.

Affected economic and social infrastructure

A total of 432.1 ha of paddy land and 497.4 ha of upland will be lost. According to both local and official views these include some of the most fertile land. A list of land owners and lands lost are shown in Appendix 2. The lands are located in 12 DN Divisions. More than the economic loss farmers show a strong attachment to their lands for historic reasons. Paddy cultivation is a special way of life which accounts for people cultivating paddy despite the low economic return of their harvest.

Farmers use, cattle and buffaloes as farm power. It has not been possible to ascertain whether farmers will sell their animals or take them into the resettlement areas. A percentage of animals will be sold, which means that new sources of farm power will be needed in the resettlement areas.

Construction of the reservoir will affect the established irrigation network of the area, causing loss to cultivated land in a number of villages. There is the likelihood of the anicut across Kambarawe ganga being submerged affecting 104.8ha land cultivated under both banks of the river, while another 76 ha irrigated from Ambanganga will be lost. The Palagoda Amuna off Ambanganga and the Kongahawela anicut from Kalugal Oya too will be affected.

As the settlements are very old, a number of well established social institutions are serving the population in the area. They are shown in Table 4.6.2 and 4.6.3. They will be affected in whole or in part due to inundation of the area.

MASL will develop an area of about 2000 ha or more in D1 which will be sufficient to meet the requirements of the 1064 families of 951 house holds. MASL will provide the necessary infrastructure facilities needed by settlers.

Impact of Construction Activities

Both positive and negative impacts can be expected from construction activities. The main features of construction will be the establishment of borrow areas, rock quarries, transportation, and generation of sediment.

The identified borrow for impervious material lies between 700m and 1700 m from the dam axis in the scrub jungle areas on the left bank of Elahera-Minneriya-Yoda Ela close to the 20th mile post on the Pallegama – Naula Road. This area lies in the proposed extension of the Minneriya, Giritale, Sanctuary.

The quantity of impervious material required for the core zone will be small, about 400,000 m^3 while another 200,000 m^3 of selected earth is required in the up stream earth zone and a further quantity is needed for coffer dams.

There are no settlements in the proposed borrow areas.

Two rock quarries have been identified, one on the northern slopes of a hillock 1000m. upstream of the dam axis. The second quarry will be located on the lift bank of Amban ganga on the southern slope of the Moragahakanda hill. Both quarries are covered with forest. There are houses about 600m way from quarry number 2, but they will be subsequently submerged.

The proposed borrow for filter and material and fine aggregate is on the right bank of Amban-ganga.

This area will be subsequently inundated, the overall the impact due to borrowing or quarrying have minimal effect on people and property. During the construction period, the life will be disturbed, but proper landscaping including reforestry will be planned to minimize the negative effects.

Transport of Material

Distances to be traveled in transporting material is about 1.5km as the 'crow flies'. The operational area in which major construction activities will take place is about 3.5 km x 3.2 km. in extent. There are between 12-15 houses on the 22nd mile on the Naula – Pallegama road which will feel the impact of dust and noise. However these houses will be inundated once the reservoir is completed and the effect is therefore temporary.

A number of road crossings and at least one river crossing will be involved in transporting material. The regular vehicular traffic on the Pallegama – Naula main road will be some what affected.

The haul road will be watered to keep down the dust.

The haul road used for transport of borrows material and quarry material has to specially constructed using compact base course materials to withstand the type of hauling equipment.

Generation of Sediment

Sediments will be generated at the dam base haul roads and borrow areas, due to erosion by rain. Coffer dams would be formed upstream and down stream of the dam site obviating the erosion material reaching the Elahera anicut downstream.

Dam Site

Available drilling and adit data indicate that the area is underlain with limestone, block faulting is also specifically stated.

These may promote serious leakage problems if a substantial storage reservoir is built. Solution cavities already reported will increase and storage water will enter underground acquifers.

Grouting test result plan from 6 holes drilled near dam axis show that lugeon values vary from 169.7 to 167.5 indicating porosity.

The survey to carry out drill holes was made presumably in 1958-68 period. The position has changed since then with the reservoir area being exploited for gems, feldspar and mica. These operations may have punched through the impervious zones of lugeon values of less than 1.

These activities will have to be stopped when construction work begins. The people engaged in these activities will lose their employment unless alternate sites are opened.

Beneficial Impact of Construction Activities.

Substantial employment opportunities will be created. It is estimated that about 2000 persons will be employed during peak period. Many services will be established to serve the construction population.

The reservoir will contribute to enhance habitat and bio-diversity. The peripheral forest areas will have more water. This will attract more bird life and support a larger population of wildlife.

Significance of environmental impacts are summarised in the adjoining table, 4.6.4.

Impact and Mitigation

The significant impacts and suggested mitigatory measures are summarized in the accompanying Fig: 5.3.

Monitoring Plan

The monitoring plan includes monitoring of water quality and levels; watershed monitoring and monitoring the implementation of mitigatory action to minimize impact on flora and fauna.

Further, monitoring of construction activities and resettlement is also included in the plan.

Conclusion

The study team has concluded that the Moragahakanda Agriculture Development Project could be implemented with minimal adverse environmental effects, if the suggested mitigation and recommendations are adopted.

Recommendations

* Updated feasibility study including further geological investigations.
* Preparation of a mineral extraction plan
* Forest clearing to be conducted following the given guidelines
* Enrichment of habitats
* Conducting a biodiversity study
* Conducting a public awareness programme
* Implement resettlement according to the given guidelines.

SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

Table 4.6.4.

Possible Impacts	SIGNIFICANCE				
	Adverse				
	Minor	Moderate	Major	Critical	Beneficial
Physical Environment					
Rainfall & Evaporation	□				
Wind	□				
Water Quality	□				
Sedimentation		□			
Soil Erosion			□		
Water Uses		□			
Vicinity of the Reservoir					□
System H, IH, MH, G & D1					□
Reservoir Bed				□	
Borrow Area		□			
Catchment		□			
Dry Weather Flow	□				
Mineral Resources			□		
Land Use		□			
Biotic Environment					
Flora		□			
Fauna			□		
Human Settlement					
Population			□		
Land Inundation		□			
Farm Animals			□		
Cultivation			□		
Housing			□		□
Infrastructure	□				
Construction Activities					
Borrow Area for Impervious Material			□		
Rock Quarries	□				
Borrow of Filter Material and Fine Aggregates					
Transport of Materials	□	□			
Generation of Sediments		□			
Dam Site				□	
Employability					□
Post Project					
Irrigation		□			□
Agriculture		□			□
Area Development - Elahera	□				□
- Roads		□			□
- Government Building		□			□
- Services	□				□
- Urban Development		□			□

Figure 5.3 Summary of Impacts and Mitigation

SIGNIFICANT IMPACTS	MITIGATION
Soil erosion in the catchment and reservoir sedimentation	Formulate and implement water shed management plan
Loss of storage due to unsatisfactory water tightness in reservoir bed	Detailed investigation to establish extent of grouting
Exposure of permeable zones due to borrow pits in the reservoir bed	Investigate reservoir bed prior to borrowing
Loss of storage water from foundation	Investigation and grout curtaining
Generation of sediments from construction activities	Minimize production of sediments
Loss of a small area of wild life reserve by inundation	Declare adjacent area of similar acreage as wild life reserve
Loss of wild life habitat	Enrich and enhance the carrying capacity of wild life habitats in the area.
Loss of elephant pathways	Allocate land for corridor.
Loss of Human settlements	Establish settlements in D1 Area
Loss of Agriculture land	Provide land in D1 Area
Break down of social life	Social development programmes by MASL
Loss of public building	Provide new buildings in resettlement areas
Loss of other infrastructure	Provide infrastructure in resettlement areas

Abbreviations

AMDP	Accelerated Mahaweli Development Programme
CBO	Community Based Organisation
CEA	Central Environmental Authority
CITES	Convention of International Trade in Endangered Species
DDHS	Divisional Director of Health Services
DP	Distribution Point
DS	Divisional Secretariat
EIA	Environmental Impact Assessment
FD	Forest Department
FFPO	Funa and Flora Protection Ordinance
FO	Farmer Organisation
GN	Grama Niladhari
HFL	High Flood Level
ID	Irrigation Department
JICA	Japanese International Cooperation Agency
LDO	Land Development Ordinance
LHG	Low Humic Gley
MADP	Moragahakanda Agricultural Development Project
MALF	Ministry of Agriculture Lands and Forestry
MASL	Mahaweli Authority of Sri Lanka
MCM	Million Cubic Meters
MEP	Mahaweli Environmental Project
MP	Mile Post
NEA	National Environmental Act
NGO	Non-Governmental Organisation
OFCs	Other Field Crops
OPD	Outdoor Patient Department
OSF	Other State Forests
PAP	Project Affected Person
PCHD	Provincial Council Highways Department
PMU	Planning and Monitoring Unit (of MASL)
PS	Pradeshiya Sabha
RBE	Reddish Brown Earth
RDS	Rural Development Society
RKP	Rock Knob Plains
SD	Survey Department
SEDZ	South East Dry Zone
SLDS	Sri Lanka Demographic Survey 1994 (Conducted by the Department of Census & Statistics
SOF	Sparse and Open Forests
TOR	Terms of Reference
VD	Valuation Department
WMP	Water Management Panel
WMS	Water Management Secretariat

1. INTRODUCTION

1.1 Background

The Mahaweli Authority of Sri Lanka (MASL) commissioned TEAMS (Pvt) Limited to undertake the preparation of the Environmental Impact Assessment Report for the Moragahakanda Agricultural Development Project. Moragahakanda Agricultural Development Project, one of the five major components of the Accelerated Mahaweli Development Programme, is to be implemented as the final phase of the Programme. The Project, while inundating 28.5 km^2, was planned to augment the supply of irrigation water to 67,900 in systems H,IH, MH, G, D1, Kaudulla Scheme and 2000 ha of new land in System D to accommodate displaced families (Maps 1.1 and 5.10.6).

1.2 Mahaweli Development Programme

Development of the Mahaweli Ganga Basin for food production, employment generation and generation of hydro-electric power had been envisaged by the Government of Sri Lanka as far back as the 1960s. A Master Plan for the Development of the Mahaweli basin was prepared by UNDP/FAO and the Irrigation Department in 1968. This plan provided for the irrigation development of 365,000 ha and hydro-power generation of approximately 500 MW. Work on the Mahaweli Development Program commenced in 1970 and the first project, Polgolla Diversion, was completed in 1976. In 1977 it was decided to accelerate the pace of development and the revised Accelerated Mahaweli Development Programme was formulated. This revised programme involved the development of 204,000 ha in 8 irrigation systems and hydro-power development of 470 MW, through the construction of 5 dams including Moragahakanda. However the Moragahakanda project was not implemented under the Accelerated Mahaweli Development Programme and is considered for implementation only now. (MASL, Jun. 1996, Re-appraisal of the Moragahakanda Project).

1.3 Irrigation Development Schemes

The major share of public investment during the 1978-1986 period went into irrigation and agriculture and most of this investment was on the Accelerated Mahaweli Development Programme. Though it was envisaged to develop 320,000 acres for irrigation under the Mahaweli programme, up to 1993 the average cultivated acreage was only 165,000. (Ministry of Lands Agriculture and Forestry, Feb. 1995, National Policy Framework, Agriculture, Lands and Forestry)

Following the completion of the Accelerated Mahaweli Programme the trend has been to move away from investment on new irrigation projects. Rehabilitation of existing irrigation schemes under programmes such as the National Irrigation Rehabilitation Project and the Village Irrigation Rehabilitation Project and handing over the management and maintenance of schemes below the distributory canal level to farmer organizations are the current directions in the government policy. In rainfed areas a policy of irrigating limited extents of land utilizing agro-wells is being vigorously pursued.

The main objective of the irrigation policy is to realize the returns to investment on irrigation through increase in productivity and efficiency in the use of irrigation water, improvement of living standards of the farming community, food security for the nation and general improvement of a sustainable environment through development of social and institutional infrastructure.

1.4 Development of Agriculture

Rice being the staple carbohydrate of Sri Lankans, Agriculture has become almost synonymous with paddy cultivation. About 1.8 million farmers or 10% of the total population are engaged in paddy cultivation. Rice accounts for 45% and 40% of the per capita calories and proteins respectively in the Sri Lankan diet. Hence, in planning for food security by pursuing a policy towards achieving self sufficiency in the major staple,

rice should be a major policy goal.

Dramatic changes have taken place in rice production of the country in the last one and a half decades. The main reasons for this development are area expansion and seed-fertilizer technology. It is significant that the local production met 90% of the rice demand in 1992. It is estimated that the demand for rice in the year 2020 will be 2.63 m mt and to achieve this target at present levels of cultivation the yield will have to be increased from 3.5 to 4.5 t/ha which is a priority in the current agriculture policy recommendations. It is planned to achieve this yield level by increasing the supply of seed paddy-particularly the long aged varieties and increasing cropping intensity by expanding water management through rehabilitation of minor tanks and utilization of ground water.

Other Field Crops (OFC) are also an important group of crops grown under rainfed upland or under minor irrigation schemes in the dry zone. Usually most of the rice farmers are also engaged in OFC production, excepting a small percentage whose main occupation is OFC production, particularly chillies and onion growers and upcountry vegetable growers.

The current policy on OFCs is to increase local production to meet the annual domestic demand and progressively cut down the import of pulses, coarse grains, vegetable oils and livestock feed. In this respect rehabilitating minor tanks and ground water utilization is encouraged.

1.5 Moragahakanda Agriculture Development Project

Reviewing water management some years after the completion of the Accelerated Mahaweli Development Programme it was revealed that inadequate supply of irrigation water to some areas restricted the cropping intensity. Thus, the Moragahakanda Agricultural Development Project was required to augment the irrigation water supply of Mahaweli Systems H, IH, G and where the cropping intensity and yield are below the planned levels.

1.6 Requirement for the Environmental Study

The Government of Sri Lanka with its commitment to Environmental Conservation has activated many programmes towards this end. The National Environmental Act, the establishment of the Central Environmental Authority under this Act, and the National Environmental Action Plan are among the important achievements.

The National Environmental Act requires that large irrigation projects be assessed for their environmental impacts. Further, environmental impact assessment (EIA) of development projects ensure that environmental, economic and social considerations are integrated with the planning and decision making process.

As specified by the National Environmental Act and World Bank guide lines an EIA was conducted on the Accelerated Mahaweli Development Project as a whole in 1980. This EIA assessed the many components of the Project including the Moragahakanda Agricultural Development Project, considering them together.

However, as the Moragahakanda Project is being implemented 16 years after the EIA, the Central Environmental Authority as the implementor of the National Environmental Act, has advised the Mahaweli Authority of Sri Lanka to prepare a separate Environmental Impact Assessment Report for Moragahakanda. The present study is being undertaken to cater to this need of the project proponent, namely Mahaweli Authority of Sri Lanka.

1.7 Legislative Framework

The purpose of the EIA is to ensure that environmental consequences of development projects are recognized and taken into account early in project design so that the sustainability of the project is assured. EIA has also gained recognition as an useful tool for promoting environmentally sound and sustainable development.

The EIA system was administratively introduced to the whole country by a decision of the Cabinet of Ministers in 1984. Subsequently, the statutory introduction was made by an amendment to the National Environmental Act No 47 of 1980. The National

Environmental Act (NEA) was amended by Act No 56 of 1988 to include a provision relating to environmental impact assessment contained in Part IV C of the statute entitled `Approval of Projects'.

Under the provisions of Section 23 Z of the NEA the EIA process applies only to `Prescribed Projects' which have been specified by the Minister of Environment and Parliamentary Affairs in Gazette Extra-ordinary No 772/22 of 24th June, 1993 and is being implemented through designated Project Approving Agencies as prescribed by the Minister under section 23 CC of the NEA. Under section 23 CC of the NEA, regulations have been made by the Minister stating the procedures that should be followed in order to achieve the requirements of the NEA.

The Central Environmental Authority as the agency entrusted with the responsibility of implementing the above provisions of the NEA, will promptly advise the Project Approving Agency of any amendments to the NEA relevant to Part IV C and/or the orders and regulations included in Gazette Extra-ordinary No 772/22.

Part I, II and III of the Schedule ordered under Section 23 Z of the NEA lists projects and undertakings prescribed by the Hon. Minister of Environment and Parliamentary Affairs for which approval shall be necessary under Part IV C of the NEA. The schedule includes `All river basin development and irrigation projects excluding minor irrigation works as defined by Irrigation Ordinance (chapter 453)', and `Conversion of forests covering an area exceeding 1 hectare'. Accordingly, as Moragahakanda Agricultural Development Project is categorized as a major irrigation project and conversion of forest cover exceeding 1 ha is envisaged under the project, an EIA is required for approval of the project. However, as an EIA has been conducted for the Mahaweli Development Project, earlier, the Central Environmental Authority has decided that the current requirement is to prepare an Environmental Impact Assessment Report.

After reviewing the Environmental Impact Assessment Report, the Central Environmental Authority as the project approving authority, will approve the implementation of the project.

1.8 Scope of the Study

A scoping exercise was carried out by the consultants with reference to the Terms of Reference (TOR) provided by the client, Mahaweli Authority of Sri Lanka (MASL). This TOR has been formulated by CEA. This included team discussions of the consultants, meetings with the client and discussions with the Central Environmental Authority. As a result the following were identified as areas that could be subject to significant impacts:

Wild life, Forest cover, Geology and hydrogeology, Quality of water and soil, Human settlements, Down stream water uses.

Temporary effects were identified as resulting from construction activities and influx of labour force.

1.9 Approach to the Study

The preparation of the Environmental Impact Assessment Report was undertaken by a multi-disciplinary team of consultants. After preliminary discussion with the client and the Central Environmental Authority the scope of work to be undertaken and the reporting format were finalized. Based on the scope of work, information already available in the TAMS EIA and other available reports were evaluated by the consultants. This enabled the identification of additional information required and surveys to be conducted. Based on these the work plan for the study was prepared, methodology defined and the work schedule of individual consultants determined. The next stage was the evaluation of impacts identified during the scoping exercise and recommending mitigatory action. A monitoring plan was then developed to encompass all the monitoring activities recommended by the consultants and recommendations and conclusions forwarded after a final discussion of the consultant team. Finally the collective and collaborative inputs of all the consultants were brought together into the agreed format as the Environmental Impact Assessment Report.

1.10. Consultative Meetings

Public consultation is an essential part of the project planning process and is a formal requirement in environmental assessment.

During the Study, interviews were held with groups of villagers as well as with individual farmers and workers who will be affected by the Project. Opinion leaders and public officials were also interviewed and written submissions entertained. List of Persons met is given in Appendix 1.

1.11 Layout of the Report

Moragahakanda Agricultural Development Project Environmental Impact Assessment Report is in three Volumes.

The remainder of the Environmental Impact Assessment Report is as follows.

Chapter 2 gives the details of the proposed activity to be implemented by MASL. The objectives, scope and the nature of the activity is described in this section.

Chapter 3 presents a detailed description of the environment affected by the proposed activities of the project. The physical features, mineral resources, biological resources, and the socio-economic environment affected are established in detail in this chapter.

Environmental Impacts of the project activities are assessed in Chapter 4 of the report. The long term impact on physical resources including minerals, biological resources and the socio-economic environment are evaluated. The impact of construction activities is considered separately.

Chapter 5 proposes mitigatory measures to minimise the adverse impacts identified in the previous chapter.

Chapter 6 presents a Monitoring Programme designed to ensure that the mitigatory measures identified in the previous chapter will be taken up by the Implementing Agency.

Finally, Chapter 7 presents conclusions and recommendations of the Study.

References and Appendices are appended at the end of the present Volume.

Volumes II and III present the Maps and the Photographs related to the study, respectively.

CHAPTER 2: DESCRIPTION OF PROPOSED ACTIVITY

2.1 Aim, Objectives and Scope of the Proposed Project

The Project aims to maximise the potential agricultural benefits through the efficient use of land and water resources.

The objectives of the Project are;

i. to increase and stabilise yield and production in major irrigation schemes served by the Project through a regular water supply and proper irrigation and drainage management.

ii. to increase agricultural production by expanding new agricultural land and augmenting irrigation water supplies.

iii. to create employment opportunities in the command and resettlement areas through agricultural development.

iv. to settle displaced farmers in the newly reclaimed areas, and

v. to improve the living standards of the affected people through increased agricultural production, income and employment.

The proposed Project envisages construction of a dam of maximum height 61 meters across Amban Ganga, a major tributary of the Mahaweli River, at a narrow gorge approximately 2 km upstream of the existing Elahera anicut. The reservoir area has a rather flat topography covered largely by forest. Net storage capacity of the reservoir is 500 MCM.

The command area of the Project comprises, in System H, a total extent of 31,100 ha of land cultivated under the Kalawewa tank, the Dambulla Oya reservoir and the Kandalama tank. No new land will be taken up for development in System H. The proposal is to divert about 250 MCM of additional water into the area through the existing Bowatenna tunnel during yala season to improve the cropping intensity from 1.5 at present to 1.85. It is expected that in an average year, about 10,000 ha of land will be cultivated with other field crops (OFCs) during yala season on account of the Moragahakanda Project.

About 250 MCM of additional water will be supplied to the area downstream to meet the deficit during yala season in Systems G and D1. In addition an extent of 2,000 ha or more laying to the North-East of the Kaudulla scheme irrigable area will be newly developed through irrigation to meet resettler demand.

Taking into consideration the farmers' familiarity with the crops, soil properties, climatic conditions and market prospects in Sri Lanka in the future, paddy will be the

predominant crop promoted in the newly developed areas. However in the yala season emphasis will be on OFCs, to conserve water as well as increase farmer incomes, in the existing lands as well as in the newly opened lands.

2.2 Nature of the Activity

The proposed Moragahakanda Project as stated earlier, envisages construction of a rockfill dam across the Amban Ganga, upstream of Elahera anicut, creating a reservoir with a net storage capacity of 500 MCM. It deviates from the Jica proposal in that it will reduce the area inundated to 28.5 km^2

The maximum height of the proposed dam is 61m reduced from the JICA option of 71m. The earlier project proposal included a power component for an installed power generation capacity of 26 MW.This idea has been dropped.

The main features of the project are given below:

2.3 Dam and Reservoir

The reservoir proposed (JICA study 1989) at Moragahakanda on Amban Ganga, 2 km upstream of the present Elahera anicut was designed to store 686 mcm water, with a 71 m head. The storage was composed of the 782 sq.km catchment run off augmented by the diversion from Polgolle via Bowatenna.

Nedeco Study of 1979 has set a limit of 875 MCM per year as possible diversion from Polgolla based on long term average flows as the balance water was designed to go to Victoria, Randenigala and Rantembe for power generation at a rated head of 190m, 78m and 31.5m respectively.

Originally Polgolla diversion was kept at 1538 MCM to give Moragahakanda a storage of 902.8 MCM as per the JICA study.

The Elahera anicut on Amban Ganga directs Amban Ganga water via Elahera, Minneriya, Yoda Ela to Minneriya and Giritale and on to Kaudulla and Kantale through the facilities already available.

The proposed project envisages the construction of a dam of maximum height of 61m compared with the JICA proposal (1989) of 71m. The nett storage capacity is 500 MCM as against 686 MCM in the JICA proposal.

The project proposes a main rockfill dam and two saddle dams, the first with a concrete gravity spill of maximum height 52m and the second a rockfill of maximum height 31m.

The reservoir area is 28.5 sq.km of gently sloping land largely covered by forest, but also consists of paddy land and some mineral resources.

Since the reservoir bed in the 1989 JICA proposal will be reduced, the number of families to be displaced will also be less and the possible water losses from the reservoir bed will drop.

Capital costs of the headwork and infrastructure, road diversions and re-settlement of evacuees will be reduced as well as the duration planned for such construction.

Dam and Reservoir		**Elevation**
Catchment area	782 km^2	High water level 184 m
Reservoir surface area	28.5km^2	Flood water level 186 m
Gross storage capacity	548 MCM	Low water level 154 m
Nett storage capacity	500 MCM	

Parameters of the Dam

Type	Main Dam Rockfill	1st Saddle Dam Concrete	2nd Saddle Dam rockfill
Crest elevation	188.0m	187.0m	188.0m
Maximum height	61.0m	53.0m	31.0m
Crest length	420m	370m	270m
Dam volume (x10^3 m^3)	2,040	350	370

2.4 Spillway

Overflow weir and stilling basin with 4 no. 17.5mx8.5m gates have been designed for the discharge of 3400 m^3/sec.

The designed flood inflow is 1.2 times the 200 year flood discharge estimated at 4840m^3/Sec. The major physical activity due to the project will be on the main dam site 2 km upstream of the Elahera anicut on the Amban Ganga, in the first saddle crossing the Naula – Elahera – Pallegama road at about 17 km from Naula where the concrete spilway and diversion channel will be constructed together with the rockfill 2nd saddle dam on the left bank.

Moragahakanda – MASL

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construction work includes:

aring, stripping and excavation for foundations, river diversion channel and minor drainage channels.

- Construction of rockfill dams in the main dam and second saddle dam consisting of about 2.4 million 3^m of rockfill with possibly upstream concrete facing, grouting and upstream toe cut off are the major construction activities. The preliminary main dam design shows a centre earth core protected by filter zones, while the massive rock zones provide the strength and stability. Also blanket grouting to 5m and curtain grouting to 30m depth is planned. The rockfill will be compacted in thin layers as in most modern rockfill dams to minimise post construction settlement and distortion.

  An activity which can have appreciable environmental effects is the operation of quarries for excavation of 2.4 million m^3 rock, involving heavy drilling and blasting. There will be another, 400,000 m^3 of coarse aggregate to be prepared for the construction of the concrete gravity spillway and other appurtenant structures.

  The other important construction activity is the building of the concrete gravity spillway and broadening the diversion channel to form the spill tail.

- The most important consideration in dam construction is safety. The areas below the dam need to be protected from the consequences of dam failure or untimely release of the reservoir contents. The foundation of the dam must be stable under all conditions and capable of carrying the weight of the structure.

  Instrumentation is done during construction to enable pore pressures, settlements, deflections and lateral movement to be measured during and after construction.

b. Settlement Area Development in System D1 - Kaudulla

Construction work in about 2000 ha or more in D1 Area will consist of the construction of channels and roads involving excavation of earth using earth moving machinery such as excavators, front end loaders, dozers and other supporting equipment such 'motor graders', compactors etc.

As a pre-requisite to land preparation for cultivation, shrub jungle clearing, and at least first leveling will be done by the project. Clearing of land involves use of dozers, windrowing and burning exposing the soil to erosion depending on the slopes and the intensity of rainfall. The land has only gentle slopes and the work is normally done in the dry season.

However, land levelling in any form would disturb the soil and further expose it to erosion unless the ridges are formed at the same time.

There will be extensive earth work in formation of farm roads. While the channel bund slopes will be turfed, the new roads are subject to erosion.

2.5.2 Operation Phase and Management System

a. Operation and Maintenance of the Moragahakanda Reservoir

The proposed Moragahakanda Reservoir will be maintained by the Director, Head Works stationed at Digane, through officers delegated by him. The operation of water issues for irrigation is handled by the staff of the Director, Head Works based on the operational policy decisions made by the Water Management Panel (WMP). The WMP is advised by the Water Management Secretariat (WMS) which is a technically specialised body.

The WMP makes operational policy decisions and sets the overall cultivation programmes. Once the decisions are made, the diversion and distribution of water and monitoring of the total programme will be done by the WMS.

The construction of Moragahakanda Reservoir allows an additional 200-250 MCM to be diverted through the Bowatenna tunnel to System H. On the assumption that of the total extent of 31,000 ha of land cultivated in System H, and 10,000 ha in yala will be cultivated with other field crops, it is expected that the present cropping intensity of 1.5 will increase to 1.85.

In the area downstream of Moragahakanda too, additional water will be supplied to meet the deficits during yala in Systems G and D1, and cultivation of 2000ha of new land lying to the North and East of the Kaudualla Scheme irrigable area.

The functions of the operational staff at Moragahakanda Head Works will be:

- release of water to System D1 and System G according to the programmes drawn up by the WMS;
- maintain the Dam spill and the appurtenant facilities in the same excellent condition through out its life;
- monitor the pre pressure, internal, vertical and horizontal displacements, stresses and strains, as well as surface movements;
- monitor the behavior of the reservoir bed and slopes.

b. Management System

There is an established system of Water Management in the Mahaweli Systems H, IH, G and D1. System H and G are managed by MASL, while systems IH and D1 are managed by Irrigation Department.

The systems H and G are divided into Blocks and Units. The water distribution under the distributory canal is the responsibility of the farmer organizations (FOs). The MASL supervises the functions in the distributing canal and below, while the engineering arm (earlier MECA and presently the Head Works) supervises the distribution in the main canal.

Bulk issues are made to the systems as planned by the WMS. The water distribution downs stream of the Sluice by the respective RPMM. WMS decisions are made on feedback for water requirements within each system.

The water management in Systems IH and D1 by the Irrigation Department is done on a tank by tank basis. Tanks such as Nachchaduwa, Tissawewa and Nuwara wewa in system IH are fed in bulk and the water management, under each tank and main canals, is managed by the ID with the FOs being responsible for water management in the distributory canals and below.

In System D1 bulk issues are made to Minneriya, Giritale, Kaudulla and Kantale tanks. The water management in distributory canal and below is the responsibility of the FOs.

CHAPTER 3: DETAILED DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Historical and Archaeological Significance

HISTORY REVISITED

The skills of our ancestors in building anicuts across the Mahaweli and its tributaries are really amazing. Among them the most ancient is the Elahera Anicut built across the Amban Ganga to convey the life giving water to the Minneriya Tank. The honour of being the first to attempt to divert water to the Rajarata, falls on Vasabha who ruled around 65 AD. King Mahasen, around 275 AD, renovated and extended the Elahera canal to feed Minneriya and Kaudulla tanks built by him.

King Agbo II, by linking the Elahera Canal to feed Giritale and Minneriya created an incomparable irrigation network.

The Angamedilla Anicut constructed by King Upasena in 368 AD to make the lands bloom in the Rajarata is a distinctive feature. Initially the water was conveyed to Topa Wewa. At a later date, the manner in which King Parakramabahu the Great (115 AD) improved the canal system to feed Parakrama Samudra by joining Erabadu Wewa. Dambulla Wewa, Topa Wewa and Nika Wewa is now a legend. Haththota Amuna built across Kalu Ganga, a branch of the Amban Ganga, having made the land fertile along its path was linked to the Elahera Canal. According to history, this anicut was the work of King Agbo II (608 AD).

The proposed Moragahakanda Project Area had been at the centre of a hydrological network of the ancient population. The presence of a number of small tanks in a cascading system and a number of anicuts is living testimony to the existence of old settlements in the area. Hattotu Amuna and Elahera Anicut continue to support a large extent of agricultural lands in Raja Rata. Four villages affected by inundation have direct historic links. Radawela (Rajawela), Kumara Kanda, Nawanaliya, Kambarawa are historic names. Yet there are no worthwhile monuments of archaeological value, that call for attention.

A pathway used by King Dutugamunu passed through Ambana. Elagamuwa. Thalagoda and Ambana were battle-fields and provided safe places for princes during the time of King Vijayabahu 1 and King Parakramabahu The Great.

During the historic Matale Rebellion (1848 AD), Guard points had been established at Kongahawela and Talagoda. The first school had been opened during this period. One of the buildings of the Pubbiliya School has a plaque indicating that it was constructed in 1865 A.D.

Kumara Kanda continues to be a source of medicinal plants. This mountain area is said to contain 79 varieties of rare medicinal plants. The area referred to is outside the inundation area.

3.2 Physical Features

3.2.1 Climate

The project area (System H and D) is characterised by a topical monsoonal climate, with little temperature variation through out the year (25^0 C to 28^0 C at Mahailluppallama), with specific dry and wet season.

The daily temperature variation is more significant than the seasonal change (daily maximum range from 28^0C to 33^0C, and the daily minimum range from 20^0 C to 24^0 C).

The mean annual relative humidity is about 80 percent with only a small variation during the year from 75 percent in September to 88 percent in December.

There are two distinct rainfall seasons. North-East winds prevail during the maha season while the South-West winds prevail during the yala season. The daily maximum wind velocities range from 5.5 km/hr in November to 16.4km/hr. in June. Hingurakgoda Meteorological Station in System D show an average annual rainfall of 1594 mm (1949-1994), of which about 75 percent falls within the North-East monsoon season. The variation in annual rainfall during the period under review is significant, ranging from 970mm to 2830mm.

The potential annual average evaporation is estimated at 1850mm.

3.2.2 Topography

Moragahakanda dam site is located at a narrow gorge of the Amban Ganga cutting through a North-South ridge connecting Herathgedera (402m), Moragahakanda (380m) and Wewamana (459m) peaks. The river bed itself is at 130m. There are two knolls situated on the north mountain ridge across the dam site at altitudes of 150m and 180m respectively. The reservoir bed is in gently sloping terrain, though the catchment area in its upstream reach consists of mountains of steeper slope that surround Matale and Naula (Maps 3.2.1 and 3.2.2).

3.2.3 Drainage

No special drainage channels are constructed in the Mahaweli areas such as System H and G, nor are such drainage systems designed and installed for System IH or D1. System IH is a collection of tanks in Anuradhapura and each tank utilizes the existing natural stream for drainage. Similarly in system D1, each major tank utilizes the existing natural drainage system.

In System H and D1 too the existing oyas and streams are used for drainage purposes. No artificial improvements have been done to these streams.

In System H, the Kalawewa basin drains into Rajangane wewa.

3.2.4 Soils

(a) System H

Reddish brown earth (RBE) are predominant (60 percent) in System H with low humic gleys (LHC) in the valley bottom (40 percent). They occur in the catenary sequence in the undulating landscape.

The well drained and imperfectly drained RBE soils are found on the convex upland and mid slopes, respectively while the poorly drained, LHG soils are in the concave valleys and bottom lands.

(b) Systems D&G

RBE soils extend over undulating higher elevations in Systems D and G. JICA Study reports that 60 percent of these RBE soils are well drained while 40 percent are imperfect or poorly drained. The lower catena consists of alluvial soils in Systems D1, D2 and A./D the soil texture varying from heavy clay to coarse sand depending on the location. It is reported that 75 percent of these soils are imperfectly/poorly drained. The rest are moderate to well drained, located in river levees and flood plains.

LHG soils develop over the low-lying old alluvium in System D and G and are generally found in association with RBE soils in a catenary sequence.

Solonetz are found in System D, together with lithosols in rock knob plains (RKP) and mountains.

These soils are not suitable for irrigation farming. LHG soils and imperfectly/poorly drained alluvium are suitable for rice cultivation.

3.2.5 Water Resources

The project water resources consist of the runoff from the Amban Ganga catchment and the water diverted from the Mahaweli Ganga through the Polgolla diversion. This water is first impounded at Bowatenna and directed to Systems H, IH and MH areas at the average of 600 MCM which is based on records of flow from Bowatenna Reservoir during 1984-1995 (WMS of MASL). The Amban Ganga has a catchment area of 782 km^2 at the proposed dam site. The average annual runoff at the gauging station at Elahera is 818 MCM ($26m^3$/sec). The flood discharge at the proposed dam site is estimated at 3880 m^3/sec.for a return period of 200 years.

Diversion of Amban Ganga flow is made from the Nalanda reservoir 10km upstream of Bowatenna to the Dewahuwa scheme, which is estimated at 27 MCM annually.

The present fixed diversion policy Polgolla is based on a long term average diversion to Amban Ganga of 875 MCM annually. In years of more than average run-of, it is possible to divert more water, while it may become necessary to reduce diversions, in certain other years.

Water Balance **Annual Inflow (MCM)**		**Annual Outflow (MCM)**	
Polgolla diversion	875	Diversion to Dewahuwa	27
Ambanganga	818	Diversion at Bowatenna	600
		Add. to H area to increase C1 from 1.5 to 1.85	250
		Requirements of G, 'D'	810
Average total inflow	1693	Average total req.	1687

3.2.6 Geology

One of the main features of the Dam site area is the occurrence of relatively large bands of marble/crystalline limestone, interlayered with garnetiferous gneisses. These are on the left limb of a folded structure (The Teligam antiform Map 3.2.7a.)

Generally the dam site area – main dam, saddle 1, saddle 2, is criss- crossed by fractures. These are aligned in North East-South West and North West-South East directions (Map 3.2.7c). A broad limestone band extends through a main dam and sub dam, axis area into reservoir bed. Further it is seen that sub dam 2 also encountered limestone area on the left and right abutment (map 3.2.7a).

The area to the North East direction of the dam and saddles shows little or no drainage. The North Western slopes of the North West abutment of saddle 2 is highly karstic.

The Western edge of the reservoir is traversed by two conjugate shear planes. The above indicate structural weakness of the area, geologically.

3.2.7 Mineral Resources

The reservoir area is known to be rich in feldspar, quartz and Mica. Talagoda area, around the 22 km post from Naula on the Elahera road, has been known for its mineral resources since early 60's. The principal mineral exploited was Feldspar for use in the ceramic industry. More recently, (since the late eighties), Mica resources of the area have attracted commercial interests. As a result deposits north of the river around Medapihilla are being exploited. Further exploration by entrepreneurs led to the discovery of Mica and Silica Quartz around the Kambarawa hills. The latter is the commercialised name for vein quartz. Both Mica and Silica Quartz are exploited for export whilst Feldspar is mined mostly for local consumption (3.2.7a).

The extraction of these minerals have not received sufficient attention from governing authorities or agencies. The result has been unsystematic mining and under utilization of these valuable mineral resources and the dereliction of the land. Photographs in annex show the quarried faces of mineral deposits exploited for Feldspar – a key raw material in the ceramic industry. This quarry is North East of the 22nd km.post on Naulla-Elahera road.

Sporadic extraction of Mica had taken place to the North and South of the Kongahawela area. Many of the pits have been abandoned due to flooding at 3-5m depths (Photograph 44 in Volume III)

Most of these resources are generally well within the 200m contour level and will readily be submerged under the estimated high water level of 186m elevation (above MSL). However the Kambarawa mineral resources, mainly Mica and Silica Quartz are located in hills generally above the 300m elevation and therefore would not be subject to inundation by the proposed reservoir.

These field observations have to be supplemented with more drilling data for a better assessment of the water tightness of the overall dam site area. Location of mineral resources is given in appendix 4.

3.2.8 Extraction of Mineral Resources

Crystalline Limestone (Marble)

At a number of localities within the Matale district, crystalline limestone occurs mostly as exposures of continuous bands. This material may be used to produce lime or fertiliser/soil conditioner, depending on the composition. Marble chips have a further utility in the Terrazzo Industry..

Crystalline limestone occur mainly in the Bowatenne – Ambana areas

Mica

Mica deposits are among the most significant mineral occurrences of the Matale district. Phlogopite is the commonest economically important variety. The mineral is usually found in large Pegmatites associated with Feldspar and Quartz. Mica had been commonly mined. Some of these pits are yet in operation while some others have been abandoned. There are further mining prospects.

The mining and processing techniques are rather primitive and may be a source of health and environmental hazards.

At present mica is exported in its raw form as books or scraps. As there are considerable reserves, it could form the basis of a successful local industry. .. Areas of important occurrences are listed below..

1. Kambarawa (fairly large mica deposits and several working mines exist in the Galbode – Kambarawa area).
2. Moragahakanda (Several important mica deposits are present and the mineralisation can be traced towards Elahera. Many of them are located within the area to be inundated under the Moragahakanda reservoir).
3. Ambana-Gantuna ridge (several minor occurrences of mica have been observed)
4. North of Medapihilla
5. Talagoda (Mica-rich zone runs in the NE direction beyond the district boundary)

Gemstones

Gemstones belonging to *corundum* and *garnet* families are found in-situ at shallow depths, mostly within 1-2m. The contact zone between underlain marble and other rocks, particularly pegmatites, appears to be rich in gemstones. Another in-situ type gem occurrence was noticed about 01 Kilometer North-East of Diganakanda.

Gem mining, according to field informants, is mostly conducted illegally. However, there appears to be a keen interest in semi mechanised river bed and reservoir bed gem mining, in the Moragahakanda sub dam 2 area.

Feldspar

Many of the major Feldspar deposits in Sri Lanka are located in the Matale district. The Feldspar deposits are mostly in the form of pegmatites, sometimes containing a very small amount of Quartz and Mica as well. Presence of radio- active minerals, such as Allanite is also indicated by the high radiation counts.

A well known Feldspar deposit is located at Talagoda and it has been surveyed in detail by the Geological Survey Department. Feldspar from this deposit has been utilized by the Ceramic Corporation and at present there is no mining activity. The mining activity can be reactivated, as more reserves are now available.

Vein Quartz

At Dambagolla in the Naula Division, a large Vein Quartz deposit occurs covering an area of about 10 hectares. A minor part of this deposit has been consumed and a significant amount of good quality Vein Quartz is still available. A thorough evaluation is recommended.

In Medapihilla – Kahagolla, there is a Vein Quartz deposit covering a very large area (about 50 hectares). Vein Quartz from the upper horizons seems to be of good quality but it may degrade with depth. However, this occurrence has to be surveyed in detail.

Other occurences of small to medium size Vein Quartz deposits are located at Kahagolla, Patana and Ambana (near Bowatenna Power Station).

Construction Materials

Most of the charnockitic rocks and gneissic rocks (high-grade metamorphic rocks) can be used as concrete aggregates, road metal or construction material.

Brick and Tile Clay

A reddish clayey soil suitable for the brick industry is available at Kumbiyangaha-Ela at Kongahawela. There is a potential to expand the local brick industry.

Graphite

There is evidence of Graphite mineralisation areas which are suitable for further geological and geophysical exploration.

3.3 Flora

3.3.1 Natural Vegetation Types in the Affected Area

The natural vegetation types in the affected area cover an area of approximately 5450 hectares. This includes natural plant communities in dense forests, sparse and open forests and grasslands. Based on the climatic conditions of the area five major natural vegetation types have been identified. These are as follows:

a. *Moist Monsoon Forests*:
   Annual rainfall 1800m.m. – 2500m.m.
   Canopy density over 70 percent

b. *Dry Monsoon Forests:*
   Annual rainfall 1000m.m. – 1800 m.m
   Canopy density over 70 percent

c. *Sparse and Open Forests*
   Not a natural vegetation type
   Canopy density/less than 70 percent

d. Grass *Lands* – Damana and Villu Grass Lands:
   Annual rainfall less than 1800 m.m.

The distribution of these natural vegetation types within the affected area is shown in Map 3.3.1 and Table 3.3.1.

Table 3.3.1: Distribution of Natural Vegetation Types within the Affected Area

	Vegetation Type	Distribution
a.	Moist Monsoon Forests	Reservoir area
b.	Dry Monsoon Forests	Command area
c.	Sparse and Open Forests	Command area
d.	Grass Lands	Command area

Moist Monsoon Forests:

These forests are characteristic of the intermediate zone where the annual rainfall range is 1800 mm to 2500 mm and the elevation less than 1000m. There is a rainfall peak between October and January followed by a pronounced dry season about three months. This forest type can be seen in the proposed reservoir area. Around 70 percent of the proposed Moragahakanda reservoir area is covered with this forest type.

The dominant tree species found in this forest type are, *Berrya cordiffolia* (Halmilla) *Holoptelia integrifolia* (Godakirilla), *Artocarpus nobillis* (Wal-Del), *Vitex altissima* (Milla), *Filicium decipiens* (Pihimbiya), *Pterospermum canescens* (Welang), *Manilkara hexandra* (Palu), *Chloroxylon swietenia* (Burutha) *Chukrasia tabularis* (Hulan Hik) *Nephelium longana* (Mora), *Melia dubia* (Lunumidella) etc.

Dry Monsoon Forests:

This is the most significant forest type in the command area of the proposed Moragahakanda reservoir. Generally these forests occur in climates with an annual rainfall between 1000m.m. to 1800 m.m. received from October to January with a pronounced dry period of 3 to 6 months. Average temperature is usually more than 26^0 c. Dry monsoon forests include both sub types, dry evergreen and moist deciduous forests in the dry zone. Of these two sub types, forests in the command area include only the moist deciduous category of forests, which are the most wide spread forests in the dry zone. Dry monsoon forests are found in the command area (Polonnaruwa district) and around 85 percent of the command area and reservoir area are covered in both these Categories of forest.

A characteristic feature of this forest type is the presence of emergent dominants, which rise to about 3m. above the general level of the canopy which is 20 to 25m. in height. Most of the emergents are deciduous and semi-deciduous species such as *Chloroxylon swietenia* (Burutha), *Vitex altissima* (Milla), *Sapium insigne* (Telkaduru) *Berrya cordifolia* (Halmilla) *Haldina cordifolia* (Kolon) – *Pterospermum*

suberifolium (Velang) etc. Common evergreen emergents are *Manilkara hexandra* (Palu), *Alseodaphne semicarpifolia* (Wawarana), and *Diospyros ebenum* (Kaluwara). The filler species are evergreens such as *Dryptes sepiaria* (Weera). The under storey is usually composed of semi-evergreen species such as *Garcinia spicata (*Gotukola*)* , *Pleurostylia opposita* (Panakka), *Syzygium cumini* (Madan), *Sapindus emarginatus* (Penela) and *Cassia fistula* (Ehala) etc.

Sparse and Open Forests

This is not a natural vegetation type. Sparse and open forests can fall under any natural vegetation type but canopy density of such forests is less than 70 percent due to human interference. This category of forests is found in the command area.

Grasslands

Grasslands in the command area include damana and villu grasslands. Small extents of these grasslands are found in isolated patches. Villu grasslands are associated with wetland conditions around irrigation tanks, river banks and flood plains in the area. Damana grasslands are a savannah type of vegetation found in the dry zone but differs from typical Savannah. Principal tree species associated with damana grasslands are *Limonia acidissima* (Divul), *Manilkara hexandra* (Palu), *Acacia leucophloea* (Keeriya), amidst Imperata and other grasses.

3.3.2 Total Extent of Forest Cover in the Affected Area

Natural Forests

The total natural forest cover in the affected are includes 2 forest types and sparse and open forests covering around 5450 ha. Total natural forest area that will be affected in the reservoir area and command area are 3565 ha. and 1867 ha. respectively. The extents of various forest types in the affected area are shown in table 3.3.2.

Table 3.3.2: The estimated various forest types and forest plantations in the affected area

Affected Area	Forest Type				Total (ha.)
	Natural forests			Forest Plantations (ha.)	
	Moist monsoon forests (ha)	Dry monsoon forests (ha.)	Sparse and open forests (ha.)		
Reservoir Area (Matale District)	3540	-	45	30	3615
Command Area (Polonnaruwa Districts)	-	1804	63	-	1867
Total	**3540**	**1804**	**108**	**30**	**5482**

The natural forest area that will be inundated is around 3585 ha. This area is found to be a continuous forest adjacent to the Minneriya-Giritale Nature Reserve, located in Matale district.

A list of endemic plant species found in the proposed reservoir area is given in table 3.3.3.

Table 3.3.3: List of Endemic Plants in the Reservoir Area

	Species	Local Name	Group
1	*Derris parriflora*	Sudu Kalawel	Creeper
2	*Leucas zeylanica*	Geta Thumba	Herb (m)
3	*Munronia pinnata*	Bin kohomba	Herb (m)
4	*Cassia kleinii*	-	Shrub
5	*Vernonia Zeylanica*	Heen Getiya	Shrub
6	*Lepisanthes tetraphylla*	-	Tree
7	*Ostodes minor*	Netual	Tree
8	*Tricalysia dalzelli*	Gal seru	Tree

M – Medicinal plant

Forest Plantation

The only forest plantationsfound in the affected are is the 30ha. Eucalyptus plantation in the reservoir area. No forest plantations are found in the command area.

Floral diversity, endemic, endangered/threatened plant species in the affected area.

Reservoir area:

As stated earlier, natural forests in the reservoir area fall under the Moist Monsoon forest type which has a relatively high floral diversity when compared with natural forests found in the command area. Generally these forests consist of significant amounts of endemic plant species as well. It has been reported that the floral diversity and the endemism of moist monsoon forests (found in the intermediate zone) are greater than those of dry monsoon forests (found in the dry zone) but less than lowland rain forests (found in the wet zone).

The field survey carried out in the moist monsoon forests in the reservoir area indicates a fairly high floral diversity in the area. Total of 92 plant species have been recorded from the area. This includes 5 species of creepers, 14 species of herbs, 29 species of shrubs and 44 species of trees. A total of 08 endemic plant species including 01 creeper, 02 herbs,02 shrubs and 03 trees have been recorded. None of the species recorded from the reservoir area falls under the category of endangered or threatened species. Table 3.3.4 provides a summary of information on the plant species diversity recorded from the Moist Monsoon Forests in the reservoir area.

Table 3.3.4: Plant species diversity recorded in natural forests (moist monsoon forests) in the reservoir area.

Group	Number		Endemic Species	Endangered/ Threatened Species
	General	Species		
Creepers	5	5	1	-
Herbs	14	14	2	-
Shrubs	26	29	2	-
Trees	43	44	3	-
Total	88	92	8	-

Command Area

Natural forests in the command area falls mainly into the Dry Monsoon forest type. There are around 1800 ha. of Dry Monsoon Forests in the command area in addition to 63 ha. of sparse and open forests.. Floral diversity of Dry Monsoon Forests is generally lower than that of Moist Monsoon Forests found in the intermediate zone.

Field surveys were conducted in both Dry Monsoon Forests and sparse and open forests in the command area.

A total of 71 plant species have been recorded in the Dry Monsoon Forests of the command area. This includes 08 species of creepers, 04 species of herbs 13 species of shrubs and 46 species of trees. A total of 08 endemic plants species were found in this forest type. This includes 01 creeper, 01 herb, and 06 tree species. Two threatened plant species have also been recorded from this area. These include *Jasminam angustifolium* (Wal pichca), a creeper and *Diospyros quaesita* (Kalumediriya) a tree species. This information confirms the fact that the floral diversity of forests in the command area (dry monsoon forests) is less than that of the reservoir area (moist monsoon forests). Table 3.3.5 provides a summary of information on the plant species diversity recorded in the Dry Monsoon Forests in the command area.

Table 3.3.5:Summary Information on Plant Species Diversity in the Dry Monsoon Forests in the Command Area

Group	Number		Endemic Species	Endangered / Threatened Species
	Genera	Species		
Creepers	8	8	1	1
Herbs	4	4	1	-
Shrubs	12	13	-	-
Trees	39	46	6	1
Total	63	71	8	2

A list of endemic plant species found in the command area (with the forest type) is given in Table 3.3.6.

Table 3.3.6: List of Endemic Plants in the Command Area

	Species	Group	Forest Type
1.	*Jasminum angustifolium* (Wal Pichcha)	creeper	DMF/SOF
2.	*Munronia pinnata*	herb	DMF
3.	*Diospyros quaesita* (Kalumediriya)	tree	DMF
4.	*Discospermum sphaerocarpum*	tree	DMF
5.	*Drypetes gardneri* (Gal Weera)	tree	DMF
6.	*Holarrhena mitis* (Kiri Mawara)	tree	DMF
7.	*Lepisanthes tetraphylla* (Dikkenda)	tree	DMF/SOF
8.	*Mangifera zeylanica* (Etamba)	tree	DMF

DMF - Dry Monsoon Forests SOF - Sparse and open forests

A total of 60 plant species were recorded in the sparse and open forests found in the command area. This included 05 species of creepers, 0 4 species of herbs, 25 species of shrubs and 26 species of trees. Only 02 endemic plant species were found. Two threatened plant species were also recorded in the sparse and open forests of the command area. These are *Jasminum angustifolium (Wal Pichcha)* a creeper and *Xanthium indicum (Agada)*, a shrub. Table 3.3.7 provides the summary of information on the plant species diversity recorded in the sparse and open forests in the command area.

Table 3.3.7: Plant species diversity recorded in the sparse and open forests in the command area.

Group	Number		Endemic species	Endangered/ Threatened Species
	General	Species		
Creepers	5	5	1	1
Herbs	4	4	-	-
Shrubs	25	25	-	1
Trees	24	26	1	-
Total	58	60	2	2

Plants with Economic Value:

Plants in the Reservoir Area:

Around 47 percent of the plants recorded in the forests within the proposed reservoir area have some form of economic importance such as medicinal plants, food, timber or trees used for agricultural implements. In addition, all the woody plants in these forests have some economic value at least as fuel wood (which is not discussed in this report). The survey carried out in the reservoir area recorded 20 species of medicinal plants (mainly creepers, herbs and shrubs) 06 species of plants used for food (leaves, flowers, fruits, seeds and tubers) and 22 species of trees used for timber or agricultural implements. This is an indication that about 28 percent of the plants in the forests have either food or medicinal value and nearly 20 percent have timber value or used for agricultural implements. Many of the food items collected from the forests are consumed as vegetables or fruits. According to a recent survey carried out by the Forest Department, in the intermediate zone and dry zone forests, food collection rates by the people living in the vicinity of forest areas are relatively high. Around 60-65 percent of households are said to collect some form of food plants from the forest. But the data collected from the survey of the forests in the reservoir area show somewhat different results. Only a few species of food plants have been identified from the area. A list of plants with medicinal and food value identified from the area is shown in Table 3.3.8

Table 3.3.8: Edible and medicinal plants recorded from the natural forests in the reservoir area.

Botanical Name	Common Name	Medicinal Use	Edible
Aspuragus falcatas	Hathawariya	*	
Gloriosa superba	Niyangala	*	
Salacia reticulata	Kothala Himbutu	*	
Aerva lanata	Polpala	*	
Curculigo orchioides	Bim-thal, Sudu Kela	*	
Desmodium triflorum	Heen Undupiyali	*	
Fleurya interrupta	Kahambiliya	*	
Leucas zeylanica	Geta Thumba	*	
Munronia pinnata	Bin Kohomba	*	
Phyllanthus debilis	Pitawakka	*	
Vernonia cinerea	Monara-Kudumbiya	*	
Abutilon asiaticnm	Anoda	*	
Calotropis gigantea	Wara	*	
Capparis zeylanica	Wellangiriya	*	
Gmelina asiatica	Demata	*	
Tephrosia purpurea	Kathuru Pila, Pila	*	
Alstonia scholaris	Rukattana		*
Canthium coromandelicum	Kara		*
Cordia dichotoma	Lolu		*
Dimocarpuslongan	Mora	*	
Madhucalongifolia	Mee	*	
Nauclea orientalis	Bakmee, Piyal	*	
Pongamia pinnata	Karanda	*	*
Syzygium cumini	Ma-Dan	*	*
Tamarindus indica	Siyambala		

Plants in the Command Area:

Dry monsoon forests: Around 73 percent of the plants recorded in the dry monsoon forests within the command area have some form of economic importance such as medicinal plants, edible plants, timber or trees used for agricultural implements. The field survey carried out in these forests identified 52 plant species of economic value including 23 species of plants with medicinal value, 7 species of edible plants (plants used for food), 27 species of trees used for timber and 5 species of plants used for agricultural implements. This indicates that around 42 percent of the plants in these forests have either food or medicinal value and another percent of plants have timber value or used as agricultural implements. The results of this survey indicate the importance of dry zone forests (dry monsoon forests) as a source of non-timber forest products such as medicinal plants and edible plants. In addition these forests consist of a large number of woody species which could be used as timber.
A list of plants with medicinal and food value identified in these forests is given in Table 3.3.9.

Sparse and Open Forests:

Around 62 percent of the plants recorded in the sparse and open forests within the command area show some form of economic importance such as medicinal plants, edible plants, timber or trees used for agricultural implements. The field survey carried out in these forests identified around 37 plant species of economic value including 18 species of medicinal plants, 06 species of edible plants, 07 species of trees used for timber and 06 species of plants used for agricultural implements. This indicates that around 40 percent of the plants identified in these forests have either food or medicinal value and another 22 percent have timber value or used as agricultural implements. These results show the relatively low value of these forests in terms of timber and non timber forest products when compared with other forests in the command area and the reservoir area. (Dry monsoon and moist monsoon forests). A list of plants with medicinal and food value identified in these forests is given in Table 3.3.9.

Table 3.3.. ९:. Edible and medicinal plants recorded from the natural forests in the command area (with the forest type)

Botanical Name	Common Name	Forest Type	Use
Asparagus falcatus	Hathawariya	DMF	M (C)
Cissampelos parelra	Diya Miththa	SOF	M (C)
Dregea volubilis	Kiri Anguna	DMF	M (C)
Fleurya interrupta	Kahambiliya	DMF	M (C)
Ichnocarpus fruteseens	Kiriwel	DMF/SOF	M (C)
Jasminam angustifolium	Wal Pichcha	DMF/SOF	M (C)
Salacia reticalata	Kothala Himbutu	DMF	M (C)
Aerva lanata	Polpala	DMF/SOF	M (H)
Curculigo orchioides	Bimthal	DMF	M (H)
Hemidesmus indicus	Iramusu	DMF/SOF	M (H)
Munronia pinnata	-	DMF	M (H)
Vernonia cinerea	Monara-Kudumbiya	SOF	M (H)
Carissa spinarum	Karamba	DMF/SOF	F (S)
Abutilon asiaticum	Anoda	SOF	M (S)
Achyranthes aspera	Karalheba	SOF	M (S)
Glycosmis angustifolia	-	DMF/SOF	M (S)
Calotropis gigantea	Wara	SOF	M (S)
Glycosmis pentaphylla	Wekurundu	DMF	M (S)
cassia tora	Pethi Thora	SOF	M (S)
Gmelina asiatica	Demata	DMF/SOF	M (S)
Ocimum gratissimum	O-Thala	SOF	M (S)
Opuntia dillenii	Katu-Pathok	SOF	M (S)
Sida rhombifolia	Kotikan-Bevila	SOF	M (S)

Solanum melongena	Wambatu	SOF	F (S)
Tephrosia purpurea	Katupila	SOF	M (S)
Alstonia scholaris	Rukattana	DMF	M (T)
Azadiracta indica	Kohomba	DMF	M (T)
Bridelia retusa	Ketakela	DMF	M (T)
Canthium coromandelicum	Kara	SOF	F (T)
Cassia fistula	Ehela	SOF	M (T)
Cordia dichotoma	Lolu	SOF	F (T)
Dimocarpus longan	-	DMF	F (T)
Holarrhena mitis	Kirimawara	DMF	M (T)
Limonia acidissima	Divul	DMF	M / F (T)
Madhuca longifolia	Mee	DMF	M (T)
Mangifera zeylanica	Etamba	DMF	F (T)
Morinda tinctoria	Ahu	SOF	M (T)
Schleichera oliosa	Kon	DMF	F (T)
Murraya koenigii	Karapincha	SOF	F (T)
Sterculia foetida	Thelabu	DMF	F (T)
Strychnos nuxvomica	Godakaduru	DMF	M (T)
Strychnos potatorum	Ingini	DMF	M (T)
Syzygium cumini	Maa-Dan	DMF/SOF	M / F (T)

F - Food Plant M - Medicinal Plant

C - Creeper H - Herb

S - Shrub T - Tree

DMF - Dry Monsoon Forests SOF - Sparse and open forests

3.4 Fauna

Field observations revealed that a wide variety of vegetation types ranging from dry tropical forest to wetlands and grasslands are present within the project area. These types are the result of combination of several factors such as climate, topography, geographical location and edaphic features of the sites. As fauna has great affinity to its habitat type, a wide variety can be anticipated including several species of Endemic fishes, Amphibians, reptiles and birds, small mammals and large mammals. Some migratory birds species are also common during the winter months from October to April of the year.

Ground survey confirmed the presence of fishes, Amphibians, Reptiles, Birds, Mammals and Butterflies listed in Table 3.4.2 within the study area (A more comprehensive list is provided in TAMS report). According to the field investigations Moragahakanda fauna includes 05 endangered species and 02 threatened species (IUCN Red Data Book) within the Morgahakanda Area (Table 3.4.1).

This area provides the habitat for a number of important species such as *Puntius Ceylanensis, Calotis Ceylonensis*, Red faced malkoha.

Table 3.4.1

Species	Distribution in Sri Lanka	Status
Elephant	Dry zone and bordering Wet zone	Endangered in Sri Lanka
Leopard	- Dry zone and bordering wet – zone	- Endangered in Sri Lanka -
Red-faced malkoha	- Dry zone and bordering wet zone	Endangered
Bengal Monitor	Sri Lanka	Endangered
Python	Sri Lanka	Endangered
Purple faced langur	Sri Lanka	Threatened
Toque Macaque	Sri Lanka	Threatened

3.4.1 Elephant Population in the Project Area

Post independent development in agriculture and resettlement, in the dry zone, has been at the expense of wild life habitat. The adverse impact on wild life is most evident in the case of the elephant. Settlement schemes, agricultural and irrigation projects in general have altered, disrupted and reduced food and other critical resources vital for their survival. Equally important is the break in the continuity of habitat which has isolated surviving herds into small pockets increasing the man-elephant conflict.

Today this majestic animal has taken its place in the category of "endangered species" (IUCN Red Data Book). It is also listed in Appendix 1 of the Convention of International Trade in Endangered Species (CITES). It has been reported that approximately 800 elephants inhabit the Mahaweli areas (TAMS 1981). But field observation and other information support the argument that the elephant population is much higher than the estimated number (800 heads).

Interview with experts say that more than 100 elephants move in and out of the reservoir bed area of Moragahakanda. Ground survey confirmed high elephant activity within the area.

Large areas have been set apart for wild life under the AMDP. The MASL along with the DWLC has taken action to translocate small pocketed herds in an attempt to prevent their destruction. The Minneriya- Giritale Reserve to the North, Wasgamuwa to the South East and the Somawathiya sanctuary to the North East of the command areas are the principal areas provided to protect wild life that would be displaced by the project.

A large number of faeces was sited in the porposed reservoir bed area indicating high activity within the area. According to DWLC personnel and other staff there is a consistent pattern of elephant movement due to adequate supplies of fodder and water year round. Field investigations reveal that elephant activity was particularly high close to Ambanganga, as could be expected, due to regular water supply.

Generally the size and the location of the home range depend on several factors such as availability of water, fodder, shade and other critical mineral resources of the area. Presence of high elephant activity indicates that the targeted area for the reservoir provides most of their requirements.

3.4.2 Migratory routes

This area forms a part of the corridor through which the elephants travel from Wasgamuwa to Minneriya, Giritale Nature Reserve. Ground information reveals that, unlike in the other areas, this project area provides fodder for elephants throughout the year leading to migration of elephants into the area, especially during the dry months. There is some disagreement about the exact size and nature of the herds, but there seems to be a semi-permanent herd of 30 of 40 elephants within the proposed nature reserve. The migratory herds, consisting of several herds cause considerable damage to crops and threaten human lives in adjoining areas. Animals take refuge in isolated forests during the day and raid the fields at night in search of food and other resources.

3.4.3 Species Diversity in the Project Area

The Moragahakanda Project area and its environment still harbours 100-125 elephants *(Elephas maximus)* (Wildlife Officials Communication). Other animals include a fair number of Sambhur *(Cervus unicolor unicolor)*, Spotted deer *(Axis axis)*, Mouse deer *(Tragulus meeminna)*, Wild boar *(Sus scrofa)*, Grey langur *(Presbytis entollus)*, Toque monkey *(Macaca sinica)*, Prorcupine *(Hystrix indica indica)*, *Grey mongoose (H. edwardii Lanka)*, Ruddy mongoose *(H. smithii zeylanicus)*, *Civet cat (Veverricula indica mayori)*, Black naped hare *(Lepus nigricollis)*, a few Leopards *(Panthera pardus fusca)*, and Indian Pangolin *(Manis crassicaudata)* as well. This area is an important habitat for birds too. See table 3.4.2 for details of other species.

Table 3.4.2

Fresh Water fishes of Moragahakanda area 26-29th June

	Endangered Species	Endemic Species
1. Puntius sarana	-	-
2. Puntius filamentosus	-	-
3. Puntius bimaculatus (E)	+	++
4. Puntius srilankensis (E)	+	++
5. Puntius martenstyn (E)	+	++
6. Rasbora caveril	-	-
7. Rasbora daniconius	-	-
8. Lepidocephalichthys thermalis	-	-
9. Oriocormis mossambicus (thilapia)	-	-
10. Chela laubuca	-	-
11. Danio malabaricus (pathirana)	-	-
12. Garra phillipsi (E)	-	++
13. Gobius gramafomius	-	-
14. Mastacembelus armatus	-	-
15. Schistura notostigma (E)	+	++
16. Channa punctata	-	-
Reptiles of Moragahakanda Area – 26-29th June 1997		
1. Elpha helena	-	-
2. Elipa helana	-	-
3. Catotes varsicolor	+	++
4. Catotes ceylonensis	+	++
5. Otocryptis wiegmani	-	-
6. Hemidactylus spp.	+	++
7. Varanus varanus	-	-
8. Naja naja	-	-
9. Chrysopelea taprobanica	-	-
10. Mabuya carinata	-	-
11. Ahaetulla nasutus	-	-
12. Common rat snake	-	-
13. Coluber mucosus	-	-
Amphibian fauna of Moragahakanda area 26 – 29th June 1997		
1. Bufo malanostictus		-
2. Limnoneces limnocaharis		++
3. Hoplobatrachus erassus		-
4. Euphtyctis cyanophlyctis		++
5. Philauthus spp.		-

Butterfly fauna of Moragahakanda area 26 – 29th June 1997		Endangered
1. Common rose		-
2. Common cerulean		-
3. Common emigrant		-
4. Lemon emigrate		-
5. Common gull		-
6. Common Indian crow		-
7. Common jezebal		-
8. Common tiger		-
9. Common jay		-
10. Common sailor		-
11. Common mormen		-
12. Common pierrot		-
13. Common leopard		-
14. Common silverline		-
15. Peacock pansy		-
16. Small grass yellow		-
17. Plane tiger		-
18. Psyke		-
19. White four – ring		-
20. Lime butterfly		-
21. Blue tiger		-
22. Glassi tiger		-
23. Three spot grass yellow		-
24. Lemon pansy		-
25. Tawny coster		-
26. Plum judy		-
27. Great banded awl		-
28. Tailed jay		-
29. Dark wonder		+
30. Blue oak leaf (E)		-
31. Glad bye bush crow		+
32. Banded peacock (E)		-
33. Chocklet soulder		-
34. Plumbous silver line		-
35. Black prince		-
36. Blue pansy		-
37. Great orange tip		+
38. Blue mormen (E)		-
39. Red mellody		-
40. Blue glassi tiger		-
41. Common silver line		

Bird species found at Moragahakanda	Endangered	Endemic
	-	-
1. Black crow	-	-
2. Common babbler	-	++
3. Brown capped Babblee	-	-
4. Black fronted babler red vented bulbul	-	-
5. Red vented bulbul	-	-
6. White browed bulbul	-	++
7. Black capped bulbul	-	-
8. Ceylon lora	-	-
9. Golden Fronted Chloropsi	-	-
10. Jerden Chloropsis	-	-
11. Back robin	-	-
12. Magpie robin	-	-
13. Ceylon shama	-	-
14. Ceylon paradise fly catcher	-	-
15. White browed fantail flycatcher	-	-
16. Ceylon tailer bird	-	-
17. Small flowerpecker	+	++
18. Souther magpie robin	-	-
19. Black headed cuckoo-Shrike	-	-
20. White Browed Prenia	-	-
21. Ceylon pied shrike	-	-
22. Franklin prenia	-	-
23. Ashy prenia	-	-
24. Common drongo	-	-
25. Ceylon Black headed Oriole	-	-
26. Ceylon grackle	+	++
27. Common hill Mynah	-	-
28. Common Mynah	-	-
29. Spotted munia	-	-
30. White backed munia	-	-
31. Indian skylark	-	-
32. Purple sunbird	-	-
33. Purple rumped sunbird	-	-
34. Lauten's sunbird	-	-
35. Ceylon Red backed woodpecker	-	-
36. Crimsom backed woodpecker	-	-
37. Yellow fronted Barbet	-	++
38. Brown headed barbet	-	-
39. Indian roller	-	-
40. Green Bee-eater	-	-
41. White breasted kingfisher	-	-
42. Yellow fronted Babler	+	-
43. Small Barbet	-	-
44. Chesnut headed bee eater	-	-
45. White Breasted Kingfisher	-	-
46. Stck-billed kingfisher	-	-

47. Common kingfisher	-	-
48. Tree toed kingfisher	+	-
49. Malabar pied hornbill	-	-
50. Palm swift	-	-
51. Indian edible nest Swift	-	-
52. Pied crested cookoo	-	-
53. Blue faced Malkoha	-	-
54. Common coucal	-	-
55. Rose Ring Parakeet	-	-
56. Ceylon Lorikeet	-	++
57. Aleiendrian Parakeet	-	-
58. White bellied sea eagle	-	-
59. Creasted hawk eagle	-	-
60. Brahaminy kite	-	-
61. Creasted hony Bazzard	+	-
62. Spotted dove	-	-
63. Pompadour Green Pigeon	-	-
64. Ceylon Bronze-wing pigion	-	-
65. Jungle fowl (E)	+	++
66. Ceylon sperfowl (E)	+	++
67. Bush Quail	-	-
68. Busted Quail	-	-
69. White Breasted water hen	-	-
70. Red Wattled lap-wing	-	-
71. White neck stork	-	-
72. Indian darter	-	-
73. Little commarant	-	-
74. Ceylon serpent eagle	-	-
75. Ceylon shikra	-	-
76. Large egret	-	-
77. Green Tree Wabler	-	-

* Key.

\+ Endangered
++ Endemic

3.4.4 Ecologically sensitive areas in the Study Area

In a general sense, virtually the entire project site could be regarded as a relatively important wildlife habitat, as elephants and other species have spread their home ranges through out the area. However, field investigations have revealed that certain sections of the study area play a more important role in terms of specific requirements such as feeding and resting places for elephants, primates and birds. The study area can be considered to be a fairly good habitat for elephants as it contains a considerable number of fodder species suitable for the animals..

In terms of size, the forest habitats make up the largest proportion of wildlife habitat of the study area. Wildlife includes the flora as well as the fauna of the area. These species offer food to a wide range of animals including frugivorous birds, Cervids, Primates, Wild boars and Elephants.

During the field survey, elephant activity was noted in several places of the study area. In addition, appearance of fresh dung indicates the recent presence of a large concentration of elephants, which suggested that elephants moved between habitats through this area. This shows that the area has been a 'corridor' between these wild life reserves.

3.4.5 Human Elephant Conflict

Human- elephant conflict appeared to be more pronounced in the under mentioned areas due to settlements being located in close proximity to areas of intense elephant activity. The areas are.

Kambarawa
Elahera,
Kiri oya,
Pubbiliya
Kongahawela
Talagoda.

3.5 Socio-Economic Aspects

3.5.1 Demographic Features

The population density in the GN Divisions of the inundation area, in 1996, varied from 41 to 213 persons per sq. km. with an overall density of 78.6 persons per sq. km. The corresponding figures, in 1994, for Naula DS Division was 100 and for the entire Matale District was 212. The low density of population in the inundation area indicates the rural nature of the population (Table 3.5.1).

Naula DS Division has a relatively low household size of 4.3 compared to that of 4.5 for Matale District, according to the Sri Lanka Demographic Survey (SLDS)- 1994.

Table 3.5.1 : Demographic Characteristics of the Householders in the Inundation Area and Its Vicinity

GN Division	No. of Families	Population				Area of DS Division (Sq.km.)	Density (Persons per Sq.km.)
		Males	Females	Total	Sex Ratio (*)		
Elgamuwa	190	346	339	685	102.06	3.9	175.64
Galboda	76	126	150	276	84.00	2.2	125.45
Galporugolla	94	158	170	328	92.94	20.2	16.24
Kadawatha	141	263	272	535	96.69	3.2	167.19
Kambarawa	215	424	312	736	135.90	18.1	40.66
Kongahawela	68	123	137	260	89.78	1.3	200.00
Maragamuwa	107	166	183	349	90.71	5.2	67.12
Medapihilla	90	162	166	328	97.59	3.2	102.50
Millagahamullathenna	150	287	267	554	107.49	2.6	213.08
Pubbiliya	105	247	168	415	147.02	5.8	71.55
Rajawela	238	500	450	950	111.11	6.5	146.15
Thalagoda	185	384	356	740	107.87	6.1	121.31
Total / Overall	1659	3186	2970	6156	107.27	78.3	78.62

(*) Number of males per 100 females
Source: Resource Profile. Naula Divisional Secretariat (1996)

Naula DS Division	5,853 (#)	12,215	12,856	25,071	95.0	250.1	100.20
Matale District	93,477 (#)	208,324	214,388	422,712	97.2	1993.3	212.10

(#) Number of Households
Source: Demographic Survey 1994 - Sri Lanka, Release 2 & 3. Department of Census and Statistics, Colombo (1997)

The sex ratio in the GN Divisions of the inundation area varies from 90 to 147 with overall ratio of 107 males per 100 females. According to SLDS 1994, sex ratio in Naula DS Division was 95.0 whereas for the Matale District it was 97.2.

Ethnically and culturally the population shows a homogenous character. Except for three Tamil families – one each in Maragamuwa, Medapihilla and Millagahamullathenna—the rest of the population in the inundation area are Sinhalese. Majority of the population had their origin in the region and are linked to the local population mainly through marriage ties. Very few have come to reside in the area due to their occupation. In-migration has been very low as evident from Table 3.5.2. Overwhelming majority of the families are of the nuclear type and about 1 in 5 have extended families.

Table 3.5.2: Persons by Period of Stay in the Usual Residence

	Period of Stay in the Usual Residence					Total
	<1 yr	1 - <3	3-<5	>5	Since birth	
Naula DS Division	2.3	4.6	3.1	31.1	58.9	100
Matale District	2.5	6.6	4.7	31.6	54.6	100

Source: Sri Lanka Demographic Survey – 1994: Release 3, Department of Census and Statistics, Colombo (1997).

The population in Naula area is more literate than the population as a whole in Matale District. According to SLDS 1994, illiteracy rate in Naula DS Division was 10.9% whereas for the Matale District it was 13.5%.

According to the same source, Naula DS Division had a very low unemployment rate of 4.6 percent compared to 10.5 percent for Matale District.

3.5.2 Housing, Domestic Water Supply and Sanitation

Although the housing conditions and related facilities vary across the GN Divisions, as the following statistics reveal, the overall living conditions in the inundation area are relatively better compared to normal villages.

Temporary houses	19% to 71%	Average 44 %
Houses without access to safe Drinking water	0 to 99%	Average 31%
Houses without latrines	0 to 66%	Average 19%
Houses with electricity supply	0 to 07 %	Average 03%

Source: Table 3.5.3

Approximately 58 percent of the houses are of permanent nature. Permanency is identified according to the material used for roofs and the superstructure i.e. tiles, asbestos/corrugated sheets for the roof, burnt bricks for the walls, plastering and the manner of construction. Sixty nine percent of the households have access to safe drinking water and a high percentage (81 percent) of the residences have latrines. The facility most deficient is electricity. Only 3 percent of the households have electricity.

3.5.3 Land Tenure

Majority of the persons affected by the Project (PAPs) own the lands they occupy. Ownership is through long usage (paraveni). Less than one-third can be regarded as encroachers on state land who do not have any title to the land they occupy. The type of permits held by the occupants of land who have legal titles fall into the following classes:

Private (Sinnakkara)	29.3 %
LDO (Land Development Ordinance) Permits	29.6%
Annual or Temporary Permits	19.1%
Swarna Boomi	16.9%
Nindagam	0.1%
Regularised Encroachments	0.5%
Others	4.5%

Source: "Socio-Economic Census of Affected Dwellers in the Proposed Moragahakanda Project Area "Planning & Monitoring Unit, MASL (September 1996).

Most of the residents who do not have legal title to the land have come to the area prior to 1985. Only about 24 percent of total enchroachers have arrived in the area after this date. This information will help to determine a cut off date for encroachers who will receive full resettlement benefits.

Table 3.53: Socio-Economic Conditions of the Householders in the Reservoir Area and Its Vicinity

GN Division	No. of Houses	% of Temporary Houses	% of HHs without Access to Safe Drinking Water	% of HHs without Latrines	% of HHs with Electricity Supply	% of Families receiving poverty alleviation assistance.
Elgamuwa	180	44.4	34.2	15.8	0	24.7
Galboda	64	59.4	43.4	43.4	0	35.5
Galporugolla	89	34.8	98.9	66.0	0	33.0
Kadawatha	138	59.4	36.9	2.8	0	31.9
Kambarawa	198	19.2	52.1	45.1	0	32.6
Kongahawela	55	25.5	10.3	0	29.4	30.9
Maragamuwa	91	71.4	0	17.8	0	40.2
Medapihilla	73	90.4	22.2	10	0	27.8
Millagahamullathenna	130	53.8	6.7	6.7	6.7	34.7
Pubbiliya	101	14.9	40.0	9.5	0	56.2
Rajawela	235	36.2	14.7	13.9	6.4	39.9
Thalagoda	160	56.3	43.2	8.1	0	20.0
Total/Overall	1514	44.5	31.2	19.4	3.0	34.9

Source: Resource Profile. Naula Divisional Secretariat (1996)

Naula DS Division	5,599	23.7	26.5	11.7	19.1	
Matale District	90,109	18.4	27.1	8.2	27.2	

Source: Demographic Survey 1994 - Sri Lanka, Release 2 & 3. Department of Census and Statistics, Colombo (1997)

The Socio-Economic Census of Affected Dwellers in the Proposed Moragahakanda Project Area conducted in 1996 by PMU of MASL reported that under the High Dam Option 2325 households are within the reservoir area and only 785 have legal title to the land they occupy. Under the Low Dam Option, which will be the most likely scenario of the project, the number of households falling within the inundation area is 951 (Table 4.6.1). The exact number can be determined only after a perimeter survey, which will have to be undertaken at the feasibility stage of the studies.. According to the MASL Socio-Economic Census – 1996, two thirds of the households do not have title deeds to the land they occupy. It can reasonably be assumed that the percentage of encroachers under the Low Dam Option will be about the same, so that 66 percent of the total 951 households could be regarded as having no title to the land they occupy.

3.5.4 Land Use

The land use pattern in the reservoir area and its vicinity is shown in Map 3.5.4. Cultivation is limited to an area less than 5 percent of the inundation area and confined to pockets which have a regular supply of water (streams, canals etc.). This is particularly noted in paddy cultivation. Homestead cultivation is generally rainfed. The better cultivated homestead are however located close to water sources,where water could be pumped easily. Paddy is the main crop cultivated during Maha season. Other field crops (OFCs) such as Chillies, Big Onions, Vegetables and Tobbaco are cultivated in the paddy lands during the yala season. However, in Elagamuwa South area where irrigation facilities are available paddy is cultivated during both seasons. Average yields of the principal crops are shown in Table 3.5.4.

Table 3.5.4: Average Yields of Principal Crops Cultivated in Reservoir Area (mt./ha.)

Crop	Season & Year	Irrigated	Rainfed
Paddy	Maha 94/95	3.02	2.91
	Yala 95	3.76	-
Chillies	Maha 94/95	1.9	2.2
	Yala 95	1.5	-
B'Onion	Maha 94/95	3.6	-
	Yala 95	4.3	-
Vegetables	Maha 94/95	5.3	3.6
	Yala 95	4.8	-

Source: Socio-Economic Census of Affected Dwellers in the Proposed Moragahakanda Project Area. PMU. MASL (Sept. 1996).

Animal husbandry activities are also practised by the householders in the inundation area. The animal population includes 659 neat cattle, 891 buffaloes, 1295 poultry 50 goats and 18 pigs (Table 3.5.5).

Table 3.5.5: Animal Husbandry in the Inundation Area and its Vicinity

	Animal Variety (Number)				
	Neat	Buffaloes	Poultry	Goat	Pig
Elagamuwa	80	60	90	20	10
Galboda	30	300	25	-	-
Galporugolla	36	24	146	-	-
Kadawatha	55	37	223	-	-
Kambarawa	78	132	180	17	-
Kongahawela	10	28	42	-	-
Maragamuwa	60	40	50	-	-
Medapihilla	150	10	50	-	-
Millagahamullathe	40	42	60	6	8
Pubbiliya	60	52	53	-	-
Rajawela	30	106	51	7	-
Thalagoda	30	60	325	-	-
Total	659	891	1295	50	18

Source: Resource Profile, Naula Divisional Secretariat (1996).

3.4.5 Occupational Pattern

According to the Sri Lanka Demographic Survey 1994, Naula DS Division had a very low unemployment rate of 4.6 percent compared to 10.5 percent for Matale District.

Occupational distribution of the persons affected by the Project , according to the MASL Socio-Economic Census 1996 is as given below:

Professional	3.3 percent
Administrative	1.5 percent
Clerical	1.5 percent
Trade	3.6 percent
Services	3.3 percent
Agriculture	78.4 percent
Manufacturing	8.4 percent

An overwhelming majority of the gainfully employed (almost 80 percent) are engaged in agriculture as their main occupation. Production is the second most common occupation of 8.4 percent of the population. They include those in mining of Feldspar, Mica and Quartz. People engaged in agriculture as their main occupation, take up mining and hire their labour as secondary occupations, during the off-season.

Women in the inundation area are better employed than women in other rural areas being gainfully engaged in agriculture, brick making, mica cleaning and sorting, breaking metal and quartz and so forth.

The people concerned have traditional knowledge of paddy farming. Those who have limited access to paddy land, particularly the younger people, have developed skills in the cultivation and marketing of OFCs. The industrial skills prevalent are carpentry, masonry, smithy work and retail trading. These skills could be used profitably by those who move into the new resettlement area.

3.4.6 Health

Under the Naula Divisional Director of Health Services (DDHS), there are two Peripheral (Rural Hospital) Units at Kongahawela and Nalanda and a Central Dispensary at Opalgala.

The leading causes of hospitalization in the Peripheral Units in 1996 are given in Table 3.5.6. The most frequent diseases are associated with the respiratory system and virus infections. Malaria, a vector borne infectious disease, is the second leading cause of hospitalization. About 2 percent of the patients seeking Out-door Patient Department (OPD) or getting admitted to the hospitals, suffer from Malaria (Table 3.5.7).

Out of the water borne diseases, Bacilliary Dysentery is relatively more prevalent in Naula DS Division than Typhoid Fever and Infective Hepatitis, which are less frequent as shown in (Table 3.5.8).

Table 3.5.6 Leading Causes of Hospitalization in Peripheral Units in Naula DS Division 1996.

Rank Order	ICD No.	Disease	Cases	% of Total Cases	Cases per 100,000 population
1	J45, J46	Bronchial Asthma	481	6.6	1.804
2.	B 54	Malaria	371	5.1	1.392
3	J 21	Acute Bronchitis	337	4.6	1.264
4	A 81	Viral Diseases	335	4.6	1.257
5	A 09	Gastro-Enteritis	282	3.8	1.058

Source: DDHS, Naula (August 1997)

Table 3.5. 7 Incidence of Malaria in 1994, `95 and `96

Year	Total No. of Patients with all diseases	No. of Malaria Patients	% of Malaria Patients	Rate per 100,000 population
1994	104,675	2,342	2.24	8,788
1995	101,418	1,536	1.51	5,763
1996	104,617	1,979	1.89	7,426

Source: DDHS, Naula (August 1997)

Table 3.5. 8Incidence of Water Borne Diseases by each Quarter in 1994, `95, `96

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
Bacillary Dysentery:					
1994	138	48	184	273	653
1995	51	85	79	59	273
1996	14	31	15	112	172
Typhoid Fever:					
1994	-	-	1	-	1
1995	2	-	-	-	2
1996	-	1	1	-	2
Infective Hepatitis:					
1994	-	-	-	-	-
1995	-	2	-	-	2
1996	1	-	-	1	2

Source: DDHS, Naula (August 1997)

3.5.7 Infrastructure

The infrastructure and the social institutions indicate that these villages consist of stable communities. The villages are interconnected by roads and paths to an extent which leave the villages rarely isolated (see Map 3.5.7). Buses ply on the main hard surfaced roads, while private van services operate on some of the gravel roads.

The other infrastructure in the inundation area are listed in Table 4.6.3.

3.5.8 Institutional Aspects

As common to the rest of rural Sri Lanka, there are many Non-Governmental Organisations (NGOs) and Community-Based Organisations (CBOs) serving the Naula DS Division which includes the Reservoir Area. In addition to the government instititons, these NGOs and CBOs are engaged in community development, providing rural credit facilities, facilitating (paddy) farming activities, assisting members in distress, engaging in religious activities and so forth. There is however a wide variation in their level of performance ranging from highly active to almost being defunct.

A list of the institutions, NGOs and CBOs which will be affected due to ponding is shown in Table 4.6.2 and summarised in Table 3.5.9. The existence of such a large number of NGOs and CBOs goes to show the participatory characteristics of the rural communities in the inundation area.

Table 3.5.9: Number of Institutions, NGOs and CBOs Affected

Type of Institutions (NGO/CBO)	Number Affected
GN Division	12
Gramodaya Mandalas	5
Rural Development Societies	5
Farmer Organisations	11
School Development Societies	3
Death Donation Societies	10
Sports Societies	3
Youth Societies	3
Thrift and Credit Cooperative Societies (SANASA)	3
Red Cross Societies	1
Samurdhi Societies	2
Lions Clubs	1
Sarvodaya Societies	1
Women's Societies	1
Temple Societies	10

Source: Table 4.6.2

3.5.9 Vulnerable Groups

The information in respect of the major vulnerable groups in the inundation area is provided in Table 3.5.10. Accordingly, there are 402 families receiving Samurdhi assistance and 162 persons receiving Poor Relief Assistance.

Elderly people are usually cared for by the extended family with the result that they are generally not destitute.

Table 3.5.10: Poverty Alleviation Assistance Recipients in the Inundation Area and its Vicinity

GN Division	No. of families receiving specified amount of Samurdhi Assistance					Poor Relief Assistance
	Total	Rs.1000/-	Rs.500/-	Rs.200/-	Rs.100/-	
Elagamuwa	47	-	18	15	14	-
Galboda	19	-	07	07	05	08
Galporugolla	25	-	08	08	09	06
Kadawatha	29	11	03	07	08	16
Kambarawa	53	01	21	21	10	17
Kongahawela	16	01	07	01	07	05
Maragamuwa	25	-	07	08	10	18
Medapihilla	16	03	02	04	07	09
Millagahamullathenna	37	05	17	09	06	15
Pubbiliya	37	03	08	16	10	22
Rajawela	73	10	36	16	13	37
Thalagoda	25	08	02	09	06	12
Total	402	42	136	101	105	165

Source: Resource Profile, Naula Divisional Secretariat (1996).

CHAPTER 4: ENVIRONMENTAL IMPACTS

Major Dams are known to have far reaching consequences on the environment. The immediate environment lost or denied will be known, but some of the long term consequences will come in to effect only once the project is complete. As far as possible all the known and likely impacts have to be studied at the earliest stage of planning. The following environment components are taken up in the present study.

- Physical Environment
- Mineral Resources
- Flora
- Fauna
- Land
- Human Settlement
- Infrastructure
- Construction Activities

4.1 Physical Environment

4.1.1 Climate

Rainfall and Evaporation

The proposed development work would have no significant impact on the rainfall pattern as the reservoir area to be cleared is limited and the vegetation is mainly open dry forest.

About one half of the command area consist of dense forest and the rest is scrub jungle. Although this land area will be cleared it will have no major effect on the evapo-transpiration as the cleared area will be cultivated with paddy and other field crops, during both seasons.

While the clearing of forest areas in the reservoir area will result in the reduction in evopo-transpiration rate, inundation of the area could increase evaporation due to the large water surface created by impounding. The loss-gain effect will be difficult to quantify. Nevertheless, it is known that increased evapo-transpiration tend to increase the thunderstorm activities in the immediate locality.

Wind

In considering the influence of wind on the ecosystem the local wind pattern and velocity plays a major role. In the reservoir area winds are predominantly from the Northeast.

The length of the proposed reservoir is expected to be about 9.2 km North-South and the width about 6.5 km East-West.

In the reservoir area Monsoonal winds during the North East Monsoon appear to be stronger than the South West Monsoonal and inter Monsoonal winds.

The stronger winds could affect the water mixing pattern of the reservoir and disturb stratification. However, the limited open water surface of the reservoir will limit the effect of winds on the reservoir.

4.1.2 Water Quality

Water in the Amban Ganga, which will be stored in the proposed reservoir, has been tested by United States Operations Mission as far back as 1960/1961. The test results indicate low conductivity (<475 US) and Sodium Absorption Ratio (<10). Thus, the water can be considered suitable for irrigation.

The damming of the river to impound its water in the Moragahakanda reservoir would not change the water quality significantly unless thermal stratification sets in.

4.1.3 Sedimentation

Sedimentation of reservoirs occurs naturally but human interventions in the catchment can aggravate the situation. The sediment load of waterways consists of two parts - suspended and bed load. Fine material which is easily carried by the flow is the suspended load while the bed load consist of coarser material which is more difficult to be moved by the flowing water. Suspended load is generally dependent on its availability in the watershed and the bed load on the transporting ability of the stream.

The primary area of sediment yield is soil erosion of the catchment. Sediment yield is increased by steep slopes and rainfall intensity.

With the construction of the Moragahakanda reservoir the main portion of sediment transported from the upper reaches of the catchment will be trapped in the reservoir. If the Amban Ganga is denied of its normal sediment load in the downstream reaches it would tend to scour its bed and cave its banks. However, as the flow will be very much reduced due to storage in the reservoir these actions will be curtailed.

Sedimentation on the Moragahakanda reservoir will not have a very significant impact as the sedimentation is not expected to exceed 15 MCM in 100 years (JICA, 1989). This is approximately 1/3 of the dead water storage of 48 MCM.

4.1.4 Soil Erosion

The annual soil loss from an area depends on the rainfall, erodability, length of slope and gradient , cropping management and erosion control factors. If the soil loss exceeds soil formation the soil fertility would decrease. This is one of the expected adverse impacts of the proposed development activities if the catchment is not properly managed and chena cultivation eliminated in the upper catchment.

4.1.5 Hydrology and Water Resource

Water Uses Downstream of the Elahera Anicut

It is rarely that water would spill over the Elahera anicut to provide flow downstream along the river course. However 12.4 km downstream of the Elahera anicut is the confluence of Kaluganga which has a regular flow and is the main contributor to the diversions to Parakrama Samudra at Angamedilla anicut. Even at present, unless there is a heavy discharge, all the flow along Ambanganga is diverted along the Elahera - Minneriya canal. For this reason the storage of Ambanganga flow in the proposed Moragahakanda Reservoir has no appreciable impact on riparian rights of downstream water uses.

However, Attaragallewa anicut scheme is sited about 5 km downstream of Elahera anicut. Though this scheme consists of 225 ha. it utilizes the leakages and seepage water agumented by 10 cusecs (0.28 cumecs) issue from Elahera anicut.

Elahera town has a water supply scheme, the source of water being the Elahera - Minneriya channel.

There are settlements, along Naula - Pallegama road in the 16th mile and a large settlement at Attaragallewe extending from the 17th to the 19th mile from Naula. They are dependent on wells and boreholes for their water supply.

Impacts in the Vicinity of the Proposed Reservoir

There would be a beneficial effect on the environment around the reservoir, as the presence of a water spread will improve the micro-climate as well as the ground water situation in the periphery of the reservoir.

However there will be loss of water resources to people whose lands will be irrigated. At present 4 anicuts providing irrigation facilities to 273 ha of good paddy land will be submerged together with the domestic wells.

Impacts in systems H, IH, MH, G and D1

The project has a positive impact on existing lands in Systems H, IH, G and D1. The cropping intensity is estimated to increase from 1.50 to 1.85 with the additional water resources made available as a result of the proposed Moragahakande Reservoir.

4.1.6 Reservoir Bed

If the area is to be impounded by a dam, the same weaknesses discovered on dam adits may lead to loss of storage, especially if a head of 61m of water is stored.

In investigating the geological formations it is seen that the band of quartzite rock thins out towards the left bank and is bordered by a similar tongue of gneiss rock, both together enclosed by charnockite. The several tongues of various rock types tapering into other rock types as depicted in the sectional drawing (Vol. II drawing II-

warranted. The grout test which has been carried out on the left abutment of sub dam 1 also reveals that cavities are found between 10-20m depth. Fissures between 10 to 26m depth are found at 1 to 2m intervals. They appear to be inter connected.

Reservoir bed water tightness is in doubt with the pockets of mining being spread over a large area exposing subterranean strata. The effects have to be thoroughly investigated.

The reservoir bed is an area of high human activity. The reduction of the original dam height of 71m to a 61m height was a compromise to reduce the numbers affected by resettlement.

The exploitation of the catchment by human activity even for the reduced dam height of 61m will ensure high soil erosion into the reservoir. This is evident in the silting up of the ancient anicut on Amban Ganga.

It is reported that 18 Grama Niladhari divisions are affected by the earlier proposed reservoir and that 2500 families will be affected as per the PMU survey of November 1995 for the original dam of 71m height.

With the reduced dam of crest level 188 m the number of affected settlers will be 1064 families in 12 GN Divisions. But, since November 95, fresh encroachments have taken place, some under political or other patronage to entitle those affected with new lands if the reservoir project is implemented.

Our inspection revealed several new houses that had been constructed in 1997. If the government is to push forward this project, encroachment has to be halted and or cutoff date established to determine the actual extent of settlement in the reservoir bed area earmarked for the 61m high dam.

4.1.7 Borrow Area

In the event that the borrow area is located within the reservoir bed, the area has to drilled to ensure that borrow material will not expose permeable zones or fracture zones. During feasibility, selected borrow areas should be confirmed or fresh borrow areas located which do not expose permeable zones or fracture zones.

4.1.8 Catchment

The exploitation of the catchment by human activity even for the reduced dam height of 61m will lead to soil erosion. The material will find its way to the reservoir. Already this is evident in the silting of the ancient anicut on the Amban Ganga.

4.1.9 Impact on Dry Weather Flow

The spilling history of existing Elahera anicut shows that the anicut diverts all the water thereby leaving the downstream of the river dry.

The proposed construction of the reservoir upstream will assume that spilling will be confined to even rare occasions, for extreme flood situations.

Allai scheme situated at the tail end will not be influenced as it will be dependent only on drainage flows from system C and part of system B together with release of Mahaweli Water downstream of Minipe.

In the event the 61 m dam is built and water is stored, high evaporation rates in the area will lead to losses to the atmosphere at about 6 mm per day. This will have some micro influence in the periphery with changes in humidity and temperature.

4.2 Mineral Resources

Large tracts of the approaches in Kambarawa and Galboda will be inundated, cutting off access to some of the major mineral deposits of the area. In addition these inundations will inhibit directly or indirectly mineral extraction in Opalagala, Moragolla, Galboda, Kirimetiya, Talangamuwa, Elagamuwa, Nawaneliya and Kambarawa, thereby affecting the day to day life of the people engaged in the mining and mineral activities including, miners, transporters, processors, prospectors, entrepreneurs, developers, managers and exporters. The loss of workable resources will also affect the foreign exchange earning capacity through lack of mineral for export. (See photographs 42, 43, 45 and 46 in Volume III and the Table in Appendix 4 Vol.I).

There is evidence of river bed mining and river bank mining for gems. The possibility of high ground gem deposits cannot be ruled out in the reservoir bed, reservations and the surrounding area. It is also well known that some gem mining activities are carried out illegally and go undetected. Assessing the extent of such resources takes time. This potential therefore remains largely unknown and will be unrealized to a large extent if the project gets underway very early. There is also a likelihood of mechanized gem mining project proposals covering the inundation area. This will enable a certain percentage of the resources to be exploited before inundation sets in. The selection of burrow areas upstream which would be almost equivalent to the selection of semi mechanised gem gravel mining in the proposed reservoir bed and the disturbance and removal of the natural impervious blanket in the reservoir basin can lead to possible future reservoir leakage problems. (vol II page II-51).

4.3 Flora

As shown in the **Table 3.3.2** of this report, there are about 5480 ha of forest land in the affected area. Of this, total area around 3615 ha of forest lands are located in the reservoir area which includes 30 ha of Eucalyptus plantations. The balance extent of, nearly 1860 ha of forests are within the Command Area.

Information on the floral diversity, endemic and endangered/threatened plant species and plants with economic value in these forests were provided in Section 3.2. Eight endemic plant species have been recorded in the reservoir area and similarly 8 endemic species have been recorded in the command area. No endangered or threatened species were recorded from the reservoir area, but 2 species of endangered/threatened category were found in the command area. These are "Wal Pichcha" and "Kalumediriya".

The command area is under that area identified by MASL for development under the Mahaweli Development Programme.

All the plant species identified in these forests including endemic, threatened and endangered species are generally available in other Moist Monsoon and Dry Monsoon Forests in the area. According to the distribution none of the species recorded are exclusive to these localities, (none of the species are endemic to these forests). Therefore, the clearing of these forests in the reservoir and command areas will not result in the extinction of plant species. Since the proposed reservoir and command areas are surrounded by other forests, clearing of the forests in these areas will not create any serious socio-economic problems on account of the forests being lost as sources of food and income.. The removal of forests may create micro climatic variations in the area (specially temperature). This may be more significant in the command area than in the reservoir area due to the climatic conditions in the dry zone. Removal of forest in the reservoir area may not be very significant due to a large water body being created. The adverse impact on micro climatic conditions could be minimized by adopting a well planned and proper forest clearing system supported by planting homesteads, roads and avenues with suitable trees.

4.4 Fauna

The present study reveals that the most serious impact of the project will be on the elephant population inhabiting the reservoir area. It has to be realised that the elephant problem does not start with the implementation of the Moragahakanda Project.

Opening new land for agriculture and settlement in the dry zone has been at the expense of wild life habitat. Being the largest animal the adverse effects are mostly felt by the elephants occupying these areas.

Settlements located in Bakamuna, Talagoda and Elahera within the proposed project area is already facing severe conflict situations between the farmers and the elephants. The position can be expected to escalate due to inundation of the present feeding grounds in the reservoir areas.

There is a need for a broader understanding of the ecological processes and the degree of stability that should be established to safeguard the elephant population.

The carrying capacity of the protected areas must be properly understood to ensure that the population of around 100 animals can be contained within these areas by ensuring adequate food and water requirements for the animals other measures will be effective thereafter.

With the emergence of the Moragahakanda programme, the need has arisen to focus on the conservation of natural environment and wildlife, especially to provide adequate habitat requirements to the shrinking elephant population in the area. Hence it is apparent that elephant conservation should be taken up as an integral part of Moragahakande development in order to ensure the long term survival of the elephant on the one hand and sustainability of the development projects, on the other.

The long term viability of the Wasgamuwa-Minneriya, Giritale proposed corridor is doubtful in view of:

i. Size and Shape;
ii. Resources of the corridor;
iii. Land use pattern on either side of the corridor;
iv Agricultural practices on either side of the corridor

The proposed development activities in the Moragahakanda area would attract encroachments and these may cut across relatively well established migratory routes of elephants living in Proposed Minneriya Giritale Nature Reserve. This will create serious problems for settlers as well as for the animals. Small fragmented protected areas cannot provide year round resources for viable populations of large mammals such as elephants, unless there is scientific management. The problem is aggravated by people who live inside or in proximity to protected areas an who intrude and utilize the resources of these small forest areas. Accordingly to preserve its identify an attempts must be made to administer protected areas as an indispensable component of a natural area system. Therefore, a strategy has to be developed to manage protected areas adjoining wildlife and forest reserves and other State forests areas as a contiguous system through the establishment of corridors, and where possible extensions to park boundaries.

It is important to remember that the corridors have to be established in areas where the elephants actually use them and are in need of them. Shifting of the corridor according to the wishes of the people will be courting disaster for both the human and elephant populations. Distance, usage and availability of critical resources will have to play a vital role in the selection of corridors.

Possible Ecological Impact on the Site

The anticipated ecological impacts due to the proposed project activity are explained under the following categories:

Removal of Present Vegetation

The main impact will be the concomitant loss of fauna and flora in the area. Considering the nature of the habitat and available information on the fauna and the flora of the area, a complete faunal inventory of the area essential to see whether there are unknown site specific species. On the other hand forest loss may result in habitat degradation, loss of nesting and roosting sites of certain birds.

Taking the Conservation criteria (Usher, 1960) into consideration, conservation value of the proposed site can be ascertained as explained below. This is a tool in achieving the objective of conservation, research, education and recreation. This process as explained below indicates the high conservation value of the area for Conservation of Bio-diversity.

Removal of vegetation cover of the project site will force the migratory species such as elephants, wild boars, and parakeets to migrate to adjacent areas in search of food resulting in crop damage.

Soil Erosion

As a result of clearing of vegetation, the soil layer will get disturbed and soil erosion could occur during heavy rains. Preventive, such as terracing, re-vegetation or keeping belts in between barren areas will be necessary.

Criteria used to asses the conservation value of Moragahakanda Project site:

(1) **Size** - The importance or conservation value of an area increases with its size. The extent of the proposed area is more than 4000 ha and this contributes a very high percent of available land in the district, see (land use map)

(2) **Diversity** - Diversity is the ratio between the number of species and the number of individuals. Variety in number of communities and species is one of the most important criteria. Available information and site investigations reveal that habitat and species diversity are fairly high here as an area to be considered for conservation purposes. Species such as *Puntius ceylanensis*, Malkoha, *Calotis ceylanensis* are found in the area. But representative sample of the same habitats are also found within undisturbed areas of the region.

(3) **Naturalness** - Naturalness is interpreted as unmodified by human influence. In principal, the area should have experienced minimum modification by man or, must have potential for restoration. Due to the presence of a natural ecosystem in the area this factor becomes very high. Most of the areas that would be subject to modification are natural habitats.

(4) **Rarity** - One of the most important purposes of many areas to protect rare or endangered species and communities. Rarity has been given international importance. As far as available literature is concerned, this factor is fairly high because a variety of rare species are present.

(5) **Uniqueness** - A unique area contains natural (or cultural) features that are outstanding on a national and international scale. Location has specific features.

(6) **Fragility** - Fragile habitats, species, and communities have a high sensitivity to environmental changes. The project area does not come under this category. Owing to impounding of water most of the villus and down stream wetland get affected severely. The entire aquatic environment would be changed, resulting in high loss of bio-diversity in down stream areas and salinity problems. On the other hand migratory species will also be affected.

(7) **Typical-ness** - Not only should unusual features be selected, but it is important to represent typical areas of common habitats and communities of the bio-geographic realm. In this regard, similar areas are not available in the region.

(8) **Historical Records** - If an area has been studied and monitored for a long period , it is of greater than a comparable unmonitored area and the value would be reduced if studies are not continued. This area has not been subjected to comprehensive monitoring.

(9) **Position in an ecological /geographical unit**

One should try, if possible to include within a single large area as many of the important and characteristic formations, communities and species, as possible. Such areas will be more valuable than those representing a single formation or community. It represents part of dry zone bordering wet zone which has high priority at present.

(10) **Potential value** - This forest area could, through appropriate management, eventually develop a conservation interest substantially greater than its present value. This has high conservation value in the future.

In applying these selection criteria, the following were taken into account:

(i) Some of the criteria may overlap, be equally important or additive.
(ii) Some are mutually incompatible - eg. "rarity" versus "typicalness"

Taking the above factors into consideration, it is clear that the area has a very high conservation value and has tremendous impact on the down stream environment.

4.5 Land

The proposed Moragahakanda reservoir with a HFL of 184 m has, mostly gently sloping land of 0-2 percent slope and 2-4 percent slope. However to the reservoir edge south of the dam axis in Talagoda and Galporugolla GN Divisions, the slopes would be as much as 8-10 percent and sometimes over 10 percent. Further south in Kambarawa GN Division the slope on the reservoir boundary is 4-8 percent. The steeply sloping areas are covered by forests.

The land that would be affected by the Moragahakanda Reservoir could be estimated on the basis of land-use only, as an approximation due to lack of detailed maps. On this basis it is estimated that under the Low Dam Option the area falling within the reservation boundary consist of:

Forest	40.5 percent
Wood/Brush Wood/Scrub/Chena	31.0 percent
Garden	16.5 percent
Paddy land	12 percent
Total	100 percent

The paddy land being inundated falls within agro-ecological regions IM3 and IU1, while Kambarawa ganga and Amban ganga starts in WM3. An extent of 86.5 ha of Kambarawe fields have assured supply of irrigation water for two seasons. Similarly 68.4 ha of Elagamuwe paddy land and 58 ha of Talagoda paddy land also have assured supply of irrigation water.

The large extent of garden shown in the land use map are not all cultivated. All the households and homegradens together with land developed as highland cultivation form this area. The residences, service buildings, boutiques, schools, temples etc. are located on this type of land. These are the inhabited areas and when these areas go under water, people will be displaced.

The majority of the land being inundated (over 70 percent) is forest, wood, scrub or chena. Resources that may be lost when these areas are inundated include timber and minerals, which will be dealt with separately.

4.6 Human Settlement

4.6.1 Population

Under the Low Dam Option, 1064 families in 951 households are likely to be evacuated (Table 4.6.1). These are traditional farming communities, with well established traditions, norms and relationships. They have evolved certain cultural practices of mutual help and sharing which has enabled the different elements to integrate into communities. They continue to uphold the extended family system thereby supporting the weak and the old. It is also the foundation for mutual support in production and community activities.

The mutual help and support system includes labour mobilisation practices such as Attam in cultivation and "Shramadama" in case of household functions and village works. Sharing of implements, animals, tools and seed in the production process and exchange of food and produce are the basis for reciprocity and redistribution among the villagers. These cultural practices help to overcome many social barriers so much so that different castes within the same Grama Niladhari Division work and live in harmony. Such a situation was noted in Galboda, Rajawela and Kongahawela.

Irrigated cultivation in the Mahaweli areas is an intensely planned activity, which require adherence to specific time schedules. They require simultaneous action by all the farmers, which may reduce exchange of labour and mutual support. Family labour alone may not be adequate to meet all requirements necessitating hired labour. There will be seasonal migration of agricultural labour into the project area from neighbouring regions. Some may wish to settle down in vacant plots causing an encroachment problem as witnessed in other settlement areas.

The extent to which the project will affect the resident population is given in Table 4.6.1.

Table 4.6.1: Number of Households and Extent of Land Affected in each GN Division under Low Dam Option

Name of GN Division	Total in the Division		Falling within inundation Area				
	No. of Families	No. of Houses	No. of Families	Population	No. of Houses	Paddy Land (ha.)	Upland (ha.)
Elagamuwa	190	180	190	729	180	75.7	137.6
Galboda	76	64	51	227	46	31.7	40.3
Galporugolla	95	90	95	374	90	32.6	35.0
Kadawatha	148	136	148	552	136	2.2	55.5
Kambarawa	215	210	205	777	200	104.8	80.1
Kongahawela	68	55	19	79	14	26.7	8.6
Maragamuwa	107	91	0	0	0	11.7	0.2
Medapihilla	90	73	90	328	73	10.1	8.5
Millagahamulathenna	150	130	83	301	54	3.4	37.5
Pubbiliya	105	101	0	0	0	0.2	-
Rajawela	276	235	1	3	1	52.1	7.5
Thalagoda	185	160	182	729	157	80.9	86.6
Total	1705	1525	1064	4099	951	432.1	497.4

Source: As reported by each Grama Nildhari (August 1997)

4.6.2 Social Institutions

Social institutions emerge according to the understanding of the communities of their needs and their willingness to participate in joint action. These institutions also reflect the maturity of the community. The institutions operating in the area and the extent of impact on them are shown in Table 4.6.2.

Movement of families out of the area will have certain effects at divisional and the local government level administration. Due to the decreasing of number of people, departments and local authorities will have reduced demands for their services. At divisional level the Grama Niladhari divisions may have to be carried out afresh and the excess staff moved to other areas whether they too will more with the settlers is a decision, the divisional administration will need to resolve relocating of funds allocated to these authorities for capital works and services may be reduced but a lot of other duties like land surveys, holding land kachcheries, may be enhanced. Depending on the extent of the changes adjustment will occur in the staff composition of these institutes.

4.6.3 Means of Production

(a) Land Lost

The total land that would be lost due to inundation is presented in Table 4.6.1. List of land owners and the extent of their paddy land and upland affected is presented in **Appendix 2**.

According to the official version as well as the individual views, some of the most fertile lands in the Naula Divisional Secretariat Division will be submerged. Apart from the economic loss the farmers show a strong attachment to these lands due to historic reasons. Paddy cultivation is considered a special way of life more than an economic activity. This accounts for people continuing to cultivate paddy in small parcels of land which are economically marginal.

(b) Animals

The farmers use cattle and buffaloes mainly for draught purposes. They are left to fend for themselves. It has not been possible to ascertain whether the re-settlers will take the cattle with them, into the new areas. It is likely that most of the animals will be sold to neighbours but a part of cattle population is most likely to end up in slaughter houses. The loss of their animals will mean that new sources of farm power have to be obtained to work the lands in the new settlement areas.

Table 4.6.2: Institutions, Non-Governmental Organizations (NGOs) and Community Based Organizations (CBOs) Affected.

Type	Description	Extent Affected
GN Divisions	1. Elagamuwa	Fully
	2. Galboda	Major Part
	3. Galporugolla	Fully
	4. Kadawatha	- do -
	5. Kambarawa	Major Part
	6. Kongahawela	Minor Part
	7. Maragamuwa	In significant part
	8. Medapihilla	Fully
	9. Millagahamulathenna	Around half
	10. Pubbiliya	In significant part
	11. Rajawela	- do -
	12. Thalagoda	Almost fully
Gramodaya Mandala	1. Galboda Gramodaya Mandalaya	Fully
	2. Galporugolla Gramodaya Mandalaya	- do -
	3. Kadawatha Gramodaya Mandalaya	- do -
	4. Kongahawela Gramodaya Mandalaya	Partly
	5. Millagahamullathenna Gramodaya Mandalaya	- do -
Rural Development Society (RDS)	1. Elgamuwa RDS	Fully
	2. Galporugolla RDS with 100 members	- do -
	3. Kongahawela RDS with 55 members	Partly
	4. Millagahamullathenna RDS	- do -
	5. Rajawela RDS with 500 members	- do -

Continued.....

Continuation of Table 4.6.2

Farmer Organisation	1. Elgamuwa Govi Kamituwa	Fully
	2. Galboda Govi Sanvidhanaya	- do -
	3. Galporugolla Weera Govi Sanvidhanaya	- do -
	4. Kadawatha Govi Sanvidhanaya	- do -
	5. Kambarawa Govi Sanvidhanaya	- do -
	6. Kongahawela Govi Sanvidhanaya	Partly
	7. Maragamuwa Govi Sanvidhanaya	- do -
	8. Medapihilla Perakum Govi Sanvidhanaya	Fully
	9. Millagahamullathenna Govi Sanvidhanaya	Parly
	10. Pubbiliya Govi Sanvidhanaya	- do -
	11. Talagoda Govi Sanvidhanaya	Fully
School Development Society	1. Elgamuwa School Developmet Society	Fully
	2. Galboda School Development Society	- do -
	3. Kadawatha School Development Society	- do -
Death Donation Society	1. Elgamuwa Death Donation Society	Fully
	2. Galboda Parakum Death Donation Society	- do -
	3. Galporugolla Eksath Maradhara Samithiya	- do -
	4. Kadawatha Death Donation Society	- do -
	5. Kambarawa Samagi Maranadhara Samithiya	- do -
	6. Maragamuwa Death Donation Society	Partly
	7. Medapihilla Death Donation Society	Fully
	8. Pubbiliya Samagi Maranadhara Samithiya	Partly
	9. Rajawela Eksath Death Donation Society	- do -
	10. Talagoda Death Donation Society.	Fully

Source : As reported by each Grama Niladhari (August 1997)

Continuation of Table 4.6.2

Sports Society	1. Kadawatha Sports Society 2. Kongahawela Sports Society 3. Millagahamullathenna Sports Society	Fully Parly - do -
Youth Society	1. Galboda Pibidena Youth Society 2. Millagahamullathenna Youth Society 3. Rajawela Youth Society.	Fully Parly - do -
Sanasa	1. Elgamuwa Sanasa 2. Galporugolla Sanasa 3. Millagahamullathenna Sanasa	Fully - do - Parly
Red Cross Society	1. Kadawatha RCS	Fully
Samurdhi	1. Galporugolla Samurdhi Balakaya 2. Kongahawela Samurdhi Society	Fully Partly
Lions Club	1. Medapihilla Lions Club	Fully
Sarvodaya	1. Millagahamullathenna Sarvodaya	Partly
Women's Society	1. Medapihilla Janashakthi Women's Society	Fully
Temple Society	1. Elagamuwa Nandarama Vihara Temple Society 2. Galboda Veluvanarama Vihara Temple Society 3. Galporugolla Temple Society 4. Kambarawa Temple Society 5. Maragamuwa Temple Society 6. Medapihilla Veheragodella Temple Society 7. Millagahamula Temple Society 8. Pubbiliya Temple Society 9. Rajawela Temple Society 10. Thalagoda Sri Pushparama Temple Society	Fully - do - - do - - do - Partly Fully Partly - do - - do - Fully

Source : As reported by each Grama Niladhari (August 1997)

AMS
Moragahakanda - MASL

(c) Cultivation

The area affected under the lower dam option is very much less compared to the higher dam option.. Under the 195 m FSL, with a reservation of 100 m 19 GN Divisions in the Naula DS Division would have been fully or partly affected However with the Low dam Option (184m plus 100m reservation), the affected area would be limited to 12 GN Divisions as listed in **Table 4.6.1.**

In Galboda and Rajawela GN Divisions only a portion of the paddy lands will be inundated. About 30 percent of the Rajawela paddy tract, under the Rajawela anicut on Ambanganga falls under the proposed reservoir reservation. The areas affected in Pubbiliya and Maragamuwa GN Divisions are scrub jungle or chena, which has very little impact on the economy of the residents

(d) Housing

The total number of houses that would be submerged will be 951. Their spatial distribution , GN Division wise are given in **Table 4.6.1.**

(e) Administrative and Social institutions

The Institutions that will be affected by the Project are given in **Table 4.6.2.**

4.7 Infrastructure

Economic and social Infrastructure that would be affected are listed in **Tables 4.61 and 4.6.3.**

4.7.1 Irrigation Infrastructure

Large extents of fertile paddy land, which are being cultivated under irrigation in both Maha and Yala (though Yala may be more successful with OFCs) will be inundated. The affected areas are 76 ha in Elagamuwa, irrigated from Ambanganga, and 104.8 ha, located under both banks, fed by an anicut across Kambarawe ganga in the Kambarawe GN Division. There is a likelihood of the anicut being submerged. In addition paddy areas fed by Talagoda Amuna, off Ambanganga will be inundated. The lands affected are 80.9 ha in Talagoda, 10.1 ha in Medapihilla and 32.6 ha in Galpuragolla GN Divisions.

About 18 ha of the paddy land under Konagahawela anicut from Kalugal oya also falls within the proposed reservoir reservation boundary, though the anicut is not submerged. 20 ha under Radawella anicut in the lower reaches of the tract are also affected. The paddy areas falling within the reservoir reservation in Kongahawela GS division is 27 ha, while in the Rajawela GN Division, it is 52 ha.

The irrigation infrastructures which are submerged are: Kambarawe anicut across Kambarawe ganga, Elagamuwa and Talagoda anicut across Amban ganga, and Kongahawela anicut and their channel systems together with any structures thereon.

Table 4.6.3: Economic & Social Infrastructure Affected

Item	Description	Extent of Impact
1. Schools	Elagamuwa GN Division: Junior School - Classes from year 1-8. 107 pupils (M 59 + F 48) and 8 teachers, one permanent building of 1200 sq.ft. and 2 temporary buildings of 960 sq. ft. in both. 1 acre out of 3 1/2 acres is cultivated. Kadawatha GN Division Elagamuwa Maha Vidyalaya - Classes from year 1-13. 572 pupils with 23 teachers. 5 permanent buildings of 6600 sq.ft. Teacher's Quarters, playground pavilion. 3 1/2 acres land cultivated banana, mango, coconut and 100 teak plants. Children from Elagamuwa, Kambarawa, Kadawatha, and Thalagoda GN Divisions attend. Only 5 children from thearea not going under water. Attend these schools Kambarawa GN Division 1. Junior School with classes from grade1-10. 206 pupils, 10 teachers, 5 buildings of 4800 sq.ft.,01 Teachers Quarter of 1200 sq. ft. 2 ac.of land under banana cultivation. 2. Junior School with 300 pupils.	Falls within inundation area. Completely affected. -do- -do-
2. Post Office	Kambarawa GN Division Sub Post Office with a staffof 3, housed in a private building. Thalagoda GN Division Sub Post Office	-do- -do-
3. Rural Hospital	Kongahwela GN Division Kongahawela Rural Hospital	Marginally affected
4. Govt. Quarters	Millagahamullateune GN Division Land Allotment Officer's Quarters of 420 sq.ft. on one acre land.	Falls within inundation area. Completely affected
5. Co-operative	Kadawatha GN Division	

Item	Description	Extent of Impact
	Housed in a private building	-do-
6. Temple	Elagamuwa GN Division Nandarama Viharaya Kambarawa GN Division 2 Temples one of which is Sri Veheregodella Viharaya with 8 acres of land containing Viharaya, Sermon Hall, Bhikku Residency Millagahamullatenna GN Division Shrine room 172 sq.ft. Sermon hall. 2100 sq.ft., Protection wall 805 sq.ft. 1 acre uncultivated land . Talagoda GN Division Sri Pushparama Viharaya	 -do- -do- -do- -do-
7. Community Halls	Elagamuwa GN Division Community Hall	 -do-
8. Cemetery	Medapihilla GN Division Medapihilla Cemetery one acre in extent	 -do-
9. Transportation	Main Roads: Bus Routes 9 km Minor Roads: 12 km Foot Paths	-do-
10. Electricity	33,000 volts High Tension Lines and Service Lines	-do-
11.Telecommunication	Service Lines - 5 Km	-do-

Source: As reported by each Grama Niladhari (August 1997)

4.7.2 Public Buildings

Public buildings that are either completely or partially affected include four schools, a rural hospital, three sub-post offices, a cooperative sales outlet and one government quarters.

(a) Schools

Kongahawela MV, a leading school in the area with 659 students is spared from inundation in that the reservation boundary passes through a part of the land at a high level. Since the extent is small and will have very little environmental impact this area can be easily excised from the (100m) reservation.

Elagamuwa MV with 572 students in the Kadawata GN Division will be totally inundated.

The other schools, which are affected, are the Kambarawe Kanishta Vidyalaya with classes from year 1-10 catering to 206 students and a junior school with about 300 students in Kamabarawe GN Division and Elagamuwa Kanishta Vidyalaya with 107 students.

(b) Sub Post Offices

The sub-post offices which would be inundated are in Kambarawa and Talagoda, while the Kongahawela post office will fall within the reservation but not within the FSL contour. At 184 FSL of the Moragahakanda Reservoir, the villages of Kambarawe and Talagoda will be lost, while the Kongahawela post office will be within the reservation. All the buildings are privately owned except Kongahawela, sub post office which is a 805 sq.ft. permanent building.

(c) Hospital/Dispensaries

There is only one public curative health facility in the area under study which is the Kongahawela hospital. This is a 68 bed peripheral unit. The Kongahawela hospital is above the high water level, but a section of the premises falls within the 100 m reservation line. The extent of land affected is very small and the present hospital boundary could be taken the boundary of the reservoir reservation .

No other health facilities are affected by the reservoir.

(d) Other Public Buildings

In the Kongahawela GN Division the Primary Cooperative Society and Cooperative Rural Bank near Ambana Junction, lie outside the reservation limit.

The Public Health Inspector's Office and quarters near the Kongahawela MV may be on the boundary of the reservation, while the 1200 sq.ft. permanent building used as the public library falls within the reservation boundary, but well above the FSL.

Two garment factories named Charaka Apparels Ltd. and Laggala Apparels Ltd. on the Naula road, which would have been affected on the basis of earlier proposals, are now well outside the reservation limits. These two factories are separate companies functioning in adjacent buildings in the same premises. The workers consist of local villagers as well as outsiders. Impounding of the area will not affect access to the factory premises.

The Agriculture Centre at the Konagahawela junction on a 0.5 acre land with fertiliser stores and quarters, totaling 3993 sq.ft. of permanent buildings on the Pubbiliya road will fall within the 100m reservation of the reservoir. There is also a market building near the junction, consisting of 8 boutiques of nearly 1000 sq.ft. area which will similarly fall within the reservation.

4.7.3 Roads

The Naula - Pallegama Class ' B' RDA road will be submerged from the 26th mile post (from Pallegama) to the 20.5 mile post, for a length of 5.5 miles (8.85 km). However, allowing for the reservation of 100m from the FSL contour, this road from about 26.35 miles would be affected. A road deviation will be constructed from Kongahawela junction near 26 mile post as a mitigatory measure.

There are many other minor roads, belonging either to the Central Provincial Council, Ministry of Highways or the Amban ganga Korale Predeshiya Sabha (PS). The roads which will be inundated at 184.0m FSL are listed below.

- Kongahawela - Radawela - will be submerged only at the causeway across Kalugala Oya, and 150m - 200m of road on either side will fall within the reservation.
- Ambana - Elagamuwa - Kambarawe road from point 2 km from Moragolla Kanishta Vidyalaya junction, past Elagamuwa and Kambarawe villages upto the Kambarawe anicut will be submerged. This road is a Provincial Council Highways Department road (PCHD) and treated as 3 separate roads: Ambane-Moragolla, Moragolla-Elagamuwa and Elaganuwa-Kambarawa roads. Beyond Kambarawe village is a PS road. The total length of road affected is 11.40 km of which, about 8.8 km are PCHD roads and 2.6 km PS road.
- There is another road turning off from the above road about 2km from the Moragolla Kanishta Vidyalaya junction, proceeding to Galboda - Dammantenna - Puwakpitiya. This PS road is now neglected. About 0.5 km of this side road will be submerged, cutting off access to Dammantena from this end. Also the foot path leading to Kirimetiya will be cut off while the village will be inundated.

4.7.4 Electricity

The 33,000 volt, power transmission line proceeds from Naula to Hattota via Elahera. A spur line also of 33,000 volts, proceeds from Elahera to Bakamuna. This transmission line will be submerged from 10 km to 19 km on the Naula - Pallegama road. It supplies power to Kongahawela Rural Electricity Scheme with a transformer at Konaghawela junction, which includes the Hospital supply. The next transformer is at Elahera and there is only a high tension(HT) line from Kongahawela to Elahera.

4.7.5 Telecommunication

The nearest telephone exchange is at Naula. Underground cables are laid upto the Konagahawela Hospital. There will be no submergence at the FSL of 184m, except at a culvert near the public library. Of these two distribution points (DPs) near the hospital, one serve 6 telephones around the Kongahawela area and the other serves only Talagoda sub post office 5 km away.

The 5 km of telephone line with about 90 posts will be submerged. This line would then be abandoned after retrieving usable material. No other telephone lines are affected by the Low Dam Option.

4.7.6 Temples

A number of small Buddhist temples associated with the villages will get inundated. These are Sri Nandaramaya Temple in Elagamuwa GN Division, Talagoda temple (Sri Pushparama Viharaya) and two temples, one on either bank of Kambarawa ganga in the Kambarawa GN Division. Another temple area near the Kongahawela Junction in the Millagahamulla GN Division with a shrine room, dharmasalawa (sermon hall) and decorative wall around the bo tree too will be affected.

4.8 Impact of Construction Activities

The borrow areas for dam construction, and quarry sites for rock material have been identified at the feasibility stage of study by JICA. These sites are shown in **Map No 4.1.7**.The quantity of material to be extracted will be much reduced due to lowering of the crest level.

4.8.1 Borrow Areas and Quarries

(a) Borrow of Impervious Material

The identified borrow for impervious material lies between 700 metres and 1700 metres from the dam axis, in scrub jungle area on the left bank of Elahera - Minneriya Yoda ela close to the 20th mile post on the Pallegama - Naula road. (See Map 4.1.7) However this area lies in the proposed extension of the Minneriya - Giritale sanctuary that meets the Wasgamuwa strict natural reserve. The proposed "elephant corridor" also would cross this area. The proposed borrow area falls within Talagoda GS Division in Amban Ganga Korale DS Division and partly in Elahera DS division in the Polonnaruwa district.

The quantity of impervious borrow material required for the core zone will be small, about 400,000 m^3 while another 200,000 m^3 of selected earth is required in the upstream earth zone and further quantities of common earth material is required in the coffer dams.

There are no settlements in the proposed borrow area for impervious material, and adverse social affects are therefore minimal..

(b) Rock Quarry

Rock quarries create noise and dust and there is the danger of particles falling outside the demarcated zone. Though danger to existing settlement is small, adherence to strict instructions in respect of handling explosives, design of blast and wiring will be necessary to minimize danger.

The area demarcated for rock quarries are:

Quarry 1: On the northern slopes of a hillock 1000 metres upstream of the dam axis. The area is now covered with thick forest.
The quarry is located in the Kambarawa GN Division, but is 300 – 500 metres from settlements along the Pallegama – Naula road on the 22nd mile. However these settlements and the road falls within the reservoir and would be finally inundated when the reservoir is constructed..

Quarry 2: Which is on the left bank of Amban Ganga and on the southern slope of the Moragahakanda hill, is also covered with forest. This quarry is more than 400 metres from the Pallegama – Naula road on the 22nd mile. The houses are located and people are settled close to the road about 600 metres away from the quarry. These houses will subsequently fall within the reservoir bed. The area identified for the quarry Q2 fall within Talagoda and Kadawatha GS divisions.

(c) Proposed Borrow Area for Filter Material and Fine Aggregate

The project proposes to borrow filter material and fine aggregate within the loop of Amban Ganga, on the right bank parallel to the 22nd mile of the Pallegama – Naula road, in the Kambarawe GS division. The area is covered with scrub jungle and lies 750-1500 meters upstream of the dam axis. This area will also be inundated when the dam is constructed.

Deposits of sand, sandy silt and clay with occasional gravel from the river bed deposits and the residual soil cover is 1 to 2 metre thick on the river banks.

Though the quantity of filter material and fine aggregate to be excavated is not large, there is bound to be some disturbance of the permeable surface strata in the proposed reservoir bed by this operation, at an average distance of 1000 metres upstream of the dam.

At the main dam site, a superficial layer within 10 metres to 20 metres in-depth, is a zone of high leakage with more than 50 lagoon units, while it is underlain by a zone of 5 to 15 lagoon units about 10m. in thickness. A water tight zone less than 1 lagoon unit is found below 20m. (JICA feasibility 1979). Borrow for filter material will be limited to the surface layers of sand below residual soils at depths of 1 metre to 4 metres, and the disturbance of the existing strata is not expected to open new paths of heavy loss of water from the reservoir at this distance of 1 km upstream of the dam site. However all residual soil cover should be stockpiled and used to spread and compact over the borrowed area.

These borrow areas will be the recipient of finer silt material through sedimentation when the reservoir is in operation.

Overall, the impacts due to borrow or quarrying have minimal effect on people or property. During the construction phase it is expected that wild life will be disturbed close to these sites. Landscaping, including reforesting will have to be planned to take effect during the post construction phase.

4.8.2 Transport of Material

The distance of the quarries and borrow areas is within 1.5 km as the "crow flies". In construction of the main and saddle dams, large quantities of rock, earth and sand will be transported on haul roads. The operation would result in there being a number of road crossings and at least one river crossing.

The operational area where major activities during construction will take place, in an area, 3.5 km x 3.2 km in extent . This area will see major machinery activity and would completely lose the present quiet and peaceful atmosphere. Fortunately this particular area is very sparsely populated, and houses are on the Naula – Pallegama road. There are about 12-15 houses on the 22nd mile which will be inundated by the reservoir.

The transport of material will cause noise and dust, along earth construction roads. These will be upgraded by watering and compacting base coarse material, to minimize machine breakdown and; speed up haul, if not for any other reason, The haul road will be watered frequently to keep the dust down, as the clouds of dust hamper efficient movement of haul trucks.

Adverse impact is the danger to any other vehicular traffic on the Pallegama – Naula road, at the road crossing.

The adverse affects of the large quantities of materials (3.0 x 10^6 m3 maximum) being moved are mainly dust pollution and noise pollution. To a lesser degree the clearing of vegetation along the haul roads will also disturb the existing fauna in the area.

4.8.3 Generation of Sediment

The dam site which would be completely cleared of vegetation and stripped of top soil and weathered rock and exposed to the elements for sometime, before the base layers could provide cover. The dam base area is liable to be eroded during rain, but at this time cofferdams would have been formed upstream and downstream of the dam site. This may result in the sediment being trapped in the river channel. There is therefore less likelihood of the erosion material reaching the Elahera anicut downstream.

Further, sediment is generated in clearing and forming haul roads and operating borrow areas. Haul roads are subject to wear and tear, and the loosened material is liable to be eroded, unless preventive action is taken. Some of the sediment run- off from the haul roads leading to the borrow area and from the borrow area itself, will find its way downstream of the coffer dam and be deposited upstream of the Elahera anicut.

4.8.4 Dam Site

Available drilling and adit data indicate that the area is underlain by limestone. Block faulting is also specifically stated.

These may promote serious leakage problems if a substantial storage reservoir is built. Further as limestone goes into solution, solution cavities already reported will increase and storage water will enter underground aquifers and consequently will be lost for the purpose the storage is proposed.

The geological profile of the dam site, (Geological Profile of Dam, JICA, 1979, Vol II) clearly depicts block faulting from DH 114 to DH22 on saddle dam No.1 to a level of about 152m, in main dam and abuting hill DM 35 to Adit No.2 and DM 34 and on saddle dam No.2 from DH 123 to centre of dam.

Grouting test result plan shows from the data taken from 6 holes GH 1 to GH 6 drilled near dam axis, that lugeon values vary from 169.7 in GH3 to 167.5 in GH 2 which indicates porosity.

In fact GH3 has a cavity to a depth of 8 metre. Drill holes GH1, GH4, GH5, GH6 all give lugeon values of over 30 to depth of about 28 to 30 metres. No core recovering is reported in GH2, GH3 and GH6 which indicates solution caverns.

In fact grout intake of over 1 per metre has been noted in GH 3 from 9 metre depth to 29 metre depth. This is over 10 times the grout intake per metre normally assigned for such tests.

Crytaline limestone dipping at about 40^0 is noted from the dam axis geological profile. These are of about 30 metre thick in depth.

Although the Lugeon map of Dam site indicates the crystalline limestone have Lugeon values below one the faulted zones show higher values supporting the view of high porosity.

The Survey to carry out the drill holes were made presumably in 1959-1968 period or in 1978, in which event large scale changes have been made since.

The position today is the bed of proposed tank has been exploited by mining for gems, feldspar quartz and mica. These operations would have punched through the impervious zones of lugeon values below 1.

Even wells have been constructed to irrigate high value crops by pumps. Since pumps are used for all mining operations the likelihood of artificial ground water level fluctuations can be expected. Such changes of gradient accelerate water movements underground and would promote solution cavity growth.

According to Houlsby (1977) and FB Bell (1980) high Lugeon values predict presence of openings up to 1mm in underground strata increasing to 6mm. With a 61m head of water the situation will deteriorate rapidly by solution and the reservoir may be a repeat of Palumakkaraya wewa a minor tank in Sigiriya which was repaired in 1983 but unable to store water as they exit downstream as new springs.

The adits at main dam No.5 at elevation 144.8m level and No.8 at 175.7m level on saddle dam were inspected. Both adits indicate fractured strata on walls and roof. The base was covered with water and mud and bat drippings (faeces). In adit 8 the roof has collapsed close to the entrance. Both indicated limestone features.

Thick mica deposits are found in the reservoir bed area and are being mined for export. Quartz and feldspar is also mined on a commercial scale. These activities will have to be stopped when construction work begins. The people engaged in these activities will lose their employment unless alternate sites are opened.

4.8.5 Beneficial Impact of Construction Activities

There are tangible and intangible benefits during construction. The construction costs have been estimated to be US $ 347 million, at 1995 prices. This includes the power intake and powerhouse (US $ 8 million) excluding power generation machinery. Construction would take 6 years according to preliminary plans.

Substantial employment opportunities will be created during the construction phase. It is estimated that about 2000 persons will be employed during the peak of the construction phase. The spin-off effects of construction would be the many services that would be created to meet the demands of construction workers. Indirect employment thus generated cannot be easily estimated, but would be substantial.

4.8.6 Beneficial Impacts of Reservoir

The beneficial effects of the reservoir are that it will contribute to habitat enrichment and biodiversity enhancement.

The peripheral forest areas of this reservoir will have more water and will provide a rich habitat. This will attract more bird life and assist is sustaining larger populations of other wild life.

Table 4.6.4

SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

Possible Impacts	SIGNIFICANCE				
	Adverse				
	Minor	Moderate	Major	Critical	Beneficial
Physical Environment					
Rainfall & Evaporation	☐				
Wind	☐				
Water Quality	☐				
Sedimentation		☐			
Soil Erosion			☐		
Water Uses		☐			
Vicinity of the Reservoir					☐
System H, IH, MH, G & D1					☐
Reservoir Bed				☐	
Borrow Area		☐			
Catchment		☐			
Dry Weather Flow	☐				
Mineral Resources			☐		
Land Use		☐			
Biotic Environment					
Flora		☐			
Fauna			☐		
Human Settlement					
Population			☐		
Land Inundation		☐			
Farm Animals			☐		
Cultivation			☐		
Housing			☐		☐
Infrastructure	☐				
Construction Activities					
Borrow Area for Impervious Material			☐		
Rock Quarries	☐				
Borrow of Filter Material and Fine Aggregates					
Transport of Materials	☐	☐			
Generation of Sediments		☐			
Dam Site				☐	
Employability					☐
Post Project					
Irrigation		☐			☐
Agriculture		☐			☐
Area Development - Elahera	☐				☐
- Roads		☐			☐
- Government Building		☐			☐
- Services	☐				☐
- Urban Development		☐			☐

CHAPTER 5: MITIGATORY MEASURES

MASL had recognised that large scale development of unopened areas would result in significant environmental impacts. To understand the nature and extent of the effects the Accelerated Mahaweli Development Programme (AMDP) will have on the environment a study was initiated in 1980. The study popularly identified as the TAMS study covered the entire AMDP area including down stream characteristics. A detailed analysis was made on the terrestrial, aquatic and human environments. Impacts of the AMDP on the surrounding areas as well as the upper Mahaweli watershed were also taken into consideration.

MASL has taken action to implement the recommendations given in the TAMs report. The Japanese International Cooperation Agency (JICA) conducted a study of system D in 1979. An Environmental Plan of Action for the entire AMDP was prepared in 1981. Initial assessments of environmental impacts of each system was a part of the feasibility studies of each system.

The Action Plan recognised 8 environmental sections. Projects and programmes were developed to suit each sector. Almost all the recommendations have been implemented.

5.1 Mitigation of Impacts on Physical Resources

The possible impacts on the Physical Resources have been discussed in chapter 4. It has been shown that the impacts are reduced with the choice of the Lower Dam Option. The impacts have been minimized by limiting the magnitude of the action.

5.2 Geology

5.2.1 General

Minerals are a Nation's wealth and like in all land use applications their development should be undertaken carefully through all development phases from exploration to processing and use.

It has to be understood that mineral resource use entails both positive and negative impacts. The inevitable effects can be mitigated, though not totally, but in most cases to reasonable and acceptable standards.

Under the project, the Dam site requirements will entail borrowing, quarrying earth material for the Dam construction work. Work is likely to be scheduled mostly during the dry seasons resulting in an increase in air pollution, which would be a major hazard. Regular spraying with water would minimize dust pollution at site and during transportation. Any resulting sedimentation should be directed, as far as possible to sedimentation tanks, and clear water should be allowed into natural drainage systems.

5.2.2 Mineral Resources

Access to mineral deposits which get cut off should be considered at the early planning stage of the current project proposal. Additional investigations will be needed at the feasibility stage to determine the type and extent of deposits in the various locations

The appropriate Agency to grant authorisation ,guide and ensure adherence to standards is the GSMB . Their services would be needed at the feasibility stage onwards.

Some mineral deposits may get surrounded by water but yet remain on high ground above High Water Level of the proposed reservoir. These should be extracted in the best manner possible before isolation or should be so planned for extraction at the Low Water Level elevation with provision for transport over the waters.

List of work to be performed at the feasibility stage

At the feasibility stage the processing and development of the following mineral resources Quartz, Feldspar, Mica, and Borrow material have to be assessed in terms of currently worked mineral deposits

i. Possible Inundation

When the considered full supply level of the reservoir is reached, please refer to Appendix 4 where the following mineral varieties are indicated with given locations and coordinates and the present ('97) state of activity. Reconsider the working of economically tractable minerals now restricted by the Department of Wild Life conversation. Once inundation takes place these areas will not be available to either man or beest. e.g. the Quart & Feldspar deposits North of the road at Thalagoda. (Please refer Map 3.2.8 main report Volume II)

ii. Leakage Conditions

Due to exposure of leakage paths during mineral extraction lose to be clearly assessed under mineral extraction. The exploitation programme which has to be developed at the onset of the feasibility study with the concurrence of the GS & MB & the dam & reservoir engineering consultants.

iii. Access Safeguards

Accesses to present mineral workings would be inundated and or may be in a risky peripheral area of the reservoir specially at full supply level. These accesses have to be maintained at safe level and therefore, will need retaining at inundation level and regarding for most parts in the reservoir peripheral area. Examples are accesses to Kambarawa and Talagoda.

iv. Reassessment of Reserves

Some of the areas such as the mineral deposits around Talagoda, that may remain above water levels of the reservoir need to be assessed for the mineral reserves and evaluated for or against extraction. If it is for, then access over reservoir waters will become necessary. Such aspects need to be evaluated.

v. Mineral Potential

Areas that have been leased out to mineral prospectors under the Act, Rules & Regulations of the GS & MB that come within and in the near periphery of the reservoir limits have to be evaluated in term of i., ii. & iv. above that is (i.) possibility of inundation, (ii.) creation of leakage potential, (iv.) reserve value.

The above items have to be discussed by the reservoir contractors in close conjunction with the GS & MB. Also could evaluate the mineral resources and the geologic conditions that may affect the satisfactory condition of the reservoir.

5.3 Water Resources

The operation of the proposed Moragahakande reservoir will have to ensure irrigation water supply to Elahera anicut to feed systems G and D1, together with the present practice of issuing 10 cusecs (0.28 cumecs) to augment the drainage flow to Attaragallewa anicut 5 km downstream of Elahera anicut. No further mitigatory measures are necessary for water uses downstream of the dam.

Since lands fed by existing irrigation schemes will not be submerged, no mitigatory measured will be necessary. Instead PAPs will be settled in zone D1 with irrigation for cultivating two seasons.

5.4 Flora

Action to be taken to minimise the impact of the loss of forest cover will include the following activities.

i. Controlled felling in settlement areas.
ii. Small blocks of forests will be left uncleared. This will help in maintaining favourable micro climatic conditions in the area.
iii. Roadside, stream bank and avenue planting in the development areas. Suitable tree species will be planted in these areas to provide shade, improve

aesthetic value and amelioration of the environment in the area. Timber, fuel wood and fruit tree species will be planted in homesteads.

iv. Establishing both fuel wood plantations and conservation forest plantations near settlements.

v. Establishing timber and conservation forests along the Minipe RB Canal.

vi. Developing the National Forestry Master Plan training centre and enhancing the capacities of the Forest Department.

vii. A detailed survey will be conducted to inventorise endangered medicinal plants and flora in the detailed feasibility studies.

viii. Suitable nurseries will be established. Endangered medicinal and other flora will be planted in the 100m reservation and the conservation forest area of Moragahakanda.

5.5 Fauna

Under the Environmental Plan of Action for the accelerated Mahaweli Development Programme, Wild Life Reserves of different hierarchical levels have been established within an area of over 230,000 ha of high quality wild life habitats to protect the bio diversity and the endangered, endemic fauna and flora in the following areas:

i.	Maduru Oya National Park	58,850 ha
ii.	Wasgamuwa National Park	36,948 ha
iii.	Somawathi National Park	37,762 ha
iv.	Flood Plains National Park	17,350 ha
v.	Trikonamadu Nature Reserve	25,019 ha
vi.	Giritale Minneriya Nature Reserve	14,222 ha
vii.	Victoria Randenigala Rantambe Sanctuary	42,087 ha

Other Programmes included:

a. Develop infrastructure facilities such as boundary surveys, buffer zones, roads, buildings, training centres and sign boards for new parks and reserves in AMDP.

b. Conduct AMDP park design planning studies including research surveys and conflict analysis. These include park systems plans, management development plans, relocation activities, elephant conflict studies, fauna and flora research surveys.

c. Expand and strengthen capabilities of the Department of Wild Life and establish National Training Centres.

d. Develop National Wild Life Programme for conservation policy and management.

These programs have helped to preserve the protected areas adjoining the project areas.

In the context of the Moragahakanda Project a large extent of bio-mass will be submerged thereby depriving a large extent of the ranging ground of the wild life. Most importantly the reservoir will deprive elephants of free movement. To ensure the long term survival of a viable elephant population and conservation of bio-diversity in the target area, the project would set aside sufficient ground area. The following action is proposed to mitigate the effects of the project on the elephant population:

Establishing Elephant Corridors
Providing Extensions to Protected Areas

Action would be taken to establish a corridor between Wasgamuwa and the proposed Minneriya Giritale Nature Reserve, encompassing the catchment of Moragahakanda.

Immediate action is needed to establish the proposed Minneirya – Giritale Nature Reserves as recommended by the Mahaweli Environmental Project (MEP).

Urgent action will be taken to expand the proposed Minneriya – Giritale Block III in the West.

The idea of establishing - Buffer Zones has been re introduced with the recent amendments to the FFPO, Suitable Buffer Zones will be set-up in the peripheral areas under the Protected Area Centered Community Development Programme.

Once the dam is constructed this area will form the natural corridor for the elephants to move from Giritale to Wasgamuwa. The extent of the corridor will be restricted to the area between the dam and a few settlements to the east about 3-4 km away from the dam site. It may however be noted that elephants are in the habit of visiting these cultivated patches in the settled area even today. The construction of the dam will intensify the elephant-man conflict. Proper measures will have to be taken to aviod escalation of the conflict. There are about 15 households within the proposed corridor which will have to be removed, once the area is gazetted.

Zonation and assigning areas to different land use categories would be done carefully considering the needs of the local people.

A Habitat Enrichment Programme within the Protected area network is essential for conservation for the elephant population. This will ensure that habitat requirements are met within the influence zone.

Most animals, including elephants, move of their own accord from place to place to satisfy their year round needs. If these movements can be confined within a given area there will be a strong tendency for animals to remain in that area, until numbers build up causing them to disperse and colonise additional land. Restraining the elephants to the protected areas and link forests is only practical if adequate food, water and cover for elephants are provided. Habitat enrichment is the best and often the only practical way of confining elephants within a protected area. This necessitates strict control over the visitors and other land uses in the area. The habitat

enrichment would commence from the interior of parks in order to distract the elephants from the periphery.

Keeping down stream areas of the dam undisturbed in their present condition is important as this is very good elephant country and a vital corridor for elephants.

This area is a very good example of elephant feeding ground that should be preserved without any habitat alteration and/or management. Any development of this area should await a comprehensive study of its bio-diversity. Proposals to establish settlements immediately below the dam site is not recommended. At least a distance of 2 km downstream of the dam should be protected as it is required to facilitate elephant movements.

The MASL will take immediate action to declare the catchment of the Moragahakanda Reservoir to preserve habitat for important species.

Adjoining areas will be conserved to compensate for the loss of habitat due to dam construction and settlement schemes.

The flow of the Ambanganga will be regulated to provide adequate water to maintain the ecological balance of the wet lands in down stream areas.

5.6 Land

The mitigatory action proposed to minimize the adverse affects the project will have on some of the valuable land subject to inundation are as follows:

(a) provide alternate irrigable land in good agricultural soils as replacement for the 2 crop-irrigated land that would be inundated under the Project.
(b) exploit resources such as timber, minerals etc. before land is inundated.

5.7 Infrastructure

5.7.1 Irrigation Infrastructure

There is no mitigatory measure possible in respect of project impacts on irrigation infrastructure such as Kambarawa anicut on the Kambarawa ganga, Elabgamuwa annicut and Talagoda anicut across Amban ganga and Kongahawela anicut across Kalugal Oya. The first three anicuts would be submerged together with the irrigable areas under them.

The contemplated mitigatory action is to provide alternate irrigable land under D1. However some of the absentee large land owners in Elagamuwa, Kambarawa and Talagoda will not benefit from this solution. Only the owner cultivators and the Ande cultivators will benefit. However MASL will provide suitable compensation measures considering the nature of the claims.

5.7.2 Public Buildings

The 3 public buildings on which the project will have an adverse effect are located at Kongahawela. They are:

- Kongahawela Maha Vidyalaya
- Hospital
- Post Office

All three buildings will be above the full supply level but within the 100m reservation. Whether they should be relocated or permitted to continue in their present locations with suitable mitigatory measures being taken will depend on the following considerations.

- Need extent for which the services will be required
- Accessibility to these centres
- Pollution of reservoir

A portion of the population using the services will move out of the area due to inundation. With no in-migration the demand for services will be lessened after the project. The services have to be continued for the sake of the remaining population.

Accessibility to the centres will be cut off from both the eastern and southern areas due to inundation. The Naula access to Kongahawela is above the FSL and will be the main access. The through traffic to Matale and Dambulla from Pellegama – Bakamuna and Elahera will take the new access road reducing the volume of traffic to Kongahawela. This will also result in a reduction of demand for their services.

The extent of reservoir pollution is negligible in the case of the school and the post office. Since the hospital is on high ground there is the likelihood of waste entering the reservoir. As there is a distance of almost 100m from the reservoir, proper waste disposal system when installed will overcome this problem.

The portion of the premises which come within the 100m reservation limit could be excluded in demarcating the reservoir boundaries.

Four temples will be completely inundated. These temples are one in each of the villages. Talagoda, Elagamuwa and two in Kambarawe. It is recommended that, along with the settlement of the people in each village, collectively as far as possible; assistance is provided to re-establish the temples which will be lost. The temples are identified in section 4.1.3 (a).

The effects on other public buildings such as the Kongahawela GS area Primary Cooperative Society and Cooperative Rural Bank near Ambana Junction, the PHI's office and quarters, the public library and the agricultural centre are described in section 4.7. With the re-orientation of population centres, change in access facilities and re-adjustment of catchment areas, these public buildings should be re-established giving due consideration to these factors.

5.7.3 Roads

(i) The main Pallegama – Naula road will be affected to a length of about 5.5 miles due to inundation, cutting off communication with the present villages of Talagoda, Kadawatha, Elagamuwa and the Elahera town. However most of Talagoda, Kadawatha and Elagamuwa villages will be submerged

This would mean that present day transactions with some urban centres will cease. In planning roads for the post project area, thought has to be given to the administrative centres and the marketing centres that would have to be reached by the remaining population.

It is proposed that a road deviation be provided by improving Kongahawela – Pubbiliya road (8 km) or provide alternatives as described below.

(a.) Extend Kongahawela – Pubbiliya road to meet a road constructed from Bakamuna to Dambulla via Kalundewa a distance of about 10 km; or

(b.) Construct a new road from Pubbiliya to Elahera (about 8 km) skirting an existing foot path.

The first proposal is more logical as Medapihilla, Kadawata, Elagamuwa and Talagoda villages which benefited from facilities in Kongahawela, travelling along the section of Pallegama – Naula RDA road, will not exist after construction of the reservoir.

With the opening of a bridge across the Mahaweli ganga at Hettipola, an important road will be developed linking Hasalaka to Elahera and Bakamuna. The development of Dambulla – Kalundawe – Bakamuna – Attanakadawela – Polonnaruwa road will open a route to the important market in Dambulla.

(ii) Minor Roads

(a) Kongahawela – Radawela : The newly constructed causeway across Kalugala Oya should be raised with more vents added over the present openings or a bridge constructed to replace it. The sections of road 150-200m. on either side of the causeway have to be suitably raised.

(b) Ambana – Elagamuwa - Kambarawe road: No mitigatory action is required as the villages it serves go under water.

(c) Galboda – Dammantenna – Puwakpitiya road
No action is required where 0.5 km of the road referred to in 4.1.3 (b) will be submerged. Villages of Maha ela Dammantenna and Galaboda have access to Naula via Moragolla – Ambana – Kumbiyangala Ela road.

Kirimetiyawe is a small village that will be submerged, but a few huts and garden area may be above the HFL. Their access would be cut off but it would not be feasible to provide them with new access. The families will have to be evacuated and re settled.

5.7.4 Power

The 33000volt high-tension transmission line to Elahera would be deviated at the Kongahawela junction as follows:

(i) Kongahawela – Maragamuwa – Pubbiliya along the road, and Pubbiliya to Elahera across the scrub/forest, a total of 14-15 km.

or

(ii) Kongahawela – Maragamuwa along the road and Maragamuwa to Elahera across scrub/forest a total of 12-13 km.

The CEB can retrieve and re-use the aluminum electric cables, some accessories and posts.

5.7.5 Telecommunication

Talagoda area would be sub merged and the Telecom can retrieve the material in the 5-km of telephone line to Talagoda post office. No new telephone line is required.

5.8 Mitigation of Construction Impacts

Short term, impacts of construction activities can be severe. Further, residual impacts may result if adequate mitigatory measures are not adopted during the construction period. Most of the mitigatory action has to be implemented by the contractor undertaking the construction work. Thus, in preparing the bidding documents it is necessary to include clauses to ensure that the mitigatory actions suggested below are implemented.

5.8.1 Transport of Materials

(a) **Haul road** – used for transport of borrow material and quarry material has to be specially constructed using compacted base coarse material to withstand the type of hauling equipment. This will reduce the rolling resistance, if maintained regularly with motor grade and sprinkler bowser, and compacted as required. The contractors will recover the investment by enhanced efficiency of operations. Sprinkling with water will eliminate dust, prolong tyre life through cooling and reduce accidents.

(b) **Road Crossings** – Road signs should be used at crossings to warn of Heavy Equipment operation as well as to indicate permissible vehicle/equipment speeds.

5.8.2 Borrow Areas and Quarrying

(a) **Borrow Areas** - All top soil and waste material should be stockpiled to dress the surface once the borrow is graded for drainage and treated to improve appearance.

The borrow area for impervious material crosses the proposed elephant corridor and lies in the proposed extension of Minneriya – Giritale sanctuary to meet the Wasgamuwa reserve. The elephants are presently crossing upstream of the proposed dam axis.

During construction, it is best to leave a corridor downstream of the dam axis, necessitating investigation of a new Borrow Area for impervious material, preferably upstream of the dam axis.

(b) **Rock quarries** – Supervising consultants should examine, approve and monitor quarry operations, including proper design and control of blasting.

5.8.3 Vegetation and Landscape

Except where required for permanent works, quarries, borrow pits, staging and processing areas, dumps and camps, all trees, saplings and shrubbery should be protected from unnecessary damage by contractor operations. The natural landscape should be preserved to the extent possible by conducting operations in a manner that will prevent unnecessary destruction or scarring of the natural surroundings.

5.8.4 Soil

Rich soils can be stripped and transferred to sites with soil deficiencies or stacked for later agricultural uses such as for landscaping the site after construction. Improvement of soils for agricultural purposes through soil imports is a common practice in the northern peninsular region though not common elsewhere. Less rich soils that have to be removed can be used for land fill purposes, landscaping and for growing vegetation screens other than for improving agriculture.

It has to be remembered that quite extensive sites have been identified for soil and rock extraction for the project. Such areas will need effective rehabilitation for which displaced soils can be used effectively both for improvement of land use and esthetical purposes.

5.8.5 Buildings for Construction and O&M

The contractors on the Dam and appurtenant works will establish a large camp to execute the work. The siting of the camp buildings away from the corridor downstream of this dam axis, where wild elephants frequent, is essential. Similarly the buildings to be used for O&M activities should be sited away from this "corridor".

It is recommended that the majority of buildings for the construction camp be temporary or semi permanent, and be sited at a higher contour as feasible, inside the proposed reservoir. Certain permanent buildings such as the office, Resident Engineer's quarters etc. could be sited, bordering the existing Irrigation Department complex. These buildings could then be part of the O&M buildings and the proximity to the Irrigation Department would facilitate coordination of O&M activities.

5.9 Moragahakanda Catchment (watershed) Management

Mahaweli initiatives in this respect include:

a. Establishing a Water Shed Protection and Development Project to manage and coordinate catchment activities under MASL.

b. National Land Use Planning Programme, and photographic survey of the Moragahakanda catchment as the first step in preparing the master plan for catchment development. Preparation of a plan indicating the boundaries of the catchment of the Moragahakanda reservoir at the feasibility stage of studies.

c. 100 meters from the FSL of the Moragahakanda reservoir will be marked on ground and will be preserved as the 100m reservation. This reservation area will be planted as a conservation cover.

d. The areas under forest cover at present in the Moragahakanda Reservoir catchment will be preserved as forest reservation in the Moragahakanda

catchment. The barren land area within the preserved area will be planted with forest cover.

e. Establishing conservation measures to minimize soil losses, in the catchment area of the Morogahakanda reservoir. Measures include reforestation with timber and fuel wood plantations, crop diversification and engineering works.

f. Inter Agency coordination has been established to integrate the work done by the individual Agencies with MASL strategy of catchment development.

5.10 Human Settlement

In respect of the residents of the area one of the most important decisions has been the selection of the low dam option in preference to the previously determined higher dam. This decision has reduced the impact on all environmental dimensions. As regards the population, the lower dam has reduced the number to be evacuated by almost half. The total number of families that may have to be relocated will be 1062 families in 951 houses in the impounding area and about 15 families living in the proposed corridor. (This latter number will vary depending on the final selection of the size of the corridor).

The MASL strategy for the displaced families consists of:

- Land acquisition and compensation
- Relocation
- Provision of facilities in the resettlement areas.

5.10.1 Land Acquisition and Compensation

Land Acquisition

Private and Swarnabhomi lands, that would be lost due to Project activities will be acquired.

Land acquisition is a quasi legal procedures laid down under the Land Acquisition act, amended by Act No. 60 of 1961, Act No.5 of 1964, Act No.28 of 1964 and Act No.8 of 1979 of the Government.

The process of acquisition takes the following form.

The Acquiring Officer of the District under the directions of the Minister of Lands, publishes a notice under Section 2 indicating the intention to investigate the suitability of the identified land for public purposes. Compensation is paid under Section 3 for any damages caused during the investigation. If it is found that the land is suitable, notice is given to the owner(s) under Section 3 (3).

An issue of declaration under section 4(5)(1) is considered evidence that it is needed for public purposes. When a declaration under Section (5) is gazetted, plan(s) can be prepared by the Survey Department.

The state takes possession of the required land by an order of the Ministry of Lands, published in the newspapers or when urgency demands, by gazette notification under Section 38 of the Act. This compels the people in occupation of the land or buildings to leave the premises. The Acquiring Officer is then in a position to take over the land.

Compensation

Under this procedure, compensation for land and buildings including cultivation will be paid to the evacuees after completing inquiries under Section 9 and issue of awards made under Section 17 of the Act.

Before the families are evacuated, the value of the land, houses and cultivation should be assessed by the Valuation Department and payments made accordingly.

Compensation for paddy land involves a somewhat more complicated procedure before issue of awards under Section 17. The process of awarding compensation take the following form.

i. Survey of parcels of land will be carried out by the Survey Department, permanent plans prepared and submitted to the Government Agent.

ii. On receipt of the survey plans, a notice will be published in the newspapers and/or government gazette calling for written claims under Section 7. All claimants are requested to attend inquires into the title of the land under Section 9.

iii. When there is no dispute action will be taken under Section 10/1 A. When the title is disputed the Courts are notified and legal procedures instituted under Section 10/1B.

iv. After successful completion of inquiries, the claims and inquiry notes are forwarded to the Valuation Department.

v. The Valuation Department investigates local land sales and Land Registry entries before assessment and preparation of valuation reports.

vi. On receipt of the valuation reports the Government Agent is empowered to issue awards under Section 17.

vii. If the parties are satisfied with the compensation, offered payments can be made forthwith.

viii. If they are not satisfied, they can appeal to the Land Acquisition Board of Review for arbitration. The decision of the Board has to be awaited to pay compensation.

The prevailing local land tenure system permits the fragmentation of land to any extent. This has resulted in a multiplicity of claimants owning undivided shares. Concomitant with it, is the absence at times of legally valid documents in support of the claims and the natural human tendency to overstate claims as well as to make invalid claims on barely tenable ground through ignorance or avarice.

The entire procedure, which involves a number of government departments, is time consuming and causes considerable delays in settling claims. This is quite disadvantageous to the re settlers, even though interest is paid for the delayed period, because they have no other capital so needed desperately to recommence their life in the new area. Under the Project, undisputed claims will have to be settled without delay.

This will act as an incentive to the others, to settle their disputes promptly.

However, MASL will determine compensation after due consultation.

Compensation for Land

Compensation will be determine on the following basis.

Private land will be fully compensated through each settlement. Nindagam lands will be treated in the same manner.

As for permit holders, they are not entitled to receive a cash payment for their land. They will be granted a payment in consideration of the development work carried out on their plots. This category will include the LDO permit holders and the regularised encroachers.

Encroachers who have been living on the land before the cut off date will also receive payment for the development of such lands and alternative lands plus other assistance that will be provided for the other settlers under the settlement schemes.

Swarna Boomi deeds are issued at a land kachcheri to residents who have occupied the land for a long time. They have the right to sell the land. As such, title holders will be eligible to receive full compensation for the land.

Annual or temporary permit holders will not receive any payment for the land, because they lose claims to the land at the end of the period for which the permit is issued.

All such residents who have developed their lands will receive a payment for their development work, based on a government valuation.

Owners of the 951 houses that will be inundated and 15 approximately, in the proposed Elephant corridor will be entitled to compensation. They will be permitted to remove useable material.

5.10.2 Compensation Options

Compensation is offered to persons who lose their cultivation as well as their land. Any buildings resting on the land too will be eligible for compensation. Several options are offered so that the affected people will not feel cheated or unduly disadvantaged due to the Project. The following options will be available.

i. Options for all

In the event that land is acquired for the project, compensation will be given for crop loss, tree loss or other cultivation loss as well as for the soil.

ii. Severed Agricultural Land

In case small parcels of land are divided.

(a) When acquisition leaves the owner a parcel of land, which drastically reduces or destroys its economic viability, he shall have the option of offering the remaining land for acquisition for which compensation will be given at a rate not less favourable than the rate of acquisition.

(b) An owner of several parcels of land may offer the entire land for acquisition.

iii. Injurious Affection

When the owner wishes to retain the remaining portion of the divided land he will be in a position to claim compensation for depreciation of the portion of land retained, while the land compulsorily acquired will receive the scheduled rate of compensation.

iv. Loss of Access

In the case access to the land is obstructed or the remaining land becomes land locked, action will be taken to provide alternate access, or pay compensation or provide alternate land after acquiring the land locked parcel of land.

5.10.3 Cut off Date for Encroachment for Compensation

MASL has recommended that the cut off date for encroachments for compensation should be September 1996 and the following reasons have been given for selecting the above date.

- It being the date of the survey conducted by the PMU/MASL (Socio-Economic) census of affected dwellers in the proposed Moragahakanda Project Area, Planning and Monitoring Unit MASL.

- Discourage the increase of encroachments into the project area.

5.10.4 Relocation

The primary solution to the families affected by the project (private land owners, Swarnabhmi holders LDO permit holders and selected encroachers) will be resettlement. Those who have been earmarked for resettlement will have an option of moving into a location of their choice outside the settlement area. In such instances they will be given development assistance in cash to settle down in the new area.

These-settlers will be offered land under Mahaweli Zone DI

They will be given the option of selecting their community group who will form their neighbours in the new resettlement areas and work together. This will minimize the trauma of re- establishing in a new environment.

The exact plot of land allocated to re-settler, will be determined by drawing lots.

Re settlers will be permitted to remove any useable material from their house and lot in their original place in the project area. The homestead lot will have a parallel paddy lot earmarked in the irrigable area.

Among the re-settlers there are about 500 people engaged in mining, quarrying, cleaning, storing and transport of minerals. These are gender specific activities. Collecting rock blasting and mining are male specific, whereas cleaning and packing are female related activities. The males engage in mining activities mainly during the off season. Females are engaged on a regular basis in these activities.

Some families may wish to retain their present form of employment and remain in an area close to mining sites. Such families would be given the option of remaining in the neighborhood. Provision will have to be made for housing lots for such families close to mining sites.

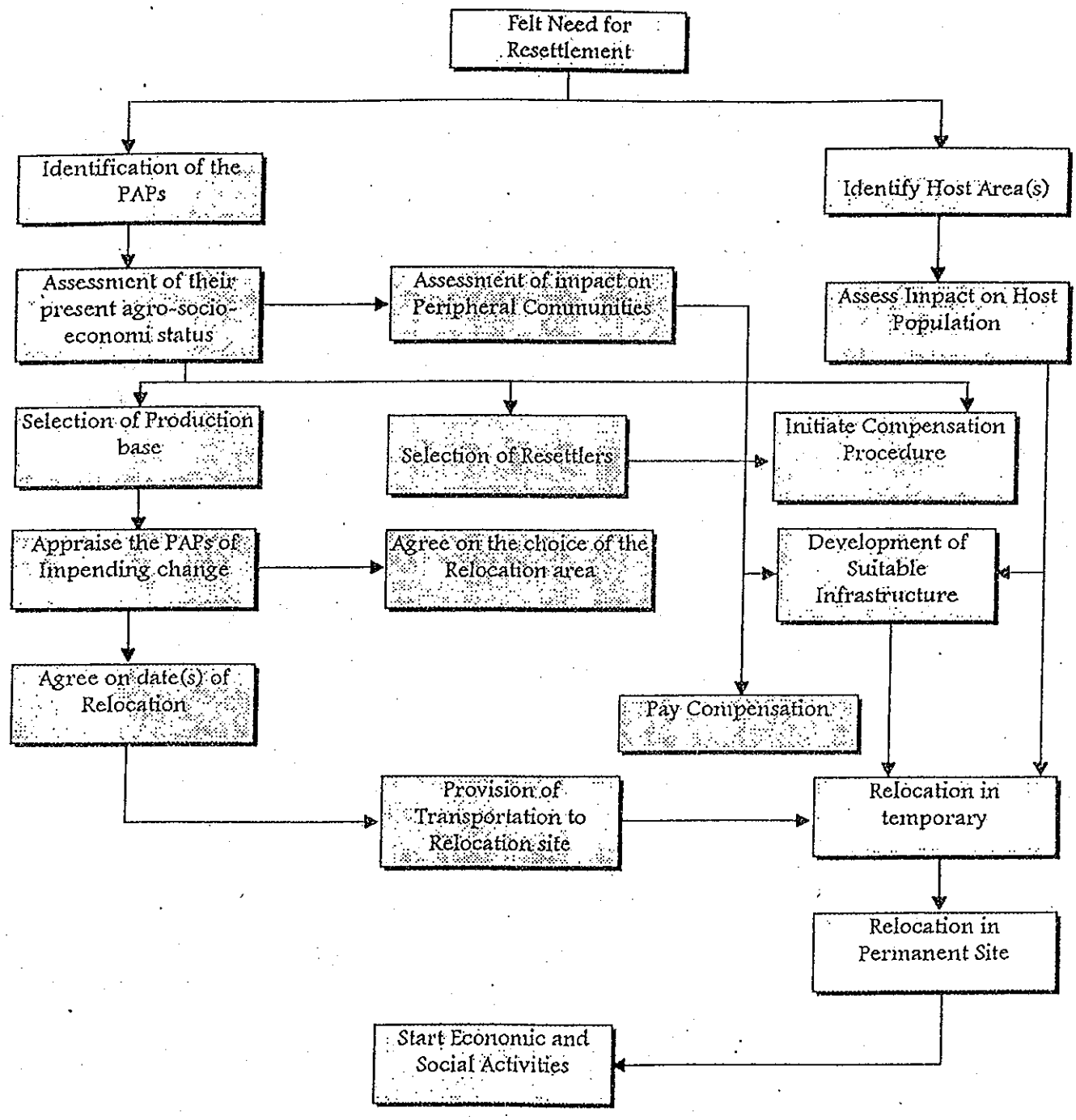
The re-settlers will lose their part time mining activities in the new settlement areas. However developing their homesteads and paddy lots will be a full time activity for the entire family in the first two or three years.

5.10.5 Resettlement

The processes of settlement consist of two parallel streams of activity as shown in **Figure 5.1.**

Criteria for selecting persons affected by the Project (PAPs):

i. Cultivators resident in the affected area
ii. Those who have been left with an uneconomic parcel of land
iii. Those who will lose more than 50 percent of their land.
iv. Those who will demand road access and will get isolated.
v. Those who will lose their cultivation rights.
vi. Those whose houses are affected
vii. Those whose lands will be needed for project purposes identified by acquisition boundaries.
viii. Those who are not directly affected but lose most of the family ties and relationships, due to PAPs being relocated.
ix. Selected encroachers. Cut off date for re-setters will be the start date of the Mahaweli authority socio-economic survey. (September 1996)



PAPs = Project Affected People

Figure: 5.1: The Resettlement Process

5.10.6 Preferred Areas for Resettlement

Interviews conducted during the present study reveal that the area preferred by most of the residents is in the vicinity of their present location. Particularly the land less and those with small parcels would not mind setting anywhere if cultivatable land is provided. People who prefer to leave the area do so because there has been very little development in the area for the past twenty-five years or so. This they say is because most development work was delayed, as there was the possibility of the Moragahakanda Project being implemented.

5.10.7 Criteria for Selecting Resettlement Sites

MASL uses the under mentioned criteria in selecting suitable re settlement sites.

i. Adequacy of land

The site should have sufficient land to accommodate the agricultural and social infrastructural requirements of the resettler population. Since MASL settle people in units of 200-250 families, a site must be able to support at least one unit, to ensure the efficient use of infrastructure.
Land should also be available forest/ stream reserves. There should be provision for village wood lots and grazing and additional land for future development of the communities

ii. The land should be free of encumberances ie. Free from encroachments or multiple claims.

iii Since paddy cultivation will be the main crop, water should be avilable for two – season cultivation.

iv. Potable water should be available for domestic use.

5.10.8 Sites for Resettlement

A number of sites have been investigated at different locations. The most favourable site is the command area off the Kaudulla Settlement Scheme in Mahaweli System D1. A total area of approximately 9,000 ha. is available for development under the system.

The site is situated to the North – East of the present Kaudulla Irrigation Settlement Scheme in the Medirigiriya Divisional Secretarial Division (see Map 5.10.6). The distance by road from Kongahawela (which is more or less central to the reservoir areas) to the relocation site is about 150 km.

This land, identified as D1 under the Accelerated Mahaweli Development Programme, is largely in jungle. The southern part of it, which is earmarked for resettlement, falls within Stage III of the Kaudulla Development Scheme with a large number of abandoned small tanks, which include.

Peramadu Wewa
Kadamaradankaduwa
Dutuwewa
Koon Wewa
Naakkulam
Ichchaikadu
Maharalapanawewa

They will be incorporated into the new irrigation network. MASL has identified a total extent of 9000 ha for future development.

MASL will develop an area of about 2000 ha or more in D1 which will be sufficient to meet the requirements of the 1064 families of 951 house holds. The land will be suitable for irrigated agricultural settlement in terms of the physical features of the area. Development under Stage III of the Kaudulla Scheme envisages a separate canal to irrigate the area. Further investigations will be needed to identify a takeoff point from the main canal that could directly irrigate, thus eliminating a conflict among the old water users and the new settlers area marketed for re-settlement.

The host population in this area consists mainly of encroachers who are fairly scattered over the entire area in small numbers. The exact number of encroachers is not known. A census of the existing population will have to be carried out to safeguard any rights of these residents. Provision will be made to accommodate the eligible encroachers for land settlement under MASL terms and conditions.

At present the area is the feeding ground of wild elephants. Taking away about 2000 ha for development will not seriously affect the roaming herds, more or less. The same degree of conflict that exists in Medirigiriya area will continue to exist.

There have been occasional threats from the terrorists in the Medirigiriya area. The incidents are less frequent than in the past. This is not regarded as a long-term barrier to settlement.

The area under consideration lacks most of the social infrastructure. However the neighboring area centered around Medirigiriya have the following facilities:

Bus service to new Town Medirigiriya
Rural Hospital
Post Office
Police Station and Police Post

The Kaudulla Irrigation Office is situated in the New Town, which is at the Northern most border of Stage II Development Area. There are buildings consisting of the office, stores and 15 staff quarters which were constructed by MASL for developing the command area. Due to changes in development priorities, the buildings have been handed over to the Irrigation Department. MASL will provide the necessary infrastructure and facilities needed by settlers.

5.10.9 Resettlement Package

The MASL has a long-term commitment towards the settlers. Settlers in system B,C,G,H,L and Udawalawe continue to be supported long after their settlement. There is yet no cut-off date for withdrawal when the functions can be handed over to Line Departments.

Transport

Displaced persons will be provided transport to the new locations for their family members as well as their belonging. Any material recovered from the demolished building too will be transported.

Settler Assistance

The MASL has recommended the following assistance to be provided to the settlers as a component of the total resettlement package.

1. Material to the value of Rs.6,000/- (Tiles or roofing sheets) to build a house and free transportation for their own building materials to the new area.
2. Free issues of dry rations for five members of the family till they obtain their 1st harvest.
3. Free seed paddy and fertiliser for their 1st and the 2nd cultivation.
4. Free Agriculture implements such as mamoties, crow bars, axes, knives.
5. Free plants such as coconut, mango and citrus for planting in the homesteads.
6. Materials to the value of Rs.5000/- to build a well for drinking water in the homestead and
7. Materials to the value of Rs.3,000/- to build a toilet (Ceramic water seal squating).

MASL also has recommended that the development of the down stream settlement to be constructed along (parallel) with the development of the Moragahakanda Reservoir.

Food Assistance

Assistance will be sought from the World Food programme to provide five members of each family with basic rations for a period of 18 months or until such time as they are capable of obtaining their first harvest which ever is early.

Health Care and Sanitation

This aspect has been a significant mitigatory measure for the settlers. Health care facilities are provided to all settlers. At the early stage of settlement a mobile unit caters to settler requirements. More permanent arrangements are made as the population stabilizes. A three stage health service system is arranged at Divisional, Sub Divisional and at Gramodaya levels.

The Anti Malaria Campaign has been extended to the MASL settlement areas. Community wells, shallow and deep wells and pipe borne water for settlers and townships are provided to ensure quality water for drinking and other domestic use. The settlers have also access to water from canals. Steps are provided to access deep sections of the canals.

5.10.10 Capacity of the Implementing Agency

MASL is the most experienced organization in Sri Lanka dealing with compulsory and voluntary settlement of large populations. A total of 115,000 families have been altogether settled in systems H,C,B,G,L and Uda Walawe. Affected people of Victoria and Kotmale Project have been effectively relocated in large settlement scheme in Systems C and B. Past experience has created a high level of conceptual clarity of the many issues related to relocation and MASL has taken affective measures to overcome them. It has developed and organizational structure to deal with settlement. The Field Level Management Structure of MASL is given in **Figure 5.2.**

MASL has a well defined plan of action with regard to settlement of large populations. Macro level planning and implementation of settlement is under a separate division committed entirely to the social and economic welfare of settlers. Another division looks after all downstream construction and maintenance.

The summary of Impacts and Mitgatory Measures are shown in **Figure 5.3.**

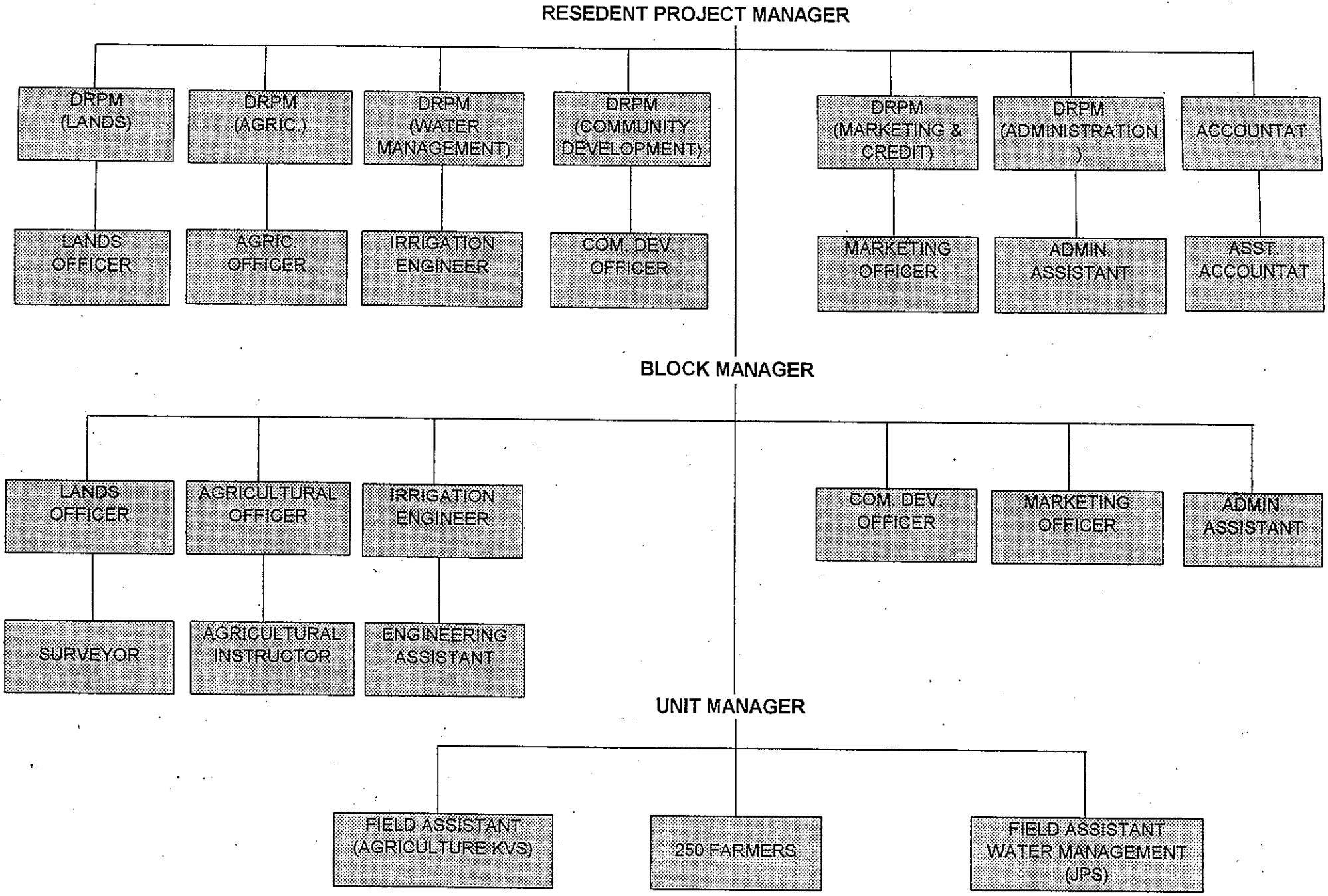


Figure : 5.2 : Field Level Management Structure of the Mahaweli Authority of Sri Lanka

Figure 5.3 Summary of Impacts and Mitigation

SIGNIFICANT IMPACTS	MITIGATION
Soil erosion in the catchment and reservoir sedimentation	Formulate and implement water shed management plan
Loss of storage due to unsatisfactory water tightness in reservoir bed	Detailed investigation to establish extent of grouting
Exposure of permeable zones due to borrow pits in the reservoir bed	Investigate reservoir bed prior to borrowing
Loss of storage water from foundation	Investigation and grout curtaining
Generation of sediments from construction activities	Minimize production of sediments
Loss of a small area of wild life reserve by inundation	Declare adjacent area of similar acreage as wild life reserve
Loss of wild life habitat	Enrich and enhance the carrying capacity of wild life habitats in the area.
Loss of elephant pathways	Allocate land for corridor.
Loss of Human settlements	Establish settlements in D1 Area
Loss of Agriculture land	Provide land in D1 Area
Break down of social life	Social development programmes by MASL
Loss of public building	Provide new buildings in resettlement areas
Loss of other infrastructure	Provide infrastructure in resettlement areas

CHAPTER 6: MONITORING PLAN

6.1 Monitoring Plan

This chapter presents a Monitoring Plan that need to be implemented once the Moragahakanda Project has been accepted as environmentally sound on the basis of the present study. It consists of the following main sections.

- Environmental Monitoring Plan
- Resettlement Monitoring

6.2 Environmental Monitoring Plan

6.2.1 Dam and Reservoir

The susceptible areas of the proposed main and saddle dam foundations together with their abutments were indicated in Chapter 4. During construction stage piezometers should be installed in all sensitive areas of the dam site including the dams themselves. The locations and requirements of piezometer and other instrumentation will be finalized at feasibility and final design stages.

The piezometer observations should be made and recorded together with time of observation and reservoir levels, before, during and after impounding the reservoir. Experts would be able to use this information supplemented with data from other forms of instrumentation to interpret the behaviour of the foundation and abutments. The reservoir bed is used for quarrying mica, quartz, feldspar and gemming. As pumps are being used in the mining process the ground water table has been disturbed.

Once the project commences, these activities will be stopped. It is advisable to monitor the ground water table on a grid, relative to Amban Ganga levels. With impounding, the ground water level will rise but may even be lost to other aquifers due to the natural limestone and block faulting. Monitoring will help to identify the extent of the changes taking place and initiate corrective action when necessary.

Impounding may also influence Bowatenna storage due to reduced gradients for aquifers. This has to be checked by continuous monitoring of the water table.

Besides ground water levels, other parameters that should be monitored are temperature, evaporation wind speeds, water quality and extension of high lands cultivated by pumping from the river or irrigation canals. Periodic silt sampling of the inflow water should be done by the MASL to monitor the extent of sedimentation in the reservoir.

6.2.2 Moragahakanda Watershed

To control erosion in the upper watershed, cultivation of the catchment area should be monitored regularly by MASL, Forest/Wild Life Rangers and Environmental Officers attached to local authorities, jointly. For this purpose a joint programme has to be developed under the aegis of MASL to ensure frequent (as least monthly) visits to the catchment areas.

By controlling and managing the forest clearing and agricultural activities in the catchment, siltation in the reservoir and soil erosion can be arrested.

6.2.3 Flora and Fauna

There are several actions proposed to mitigate the impact of flora and fauna. These should be implemented by MASL with the assistance of the Department of Wild Life Conservation and Forest Department. The Development Division of MASL will be responsible for implementation and monitoring.

6.2.4 Construction

It is essential to monitor the implementation of the mitigatory measures that have been recommended to minimize the affects of construction activities. The MASL and Supervising Consultant should monitor the construction activities to check whether the contractor is adhering to the environmental safety clauses included in the bid document.

6.2.5 Command Area

Periodic water quality monitoring of standing water and drainage water in the fields of the command areas would help in identifying any increases in salinity and sodicity of the soils. Such monitoring procedures should be implemented by organizations assigned by MASL.

6.3 Resettlement Plan

The Planning and Monitoring Unit (PMU) of MASL is the Agency responsible for planning and monitoring of the Moragahakanda Project. Time schedules for project activities and executing responsibilities will be defined once the fresh updating of Feasibility Study is completed.

The resettlement process is complex and involves a number of agencies. For better coordination a monitoring plan should include the activities listed in Table 6.3.1.

Table 6.3.1: Resettlement Monitoring Plan

Activity	Responsibility
1. Reservoir Area	
1. Perimeter Survey and Land Marking	DS/SD/MASL
2. Gazettification of the Area	DS
3. Conduct Census of Households	DS/GN/MASL
4. Land Acquisition Procedure	DS
4.1 Land Acquisition Survey	SD/DS/MASL
4.2 Gazettification of Land Acquisition	DS
4.3 Holding Land Kachcheri	DS
4.4 Establishing Claims for Compensation	VD/DS
4.5 Payment of Compensation	DS/MASL
5. Identification and Extraction of Timber	FD
6. Establishment of Mechanism for Participatory Resettlement	MASL
7. Preparation of Time Table for Resettlement	MASL
8. Transportation of Resettlers to Host Area	MASL
II. Command Area/Resettlement Area – 2: Kaudulla	
1. Construction of Irrigation Network	MASL/CONTRACTORS
2. Survey of Resettlement Area	MASL
3. Site Clearing	
4. Preparation of Resettlement Layout Plan	MASL
5. Demarcation of Allotments	MASL
6. Offer Allotments to re settlers	MASL
7. Providing Food Aid	MASL
8. Providing Development Assistance	MASL

Abbreviations:

DS	-	Divisional Secretary-Naula
FD	-	Forest Department
GN	-	Grama Niladharis
MASL	-	Mahaweli Authority of Sri Lanka
SD	-	Survey Department
VD	-	Valuation Department

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusion

Moragahakanda Agricultural Development Project could be implemented with minimal adverse environmental impacts provided that the mitigatory activities suggested above and recommendations given below are adopted without any alteration or delay.

Notwithstanding the Monitoring Plan presented in Chapter 6, the undermentioned recommendations are made in respect of the different environmental components.

7.2 Further Updating of Feasibility Study

Feasibility Studies of the Moragahakanda Project has been done by JICA in 1978/79 and updated in 1988. Since then a considerable time has elapsed and scaling down of the Project has been decided. At present there is a need for further study of relevant environmental issues highlighted in the present study and identification and planning of actual implementation details. In view of the above there is a need for fresh updating of the Feasibility Study of Moragahakanda Project.

7.3 Geology and Minerals

i. It is recommended that detailed drilling investigations should be carried out in limestone outcrop areas as the left abutment area of saddle dam 2, the reservoir bed area upstream of Saddle Dam 1 and the base of the main dam. It has also been found that unstable rock formations occur in the reservoir area, and might affect the water tightness. For the same reason, moving large quantities of earth from the tank bed should be done only after detailed investigation. The investigations should be undertaken during the Feasibility Study Stage.

ii. In the light of past experience from Bowatenna and Kotmale tunnelling and more recently from Samanalawewa Reservoir, continuous monitoring and close co-ordination of construction activities will be necessary. It is recommended that a permanent Panel of Experts be established to look in to problems and initiate timely action. They will also monitor the implementation of the initiatory measures recommended.

iii. Budgetary provisions should be made for the effective functioning of this Panel. The expenses must be included as a part of the Project Costs.

iv. The borrow pit and quarry areas should be examined for mineralogical and structural details and inventories potential minerals to be extracted.

v. Plans should be drawn to extract the mineral resources likely to be lost during the Feasibility Study Stage. Exploitations, at an acceptable level, should be carried out in close co-ordination with the Geological Survey and Mines Bureau and the National Gem and Jewellery Authority.

vi. In case of mining, as activities are accelerated, proper monitoring should take place to avoid complications (as mentioned under (1) above). For this purpose, a special Monitoring Panel should be established comprising of representatives of the following Agencies.

- Divisional Secretariat
- Geological Survey and Mines Bureau (Geologist/Mineralogist)
- Irrigation Department (Hydrologist)
- Gem and Jewellery Authority
- Department of Wild Life Conservation
- Department of Forests

The TOR of Monitoring Panel should include the regulations to be relaxed and the modalities of operation to enable optimal extraction within the framework of Environmental Guidelines.

vii. Earlier mechanized gem mining proposals, one on high ground and the other in river bed were failures, due to various reasons. However, if semi mechanized mining allowed it should be taken up case by case to avert any possible serious environmental disaster as conditions of the reservoir bed are somewhat similar to those of Samanalawewa Reservoir.

viii. A license should be obtained from the Geological Survey and Mines Bureau; for exploration of minerals, the exploration licensee to the exclusive right to mining of minerals within the area specified in that license.
For mining, a relevant mining license will be obtained from the GSMB.

7.4 Forest

i. The inundation area should be clear felled. Except in island areas formed after inundation all useable materials should be removed before inundation. MASL will be required to liaise with the State Timber Corporation for any log and clearing operations so that optimum utilization of the timber, round poles and firewood is made possible. This should be an advanced operation.

ii. Arrangements must be made for the removal of any logs that may block the sluice of the Main Dam subsequently.

iii. Select felling should be carryout in the settlement areas to ensure that only the land needed for development is cleared.

iv. Planting of shade trees along the new roadways and avenue planting should be made a part of the resettlement program.

v. The reservoir reservation strip of 100 m should be wooded to protect inlet streams and deep gradient from erosion. Endangered medicinal plants and flora should be planted.

vi. A survey should be conducted of the endangered medicinal plants and flora during the feasibility studies

vii. Nurseries should be established in the conservation forest area of the Moragahakanda Reservoir.

7.5 Wild Life

The need to protect the elephant population while safe guarding the settlers from wild life damage has been a dilemma for MASL. The reservoir reduces the natural habitat of the elephant earlier occupied the tank bed area. The provision of an elephant corridor increases the elephant movement within the confines of the corridor. A well-conceived practical management plan is needed to contain the man - elephant conflict. Such a Plan will include,

i. Strengthen the Wild Life Office near the Dam Site with properly trained personnel in elephant management.

ii. Developing programme to retain elephants in gazetted wild life reserves by using physical barriers and other appropriate methods as power fences.

iii. Relocate houses of settlers that are situated in critical/vulnerable areas.

iv. Prevent further encroachments by gazetting the area and proper monitoring.

v. Carrying out habitat enrichment in the protected area network, by growing grasses which will make the area attractive to elephants. Experiments have shown that **Bracheria sp** is very attractive and salt tolerant. Tanks within the area have to be restored in order to ensure fresh water suppliers, for wild life, partially during the dry season. This will attract more birds and other species.

vi. A comprehensive study on bio-diversity must be undertaken to assess the important species in the Project Area. This study should also lead to the development of a management plan for long term wild life conservation. The study should be incorporated in the Project Cost.

7.6 Human Settlement

i. A public awareness programme should be launched immediately after the Cabinet approval is received for the Project. The people of the area have been anticipating that the Moragahakanda Project will be launched. Due to long years of uncertainty, they are anxious to know whether the Project will take place definitely, so that they could make certain investment decisions. Public officials such as the Divisional Secretaries, Grama Niladhari and political leader ship such as members of Pradeshiya Sabhas, medical officers and school teachers are concerned because a decision to implement the scheme will mean their readjustment to new challengers.

ii. The intended areas of resettlement should be gazetted very early and protected from encroachers.

iii. The elephant corridor is very narrow, about 2 miles crossing to the Naula - Elahera road and very close to the Dam. Therefore all precautions should be taken to minimize disturbance to wild life. Temporary Construction Camps including residential quarters should be located within the reservoir area above the water line.

iv. Other Buildings, which could be used for administrative and residential purposes, may be located at Elahera. Since the present cart tract will be developed as the diversion road skirting the reservoir Elahera is likely to develop as a junction town and planning of the Elahera township should be a project responsibility.

v. Acquisition proceeding can be expedited, but delays in surveys and payment of compensation have been experienced in the past. All efforts must be made to pay the compensation before the settlers take up residence in the new areas.

vi. Part payments of compensation should be minimized. Experience with Kotmale and Victoria resettlers indicate that the affluent farmers who received timely compensation made faster progress in establishing themselves in the new areas.

vii. Settlement staff should be associated from the earliest stage of the resettlement phase. Block Manager and 4 Unit Manages should be made responsible for activities in the Command Area.

viii. The affected population must be medically screened prior to resettlement to identify nutritional status, communicable diseases and diseases that may accelerate due to stress and conditions in the resettlement areas.

ix. Project affected families, who enjoy a two season cultivation, should be encouraged to take up settlement in the command area.

x. A more realistic grant must be given to the resettlers for house construction. The core dwelling must be a permanent structure.

xi. Permanent householders in the affected area who do not wish to move into distant resettlement areas should be provided homesteads in the vicinity. The categories who would prefer such an option will be traders, miners, professionals etc.

People eligible for resettlement but opt to either stay in the vicinity or move to a location of their choice should be given a special resettling allowance in addition to compensation awarded.

xii All borrow sites which are outside the inundation area should be landscaped to avoid erosion. The outcome should be aesthetically sound.

xiii. A cut-of date for settling in the area should be decided to avoid adventurers who take up residence from making claims for resettlement. The most logical cut off date will be the start date of the socio-economic survey conducted by MASL which would be 1st September 1996.

xiv. Encroachers must be screened for eligibility of settler benefits and treated accordingly.

xv. The use of local officials ie. Grama Niladhari etc. should be consulted and their assistance obtained in developing and executing the resettlement plan.

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APPENDICES

PERSONS MET

Appendix 1

Mr. S.W.K.J.Samaranayake	Director General, MASL
Mr. P.T. Senaratne	Secretary General, MASL
Mr. Milton Amrasinghe	Managing Director, MEA, MASL
Dr. R.D. Wanigarathna	Director, PMU, MASL
Mr. S. Karunarathna	Director, HAO&M, MASL
Dr. H. Manthrithilake	Director, F&E MASL
Mr. H.A. Wickramarathna	Chief Civil Engineer, MEA, MASL
Mr. S.W. Dissanayake	Dy. Manager (Env.) MEA, MASL
Mr. M.M.S.R. Perera	Dy. Manager (Env.) MEA, MASL
Mr. N.P. Tittagalle	Ag. Economist, PMU, MASL
Mr. D.C.S. Elakanda	Principal Engineer/Env. Planner, PMU, MASL
Mr. R.B. Ramanayake	AD (E&TS) HAO&M, MASL
Mr. G.D. Perera	Agronomist,MEA, MASL
Mr. Gunawardena	RPM System B, MEA, MASL
Mr. R.D. Wickramasinghe	MEA, Bakamuna, MASL
Mr. Lakshman Bandara	Project Manager, IMD, Giritale
Mr. H.M. Junaid	IE, Kaudulla
Ms. Asoka Dassanayake	Draughtsperson, IE Office, Kaudulla
Mr. H.M. Somathilaka	Divisional Secretary, Naula
Ms. R.M.C.M Herath	Add. Divisional Secretary, Naula
Mr. Y.M.P. Yapa	Administrative Officer, DS Office, Naula
Dr. W.A.D.S.Jayashantha	Regional Director of Health Services, Naula.
Dr. (Ms.) Anandi	AMP, Central Dispensary, Dasgiriya
Mr. P.L. Jinadasa	DO, Govi Kendraya (Ag. Service Centre), Kaluganga.
Mr. E.W. Abeyratna Banda	GN, Elagamuwa
Mr. S.B. Ratnayake	GN, Galboda
Mr. W.G. Gonatilake	GN, Galporugolla & Kambarawa
Mr. L.G. Premaratna	GN, Kadawatha
Mr. E.M.K. Ekanayake	GN, Kongahawela
Mr. U.G. Heenbanda	GN, Maragamuwa & Pubbiliya
Mr. R.P. Nimal Rajapaksa	GN, Medapihilla
Mr. K.B.G. Punchibanda	GN, Millagahamullathenna
Mr. I.G. Wasantha Piyadasa	GN, Rajawela
Mr. D.M. Chandrasekera	GN, Thalagoda
Mr. G.P.M. Punniyadasa	GN, Ambana & Senagama
Mr. M.M. Muthu Banda	GN, Bambara Gaha Watta
Mr. R.M.K. Sirinama Bandara	GN, Dambagolla
Mr. H.M. Premaratna	GN, Gamg Ema Yaya
Mr. H.B. Abeysinghe	GN, Halamba Gaha Watta
Mr. S.M.A.N. Wilbert Silva	GN, Kubiyangaha Ela
Mr. P.G. Karunaratna	GN, Moragolla and Opalgama
	GN, Opalgama
	GN, Senagama
	Principal, Bambaragahawatte Junior School
	Officer-in-Charge, Plumbago Processing Centre, Kongahawela.
	Public Health Worker, Helambagahawatte
	Samurdhi Niyamaka, Helambagahawatte
	Samurdhi Niyamaka, Kadawatha
	Principal, Elagamuwa Junior
	Principal, Kongahawela Maha Vidyalaya
	Divisional Manager, MPCs, Kongahawela
	Manager, Rural Bank, Kongahawela.

Mr. Nimal Kenaherarachchi	Librarian, Sri Naga Vidyalaya, Naula.
Mr. I.G. Dharmadasa	Principal, Kongahawel Maha Vidyalaya
Mr. W.G. Jayathunga Banda	Weera Govi Sanvidhanaya, Galporugolle
Mr. H.M.U Thilakarathna Banda	Principal, Galboda Junior Vidyalaya.
Mr. R.M. Kulathunga Banda	President Conciliation Board, Galporugolla
Mr. A.G. Senerath	President, Sri Sucharitha Sasanaraksha Samithiya, Kambarawa
	Principal, Kambarawa Vidyalaya.
Mr. K.M. Tkiri Banda	President, Gramodaya Mandalaya, Kambarawa.
Mr. R.B. Ekanayake	Registrar of Marriage, Birth and Deaths, Kambarawa.
Mr. G.V.S.K. Wijerathna	Principal, Agra Bodhi Vidyalaya, Kaluganga
Mr. M.G. Wijebanda	Farmer, Kongahawela
Mr. W.B. Ratnayake	Villager, Kambarawa.

Appendix 2

List of Land Owners in the Inundation Area and Extent of Their Land Affected

E407 Elagamuwa GN Divison

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1488	P.G. Gunarathne	04	Farmer	0.0	0.2
1241	N.G. Wijerathne	05	-do-	0.0	0.4
1242	N.G. Piyadasa	06	-do-	0.0	0.2
1243	N.G. Kudabanda	04	-do-	0.0	0.2
1244	W.M. Tikiribanda	04	-do-	0.3	0.2
1246	W.M. Indra Kumari	04	-do-	0.0	0.2
1486	A.M. Abeyrathne	04	-do-	0.0	0.2
1426	P.G. Sumanawathie	04	-do-	0.2	0.2
1419	W.M. Ukkubanda	04	-do-	0.2	0.2
1416	P.M. Muthubanda	04	-do-	0.3	0.2
1417	A.B.G. Kapilarathne	02	-do-	0.05	0.4
1418	A.B.G. Tikiribanda	06	-do-	0.2	0.1
1422	W.M. Karunarathne	06	-do-	0.0	0.1
1245	A.B.G. Ranbanda	05	-do-	0.0	0.6
1421	W.M. Wijerathne	04	-do-	0.2	0.2
1420	D.M. Dassanayake	05	-do-	0.2	0.2
1484	P.A.G. Dasanayake	06	-do-	0.2	0.4
1444	R.M. Heenbanda	01	-do-	0.0	0.8
1439	P.A.G. Muthubanda	02	-do-	0.6	0.1
1240	P.A.G. Ekanayake	05	-do-	0.4	0.4
1440	P.A.G. Punchibanda	03	-do-	0.0	0.2
1398	N.G. Mudiyanse	02	-do-	0.3	0.2
1427	P.G. Kalubanda	05	-do-	0.8	0.4
1428	R.M. Rammenike	04	-do-	0.0	0.2
1344	W.M. Punchibanda	04	-do-	0.3	0.4
1335	R.M.D. Jayathilakebanda	04	-do-	0.4	0.4
1336	R.M.C. Wijerathne	5	-	0.6	0.2
1265	R.M. Dingiriamma	01	Farmer	0.2	0.2
1264	R.M.C. Somarathne	03	-	0.2	0.2

E407 Elagamuwa GN Divison - Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1502	I.G. Sarath Wijerathne	02	-	0.0	0.2
1298	A.A. Gunawardhana	06	-	0.4	0.4
1491	I.G. Premadasa	05	-	0.3	0.0
1262	Y.W. Ellepola	04	-	0.0	0.1
1340	W.G. Rammenike	04	-	0.0	0.2
1409	R.A.D.G. Ranasinghe	05	-	0.0	0.1
1501	D.G. Justis Doluwarage	03	-	0.0	0.1
1503	D.G. Shantha Anura Bandara	01	Farmer	0.0	0.1
1279	R.M. Nimal Rathnayake	03	-	0.0	0.1
1376	U.G. Rukman Senanayake	01	-	0.0	0.2
1273	K.P.G. Abeysinghe	01	-	0.0	0.2
1342	W.G. Pragnarathne	01	-	0.0	0.1
1342	A.G. Babi	01	-	0.0	0.1
	A.B.G. Punchi Menike	05	-	0.0	0.2
	N.G. Jayathilake	04	-	0.2	0.1
	R.M.D. Samarathunga	01	-	0.0	0.2
	G.G. Tennakoon	01	-	0.0	0.1
1441	M.M. Kapila Weerasinghe	01	-	0.0	0.1
	T.M. Punchi Menike	01	-	0.0	0.1
	G.U.G. Somawathie	05	-	0.0	0.8
	K.P. Baby	01	-	0.0	0.1
	I.G. Manikee	01	-	0.0	0.2
H.N. 15	R.M. Sidni Kumari Ekanayake	02	Farmer	0.0	0.2
90 A	K.P.G. Jayasinghe	01	-do-	0.0	0.4
43	M.H. M. Thilakarathne	01	Police	0.0	0.1
1362	M.P. Wickramasinghe	04	Service Farmer	1.0	0.2
1414	M.H.M. Dingiribanda				

E407 Elagamuwa GN Divison- Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1361	E.W. Jayampathi Bandara	03	Army Service	0.0	0.1
1411	E.W. Wijithawathie	04	Farmer	0.0	0.2
1394	M.H.M.K.D. Herath	04	Teaching	0.3	0.1
1960	Gamini Allepola	06	Farmer	0:0	0.0
1412	K.B. Wijethunga	07	-	1.2	0.4
1353	J.B. Allepola	05	Farmer	0.4	0.1
H.N. 128	M.M. Nishantha Dhammika Kumara	02	-do-	0.0	0.1
46 A	G.G. Janaka Bandara	01	-do-	0:0	0.1
52	E.B. Abeysinghebanda	01	-do-	0.0	0.1
	TOTAL			39.9	52.61

Settlements located in Bakamuna, Talagoda and Elahera within the proposed project area is already facing severe conflict situations between the farmers and the elephants. The position can be expected to escalate due to inundation of the present feeding grounds in the reservoir areas.

There is a need for a broader understanding of the ecological processes and the degree of stability that should be established to safeguard the elephant population.

The carrying capacity of the protected areas must be properly understood to ensure that the population of around 100 animals can be contained within these areas by ensuring adequate food and water requirements for the animals other measures will be effective thereafter.

With the emergence of the Moragahakanda programme, the need has arisen to focus on the conservation of natural environment and wildlife, especially to provide adequate habitat requirements to the shrinking elephant population in the area. Hence it is apparent that elephant conservation should be taken up as an integral part of Moragahakande development in order to ensure the long term survival of the elephant on the one hand and sustainability of the development projects, on the other.

The long term viability of the Wasgamuwa-Minneriya, Giritale proposed corridor is doubtful in view of:

i. Size and Shape;
ii. Resources of the corridor;
iii. Land use pattern on either side of the corridor;
iv Agricultural practices on either side of the corridor

The proposed development activities in the Moragahakanda area would attract encroachments and these may cut across relatively well established migratory routes of elephants living in Proposed Minneriya Giritale Nature Reserve. This will create serious problems for settlers as well as for the animals. Small fragmented protected areas cannot provide year round resources for viable populations of large mammals such as elephants, unless there is scientific management. The problem is aggravated by people who live inside or in proximity to protected areas an who intrude and utilize the resources of these small forest areas. Accordingly to preserve its identify an attempts must be made to administer protected areas as an indispensable component of a natural area system. Therefore, a strategy has to be developed to manage protected areas adjoining wildlife and forest reserves and other State forests areas as a contiguous system through the establishment of corridors, and where possible extensions to park boundaries.

It is important to remember that the corridors have to be established in areas where the elephants actually use them and are in need of them. Shifting of the corridor according to the wishes of the people will be courting disaster for both the human and elephant populations. Distance, usage and availability of critical resources will have to play a vital role in the selection of corridors.

Affected Land of Those Who are Residing Outside Inundation Area

E407 Elagamuwa G.N. Division

Name of Head of Household	Address	Land within inundation area	
		Paddy Land (ha)	Up Land (ha)
S.K. Rathwatta	Walala, Manikhinna	1.6	23.0
S.K. Weerakoon	Udugama, Palapathwala	4.8	23.0
Samarajeewa Allepola	Allepola, Palapathwala	1.2	0.0
A.M. Kiribanda	Medapihilla, Thalagoda Junction	0.8	0.0
P.K. Ekmon Singngno	Kadawatha, Thalagoda Junction	1.6	0.0
Kumara Henaya	Galboda, Dammanthanna	0.4	0.0
Nanda Udalagama	No.100, Watapuluwa,Kandy	2.8	0.0
D. Anura Jayathunga	Kadawatha, Thalagoda Junction	2.2	0.1
A.K.S. Sumanasiri	No.49, Haththota Amuna Wellewela	1.3	0.0
W.G. Heenmenika	Kadawatha, Thalagoda Junction	0.2	0.0
W.G. Tikiri Menika	Monaruwela, Palepola	0.2	0.0
Suleiiyamma	No.45, Bowela Rd, Matale	0.7	0.0
R.B. Kapuwatta	Kotuwe gedara, Matale	0.2	0.0
I. Allepola	Allepola, Palapathwala	0.3	0.0
H.M. damayanthi Allepola	Allepola, Palapathwala	0.3	0.0
H.M. Kalyanawathie	Aluthgama, Palawela, Matale	0.3	0.0
H.M. Punchirale	Thalagoda, Thalagoda Junction	0.8	0.0
B.M. Podimenike Basnayake	Kadawatha, Thalagoda Junction	0.8	0.0
L.B. Wickramasinghe	-do-	0.6	0.0
A.M. Karunawathie	Heeritiya, Bakamuna, Track 02 No. 1	0.4	0.1
C.B. Kulathunga	Allepola, Palapathwala	0.3	0.0
K.M. Seetha Kumari	Pubbiliya, Koongahawela	0.2	0.0
V.M. Janadasa	Kambarawa, Thalagoda Junction	0.3	0.0
V.M. Karunarathne	-do-	0.3	0.0
Karunarathne Ekanayake	Debawela, Mahawela	0.2	0.0
Deniya Bandara Allepola	No. 72 Amsi Rd, Matale	2.0	0.0
R.M. Heenbanda	No. 45, Siyambalawa, Bakamuna	0.2	0.0

E407 Elagamuwa G.N. Division - Continued

Name of Head of Household	Address	Land within inundation area	
		Paddy Land (ha)	Up Land (ha)
K.M. Ekanayake	Matale	0.4	0.0
M.H.M. Yasarathne	Thalagoda, Thalagoda Junction	0.6	0.1
A.G. jayasena	Medapihilla, Thalagoda Junction	0.2	0.0
E.N. Mohonmudu Ali	Akurana, Matale	0.3	0.0
M.M.P.B. Marasinghe	Aluthgama, Malawela, Matale	0.6	0.0
P.S. Kulathunga	Koongahawela	0.8	0.0
N.G. Paligu Menike	Kambarawa, Thalagoda Junction	0.4	0.0
A.W. Wijerathna	Galboda, Mahaela, Dalumanthanna	0.3	0.0
A.B. Wickramasinghe	Kahatapitiya, No. 57 Aththanakadawala	0.4	0.0
D.M. Ukkubanda	Dambassa, Opalgala	0.2	0.0
E.W.M. Kumarihami	No.501, Udamgamuwa, Lali Ambe	0.2	0.0
S. Bandaranayake	Dammanthanna, Galboda	0.2	0.0
P.G. Rammenike	Thalagoda, Thalagoda Junction	0.2	0.0
S.M. Bandaranayake	Millawana, Matale	0.0	0.4
E.W.M.E.W. C. Kumarihami	Kadawatha, Thalagoda Junction	0.2	0.0
W.G. Dingiriamma	-do-	0.2	0.0
H.P. Hemani	-do-	0.4	0.0
H.M. Chandralatha Allepola	Allepola, Palapathwala	0.9	0.0
E.W. Sumana Kumarihami	Pallegama, Dambulla	0.2	0.2
N.M. Lokubanda	Kadawatha, Thalagoda Junction	0.6	0.0
K.P.G. Menik	Thalagoda, Thalagoda Junction	0.0	0.2
Anura Wicramasinghe	Kadawatha, Thalagoda Junction	0.6	0.0
G.M. Piyal	Welikada, Rajagiriya	0.0	8.0
Palika Ramani	-do-	0.0	8.0
D.W. Weerakoon	Madawala, Galagedara	0.0	8.0
M.G. Piyasena	Ankumbura, Alawathugoda	0.0	11.3
A.M. Amarakoon	1st Mile Post, Naula	0.0	0.8
Ranjani Obeysekara	Medipola Watta, Medipola	1.2	0.8
W.M. Premarathne	Thalagoda, Thalagoda Junction	0.4	0.0
P.K. Sarath Kumara Ranathunga	Kadawatha, Thalagoda Junction	0.8	0.0
Total		35.91	84.98

List of Land Owners in the Inundation Area and Extent of Their Land Affected

E 208 Galboda G.N. Division

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1666	E.M.U.W. Bandaranayake	05	Farmer	0.6	0.6
1903	B.G. Andiris Appu	05	-do-	0.2	0.8
1904	B.G. Dingiri Ethana	02	-do-	0.2	0.0
1889	B.W.Kapilarathna Banda	07	-do-	0.8	1.2
2028	A.W. Wijerathna Bnada	07	-do-	1.6	0.8
1911	G.G. Tikiri Bnada	04	-do-	0.0	0.2
1872	H.G. Sirisena	06	-do-	0.0	0.6
1941	R.W. Ranasinghe	05	-do-	0.2	0.4
2014	W.M. Ukku Amma	04	-do-	0.1	0.1
1921	E.M.H.G. Punchi Banda	04	-do-	0.0	0.4
1887	D.R.B.H.M.W.W. Ariyasinghe	04	Teaching	0.2	0.0
2029	E.M.H.G. Premaratne	03	Farmer	0.1	0.1
1940	M.W. Kumarasinghe	06	-do-	0.3	0.1
1909	H.M.G. Wijesinghe	03	-do-	0.1	0.2
1943	H.G. Mainahenaya	04	-do-	1.0	0.7
1702	S.P.G. Dingiri Amma	02	-do-	0.7	0.9
2015	B.G. Premathilake	03	-do-	0.0	0.0
1006	B.G. Dingiri Ethana	03	-do-	0.3	0.1
1610	E.M.H.G. Somaratne	04	-do-	0.0	0.4
1875	G.G. Ratnayake	06	-do-	0.3	0.8
1651	G.P. Munasinghe	05	Retired	2.8	0.8
1876	B.G. Ratnapala	05	Farmer	0.0	0.1
1608	W.M. T. Kumara Munasinghe	05	-do-	0.0	0.8
1888	G.G. Wimalasena	04	-do-	0.6	1.1
1840	P.G. Sugathadasa	04	-do-	0.7	0.7
2044	E.M.U.W.R. Bandara	05	-do-	1.6	0.2
2013	S.L.S.G. Kumara	02	-do-	0.8	8.0
1952	W.W. Wijesekara	06	-do-	0.6	0.4
1724	W.W. Senavirathna	03	-do-	0.7	6.3

Galboda G.N. Division- Continued

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1901	A.W. Leelawathie Kumarihami	01	-	0.1	0.0
1907	W.W. Anoja Kumarihami	02	-	0.0	0.2
1953	L.B. Nalagune	03	Teaching	1.2	1.2
2027	B.G. Pangna ratne	05	Farmer	0.0	0.4
2011	B.M. Ukku Banda	05	-do-	0.1	0.1
2043	E.S.K. Seneviratne	04	-do-	2.6	0.2
2026	E.W. Bandaranayake	03	-do-	1.0	1.4
1699	E.W. Abeysinghe	03	-do-	0.0	0.1
1735	W.W. Kulasinghe	05	-do-	0.0	0.0
1910	H.M.G. Thilakaratne	06	-do-	0.0	0.6
1652	M.B. Munasinghe	03	-do-	1.0	1.0
2012	H.M.G. Somaratna	05	-do-	0.0	0.2
2025	U.A. Jayaratne	04	-do-	0.0	0.2
1050	H.M.G. Bandara Menike	05	-do-	0.1	0.4
1736	A.W. Anula Kumarihami	02	-do-	0.6	4.0
2019	W.W. Hema Kumarihami	01	-do-	0.2	0.0
2024	E.W. Tikiri Kumarihami	02	-	0.4	0.0
1890	W.M.Dingiri Amma	04	Farmer	0.0	0.4
1902	D.M. Punchibanda	05	-do-	0.0	0.4
1722	E.W. Wijekoon Banda	04	-do-	0.0	0.6
1920	S.C. Rambukwella	05	-	0.0	0.2
1609	E.M.H. G. Thilakaratne	04	Farmer	0.0	0.6
	TOTAL	227		22.0	39.5

Affected Land of Those Who are Residing Outside Inundation Area

Galboda G.N. Division

Name of Head of Household	Address	Land within inundation area	
		Paddy Land (ha)	Up Land (ha)
H.M.G. Jayatilake	Pilihudugolla Bathalawaththa Naula	0.1	0.0
A.G. Nimal Nandasiri	Dehideniya, Lali Ambe Matale	0.5	0.0
A.W. Premaratne	Adikaram walawwa, Kohotha Moragaspitiya Pallepola	1.0	0.0
U.W. Seetha Kumarihami	Poddalgoda, No. 43 Walpola, Udispathtuwa	0.2	0.0
E.M.U.W. Kulathunga Bandara	23/12, 2nd Step New Town Anuradhapura	0.4	0.2
W.W. Nalina Wardana	North Uduruwa, Unduruwa Galkiriyagama	0.3	0.4
E.W. Wijerathnabanda	Enawaluwa	0.3	0.2
A.B. Thalagune	53/7, Gregory Rd Colombo 07.	1.1	0.0
D.B. Thalagune		0.8	0.0
P.B. Thalagune		0.8	0.0
Sudarma Munasinghe	Sirimal watta, Amunugama Gunnapana	2.4	0.0
A.A. Banda Ranayna	Adikaram Walawwa Mahakotte, Matale	0.8	0.0
Anil Wickramasinghe	101, Thithathotuwa Aluvihare, Matale	0.4	0.0
G.K. Marapana Wickramasinghe	Thalagoda Junction Matale	0.4	0.0
TOTAL		9.6	0.8

List of Land Owners in the Inundation Area and Extent of Their Land Affected

4501A **Galporugolla G.N. Division**

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1536	B.M.K.B. Senanayake	03	Farmer	1.0	0.4
1563	W.G. Ekanayake	05	-do-	0.0	0.4
1494	E.G. Sunil	05	-do-	0.0	0.4
1389	K.M.G.S. Karunathilake	04	-do-	0.0	0.4
1469	H.G. Dewid	03	-do-	0.0	0.4
1560	R.M. Dissanayake	04	-do-	0.0	0.4
1424	R.M.P.G.K.B. Rathnayake	04	-do-	0.0	0.4
1388	R.M.P. Tikiribanda	06	-do-	0.4	0.4
1493	B.G. Pinsiri	03	-do-	0.0	0.0
1546	R.M.A.G. Wijerathna	05	-do-	1.8	0.2
1497	A.G. Ranbanda	02	-do-	0.4	0.4
1593	A.G. kiribanda	02	-do-	1.2	0.4
	A.G. Somadasa	04	-do-	0.0	0.4
1577	R.M. Kulathungabanda	05	-do-	0.8	0.8
1534	A.G. Ranjithbanda	04	-do-	0.2	0.0
1535	A.G. Upathisabanda	05	-do-	0.0	0.4
1562	A.G. Upali Attanayake	04	-do-	0.0	0.4
1425	R.M.A. Jayarathnabanda	04	-do-	0.0	0.4
1464	H.G.Matin	05	-do-	0.8	0.4
1498	A.G. Pemawathie	03	-do-	0.0	0.2
1381	W.G. Jayathungabanda	06	-do-	1.6	0.4
1379	D.G. Piyasena	05	-do-	0.0	0.4
1378	D.G. Sunil	04	-do-	0.0	0.4
1400	R.G. Ranbanda	05	-do-	1.6	0.4
1463	E.G. Sirisena	02	-do-	0.4	0.4
1423	A.G. Kapilarathna	03	-do-	0.4	0.4
1528	M.Saiman	05	-do-	0.4	0.4
1387	A.G. Premarathna	05	-do-	0.0	0.2
1532	E.G. Saiman	05	-do-	0.0	0.2
1530	B.M. Sunil Peiris	04	-do-	0.0	0.4
1553	W.G. Gunarathna	05	-do-	0.0	0.1
1451	R.M.W.G.B. Rathnayake	05	-do-	0.0	0.4
1527	W.G. Chandra Rthnabanda	04	-do-	0.0	0.4

Galporugolla G.N. Division- Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1579	R.M. Nawarathna	05	-do-	0.0	0.8
1511	A.G. Tikiribanda	05	-do-	0.2	0.4
1380	B.M. Nawarathnabanda	06	-do-	0.6	0.4
1403	A.G. Kalubanda	04	-do-	1.2	0.4
1462	W.M.A.G. Sarath Wijerajh	03	-do-	0.0	0.0
1550	R.M.P. Wijerathna	04	-do-	0.8	0.8
	R.M.P. Lional Rathnayake	03	-do-	0.0	0.0
1499	R.M. Lokubanda	07	-do-	0.0	0.2
1495	R.M.G. Upali Priyarathna	03	-do-	0.0	0.2
1548	W.G. Punchibanda	03	-do-	1.2	0.8
1549	W.G. Punchimenike	01	-do-	0.4	0.0
1539	R.M.A. Priyantha Kumari	02	-do-	0.0	0.0
1538	R.M.A. Abeysinghe Banda	02	-do-	0.4	0.4
1598	R.M.A. Punchibanda	04	-do-	0.4	0.4
1595	A.G. Nawarathnabanda	06	-do-	0.4	0.4
1509	R.R.G. Ranbanda	04	-do-	0.4	0.4
	B.M. Shantha Basnayake	03	-do-	0.0	0.0
1599	W.G. Thilakarathna	05	-do-	0.4	0.2
1597	I.G. Ekanayake	05	-do-	0.0	0.4
1596	G.G. Jayasena	04	-do-	0.0	0.4
1521	W.G. Ranbanda	03	-do-	0.0	0.4
1594	P.G. Somarathna	05	-do-	0.4	0.4
1492	K.A.G. Sirisena	04	-do-	0.4	0.2
1470	H.G. Samara	03	-do-	0.8	0.4
1537	W.G. Mudiyanse	04	-do-	02	01
1456	H.G. Punchisena	03	-do-	0.0	0.0
1529	I.G. Lensuwa	04	-do-	0.4	0.4
1556	W.G. Dharmadasa	05	-do-	0.0	0.2
1565	E.G. Jayasiri	02	-do-	0.4	0.4
1386	M.H.A. Gamini	05	-do-	0.0	0.4
1564	H.G. Kudahenaya	05	-do-	0.4	0.4
1510	A.G. Mudalihami	05	-do-	0.4	0.4

Galporugolla G.N. Division- Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1382	R.M.D. Manel Obeysekara	05	-do-	0.0	0.1
	A.G. Jayarathnabanda	02	-do-	0.0	0.0
1452	W.G. Suraweera Rathnabanda	01	-do-	1.2	0.4
	A.G. rathnayake	03	-do-	0.4	0.3
1404	W.G. Dissanayake	05	-do-	0.8	0.4
1583	R.G. Dingiribanda	02	-do-	1.0	0.4
1585	R.G. Nawarathna	02	-do-	0.2	0.0
1584	R.G. Senanayake	05	-do-	0.0	0.0
1559	A.G. Ukkubanda	03	-do-	0.4	0.4
1480	A.G. Kiribanda	02	-do-	0.8	0.4
1482	W.G. Punchibanda	02	-do-	0.4	0.4
1561	A.G. Dharmasena	05	-do-	0.0	0.4
1533	B.G. Ranbanda	06	-do-	0.4	0.4
1581	B.G. Kiribayya	06	-do-	0.0	1.2
1471	K.M.G. Dayananda	05	-do-	0.4	0.4
1540	R.M.D. Punchibanda	05	-do-	0.0	0.4
1586	K.M. Sumanadasa	06	-do-	0.8	0.4
	R.M.W.G. Dingiribanda	02	-do-	0.0	0.4
	A.G. Tikiribanda	04	-do-	0.0	0.4
1578	R.M. Tikiribanda	02	-do-	0.8	0.4
1462	W.G. Kalubanda	04	-do-	0.0	0.4
1454	W.G. Jayathilake	05	-do-	0.4	0.4
	W.G. Nimal Karunarathna	03	-do-	0.0	0.4
1483	B.M. Piyasoma Basnayake	03	-do-	0.0	0.4
1481	B.M. Wickramasinghe	02	-do-	0.4	0.4
1482	A.G. Punchibanda	05	-do-	0.4	0.4
1399	B.M. Kalubanda	02	-do-	0.0	0.4
1547	E.G. Nimal Irathna	04	-do-	0.4	0.4
1401	A.G. Kalubanda	02	-do-	0.8	0.4
1455	M.G.Wijerathna	04	-do-	0.0	0.4
	TOTAL	374		32.5	34.9

Affected Land of Those Who are Residing Outside Inundation Area

Galporugolla G.N. Division

Name of Head of Household	Address	Land Within Inundation Area	
		Paddy Land (ha)	Up Land (ha)
None			

List of Land Owners in the Inundation Area and Extent of Their Land Affected

E 407B Kadawatha G.N. Division

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1042	P.K. Akmon Signgno	04	Sales	0.0	0.6
	W.G. Padmasiri	01	Farmer	0.0	0.0
1043	P.K. S. Kumara Ranathunga	03	-do-	0.0	0.0
	W.G. Dayapala	04	Driver	0.0	0.0
0747	T.W. Nimal Tilakeratna	04	Farmer	0.0	0.2
0889	L.B. Wickramasinghe	04	Sales	0.0	0.3
1041+ D10	A.G. Muthubanda	05	Sales	0.0	1.1
4005	W.M. Lokubanda	03	Sales	0.0	0.2
0861	E.W.Chandrakumarihami	04	Teaching	0.0	0.2
1063	T.W.G.B. Thilakaratne	02	Army Soldier	0.0	0.2
0862	H.G. Hemanee	04	Farmer	0.0	0.3
0975	D.M. Abeysinghe Bandara	07	-do-	0.0	0.2
0974	D.M.S.K. Dunuthilake	03	-do-	0.0	0.1
0914	E.D.G.G. Wijesinghe	02	-do-	0.0	0.1
	N.K.Heenmenike	01	-do-	0.0	0.4
0985	P.G. Premarathe	08	Black smith	0.0	0.2
0967	P.G. Abeysinghe	04	Black smith	0.0	0.1
1031	P.G. Chandrasena	03	Farmer	0.0	0.1
	P.G. Anagidothu	01	-	0.0	0.0
0868	D.D. Jayathunga	04	Co-op Manager	0.0	0.6
1009	R.M. Tikiribanda	05	Farmer	0.0	0.4
	K.A.G. Ranaweera	01	-do-	0.0	0.4
1008	W.A.R.L. Wijesinghe	02	-do-	0.0	0.6
	W.G. Rathnaibad	01	-do-	0.0	0.0
0982	W.G. Tikiri Appu	06	-do-	0.0	0.6
0876	U.G.S. Kumarihami	03	-do-	0.0	0.6
0877	S.D. Amunugama	02	Retired Post Master	0.0	0.6
0891	M.W. Samarasinghe	04	Farmer	0.0	0.4

E 407B Kadawatha G.N. Division - Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
0996	M.W. Abeykoon Bandara	04	-do-	0.0	0.6
0746	U.M.G.B. Janapala	02	Retired Principal	0.0	0.5
0994	U.M.A.K. Janapala	04	Police	0.0	0.0
0744	U.M.S.K. Janapala	03	Nevy Soldier	0.0	0.0
0745	A.W.R.B. Wickramasinghe	05	Farmer	0.0	0.4
0869	D.M. Tikiri Menike	05	-do-	0.0	0.6
1033	H.G. Heen Appu	07	-do-	0.0	0.4
1010	L.B.R.N. Kumarihami	05	-do-	0.0	0.4
1032	J.A.S. Jayakodi	05	-do-	0.0	0.4
0798	H.M. Ranmenike	01	-do-	0.0	0.6
0913	A.M.G. Wijekoon	05	-do-	0.0	0.0
0992	W.M. Tikiribanda	03	-do	0.0	0.4
1036	W.M.G. Dingiribanda	03	-do-	0.0	0.4
1037	W.M.G. Gunaratne	04	-do-	0.0	0.0
1128	W.M.G. Nishantha	03	-do-	0.0	0.0
0991	W. Wilmon Premasooriya	03	-do-	0.0	0.2
1106	P.G. Ranmenike	01	-do-	0.0	0.4
1130	K. Simiyon Ruberu	04	-do-	0.0	0.4
1111	P.A.D.S.P. Pulasinghe	05	-do-	0.0	0.4
1132	W. Gilbut Dias	01	-do-	0.0	0.2
1131	W. Sunil Dias	05	-do-	0.0	0.4
1105	K. Wiliyon Ruberu	05	-do	0.0	0.4
0993	H.M.Siril Samaranayake	05	-do-	0.0	0.2
0995	W.G. heenbanda	07	-do-	0.8	0.6
1110	I.G. Ukku Menike	04	-do-	0.0	0.4
1104	W.G. Jayathilake	06	-do-	0.0	0.3
1035	W.G. Maddumabanda	05	-do-	0.0	0.2
1129	W.G. Ranasinghe	04	-do-	0.0	0.4
0990	G.G. Ukkubanda	03	-do-	0.0	0.2

E 407B Kadawatha G.N. Division - Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
0800	W.G. Muthumenike	01	-do-	0.0	0.4
0971	N.W.G. Dissanayake	03	-do-	0.0	0.4
1133	L.G. Perera	05	-do	0.0	0.4
0989	S.G. Mudiyanse	02	-do-	0.0	0.4
0987	S.G. Wijerathne	04	-do-	0.0	0.3
1045	S.G. Roopasinghe	05	-do-	0.0	0.4
0972	S.G. Gunarathne	05	-do-	0.0	0.6
0988	G.G. Winter	03	-do-	0.0	0.0
1044	H.D. Mendis	02	-do-	0.0	0.6
1134	K.Sumanadasa	03	-do-	0.0	0.2
1081	B.G. Ekanayake Banda	03	-do-	0.0	0.0
0890	M.W. Somarathne	06	-do-	0.0	0.4
	M.W. Somaweera	01	-do-	0.0	0.0
0900	N.G. Jayathilake	05	-do-	0.0	0.8
0859	N.G. Senavirathne	02	-do-	0	0.4
1112	N.G. Abeyrathne	03	-do-	0.0	0.3
0856	B.G. Hinni Mahaththaya	04	-do-	0.0	0.6
1150	W.G. Pinchi Amma	02	-do-	0.0	0.6
1001 or 0667	M.M.G.G. Jayasinghebanda	04	-do-	0.0	0.6
1034	U.G. Heenmenike	05	-do-	0.0	0.2
1021	A.G. Punchibanda	01	-do-	0.0	0.2
1114	V.K.P. Senevirathna	06	-do-	0.0	0.2
1113	M.M. Yasomenike	04	-do-	0.0	0.4
0852	A.G. Mudiyanse	08	-do-	0.0	0.6
1046	A.G. Dingiribanda	03	-do-	0.0	0.6
1020	A.G. Chandramenike	02	-do-	0.0	0.0
1090	A.G. Abeyrathna	03	-do-	0.0	0.0
1014	A.G. Kalubanda	05	-do-	0.0	0.6
1017	R.M. Punchibanda	05	-do-	0.0	0.4
1107	P.K.Hemasiri Ranasinghe	06	-do-	0.0	0.8
1022	G.G. Weerasinghe	06	-do-	0.0	0.8

E 407B Kadawatha G.N. Division - Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1120	R.M. Wijesooriya	05	-do-	0.0	0.4
1015	K.P. Eminawathie	02	-do-	0.0	0.6
1010	W.G. Karunarathne	05	-do-	0.0	0.4
	Y.M.G. Abeyrathnebanda	01	-do-	0.0	0.6
1085	B. Premarathne	07	-do-	0.0	0.8
0799H 5	H. Milton Mendis	06	-do-	0.0	0.4
1147	D.K.G. Heenmenike	02	-do-	0.0	0.4
1140	R.M. Karunathilake	03	-do-	0.0	0.0
1095	M.M. Mudiyanse	05	-do-	0.0	0.6
1086	N.G. Kalubanda	05	-do-	0.0	0.6
1018	R.M. Podimenike	02	-do-	0.0	0.1
1149	D.K.G. Ukkubanda	06	-do-	0.4	0.8
11481	D.K.G. Nawarathna	03	-do-	0.0	0.4
1144	T.M. Wijerathna	04	-do-	0.0	0.4
1121	P.G. Rambanda	04	-do-	0.0	0.4
1117	B.K.G. Alwis	05	-do-	0.0	0.8
1118	B.K.G. Jayasena	03	-do-	0.0	0.2
1093	W.M. Karunarathenbanda	06	-do-	0.0	0.4
1096	D.M. Bandaramenike	01	-do-	0.6	0.6
1092	K.R.G. Dawith Signgno	06	-do-	0.0	0.2
1089	B.G. Rambanda	02	-do-	0.0	0.6
1116	M.W. Senarathne	05	-do-	0.0	0.6
0978	T.H. Shelton Peiris	05	-do-	0.0	0.4
1083	R.M.Dissanayake	05	-do-	0.0	0.6
1084	U.W.M. Suberathne	06	-do-	0.0	0.4
0873	H.M. Premarathne	05	-do-	0.0	0.5
0874	H.M. Wimalarathne	01	-do-	0.0	0.2
0973	A.M. Kapilarathnebanda	04	-do-	0.0	0.6
1119	A.M. Kulathilakebanda	04	-do-	0.0	0.2
0959	A.M. Chandrakumari Abeysinghe	04	Machine Operator	0.0	0.2
1146	A.M. Upali Kulasooriya	03	-do-	0.0	0.4
1097	R.M. Yasarathnabanda	03	-do-	0.0	0.4

E 407B Kadawatha G.N. Division - Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
	P.K. Edwin Signgno	03	-do-	0.0	0.6
0986	P.K. Jagath Priyantha	05	-do-	0.0	0.4
	D.K.G. Punchirala	02	-do-	0.4	0.2
1011	D.K.g. Wijerathna	05	-do-	0.0	0.4
1013	D.K.G. Senevirathna	03	-do-	0.0	0.2
1012	U.G. Lokubanda	04	-do-	0.0	0.2
0870	U.G. Rambanda	06	-do-	0.0	0.2
0899	U.G. Ukku Menike	01	-do-	0.0	0.0
	T.M. Wilfred	04	-do-	0.0	0.0
0955	T.H. Joseph	02	-do-	0.0	0.4
0954	T.H.Lional	04	-do-	0.0	0.4
0956	H.K.R.P. Aron Siggngno	04	-do-	0.0	0.4
0857	K.M. Tikiribanda	05	-do-	0.0	0.6
0871	D.M. Lokumenike	03	-do-	0.0	0.2
0958	D.M. Dassanayake	03	-do-	0.0	0.2
0957	W.M. Gunarathnebanda	05	-do-	0.0	0.2
0954	U.W.M. Tikiribanda	02	-do-	0.0	0.6
0872	M.M. Pinchiamma	01	-do-	0.0	0.6
0895	D.M.W. Nandawathie	04	Co-op Manager	0.0	0.4
0896	N.G. Pinchibanda	05	Farmer	0.0	0.8
0951	N.G. Premarathne	06	-do-	0.0	0.6
0892	K.G. Heenbanda	04	-do-	0.0	0.4
1145	N.W.G. Jayasinghebanda	02	-do-	0.0	0.4
0800/1	RohanaKumara Janapala	02	-do-	0.0	0.0
0746/1	Halamba- Somadasa Mendis	02	-do-	0.0	0.0
1044/1	M.H.M. Yasarathnabanda	02	-do-	0.0	0.0
1150/1	Herath Mudiyanselage Somaratrhna	02	-do-	0.0	0.0
0895/1	TOTAL	552		2.2	53.4

Affected Land of Those Who are Residing Outside Inundation Area

Kadawatha G.N. Division

Name of Head of Household	Address	Land within inundation area	
		Paddy Land (ha)	Up Land (ha)
Weda Panditha Gedara Ukku Ethana	-	0.0	0.4
E.W.B.M.W.Anil Wicramasinghe Jayantha Kumari Wicramasinghe	Nikakotuwa, Aluvihare Matale	0.0	0.4
H.M. Ranbanada	Karandagolla, Elahera	0.0	0.4
Y.M. Wijerathnabanda Yapa	-	0.0	0.6
W.M. Punchibanda	Elagamuwa, Thalagoda Junction	0.0	0.2
TOTAL		0.0	2.0

Kambarawa G.N. Division - Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1868	Y.G. Gunathilake	03	Farmer	0.0	0.4
1754	M.W. Senevirathne	05	-do-	0.0	0.4
1613	A.G. Jeewananda Weerasinghe	03	-do-	0.0	0.4
1808	A.G. Ukku	04	-	0.0	0.2
1761	W.G. Somathilake	05	Farmer	0.0	0.4
1798	K.G. Rathnayake	05	-do-	0.0	0.4
1755	B.M. Kiriwasthu	05	-do-	0.0	0.4
1765	A.G. Heenbanda	03	-do-	0.8	0.4
1838	Y.G. Nimal Gunatilake	03	-do-	0.0	0.4
1622	W.M.M.G. Jayasinghe	04	-do-	2.4	0.4
1623	E.M. Lokumenike	01	-	0.0	0.4
1834	A.G.Dingiribanda	05	Farmer	0.0	0.4
1793	H.M.W. Rathnayake	05	-do-	0.0	0.4
1816	B.M. Parakrama Rathnayake	03	-do-	1.4	0.2
1760	R.M.A.G. Senarathne	03	-do-	0.5	0.2
1762	R.M.A.G. Nimal Rathnayake	03	-do-	0.2	0.2
1591	H.M.W. Lokubanda	06	-do-	0.2	0.2
1600	D.G. Somasiri	06	-do-	0.0	0.4
1770	Y.G. Bodipala	06	-do-	1.0	0.4
1777	M.G. Gunarathne	05	-do-	0.4	0.2
1517	K.M.G. Kahagala	03	-do-	0.0	0.0
1775	A.G. Nanthilake	04	-do-	0.4	0.4
1624	H.H. Siripala	03	-do-	0.0	0.2
1753	B.M. Gamini Jayathissa	03	-do-	0.0	0.4
1638	A.G. Muthingiya	08	-do-	1.0	0.2
1792	A.G. Chethipala	07	-do-	0.8	0.6
1864	Y.G. Giragi	04	-	0.4	0.2
1468	M.G. Lokubanda	02	Farmer	0.4	0.4
0850	M.G. Bebi	03	-do-	0.6	0.4
1637	A.G. Hemachandra	03	-do-	0.4	0.4

Kambarawa G.N. Division - Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1820	A.G. Kiriya	01	-	1.6	0.4
1842	Y.A.G. Heenkira	06	Farmer	0.2	0.2
1756	A.G.M. Kulathilake	04	-do-	0.8	0.2
1863	A.G. Ariyadasa	02	-do-	0.0	0.1
1786	H.G. Dissanayake	06	-do-	0.4	0.4
1860	G.G. Karunarathne	05	-do-	0.0	0.2
1837	Y.A.G. Piyasena	04	-do-	0.0	0.2
1542	K.G. Premarathne	04	-do-	0.1	-
1516	K.M. Tikiribanda	04	-do-	1.0	0.8
1628	A.G..Muthubanda	03	-do-	0.8	0.2
1804	M.G. Tikiribanda	04	-do-	0.8	0.4
1567	E.M. Thilakarathne	04	-do-	0.0	0.2
1788	D.G. Wimalasena	03	-do-	0.0	0.2
1766	A.G. Tikiribanda	05	-do-	0.0	0.0
1518	A.G. Appuhami	02	-do-	0.8	0.4
1587	W.M. Ekanayake	04	-	0.0	0.4
1512	W.M. Nimalwijeragh	05	-	0.6	0.4
1796	K.G. Rambanda	03	-	0.0	0.2
1791	K.G. Senevirathna	01	-	0.0	0.4
1592	A.M.P.G. Kapilarathne	06	-	0.8	0.4
1776	M.G. Dissanayake	05	-	0.2	0.4
1524	A.M. Durasinghebanda	05	-	1.2	0.2
1583	R.G. Dingiribanda	02	-	1.2	0.8
4961	K.G. Wijerathne	05	Farmer	0.0	0.4
1465	D.G. Sunil Rajapaksha	06	Labour	0.0	0.2
1451	I.G. Wijerathne	04	Farmer	0.0	0.2
1767	D.W.G. Upanayake	03	-do-	0.0	0.2
1589	K.G. Heenbanda	03	Driver	0.0	0.2
1846	A.G. Somawathie	03	Labour	0.0	0.4
1601	K.G. Jayarathne	04	Farmer	0.4	0.4
1870	H.M. Punchibanda	05	-do-	0.0	0.4
1566	D.G. Premasiri	02	Labour	0.0	0.2

Kambarawa G.N. Division - Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1458	K.G. Rambanda	06	-do-	0.4	0.1
1465	D.G. Nandipala	03	-do-	0.0	0.2
1612	A.M. Punchibanda	03	-do-	0.8	0.2
1790	B.G. Dingiribanda	01	-do-	0.0	0.4
1627	A.G. Ekanayake	03	-do-	0.0	0.6
1819	A.G. Sarathkumarasinghe	03	-do-	0.8	0.0
1618	B.G. Kalubanda	02	-do-	0.8	0.4
1467	A.W. Perera	06	Mason	0.0	0.1
1617	K.K.G. Kalyanawathie	04	Farmer	0.0	0.0
1797	M.G. Ekanayake	05	-do-	0.0	0.4
1859	G.G. Somadasa	04	-do-	0.0	0.2
1824	M.G. Swarnalatha	02	Labour	0.0	0.2
1809	M.G. Tikiribanda	05	Farmer	0.2	0.4
1551	P.A.G. Siripala	03	-do-	0.2	0.2
1644	V.M. Jinadasa	06	-do-	1.6	1.2
1642	M.K.D. Jayasekara	04	-do-	0.4	0.2
1771	K.M.G.G. Jayasundarabanda	03	-do-	0.5	0.4
1816	P.G. Rambanda	03	-do-	0.4	0.6
1615	B.M. Jayantha Senanayake	06	-do-	0.2	0.1
1520	W.G. Rathnayake	04	-do-	0.8	0.0
1801	H.M. Jinadasa	02	-do-	1.2	1.6
1800	H.M. Chandrakumara	04	-do-	0.0	0.8
1847	E.M. Ukkuamma	02	-do-	0.8	0.6
1557	M.G. Kapilarathne	02	-do-	1.4	0.4
1604	K.G. Kalubanda	06	-do-	0.8	0.2
1825	K.G. Abeyrathne	04	-do-	0.0	0.2
1848	R.M.G. Dingiribanda	03	-do-	0.2	0.0
1468	K.M. Abeyrathne	05	-do-	0.0	0.4
1616	D.G. Rammenike	04	-do-	0.4	0.4
1574	A.M. Somadasa	04	Divisional Officer	1.0	0.8
1643	R.D. Jayantha Sumanasiri	03	Farmer	0.0	0.0
1641	P.G. Karunarathne	02	-do-	0.8	0.8

Kambarawa G.N. Division - Continued

House No	Name of head of Household	Family Size	Main Occupation of Head of Household	Land within inundation area	
				Paddy Land (ha)	Up Land (ha)
1642	M.K.U. Jayasekara	04	-do-	0.0	0.6
1630	B.G. Jinadasa	03	-do-	0.0	0.4
1843	K.G. Kapilarathne	01	-	1.4	0.4
1523	A.M. Muthubanda	05	Farmer	0.2	0.4
1827	B.G. Kalubanda	05	Farmer	0.0	0.4
1781	M.K. Jayasekare	03	-do-	1.6	0.2
1751	R.M. Kudamenike	03	-do-	1.4	0.4
1799	E.G. Dingiribanda	03	-do-	0.2	0.4
1632	V.M. Ekanayake	05	-do-	0.4	0.2
1633	K.M.T.B. Abeyrathne	02	-do-	0.3	0.2
1647	V.M. Paligu Menike	02	-do-	0.6	2.6
1590	E.M.R.B. Ekanayake	02	-do-	2.4	0.8
1650	A.G. Thilak Bandara	03	-do-	0.2	0.2
	TOTAL	777		93.6	78.7

Affected Land of Those Who are Residing Outside Inundation Area

Koongahawela G.N. Division

Name of Head of Household	Address	Land within inundation area	
		Paddy Land (ha)	Up Land (ha)
I.G. Anulawathie	Arangala, Naula	1.3	0.0
K.G. Rajha Wijebandara	Elahera Rd, Koongahawela	0.6	0.0
K.G. Shanthi	KamalaElahera Rd, Koongahawela	0.2	0.0
H.M. Bosomenike	Maragamuwa, Pubbiliya	0.6	0.0
G.G. Punchibanda	5th Mile Post, Koongahawela	0.2	0.0
J.M.P.G. Tikiribanda	Rajawela, Koongahawela	0.1	0.0
M.G. Abasinbanda	-do-	0.3	0.0
H.M. Ukkubanda	-do-	0.1	0.0
A.G. Perera	No.12, Vihara rd, Matale	1.0	0.0
E.W. Seelawathie Kumarihami	Rajawela, Koongahawela	0.2	0.0
M.G. Muthubanda	Akkara Panaha, Koongahawela	0.1	0.0
M.G. Sumanawathie	Maragamuwa-Pubbiliya	0.1	0.0
K.G. Kulathunga	Elahera Rd, Koongahawela	0.6	0.0
T.W. Ranjith Thilakeratne	Rajawela, Koongahawela	0.2	0.0
Rvt. Kahagala Wimalasara	Rajawela Temple, Koongahawela	0.9	0.0
H.M. Tikiribanda	Rajawela, Koongahawela	0.2	0.0
H.M. Ukkubanda	-do-	0.2	0.0
D. M. Wijerathnabanda	-do-	0.2	0.0
W.M. Punchirale	Bibila-Naula	0.2	0.0
P.G. Punchibanda	Maragamuwa, Pubbiliya	0.4	0.0
T.D. Dasanayake	Koongahamula, Palapathwala	0.5	0.0
T. Upali Ruberu	Elahera Junction, Naula	0.4	0.0
P.B. Thalagune	6th Mile Post, Koongahawela	0.4	0.4
H.M. Tikiribanda	Rajawela, Koongahawela	0.6	0.0
W.A. Dayasepali	Sepali Stores, Koongahawela	0.1	0.0
M.K.G. Punchibanda	Rajawela, Koongahawela	0.3	0.0
H.M. Heembanda	-do-	0.2	0.0
I.G. Kungna	Ganimayaya, Ambana	0.5	0.0
A.M.R. Razeed	Elahera Rd, Koongahawela	0.2	0.4
H.G. Punchiappu	-do-	0.2	0.0
H.M.U.G. Rambanda	-do-	3.3	0.0

Koongahawela G.N. Division - Continued

Name of Head of Household	Address	Land within inundation area	
		Paddy Land (ha)	Up Land (ha)
A.G. Rambanda	Rajawela, Koongahawela	0.5	0.0
W.A. Sumathipala	Elahera rd, Koongahawrla	0.6	0.0
W.B.G. Thilakaratne	5th Mile Post, Koongahawela	0.4	0.0
P.B. Herath	Udawela, Theldeniya	0.6	0.0
H.M. Fareed	Ukuwela, Matale	0.2	0.0
H.M. Karunaratne	Maneengamuwa, Pallepola	0.2	0.0
H.M. Thilakaratne	Welpahala, Walawela	0.1	0.4
H.M. Abeykoonbanda	Rajawela, Koongahawela	0.1	0.0
H.M. Tikiribanda	1st Mile Post, Naula	0.1	0.0
H.M. Nawarathnabanda	Rajawela, Koongahawela	0.1	0.0
H.M. Podibanda	-do-	0.2	0.0
D.A.T. Dasanayake	Koongahmula, Palapathwala	2.0	0.0
K.G. Wijebanda	Maragamuwa, Pubbiliya	0.4	0.0
K.R. Gunaratne	Elahera Rd. Koongahawela	0.4	0.0
M.G. Punchibanda	7th Mile Post, Koongahawela	0.0	0.4
W. Rambanda	6th Mile Post, Koongahawela	0.0	0.4
T.W.T. Kumarihami	Elaganuwa, Thalagoda Junction	0.4	0.0
T.W. Ekanayake	-do-	0.4	0.0
M.G. Kalumenike	Elahera rd, Koongahawela	0.2	0.0
H.M. Tikiribanda	Rajawela, Koongahawela	0.1	0.0
T. Ruberu	Elahera Rd, Koongahawela	0.4	0.0
W.G. Heembanda	-do-	0.2	0.0
TATAL		22.3	2.0

List of Land Owners in the Inundation Area and Extent of Their Land Affected

Maragamuwa G.N. Division

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
	None				

Affected Land of Those Who are Residing Outside Inundation Area

E 406 Maragamuwa G.N. Division

	Name of Head of Household	Address	Land within inundation area	
			Paddy Land (ha)	Up Land (ha)
1	A.G. Bandara Menike	50/c, Maragamuwa Pubbiliya	0.3	0.0
2.i 2.ii 2.iii 3iv	G.G. Sudharma Pathmalatha G.G. Jayathissa G.G. Renuka Damayanthi G.G.Inoka Damayanthi	-do-	1.0	0.0
3	G.G. Ukkubanda	13, Maragamuwa Pubbiliya	1.0	0.2
4	K.G. Ekanayake	12, Maragamuwa Pubbiliya	0.4	0.0
5	K.G. Ranbanda	11/A/4, Maragamuwa Pubbliya	0.2	0.0
6	K.G. Tikirimenika K.G. Tikirimenika	12, Maragamuwa Pubbiliya	0.4	0.0
7	W.M. Abeykoon	17/B, Maragamuwa Pubbiliya	0.4	0.0
8i	G.G. Ukkubanda	14, Maragamuwa Pubbiliya	0.3	0.0
8ii	G.G. Ukkubanda	-do-	0.5	0.0
9	K.G. Ukkubanda	25, Maragamuwa Pubbiliya	0.4	0.0
10	K.G. Wijeratne Banda	26, Maragamuwa Pubbiliya	0.4	0.0
11	K.G.Muthubanda	16, Maragamuwa Pubbiliya	0.3	0.0
12	M.M. Tikiribanda	22/A, Maragamuwa Pubbiliya	0.6	0.0
13	M.M. Kalubanda	30, Maragamuwa Pubbiliya	0.5	0.0
14	G.G. Tikiribanda	35/A, Maragamuwa Pubbiliya	0.6	0.0

E 406 Maragamuwa G.N. Division - Continued

	Name of Head of Household	Address	Land within inundation area	
			Paddy Land (ha)	Up Land (ha)
15	G.G. Punchibanda -do- -do- -do- -do-	43, Maragamuwa Pubbiliya -do- -do- -do- -do-	0.0	0.0
16.i.	G.G. Senaviratne G.G. Wijeratne	48, Maragamuwa Pubbiliya	1.0	0.0
16.ii.	-do-	-do-	0.0	0.0
17	L.G. Dingiribanda -do-	50/c/3,Maragamuwa Pubbiliya -do-	0.3	0.0
18	G.G. Ranmenika	19/A, Maragamuwa Pubbiliya	0.3	0.0
19	G.G. Punchimenika	50/C/5,Maragamuwa Pubbiliya	0.3	0.0
20	G.G. Heenbanda	50/C/6, Maragamuwa Pubbiliya	0.4	0.0
21	G.G. Abeyratnebanda	22, Maragamuwa Pubbiliya	0.4	0.0
	TOTAL		11.7	0.2

List of Land Owners in the Inundation Area & Extent of Their Land Affected

Millagahamullatenna G.N. Division

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
0512	S.B. Hunupitiya	04	Farming	0.0	1.1
0512	K.A. Jayantha Podimenike	01	-	0.0	0.0
0512	E.G. Sunil	04	Sales	0.0	0.0
D.9				0.0	0.0
0512	E.G. Heenmenike	02	-	0.0	0.0
0616	W.G. Rambanda	03	Farming	0.2	0.8
0566	R.M.K. Sirinama Bandara	07	Grama Niladhari	0.0	0.4
0547	H.M. Karunaratne	06	Farming	0.0	0.4
J06	R.A. Jayathilake	05	Sales	0.0	0.8
-	W.G.M. Ananda	03	Army Service	0.0	0.0
J04	M.G. Palis	01	Sales	0.0	0.0
D.4	W.P.C. Wickramarathna	03	Sales	0.3	1.6
D.1	M. Donnald	05	Farming (Sales)	0.0	0.0
0614	P.K. Padmasiri Ranasinghe	05	Teaching	0.0	1.4
J10	M.G. Premadasa	03	Barber	0.0	0.0
Unclear	K.A. Jayatissa	07	Sales	0.0	0.4
F 8,9	A.G. Subaneris	08	Sales	0.0	0.8
J11	W.G.M. Mahindabandara	Single	Sales	0.0	0.0
0496	C. Hewa Patirana	05	Watcher	0.0	1.2
Unclear	A.G. Pelis (Sales Centre)	04	Retired	0.4	0.8
0628	P.B. Thalagune	06	Retired	0.6	1.6
0627	A.J.Y. Edwin Appuhami	05	Farming	0.2	0.8
0596	P.G. Jayawardena	06	Farming	0.0	0.4
-	S.M. Nawaratnabanda	04	Sales	0.5	2.0
0535	Sales Centre S.M. Nawaratnabanda			0.0	0.0
0620	G.G. Nandapala	05	Farming	0.0	0.0
0620	G.G. Ranjani	02	Farming	0.0	0.0
0613	D.M. Rammenika	02	Retired	0.0	0.8
0612	M.K. Bandara Menike	04	Farming	0.0	0.0
0613	M.K. Nimal Chandrasekera	02	Air Force	0.0	0.0
0594	M.G. Nawaratna	03	Teaching	0.0	0.0
0619	M.G. Piyaratna	05	Sales	0.0	0.0

Millagahamullatenna G.N. Division - Continued

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
0569	M.G. Abayaratna	04	Farming	0.0	0.0
-	H.M. Kusumawathi	03	Disabbled	0.0	0.0
0570	M.A. Saiman	03	Farming	0.0	0.4
0570	M. David	05	Welder	0.0	0.0
0514	D.A.U. Dassanayake	03	Farming	0.0	1.6
0514	D.A. L. K. Dassanayake	02	Police	0.0	0.0
0779	M.G. Suneetha	06	Farming	0.0	1.2
	(U.G. Abeyratna)			0.0	0.0
0558	A.J.Y. Abraham Appuhami	05	Post Man	0.0	0.4
0621	A.G. Gnanakanthi	03	-	0.0	0.6
0622	W.S. Appuhami	05	Technician	0.0	0.0
0610	A.H.G. Jinadasa	03	Farming	0.0	0.4
0610	P.G. Ukkubanda	02	Farming	0.0	0.0
0537	B.M. Karunaratna	01	Farming	0.0	0.4
0563	M.G. Kusumawathi	02	Labourer	0.0	0.4
-	J.M.K. Sarath Gnanaweera	04	Army Soldier	0.0	0.0
0593	P.G. Karunawathi	02	Labourer	0.0	0.4
5093	R.M. Jayaweerabanda	02	Farming	0.4	0.4
0629	P.G. Heenbanda	04	Farming	0.0	0.4
0630	P.G. Kiribanda	04	Farming	0.0	0.4
0536	M.G. Karunaratne	05	Farming	0.2	0.8
0548	E.M. Seetha Kumarihami	02	-	0.0	0.4
0548	W.M. Bandula Wijekoon	03	Farming	0.0	0.0
	M.G. Punchibanda	03	Farming	0.0	0.8
	M.G. Tikiribanda	02	Farming	0.0	0.0
0412	W.M. S. Wijekoon	05	-	0.0	0.0
0592	H.M. Abeykoon	02	-	0.0	0.4
0581	A.P. Nimal Karunarathna	02	Sales	0.0	0.8
0516	W.M. Tikiribanda	07	Teachiing	0.0	0.4
-	G. David Singnor	05	Retired	0.2	0.2

Millagahamullatenna G.N. Division - Continued

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
0413	H.M. Samarakoon	05	Farming	0.0	0.4
0421	K.B. Punchimenika	04	Labourer	0.0	0.6
0423	H.M. Gamini Herath	05	Labourer	0.0	0.0
0402	T.M. Wijeratnabanda	04	Farming	0.0	0.4
0608	P.G. Wijeratna	06	Farming	0.2	0.4
0422	A.M. Puncibanda	03	Farming	0.0	0.4
0607	R.M. Kiribanda	04	Farming	0.0	0.8
0607	P.G. Kapilaratnabanda	02	Farming	0.0	0.0
-	D.M. Dissanayake	04	Farming	0.0	0.0
0405	P.G. Premaratna	03	Farming	0.2	0.8
0400	H.A. Sonnandara	03	Retired	0.0	0.4
0401	H.A. Gunawardena	03	Farming	0.0	0.6
0407	A.G. Amaranayake	03	Sewing Helper	0.0	0.0
0457	W.A. Saiman	05	Labourer	0.0	0.6
0458	W.A. Meginona	01	Labourer	0.0	0.6
0458	D.M. Muthumenika	04	Labourer	0.0	0.0
0458	D.M. Wijebandara	02	Labourer	0.0	0.0
0410	A.M. Sirilbanda	03	Labourer	0.0	0.4
0460	H.M. Weerakoon	04	Labourer	0.0	0.6
0490	M.G. Jayaratnabanda	04	Labourer	0.0	0.8
-	B.K. Ranasinghebanda	03	Sales	0.0	0.0
0628	S. Kadawatha Arachchi	02	Labourer	0.0	0.0
	Total	301		3.4	34.0

Affected Land of Those Who are Residing Outside Inundation Area

Millagahamullatenna G.N. Division

Name of Head of Household	Address	Land Within Inundation Area	
		Paddy Land (ha)	Up Land (ha)
P.G. Ariyasinghe	Akkara Dahaya Mahawala Ulpatha	0.0	0.2
H.M.K.G. K. Herath	Matale Nikula	0.0	0.8
H.P. Chandrasiri	Naula Mile Post 1	0.0	1.0
W.A. Sumathipala	Naula Kongahawela	0.0	1.2
Total	Kongahawela	0.0	3.2

List of Land Owners in the Inundation Area and Extent of Their Land Affected

Ex 406/A

Pubbiliya G.N. Division

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
	None				

Land of Those Who are Residing Outside Inundation Area

Pubbiliya G.N. Division

Name of Head of Household	Address	Land Within Inundation Area	
		Paddy Land (ha)	Up Land (ha)
D.H.M. Kirimenika	No.71, Pubbiliya	0.2	-
		0.2	

List of Land Owners in the Inundation Area & Extent of Their Land Affected.

E 409 A Rajawela G.N. Division

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
-	A.G. Tikiribanda	03	Farming	05	01
Total		03		2.0	0.4

Affected Land of Those Who are Residing Outside Inundation Area

E 409 A Rajawela G.N. Division

Name of Head of Household	Address	Land Within Inundation Area	
		Paddy Land (ha)	UpLand (ha)
M.D. Aluwihare	Opposite School, Sigiriya	0.4	0.0
T.S. Ruberu	No. 4, Naula	1.4	0.0
M.K.G. Heenbanda	Rajawela, Kongahawela	2.8	0.0
A.G. Heenbanda	Rajawela, Kongahawela	1.0	0.6
K.H. Gamini	11/B, Kongahawela	0.2	0.0
A.G. Perera	No. 12, Vihara Rd, Matale	6.5	0.0
A.J. Bandaramenika	Rajawela, Kongahawela	0.6	0.1
W.G. Kirimenika	Rajawela, Konhagawela	0.2	0.6
W.B.G. Thilakaratne	Rajawela, Kongahawela	0.2	0.0
H.M.M.K.G. Tikiribanda	Rajawela, Kongahawela	0.6	0.0
W.A. Sumathipala	Dewarammulla, Pallepola	0.2	0.0
I.W. Nandawathi	Dewarammulla, Pallepola	0.8	0.0
E.W. Ekanayake	Thalagoda, Kadawatha	1.4	0.0
Chandra Kumari Menike	Medawalawwa, Aluwihare	0.7	0.0
J.S. H. Seelawathi	Rajawela, Kongahawela	1.4	0.4
A.G. Tikiri Menika A.G. Dingiribanda R. R. Bandara	Moragolla, Ambana	0.5	0.0
M.G. Dingiriamma	5 Mile Post, Kongahawela	0.1	0.0
H.M. Lokubanda	Rajawela, Kongahawela	0.1	0.0
Ansan Umma	Oyapahala, Matale	0.6	0.0
N.C.M. Latheef	Oyapahala, Matale	0.6	0.0
N.C.M. Sharuk	Oyapahala, Matale	0.6	0.0
N.C.M. Inona	Oyapahala, Matale	0.6	0.0
N.C.M. Daruk	Oyapahala, Matale	0.6	0.0
N.C.M. Darup	Oyapahala, Matale	0.6	0.0
N.C.M. Sinni Parikkiya	Oyapahala, Matale	0.6	0.0
A.M. Rasees	Oyapahala, Matale	0.3	0.0
M.G. Sugathapala	Arangala, Naula	0.4	0.2
A.G. Pinchiappu	Kongahawela	0.2	0.0
A.G. Pinchiamma	Rajawela, Kongahawela	0.2	0.0

E 409 A Rajawela G.N. Division - Continued

Name of Head of Household	Address	Land Within Inundation Area	
		Paddy Land (ha)	UpLand (ha)
E.W.M.W.C. Kumarihami	Kadawatha, Thalagoda Junc.	0.2	0.0
S.B. Hulangamuwa	Aluwiharaya, Matale	0.4	0.0
A.G. Bandaramenika	Maragamuwa, Pubbiliya	0.4	0.0
H.M. Dingiriamma	Doranegama, Medawela	0.4	0.0
H.M. Muthubanda	Rajawela, Kongahawela	0.0	0.8
A.G. Jayaratnabanda	Kollongolla, Kongahawela	0.2	0.0
Kulathunga	Alahera Rd, Kongahawela	0.2	0.2
H.M. Podibanda	Weeragolla, Kongahawela	0.2	0.0
S.M. Sareem	Bigord Rd, Beligolla, Matale	0.3	0.0
H.M. Heenbanda	Rajawela, Kongahawela	1.0	0.2
A.G. Rambanda	Rajawela, Kongahawela	1.0	1.0
T.W. C. Kumarihami	Kadawatha Junction, Thalagoda Junction.	0.2	0.0
M.M. Thilakaratna	Rajawela, Kongahawela	0.2	0.2
H.M. Bandimenika	Rajawela, Kongahawela	0.2	0.0
K.R. Gunaratna	Alahera Rd, Kongahawela	0.2	0.0
Rev. Kahagala Vimalasara	Rajawela Temple, Kongahawea	4.1	0.0
Nimal Kulathunga	Elahera Rd, Kongahawela	0.2	0.0
W.A. Sepali	Elahera Rd, Kongahawela	0.1	0.0
H.M.J.I. Herath	Ambana Junc. Kongahawela	0.2	0.0
A.G. Bisomenika	Moragolla, Ambana	0.6	0.0
A.G. Ukkuamma			
L.G. Dingiribanda	Maragamuwa, Pubbiliya	0.3	0.0
H.M. Kalubanda	Maragamuwa, Pubbiliya	0.5	0.0
P.G. Punchibanda	Maragamuwa, Pubbiliya	0.5	0.0
P.G. Wijeratna	Maragamuwa, Pubbliya	0.2	0.0
P.G. Senevirathne			
N.H.H.W.W Tikibanda	Rajawela, Kongahawela	0.1	0.0
A.G. Siripala	Aluthgedara, Kongahawela	0.4	0.0
M.P.M. Paleel	Ukuwela, Marakona	0.2	0.0
A.G. Abeyratnabanda	Elahera Rd, Kongahawela	0.0	0.2
U.G. Heenbanda	Rajawela, Kongahawela	1.2	0.0
A.G. Ranjithbanda	Moragolla, Ambana	0.1	0.0
H.K.G. Lokubanda	Rajawela, Kongahawela	0.4	0.2
G.G. Ukkuamma	Rajawela, Kongahawela	0.2	0.0

E 409 A Rajawela G.N. Division - Continued

Name of Head of Household	Address	Land Within Inundation Area	
		Paddy Land (ha)	UpLand (ha)
A.G. Yasomenika	Rajawela ,Kongahawela	0.2	0.0
M.G. Premaratna	Rajawela, Kongahawela	0.0	0.4
A.G. Tikiribanda	Rajawela, Kongahawela	0.3	0.0
M.G Ranbanda	Rajawela, Kongahawela	0.3	0.0
B.G. Tikira	Rajawela, Kongahawela	0.0	0.6
M.G. Pinchibanda	Rajawela, Kongahawela	0.6	0.0
H.M Ukkubanda	Rajawela, Kongahawela	1.0	0.0
H.M Tikiribanda			
H.A Punchibanda	Rajawela, Kongahawela	0.4	0.0
H.M. Aberatnebanda	Moragolla, Ambana	0.4	0.0
Somawathie Menike	Moragolla, Ambana	0.2	0.0
H.M. Ukku Amma	Moragolla, Ambana	0.4	0.4
H.M Dingiri Amma			
G.G Punchibanda	Kongahawela	0.6	1.0
W.A Gamini Mahinda	Kongahawela	0.2	0.0
A.M Heenamma	Rajawela, Kongahawela	0.3	0.0
A.G. Soma Kumari	Opalgala, Matale	0.4	0.0
W.A. Ameema Indrani	Sepali Stores, Kongahawela	0.2	0.0
G. Chandrasiri	Sepali Stores, Naula	0.3	0.0
R.M. Punchibanda	Rajawela, Kongahawela	0.0	0.2
R.M.A. Rathnayake	Rajawela, Kongahawela	0.0	0.2
E.P. Heenmanike	6 Mile Post, Kongahawela	0.2	0.0
P. G. Gunaratne Menike	Rajawela, Kongahawela	0.2	0.0
W. M. Sumathipala	Elapara, Kongahawela	1.0	0.0
E.H. Abeyratne	Rajawela, Kongahawela	0.2	0.0
H.M Ukkubanda	Rajawela, Kongahawela	0.4	0.0
H.M. Tikiribanda			
L.G. Dingiribanda	Maragamuwa, Pubbiliya	0.3	0.0
T.G. Punchibanda	Maragamuwa, Pubbiliya	0.5	0.0
A.G. Wijebanda			
A.G. Ranbanda	Rajawela, Kongahawela	0.2	0.0
W.H. Heenbanda	Rajawela, Kongahawela	0.2	0.0
I.G.T Piyadasa	Ganimayaya Kongahawela	0.8	0.0
T.W. Meratilakeratne	Malawela, Matale	0.2	0.0
D.M.W.B. Dasanayake	Rajawela, Kongahawela	0.2	0.0
Total		50.0	7.5

List of Land Owners in the Inundation Area & Extent of Their Land Affected.

E 407 A Thalagoda G.N. Division

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
1194	P.G. Seneviratna	6	Farming	0.0	0.6
1160	H.M. Lokubanda	3	Farming	0.6	0.8
1193	A.G. Punchibanda	5	Farming	0.6	0.4
1323	R.P.M. Siril Wickrama	5	Farming	0.8	0.2
1188	H.M.G. Kiribanda	4	Farming	0.6	0.2
0898	R.A. Wijeratna	4	Farming	0.0	0.8
1303	M.H.A. Susilawathi	3	Farming	0.0	0.6
1254	M.W. Siripala	4	Farming	0.4	0.6
1334	A. Jayawathi	5	Labourer	0.2	0.6
5000	N.G. Jayathissa	5	Farming	0.0	0.2
1308	W.P. Wijeratna	4	Farming	0.2	0.8
1351	D.P. Julis Singnor K.R. Dayawathi	4	Farming	0.2	0.8
1235	K.G. Kumarihami	2	Farming	0.0	0.6
1348	H.M. Nawaratnabanda	3	Sales	0.0	0.4
1334	W.W.M.M.H. Banda	2	Farming	0.0	1.0
1078	W.G. Rambanda	01	Farming	0.6	0.6
1190	W.G. Dharmasena	4	farming	0.0	0.4
1158	K.G. Kamalawathie	4	farming	0.0	0.4
1074	W.G. Punchimenika	2	Farming	0.0	0.4
1172	R.M. Wijeratnabanda	4	Farming	0.6	0.2
1195	R.W. Premaratna	7	Post man	0.4	0.6
1323	A.M. Yasomenike	5	Farming	0.6	0.0
1156	W.M. Gnanaratna Menike	2	Farming	0.4	0.6
1157	W.M. Seneviratna	3	Farming	0.0	0.8
1205	M.G. Shantha	5	Farming	0.4	0.8
1175	K.M. Jemis	2	Faming	0.0	0.6
1174	H.M. Somadasa	4	Farming	1.2	0.2

E 407 A Talagoda G.N. Division - Continued

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
1176	H.M. Mitumenika	1	Farming	1	0.4
1173	W.G. Wijeratna	6	Farming	1.0	0.4
1199	K.P.G. Menike	3	Farming	0.0	0.8
1208	H.M. Jayathilake	4	Farming	0.0	0.2
1056	H.M. Karunawathie	3	Farming	1.0	1.0
1057	M.B. Alahakoon	2	Farming	0.6	0.4
1056	H.G. Ratnapala	4	Farming	0.0	0.4
1181	A.M. Lokubanda	4	Farming	0.0	0.8
1192	M.A. Akman Dias	4	Farming	0.4	0.4
1217	W.M. Seneviratna	5	Hospital labourer	0.2	0.2
1068	D.M. Jayaratnabanda	3	Farming	0.0	0.4
1228	Rohan Piyaratna	4	Farming	0.0	0.2
1206	D.P. Jayasinghe	7	Farming	0.0	0.2
1166	T.G. Podimenike	4	Farming	0.2	0.4
1062	H.M. Muthubanda	4	Farming	0.2	0.8
1068	H.M. Dingiriamma	5	Farming	0.6	0.8
1022	W.M. Chandrawathie	4	Farming	0.6	0.8
1155	H.G. Ukkubanda	5	Farming	0.0	0.6
0894	H.M. Biso Menike	8	Farming	0.0	0.2
1072	M.G. Seneviratna	3	Farming	0.0	0.2
1352	W.M. Sumanawathie	5	Farming	0.2	0.2
1236	R.A. Sumathipala	3	Farming	0.0	0.2
1221	M.M. Punchibanda	4	Farming	0.2	0.2
1256	W.M. Karasinghe	4	Farming	0.0	0.6
1237	A.G. Shelton	5	Farming	0.0	0.8
1183	H.G. Seneviratna	5	Farming	0.0	0.2
1178	G.G. Somawathie	4	Farming	0.4	0.4
1164	K.G. Punchibanda	4	Farming	0.2	0.4
1165	K.G. Heenmenika	4	Farming	0.0	0.4
0952	H.G. Appuhami	4	Farming	0.0	0.8
1172	R.W. Jemis Appuhami	2	-do-	0.0	0.6
1171	R.W. Dharmadasa	6	Farming	0.6	0.6
2375	P. Weerasinghe	6	Driver S.L.T.B.	0.2	0.4
1203	W.G. Muthubanda	3	Farming	0.2	0.2
1127	W.G. Rambanda	6	-do-	0.2	0.4
1232	H.M. Kapilaratna	5	-do-	0.0	0.6

E 407 A Thalagoda G.N. Division - Continued

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
1069	D.M. Heenbanda	4	-do-	0.8	0.4
1139	P.N. Victor de Silva	4	-do-	0.0	0.2
1176	W.W.M. Ukkubanda	4	-do-	0.8	0.4
1207	D.M. Sirisena	4	-do-	0.0	0.2
1371	W.M. Weerakoonbanda	3	-do-	0.8	0.2
1218	M.A. Buddadasa Dias	3	-do-	0.0	0.2
1188	M.D. Vitharana	3	-do-	0.6	0.2
1225	A.G. Sundara	6	-do-	0.8	0.4
1084	H.M. Punchirala	3	-do-	0.0	0.8
1300	W.M. Kularatna	5	-do-	1.0	0.4
1080	A.G. Pinchibanda	7	-do-	0.6	0.6
1230	A.G. Ukkuamma	3	-do-	0.0	0.4
1197	A.G. Appuhami	4	-do-	0.2	0.4
1189	A.G. Heenbanda	1	Sales	0.4	0.4
1176	W.A. Ratnasiri	5	Farming	0.0	0.6
1152	W.M. Alahakoonbanda	3	-do-	0.0	1.0
1257	G.G. Weerasingh	4	-do-	0.2	0.4
1070	E.M.M. Ekanayake	5	-do-	2.0	0.2
1058	D.G. Lalith	3	-do-	0.0	0.2
1123	H.M. Weeraratna	5	-do-	0.4	0.4
1182	R.W. Jayaratna	4	-do-	0.0	0.6
1122	H.M. Punchibanda	6	-do-	0.8	0.4
1231	E.L.G. Jayathilake	3	-do-	0.0	0.6
1124	D.M. Nawarathna	3	-do-	0.2	0.2
1253	H.M. Thilakaratha	3	Army Soldier	0.0	0.2
1204	W.G. Senaviratna	2	Farming	0.0	0.2
1301	D.M. Muthubanda	6	-do-	0.0	0.4
1252	W.R.D.M. Abeyratna	5	-do-	0.0	0.8
1210	A.G. Tennakoon	5	-do-	0.6	0.2
1187	W.M. Nawaratnabanda	5	-do-	0.0	0.8
1051	U.G. Kiribanda	5	-do-	0.0	0.2
1324	L.N. Ranjithkumar	3	-do-	0.0	0.4
1223	J.A. Appuhami	5	-do-	0.6	0.4
1125	R.M.K. Karunaratna	2	-do-	0.0	0.2
0878	W.R.M.A.G. Dissanayake	5	-do-	0.4	0.4
2121	C.B.M. Chandrasera M.	1	-	0.0	0.2

E 407 A Thalagoda G.N. Division - Continued

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
1259	K.P.G. Nandoris	5	-do-	0.0	0.8
1052	B.W.G. Muthubanda	4	-do-	0.4	0.2
1054	A.G. Muthubanda	4	-do-	1.2	0.4
1072	A.G. Herathbanda	3	-do-	0.2	0.4
1115	R.M. Ranasinghe	5	-do-	0.2	0.8
1137	H.M.G. Wijeratna	6	-do-	1.2	1.0
1162	H.M. Lokumenika	2	-do-	0.4	0.8
0953	H.G. Tikirimenika	7	-do-	0.0	0.4
0121	H.M. Kiribanda	5	-do-	0.8	0.8
1231	A.G. Dingiribanda	5	-do-	0.4	0.6
1299	W.M.G. Dasanayake	3	Teaching	0.2	0.2
1305	L. Wijewardena	4	Farming	0.0	1.0
1234	N. Karunaratna	3	Farming	0.0	0.4
1073	M.W. Podiappuhami	2	-do-	0.8	1.0
1128	R.M. Ratnauyake	5	-do-	1.2	0.2
1135	W.M.P.B. Weerasekera	4	-do-	0.0	0.6
1164	W.M.T.B. Weerasekera	6	Sales	1.0	0.8
1201	C.M. Karunaratna	4	Farming	0.2	0.2
1350	Sarath Gunawardena	1	-do-	0.0	0.4
1091	A.G. Wijesekera	1	-do-	0.0	0.4
1154	W.M. Chandrasiri	5	-do-	0.0	0.2
1302	W.M. Premaratna	6	-do-	1.6	0.4
1109	M.G. Bisomenika	1	-do-	0.0	0.4
1110	R.M. Piyadasa	3	-do-	0.0	0.2
1088	H.M. Muthubanda Herath	3	Teaching	0.0	0.2
1251	H.M. Mudiyanse	3	Farming	0.4	0.4
1229	H.M.G. Rambanda	5	-do-	1.6	0.4
	H.G. Nawaratna	4	-do-		0.2
1025	R.M.K. Nissanka	3	-do-	0.0	0.2
0962	H.M.Theviyaratnabanda	6	-do-	1.0	0.6
1224	A. Noel Daniel	2	-do-	0.6	0.4
1141	H.M. Hafid	2	Sales	0.6	0.6
0893	C.M. Jayaratna	4	Farming	0.6	0.6
1230	E.L.G. Anulawathie	3	-do-	0.0	0.8
0087	R.M. Heenbanda	1	-do-	1.4	0.2

E 407 A Thalagoda G.N. Division - Continued

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
0072	Rev. Kothmale Thilakadamma	1	-	0.0	0.6
	R.M.R.K. Ratnayake	1	-	0.0	0.4
1052	A.G. Kalubanda	5	Farming	0.6	0.4
1168	W.M. Dayaratnabanda	6	-do-	0.6	0.4
1148	M.W.A. Herath Appuhami	6	-do-	0.6	0.4
1233	I.G. Wickramasinghe	4	-do-	0.0	0.6
1349	G.M. Gunathilake	3	-do-	0.2	0.6
1177	H.M. Wijerathna	5	-do-	0.8	0.6
1153	W.M. Abeykoonbanda	5	-do-	0.4	0.2
1995	J.A. Dingiribanda	4	Farming	0.4	0.4
1220	A.G. Somaratna	1	-do-	0.6	0.8
1189	A.M. Heenbanda	4	-do-	0.6	0.8
1039	A.R.M. Wijeratnabanda	6	-do-	0.0	0.2
1037	A.M. Punchibanda	6	-do-	0.8	0.4
1053	A.G. Yasomenike	2	-do-	0.8	0.6
1310	W.K. Udugampola	3	-do-	0.2	0.6
1210	A.G. Tennakoon	5	-do-	0.2	0.6
1023	R.M.K. Seneviratna	4	-do-	1.4	0.6
1167	W.W.M. Premasiri	6	-do-	0.4	0.4
1032	D.P. Gunasinghe	4	-do-	0.4	0.2
1233	B.M. Wijeratna	5	-do-	1.0	0.2
1196	A.G. Mudiyanse	6	-do-	0.0	0.4
1000	A.G. Heenbanda	4	-do-	0.6	0.8
1326	E.M. Seneviratna	5	-do-	0.0	0.4
1180	A.M. Tikiribanda	5	-do-	0.0	0.8
1200	K.P.G. Sugathadasa	4	-do-	0.0	0.6
1191	P.A.G. Gunasena	2	-do-	0.2	0.4
1138	A. Danielis	3	-do-	0.0	0.4
1256	W.K. Surasena	4	-do-	0.0	0.2
1060	H.M. Bandaramenika	2	-do-	0.4	0.8
0854	C.M. Wijeratna	5	-do-	0.6	0.2
1202	M.M. Jayaratna	4	-do-	0.0	0.2
1227	M.A. Steavan Dias	4	-do-	0.4	0.4
1219	W.A. Sugathadasa	3	-do-	0.0	0.6
1212	D.M. Wijeratna	4	-do-	0.4	0.2

E 407 A Thalagoda G.N. Division - Continued

House No	Name of Head of Household	Family Size	Main Occupation of Head of Household	Land Within Inundation Area	
				Paddy Land (ha)	Up Land (ha)
1216	H.M. Karunaratha	5	-do-	0.6	0.4
1347	W.M. Nawarathnabanda	5	-do-	0.0	1.0
1071	E.L.G. Ekanayake	5	-do-	0.4	0.2
1161	E.M. Wijeratna	6	-do-	0.8	0.6
1089	H.M. Lokubanda	4	Security Service	0.0	0.2
1090	A.G. Kiribanda	5	Farming	0.8	0.2
1226	D.P. Rupasinghe	6	Farming	0.2	0.4
1222	H.M. Dingiribanda	5	-do-	0.4	0.2
1151	R.M. Punchibanda	2	-do-	0.2	0.4
1055	R.M. Punchibanda	4	-do-	0.6	0.8
1108	Y.M. David Singnor	3	-do-	0.8	0.6
1209	A.G. Jayawardena	5	-do-	0.6	0.4
1192	R.H.G. Dayawansa	2	-do-	0.0	0.2
Total		729		59.8	84.1

Affected Land of Those who are Residing Outside Inundation Area

E 407 A Thalagoda G.N. Division

Name of Head of Household	Address	Land Within Inundation Area	
		Paddy Land (ha)	Up Land (ha)
H.M. Punchibanda	Kambarawa, Matale	0.8	0.0
K.G. Ukkubanda	Maragamuwa, Pubbiliya	0.4	0.0
K.G. Wijeratna	Maragamuwa, Pubbiliya	0.6	0.0
E.W.M.E.W. Kumarihami	Kadawatha, Thalagoda Junchtion.	0.6	0.0
P.G. Tikiribanda	Maragamuwa, Pubbiliya	0.6	0.0
P.G. Ukkubanda	-do-	0.8	0.0
P.G. Kiribanda	-do-	0.6	0.0
P.G. Punchibanda	-do-	0.6	0.0
K.G. Muthubanda	-do-	0.6	0.0
D.K.G. Punchirala	Kadawatha, Thalagoda Junction	0.2	0.0
R.M. Dissanayake	-do-	0.4	0.0
U.W.M. Tikiribanda	-do-	0.2	0.0
W.G. Hemawathie	-do-	0.2	0.0
H.M. Premaratna	-do-	0.2	0.0
P.G. Rambanda	-do-	0.6	0.0
M.M.N. Dammika	-do-	0.2	0.0
N.G. Seneviratna	-do-	0.2	0.0
E.W. Rupabanda	-do-	0.2	0.0
A.M. Kapilaratna	-do-	0.2	0.0
W.G. Karunaratna	-do-	0.2	0.0
K.G. Emisawathie	-do-	0.2	0.0
I.G. Punchiamma	-do-	0.6	0.0
W.M.H.S.S.K. Karunaratna	-do-	0.2	0.0
H.M. Rambanda	Alahera, Kudagama	0.0	0.8
S.G. Mudiyanse	Kadawatha, Thalagoda Junction	0.6	0.0
D.K.P.W.M. Abeykoon	Maragamuwa, Kongahawela	0.4	0.0
K.M. Muthubanda	Kaluganga	2.0	0.0
U.M. Alahakoon	Weliwaththa, Palapathwala, Matale	0.2	0.0
U.M. Seeetha Dayananda	Penaumbada, Naula	0.2	0.0
U.M.C. Alahakoon	Kolamunna, Piliyandala	0.2	0.0
U.M.C.B. Alahakoon	Weliwatta, Palapathwala, Matale.	0.2	0.0
B.K.G. Alwis	Kadawatha, Thalagoda	0.2	0.0
P.K. Advin Signor	Kongahawela	0.2	0.0
P.K. Adman Signor	Kadawatha, Thalagoda 1042	1.6	0.2

E 407 A Thalagoda G.N. Division - Continued

Name of Head of Household	Address	Land Within Inundation Area	
		Paddy Land (ha)	Up Land (ha)
H.M. Rammenika	Kadawatha, Thalagoda	0.4	0.0
K.G. Heenbanda	-do-	0.4	0.0
E.W.S.M.U. Wickramasinghe	-do-	0.4	0.0
K.R.G. Davith Signor	-do-	0.0	0.2
R.M.S.K. Ratnayake	Gangala, Puwakpitiya, Matale	0.4	0.4
P.G. Mudalihami	Medapihilla, Kadawatha	0.0	0.8
U.W.M. Heenbanda	Elahera, Thalagoda	0.2	0.0
U.S.M. Suberatna	Thalagoda	0.2	0.0
A.K.M.P. Kumarihami	Penalabada, Naula	0.2	0.0
M.W. Karunarathna	-do-	0.4	0.0
A.G.K.M. Seetha Kumarihami	3/78, Elahera Rd, Naula	0.2	0.0
A.G.K.M. Karunawathie	3/78, Elahera Rd, Naula	0.2	0.0
A.G.K.M. Anulawathie	Galagama, Yatawatta	0.2	0.0
W.M. Punchibanda	Elagamuwa, Thalagoda	0.2	0.0
W.M. Mallika Kumari	-do-	0.2	0.0
P.B. Ratnayake	Kaludewala, Matale	0.6	0.0
A.N.R. Wickramasinghe	Kadawatha, Thalagoda	0.6	0.0
M. Wickramasinghe	-do-	0.6	0.0
G.K. Wickramasinghe	Kithigama, Matale	0.2	0.0
Total		21.0	2.4

Appendix 2 - Source : As reported by each Grama Niladhari

ORIGINAL COPY

32

DRAFT REPORT

Volume II - Maps

Submitted to

MAHAWELI AUTHORITY OF SRI LANKA
MINISTRY OF MAHAWELI DEVELOPMENT

on

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENTAL IMPACT ASSESSMENT

by

TEAMS

Consultants in Technology, Management & Development Studies

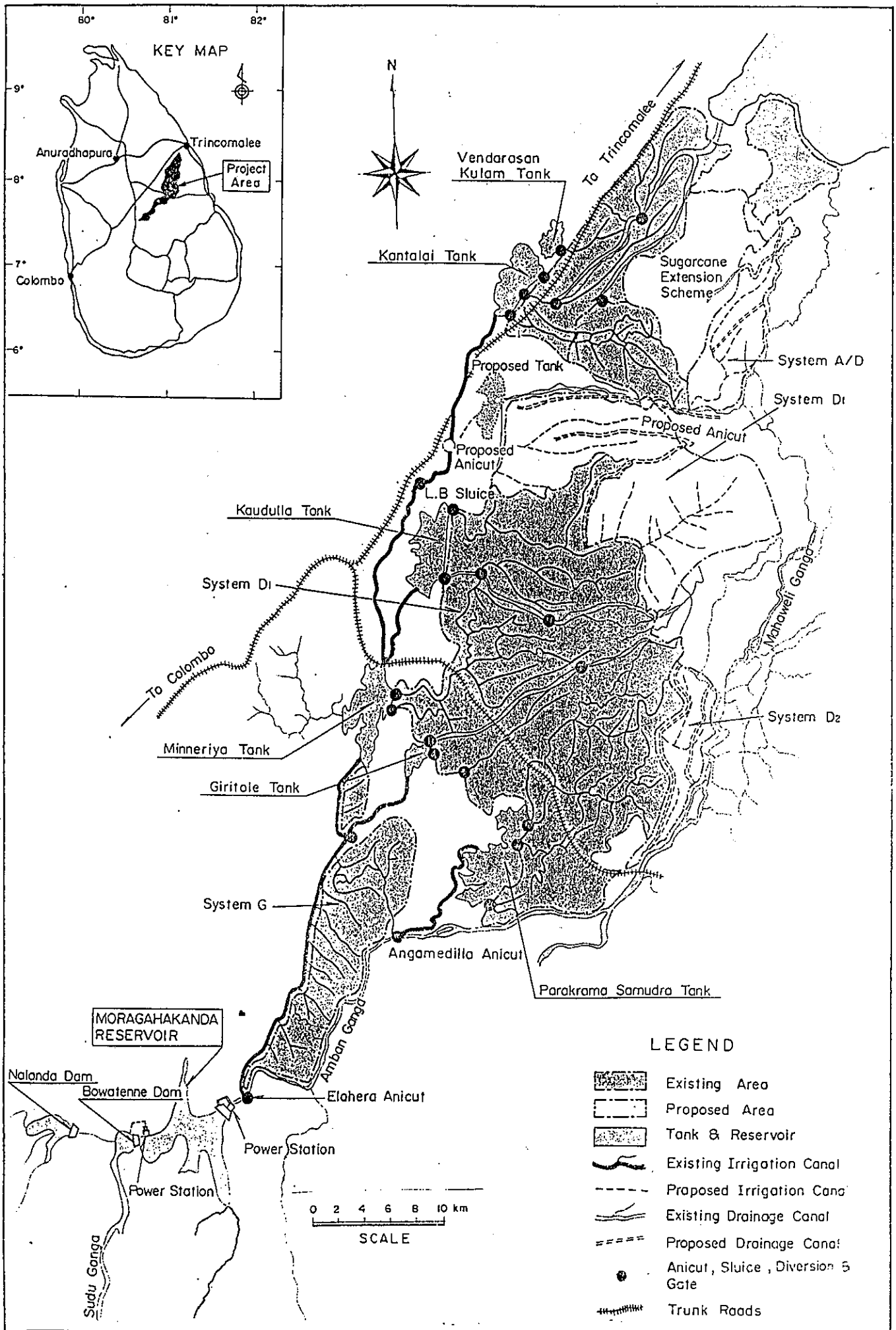
TEAMS (Pvt) Ltd. P. O. Box 262 Colombo, Sri Lanka

August 1997

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Map	1.1	Location of Project
	1.2	Detailed Map of Moragahakanda Project Area
	1.3	Reservoir Area showing GN Divisions
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	2.5.2	Surface Profile of First Saddle Dam
	2.5.3	Surface Profile of Second Saddle Dam
Map	3.1.2.a	Physical Features of Reservoir Area (Contour Map)
	3.1.2.b	Physical Features of Reservoir Area (Slope Map)
	3.1.6.a	Geology of Moragahakanda Reservoir Area
	3.1.6.b	Geology of Command Area
	3.1.6.c	Structural Complexity of Dam Site Area
	3.1.7	Mineral Resources of Reservoir Area
	3.3.1	Forest Cover - Moragahakanda
	3.4.4	Land Use Map
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Map	4.2.1	Borrow Area & Quarry Site
Map	6.3.1	Kandapitawela Proposed Resettlement Site
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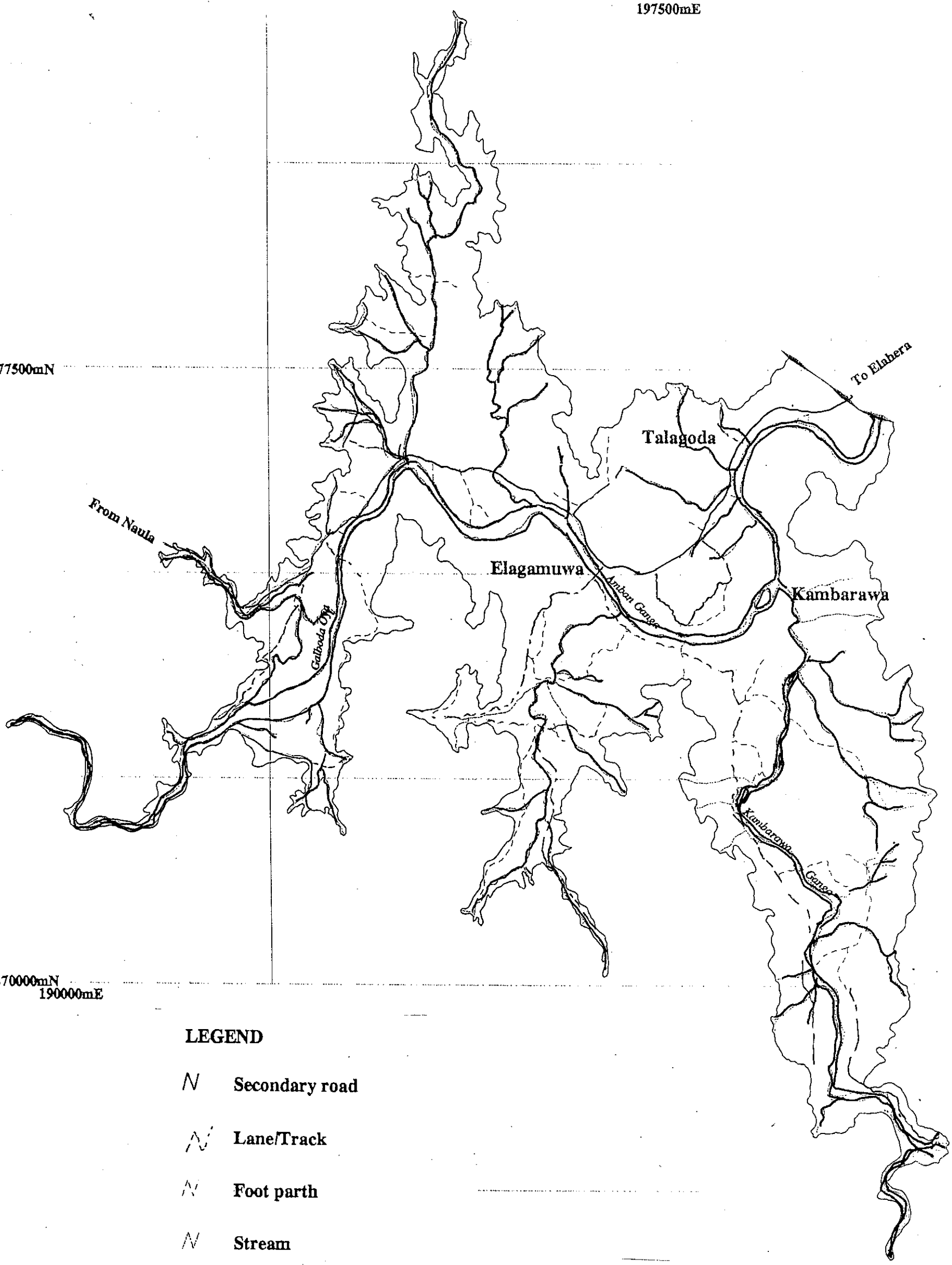
Note : Map number denotes the corresponding chapter, Section and Sub-section respectively.



MORAGAHAKANDA PROJECT- SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

MAHAWELI AUTHORITY OF SRI LANKA MINISTRY OF MAHAWELI DEVELOPMENT	TEAMS (PVT) LTD.	MAP : 1.1 LOCATION OF PROJECT

DETAIL MAP - MORAGAHAKANDA PROPOSED PROJECT AREA



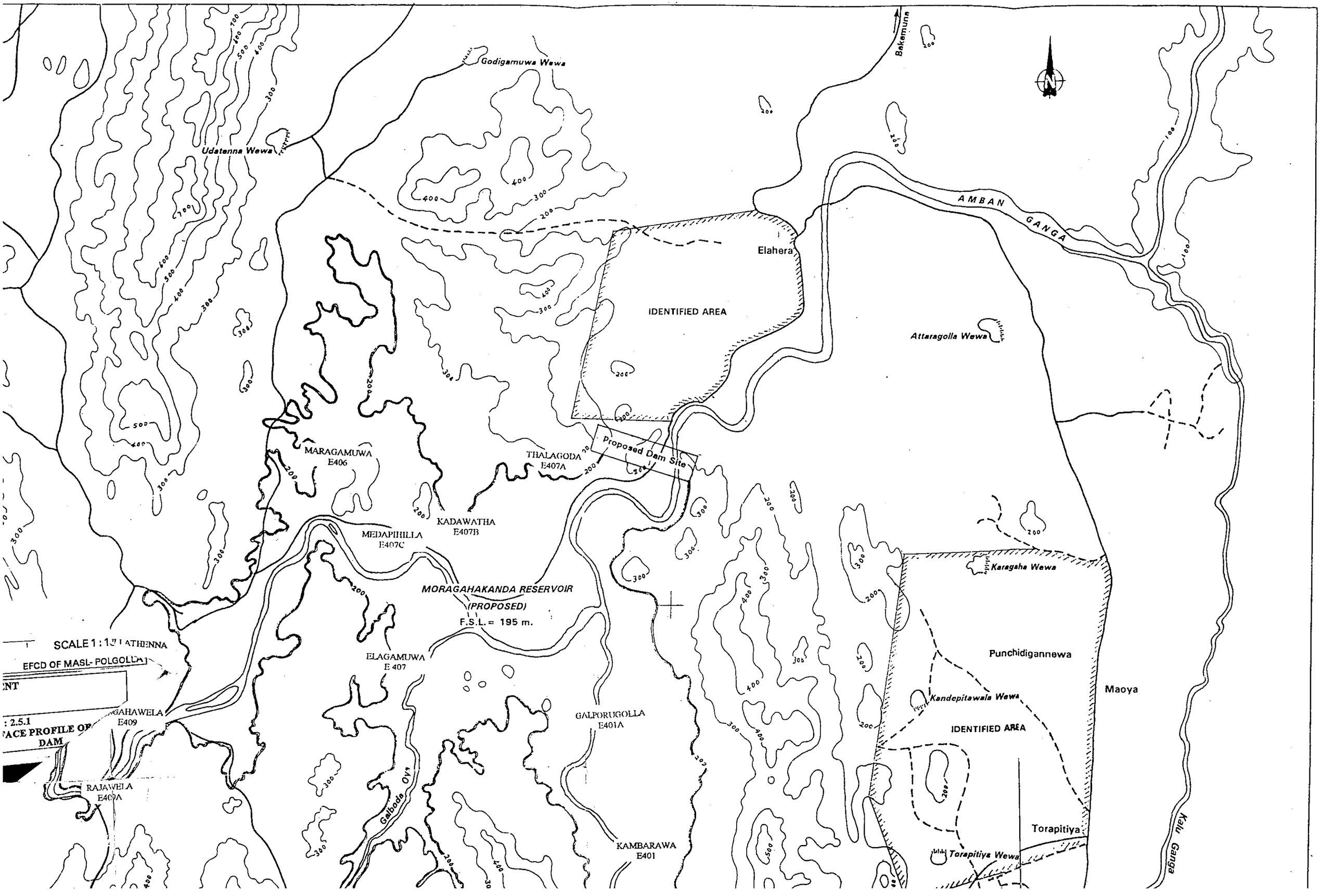
LEGEND

- Secondary road
- Lane/Track
- Foot parth
- Stream
- Moragahakanda Dam

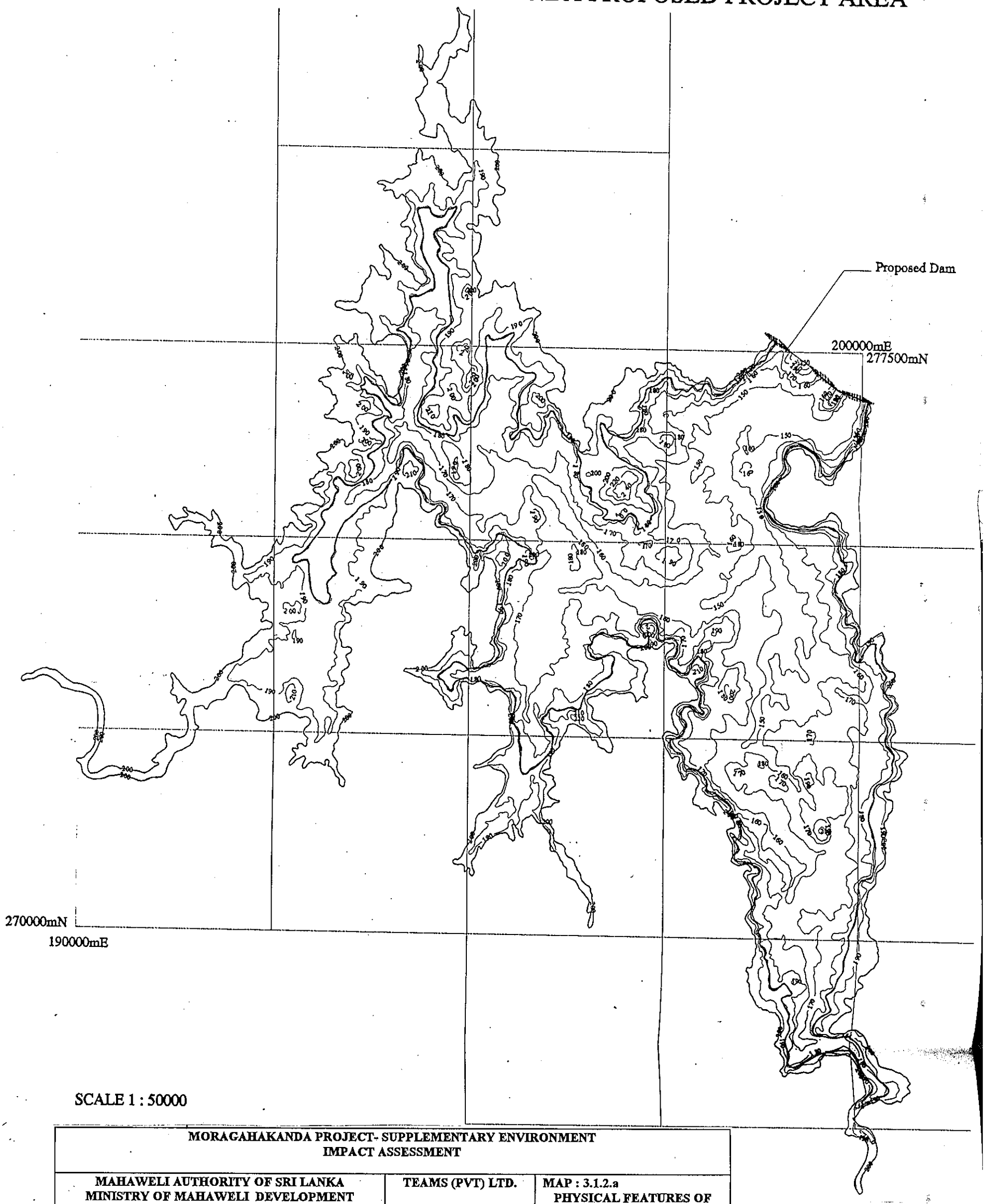
Scale 1 : 50,000

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PROPOSED MORAGAHAKANDA RESERVOIR PROJECT



CONTOUR MAP - MORAGAHAKANDA PROPOSED PROJECT AREA

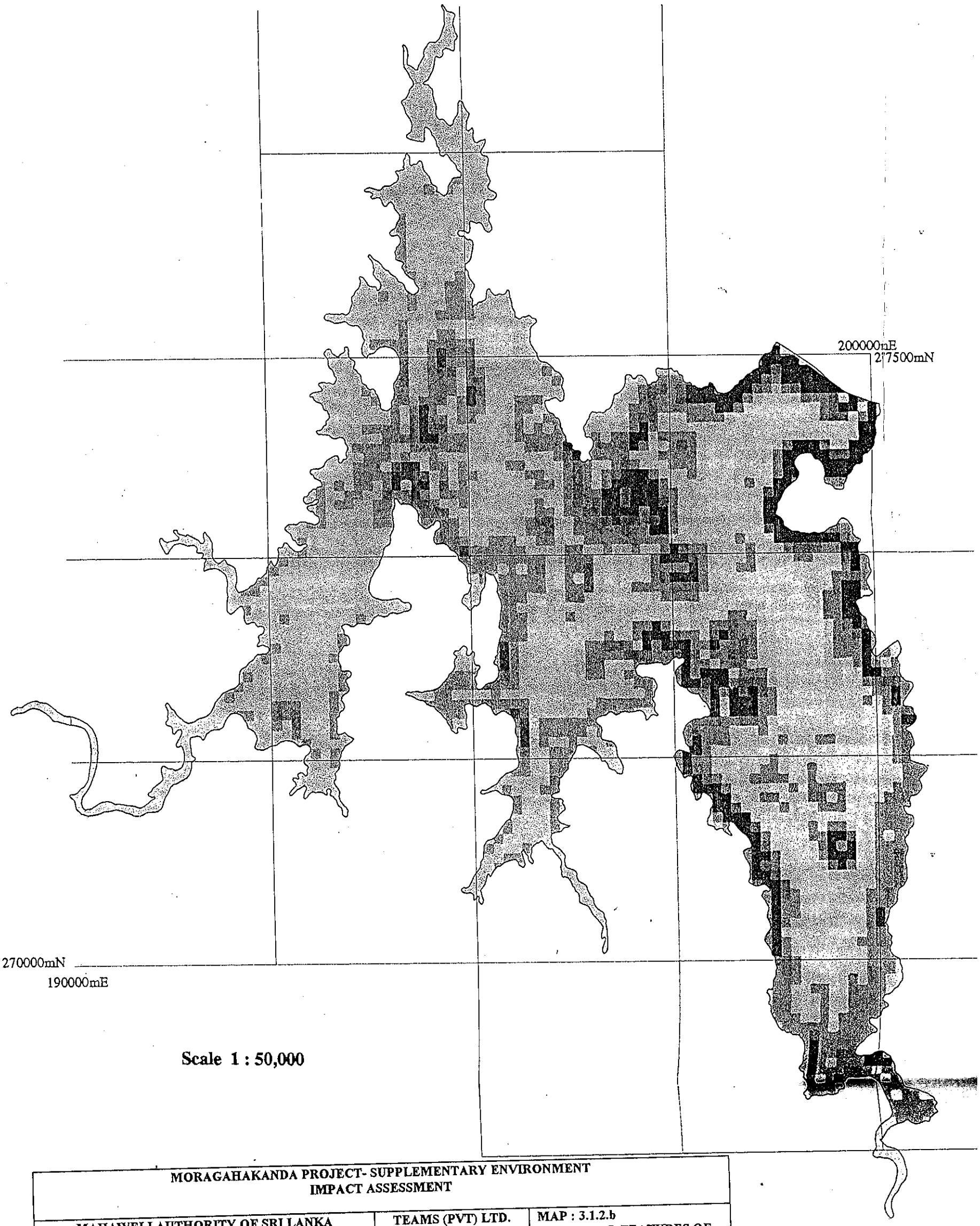


SCALE 1 : 50000

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MAHAWELI AUTHORITY OF SRI LANKA MINISTRY OF MAHAWELI DEVELOPMENT	TEAMS (PVT) LTD.	MAP : 3.1.2.a PHYSICAL FEATURES OF RESERVOIR AREA (CONTOUR MAP)

SOURCE : EFCD/MASL - Polgolla

SLOPE MAP - MORAGAHAKANDA PROPOSED PROJECT AREA



LEGEND

- 0 - 2
- 2 - 4
- 4 - 8
- 8 - 10
- > 10

Scale 1 : 50,000

SOURCE :
E&F / GIS / DR
EFCD/MASL - Polgolla
DATE-12 .05 .1997

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MAHAWELI AUTHORITY OF SRI LANKA MINISTRY OF MAHAWELI DEVELOPMENT	TEAMS (PVT) LTD.	MAP : 3.1.2.b PHYSICAL FEATURES OF RESERVOIR AREA (SLOPE MAP)

Map of Moragahakanda Project Area

Explanation

D Main Dam
S1 Saddle Dam1
S2 Saddle Dam2
Periphery of Reservoir
Joints & Fractures
BA
Q1

Requested Area for Mineral Exploration from GS&MB

Publiliyaya

PMC

Elahera

AMBAN GANGA

N

Km2 1 0 ½ 1 2

MORAGALLAKANDA

Q2

BA-F

BA-E

BA-D

BA-A

BA-B

BA-C

Amban

Galbodo

Mecapitiya

Kamattawa

Talagoda

Ganga

Elagamuwa

Kumbiyan Gaha Ela

Kongahawela

Talangomuwa

Ambana

Bowaterma Reservoir

Hadanetiya

Kombaravaka

Kandepitawila

Thorapitiya

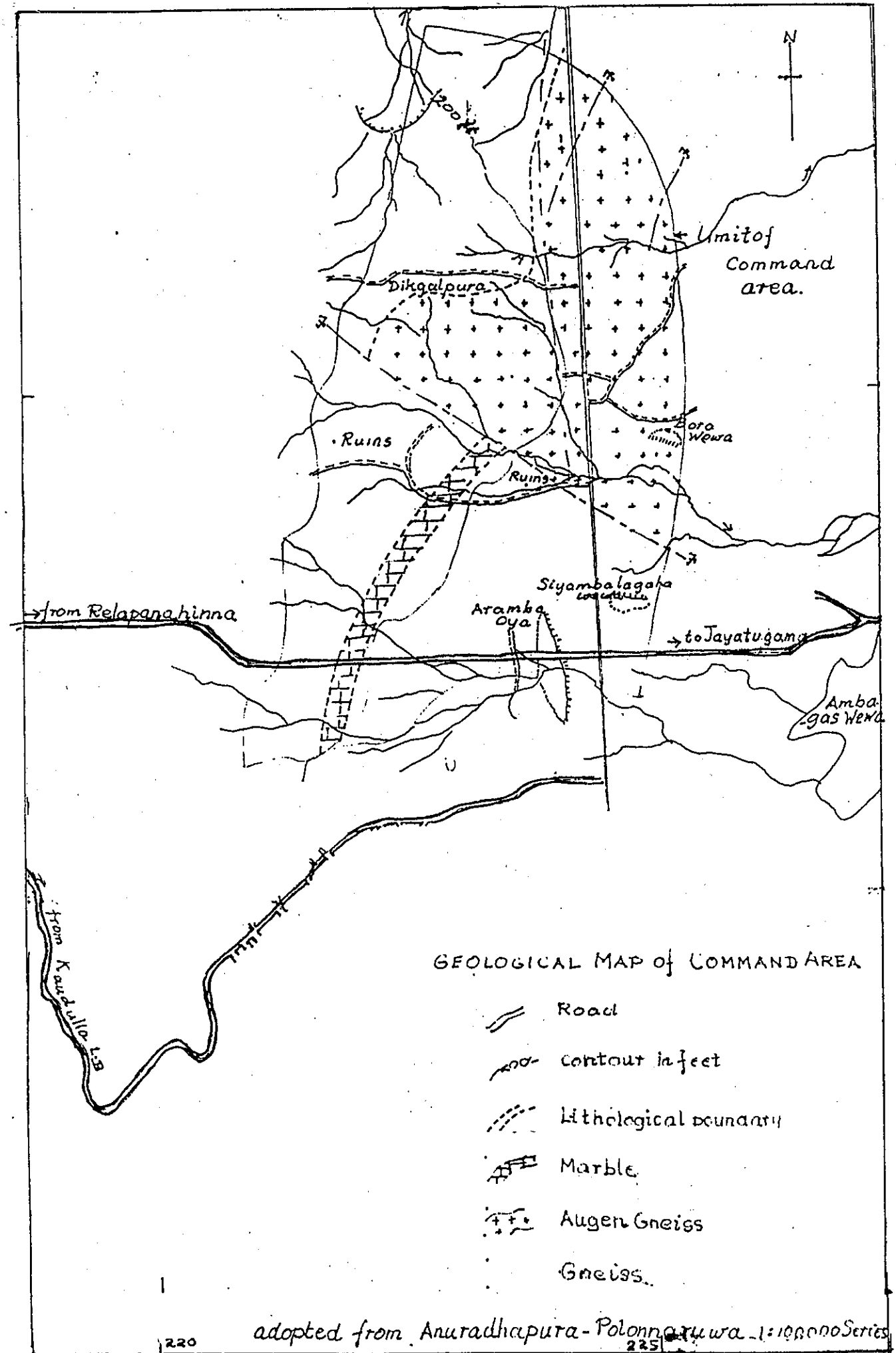
Kalu Ganga

Quartz prospect area

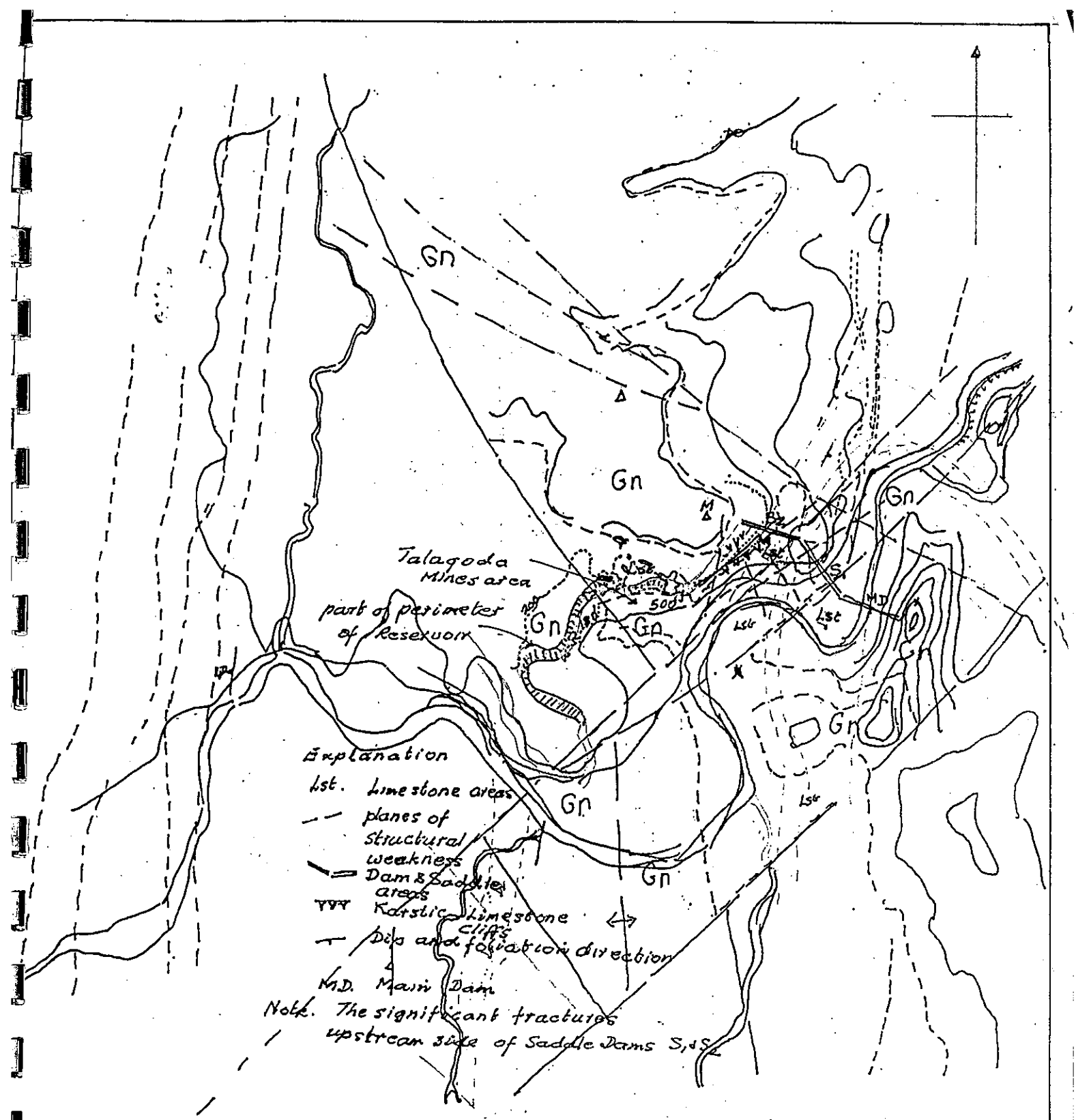
Mica & Silica Quartz prospect

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MAHAWELI AUTHORITY OF SRI LANKA MINISTRY OF MAHAWELI DEVELOPMENT	TEAMS (PVT) LTD.	MAP : 3.1.6.a GEOLOGY OF T MORAGAHAKA RESERVOIR AR



MORAGAHAKANDA PROJECT- SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT		
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MAHAWELI AUTHORITY OF SRI LANKA MINISTRY OF MAHAWELI DEVELOPMENT	TEAMS (PVT) LTD.	MAP : 3.1.6.c STRUCTURAL COMPLEXITY OF DAM SITE AREA

N

ANBAN GANGA

2 1 0 1 2
Scale

Ma Oya

Felspar

Felspar
Alanite
Phlogopite

Teligam Antiform

EXPLANATION

- Main Road
- Minor Road
- Stream
- Tank

Main Rock Type

~~Geological unit~~ (Main)

- Marble
- Quartzite
- Garnetiferous Gneiss (mainly)
- Charnockitic Gneiss

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MAHAWELI AUTHORITY OF SRI LANKA MINISTRY OF MAHAWELI DEVELOPMENT	TEAMS (PVT) LTD.	MAP : 3.1.7 MINIMAL RESOURCES OF

APURA DISTRICT

TRINCOMALEE DISTRICT

POLONNARUWA DISTRICT

IPARA DI

IDENTIFIED AREA

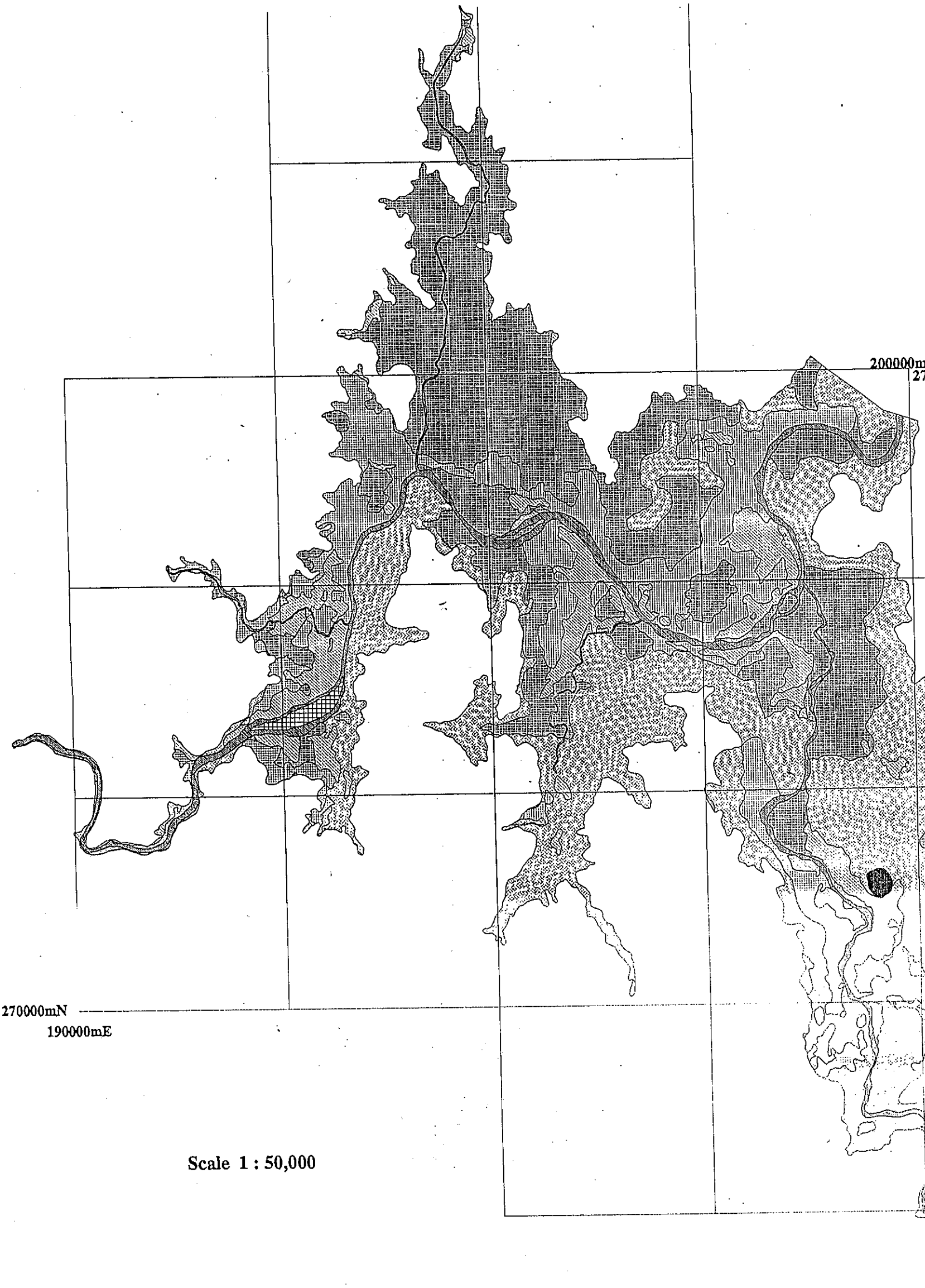
Forest

Proposed M
Reserv
Scale

- Sub-Monta
- Lowland R
- Moist Mons
- Dry Monsc
- Riverine
- Mangrove
- Sparse and
- Conifers
- Eucalypts
- Teak
- Fresh Wate
- Brackish a

- Major Roa
- Major Rive
- Railway
- District Bo

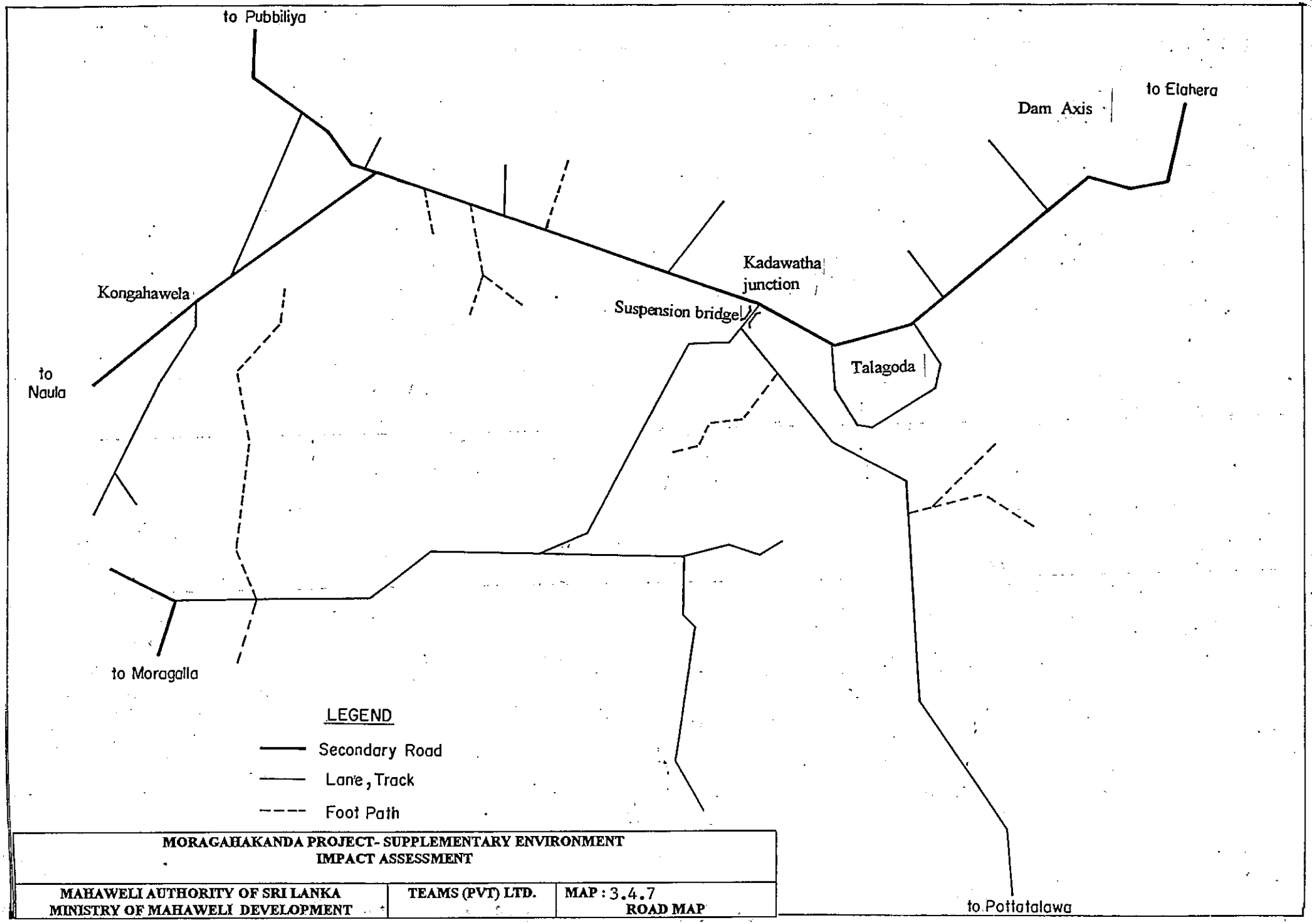
LAND USE MAP - MORAGAHAKANDA PROPOSED PROJECT AREA



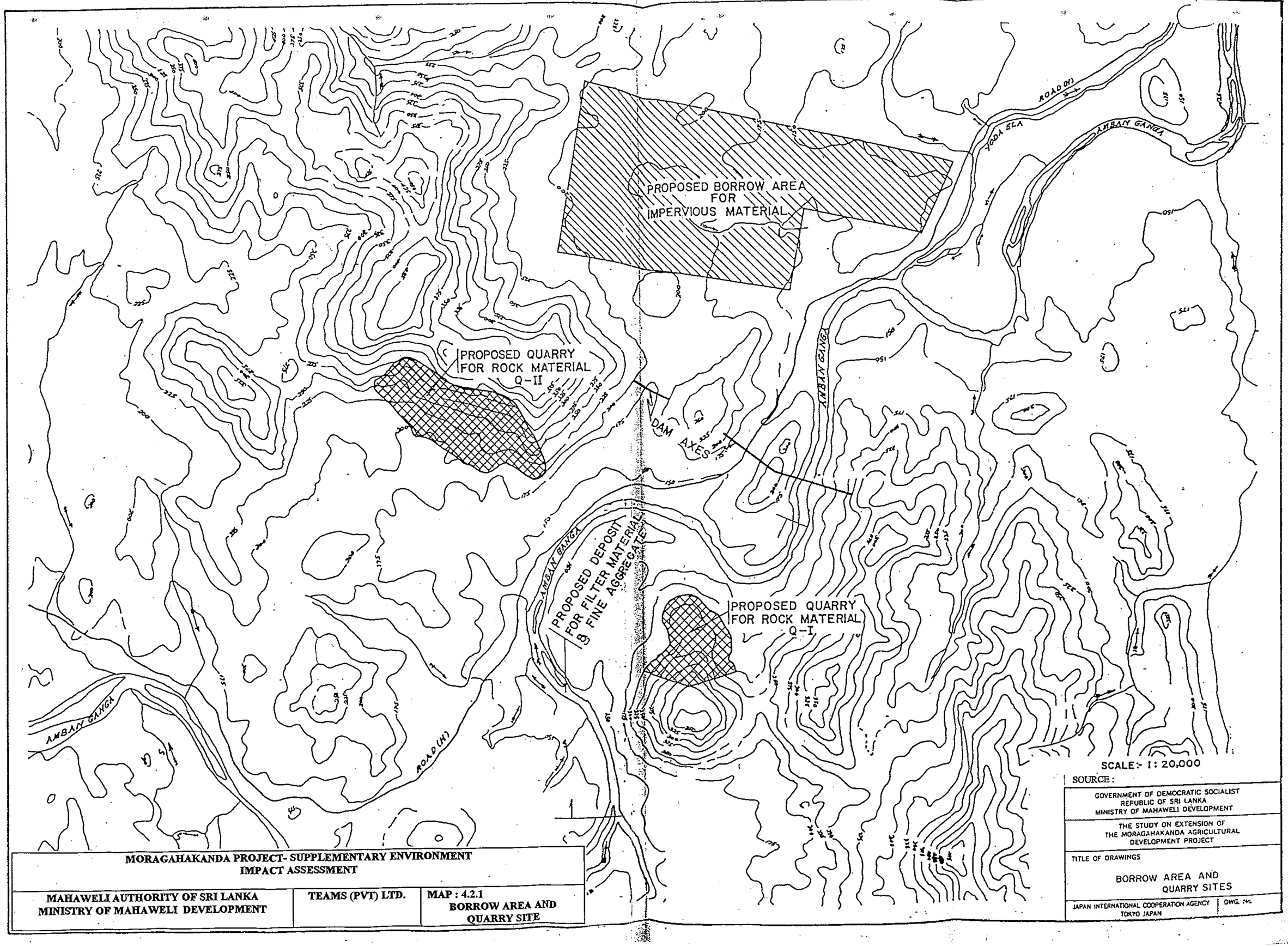
Scale 1 : 50,000

MORAGAHAKANDA PROJECT- SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT		
MAHAWELI AUTHORITY OF SRI LANKA MINISTRY OF MAHAWELI DEVELOPMENT	TEAMS (PVT) LTD.	MAP : 3.4.4 LAND USE

SOURCE : EFCD/MASL - Polgolla



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MAHAWELI AUTHORITY OF SRI LANKA MINISTRY OF MAHAWELI DEVELOPMENT	TEAMS (PVT) LTD.	MAP : 4.2.1 BORROW AREA AND QUARRY SITE

SOURCE :

GOVERNMENT OF DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF MAHAWELI DEVELOPMENT

THE STUDY ON EXTENSION OF THE MORAGAHAKANDA AGRICULTURAL DEVELOPMENT PROJECT

TITLE OF DRAWINGS

BORROW AREA AND QUARRY SITES

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO JAPAN

DWG. No.

Kandapitawala Tank

150

150

150

MA

200

Ma Oya

Maoya

150

Torapitiya

201.0

200

L A G G A L A

150.0

D I V I S I O N

288.0

TORAPITIYA
TANK

Kalugamga

Torapitiya

250

300

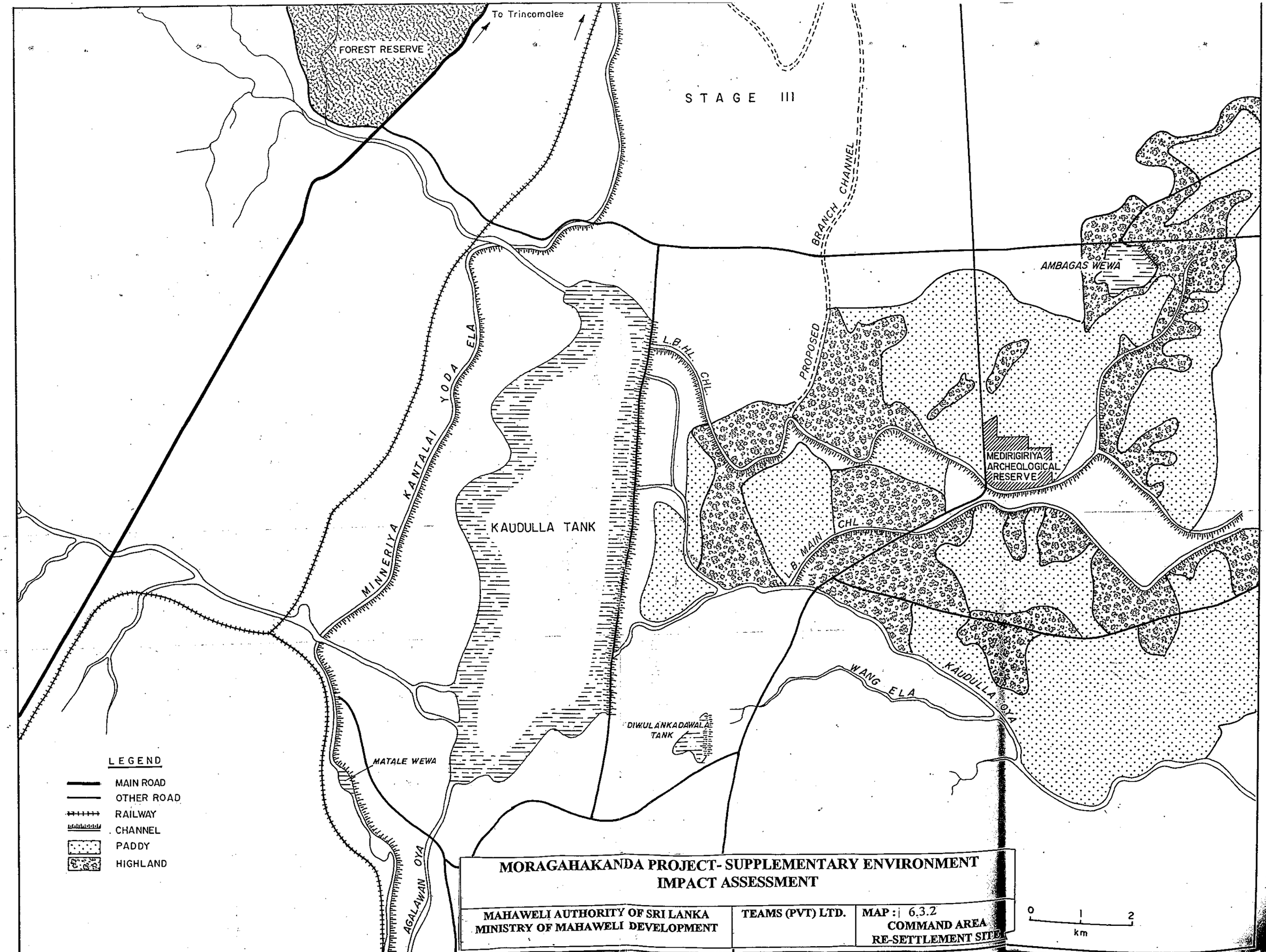
350

200

Dasgiriya

151.0

Dasgiriya


To Trincomalee
FOREST RESERVE
STAGE III
BRANCH CHANNEL
AMBAGAS WEWA
L.B.HL. CHL.
PROPOSED
KANTALAI YODA ELA
MEDIRIGIRIYA ARCHEOLOGICAL RESERVE
KAUDULLA TANK
MINNERIYA KA
L.B MAIN CHL
WANG ELA
KAUDULLA OYA
DIWULANKADAWALA TANK
MATALE WEWA
AGALAWAN OYA
LEGEND
MAIN ROAD
OTHER ROAD
RAILWAY
CHANNEL
PADDY
HIGHLAND
MORAGAHAKANDA PROJECT- SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT
MAHAWELI AUTHORITY OF SRI LANKA
MINISTRY OF MAHAWELI DEVELOPMENT
TEAMS (PVT) LTD.
MAP : 6.3.2
COMMAND AREA
RE-SETTLEMENT SITE
0 1 2
km

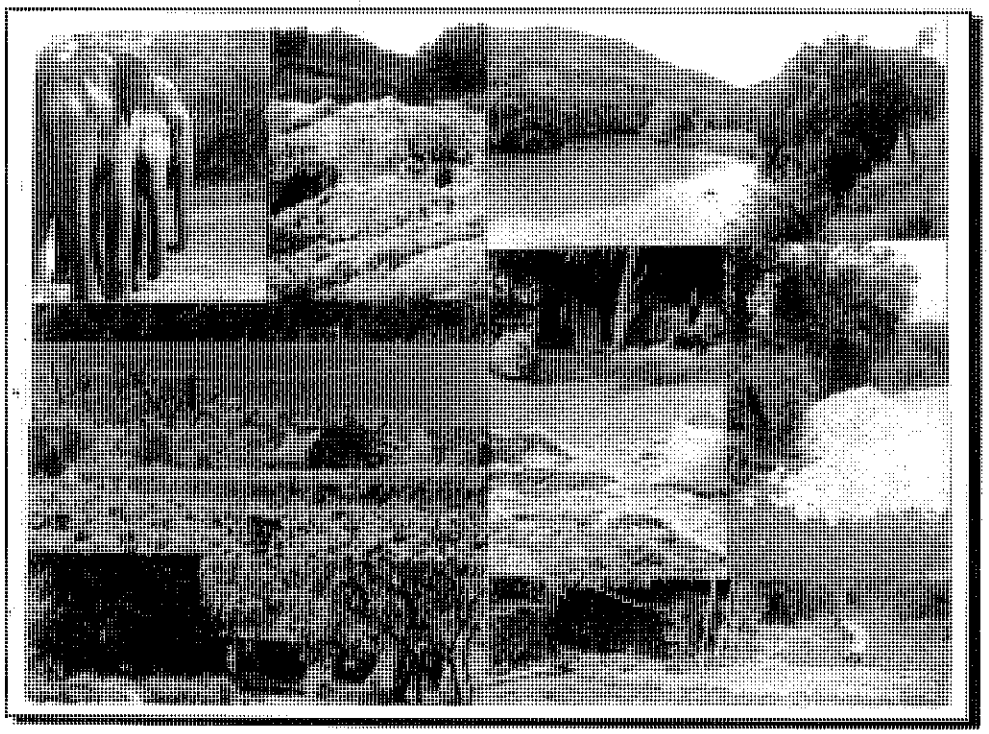
FINAL REPORT

(33)

Volume III - Photographs

on

MORAGAHAKANDA AGRICULTURAL DEVELOPMENT PROJECT
SUPPLEMENTAL ENVIRONMENTAL REPORT



Submitted to

MAHAWELI AUTHORITY OF SRI LANKA
MINISTRY OF MAHAWELI DEVELOPMENT

by

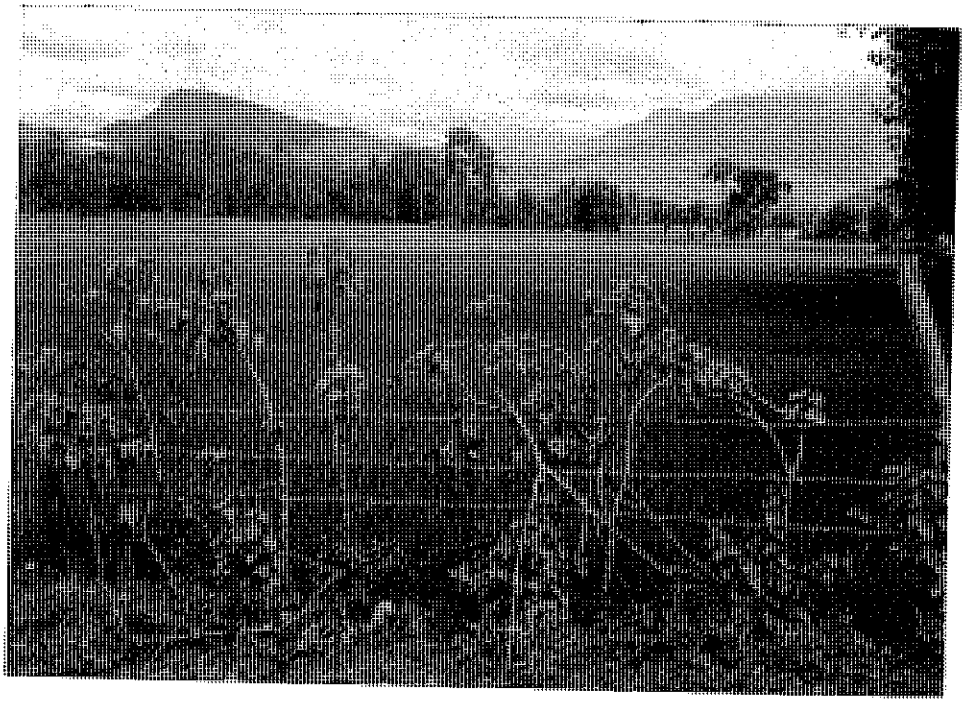
Consultants in Technology, Management & Development Studies

TEAMS (Pvt) Ltd. P. O. Box 262 Colombo, Sri Lanka

October 1997



Photograph 1 (July 1997)



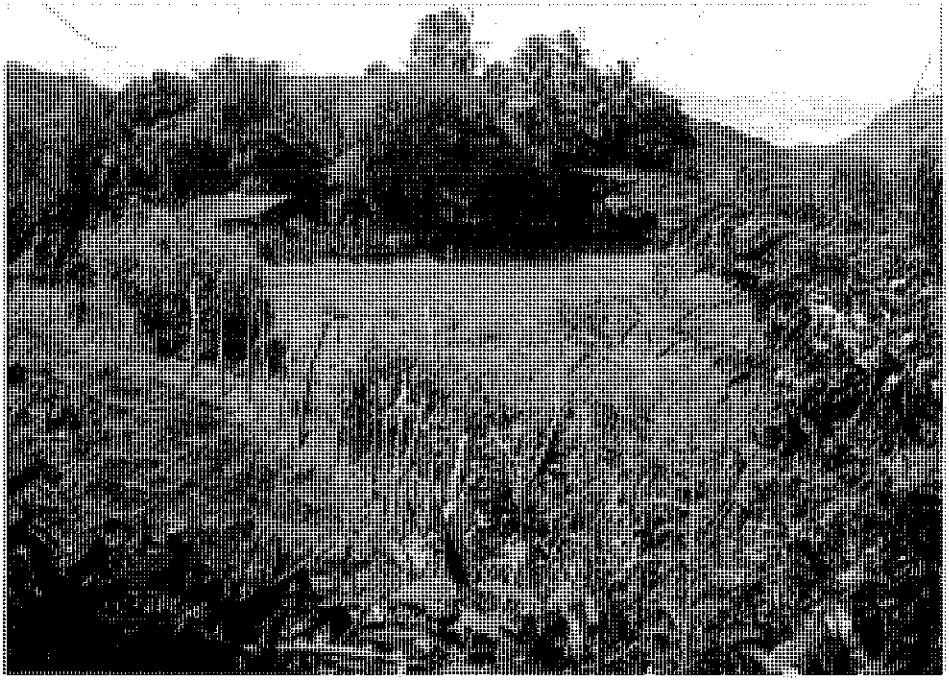
Photograph 2 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 1 & 2 :

Cultivated in both Maha and Yala seasons, these fertile paddy fields within the inundation area of Elagamuwa provide average yield of about 3.75 mt./ha (70 bu./ac.



Photograph 3 (July 1997)



Photograph 4 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 3 & 4 :

Although this village in Rajawela doesn't get inundated, the paddy fields surrounding it fall within the inundation area. Paddy in Maha season and other field crops (OFCs) in Yala season are cultivate in these fields.



Photograph 5 (August 1997)



Photograph 6 (August 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 5 & 6 :

Tobacco cultivation is popular among the farmers in the inundation area. It is cultivated both in highland with pump irrigation (above) and in lowland (Paddy fields) in Yala seasons



Photograph 7 (July 1997)



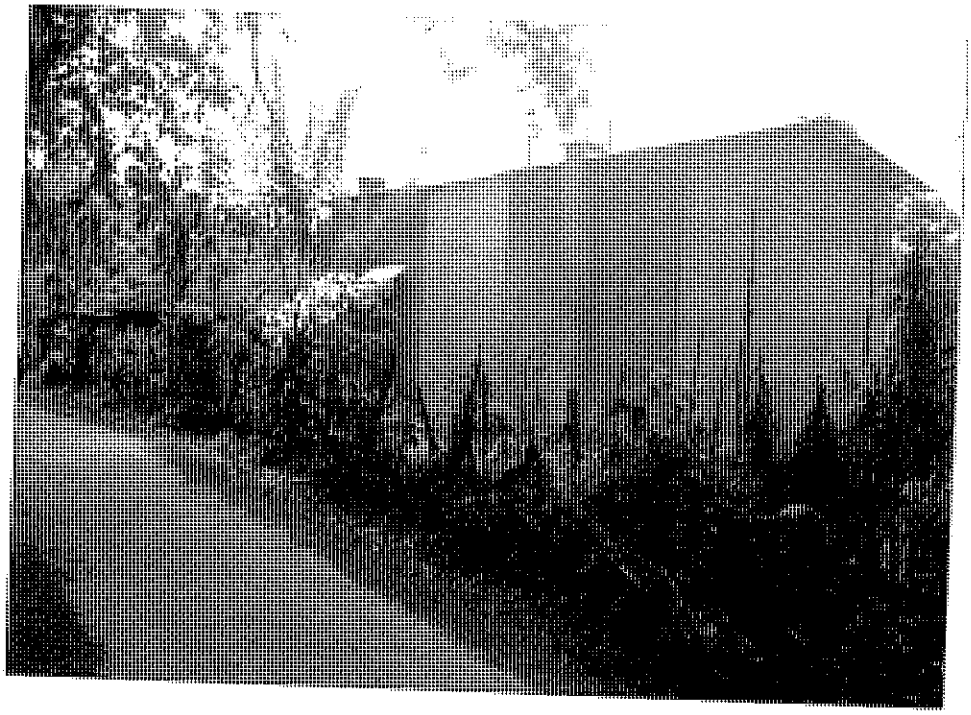
Photograph 8 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 7 & 8 :

Typical home gardens and houses within the inundation area at Galporugolla (above) and Kongahawela (below).



Photograph 9 (July 1997)



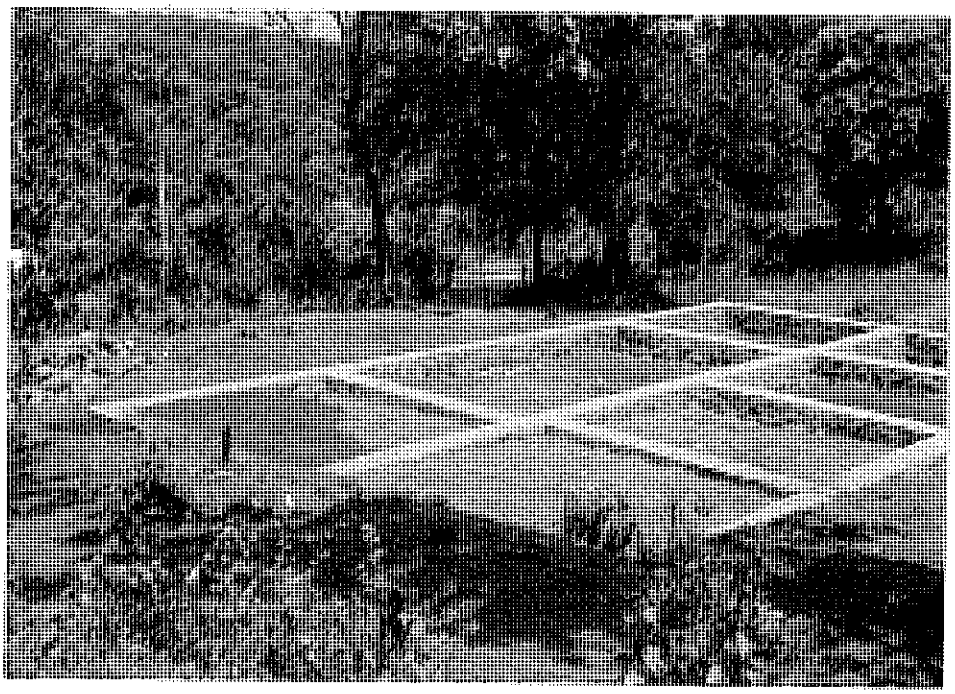
Photograph 10 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

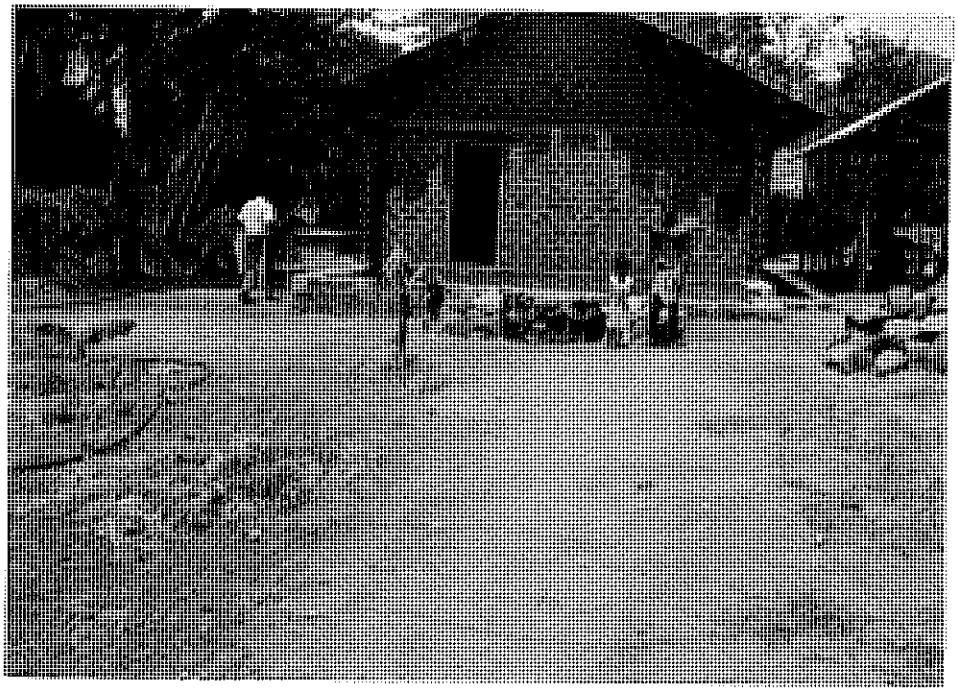
Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 9 & 10 :

Typical permanent buildings situated within inundation area : tobacco barns house (above) and a house (below) at Galporugolla



Photograph 11 (July 1997)



Photograph 12 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

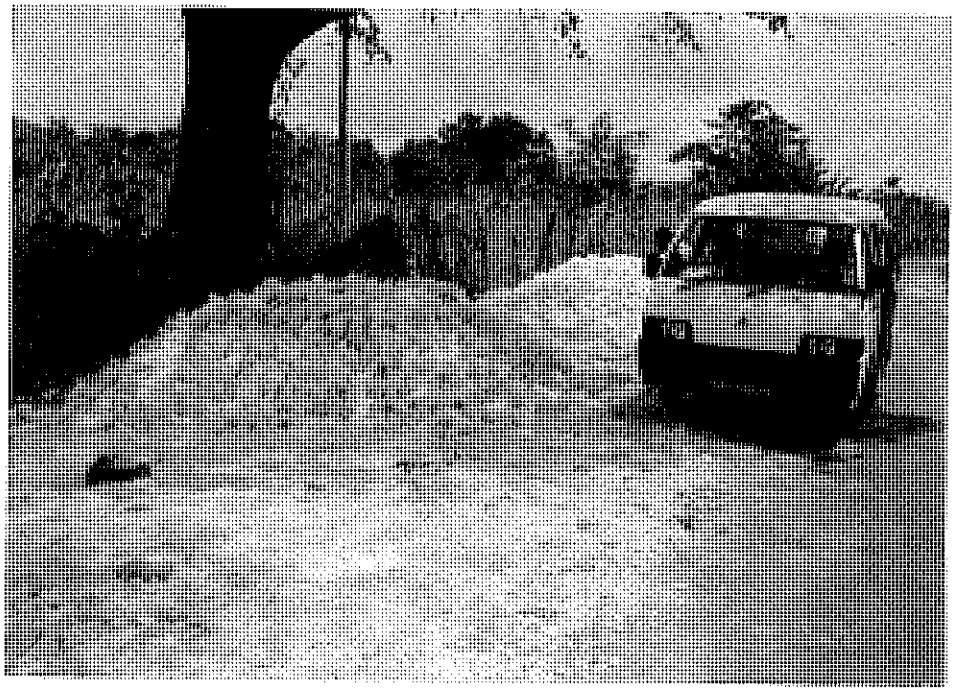
Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 11 & 12 :

There are locations where people are constructing new houses as in Medapihilla (above) and making extension to existing houses as in Kadawatha (below) at present in the inundation area.



Photograph 13 (July 1997)



Photograph 14 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

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Photographs 13 & 14 :

Surface mining is rampant in the inundation area. Common minerals include felspar (above), quartz (below) and mica (see next page) .



Photograph 15 (July 1997)



Photograph 16 (August 1997)

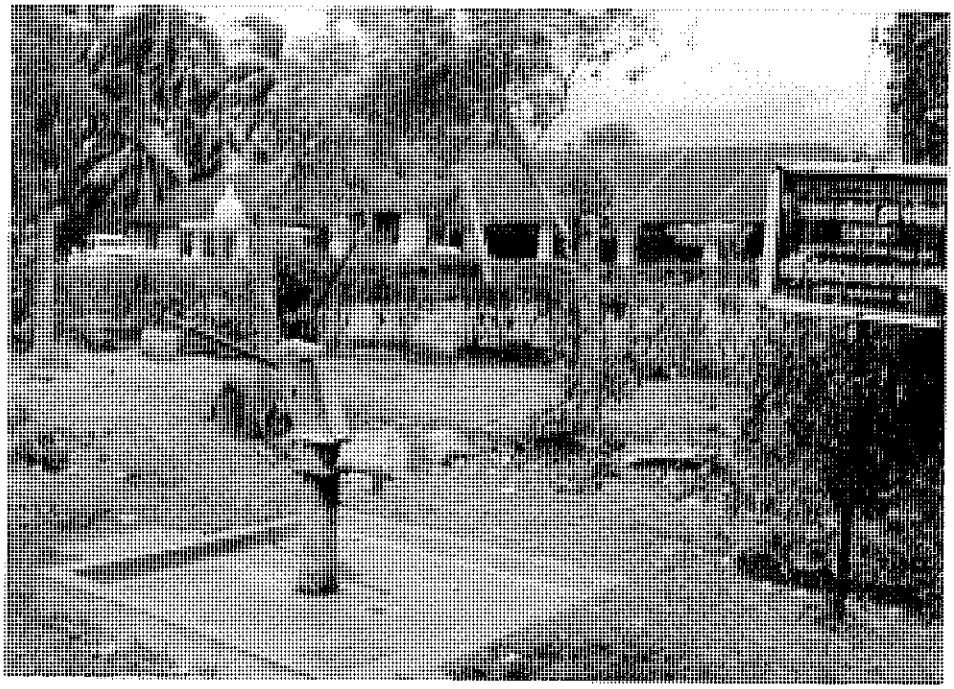
MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photograph 15 :

Mica mining is an organized economic activity in the inundation area. Washed, cleaned and graded mica is exported to Japan by a company in Aluwihare, Matale.

Photograph 16 :
Brick making (below) is a common income earning activity engaged in by some of the householders in the inundation area.



Photograph 17 (August 1997)



Photograph 18 (August 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 17 & 18 :

Being located on slightly elevated areas, the Hospital (above) and Maha Vidyalaya (below) at Kongahawela do not fall within the inundation area and remain accessible.



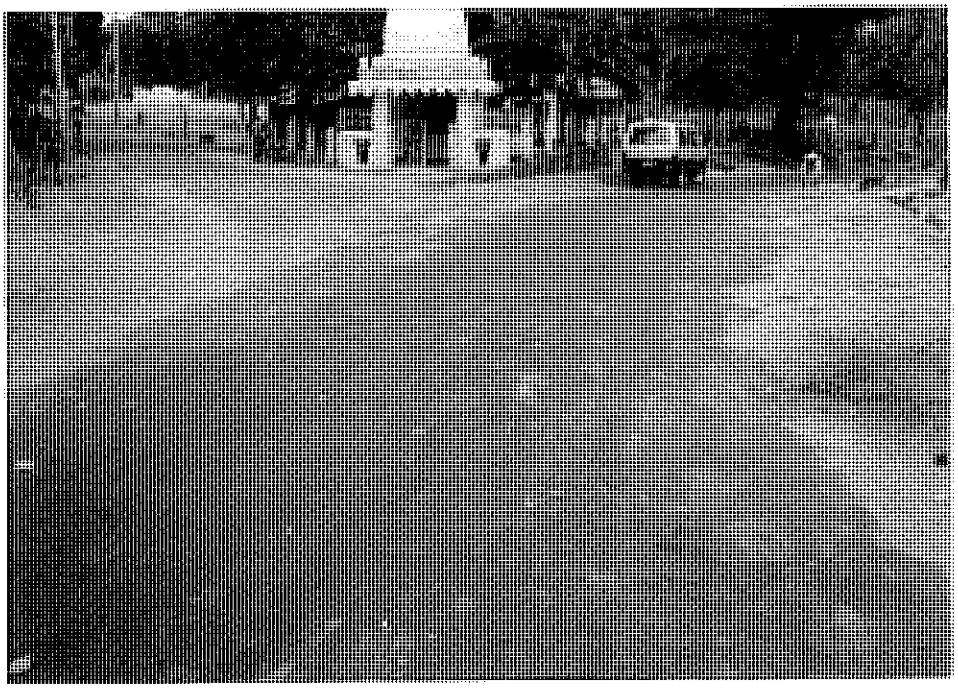
Photograph 19 (August 1997)



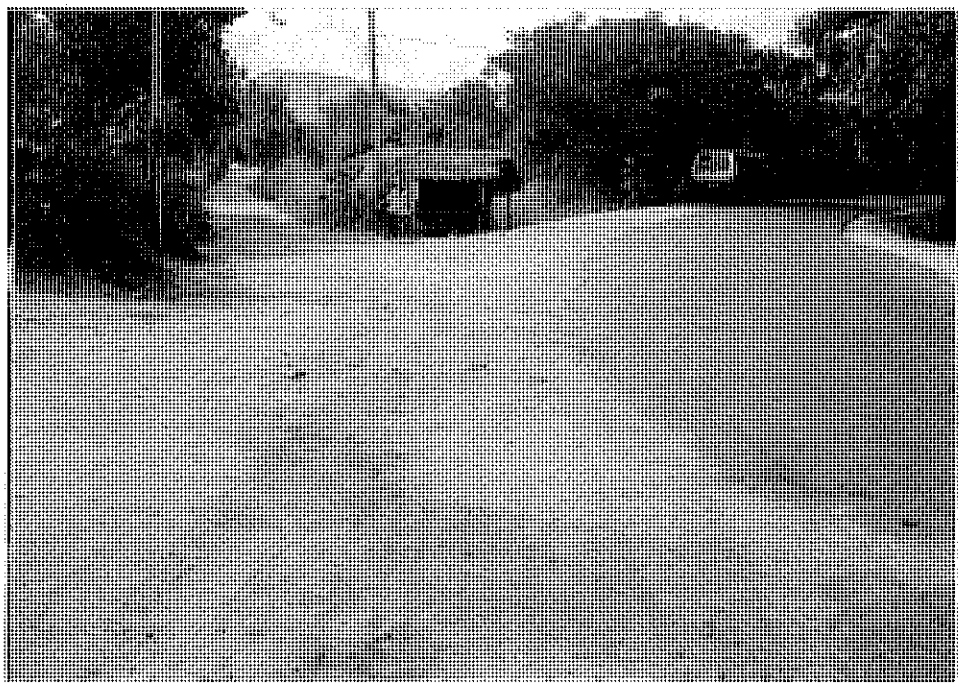
Photograph 20 (August 1997)

Photographs 19 & 20 :

Elagamuwa Maha Vidyalaya at Thalagoda (above) and Sub-Post Office at Kongahawela (below) are among infrastructure facilities falling within inundation area.



Photograph 21 (August 1997)



Photograph 22 (August 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 21 & 22 :
As a stretch of nine kilometres of Naula-Elahera road get inundated, alternative road has to be constructed to connect Kongahawela and Elahera via Pubbiliya. The road on to the left in the photograph above shows the present roadway to Pubbiliya at Kongahawela. The jeep tract on to the left in the photograph below at Elahera extends up to Welankaduwa (1 km away) from where at present only a foot path exists to reach Pubbiliya. This jeep tract and foot path need to be developed to a new motorable road to provide alternative roadway connecting Kongahawela and Elahera.



Photograph 23 (August 1997)



Photograph 24 (August 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

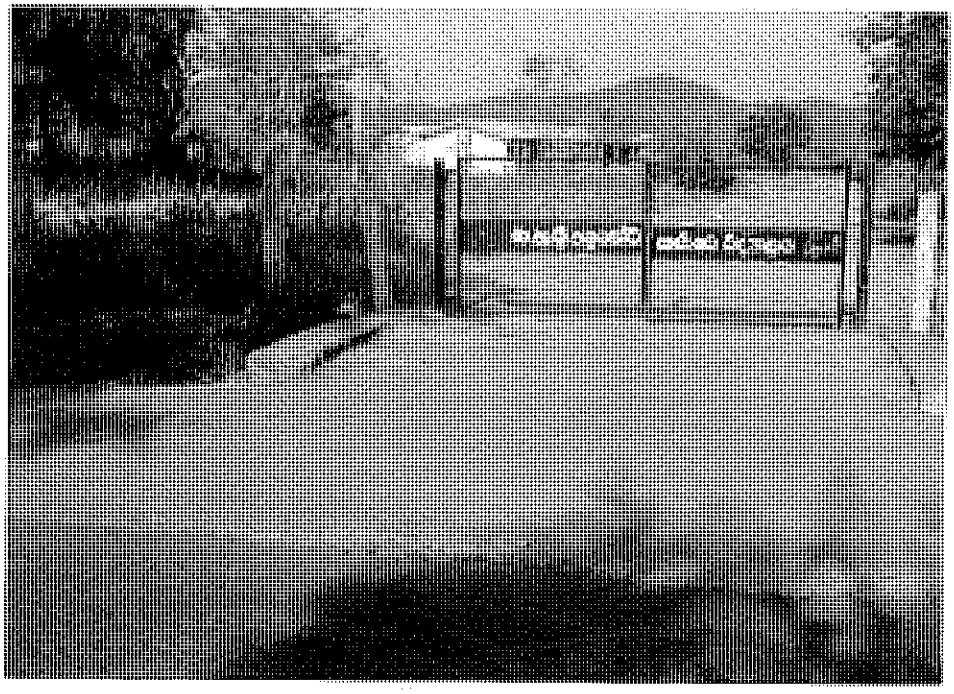
Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 23 & 24 :

Due to the fact that the existing elephant corridor lies within the inundation area, new corridor of about 4 km wide has to be provided starting almost next to the Main Reservoir Bund and stretching towards Elahera. The proposed corridor is already occupied by human habitation on either side of the road. The photographs (above and below) indicate the type of houses and homestead exisitng in the proposed corridor.



Photograph 25 (August 1997)



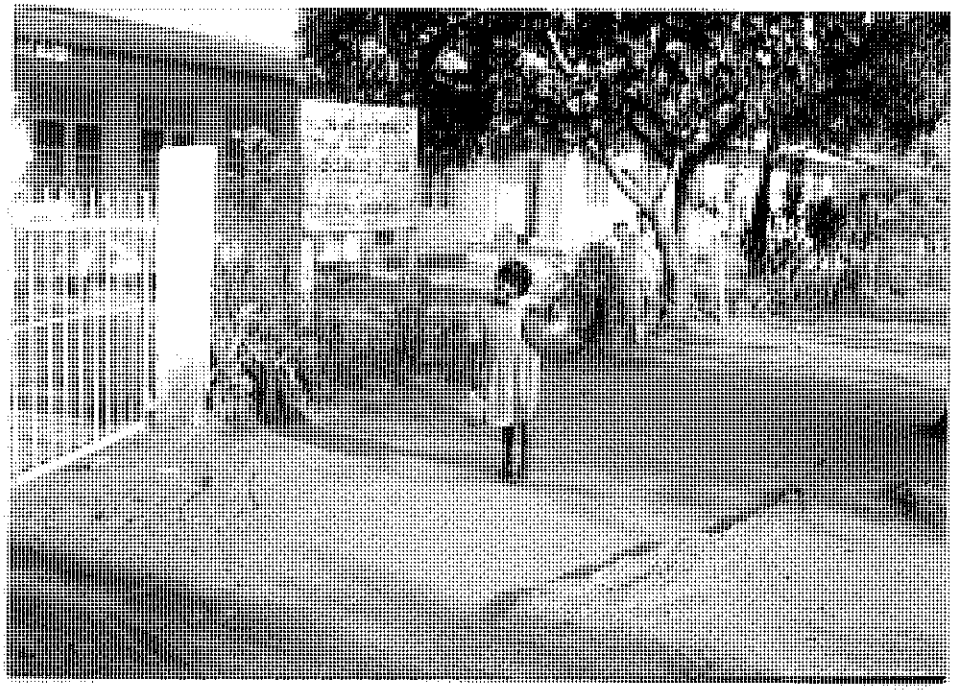
Photograph 26 (August 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 25 & 26 :

Minipura Maha Vidyalaya (above) and Agra Bodhi Junior Vidyalaya (below) at Dasgiriya are the schooling facilities already existing close to Kandapitawala host area. There schools, which need upgrading to cater to the needs of the resettled population, are situated about 5 to 6 km from the host area.



Photograph 27 (August 1997)

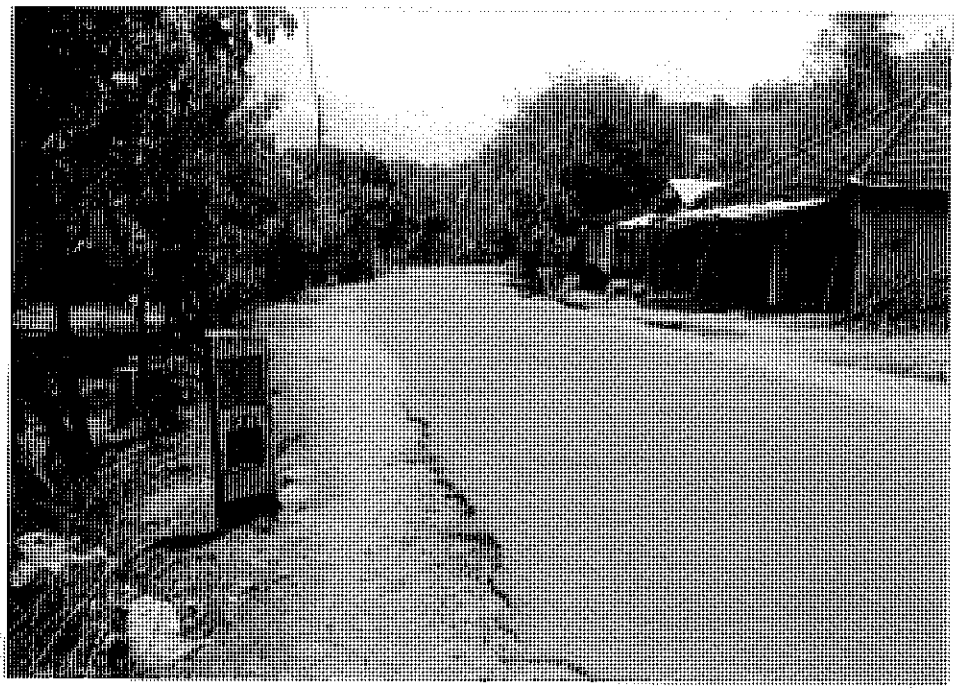


Photograph 28 (August 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photographs 27 & 28 :
Central Dispensary and Gramodaya Health Centre (above) and Public Library and Pre-School (below) at Dasgiriya are some of the other social infrastructure facilities already existing close to Kandapitawala host area which need upgrading to cater to the needs of the resettled population.



Photograph 29 (August 1997)



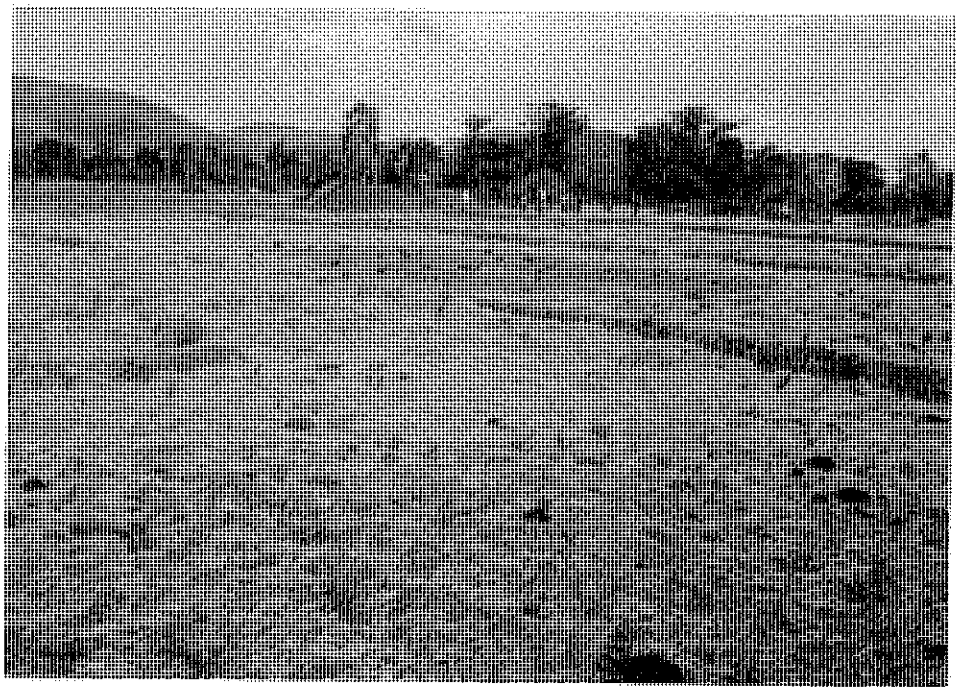
Photograph 30 (August 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

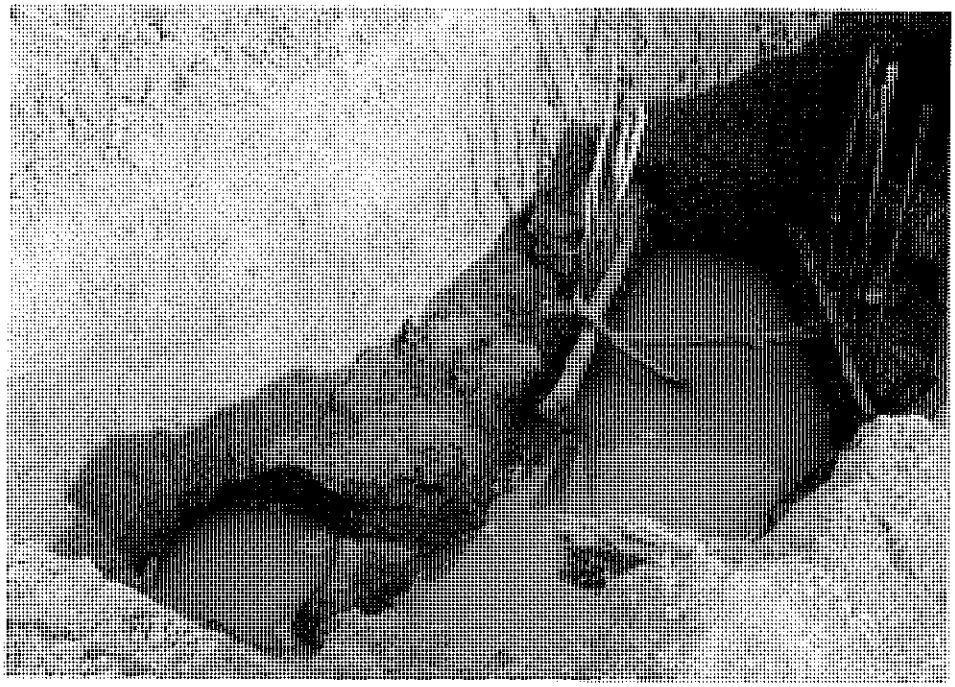
Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photograph 29 :
Nine Kilometers of the Naula-Elahera road beyond this kilometre post get inundation.

Photograph 30 :
This 30 foot wide circular road (below) at Dasgiriya, near Kandapitawela Host Area which provides access to Minipura Maha vidyalaya and Central Dispensary need tarring.



Photograph 31 (August 1997)



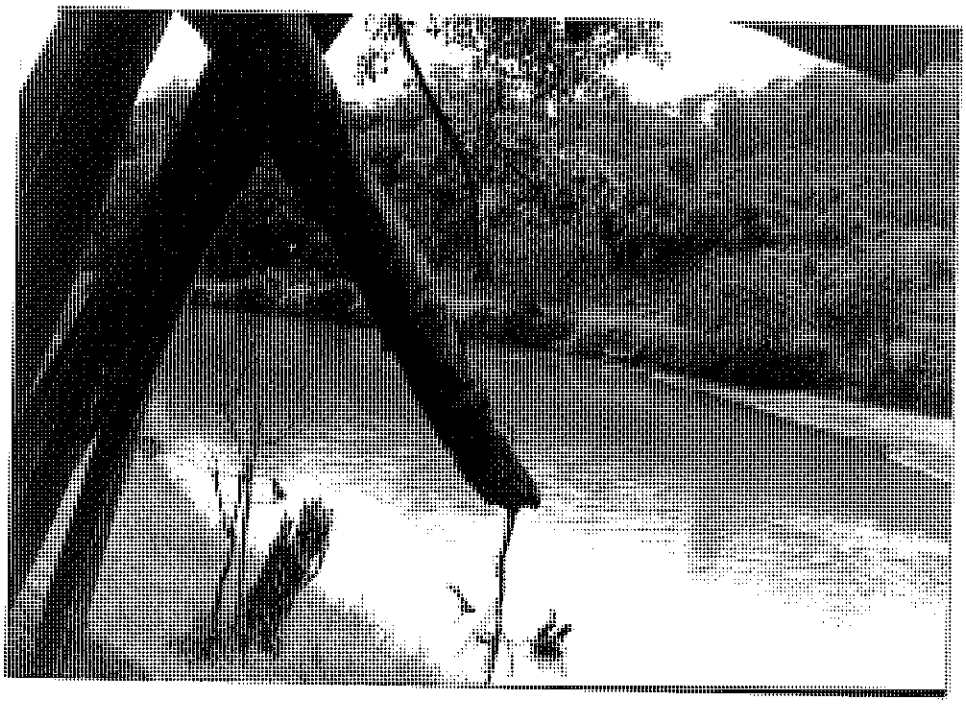
Photograph 32 (August 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

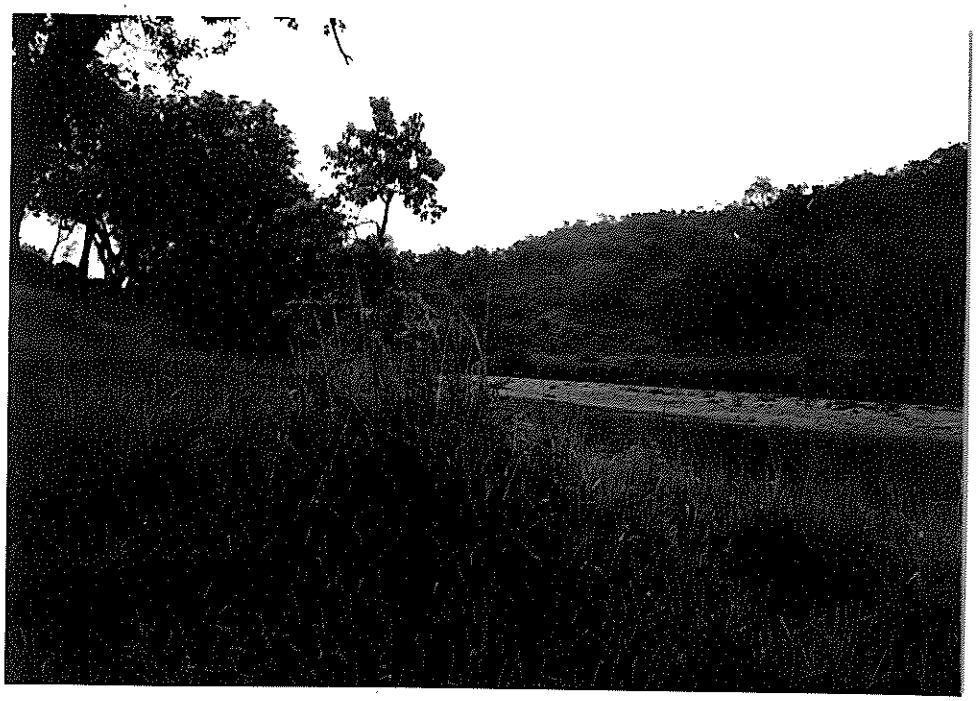
Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photograph 31 :
Located near Kandapitawela Host Area, in the lowland of Haththota Amuna area due to shortage of water for cultivation in Yala season, gemming is practised in rampant. In maha season paddy is cultivated after closing the gem pits.

Photograph 32 :
Unclosed gem pits are breeding grounds for mosquitoes. Malaria has become the commonest illness in the area around Kandapitawela.



Photograph 33 (July 1997)



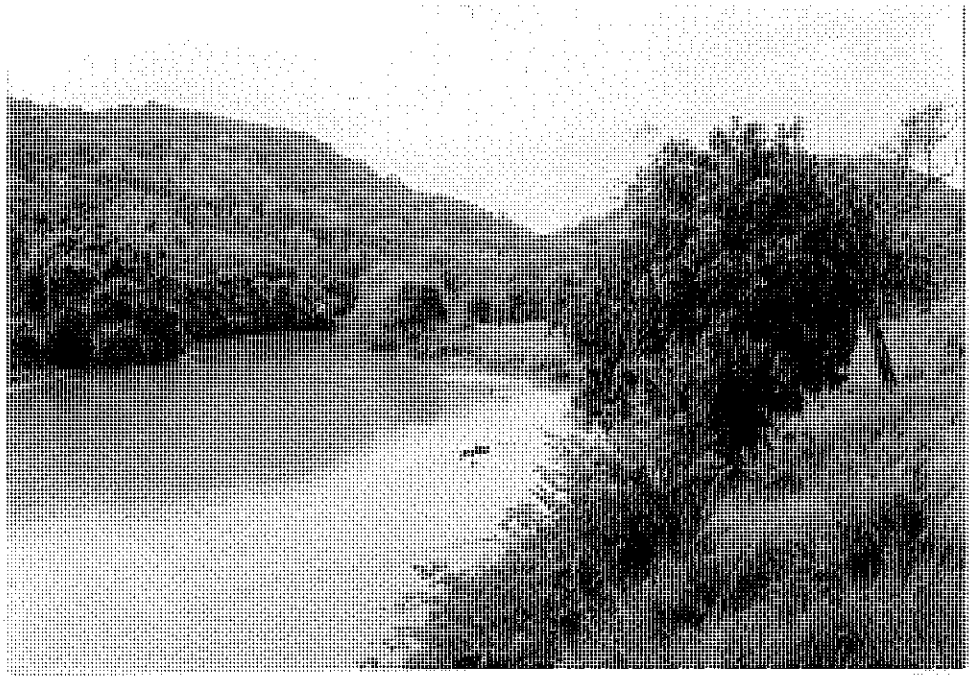
Photograph 34 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

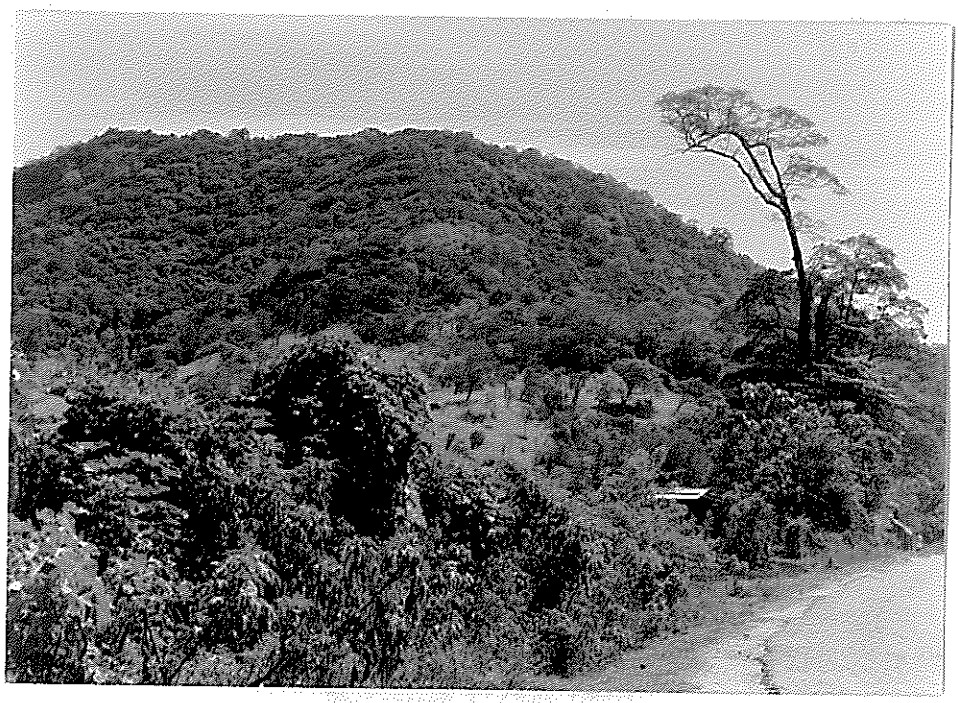
Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photograph 33:
The site of the Main Dam across Amban Ganga after a heavy rain the previous day.
the flat vegetated terrace with steep embankment over 2m, left of the tree trunk is the observational addict on the left abutment of the Main Dam.

Photograph 34:
The same site a little distance upstream from the left bank terrace. The extensive band deposit on right bank indicative for the need of a satisfactory desilting apparatus for the intended reservoir.



Photograph 35 (July 1997)



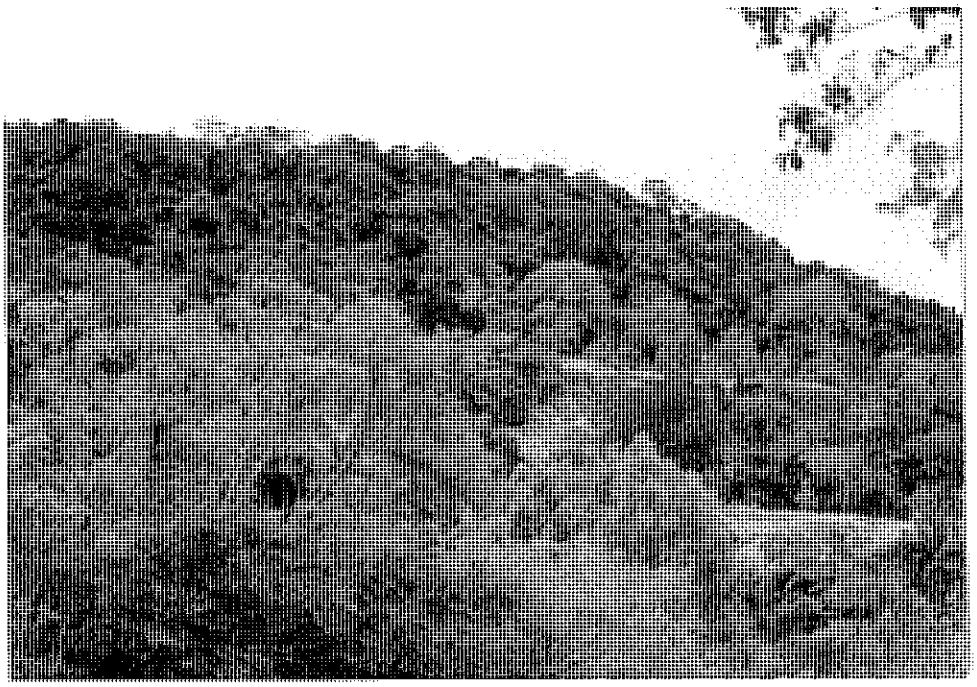
Photograph 36 (July 1997)

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Photograph 35:
View of the same site towards upstream. Part of the left bank terrace (forage ground of the elephant population) and the right bank luxurious vegetation

Photograph 36:
View of quarry site on the south western slope of Moragahakanda taken near 16 Km post on Naula Elahera bus route.

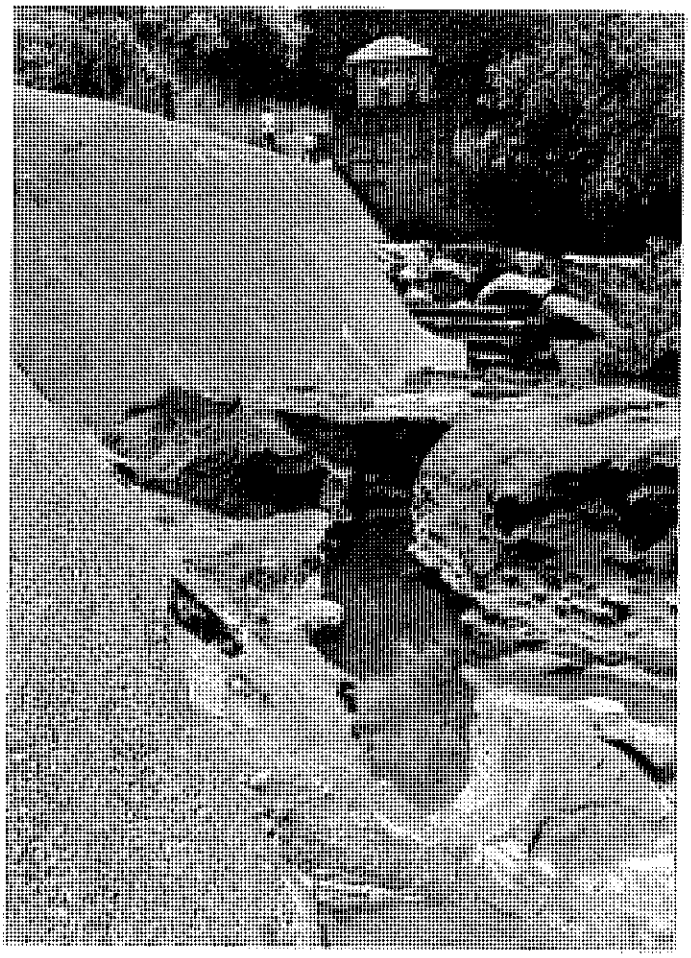


Photograph 37 (July 1997)

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Photograph 37:
View of the two lime-stone bands on the left abutment site of Saddle Dam 2. The photo analysis of aerial photo line E 33 No 198 taken in 94 indicate two sharp fracture lines giving rise to 2 limestone scarps with the upper exhibiting very strong karstic phenomena. See also Annex 3.1.6.a



Photograph 38 (July 1997)

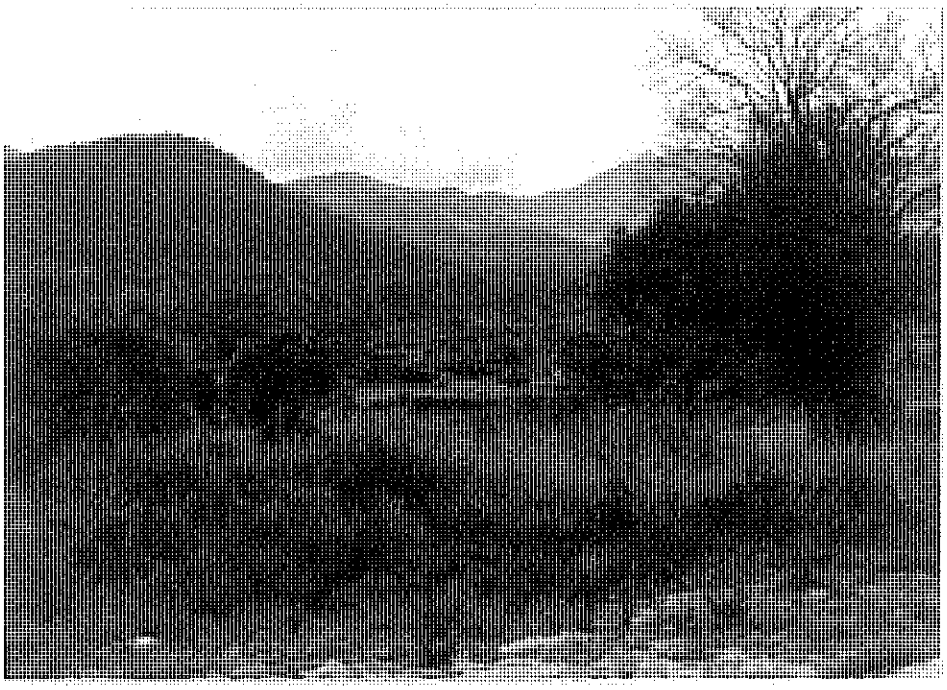
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SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

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Photograph 38:
Shows the left bank abutment area of the Dam across Amban Ganga which ponds up to direct water to the sluice and inlet gates at the Elahera Anicut diverting water through Elahera-Minneriya Yoda Ela. The highly fractured gneissic rock at the far end of the left abutment and a erosional solution cavity in the limestone bed on the down stream side of the dam base. Development of underinining and leaks were observable on the right abutment too. The limestone is traversed by thin serpentinite to bands along which the rocks show slicken slides



Photograph 39 (July 1997)



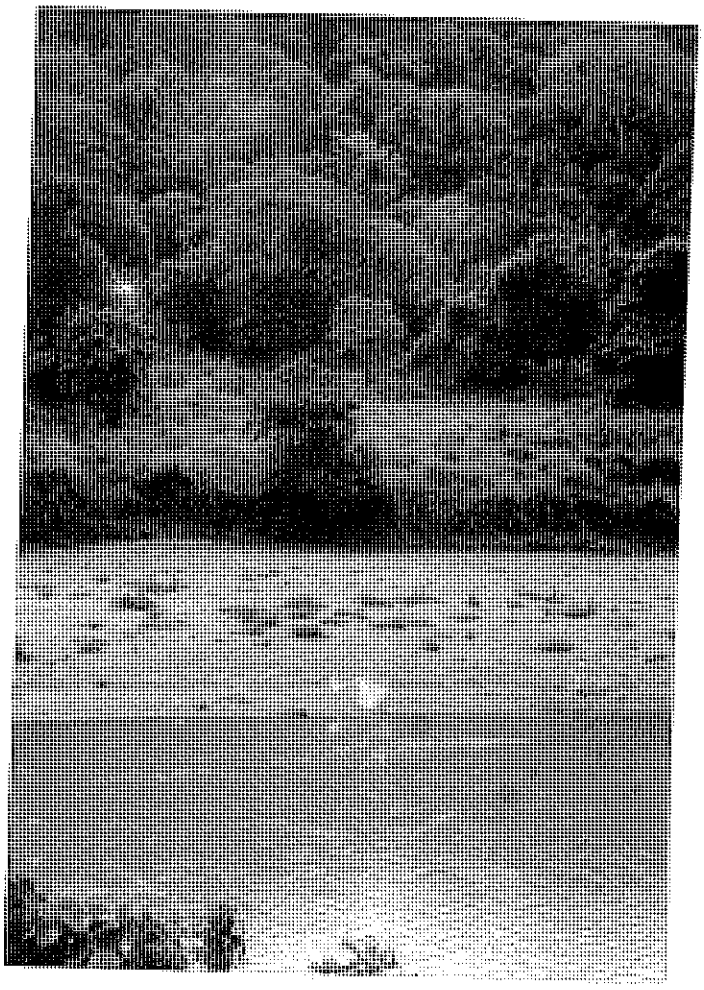
Photograph 40 (July 1997)

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Photograph 39:
Shows the nature of a member of the rock bands constituting the left embankment area of saddle No. 2 a little way on the upstream side of its left abutment. The large joint/fracture separated block of rock conducive to deep weathering. This deep weathering is noted on both the left bank abutment sites and on the right bank abutment site of Amban Ganga in dam site area.

Photograph 40:
Shows the view looking down the valley of the feldspar, Mica, quartz resource area of Talagoda, towards Amban Ganga and across into the right bank slopes of the river. Most of the Mineral Deposits in the head region of this valley will be submerged, part of which is in the foreground. The valley floor is fully cultivated and settled, which too would be submerged.

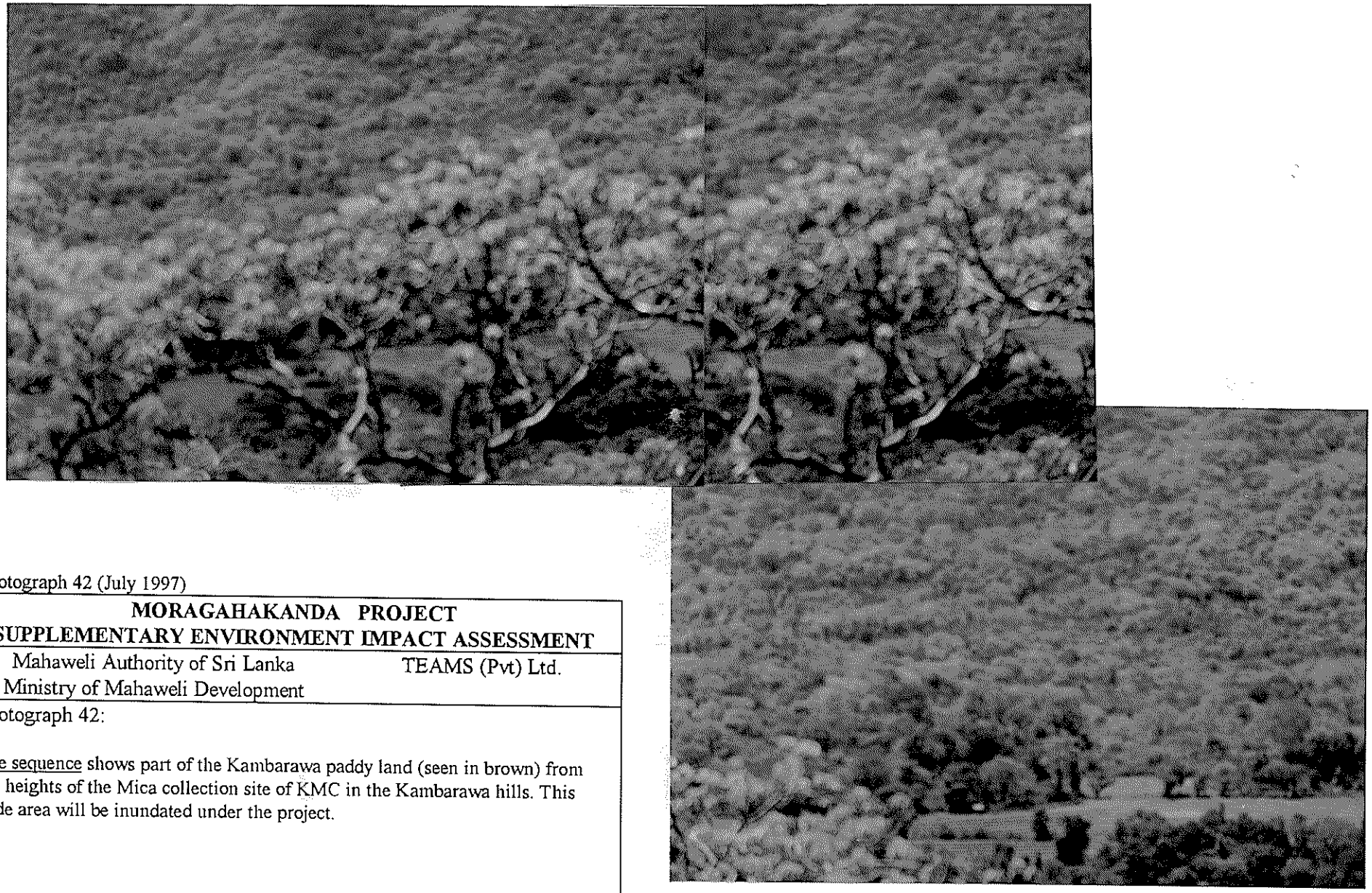


Photograph 41 (July 1997)

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Photograph 41:
This shows the view across Amban Ganga from a spot slightly in the upstream direction on the left bank. The color of the river water after one days heavy rain and the sand bank on the right bank, the terrace and the rich and diverse flora on the right bank, the terrace and the rich and diverse flora on the right bank slopes of the intended reservoir. Inundation prospects would smother at least to the branching height of the large emergent "Labu" tree seen in the top right hand corner.



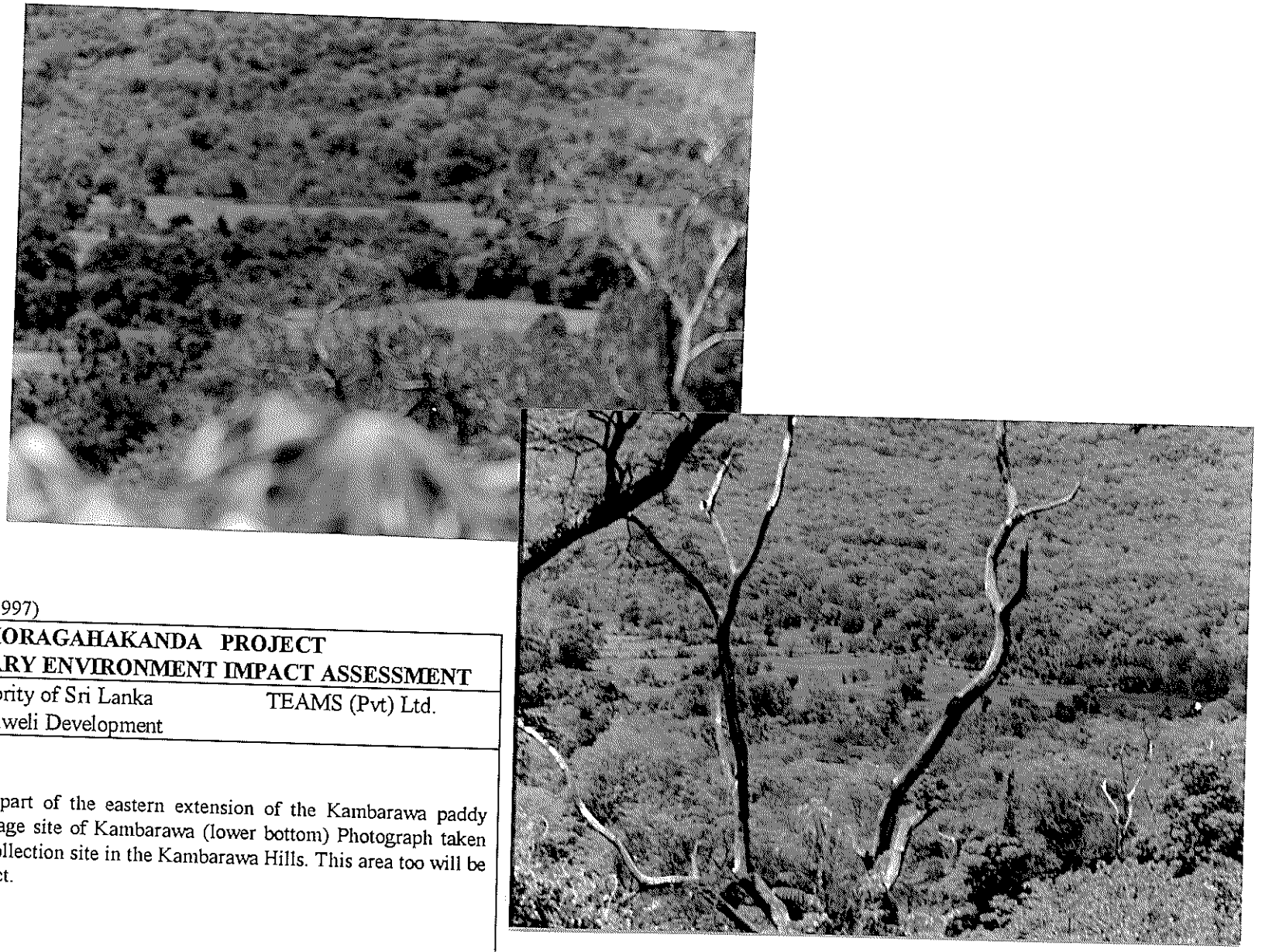
Photograph 42 (July 1997)

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Photograph 42:

The sequence shows part of the Kambarawa paddy land (seen in brown) from the heights of the Mica collection site of KMC in the Kambarawa hills. This wide area will be inundated under the project.



Photograph 43 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka — TEAMS (Pvt) Ltd.
Ministry of Mahaweli Development

Photograph 43:

The sequence shows part of the eastern extension of the Kambarawa paddy tracts into the old village site of Kambarawa (lower bottom) Photograph taken from the KMC mica collection site in the Kambarawa Hills. This area too will be inundated by the project.



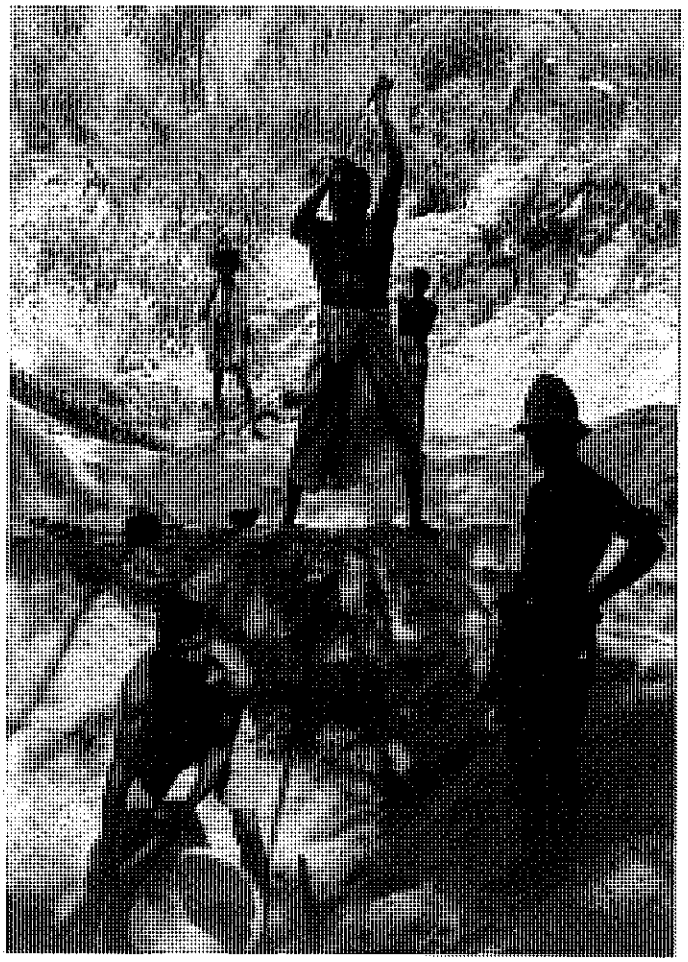
Photograph 44 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

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Ministry of Mahaweli Development

Photograph 44:

The sequence shows the compost of the Mica Feldspar, Quartz mining area in Talagoda, somewhat to the north west of the 16th Km post. The earlier productive site of feldspar for the ceramic industry. It appears to be an abundoned site due to conflict with wild life interests. Pottering by individuals still exist. Restoration is left for nature.



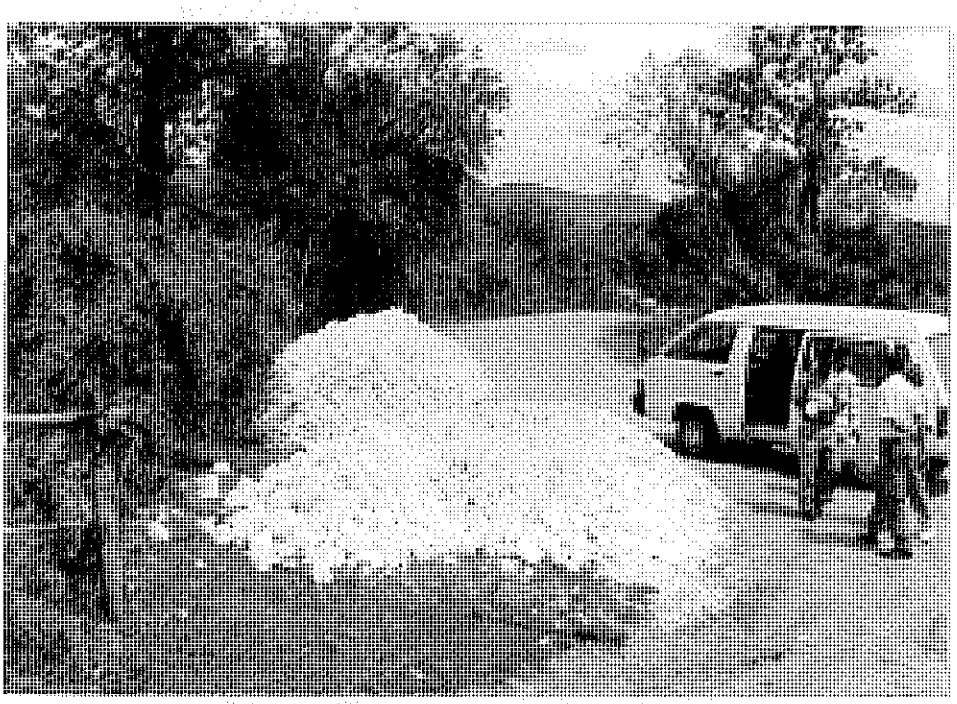
Photograph 45 (July 1997)

MORAGAHAKANDA PROJECT
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Photograph 45:

Shows part of the feldspar quarry under licence at Thalagoda.The mining activity is completely manual using simple quarring equipment. If enhanced activity ensues under the project for optimal results, these pits and trenches will have to be altered to at least semi-mechanised operations.



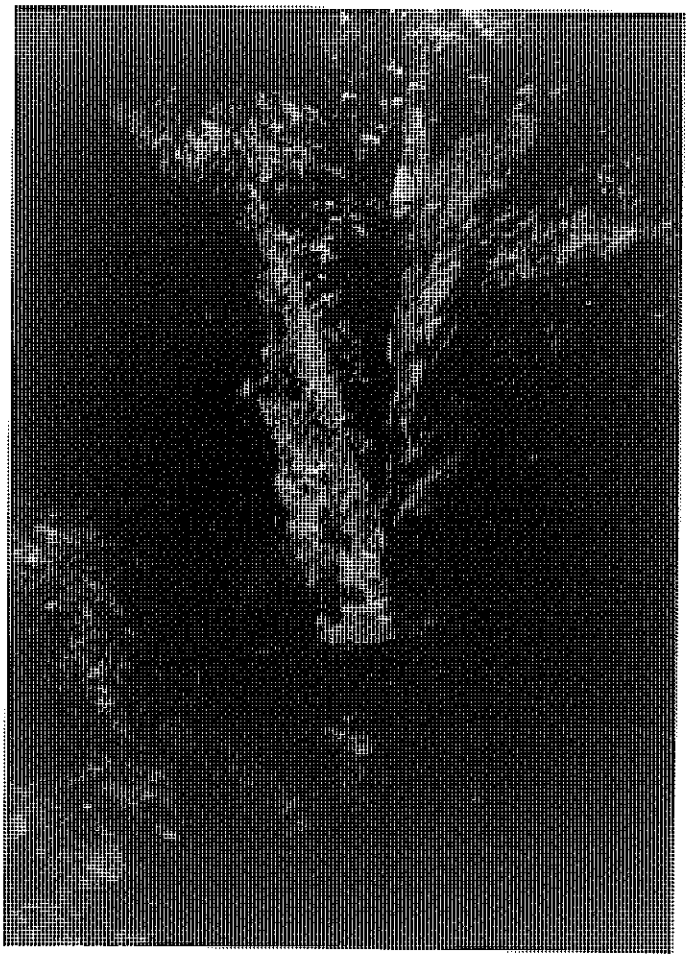
Photograph 46 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photograph 46:

Collection site of Silica quartz from Galboda area. Dump site Talagoda suspension bridge site on right bank of Amban Ganga. The Quartz is of high purity and is hand graded and sorted to meet specifications of export standards. The pale brownish heap in the middle is feldspar generally for local production. Mica, Quartz and Felspar generally occur in association with pegmatite bodies in the region.



Photograph 47 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photograph 47:

Shows a particularly excavated mica vein which had partially collapsed. Much mica still remains to be collected. The first of the Mica workings opened at Pubbiliya. Mica is of good quality phlogopite variety.



Photograph 48 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photograph 48:

Shows the width from wall to wall of the middle mica pit at Pubbliya.These mica vein appear eatensively and seems to be associated with the major fractures that extend north east of Moragahakanda towards Elehera Issues.

They are bordering the wild life reserves. There appears to be no plan for sequential land resource use for the entire area.



Photograph 49 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photograph 49:

Shows the upper- most work site on the Kambarawa hill by KMC.The entire opening is the extracted part of this Mica vein. Mica plates have been large. The man in background is holding a mica sheet over 9" broad. The vein bifurcates at this point. Mica veins appear to have developed both on vertical and horizontal planes.



Photograph 50 (July 1997)

MORAGAHAKANDA PROJECT
SUPPLEMENTARY ENVIRONMENT IMPACT ASSESSMENT

Mahaweli Authority of Sri Lanka Ministry of Mahaweli Development	TEAMS (Pvt) Ltd.

Photograph 50:

Shows individual workings on a cottage scale Mica is dug from veins and pockets in a rock band on the bottom slopes of Kambarawa range.The associated rocks are garnetiferous gneiss and marble interlayered

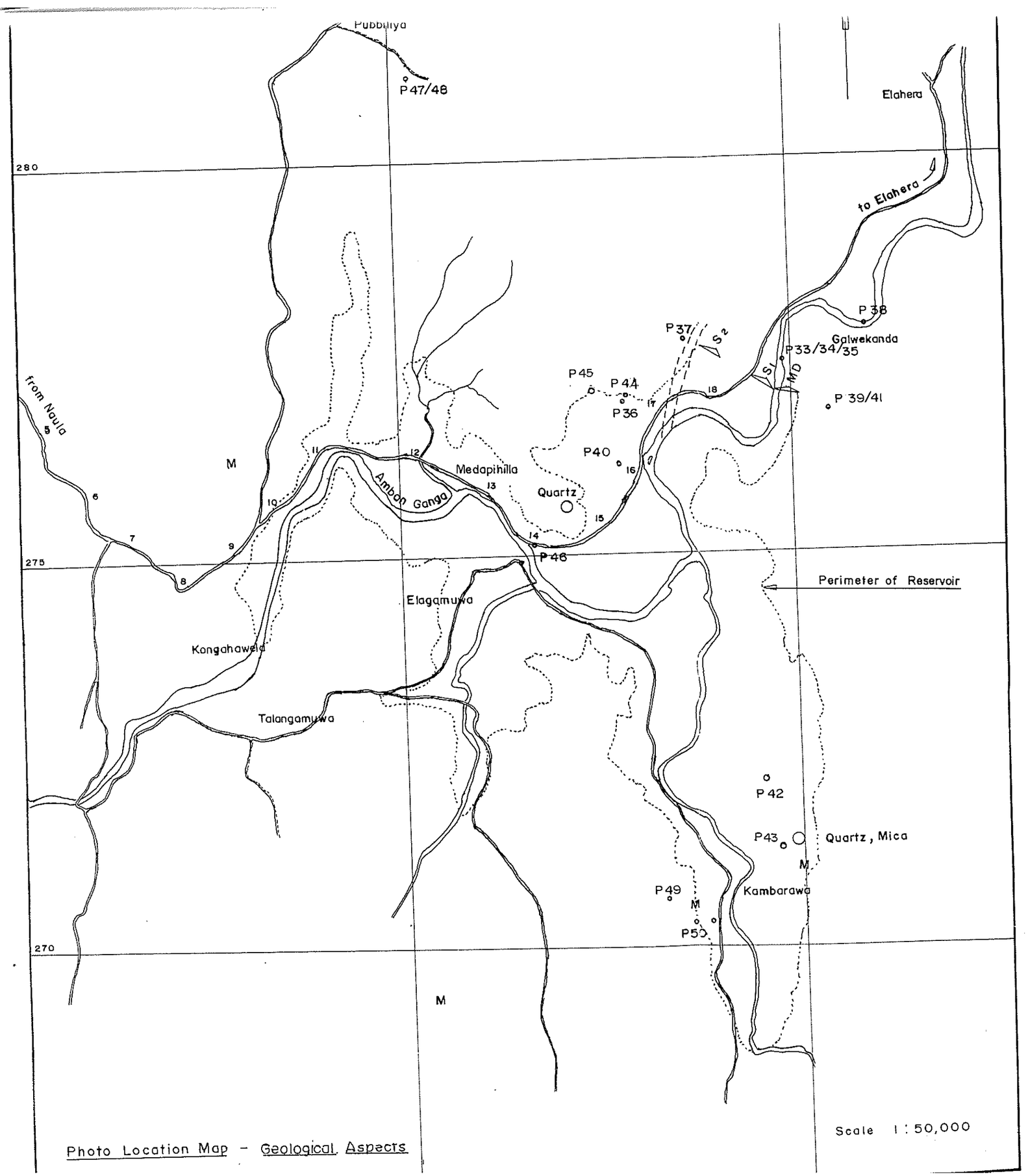


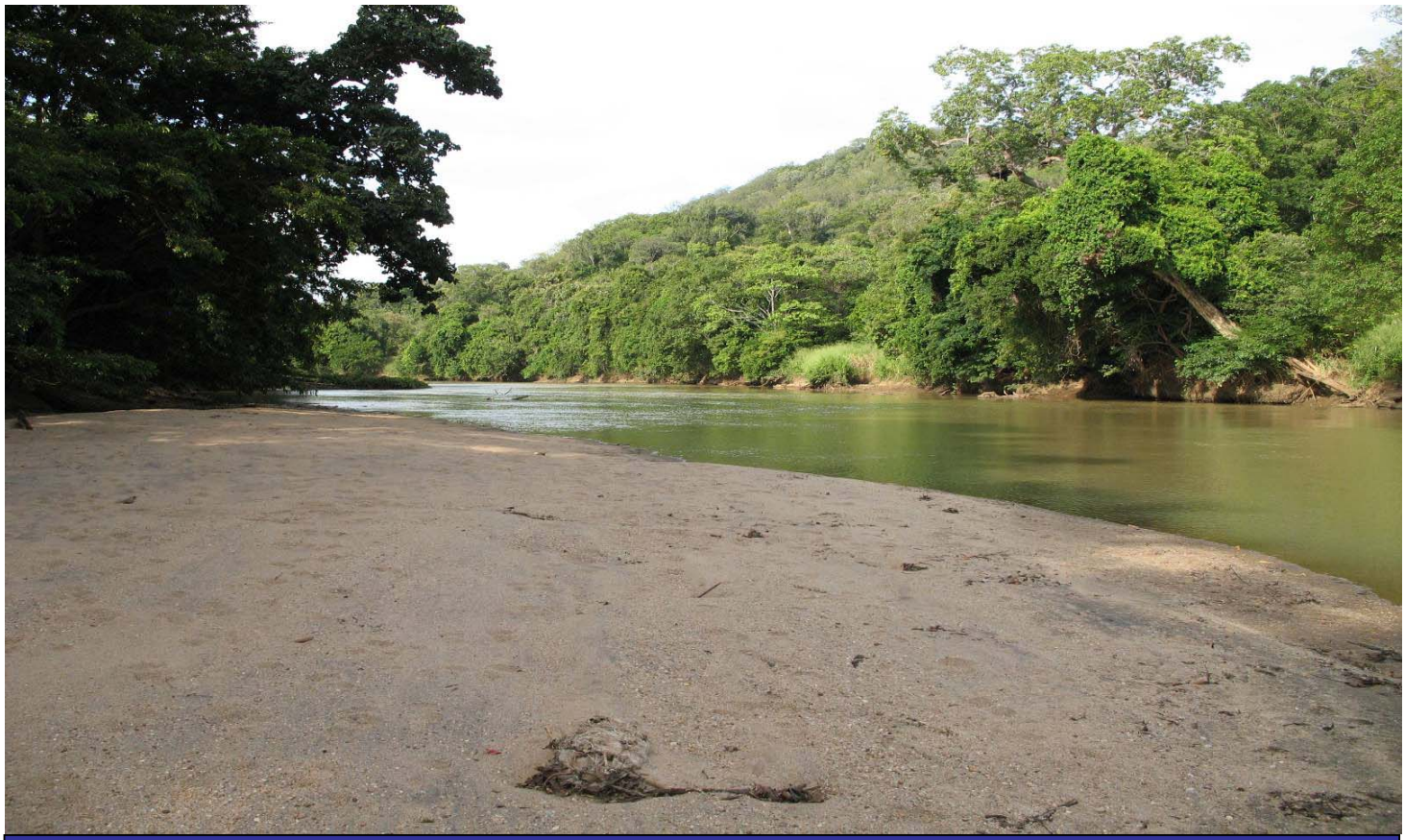
Photo Location Map - Geological Aspects

IUCN
The World Conservation Union

Biodiversity Assessment of the Moragahakanda Agriculture Development Project

Final Report

(July 2006 to March, 2007)



The World Conservation Union (IUCN) Sri Lanka

June, 2007

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The conduct of biodiversity assessments in the Moragahakanda project area would not have been possible without the dedicated support extended by the Mahaweli Authority of Sri Lanka (MASL). IUCN wishes to express its sincere gratitude to Mr J.A.S.A. Jayasinghe (Executive Director, River Basin Management) for enabling this rare opportunity and financial support of the MASL. The excellent support provided by Mr M.M.R.S. Perera, Mr. I.G. Maddumabandara and Mr. H. P. Chandrasinghe of the MASL River Basin Management and Planning Unit is greatly appreciated. Our gratitude is also due to Mr. A.N.H Fernando (RPM Bakamuna), RPM Medirigiriya and Mr. B.M.W. Basnayaka for the logistical and coordination support of our fieldwork, and to Mr. P.G. Noel Jayatissa MASL for their valuable assistance during the study.

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EXECUTIVE SUMMARY

Moragahakanda area and Amban Ganga basins were a part of our ancient irrigation civilization. For example, the Elahera anicut and the Yoda Ela were first built by King Mahasena (275-301 AD) and later renovated in the early 1940's.

The Moragahakanda Agricultural Development Project (MADP) project site is located near Elahera in the Matale district of the Central Province. The Project constitutes the final stage of the Master Plan to fully harness the water resources of the Mahaweli Ganga, Sri Lanka's largest river basin. The main goal of the MADP is to provide increased water supplies to drought-prone irrigation schemes in the North Central and Eastern Provinces of Sri Lanka.

Moragahakanda project involves the construction of a dam, about 65 m high, and two saddle dams with a total crest length of around 1,200 m on the Amban Ganga tributary, creating a reservoir with a storage capacity of some 570 million cubic metres. In addition to irrigation, provision has been made for water supplies to major towns in the region, and a 20 MW hydropower station.

In detailed field surveys, 406 flowering plant species, belonging to 93 plant families, were recorded in the project area. Among them were 29 endemic species, 14 nationally threatened species and 247 medicinal plant species. Six major vegetation types were identified in the project area with the tropical moist evergreen forests being the dominant vegetation type.

Vertebrate fauna totalling 272 species, belonging to 84 families, were recorded in various habitat and vegetation types in the project area. There were 47 endemic and 42 nationally threatened species among them.

The Project area is located at an elevation between 170 and 500 m above mean sea level and is mostly composed of metamorphic rock. The average annual rainfall is about 1900 mm received during the monsoons. The main surface water body of the area is Amban Ganga and Kabarawa Oya, its main tributary. Rainfall, run off, land use, and evapo-transpiration are the most important factors that affect the availability of surface water in the project area.

Some water bearing alluvial deposits (sandy and gravely deposits) are present along the Amban Ganga. Data indicates that the average yearly fluctuation of groundwater level is approximately 3 to 6 meters. The groundwater recharge mainly depends on the infiltration from the surface water bodies of the project area. Dug wells located in such areas have a reasonably high yield.

Water samples from tube wells, dug wells and streams have been taken into consideration, and they are reasonably free of hazardous conditions. The geochemical maps of Calcium (Ca) and Sodium (Na) are more or less similar, and the ions are more concentrated within the Kongahawela area. The total hardness ranges from 208-373 ppm and the alkalinity from 250-364 ppm. The electrical conductivity (EC) is high at 787µS/cm. The fluoride concentration values in the project area are scattered and falls within a narrow range 0.25-1.02 ppm.

Major threats to the biodiversity of MADP can be identified as habitat degradation, deterioration, modification, direct exploitation of flora and fauna and spread of invasive species. Declaration of the catchment of MADP, and the wider landscape linking Knuckles and Minneriya-Giritale Nature Reserve as a National Park will help to mitigate major threats to the biodiversity of the project area. Erecting electric fence on the perimeter of Western and Eastern boundary of the proposed park will help to decrease the potential human elephant conflict due to the development activities. Introduction of

appropriate local area development policies for likely industries can also minimize impact on biodiversity.

INTRODUCTION

HISTORICAL BACKGROUND OF THE MORAGAHAKANDA PROJECT AREA

The area covered by the proposed Moragahakanda Agricultural Development Project (MADP) is historically, one of the most important sites of river diversion for agricultural development in the dry & intermediate zones of Sri Lanka. There is a considerable amount of historical and archaeological evidence in this area to show that intricate ancient irrigation networks had been constructed in the past to facilitate agriculture. The area surrounding Moragahakanda-Elahera was then known as Ālisara-ratta. During the reign of King Gajabah II (12th century), this area belonged to Rajarata kingdom. Examination of the several historical sources and accounts of the battle between Parakramabahu I and Gajabahu II clearly show that King Parakramabahu's forces marched via "Ambavana" and "Ālisara" to "Pulattinagara" (Polonnnaruwa). Ambavana-ratta was the area between Naula and Elahera on the banks of the Amban Ganga, and is still known as Ambana. The great historian Codrington has identified several place names around Ālisara, which has been recorded in the ancient chronicles (eg. Mahavamsa) According to Codrington, Alisara ratta was Talātthala or Talākatthali, present Talagoda, near the 9th mile on the Nāula-Elahera road, and Āligama was a stronghold by the river, present Älagamuwa, 1 mile south of the 8th mile on the same road (Nicholas, 1963).

The great Elahera anicut and the canal, the most important features in the area, built along the ancient Manihira tank (Minneriya tank), were first built by King Mahasena (275-301 AD). The inscription on a stone pillar set up on the bund of the ancient Elahera anicut records that the irrigation channel on which the pillar stands is a work of Parakramabahu. This pillar, most probably, was erected after the renovation of the Elahera anicut by King Parakramabahu I.

The inscription has been translated as follows: "Hail Prosperity! By Sri Parakramabahu, the Supreme Lord of Lanka, who has engaged himself in enterprises (for the) benefit of the whole world, has this been caused to be made. Having dammed streams and rivers (and constructed) reservoirs, and also having coursed fields to make in Sri Lanka, King Parakramabahu made this, retaining all the water (or Pleasing the whole world)" (Brohier, 1941).

PROJECT BACKGROUND

Moragahakanda Agricultural Development Project is a multipurpose water resources development scheme and is the final stage of the long-term master plan for the effective use of water resources of the Mahaweli Ganga, Sri Lanka's largest river basin. The preceding stages of the Mahaweli Project saw the completion of Kotmale, Victoria, Randenigala and Rantembe multipurpose development schemes (power and irrigation).

The main goal of the MADP is to provide increased water supplies to about 81,500 ha of land under drought-prone irrigation schemes in the northern and eastern parts of Sri Lanka. The project plans to construct a dam about 65 m in height, and two saddle dams, 42 m and 21 m in height, with a total crest length of around 1,200 m on the Amban Ganga tributary, creating a reservoir to store some 570 million cubic metres of water. Provision of additional potable and industrial water supplies to major towns in the region is also envisaged. The project also includes a hydropower station with a capacity of about 20 MW.

The MADP was identified during extensive surveys of the irrigation and hydropower potential in the country, undertaken in the mid 1960s, and incorporated into the 30-year master plan for the Mahaweli

Development Program (MDP). The project site was selected during the survey and is located about 190 km north-east of Colombo. The site on Amban Ganga, about 2 km upstream of the ancient Elahera anicut, falls within the administrative district of Matale. Amban Ganga is central to the MADP. This major tributary of the Mahaweli Ganga is served by a separate 768 km^2 catchment which harvests the rainfall and regulates the flow in the river. The Amban Ganga catchment is the key to the long-term viability of the Mahaweli-fed reservoirs.

LOCATION

The project site is located near Elahera in the Matale District of the Central Province of Sri Lanka (Figure 1). The project area falls almost entirely within the Laggala electorate. It is noteworthy that forest cover in Laggala is significantly higher than in other electorates of the Matale District (Somasekaram, T., 1988).

CLIMATE

The project area falls within the intermediate climatic zone of Sri Lanka and its mean annual temperature is in the range of 22.5-25 ^{0}C. The annual rainfall varies from 1500-2000 mm in the north, and 2000-2500 mm in the south of the project area. Monthly mean rainfall in the project area is highest during the October to December period (above 200 mm), and the project area receives more than 100 mm rainfall on average per month from January to April. The dry period extends from April to September, with June being the driest month receiving less than 25 mm rainfall (Somasekaram, T., 1988).

TOPOGRAPHY

Topography of the project area is classified as flat and gentle sloping terrain, with the catchment area up stream being mountainous terrain surrounding the Matale and Naula areas. The catchment of the Moraghakanda reservoir, approximately 768 sq. km in extent, lies in the Knuckles range and consists of number of streams and rivers. Among the larger rivers are Amban Ganga, Sudu Ganga, Kambarawa Ganga, Ambakke Oya, Galbokke Oya, Ma Oya, and Kalugahaathathe Oya. In addition, there are small and micro level waterways that contribute to enrich the catchment. In all, about 175 km of large rivers, 225 km of small rivers, and 335 km of micro level waterways are found in the catchment of the Moragahakanda reservoir.

GEOLOGY AND SOIL

The general geology of the area conforms to the Highland series from the pre Cambrian era. The rock types are undifferentiated Highland series rocks, marble, quartzite, charnokite and charnokite gneiss. Major soil types in the area are reddish brown earths and low humic grey soils; reddish brown earths and immature brown loams; and erosional remnants (Somasekaram, T., 1988). In addition, the topography is characterised by undulate terrain and rolling hills and steep terrain.

Scope and Objectives of the study

This study intends to document the baseline biodiversity status of the Moragahakanda Agricultural Development Project (MADP) area in an effective, scientific and systematic manner in order to assess potential impacts to biodiversity in the area and to identify and suggest practical mitigation measures to minimize significant impacts, with recommendations for monitoring. This includes detailed investigations on impacts of reservoir construction on the ground water table and ground water

quality, riverrine species, downstream riverine habitats and possible impacts on fish migration and spawning.

Main Objectives of the study include the following:

- A detail biodiversity study in the project area including the resettlement area
- A detail survey to inventories endangered medicinal plants and flora in the project area
- Detail investigation and suitable mitigatory measures on effect of reservoir construction on ground water table and its quality and salinity, reverine species, down stream riverine habitats and fish migration and spawning.
- Prepare a framework matrix for impact mitigation and monitoring with specific time frames

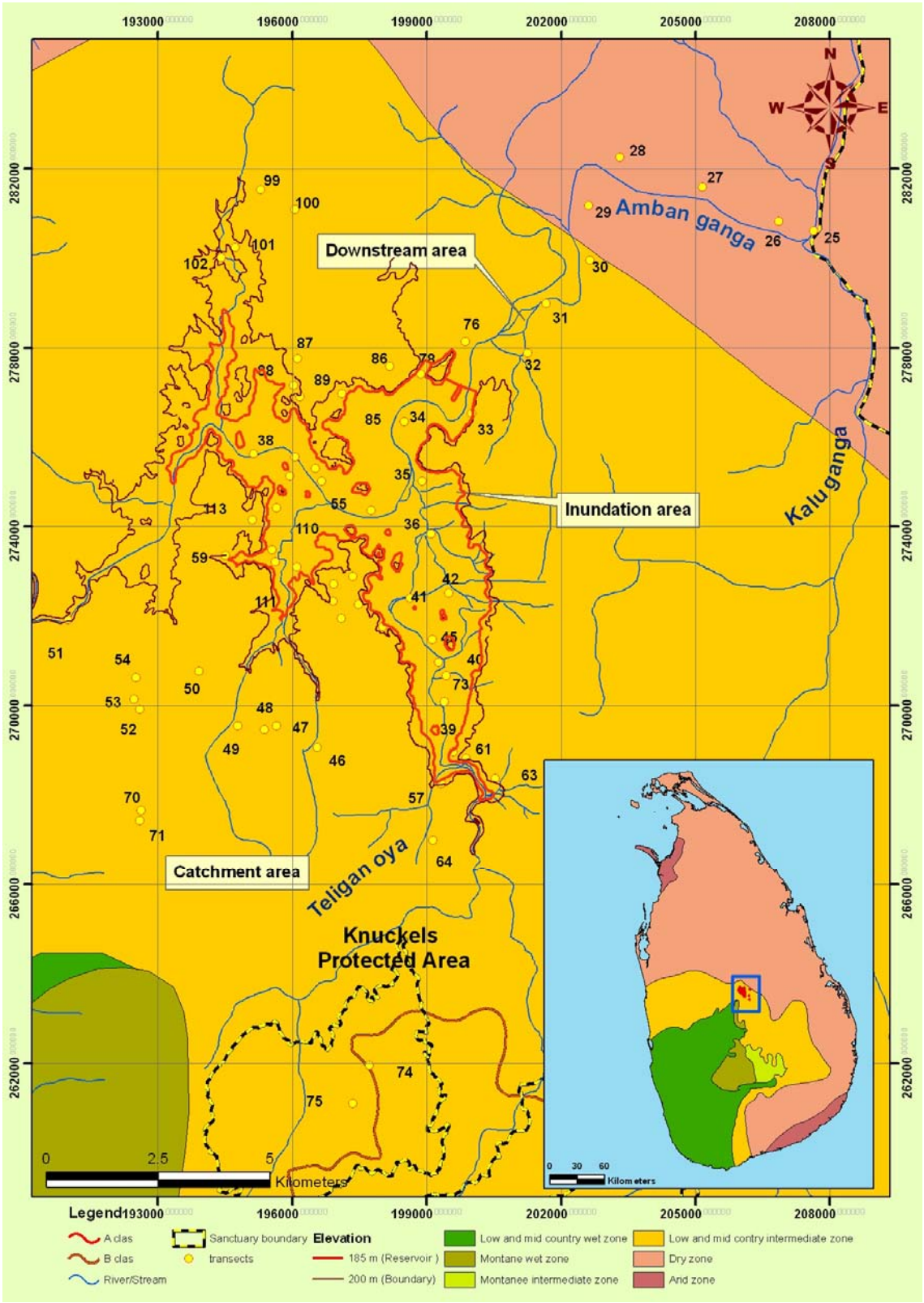


Figure 1: Location of the Moragahakanda project area

METHODOLOGY

At the very outset, a broad operational strategy was developed in order to facilitate designing and implementing project activities in an effective and scientific manner.

Published and unpublished data sources available, including data on the status of habitats, biodiversity, and water quality, were collated and studied. All available base maps were also collected. Based on these information, preliminary checklists of fauna, flora and habitat types were prepared. Preliminary sampling methods for each floral and faunal group were also designed.

A reconnaissance survey was carried out thereafter to ascertain the major habitat and vegetation types as well as to become familiar with the area. The predetermined sampling techniques were field tested and adjusted to suit the field conditions. During the reconnaissance survey, strategically important areas to be taken up for detailed biodiversity assessments were identified. To ensure complete coverage of the geographic and habitat heterogeneity, and to maximise sampling efficiency, the project area was divided into four zones, as follows:

- Areas affected by inundation
- Areas subject to direct impact along the streams below diversion points
- Upper catchments in the project area
- Relocation sites

Habitat specific inventorying of flora and fauna were carried out at selected sampling sites with adequate replicate samples. At each site, geo coordinates, floral and faunal species, and threats were documented. Photographic records were also made at each sampling site.

All faunal and floral data were compiled in Microsoft Excel in order to facilitate analysis. Proportional representation of species was calculated to ascertain abundance of species in selected taxonomic groups.

Specific sampling techniques employed for flora and fauna are given below.

PREPARATION OF FLORISTIC AND HABITAT INVENTORIES

FLORA SAMPLING

Species/population (higher plants) of diverse vegetation types in the MADP area were studied using standard scientific techniques, with appropriate modifications to suit field conditions. Initially, the habitat types (synonymous with vegetation types) found in the project area were identified and grouped according to the classifications of the Ministry of Forestry and Environment (1999). Plants were documented in 250 m^2 transects (50 m x 5 m), which is considered an appropriate sample size for the present study in keeping with the time and resources available, and the project objectives. According to available scientific literature samples ranging in size from 400-100 m^2 have been used in many forest studies. Taxonomic identification of plants was done in line with the standard herbarium methods supported by taxonomic literature.

Herbarium methods and preparation of floristic lists

Plant materials were collected, labelled and recorded in a field notebook on the site itself. Phenotypic and ecological features such as flower colour, habitat, habit etc. that may help in their identification were recorded. In the case of small plant species (herbaceous plants) the whole plant with the root system was taken as the herbarium specimen. However, in dealing with large plant species only specific vegetative parts with fruits and flowers (used as essential diagnostic characters) were collected as herbarium specimens. The specimens were fixed with methylated spirit as soon as possible. The specimens were pressed using field presses with 18" by 12" frames and dried in an electric drier with 100 W bulbs. Specimens that were dry but still tough and not brittle in consistency were regarded as being at optimum dryness.

The specimens were authenticated by reference to the standard herbarium specimens of the National Herbarium, Peradeniya, and to descriptive literature. Plants were listed under different categories as per published literature (Jayaweera 1980-1982; Ashton *et al* (1997); Senaratne (2001); IUCN (1999); Prajapthi *et al*. 2003).

FAUNA SAMPLING

Field sampling of faunal species, except freshwater fish, was carried out in parallel to floral transects. Night sampling on the Elahera-Naula main road and the Kongahawela-Kambarawa road were carried out to document nocturnal animal species, especially nocturnal mammals, reptiles and amphibians. Specific sampling techniques used are summarized in Table 1. Random observations of all the fauna species out side transects were also included as supplementary data in the final check list of fauna.

Identification and nomenclature of species were based on the latest field guides and taxonomic publications, summarized in Table 2

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Table 1: Sampling techniques used to document fauna in the Moragahakanda area

Group	Method
Fishes	Cast nets (1 cm and 3 cm gill size) drag net (1 mm gill size), Gill net (3 cm gill size) and snorkeling (direct observation in 10 m x 10 m plots in clear waters)
Herpetofauna (Amphibians and Reptiles)	100 m x 10 m belt transects, Nocturnal road surveys
Birds	100 m x 50 m line transects (direct observations and calls)
Mammals	Belt transects, direct and indirect observations
Butterflies	100 m x 10 m belt transects

Table 2: Source documents used in the identification and nomenclature of species

Group	Source
Flora	Dassanayake, M. D. and Fosberg, F. R. (Eds.) 1980 - 1991; Dassanayake, M. D., Fosberg, F. R. and Clayton, W. D. (Eds.). 1994 – 1995. Dassanayake, M. D., and Clayton, W. D. (Eds.). 1996 - 1999.
Freshwater Fishes	Pethiyagoda, R. 2006; Pethiyagoda R. 1991; Jayaram, K.C. 1999
Herpetofauna (Amphibians & Reptiles)	De Silva, P.H.D.H. 1980; Das, I. and De Silva, A. 2005; De Silva, A. 2006; Dutta, S.K. and Manamendra-Arachchi, K.N. 1996; Manamendra-Arachchi, K. And Pethiyagoda, R. 2006.
Birds	Harrison, J. and Worfolk, T 1999; Kotagama, S. 2006.
Mammals	Phillips, W.W.A. 1980; Kotagama, S. 2005**;** Weerakoon, D.K. and Goonatilake, W. L. D. P. T. S. de A. 2006.
Butterflies	D'Abrera, B. 1998; Woodhouse, L.G.O. 1950; Perera, W.P.N. and Bambaradeniya, C.N.B. 2006.
Freshwater Crabs	Bahir, M.M. and Pethiyagoda, R. 2006; Ng & Tay 2001

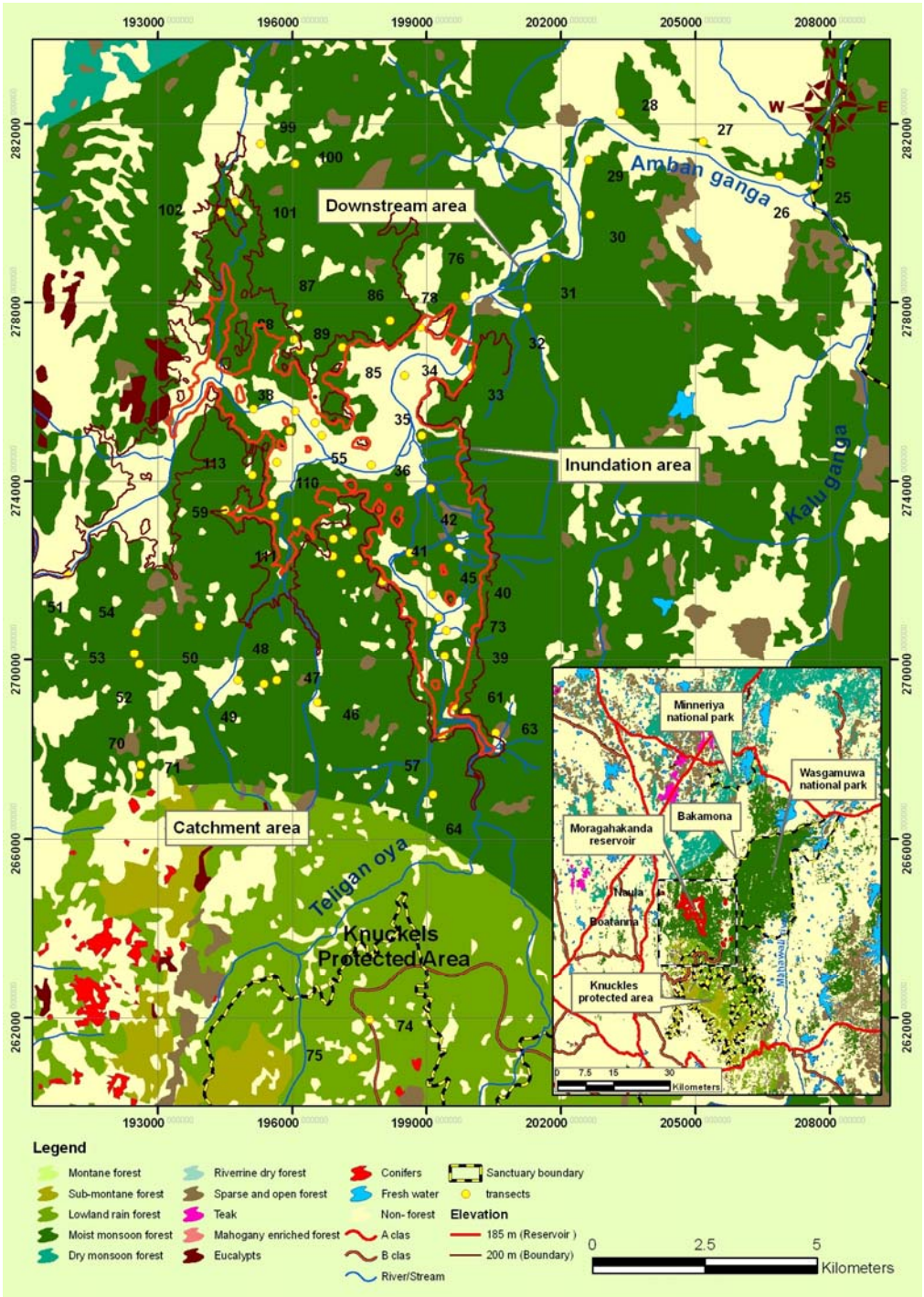


Figure 2: Sampling locations in the Moragahakanda Project area

WATER QUALITY SAMPLING

Prior to the field visit, a desktop study was carried out by interpreting aerial photos, geological maps, and topographic maps. These interpretations were used to gain an understanding of the surface drainage, structural geological set up of the area and infrastructural facilities. The desktop study was followed by a field study of the area.

Groundwater levels, water samples, and hydrogeological information were collected in the field, especially from existing dug wells, tube wells, pits, and road cuttings. The sampling points were irregularly distributed. Water samples were collected from dug wells, tube wells, and streams for chemical analysis. The pH and conductivity of the water samples were measured using appropriate instruments. The water samples were analyzed using a HATCH spectrophotometer and an atomic absorption spectrophotometer at the University of Peradeniya.

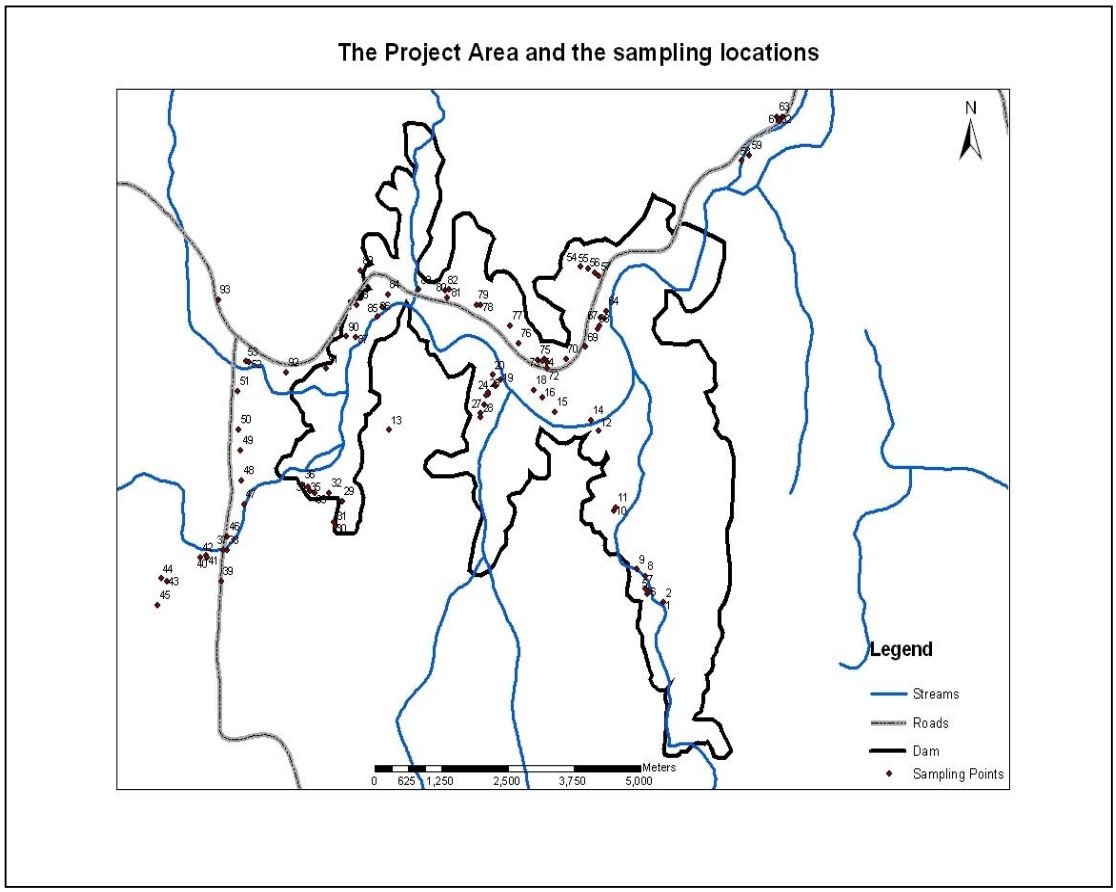


Figure 3: Sites sampled for water quality (please refer to annex 14 for geocoordinates of the sampling locations and other information)

FLORA OF MORAGAHAKANDA

The project area falls within two major bio-regions: Dry Zone bio-region [2] in the north and the Intermediate zone bio-region [3] in the south of the project area. Their key climatic and biological features include:

Dry zone bio-region [2]: Altitude 0-500 m, Annual rainfall 1250-1900 mm (mainly from October.-January) with 4-5 dry months. The dominant natural vegetation type is Dry mixed evergreen forest.

Intermediate zone bio-region [3]: Altitude 0-1000m, Annual rainfall 1900-2500 mm with less than 3 dry months. The dominant natural vegetation type is moist evergreen forest.

The habitat and vegetation types in the MADP area were identified and grouped according to MOENR (1999).

A total of 456 flowering plant species belonging to 93 plant families were recorded from the MADP area. Among them were 29 endemic and 14 nationally threatened plant species. Medicinal plant species totalled 247. See Annex I for more information on the flora.

The major floristic habitats found in the MADP area were:

- Tropical dry mixed evergreen forests
- Tropical moist evergreen forests
- Tropical thorn forests (scrublands)
- Riverine forests
- Dry patana grasslands (Savannah)
- Agricultural lands (Paddy lands, vegetable plots, Home gardens and Chena lands)

The salient features of these floral habitats are summarized below.

TROPICAL DRY MIXED EVERGREEN FORESTS

Typical dry zone climax forests are found mainly in the northern part of the project area. Basically, they have four recognizable vegetation strata: a 20-30 m high continuous tree canopy, a sub canopy up to 15 m, shrubs up to 5 m, and a layer of herbaceous plants up to 1 m. In well developed sites, the trees are densely assembled and consequently, the ground layers are comprised of a poor growth of shrubby and herbaceous forms. Plant species found in the ground layers have mesophyllous or microphyllous leaves – a typical characteristic of dry zone habitats. Exposed ground is common and forest regeneration can be observed in many places. In rocky sites, the forest structure and composition is quite different. Here, the vegetation is not dense, and shows a patchy distribution over the landscape. It is a tree dominated vegetation type with a 15-20 m high canopy, a 3-4 m shrub layer and a ground layer of herbaceous plants (0.5 m). The forest canopy is discontinuous and leaf fall is observed during the dry season (July-September). Many shrubby plants have thorny or spiny structures and are adapted to extreme dry conditions. Ground features are relatively more heterogeneous since rocky structures and bare ground exist side by side. The understory is sparse in areas with a rocky substratum. Plants are also found growing among boulders, rock crevices or on the soil. Ground water retention is very low since bedrock is often found just beneath a shallow layer of soil. Sometimes, depressions found on open rock surfaces retain rainwater and these natural mini pools contribute towards the sustenance of animal life. Whenever there are caves, they provide a safe abode to a host of wild animals to survive under harsh climatic conditions.

TROPICAL MOIST EVERGREEN FORESTS

The Tropical moist evergreen forest is a major natural vegetation type in the southern part of the project area, in the foothills of Knuckles mountain range. These forests have many large trees that shed their leaves during the long dry, windy season, from mainly July-August, e.g., *Crateava religiosa*, *Phyllanthus indica*, *Sterculia foetida*, *Bombex ceiba* and *Vitex altissima*. Hence they are some times referred to as semi-evergreen forests. Well developed forests of this type are located in and around Kambarawa. They consist of three strata: a canopy (20-25 m), a sub-canopy/shrub layer (5-10 m), and ground vegetation. Mature forests have a continuous canopy. Hence, the forest interior is dark and ground vegetation is scanty. Walking in these forests is much easier and numerous animal tracks could be found criss-crossing the ground. The vertical structure of these forests allows habitat partitioning for birds and other insects, enabling a higher animal diversity.

Giant woody lianas are also an important structural element of these forests. Thickets of lianas are found in the more disturbed sites. With the opening up of canopy, they have established themselves by clinging and raising themselves on the surrounding trees.

The forests serve as excellent catchments for Amban Ganga. Usually the stratified forests are very effective in intercepting rain, with little or no soil erosion. They also feed some perennial streams, which are very important for the sustainability of downstream ecosystems.

TROPICAL THORN FORESTS (SCRUBLANDS)

Scrublands are almost impenetrable with thick, thorny or spiny woody vegetation growing up to 4-6 m in height. Two major strata can be recognized: a shrub canopy and the herbaceous plants (< 0.5 m) beneath. Occasionally, there are scattered trees. Many plants have microphyllous leaves. Shrubs growing in exposed areas are much branched. The ground layer abounds with herbaceous life forms since it receives intense sunlight. Due to the prevailing dry climatic conditions, plants shows xerophytic adaptations e.g., thick leaves with well developed surface structures to withstand strong sunlight and minimize evaporation, seeds that remain dormant until the rainy season commences, vegetation that withstands heavy structural damage from herbivores, drought or wind, and recover in the wet season opportunistically.

RIVERINE FORESTS

The distribution of this vegetation type can be as narrow as a few meters alongside minor streams, and over 10 m wide in the flat areas on the lower reaches of rivers. Vegetation height is about 15-25 m with almost a closed canopy belt of forests. A sub-canopy (10 m) and a layer of shrubs/herbs (0.5-3 m) can also be distinguished. The general luxuriance compared to other forests makes them more akin to rain forests. Lianas are an important constituent of the forest framework. This vegetation type also has a considerably high floristic richness. Hardly any deciduous species can be found. Species such as *Terminalia arjuna*, *Madhuca longifolia* and *Diospyros malabarica* are found in abundance, especially along perennial stream banks. This evergreen character could be attributed to the unlimited availability of ground water throughout the year.

Riverine forests form the inter phase between the stream and other terrestrial habitats. It is the frontline defence against stream bank erosion due to water currents. Thick root system of trees and shrubs act as a protective cushion covering the banks. Well developed riverine forests associated with Amban Ganga and Kambarawa Oya provides convenient resting sites for birds, bats, reptiles, amphibians etc.

DRY PATANA GRASSLANDS

Dry Patana grasslands are found as small pockets in association with scrublands. According to local people, they mostly occur on lands that have been disturbed in the past. Grasslands have a simple vegetation structure - just the sea of closely grown grassy cover ranging between 0.1-1 m in height. Often, isolated and scattered trees (up to 20 m) and shrub species (up to 3 m) could be observed. Generally, the dry patana grasslands are small patches dotted on the project landscape.

Field studies on rivers, streams, reservoirs and ponds were done in relation to fauna. Belt transects for floral studies done in riverine forests encompassed these habitats also.

AGRICULTURAL LANDS

Although agricultural habitats are relatively ineffective in harbouring indigenousbiodiversity in the long run, they play a key role in sustaining the livelihoods of village communities, while absorbing the human impacts directed towards natural ecosystems.

The key agricultural habitats in the project area are:

- **Home gardens**

Home gardens are the vegetation found immediately around homesteads, and are the result of long-term manipulations. The occurrence of a tree dominated multipurpose vegetation community similar in arrangement to a natural forest is a characteristic feature of these home gardens. Well developed multi-storey home gardens can be found in the Amban Ganga valley. However, the appearance varies somewhat depending on the farming practices employed. Generally, there are several plant layers: a canopy (20 m), a sub canopy (10 m) and a shrub/herb layer (2 m). The continuous canopy allows very little light to reach the ground. Often the structure is fast changing in time and space due to weeding, pruning, fencing, digging etc. Exotic crop species are found in this habitat. The home garden is also an important faunal habitat providing animals with feeding and nesting sites. It provides people with fruits, nuts, yams, flowers, vegetables, medicines, firewood, timber etc. throughout the year. This helps to reduce the pressure on natural forests.

- **Paddy fields**

Rice being the staple food of the people, paddy cultivation is an age old practice in village communities. Rice paddy (*Oryza sativa* – Graminae) is an herbaceous plant well-adapted for marshy conditions. In almost all the villages, valley bottoms are occupied by terraced paddy lands making it a characteristic element of the village landscape.

- **Chena cultivation**

Chena cultivation (shifting cultivation) is yet another traditional agricultural system. Just before the onset of the rainy season (October) a plot of natural forest land, close to the village, is cleared by

burning and removing the shrub and herbaceous plants. In these chenas, an array of short-term crops such as Chilli, Brinjal, Cassava, Maize, Pumpkin, Cucumber, Sweet potato, Kurakkan and Mustard are grown haphazardly. The chena is an important source of cereals, vegetables and yams, which serve as both subsistence and cash crops. Once the soil fertility of the chena gets depleted in 2-3 years, the land is left fallow for 5-7 years while the farmer moves on to another forest land to start his chena anew. The plots of shrubby growth that scar the forest landscape is a result of shifting cultivation. Since chena cultivation is ecologically damaging, conservationists have endeavoured to entice villagers to engage in other forms of agriculture. Nevertheless, many chenas could be seen in and around traditional villages like Beligoda, Kambarawa, Pubbiliya, and Dammantenna. Signs of elephant presence were observed in the abandoned chena areas since they become ideal feeding habitats for elephants.

- **Vegetable plots**

Short-term vegetable crops are cultivated in small plots in almost all the settlements. Paddy lands abandoned due to a shortage of water, unproductive tea lands, open areas of homesteads and other plots of irrigable land are used to cultivate vegetables. Commonly cultivated vegetables are Capsicum, Brinjal, Cucumber, Beans, Bitter gourd, Tomato, Cassava and Okra.

MEDICINAL PLANTS IN MORAGAHAKANDA PROJECT AREA

Medicinal plants have always been a basic resource for human health. The preventive and therapeutic value of herbal remedies, their low cost and wide accessibility, and their cultural relevance is widely recognized. Interest in and demand for traditional remedies and other plant-based health products are increasing in the country, particularly in the rapidly expanding urban society and tourism industry. Increased consumption of medicinal plants, through expansion of local, regional, and global markets, has increased pressure on a resource that is largely harvested from depleted wild populations in shrinking wild habitats.

Research on the conservation and sustainable use of medicinal plants, and their habitats, has fallen far behind the demand for this important resource. Many of the species are potentially threatened by over exploitation or loss of habitat. Capacity to assess and monitor the conservation status of medicinal plants in order to manage harvesting within the limits of sustainability and to devise cost-effective alternatives for the production of medicinal plants as a resource, is extremely limited.

The current and potential value of medicinal plants in local community health, regional markets, and in global health security and trade, is widely recognized as a compelling reason to conserve diverse habitats. The wide range of habitats and taxonomic groups involved, and the variety of cultural, social, and economic conditions that affect their current use, presents substantial challenges to conservation and management efforts for these resources. Nonetheless, ground level information on medicinal plants in the Moragahakanda area will definitely be useful in meeting the challenges for medicinal plant resource management, and broadly to biodiversity resource management capability.

The present survey has shown the presence of some 213 medicinal plants in natural and semi-natural habitats of the project area, namely, Dry mixed evergreen forests, Grasslands (Savannah), Moist evergreen forests, Riverine forests and Thorn forests (scrublands). Presence of medicinal plants in all the habitat types clearly shows the significance of the Moragahakanda landscape as a natural medicinal garden. A further 34 species were recorded exclusively from agricultural lands, making a total of 247 medicinal plants in the project area. Among them, two species (*Cryptocoryne beckettii* and *Cryptocoryne walkeri*) were endemic and threatened, nine species were endemic and not-threatened,

four species (*Kalanchoe pinnata*, *Salacia oblonga*, *Salacia reticulata* and *Vanda tessellata*) were non-endemic and threatened, 232 species were non-endemic and not-threatened (see Annex II) for details). *Munronia pinnata* (Bin kohomba) is the most heavily exploited medicinal plant species in the area.

FAUNA OF MORAGAHAKANDA

VERTEBRATE FAUNA

Vertebrate fauna, from freshwater fishes to mammals, were sampled in various habitats and vegetation types in the Moragahakanda Agricultural Development Project (MADP) area. During this study, 271 vertebrate species belonging to 84 families were recorded. This amounts to 40% of the vertebrate species found in Sri Lanka. There were 47 endemic species and 42 nationally threatened species (IUCN Sri Lanka, 2000). *Puntius martenstyni* (Martenstyn's barb) and *Nannophrys marmorata* (Marbled Rock Frog), two species considered as being highly threatened with extinction (IUCN Sri Lanka, 2000), were recorded in the MADP area.

The composition of the vertebrates in MADP area, by species group, is presented in Figure 4. Birds were the dominant group accounting for 45% of the vertebrates.

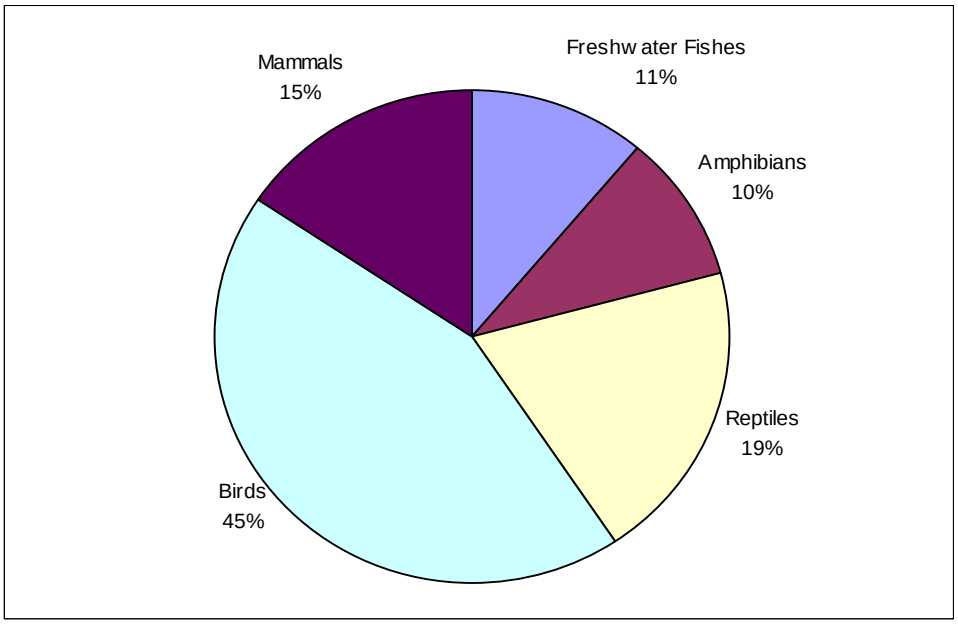


Figure 4: Species composition of Major Vertebrate Fauna of Moragahakanda area

The overall species richness of vertebrate fauna is presented in Table 3. The species richness in the MADP area is significant and could be ascribed to the habitat heterogeneity within the area. Varying climatic and geographical factors in the area have given rise to distinct habitat and vegetation types. An ecological gradient is also encountered along the Amban Ganga, from its catchment area to the down stream area i.e., from south to north of the MADP area.

Table 3: Species richness of vertebrate fauna

Group	Families	Species	Endemic	Threatened
Freshwater Fishes	10	30	9	6
Amphibians	4	27	12	7
Reptiles	13	53	15	16
Birds	36	120	9	4
Mammals	21	42	4	9
Total	**84**	**272**	**47**	**42**

Freshwater fishes

The diversity of freshwater fish fauna of the MADP area is of special interest as it falls within the Mahaweli ichthyofaunal province (Senanayake, 1980). The fish fauna in this region have not been comprehensively studied recently. Special attention was therefore paid to document the freshwater fish diversity in the area. Thirty species of freshwater fishes belonging to 10 families were recorded during the survey (annex 3). This includes 9 endemic and 6 nationally threatened species (IUCN Sri Lanka, 2000). *Labeo fisheri* (Mountain labeo), *Puntius martenstyni* (Martenstyn's barb), *Puntius srilankensis* (Blotched filamented barb), *Schistura notostigma* (Banded mountain loach) and *Belontia signata* (Combtail) were among the endemic species recorded. It is important to note that *Labeo fisheri* (Mountain labeo), *Puntius martenstyni* (Martenstyn's barb) and *Puntius srilankensis* (Blotched filamented barb) are found only in the Mahaweli river basin. Two exotic species *Oreochromis mossambicus* (Tilapia) and *Osphronemus gourami* (Giant gourami) were also recorded from the area.

Puntius srilankensis (Blotched filamented barb) was observed in the stretch from Kumaraella (where Amban Ganga and Kalu Ganga meet) to the Elahara anicut but *Puntius martenstyni* (Martenstyn's barb) was not recorded in this segment of the river. The immediate landscape on either side of the river consists of a mosaic of anthropogenic vegetation mainly comprised of paddy fields and home gardens. The absence of *Puntius martenstyni* (Martenstyn's barb) down stream of Elahara anicut is of special interest. Fast flowing, rocky riffling and clear water habitats in rivers or rivulets are the preferred habitat conditions of *Puntius martenstyni* (Martenstyn's barb). It is presumed that such habitats have been degraded or deteriorated over the years. Furthermore, these two *Puntius* species were not recorded from the river segment from Elahera anicut to Ambana Bridge in Amban Ganga. Their absence in this segment of the river could be due to the exposure and flooding of their habitats by the water discharged from the Bowatenna reservoir. Generally, at least two flooding events occur each day.

Healthy populations of these two species were recorded in Kambarawa Oya up to Puwakpitiya, during the field surveys. Their habitat conditions in this segment of the Kambarawa Oya generally include fast flowing, clear water not exceeding 1.5 m in depth. Unpublished records suggest that these species are distributed up to Illukkumbura. Riverine forests are playing a key role providing ideal conditions for many native fish, especially endemic species in the Moragahakanda area.

The considerable amount of time and effort put in to capture a specimen of *Labeo fisheri* (Mountain labeo), did not meet with success. However, the presence of this species was confirmed by interviewing local fishermen. It can therefore be concluded that this species is extremely rare in the area.

Amphibians

A total of 27 amphibian species, belonging to 4 families, were recorded in the MADP area (annex 4). This constitutes 25% of the amphibian species found in Sri Lanka and includes 12 endemic and 7 nationally threatened species (IUCN Sri Lanka, 2000). The record of *Nannophrys marmorata* (Kirtisinghe's Rock Frog) has a special significance as it is a species highly threatened with extinction (IUCN Sri Lanka, 2000). It requires specialized habitats and are found in wet, small rock crevices avoiding exposure to the elements. This unique species is restricted to the Knuckles mountain region and surrounding areas.

Two recently described species (*Philautus regius* and *Philautus popularis),* and two unidentified *Philautus* species were also recorded from the project area. According to preliminary investigations these unidentified species may be new to science. These records clearly indicate the importance of the MADP area as a habitat for unique amphibian fauna. The variety of habitats seen within the MADP area is a major contributory factor to this high diversity of amphibians. The discovery of hitherto unknown species is a distinct possibility if more surveys are carried out within the project area, especially at night.

Fejervarya limnocharis (Common paddy field frog) and *Euphlycis cyanophlictis* (Skipper frog) were the most abundant amphibian species (Table 4). These primarily aquatic species are generally regarded as common, and are distributed throughout the country. Their high population is no doubt related to the abundance of aquatic habitats in the MADP area.

Table 4: Proportional representation of Amphibian species in MADP area

Species	Proportional Representation (%)
Bufo melanostictus	0.50
Microhyla ornata	1.51
Euphlyctis cyanophlyctis	29.72
Fejervarya kirtisinghe	0.25
Fejervarya limnocharis	57.18
Hoplobatrachus crassus	1.01
Polypedates cruciger	0.50
Polypedates maculatus	0.25
Rana aurantiaca	4.28
Rana gracilis	0.76
Sphaerotheca breviceps	1.51
Philautus popularis	0.50
Philautus regius	1.76
Ichthyophis glutinosus	0.25

Reptiles

A total of 53 reptilian species (26 tetrapod and 27 serpentoid species), belonging to 9 families, were recorded in the MADP area (annex 5). Among them were 15 endemic and 16 nationally threatened species, as well as Sri Lanka's largest snake species, *Python molurus* (Python).

The tetrapod reptilians were comprised of one tortoise, two freshwater terrapins, seven agamid lizards, eight geckos, six skinks and two monitor lizards. The richness of lizard species was significant being represented by seven species of which five were endemic to Sri Lanka. *Calotes ceylonensis* is widely distributed in Sri Lanka's intermediate, dry and arid climatic zones while *Lyriocephalus scutatus* has a restricted distribution in the wet and intermediate climatic zones. And, *Otocryptis wiegmanni* is distributed in the wet zone and *Otocryptis nigristigma* in the dry zone of Sri Lanka. The occurrence of these species, which have such distinct and diverse distributional ranges, clearly highlights the importance of the MADP area in terms of biodiversity. Among the eight species of geckos recorded there were two endemic, two nationally threatened and one highly threatened species (IUCN Sri Lanka, 2000). The record of *Cnemaspis podihuna* (Dwarf day gecko), a very rare, endemic and highly threatened arboreal species, is of great significance as it has a very restricted distribution. *C. podihuna* was recorded in Sacombe Estate within the MADP area. *Nessia bipes* (Smith's snake-skink) is a very rare endemic skink species which is considered as nationally threatened (IUCN Sri Lanka, 2000).

A total of 27 snake species belonging to 6 families were documented, including five endemic and five nationally threatened species (IUCN Sri Lanka, 2000). The rare, endemic and charismatic *Trimeresurus trigonocephalus* (Green pit viper), considered a habitat specialist and found only in riparian moist habitats, was recorded from the project area. *Dendrelaphis bifrenalis* (Boulenger's bronze back) was also recorded in similar riverine habitats only. *Cylindrophis maculata* (Pipe snake) and *Typhlops sp* were the subfussorial snakes recorded from the MADP area. These snakes are extremely vulnerable in areas subject to unsustainable land use practices (logging, chena, clearance of vegetation). Furthermore there were three deadly venomous species among the snakes that were recorded from the MADP area viz., *Daboia russelii* (Russell's viper) *Bungarus caeruleus* (The common krait) and *Naja naja* (Indian cobra).

Lankascincus fallax and *Mabuya macularia* were the most abundant skink species found in the project area. These skink species are commonly found throughout the country in various habitats and vegetation types (table 5).

Table 5: Proportional representation of tetrapod reptiles

Species	Proportional Representation (%)
Melanochelys trijuga	0.45
Lissemys punctata	7.69
Calotes calotes	2.71
Calotes ceylonensis	4.07
Calotes liolepis	0.45
Calotes versicolor	8.60
Otocryptis nigristigma	9.50
Otocryptis wiegmanni	1.36
Cnemaspis tropidogaster	3.17
Hemidactylus depressus	0.90
Hemidactylus frenatus	5.88
Hemidactylus leschenaultii	2.71
Lankascincus fallax	26.24
Lygosoma punctatus	0.45
Mabuya carinata	3.62
Mabuya macularia	11.31
Sphenomorphus rufogulus	0.45

Varanus bengalensis	0.90
Varanus salvator	1.81

When considering the propotional representation of serpentod reptilians (table 6), *Ahaetulla nasuta*, *Dendrelaphis bifrenalis, Xenochrophis asperrimusa,* and *Dendrelaphis tristis* were the most abundant species. These are considered as habitat generalists and distributed throughout the country. The least abundant species of reptiles include *Trimeresurus trigonocephalus, Dendrelaphis bifrenalis, Macropisthodon plumbicolor, Calotes liolepis* and *Lygosoma punctata* These least abundant species are regarded as habitat specialists and their geographical distribution is restricted.

Table 6: Proportional representation of serrpentoid reptilia

Species	Proportional representation
Python molurus	0.45
Ahaetulla nasuta	1.81
Amphiesma stolatum	0.45
Dendrelaphis bifrenalis	0.90
Dendrelaphis tristis	0.90
Liopeltis calamaria	0.45
Macropisthodon plumbicolor	0.45
Ptyas mucosa	0.45
Xenochrophis asperrimus	0.90
Xenochrophis piscator	0.45
Trimeresurus trigonocephalus	0.45

Birds

The bird species recorded from the MADP area totalled 120 (annex 6). They belong to 36 families and include 9 endemic and 4 nationally threatened species (IUCN Sri Lanka, 2000), and 11 migrants (winter visitors). The record of *Galloperdix bicalcarata* (Sri Lanka spur fowl), an endemic, nationally threatened bird, is significant as it is primarily a rain forest species. Other charismatic endemic species include *Ocyceros gingalensis* (Sri Lanka Grey Hornbill) and *Loriculus beryllinus* (Sri Lanka hanging parrot). The composition of bird species changes from primarily forest birds in the upper catchment area of the MADP to aquatic birds in the downstream area. This is in keeping with the transition from primarily forest vegetation in the upper catchment area to the semi natural mosaic agro forest system frequented with aquatic water bodies (tanks and canals) in the downstream area.

Hirundo rustica (Barn swallow), *Pycnonotus luteolus* (White browed bulbul) and *Megalaima zeylanica* (Brown headed barbet) were the most abundant species in the project area (Annex 1). These species are habitat generalists and are distributed throughout the country in natural, semi natural and man-made habitats (Harrison & Worfolk, 1997). The abundance of *Hirundo rustica* may be due to the arrival of large numbers in the migratory season.

Mammals

A total of 42 species of mammals belonging to 21 families were recorded from the MADP area (Annex 07). Among them were 4 endemics and 9 nationally threatened species, and 4 domesticated species. The endemic species were *Paradoxurus zeylonensis* (Sri Lanka golden palm cat), *Moschiola*

meminna (Sri Lanka mouse-deer), *Trachypithecus vetulus* (Purple-faced leaf monkey) and *Macaca sinica* (Sri Lanka toque monkey). Of the endemics *Paradoxurus zeylonensis* is relatively rare. Charismatic cat species such as *Panthera pardus* (Leopard), *Prionailurus viverrinus* (Fishing cat) *Felis chaus* (Jungle cat) and *Prionailurus rubiginosus* (Rusty-spotted cat) were recorded from the project area.

Funambulus palmarum and *Elephas maximus* were the most abundant species within the project area (Table 7). *Elephas maximus,* an animal that ranges widely, was recorded throughout the project area. The endemic *Paradoxurus zeylonensis* (Sri Lanka golden palm cat) is less common in the project area.

Table 7: Proportional representation of mammals in MADP

Species	Proportional representation
Manis crassicaudata	1.34
Suncus murinus	0.27
Hipposideros galeritus	0.54
Hipposideros speoris	0.54
Cynopterus sphinx	0.80
Pteropus giganteus	0.54
Pipistrellus coromandra	0.27
Kerivoula picta	0.27
Macaca sinica	3.75
Semnopithecus priam	2.41
Trachypithecus vetulus	0.54
Loris lydekkerianus	1.07
Canis aureus	2.95
Felis chaus	0.27
Panthera pardus	0.54
Prionailurus rubiginosus	0.80
Prionailurus viverrinus	0.80
Herpestes edwardsii	2.14
Herpestes smithii	0.80
Lutra lutra	5.36
Paradoxurus hermaphoditus	2.95
Paradoxurus zeylonensis	1.88
Viverricula indica	0.80
Elephas maximus	14.75
Axis axis	1.34
Cervus unicolor	3.49
Muntiacus muntjak	2.41
Sus scrofa	8.04
Moschiola meminna	3.22
Hystrix indica	5.36
Bandicota indica	2.41

Species	Proportional representation
Mus booduga	0.54
Rattus rattus	0.80
Vandeleuria oleracea	0.27
Tatera indica	0.54
Funambulus palmarum	17.16
Ratufa macroura	4.83
Lepus nigricollis	3.22

INVERTEBRATE FAUNA

Several invertebrate fauna groups were recorded during the field survey. Quantifiable data was collected for butterflies while random observation data was recorded for the other invertebrates.

A total of 96 species of butterflies belonging to five families were recorded from the MADP area (Annex 8). This represents approximately 39 % of the butterfly fauna of Sri Lanka, and included 2 endemic and 11 nationally threatened species (IUCN Sri Lanka, 2000). The endemic species were *Troides darsius* (Ceylon Birdwing) and *Kallima philarchus* (Blue Oakleaf). The majority of the species (62.5%) were from Nymphalidae and Lycaenidae, the two families that harbour most Sri Lankan butterflies.

Euploea core (Common crow) and *Ypthima ceylonica* (White Four-ring) were the most abundant species in the MADP area (Annex II). Very rare and poorly known butterflies recorded were: *Halpe ceylonica* (Ceylon Ace), *Eurema andersoni* (One-spot Grass Yellow), *Mycalesis visala* (Tamil bush brown) and *Spindasis schistaceae* (Plumbeus Silverline). Since the project area is situated in the intermediate zone both dry zone butterfly species such as *Ixias pyrene* (Yellow Orange Tip), *Spindasis ictis* (Common Silverline), *Amblypodia anita* (Purple Leafblue) as well as wet zone species such as *Rohana parisatis* (Black Prince) are found here.

Three species of Freshwater crabs were recorded in the proposed inundation area. Two of them, *Mahata adonis* and *Oziothelphusa mineriyaensis,* were observed often in various types of wetland habitats in this area. The third, an unidentified small (~10 mm) freshwater crab species, was recorded near Elagamuwa. Preliminary investigations revealed that this species may be a new record in Sri Lanka. These 3 species were also recorded in the catchment area. In addition, another unidentified species was also recorded in the catchment area.

HABITAT-WISE DISTRIBUTION OF TERRESTRIAL FAUNA

The distribution of terrestrial fauna in the MADP area by habitat type/group clearly shows the significance of riverine forests and moist evergreen forests as refuges for local biodiversity. These two habitats, riverine forests and moist evergreen forests, jointly harbour more than half the species found in the MADP area (Table 8). The mean number of species was highest in the Moist evergreen forests (39.6, n=6), followed closely by Riverine forests (38.4, n=6).

Table 8: Species richness of terrestrial fauna associated with major habitat types

Habitat type / group	Amphibians	Reptiles	Birds	Mammals	Butterflies
Dry mixed evergreen forests	3	5	48	9	8
Savannah (Grasslands)	1	2	30	6	9
Agricultural lands	1	3	50	30	22
Riverine forests	7	17	96	35	37
Thorn forests (Scrubland)	8	10	69	27	47
Moist evergreen forest	9	23	82	28	56

The extensive moist evergreen forest patches that are distributed in the upstream of the inundation area of the Moraghakanda reservoir are extremely significant as refuges for local biodiversity. These areas are also vital as catchments for the tributaries of Amban Ganga and the reservoir, and as a buffer against siltation. Conservation actions must therefore be initiated without further delay to preserve the integrity of this particular habitat type and ensure the long-term sustainability of its biodiversity and ecological services.

Riverine habitat types along the Amban Ganga provide important biological refuge for fauna, especially downstream of the Elahera anicut. The stretch from Ambana bridge to Kumaraella along the Amban Ganga was sampled in order to document the biodiversity of the riverine habitats. The riverine habitat supported a high mean number of species (38.4, n=6) which clearly indicates its importance as refuges for local biodiversity. This is very significant especially in the downstream areas of the Elahera anicut, where the vegetation primarily is anthropogenic (paddy lands, home gardens and other agricultural lands). These riverine habitats have therefore to be conserved for the long-term sustainability of the biodiversity in the area. The current threats to the integrity of this habitat type include logging, sand mining and expansion of agricultural lands into the riverine habitats. These threats have to be minimised in order to ensure that the capacity of riverine habitats as a refuge for biodiversity is maintained continuously.

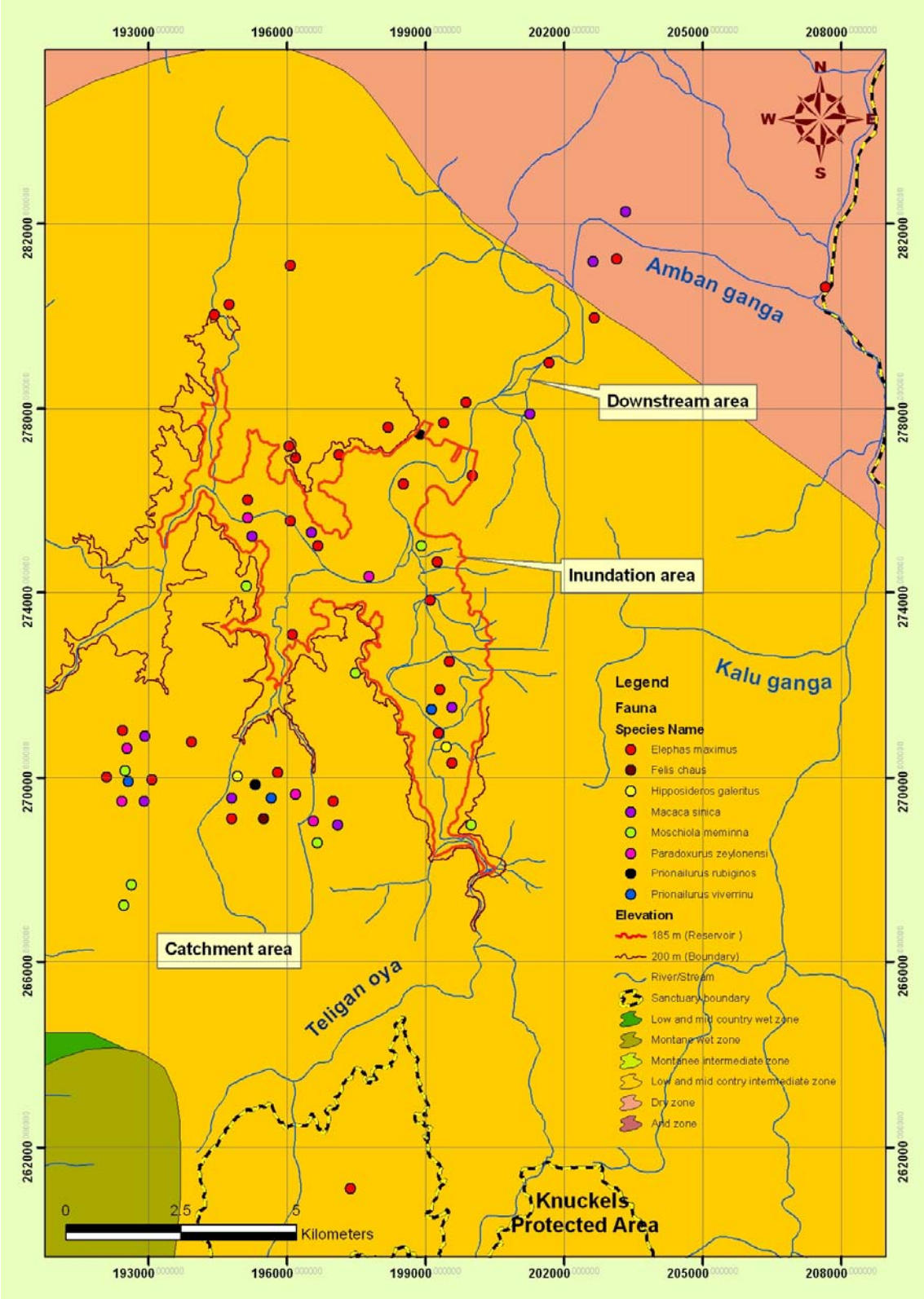


Figure 5: Distribution of endemic and threatened mammals in the MADP area (please refer to Annex 12.2 for translocation plan)

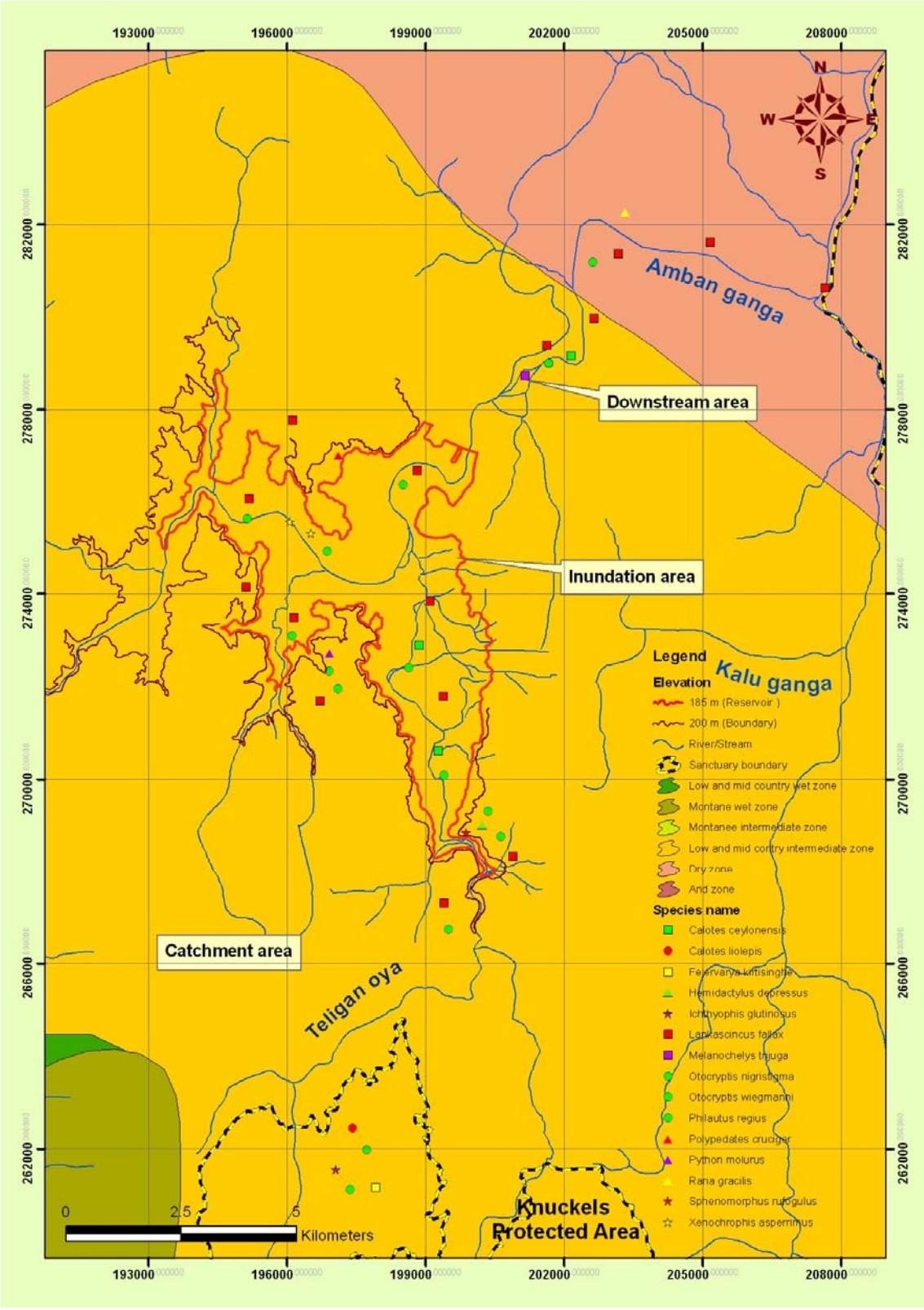


Figure 6: Distribution of endemic and threatened reptiles in the MADP area ((please refer to Annex 12.2 for translocation plan)

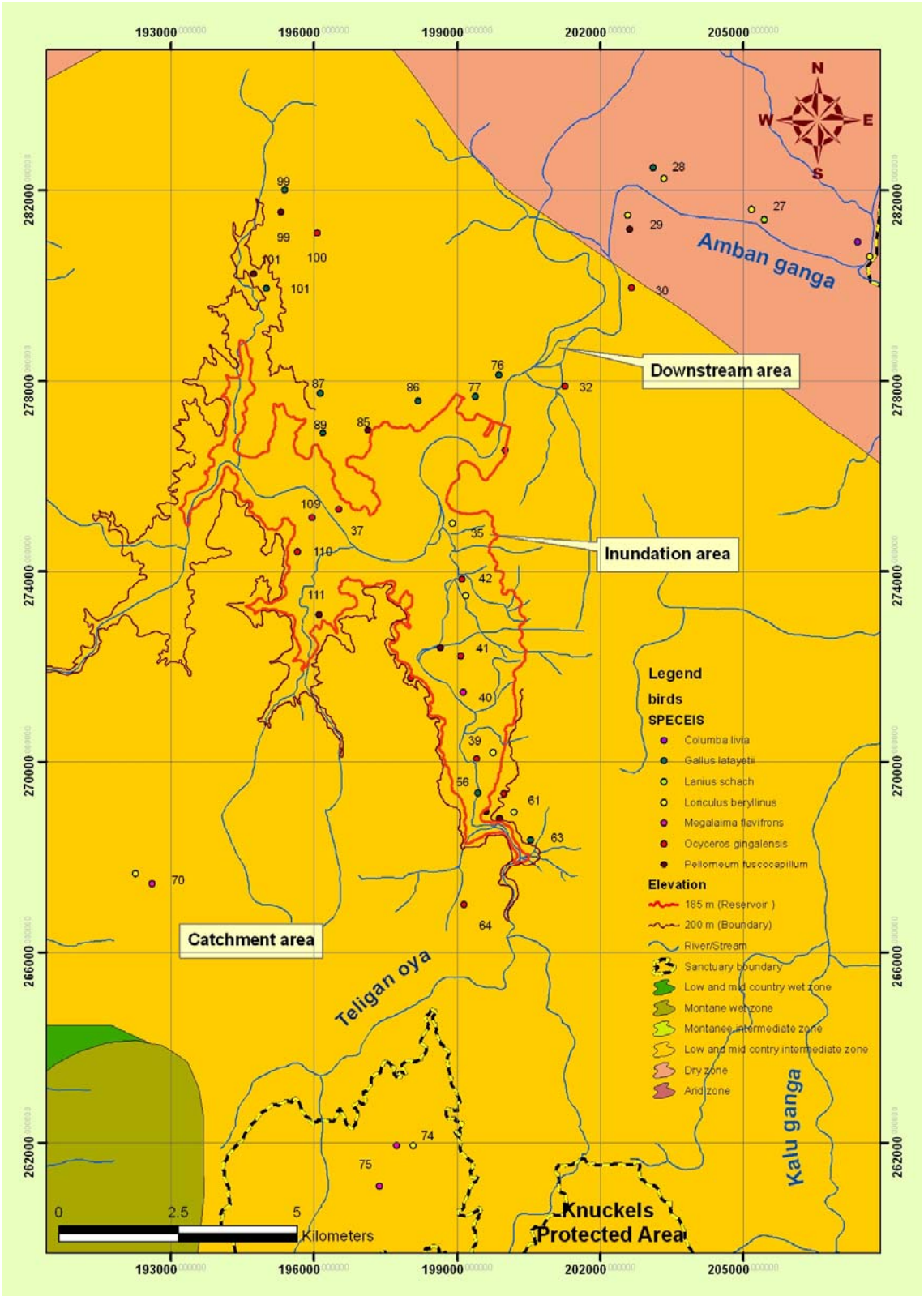


FIGURE 7: Distribution of endemic and threatened birds in the MADP area

WATER QUALITY AND WATER TABLE ANALYSIS

PHYSIOGRAPHIC AND GENERAL GEOLOGY

The relief of the project area is comparatively high and characterized by ridge and valley topography at an elevation varying between 170 m and 500 m above mean sea level. The valleys and ridges generally run in a north–south direction, parallel to the strike of the rock. The area investigated does not show any specific drainage pattern.

Geologically, the area is composed of Precambrian metamorphic rocks such as undifferentiated charnockitic gneisses, garnet biotite gneisses, and crystalline limestone. Feldspathic quartzite and quartzite bands are inter-layered with host rocks. The quartzite and crystalline limestone layers are not continuous like other rocks.

HYDROLOGY

The main surface water body of the area is Amban Ganga. Kambarawa Oya is a main branch of Amban Ganga. Surface water availability in the project area varies and is controlled by climatic conditions and the inter basin transfer of water from the Mahaweli Ganga catchment to the Nalanda and Bowatanna reservoirs. The hydrology and water chemistry of the Amban Ganga basin would also be affected.

Rainfall, run off, land use, and evapo-transpiration are the most important factors that affect the availability of surface water in the project area. The average annual rainfall is about 1900 mm received during the monsoons. About 75% of the annual rainfall is received during the Maha rains (October, November, and December), and the Yala rains (March, April, and May) contribute around 25%.

The run off is generally slow due to the vegetation cover in the hilly areas. During the rainy period, puddles of water stagnate in the depression valleys in the flat terrain. Evaporation and evapo-transpiration are considerably high in the project area.

HYDROGEOLOGY

The main water bearing formation in the project area is the crystalline bedrock and the weathered overburden. In addition, there is some water bearing alluvial deposits (sandy and gravely deposits) along the Amban Ganga. A few low yielding springs are found especially in the crystalline limestone in the project area.

The water bearing ability of hard rock depends on the presence of fractures, joints, and fissures. When fractures are concentrated in fault zones, or conjugated sets of joints meet, the permeability and water bearing properties of the bedrock can be significant. Several fracture zones/faults can be identified on the satellite imagery and air photos. Most fracture zones are oriented in a northwest-southeast direction.

The overburden consists mainly of weathered thin topsoil, residual soil, and weathered parent rock formations. Its average thickness in the project area is about 10-15 m. Weathering depends mainly on the geology, climate, and tectonic conditions. A thick overburden is expected in the areas with a crystalline limestone formation compared to the other rock types. The weathering products that are porous and permeable, as of quartzite and some Gneisses, the overburden may act as a reasonably

high yielding aquifer. In crystalline limestone formations and mica mines areas solution cavities occur, and sometimes solution cavities occur very close to the interface between rock and weathered formation. These solution cavities are at times interconnected with fractured zones. Dug wells located in such areas have a reasonably high yield. It was noted that a large amount of groundwater is pumped out in some mica mines. Some high yielding dug wells are used as agro wells.

The lower part of the overburden, especially on either side of Amban Ganga, Kambarawa Oya, and some valleys and depression areas are water bearing and act as unconfined aquifers. The dug wells receive water from the abstraction of the overburden. There are about 80 shallow dug wells located within the project area. Most of the dug wells are located in the valleys and low elevation areas and are perennial. A few dug wells are seasonal.

Drilling information available reveals that borehole yields on limestone formations are very high compared to other rock types. The average yield of wells in limestone formations is 5-10 cubic meters per hour.

Information available on the water level in tube wells is sparse. In the course of the dug well survey, the highest and lowest water levels in dug wells were also recorded. This data indicates that the average yearly fluctuation of groundwater level is approximately 3 to 6 meters. During the rainy periods, water level of most dug wells in the valleys is close to ground level, while the wells located along the fractured zones overflow.

The water level of dug wells located near the irrigation channel, fluctuates with the water level in the channel. The groundwater recharge depends mainly on the infiltration of rainwater during the Maha period. Local groundwater recharge depends on the surface water bodies of the project area.

WATER CHEMISTRY

In general, the geochemistry of the area is such that almost all the chemical parameters measured are within the WHO standards for water. As water from tube wells, dug wells and streams have been taken into consideration, it may be reasonably concluded that water in the area is free of hazardous conditions. The overall picture for cat ions is that they all show similar variation of the locations selected and analyzed. This is a positive result indicating a high level of accuracy of the water analyses.

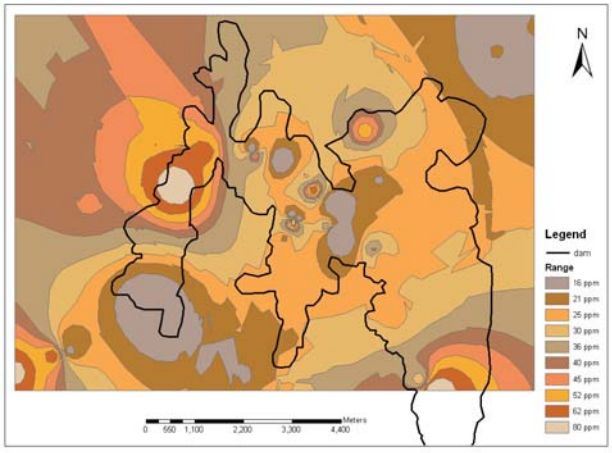


Figure 8: Geochemical map of the Calcium ion concentration of water of the area. Values ranges within 16 – 80 ppm.

The geochemical maps of Calcium (Ca) and Sodium (Na) are more or less similar, and the ions are more concentrated within the Kongahawela area. Hence, water in this area is more alkaline with the pH ranging from 7.5 to 10.8. The water was most alkaline where the maps show the highest Ca concentration. This location may contain a Calcite rock formation. A questionable aspect in the Ca map is that it shows a high Ca concentration in the Kambarawa

area although the water is of neutral pH. But as the Magnesium (Mg) concentration is high in these areas, and the governing ion here is Mg, the alkalinity (250-364 ppm) may be ascribed to Mg. A very high concentration gradient of the Mg ion is also found towards the Elahara area but here the pH and the alkalinity seem to be very low. Sulphate ions do not significantly vary within the area.

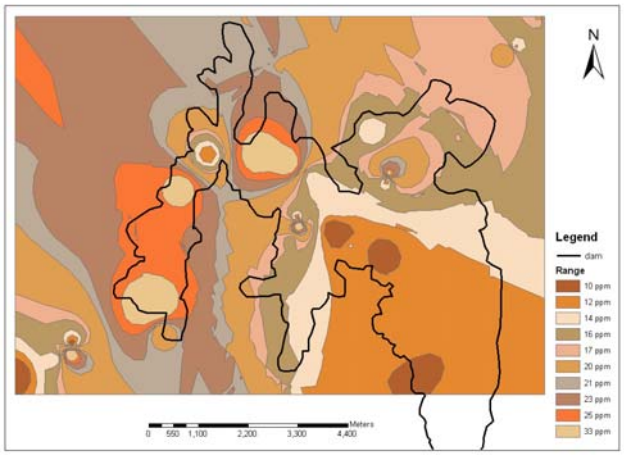


Figure 9: Geochemical map of the sodium ion concentration of water of the area. Values ranges within 10 - 33 ppm.

The Potassium (K) concentration in water is high in the Thalagoda area and that significantly affects many of the other chemical parameters, viz., electrical conductivity, total hardness and alkalinity. The total hardness ranges from 208-373 ppm and the alkalinity from 250-364 ppm. The electrical conductivity (EC) is high at 787 µS/cm, the highest value that has been recorded in the Kongahawala area.

The fluoride concentration values in the project area are scattered and falls within a narrow range 0.25-1.02 ppm, with the highest value recorded around Thalagoda area. The total iron content is slightly high in and around Thalagoda and Moragolla areas, but they are negligible considering the chemistry.

As per proposed project, the maximum water level of the reservoir area will reach up to 245 m above mean sea level. The water spread is about 30 square kilometers and the water level in the reservoir will generally fluctuate in response to the availability and usage of water. As a result, the hydrological and hydrogeological conditions of the project area will also change. The expected hydrological and hydrogeological changes are set out below.

- The groundwater level of the surrounding area will rise relative to the water level in the reservoir. The hydraulic gradient will change from place to place and will be controlled by the hydrogeological conditions of the area. Water level of the buffer zone will fluctuate according to the water level of the reservoir. A high head difference will be created at the area between upstream and down stream.

- The groundwater storage in the subsurface and overburden will be considerably increased. Higher storage is expected in the rocks that have fractured and fissured formations e.g., crystalline limestone and feldspathic quartzite formations.

- The chemical weathering within the reservoir area will increase due to the presence of water. Therefore in the long run, mica deposits will be weathered and this will produce loose formations.

- The local groundwater flow direction will change due to the reservoir in the present discharge area.

- Due to the construction, surface water could be further diluted, which would still further balance the chemistry of the area. The groundwater quality will change due to mixing with surface water.

- Changes in run off will affect the hydrology of the downstream area.
- Slope failures could be expected due to the rise in groundwater levels. Therefore, buffer width should be based on the engineering and geological conditions of the slope.

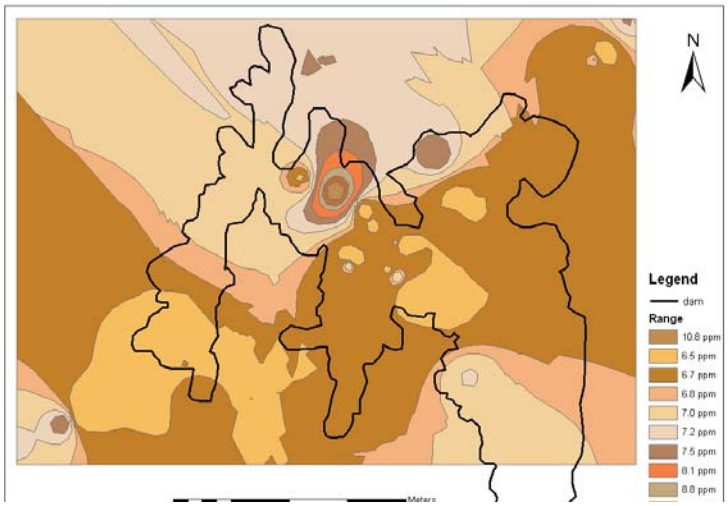


Figure 10: Geochemical map of the pH of water of the area. Values range within 6.5 -10.8.

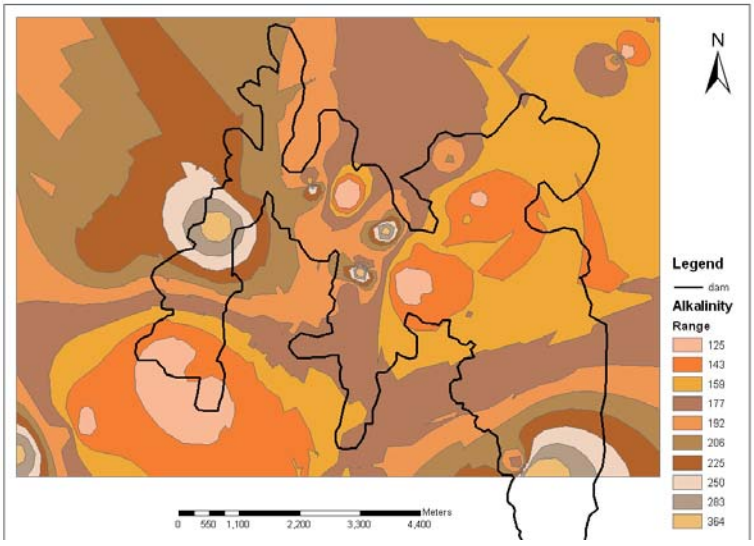


Figure 11: Geochemical map of the alkalinity of water of the area. Values ranges within 125 – 364.

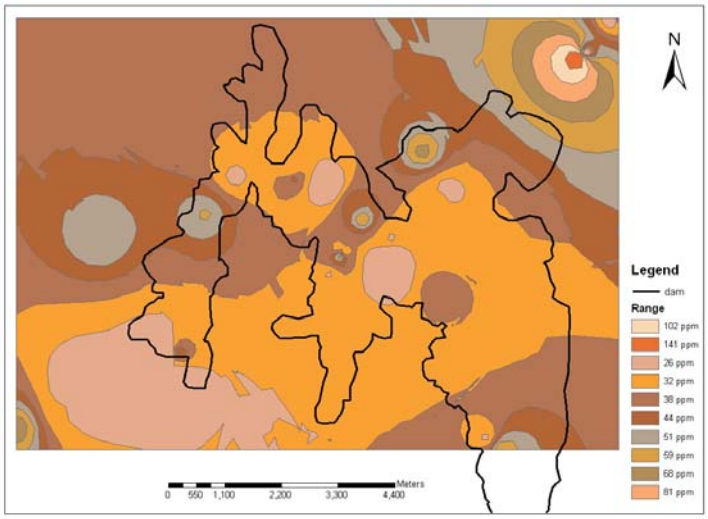


Figure 12: Geochemical map of the Magnesium ion concentration of water of the area. Values range within 26 - 142 ppm.

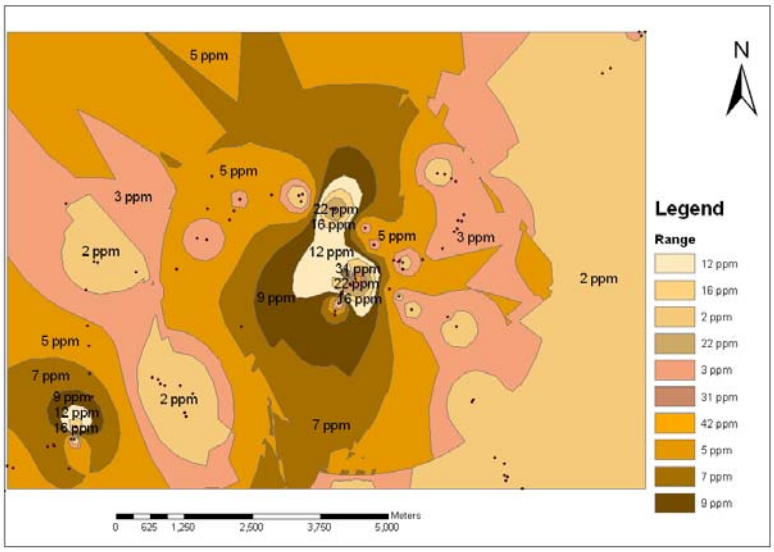


Figure 13: Geochemical map of the Potassium ion concentration of water of the area. Values ranges within 2 - 42 ppm.

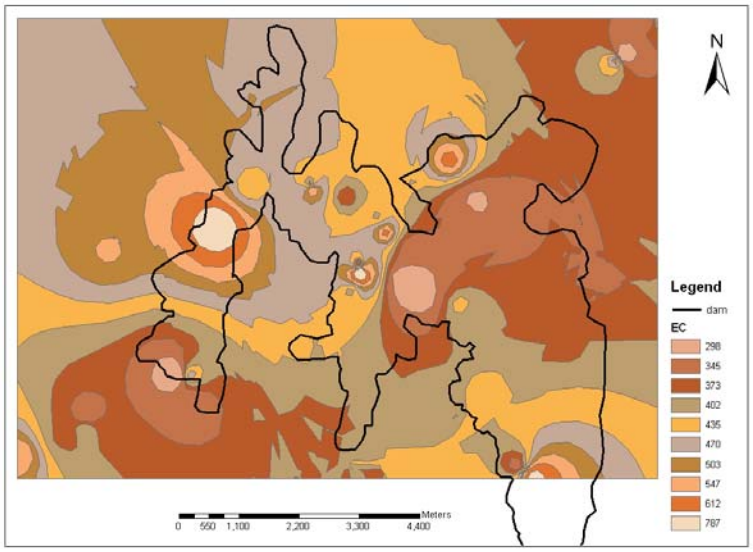


Figure 14: Geochemical map of the Electrical conductivity of water of the area. Values ranges within 298 - 787 ppm.

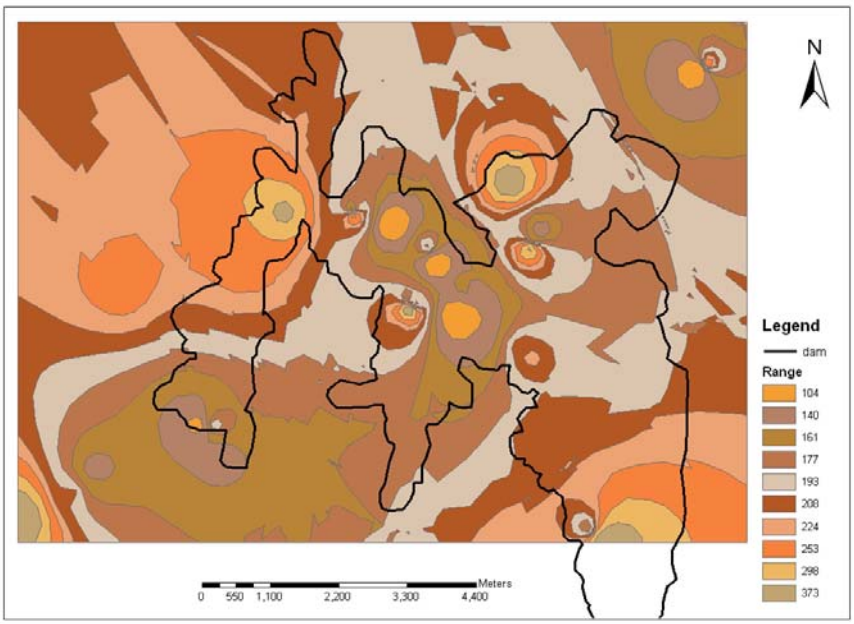


Figure 15: Geochemical map of the Total hardness of water of the area. Values ranges within 104 - 373 ppm.

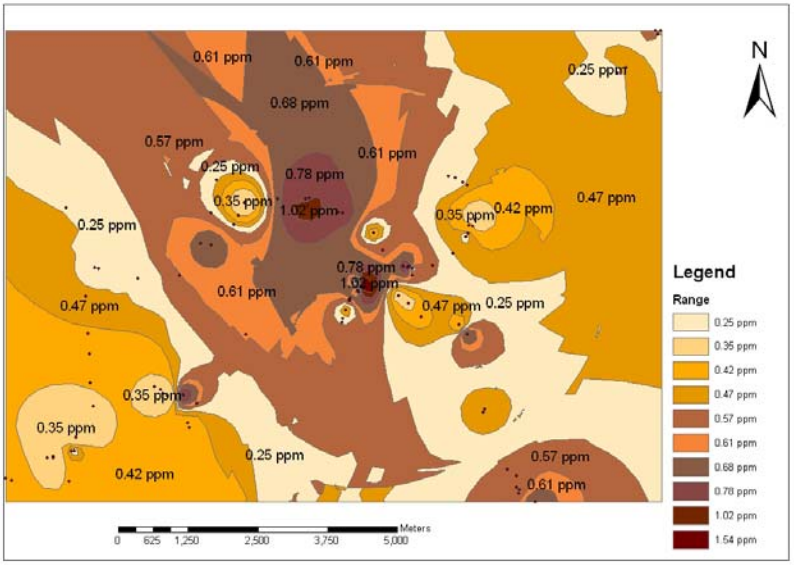


Figure 16: Geochemical map of the Fluoride concentration of water of the area. Values ranges within 0.25 – 1.54 ppm.

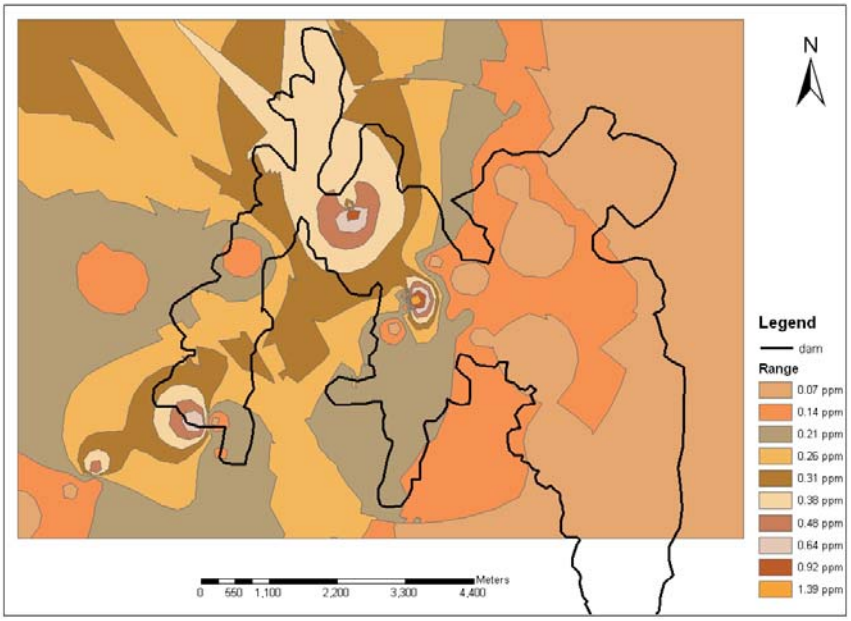


Figure 17: Geochemical map of the Iron concentration of water of the area. Values ranges within 0.07 – 1.39 ppm.

Very limited chemical water quality information is available from the inundation and downstream areas compared to the reservoir area. The water quality of three areas does not show any variations. The chemical water quality of the three areas is summarized in table 9.

Furthermore all the rw data pertaining to wqter quality is attached in Annex 14.

Table 9: Water quality of three major zones of Moragahakanda area

Parameter	SLS Standards		Water quality suitability compared to the SLS standards		
	Maximum desirable limit	Maximum permissible limit	Down stream area (%)	Reservoir area (%)	Inundated area (%)
Mg (ppm)	0.03	0.5	100	100	100
Ca (ppm)	75	200	100	100	100
F (ppm)	0.5	1.5	100	100	100
Fe (ppm)	0.3	1.0	100	100	100
pH	6.5	9.0	100	100	100
EC (µS/cm)	750	3500	100	100	100
TH (ppm)	250	600	100	100	100
Alkaliniy (ppm)	200	400	100	100	100

THREATS TO BIODIVERSITY IN MADP AREA

During the field surveys several issues were identified as threats to the sustenance of biodiversity in the MADP area. These threats can be broadly divided into three categories.

1. Habitat degradation, deterioration and modification
2. Direct exploitation of fauna and flora
3. Spread of invasive alien species

DIRECT EXPLOITATION OF FAUNA AND FLORA

Poaching

Poaching poses a severe threat to most of the large mammals that inhabit this area. Indirect evidence and other information revealed that poaching, using locally made trap guns has become a normal practice. Poaching of wild animals, making use of domestic dogs, has also been observed on several occasions. Poaching is common in the forest fringe communities. The meat is used for their consumption rather than for commercial purposes. Species that are most commonly poached are wild boar, spotted deer, hare, barking deer, and sambur.

Commercial exploitation of plants

Illegal logging and unregulated extraction of plant species has become a major issue. They are extracted for timber, firewood, medicinal and ornamental purposes. The illegal logging activities especially in the catchment areas are a concern as they lead to openings in the vegetation and subsequently to soil erosion.

Agrochemicals use

Pesticides, herbicides, and other agrochemicals are extensively used by the local farmers in paddy fields, chenas and home gardens. This can lead to various environmental problems in the area. The intensive use of agrochemicals is especially harmful to the aquatic organisms.

HABITAT DETERIORATION/DEGRADATION /MODIFICATION

Man-made fires

Farmers and local people light fires for several reasons. Farmers set fire to clear and prepare the land for chena cultivation before the rains. These fires are extremely damaging to the vegetation and destroy many habitats. Fires are also used to hunt animals. At times these fires go out of control and destroy large tracts of vegetation and endanger human habitations as well.

Habitat fragmentation

Chena cultivation and encroachment by people have fragmented lots of habitats. Tropical semi evergreen forests are heavily fragmented by chena cultivation. This situation will be aggravated with the irrigation construction activities.

Mininig

Gem mining is a major cause of water quality deterioration in the Amban Ganga and associated tributaries. Sand mining and mica mining is practiced extensively in several areas and this has lead to the clearing of vegetation and alteration of drainage patterns. Some of these abandoned mines are breeding grounds for mosquitoes and pose a health risk.

Spread of invasive alien species

The spread of invasive alien species (IAS) is a major concern for native biodiversity in the area. Plants such as *Xanthium indicum*, *Lantana camara* and *Mimosa pigra* are spreading in several areas. Furthermore proliferation of IAS with the development activities is a major concern. Therefore, necessary action has to be intiated in order to minimize such proliferation.

MITIGATION PLAN

Phase	Location	Impact	Mitigation Measure	Mitigation Plan	MITIGATION COST (RS)
Construction Phase	**Upstream**	Total disappearance of some habitats and species including valuable wild relatives of agro-biodiversity (impounding area)	Relocate species at risk (Please refer to Annex 12.1 & 12.2 This includes translocation plan, guidelines, Technical Working Group)	Please refer to Annex 12	**10,00,000.00**
			Collection of voucher specimens of flora & fauna in the inundation area	National herbarium National museum Time frame 2008-2010	**500,000.00**
			Declaration of the catchment, and the wider landscape linking Knuckles and Minneriya-Giritale Nature Reserve as a National Park.	Initiate dialogue with DWC & FD together with IUCN to discuss the plans to declare the Moragahakanda area as a protected area. DWC will follow the protected area declaration procedure. Time frame 2008-2010	**DWC, FD & MASL TO COST**
		Increased human-elephant conflict	Erecting electric fence on the perimeter of Western and Eastern boundary of the proposed park	DWC, MASL & other stakeholders together with IUCN to establish electric fence	**500,000.00 PER KM**
		Loss of traditional knowledge	Facilitate, preserve, use and actively maintain the ethno biological knowledge in the lost	Provide necessary resources to academic institutions to document the traditional knowledge by using	**1,500,000.00**

			areas through documentation.	print and audio-visual media. Time frame 2008-2009	
		Destructive land use practices outside the proposed protected area	Law enforcement, public awareness, and restoration of degraded habitats	Who: DWC,FD, Police, IUCN & MASL How: Effective law enforcement & Community outreach When: Indefinitely	**500,000.00 PER YEAR**
		Disappearance of native fish species	Prohibit introduction of competitive exotic fish species (*Labeo rohu* etc.) into the reservoir	Who: DWC, MASL & Fisheries ministry How: Continuous monitoring to prevent exotic fish introduction When: Indefinitely	**100,000.00 PER YEAR**
		Habitat destruction and deterioration and disturbance to wildlife due to construction activities (quarrying, dumping, jungle clearing, camp sites, temporary road network, transmission lines)	Strictly adhere to environmental guidelines pertaining to construction activities Awareness of relevant stakeholders Employ dedicated staff for project related environmental matters	Who: MASL How: Awareness, compliance to the CEA conditions. When: Throughout the project Who: DWC, FD, CEA &IUCN How: Awareness campaign at regular intervals for the relevant stakeholders When: Throughout the project Who: MASL How: Appoint environmental officers to monitor the environmental activities	**1,000,000.00 PER YEAR**
		Proliferation of IAS & suppression of native biodiversity	Ensure that IAS do not proliferate in the project area	Please refer to the Annex 11	**200,000 PER YEAR**
	Downstream	Deterioration of habitat quality of the downstream riverine habitat and species	Maintain a minimum flow and recreate annual flooding events by releasing water from the reservoir	Who: MASL How: Release the minimum water flow When: Every year during the rainy season	**MASL TO COST**

		Movement of fish to spawning areas affected	Install a fish ladder in the reservoir and the Elehera anicut	Please refer to Annex 13	**MASL TO COST**
Operational period					
	Upstream	Upstream land based human activities such as land clearing, agriculture, industries, expansion of settlements and soil waste will have devastating impacts on species and habitats	Introduce biodiversity friendly livelihood strategies including ecoagriculture, ecotourism Incorporate biodiversity concerns into human settlement policies Introduce appropriate local area development policies for likely industries to minimize impact on biodiversity.	Who: MASL, Agriculture Dept., DWC & Tourist board How: Training programs and pilot projects When: Throughtout the project life & after	**2,000,000.00 PER YEAR**
	Downstream	Degradation & deterioration of down stream riverine habitats	Maintain sustainable e-flow & recreate annual flash flood event to maintain the riverine habitats & floodplains	Who: MASL How: Release the minimum water flow When: Every year during the rainy season	**MASL TO COST**
		Unregulated sudden opening of sluice gates of reservoirs affecting downstream wildlife and communities	Regulate the release of water	Who: MASL How: Gradual release of flow rate When: Daily	**MASL TO COST**

MONITORING PLAN

Mitigation measure	Monitoring Parameter	Frequency	Duration	Responsibiity	Cost/Funding Source
Relocate species at risk (Please refer to Annexes 12.1 and 12.2. This includes translocation plan, guidelines, Technical Working Group)	Percentage of relocated species population survive	Quarterly Biannual (Wet and Dry)	First year Project life	DWC, FD and PGRC with technical support from Department of National Botanical Gardens and IUCN	1,000,000.00 MASL
Collection of specimens of the flora & fauna	Number of specimens have been deposited in the National herbarium & the National museum	Once	First year (wet & dry seasons)	DWC/National Herbarium/ National Museum/ Universities with the technical support of IUCN	1,000,000.00
Declaration of the catchment, and the wider landscape linking Knuckles and Minneriya-	Gazetted Notification of the protected area surrounding Moragahakanda area	Once	First year	DWC, MASL with the technical assistance of IUCN	2,000,000.00 (DWC & MASL to estimate additional costs such as relocation costs)

Giritale Nature Reserve as a National Park.					
Erecting electric fence on the perimeter of Western and Eastern boundary of the proposed park	The number of human elephant conflicts	Quarterly	Project life	DWC/MASL/Universities	500,000.00 per year
Facilitate, preserve, use and actively maintain the ethno biological knowledge in the lost areas through documentation.	Report and audio visual information on ethno botanical information	Once	First Year	National Museum, Universities and MASL	100,000.00
Establishment of fish ladder at Elehera anicut and proposed dam	Number of Fish species and individuals moving through the passage	Once a year during rainy season	After the completion of the fish ladder	MASL/ IUCN	MASL to cost and integrate into construction cost of the dam
Law enforcement, public awareness, and restoration of degraded habitats	Number of hectares converted into sustainable land use practices increased	Quarterly	Five years	MASL/FD/Irrigation/IUCN	1,000,000.00 per year
Prohibit introduction of competitive exotic fish species (*Labeo rohu* etc.) into the	Fish survey to monitor presence of exotic fish species	Bi annually	Five years	MASL/ Fisheries Dept/ IUCN	200,000.00

reservoir					
Strictly adhere to environmental guidelines pertaining to construction activities	No. of incidents of violating guidelines reduced	Bi Annual Annual	First year and project life	MASL	MASL to cost
Awareness of relevant stakeholders	Number of awareness workshops held	Full time	Project life	MASL, IUCN	
Employ dedicated staff for project related environmental matters	Competent staff are hired	Full time	Project life	MASL	
Ensure that IAS do not proliferate in the project area	Abundance of IAS low compared to baseline level	Quarterly	Project life	MASL	100,000.00 per year
Upstream land based human activities such as land clearing, agriculture, industries, expansion of settlements and soil waste will have devastating impacts on species	Introduce biodiversity friendly livelihood strategies including ecoagriculture, ecotourism Incorporate biodiversity concerns into human settlement policies	An area ecotourism plan & ecoagricultural plans are available and implemented The zonal development plan available and implemented	Project Life Project Life Project Life	MASL /Provincial council / Local authorities / Dept. of Agriculture/ IUCN	500,000.00 per year

and habitats	Introduce appropriate local area development policies for likely industries to minimize impact on biodiversity.				
Maintain sustainable flow rate to recreate annual flash flood event to maintain the riverine habitats & floodplains	Maintain a minimum rainy season spillage from Elehara anicut at an average of 18.86 mcm per month from November to March every year.	Annually	Project life	MASL/ IUCN	MASL to cost
Regulate the release of water	Incidence of mortalities related to the sudden water release reduced over time	Annually	Project life	MASL	MASL to cost

RATIONALE FOR ESTABLISHING A PROTECTED AREA FOR TROPICAL MOIST EVERGREEN FORESTS SURROUNDING THE MORAGAHAKANDA RESERVOIR.

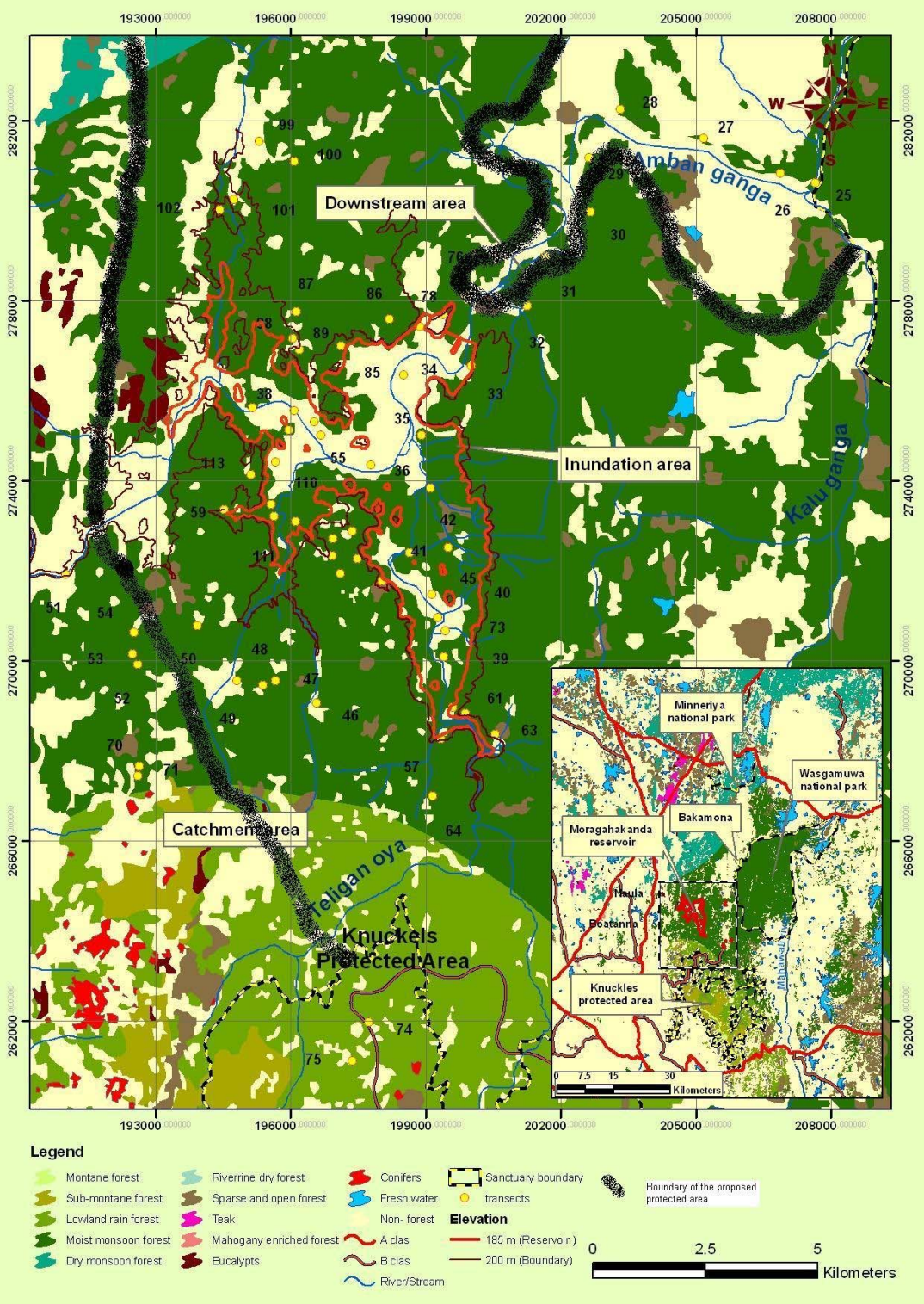


Figure 18: Map of project area highlighting the perceived boundary of the inclusion zone for establishing a protected area

INTRODUCTION TO TROPICAL MOIST EVERGREEN FORESTS

Presently our knowledge on the conservation of Tropical moist evergreen forests (TMEF) is fragmentary. Meanwhile, the forest ecosystems are being disrupted and depleted more rapidly than most other biomes. TMEF are poorly understood, scientifically. The great majority of the myriad species that inhabit them have yet to be documented beyond a preliminary account of their location, morphology, and a few other rudimentary details. As for their ecological role and functions, preliminary investigations of their basic physiobiotic relationships, community dynamics and energy flows have hardly started (Mayers. N, 1981).

The tropical moist forests, synonymous with TMEF, as defined by Mayers (1980) are evergreen or partly evergreen forests, in areas receiving not less than 100 mm of precipitation in any month, for two out of three years, with a mean annual temperature of 24 ^{0}C and essentially frost-free: in these forests some trees may be deciduous: the forests usually occur at altitudes below 1300 m, (though often in Amazonia up to 1800 m and generally in Southeast Asia up to only 750 m): and in a mature example of these forests there are several more or less distinctive strata.

The tropical moist forests are restricted mainly to the equatorial climate zone extending from about 10^{o} N to 10^{o} S with more found in the southern hemisphere than in the northern hemisphere (Richard 1952). These forests are among the most ecologically complex and diverse of ecosystems. Despite the fact that they represent a biological treasure house, beyond compare, the forests are disappearing fast mainly due to agricultural activities, logging, human settlements, fire etc. (Mayer 1981).

The climate range of the tropical moist biome covers 16 million km^{2}, but presently the forest covers only about 9-11 million km^{2} (Mayer, 1980), and its destruction continues at an increased rate, estimated at about 110,000 km^{2} / year or 20 ha / min by Sommer (1976), and about 56,000 km^{2}/year or 11 ha/min between 1975 and 2000 as estimated by Lanley and Clements (1979).

Approximately 40% of the lands that can support tropical closed forest are devoid of them now, primarily because of human action. By the late 1970's, 7.6 million ha was permanently cleared and converted into the shifting cultivation cycle. If the present rate of destruction (76,000 km^{2} / year) continues, all the remaining tropical moist forests will be cleared or seriously damaged by the year 2135 (Wilson 1988)

At present only 4%, 2% and 6% of the forests are protected in Africa, Latin America and Asia respectively (Brown 1985). Ecological and biogeographical theory suggests that 10-20% of the biome needs to be protected to ensure the survival of a majority of the species and a representative sample of ecosystems. Therefore, extreme reduction in size and fragmentation of rain forests will lead to extinction of more and more species in the near future. Among the rapidly disappearing plant species, there maybe many of potential value for timber, chemicals, medicine, and agriculture etc., whose worth has not been adequately explored. Destruction of species-rich rain forests, which have been the reservoirs of diverse genes, may affect the course of plant evolution in the world, as a whole, by closing many avenues of evolutionary development (Richards 1952). As elsewhere in the tropics, in Sri Lanka too, TMEF destruction is continuing at a rapid rate.

Rationale I: Meeting the goals of state policy – *Mahinda Chinthanaya*

Environmental conservation through a network of protected areas has been identified as one of the major state policies on conservation. Integration of environmental concerns in development activities is playing a key role in mitigating adverse impacts on the environment. Identification and declaration of a protected area around the proposed Moragahakanda Agriculture Development Project provides an excellent opportunity to support the state policy on environmental conservation, expressed in the *Mahinda Chinthanaya.* Reduction of poverty related environmental degradation through the enhancement of rural economics has been identified as a key national policy on environment. Declaration of a protected area in the proposed Moragahakanda reservoir scheme will help to achieve the national policy to increase the number of protected areas as stated in the *Mahinda Chinthanaya: Vision for New Sri Lanka* document. The macro environs of the MADP, with pristine forest habitats in the upper catchment area and the adjacent Minneriya-Giritale sanctuary provides a great prospect and a clear justification for such action. Physically linking Knuckles forest with Wasgomuwa and Giritale will help to reduce forest fragmentation, which has become the greatest threat for species survival in Sri Lanka. Connectivity provided by such a continuum will enable free movement for many species including large mammals such as elephants. Declaration of a protected area will not only provide a safe haven for many species, but also ensure the long term sustainability of the MADP by mitigating many environmental problems.

Rationale II: A forest refuge and live gene bank for sensititive species: endemic, threatened, medicinal plants and other socio-economically useful species

The current survey has shown that these forests are a gene bank for some 456 species of flowering plants which, include 29 endemic and 14 threatened species, and 261 medicinal plant species. The establishment of a protected area will ensure in-situ conservation of those 261 medicinal plants for posterity, and convert the forest to a 'tropical medicinal garden'. Moreover, Ekanayake and Ratnayake (1994) have reported the occurrence of 103 wild trees with known uses, in similar forests in the nearby Knuckles. The major utility categories of these trees were: 60.1 % timber trees, 49.5 % medicinal trees, 74.7 % fuel wood trees, 22.3 % fodder trees and 18.4 % food trees.

The forests are also known to harbour a number of wild relatives of crop plants, for example*, Carissa spinarum, Dioscorea tomentosa, Dioscorea trimenii, Eugenia bracteata, Jasminum angustifolium, Mangifera zeylanica, Phoenix pusilla, Piper sylvestr, Syzygium cumini and Ziziphus oenoplia.*

It is important to conserve the entire spectrum of genetic diversity of such species and populations in an environment that provides the most suitable functional space. Hence, these natural forests can be used to conserve useful gene pools of species, populations, landscapes and ecosystems, in their natural form, as an insurance against future problems.

Protection of these forests will also ensure that a key resource base for indigenous knowledge, including the ethnobiological heritage, is preserved by minimizing the impacts from the reservoir development activities. However, this is an extremely sensitive issue in view of the disappearance of several ancient settlements in the course of implementing the project.

Rationale III: Moragahakanda forest landscape as a wildlife corridor

The present survey revealed that these forests are home to 10% of Sri Lanka's flora (flowering plants). This is a very significant amount in relation to the land area. These species cannot be conserved in isolation; they need to be allowed to interact with plants and animals by networking surrounding areas. Establishment of a wildlife corridor will benefit both fauna and flora for their long term survival.

A wildlife corridor is a strip of wildlife habitat (of native vegetation) which, joins two or more larger, similar wildlife habitats. Corridors are critical for the maintenance of ecological processes including the movement of animals and the continuation of viable populations. The provision of landscape connections or corridors between larger areas of habitat, enable migration, colonization and interbreeding of plants and animals. Corridors can consist of a sequence of stepping stones across the landscape (discontinuous areas of habitat such as wetlands and roadside vegetation), continuous linear strips of vegetation and habitat (such as riparian strips, ridge lines etc.), or they maybe parts of a larger habitat area selected for its known or likely importance to local fauna. As a general rule the wider the corridor the better. it is for both fauna and flora. Wider corridors provide for greater diversity, less impact from adjoining land uses and associated edge effects (e.g.weeds, predators etc.) and provide habitat in their own right.

Benefits of corridors are many. Habitat loss and fragmentation are the two main contributors to the continuing decline in biodiversity across the landscape. When native vegetation is cleared, fragmented patches or islands are created. These patches may get increasingly cut-off from other areas of habitat and result in many plant and animal species becoming isolated, especially when land between the patches is permanently altered for human activities. As these vegetation patches are reduced in size and become increasingly isolated, the viability of ecosystems and individual populations of species within them is severely affected. This ultimately leads to a break down in ecological processes such as species migration, dispersal, recycling of nutrients, pollination of plants and other natural functions required for ecosystem health. The likely result is severe biodiversity decline and local extinction of sensitive species. Corridors play an extremely important role in the maintenance of biodiversity, but they can only partly compensate for the overall habitat loss brought about by the fragmentation of the natural landscape. Therefore, it is important that vegetation remnants and vegetated corridors are maintained and enhanced as a network across all lands.

Rationale IV: Mitigation of the human-elephant conflict and sustenance of a healthy population of elephants

The proposed Moragahakanda reservoir may interrupt the existing elephant migration route from the Elahera-Giritale sanctuary to Pitawala patana area in the Knuckles forest. Migratory corridors to maintain their migratory patterns are extremely important to the survival of elephant populations in the Moragahakanda area. Corridors boost the free dispersal and movements of individuals between habitats. Free movement of elephants not only enlarge their effective population size but also increases their genetic diversity, which will help to decrease the probability of extinction.

Elephants are believed to possess a 'Genetic Memory', which is inherited and passed on from generation to generation. The migratory route is an item of information, believed to be transferred genetically. Elephants are known to migrate along the same route, year after year. Generally, elephants are capable of charting new routes where human interference is minimal. However, the increase of human activities due to the Moragahakanda project, and submergence of the existing elephant corridor may create some tension between humans and elephants. The present migratory route crosses the Amban Ganga near the proposed dam site. The local elephant population would need to find an alternative migratory route several kilometers upstream or downstream from the present route. In avoiding the reservoir, if they migrate through adjacent villages it will increase the human-elephant conflict. Elahera, Ambana and surrounding areas will be adversely affected if there is an increase of elephant activities. On the other hand, the reservoir could attract elephant populations living nearby as its environs will be an ideal habitat for elephants in the receding zone of the reservoir will provide great feeding habitats with readily available water in the reservoir. Providing free movement between Minneriya-Giritale sanctuary and the Knuckles range by creating a protected area will help to reduce the human-elephant conflict in the adjacent villages. Establishment of the protected area should be supported with an extensive scientific study to understand the local elephant population and their movements.

Rationale V: Hydrocatchment values of Moragahakanda reservoir

The hills surrounding the Moragahakanda reservoir cause moisture-laden air to rise, cool and release the moisture as rain. Thus the rainfall is much higher in the mountains than in the flatter areas around Moragahakanda. A certain amount of the precipitation runs off immediately into the rivers, but much will be 'captured' by the dense forest vegetation, percolate through the soil and reach the water table. The water table contains the groundwater, which is confined within porous aquifers, and which emerges from the ground at springs to form minor streams. These groundwater fed springs enable minor streams to keep running even when dry weather prevails. The level of dissolved material in these streams is generally very low because they flow through the natural forest landscape. Opening up of these forests will reduce stream flows, silt up the reservoirs, and pollute the water.

The forest has to be viewed as a source of pure water, an abundant resource which could allow the expansion of downstrem development.

Rationale VI: Dwindling forest cover of TMEF of Sri Lanka

The structure, floristic composition and complexity of the forests in the different climatic zones are quite distinct. Only 23.88% of the country's land area is under natural forests, and TMEF accounts for a mere 3.69% (MENR, 1999). This fact alone justifies the urgent requirement for a conservation programme to save this endangered forest formation, at least as a representative ecological sample.

These figures indicate quite clearly the critical situation with regard to the TMEF in Sri Lanka. Considering the role played by these forests in catchments and watersheds, gene pool conservation, soil conservation, and more importantly as home for many faunal species, their extent is alarmingly low.

The forest cover in the intermediate zone of Sri Lanka was 320,830 acres in 1961 (Canada-Ceylon Project 1961), 315,789 acres in 1966 (FAO report) and only 300,000 acres in 1972 (SLAAS). Therefore, over the 10-year period (1961- 1972) the extent under forests in the intermediate zone diminished by 20,830 acres (Cramer L.H.1979).

Presently there are no primary forests, of any significant size, in the northern intermediate lowlands. What remains are only a few scattered patches of degraded forests enriched by line-planted exotics such as Mahogany. Four such forests, designated as National Man and Biosphere Reserves (NMBR) (Gunatilake IAUN & CVS 1990), are:

Protected area	Category	Extent(ha)
Badagamuwa	NMBR	20
Doluwakanda	NMBR	401
Kankaniyamulla	NMBR(Forest reserve)	161
Sundarapola	NMBR	10

Forests of the eastern intermediate lowlands have also almost completely disappeared, primarily due to agricultural development in the region. Protected areas in this region (Gunatilake, IAUN & CVS 1990) are:

Protected area	Category	Extent (ha)
Daragoda	NMBR	404
Thangamalai	Wildlife Sanctuary	132
Uda-walawe	National park	30,821

Some of the other noteworthy TMEF patches are Bibile forest, Mahiyangana forest, Moneragala forest, Randenigala wildlife sanctuary, northern foothill forests of the Knuckles range and Ritigala forest. In fact, the Ritigala forest patch is outside the intermediate zone of Sri Lanka, but the TMEF was found as a synusiae. Synusiae is a group of plants of similar life-form, filling the same niche and playing a similar role, in the community of which it forms a part –(Richard .P.W. 1957). Such forest patches could be found in the dry zone as isolated pockets.

According to de Rosairo (1958), the TMEF of the climax type found in the Knuckles region are confined to a distinctive climatic zone (brought out in Thornthwaites (1948) classification as homeclime ArB4'a'). The area is relatively small amounting to about 4,500 acres (1,822 ha) which, though a north-eastern monsoonal type, generally has a higher average rainfall of over 1900 mm and experiences only partial drought. Since this wetter facies of the TMEF is exclusively found in the foothills north of Knuckles, extending upto the sourroundings of Moragakanda development area, it deserves a special place to be included in a protected area management plan. The forest makes a bridge between sub montane evergreen forests of the Knuckles and drier facies of TMEF in Wasgomuwa and Randenigala. This will facilitate the free movement of wild animals between those two conservation areas through different habitats. The same phenomenon is true for plants. Therefore, the protection of the wetter facies of TMEF is important in order to maintain a broader genetic make up of wild animals and plants, which is necessary for the stability and perpetuation of the community. Furthermore, these forests play a big role as catchments and watersheds and effectively control erosion and sedimentation and sustain down stream investments. Once the forest is disturbed by chena cultivation, fire or logging it tends to end up as less productive savannah or degraded grassland. Such open canopy woodlands can be found extensively in Badulla, Ella, Gal Oya, Moneragala etc.

BIOLOGICAL UNIQUENESS OF TMEF IDENTIFIED IN PAST STUDIES.

TMEF forms a belt between evergreen rain forests and deciduous rain forests of the tropics (Whitmore.T.C. 1984). The transition from typical rain forest to seasonal (deciduous) forest is a gradual one (Walter 1971). Therefore, this forest is a transitional or ecotonal type of forest. The transition is determined more by the length of the dry season than by the rainfall per se (Walter 1971). It occurs in places where there is a regular annual period of water stress, extending over at least a few weeks. The moisture stress could be due to particular soil conditions and / or the rainfall regime. A mosaic of tree formations may occur at their boundaries. Clearly, it would not be possible to make a precise delimitation of the extent of this formation using only climatic data (Whitmore 1984).

These forests are intermediate in structure and with a physiognomy between the tropical wet evergreen and the dry evergreen forests (Kolemeyer 1957). The vegetation shows a corresponding series of gradation as the dry season becomes more pronounced and protracted (Cain S.A. & Castro G.M.de O. 1959).

TMEF is closed high rain forest in which the biggest trees sometimes attain a large size. It includes both evergreen and deciduous trees in the top canopy, in an intimate mixture but with a definite tendency to gregarious occurrence. Deciduous trees may comprise upto one-third of the tall trees, though not all are necessarily leafless at the same time. The lower stratum is composed largely of evergreen species whose average leaf size is smaller than in the evergreen rain forest. The deciduous habit is somewhat facultative, for it is more complete and of longer duration in drier years. The stature tends to be slightly less than evergreen rain forest, the maximum height being 20-25 m (Cain S. A. & Castro G.M.de O. 1959, Whitmore T.C. 1984). Butresses are found to be frequent and occur in both evergreen and deciduous species. Bark tends to be thicker, and rougher and cauliflory and ramiflory rarer. Big woody climbers are found to be abundant. Bamboos are present; ephyphytes are occasional to frequent and include many ferns and orchids. Leaf emergence in trees usually occurs one month before the beginning of the monsoon rains and is triggered off by the increasing temperature. This shows that the soil still contains sufficient water at the end of the dry period to allow the emergence of new foliage (Walter 1971, Whitmore 1984).

The annual rainfall in these forest areas is usually over 1500 mm. Because of the dry season, TMEF and its secondary forest derivatives are more easily destroyed by fire than evergreen rain forest, and therefore this formation is more easily replaced by open grassland (Whitmore 1984).

TMEF has been described by many authors based on various climatic, edaphic and biotic parameters, and it has the following synonyms in global scientific literature.

- Champion (1938) - Tropical semi-evergreen forest
- Burrt Davy (1938) - Evergreen seasonal forest
- Beard (1944) - Semi-evergreen seasonal forest (monsoon)
- Webb (1959) - Mesophyll vine forest
- Baur (1968) - Evergreen seasonal rain forest
- Paijman (1975) - Small crowned lowland hill forest (in part); dry evergreen forest
- Paijman (1976) - As part of the forest of mountain foothills below 1000 m

Similarly, in the Sri Lankan context this forest type has been described using different terminology:

- Chapman (1947) - Moist tropical semi-evergreen forest
- de Rosairo (1950) - Intermediate wet evergreen forest ecotone
- Holmes (1956) - Wet tropical evergreen forest
- Koelmyer (1957) - Tropical wet semi-evergreen forest
- Holmes (1958) - Tropical dry evergreen forest (moist facies)
- Andrews (1961) - Tropical lowland semi-evergreen forest
- Gaussen et al (1964) - *Filicium-Euphoria-Artocarpus-Myristica* series
- Perera (1975) - Tropical lowland rain forest
- Greller & Balasubramaniam (1980) - Artocarpus-Pometia-Filicium zone

Holmes (1956) has described this formation on a climatological basis correlating Thornthwait's and Swain's systems of climatic divisions. The author has identified it as moist facies of the tropical dry evergreen forest corresponding to the climes BA'r and 2.9(b) of Thornthwait's (1931) Swain's (1943) climatic divisions respectively. This type is found in isolated localities where climatic conditions are intermediate, between the major `wet' and `dry' zones, but on the whole approximates more closely to the latter. The emergent layer of the forest is higher than the typical dry zone forest and denser. There are few very widely scattered emergent dominants with occasionally, e.g. *Alstonia scholaris*, *Trewia nudiflora* and *Canerium zeylanicum*. All are deciduous. They have tall cylindric boles and plank-buttressed bases. The main canopy is 15.2-18.2 m and comprised of the following among the emergents: *Schleichera oleosa*, *Diospyros ebenum*, *D. oocarpa*, *Manilkara hexandra*, *Alseodaphne semicarpifolia*, *Mangifera zeylanica*, *Vatica obscure* (confined to the eastern province), *Syzygium sp*., *Neolitsea involucrata*, *Hydonocarpus veninata*, *Lepisanthus tetraphylla*, *Gleniea zeylanica* etc., mainly mesophyllus species. Amongst the more important of the deciduous members, are *Chloroxylon swietenia*, *Vitex pinnata*, *Berrya cordifolia*, *Nephelium longana*, *Gyrocarpus jacquina*, *Adina cordifolia* etc., which include macro and microphyllus species. As in the typical dry zone forest, *Hemicyclea sepiaria* forms the general matrix in which the other species mentioned above appear widely scattered as single stems, 6-18 m apart. These trees of the eco-dominant layer are somewhat better grown,

longer and cleaner boled than typical of the standard dry evergreen type of forest. The pole class trees of the sub-canopy are less widely spaced and include the following species of wet and intermediate climatic zone affinities: *Acronychia laurifolia, Polyalthia acuminata, Aphania bifoliants*. The shrub layer is about 3-3.6 m in height and inclined to be much denser in character than in the typical dry evergreen, and intermediate in this respect between the undergrowth of the wet and dry evergreen forests. The principal constituents, mostly microphyllus species, are: *Glycosmis pentaphylla, Polyalthia korinti, and Memecylon spp*., besides younger plants of *Dimophocalyx glabellus, Polyalthia acuminata, Nephalium longana and Acronychia laurifolia*. The ground is covered with a fair layer of leaf litter and mould. It is grassy in rainy weather, and climbers, including lianas, occur frequently. Gaussen et al (1968) described the corresponding forests as *Filicium-Euphoria-Artocarpus-Myristica* series. They strongly believed that almost all the forests of the intermediate zone are secondary in origin. The structure and composition of the climax forests could only be hypothesized and the species chosen to name this series are those which occur in the least degraded present day formations and mostly capable of maintaining themselves in more evolved formations. The climax forest could have a physiognomy nearing that of the evergreen forests of the "wet zone" but with a poorer composition. The very ancient and widespread practice of chena cultivation in this zone has changed the microclimate towards drier and more lighted conditions which has eliminated the slow growing shade demanding species of the climax forest in favour of light demanding species. The best developed forests, under present conditions, of this series have been described as high evergreen forests. It contains a large number of secondary species and facultative deciduous species. The main canopy lies between 15-20 m and may even be more, dominated by trees which reach 30 m. These emergents comprise: *Canarium zeylanicum, Xylopia parvifolia, Vitex pinnata, Mangifera zeylanica, Trewia nudiflora* etc. The main canopy is composed of: *Filicium decipiens, Artocarpus nobilis, Semecarpus obscure, Myristica dactyloides, Neolitsea involucrata* etc. The presence of *Terminalia parviflora, Melia composita, Euphoria longana, Chukrasia spp., Pterospermum canescens, and Vitex pinnata* makes for a tendency towards semi-deciduousness. R.A. de Rosairo (1958) studied the vegetation of lowland TMEF north and north-east of the Knuckles region, not far from Moragahakanda development area. He classified the main vegetation formation into three sub divisions by aerial photo interpretation correlated with field studies.

A - Tropical wet semi-evergreen forest; Climax type
B - Low jungle - Sub-seral type
C - Riparian forest - Faciation or Lociation.

TMEF - Climax type is found within the Knuckles region in a relatively small area. Topographycally, it is confined to the valley of Heenganga extending on both banks upto the irregular foothills and rolling country upto an elevation of about 1500 feet. This would mark the limit of the first scarp separating the Mahaweli river plains from those of Heenganga. The forest differs from the true dry evergreen type in that a number of facultativly deciduous species, characteristic of this particular climatic zone and common to the typical intermediate zone, are present (Koelmeyer, 1956). Its average height is seldom above 18.2 m (60 ft.) with a maximum girth of 1.8-2.1 m (6 to 7 feet). The forest is a closed type with a canopy density of about 2/3 and a well defined understory. *Vitex pinnata* is abundant and occurs with elements of the wet and montane evergreen types such as *Mangifera zeylanica*, *Cinnamomum sp*., *Semecarpus spp*. and *Calophyllum tomentosum*. *Vitex pinnata*, which is a ubiquitous species extending from extreme wet (mostly in secondary forest) to extremely dry areas. It is a facultatively deciduous species of these latter types and forms practically 50% of the tree layer near the banks of the Heenganga. Other characteristic species, also typical of the same forest type elsewhere, are *Nephelium longana, Pterospermum canescence, Semicarpus coriaceae* and *Mangifera zeylanica*. In the undergrowth, *Calamus sp*. and *Memycylon spp*. are abundant. Low jungle, which is an obvious sub-seral stage of low tree growth, with woody climbers and thorny scrubs, is considered to be

conditioned edaphycally by the presence of surface rock. However, species such as *Careya arborea*, *Alstonia scholaris*, *Semicarpus* spp., *Callophyllum* sp. and *Tricalysia dalzellii* which, are common to savanna are also found. Riparian forest, which is an interesting edaphic modification of the general TMEF is also found along the banks of the Heenganga. It is characterized by better height growth and denser undergrowth. In addition to the characteristic species of the semi-evergreen forests of the `intermediate zone' such as *Filicium decipiens*, the wet evergreen species *Myristica dactyloides* and *Cullania rosyroana,* both characteristic of primary rain forest, are also found. The riparian forest closely approaches the true wet evergreen forest type; the height of the dominants range from 24.3-27.4 m (80-90 feet) with observed girths upto 6 m (20 feet) (for *Mangifera zeylanica*). The forest is a closed, dense type with climbers such as *Pothos sp*., on the tree trunks.

Subsequent studies carried out by Balasubramaniam (1988) have revealed more information on floristic features of TMEF of the Knuckles region. Relatively undisturbed patches of TMEF are found near Illukkumbura and Laggala-Pallegama. These forests are continuous with those at Elahera and Galewela. Trees of this forest formation reach a height of 30 m. A canopy layer and a sub-canopy layer have been recognized. The shrub layer has species that are also found in the dry mixed deciduous forests or monsoon forests of the dry zone. Woody climbers or vines are common in this forest community. *Pyrrosia adnascens, Drynaria quercifilix* and the ephyphytic orchid *Vanda roxburghina* have been recorded in these forests. The characteristic tree species of this forest are *Filicium decipiens, Melia dubia, Semicarpus obscure, Dimocarpus longana, Vitex altissima, Mangifera zeylanica, Calophyllum tomentosum* and *Nothopegia beddomi*. At Laggala-Pallegama where large trees of *Zanthoxylum rhesta* have been recorded is thought to be the natural habitat of this rare species. *Memicylon umbellatum*, *Glycosmis mauritiana, Ardisia missionis* are characteristic shrub species of the understorey. *Terminalia arjuna, Mesua ferrea, Myristica zeylanica, Neonauclea zeylanica* and *Saraca indica* have been observed in riverine forest.

According to R.W. Szechowycz (1953) TMEF in the catchment of Galoya reserve are well developed in areas with sufficient depth of soil (sinusiea). The plant association has more co-dominants. The species found in this area include *Nepheliun longana, Mangifera zeylanica, Antiaris toxicaria, Mitragyyna parvifolia, Schlichera oleosa, Adina cordifolia, Diospyros ebenum, D. oocarpa, D.walkari, Berrya cordifolia* and *Lagerstroemia speciosa* etc. Along streams the undergrowth is quite rich and the plant associations have such dominants as *Terminalia arjuna, Melia composita* and *Alstonia scholaris*.

Merrit V.G. & Ranatunga M.S. (1959) described similar type of forest patches located approximately a mile west of Wellawaya. The forest is moist with tall, large diameter trees and woody creepers resembling aspects of a wet zone forest. It is unique in that there is a blending of wet zone, dry zone and semi-evergreen species, viz. *Myristica dactyloides*, *Mangifera zeylanica*, *Filicium decipiens*, *Homalium zelanicum*, *Alstonia scholaris*, *Macaranga peltata*, *Vitex pinnata*, *Semicarpus sp*. *Tetrameles nudiflora*, *Prosorus indica*, *Schlichera oleosa*, *Cassia fistula*, *Eleadendron glaucum*, *Berrya cordifolia*, *Nephalium longana*, *Garcinia tepnophylla*, *Xylopia sp*., *Neolitsea involucrata*, *Pterospermum canescence* and *Bredelia retusa*.

According to Koelmeyer (1957) species such as *Melia compositae*, *Filicium decipiens, Bombax malabaricum* and *Lagerstroemia speciosa* are better developed in TMEF than elsewhere. The best development of these forests is found in the Kurunegala district (*Artocarpus - Vitex - Filicium - Pterospermum - Nephelium* community), and around Moneragala where more dry evergreen forest species such as *Chloroxylon swietenia* and *Chukrasia tabularis* are found in addition to species found in Kurunegala forest. The dry season is not pronounced in the forests of Kurunegala district but forests of Moneragala experience a dry season with less than 100 mm (4 inches) rain fall per month, for 3-4 months.

Intermediate zone forests found in the northern lowlands of this climatic zone have been described by Greller & Balasubramaniam (1988) focusing on interrelationships of vegetation composition, leaf size and climatic warmth and altitude. As regards the flora, studied at three sites, *Artocarpus nobilis, Vitex pinnata, Dellenia retusa, Xylopia parviflora* and *Mangifera zeylanica* have become the dominants, based on basal cover, at site (1): Kankaniyamulla. And *Scutinanthe brunnea, Tetrameles nudiflora* and *Celtis cinnamoides* at site (2): Boyagoda Mukalana. Similarly, *Michelia champaka, Artocarpus nobilis, Mangifera zeylanica* and *Turpinia malabarica* have been recorded as dominants at site (3): Bambaragala.

Phyto-sociological studies, with special reference to endemic plants, done by Peris (1975) have shown the contribution of endemic species to the floristic composition, density and basal area of the intermediate zone forests, sampled at Berigoda near Kurunegala and Daragoda near Moneragala. Climatic conditions are similar at these two sites. The enumeration has been done only for trees above 30 cm gbh located in relatively undisturbed forest patches. According to the author, in these two intermediate zone forests, the number of individuals in all the girth classes is low. The gradual decline in density of the smallest girth class (30-59 cm), at both sites, eliminates recent selective felling as a possible reason. Profile height is higher at Berigoda (35 m) than at Moneragala (27 m). The trees have a low branching habit. Buttresses were most prevalent in the Berigoda forest, partly due to the abundance of *Gironniera cuspidata* and *Canarium zeylanicum*. The slightly lower floristic richness of the Moneragala intermediate zone, as compared with that at Berigoda, is also consistent with phytogeographic evidence. Certain wet zone species that occur at Berigoda are not found at Moneragala. These species have either not maintained themselves at Moneragala or not traversed the intervening montane and dry zones which separate the Moneragala forest from the nearest wet zone lowlands. Important Value Indices (summed relative density, relative frequency and relative basal area: Curtis & McIntosh, 1950) of the three leading species at each site indicate that *Nothopegia beddomei* is the most abundant in the intermediate zone forests where it shows the highest relative population density, though not basal area. This species with *Gironniera cuspidata*, and *Dillenia retusa* is co-dominant in the Berigoda forest, while at Moneragala it co-dominates with *Euphoria longana*, *Vitex pinnata*, and *Drypetes sepiaria*. Thus there is no dominance by species in the intermediate zone forests (Gunetilleke & Ashton, 1987).

Quantitative studies on woody plants of TMEF by Ekanayake (1994) in similar forests of Knuckles region, at three locations Illukkumbura, Mimure and Pallegama, show the following order of species dominance (table 10).

Illukkumbura: *Pleurostylia opposita > Palaquium hinmolpedda > Chionanthus zeylanicus > Syzygium gardneri > Actinodaphne stenophylla > Mangifera zeylanica > Semecarpus nigro-viridis > Vitex altissima > Gomphia serrata > Scolopia schreberi*

Mimure: *Dimocarpus longan > Pterospermum canescens > Vitex altissima > Eugenia bracteata > Premna tomentosa > Pleurostylia opposita > Scolopia schreberi > Mallotus philippensis > Randia malabarica > Nothopegia beddomei*

Pallegama: *Dimocarpus longan > Vitex altissima > Semecarpus nigri-viridis > Neolitsea cassia > Filicium decipiens > Terminalia bellirica > Pterospermum canescens > Phyllanthus indicus > Albizia odoratissima > Helicteres isora*

Dominance order based on average abundance values for TMEF Knuckles:

Dimocarpus longan > Vitex *altissima* > Pleurostylia *opposita* > Semecarpus *nigro-viridis* > *Chionanthus zeylanica* > Palaquium *hinmolpedda* > *Pterospermum canescens* > *Scolopia schreberi* > *Filicium decipiens* > *Neolitsea cassia.*

Hence, it clearly shows the variability of dominance in relation to spatial distribution. Dominance of *Dimocarpus longan* is a noteworthy feature of TMEF of Knuckles.

Table 10: Summary results of the studies at Illukkumbura, Mimure and Pallegama forest stands

	Illukkumbura	Mimure	Pallegama
Area sampled (m^2).	4000	4000	4000
No. of plants enumerated.	358	339	309
No. of families	23	26	26
No. of genera	31	36	49
No. of species	37	44	57
Floristic richness	91	106	132
No. of endemics	12	6	9
% Endemics	32.43	13.63	15.78
Diversity index (DI)	14.48	17.38	22.89
DI (Non-endemic)	10.37	15.44	19.95
DI (Endemic)	5.29	3.53	5.17

The phyto -sociological study in the 3 forest stands revealed the presence of some 100 species of woody plants belonging to 81 genera of 35 families. Among them 11 species (including 2 endemics) occurred in all sites. Tentative check lists of flowering plants (trees, shrubs and herbs species), prepared for the larger area of TMEF of Knuckles showed the presence of 394 flowering plant species belonging to 90 families. Among them were 50 endemic species.

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ANNEX 1: PROPORTIONAL REPRESENTATION OF BIRDS IN MORAGAHAKANDA

Scientific name	Proportional Representation
Accipiter badius	0.14
Acridotheres tristis	2.88
Actitis hypoleucos	0.07
Aegithina tiphia	1.99
Alauda gulgula	0.21
Alcedo atthis	1.16
Amaurornis phoenicurus	0.07
Anhinga melanogaster	0.07
Anthracoceros coronatus	0.89
Anthus rufulus	0.21
Apus affinis	1.71
Ardeola grayii	0.14
Cacomantis passerinus	0.75
Caprimulgus asiaticus	0.00
Casmerodius albus	0.07
Centropus sinensis	2.12
Chalcophaps indica	1.23
Chloropsis aurifrons	0.14
Chloropsis cochinchinensis	1.37
Chrysocolaptes lucidus	0.89
Chrysomma sinense	0.21
Ciconia episcopus	0.21
Circus melanoleucos	0.07
Cisticola juncidis	0.27
Clamator jacobinus	0.07
Collocalia unicolor	0.48
Columba livia	0.14
Copsychus malabaricus	1.16
Copsychus saularis	0.41
Coracina macei	0.27
Coracina melanoptera	0.27
Corvus macrorhynchos	0.14
Coturnix coromandelica	0.07
Cuculus micropterus	0.21
Cyornis tickelliae	1.16
Cypsiurus balasiensis	3.08
Dendrocopus nanus	0.14
Dendronanthus indicus	0.14
Dicaeum agile	0.07
Dicaeum erythrorhynchos	2.40
Dicrurus caerulescens	0.62
Dicrurus paradiseus	0.14
Ducula aenea	0.75
Dumetia hyperythra	0.14
Egretta garzetta	0.00
Eudynamys scolopacea	0.14
Galloperdix bicalcarata	0.07
Gallus lafayetii	1.37
Gracula religiosa	0.48

Halcyon capensis	0.48
Halcyon smyrnensis	1.44
Hemiprocne coronata	1.44
Hemipus picatus	0.14
Hemipus picatus	0.14
Hieraaetus pennatus	0.07
Hirundo daurica	1.23
Hirundo rustica	5.68
Hypothymis azurea	0.48
Hypsipetes leucocephalus	0.07
Ichthyophaga ichthyaetus	0.00
Ictinaetus malayensis	0.21
Iole indica	0.62
Ketupa zeylonensis	0.21
Lanius cristatus	0.41
Lanius schach	0.07
Lonchura malacca	1.44
Lonchura punctulata	1.16
Lonchura striata	1.58
Loriculus beryllinus	0.82
Megalaima flavifrons	0.27
Megalaima haemacephala	1.58
Megalaima rubricapilla	1.37
Megalaima zeylanica	3.63
Merops leschenaulti	1.44
Merops orientalis	2.53
Merops philippinus	0.27
Mesophoyx intermedia	0.07
Mirafra assamica	0.07
Motacilla cinerea	0.14
Muscicapa daurica	0.07
Nectarina asiatica	0.14
Nectarina lotenia	0.07
Nectarina zeylonica	1.92
Ocyceros gingalensis	0.89
Oriolus xanthornus	0.96
Orthotomus sutorius	0.96
Passer domesticus	0.14
Pavo cristatus	0.48
Pellorneum fuscocapillum	1.10
Perdicula asiatica	0.21
Pericrocotus cinnamomeus	0.34
Pericrocotus flammeus	0.55
Pernis ptilorhyncus	0.14
Phaenicophaeus viridirostris	0.55
Phalacrocorax niger	0.55
Phylloscopus magnirostris	1.58
Phylloscopus trochiloides	0.68
Pitta brachyura	0.82
Ploceus philippinus	0.55
Pomatorhinus horsfieldii	0.07
Prinia hodgsonii	0.34
Prinia inornata	0.21

Prinia socialis	0.21
Psittacula cyanocephala	1.16
Psittacula eupatria	1.16
Psittacula krameri	1.30
Pycnonotus cafer	3.08
Pycnonotus luteolus	3.56
Pycnonotus melanicterus	3.42
Rhipidura aureola	0.75
Rhopocichla atriceps	1.03
Saxicoloides fulicata	0.82
Spilornis cheela	0.82
Spizaetus cirrhatus	0.14
Streptopelia chinensis	3.15
Surniculus lugubris	0.14
Tephrodornis pondicerianus	0.34
Terpsiphone paradisi	1.78
Treron pompadora	0.75
Turdoides affinis	1.92
Vanellus indicus	0.55
Zosterops palpebrosus	0.82

ANNEX 2: HABITAT SPECIFIC DISTRIBUTION OF FAUNA

Amphibians

Thorn forests (scrublands)

Species	67	68	75	76	82	85	88	90	91	92	99	101	109	112
Bufo melanostictus	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Euphlyctis cyanophlyctis	0	18	0	0	0	4	0	0	0	0	0	1	0	0
Fejervarya kirtisinghe	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Fejervarya limnocharis	0	26	0	0	0	2	1	0	0	0	0	23	0	0
Polypedates cruciger	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Rana gracilis	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Philautus regius	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ichthyophis glutinosus	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Riverine forests

Species	25	26	27	28	30	31	32	33	34	35	36	37	38	39	40	41	42	94	107	111
Bufo melanostictus	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Euphlyctis cyanophlyctis	0	0	13	7	0	3	0	0	0	0	0	0	0	1	13	9	28	0	0	0
Fejervarya limnocharis	0	0	37	3	6	21	0	0	0	0	0	0	0	28	8	16	11	0	0	0
Hoplobatrachus crassus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Polypedates maculates	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Rana gracilis	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philautus regius	0	0	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0

Moist evergreen forests

Species	30	31	61	63	64	65	66	69	70	74	79	80	81	84	87	89	93	97	98	100	103	104	105	106	110	113
Microhyla ornata	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0
Euphlyctis cyanophlyctis	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	3	0
Fejervarya limnocharis	6	21	0	0	0	2	0	17	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Hoplobatrachus crassus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Polypedates cruciger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Rana aurantiaca	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaerotheca breviceps	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0
Philautus popularis	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Philautus regius	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Dry mixed evergreen forests

Species		
Euphlyctis cyanophlyctis	0	3
Fejervarya limnocharis	0	9
Philautus regius	0	1

Agricultural lands

Species	62	72	73	108	
Fejervarya limnocharis	0	0	0	1	1

Grasslands (Savannah)

Species	71	86
Fejervarya limnocharis	0	2

Reptiles

Thorn forests (scrublands)

Species	67	68	75	76	82	85	88	90	91	92	99	101	109	112
Lissemys punctata	0	0	0	0	0	0	0	0	0	0	16	0	0	0
Calotes ceylonensis	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Calotes versicolor	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Otocryptis nigristigma	2	0	0	0	1	0	0	0	0	0	0	0	0	0
Hemidactylus frenatus	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Hemidactylus leschenaultii	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Lankascincus fallax	3	0	0	0	0	0	0	0	2	0	0	0	0	0
Mabuya macularia	0	0	0	2	2	0	0	0	0	0	0	0	0	0
Ahaetulla nasuta	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Dendrelaphis tristis	0	0	0	0	0	0	1	0	0	0	0	0	0	0

Riverine forests

Species	25	26	27	28	30	31	32	33	34	35	36	37	38	39	40	41	42	94	107	111
Melanochelys trijuga	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotes calotes	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Calotes ceylonensis	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	2	0	0	0	0
Calotes versicolor	0	0	0	3	0	0	1	0	0	2	0	0	0	0	0	0	1	0	0	0
Otocryptis nigristigma	0	0	0	0	0	1	1	0	2	0	0	1	1	0	0	1	0	1	0	1
Hemidactylus frenatus	2	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	2	0	0	0
Hemidactylus leschenaultii	0	0	0	0	0	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Lankascincus fallax	1	0	1	0	1	3	0	0	1	0	0	0	3	0	1	0	1	0	0	2
Mabuya carinata	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0
Mabuya macularia	2	2	0	0	0	1	9	0	0	0	0	0	0	0	0	0	0	0	0	0
Varanus bengalensis	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Varanus salvator	0	0	1	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ahaetulla nasuta	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Amphiesma stolatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Macropisthodon plumbicolor	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Xenochrophis asperrimus	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xenochrophis piscator	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Moist evergreen forests

Species	**30**	**31**	**61**	**63**	**64**	**65**	**66**	**69**	**70**	**74**	**79**	**80**	**81**	**84**	**87**	**89**	**93**	**97**	**98**	**100**	**103**	**104**	**105**	**106**	**110**	**113**
Melanochelys trijuga	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lissemys punctata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Calotes calotes	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Calotes ceylonensis	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotes liolepis	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calotes versicolor	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Otocryptis nigristigma	0	1	2	4	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Otocryptis wiegmanni	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Cnemaspis tropidogaster	0	0	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemidactylus depressus	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Hemidactylus frenatus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Hemidactylus leschenaultii	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lankascincus fallax	1	3	0	3	23	1	0	1	0	0	0	1	1	0	1	0	1	0	1	0	3	0	0	0	0	1
Mabuya carinata	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mabuya macularia	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	3	0	0	0
Sphenomorphus rufogulus	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Varanus salvator	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Python molurus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Ahaetulla nasuta	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dendrelaphis bifrenalis	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dendrelaphis tristis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Ptyas mucosa	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trimeresurus trigonocephalus	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Dry mixed evergreen forests

Species		
Hemidactylus frenatus	2	0
Lankascincus fallax	1	2
Lygosoma punctatus	0	1
Mabuya macularia	2	0
Macropisthodon plumbicolor	1	0

Agricultural lands

Species	62	72	73	108	
Calotes ceylonensis	1	0	0	0	1
Calotes versicolor	3	2	0	0	5
Xenochrophis asperrimus	0	0	0	1	1

Grasslands (Savannah)

Family	Species	71	86
Agamidae	*Calotes versicolor*	1	0
Colubridae	*Liopeltis calamaria*	1	0

Birds

Thorn forests (scrublands)

Scientific name	10	12	16	20	21	67	68	75	76	82	85	88	90	91	92	99	101	109	112
Acridotheres tristis	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
Aegithina tiphia	0	0	0	1	0	0	0	0	1	0	2	0	1	0	1	0	0	0	1
Alauda gulgula	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alcedo atthis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Anthus rufulus	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Apus affinis	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0
Cacomantis passerinus	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0
Caprimulgus asiaticus	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Centropus sinensis	0	0	0	0	1	1	0	0	0	0	0	1	1	0	1	1	1	0	0
Chalcophaps indica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0
Chloropsis cochinchinensis	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	2	0	1	0
Chrysocolaptes lucidus	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Chrysomma sinense	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Copsychus malabaricus	1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Coracina macei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Cuculus micropterus	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Cyornis tickelliae	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Cypsiurus balasiensis	0	0	0	0	2	0	0	0	2	0	4	0	0	0	0	6	0	0	0
Dicaeum erythrorhynchos	1	1	1	1	1	0	0	0	0	1	1	0	2	1	0	1	0	1	0
Dicrurus caerulescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ducula aenea	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
Eudynamys scolopacea	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gallus lafayetii	0	1	1	1	0	0	0	0	1	0	1	0	1	0	0	1	1	0	0
Halcyon smyrnensis	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	1	1	0	0
Hemiprocne coronata	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Hemipus picatus	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Hirundo rustica	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	7	0	0	0

Iole indica	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ketupa zeylonensis	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Lanius cristatus	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Lonchura malacca	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Lonchura punctulata	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Lonchura striata	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0
Loriculus beryllinus	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Megalaima flavifrons	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Megalaima haemacephala	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0
Megalaima zeylanica	0	1	0	1	1	0	0	0	1	1	1	1	1	0	1	1	1	0	0
Merops leschenaulti	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0
Merops orientalis	0	0	3	3	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0
Nectarina lotenia	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nectarina zeylonica	1	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	1
Ocyceros gingalensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Pavo cristatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Pellorneum fuscocapillum	0	0	0	0	1	1	1	0	0	1	1	0	0	0	0	1	1	0	0
Perdicula asiatica	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Pericrocotus cinnamomeus	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Pericrocotus flammeus	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Pernis ptilorhyncus	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaenicophaeus viridirostris	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylloscopus magnirostris	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
Phylloscopus trochiloides	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0
Pitta brachyura	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	0	0	1	0
Ploceus philippinus	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Prinia inornata	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psittacula eupatria	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psittacula krameri	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pycnonotus cafer	0	1	0	0	1	0	3	0	1	0	0	0	1	0	0	0	0	2	1
Pycnonotus luteolus	1	0	1	1	1	0	2	0	1	0	1	1	2	0	1	0	1	0	1

Pycnonotus melanicterus	1	0	0	0	0	1	2	0	0	2	1	0	0	1	0	0	0	0	0
Rhopocichla atriceps	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Saxicoloides fulicata	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Spilornis cheela	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
Streptopelia chinensis	0	1	0	2	1	0	2	0	1	0	0	0	1	1	0	1	1	0	0
Surniculus lugubris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Tephrodornis pondicerianus	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Treron pompadora	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Turdoides affinis	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanellus indicus	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Zosterops palpebrosus	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Riverine forests

Scientific name	**1**	**13**	**18**	**22**	**25**	**26**	**27**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**56**	**94**	**107**	**111**
Acridotheres tristis	0	3	0	2	0	0	0	0	0	0	0	4	3	3	0	0	4	0	3	1	2	0	0	1
Actitis hypoleucos	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Aegithina tiphia	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	1	1	0	0	0	1	0	0	1
Alauda gulgula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Alcedo atthis	2	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	0	2	0	0	0
Amaurornis phoenicurus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Anhinga melanogaster	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthracoceros coronatus	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apus affinis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Cacomantis passerinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Centropus sinensis	0	0	0	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0
Chalcophaps indica	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	1	1	1	0	1	1	0	0	0
Chloropsis aurifrons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Chloropsis cochinchinensis	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Chrysocolaptes lucidus	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	1	0	0	0
Chrysomma sinense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ciconia episcopus	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Cisticola juncidis	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Collocalia unicolor	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Columba livia	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copsychus malabaricus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	
Copsychus saularis	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	2	0	
Coracina macei	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Coracina melanoptera	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	
Corvus macrorhynchos	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cuculus micropterus	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cyornis tickelliae	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	
Cypsiurus balasiensis	0	0	0	2	0	1	1	0	1	0	0	0	3	0	1	0	1	0	0	1	2	0	7	0	
Dicaeum erythrorhynchos	1	2	0	0	1	0	0	1	0	1	1	1	1	0	0	0	1	0	1	0	1	0	0	1	
Dicrurus caerulescens	0	0	0	2	0	0	1	1	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	
Dicrurus paradiseus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
Ducula aenea	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
Dumetia hyperythra	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Egretta garzetta	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Eudynamys scolopacea	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
Gallus lafayetii	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	
Gracula religiosa	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	
Halcyon capensis	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	
Halcyon smyrnensis	0	1	0	2	1	0	2	1	1	0	0	1	1	1	0	1	1	1	1	0	1	0	0	0	
Hemiprocne coronata	0	0	0	0	0	0	2	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	
Hieraaetus pennatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Hirundo daurica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
Hirundo rustica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	
Hypothymis azurea	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	
Ichthyophaga ichthyaetus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ictinaetus malayensis	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ketupa zeylonensis	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lanius schach	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Lonchura malacca	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lonchura punctulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0
Lonchura striata	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	4	3	0	0	0	0
Loriculus beryllinus	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0
Megalaima flavifrons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Megalaima haemacephala	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	1	0	1	1	1	0	0	0	0
Megalaima rubricapilla	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0
Megalaima zeylanica	1	2	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0
Merops leschenaulti	0	0	2	0	0	0	0	3	0	4	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Merops orientalis	0	4	0	3	2	1	2	0	0	0	0	0	0	4	0	0	0	3	0	3	0	0	2	0	0
Mesophoyx intermedia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Nectarina asiatica	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nectarina lotenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Nectarina zeylonica	0	0	0	0	1	0	1	1	1	0	1	0	1	0	1	1	0	0	0	1	0	0	0	0	0
Ocyceros gingalensis	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	0	1	0	1	1	0	0	0	0	0
Oriolus xanthornus	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0
Orthotomus sutorius	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	1	0	1	0	1	1	0	0	0	0
Pavo cristatus	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pellorneum fuscocapillum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1
Perdicula asiatica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Pericrocotus cinnamomeus	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Pericrocotus flammeus	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Pernis ptilorhyncus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Phaenicophaeus viridirostris	0	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	1	1	0	0	0	0	1
Phalacrocorax niger	0	0	0	0	0	0	0	2	0	1	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0
Phylloscopus magnirostris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Ploceus philippinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Prinia hodgsonii	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prinia inornata	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Prinia socialis	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Psittacula cyanocephala	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	2	3	0	0	0	0	0

Psittacula eupatria	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	1	0
Psittacula krameri	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	1	2	0	1	0
Pycnonotus cafer	0	2	0	0	0	2	0	2	2	2	0	0	0	0	0	0	1	0	2	2	0	0	3	0
Pycnonotus luteolus	4	2	0	1	0	1	1	1	1	2	1	2	0	3	1	0	0	1	2	4	1	0	0	1
Pycnonotus melanicterus	0	0	1	0	0	0	2	1	0	0	2	0	2	0	1	1	3	0	3	0	3	0	0	1
Rhipidura aureola	0	0	0	0	3	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Rhopocichla atriceps	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0
Saxicoloides fulicata	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Spilornis cheela	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Streptopelia chinensis	0	0	0	1	3	1	2	1	2	1	3	2	1	2	1	0	0	1	1	1	0	0	0	0
Surniculus lugubris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Tephrodornis pondicerianus	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Terpsiphone paradisi	0	0	0	0	1	0	2	1	1	0	1	0	1	1	1	0	1	1	0	3	1	0	0	1
Treron pompadora	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0
Turdoides affinis	0	0	0	0	0	0	4	0	0	0	0	5	4	0	0	0	0	4	0	0	0	0	0	0
Vanellus indicus	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0
Zosterops palpebrosus	0	0	0	0	0	0	2	0	1	0	0	1	0	1	0	0	0	0	4	0	0	0	0	0

Moist evergreen forests

Scientific name	**30**	**31**	**61**	**63**	**64**	**65**	**66**	**69**	**70**	**74**	**79**	**80**	**81**	**84**	**87**	**89**	**93**	**97**	**98**	**100**	**103**	**104**	**105**	**106**	**110**	**113**
Accipiter badius	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acridotheres tristis	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2	1	0	0	0	0	3	0	0
Aegithina tiphia	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	1	1	1	1	0
Alauda gulgula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
Alcedo atthis	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Anthracoceros coronatus	0	2	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0
Apus affinis	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cacomantis passerinus	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0
Centropus sinensis	0	1	0	1	0	0	0	0	0	0	1	1	1	0	1	1	1	0	1	1	0	0	0	1	0	0
Chalcophaps indica	1	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Chloropsis cochinchinensis	1	1	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0
Chrysocolaptes lucidus	1	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	1	0	0
Circus melanoleucos	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cisticola juncidis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Collocalia unicolor	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Copsychus malabaricus	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1	0	0
Coracina macei	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuculus micropterus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyornis tickelliae	0	0	1	0	0	1	1	1	0	0	1	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0
Cypsiurus balasiensis	0	1	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dendronanthus indicus	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Dicaeum agile	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicaeum erythrorhynchos	1	0	1	1	0	1	0	1	1	0	1	0	1	0	0	1	0	1	1	0	0	0	0	1	0	0
Dicrurus caerulescens	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ducula aenea	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Galloperdix bicalcarata	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gallus lafayetii	0	0	0	1	0	1	1	0	0	0	1	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0
Gracula religiosa	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halcyon capensis	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halcyon smyrnensis	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemiprocne coronata	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1
Hemipus picatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Hirundo daurica	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	6	0	0	0	0
Hirundo rustica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	1	0
Hypothymis azurea	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Hypsipetes leucocephalus	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iole indica	0	0	3	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ketupa zeylonensis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanius cristatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0
Lonchura striata	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loriculus beryllinus	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Megalaima flavifrons	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megalaima haemacephala	0	1	0	0	1	1	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Megalaima rubricapilla	1	1	1	1	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Megalaima zeylanica	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1	1	1	1	0	0	1	1	0	0	
Merops leschenaulti	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Merops orientalis	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Motacilla cinerea	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Muscicapa daurica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Nectarina asiatica	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nectarina zeylonica	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	1	
Ocyceros gingalensis	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	
Oriolus xanthornus	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
Orthotomus sutorius	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
Pavo cristatus	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Pellorneum fuscocapillum	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Pericrocotus cinnamomeus	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pericrocotus flammeus	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
Phalacrocorax niger	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phylloscopus magnirostris	0	0	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	1	0	1	0	0	0	0	1	1	
Phylloscopus trochiloides	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Pitta brachyura	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0	1	0	0	
Pomatorhinus horsfieldii	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prinia hodgsonii	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prinia socialis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psittacula cyanocephala	0	3	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Psittacula eupatria	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Pycnonotus cafer	2	2	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	2	2	0	0	0	0	0	1	0	
Pycnonotus luteolus	1	1	0	1	0	0	1	0	0	0	1	1	0	0	0	1	1	1	1	0	0	0	0	1	1	1	
Pycnonotus melanicterus	1	0	1	0	1	1	2	2	2	2	0	0	0	1	1	0	0	1	0	0	1	2	1	0	4	0	
Rhipidura aureola	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Rhopocichla atriceps	1	0	1	0	0	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	1	

Saxicoloides fulicata	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spilornis cheela	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Spizaetus cirrhatus	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Streptopelia chinensis	1	2	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Tephrodornis pondicerianus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Terpsiphone paradisi	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	
Treron pompadora	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turdoides affinis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	1	0	
Vanellus indicus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
Zosterops palpebrosus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Dry mixed evergreen forests

Scientific name	**2**	**3**	**5**	**8**	**9**	**19**	**23**	**25**	**29**
Accipiter badius	0	0	0	0	0	0	0	0	1
Acridotheres tristis	0	1	0	0	0	0	1	0	0
Aegithina tiphia	1	0	1	0	0	0	0	1	1
Alcedo atthis	0	0	0	0	0	0	0	1	1
Anthracoceros coronatus	0	0	0	0	0	0	0	0	2
Centropus sinensis	0	1	0	0	0	0	0	1	1
Ciconia episcopus	0	0	0	0	0	0	0	0	1
Copsychus malabaricus	0	0	1	0	1	0	0	0	1
Coracina macei	0	0	0	0	0	0	0	0	1
Coracina melanoptera	0	0	0	0	0	0	0	1	0
Cyornis tickelliae	0	0	0	0	0	0	0	1	0
Dendrocopus nanus	0	0	0	0	0	0	0	0	1
Dicaeum erythrorhynchos	1	2	1	2	0	0	0	1	1
Dicrurus caerulescens	0	0	0	0	0	0	0	0	1
Ducula aenea	0	1	0	0	0	0	0	0	1
Gallus lafayetii	0	0	1	0	0	0	0	0	0
Halcyon capensis	0	0	0	0	0	0	0	1	1
Halcyon smyrnensis	0	0	0	0	0	0	0	1	0

Hemiprocne coronata	0	0	0	0	0	0	0	0	1
Hemipus picatus	0	0	0	0	0	0	0	0	1
Hemipus picatus	1	0	0	0	0	0	0	0	0
Lonchura malacca	0	0	0	0	0	0	0	0	3
Lonchura striata	0	0	0	0	0	0	0	2	0
Loriculus beryllinus	0	0	0	0	0	0	0	1	1
Megalaima rubricapilla	0	0	0	0	0	0	0	1	1
Megalaima zeylanica	1	1	0	0	0	0	0	1	1
Merops leschenaulti	0	0	0	0	0	0	0	0	3
Merops orientalis	0	0	0	0	0	0	0	2	0
Nectarina zeylonica	1	0	1	2	1	0	0	1	1
Ocyceros gingalensis	0	0	0	0	1	0	0	0	0
Oriolus xanthornus	0	0	0	0	0	0	0	1	0
Orthotomus sutorius	0	0	0	0	1	0	0	1	1
Pavo cristatus	0	0	0	0	0	0	0	1	0
Pellorneum fuscocapillum	0	0	0	0	0	0	0	0	1
Perdicula asiatica	0	0	0	0	0	1	0	0	0
Pericrocotus cinnamomeus	0	0	0	0	0	0	0	0	1
Phaenicophaeus viridirostris	0	0	0	0	1	0	0	1	0
Phalacrocorax niger	0	0	0	0	0	0	0	0	1
Psittacula eupatria	0	0	0	0	0	0	0	0	3
Psittacula krameri	0	1	0	0	0	0	0	0	4
Pycnonotus cafer	2	1	0	0	0	0	0	0	0
Pycnonotus luteolus	4	1	1	0	1	0	1	0	1
Pycnonotus melanicterus	1	0	0	0	0	0	0	0	0
Rhipidura aureola	0	0	0	0	0	0	0	3	1
Rhopocichla atriceps	0	0	1	0	1	0	0	0	1
Streptopelia chinensis	0	0	0	0	0	0	1	3	1
Terpsiphone paradisi	0	0	0	0	0	0	0	1	2
Treron pompadora	1	0	0	0	0	0	0	0	1

Agricultural lands

Scientific name	62	72	73	83	108
Acridotheres tristis	3	1	0	0	0
Alcedo atthis	0	0	1	0	1
Anthus rufulus	0	0	2	0	0
Casmerodius albus	0	0	0	0	1
Centropus sinensis	0	0	1	1	0
Chloropsis cochinchinensis	1	1	0	1	0
Chrysocolaptes lucidus	0	0	0	1	0
Ciconia episcopus	0	0	1	0	0
Clamator jacobinus	0	0	0	1	0
Collocalia unicolor	0	0	0	0	1
Copsychus saularis	0	1	0	0	0
Coturnix coromandelica	0	0	0	1	0
Cypsiurus balasiensis	0	0	0	0	4
Dicaeum erythrorhynchos	2	1	0	0	0
Dumetia hyperythra	0	0	0	1	0
Gallus lafayetii	1	0	0	0	0
Halcyon smyrnensis	0	0	0	0	1
Hirundo daurica	2	0	0	0	0
Hirundo rustica	0	0	0	23	9
Ictinaetus malayensis	0	0	0	0	1
Lanius cristatus	0	0	0	1	0
Lonchura malacca	11	0	0	0	0
Lonchura punctulata	3	0	0	6	0
Lonchura striata	0	0	0	4	0
Loriculus beryllinus	1	0	0	0	0
Megalaima haemacephala	1	1	0	0	0
Megalaima rubricapilla	0	0	1	0	0
Megalaima zeylanica	1	0	1	0	0
Merops orientalis	1	0	1	0	2

Motacilla cinerea	0	0	0	0	1
Nectarina zeylonica	0	0	2	0	1
Oriolus xanthornus	0	0	0	1	0
Orthotomus sutorius	0	0	0	1	1
Passer domesticus	2	0	0	0	0
Pericrocotus flammeus	1	0	0	0	0
Ploceus philippinus	1	0	0	0	0
Prinia hodgsonii	0	0	1	2	0
Psittacula cyanocephala	0	0	3	2	0
Psittacula eupatria	0	0	2	2	0
Psittacula krameri	0	0	4	0	0
Pycnonotus cafer	3	1	0	4	0
Pycnonotus luteolus	0	0	2	0	0
Rhipidura aureola	0	1	0	0	0
Saxicoloides fulicata	1	1	0	4	0
Spilornis cheela	1	0	0	0	0
Spizaetus cirrhatus	0	0	1	0	0
Streptopelia chinensis	2	1	1	2	0
Terpsiphone paradisi	0	0	0	2	0
Treron pompadora	0	0	0	0	2
Vanellus indicus	0	0	1	0	0

Grasslands (Savannah)

Scientific name	**4**	**6**	**14**	**71**	**86**
Acridotheres tristis	1	0	2	0	3
Aegithina tiphia	0	0	1	0	1
Ardeola grayii	0	0	0	0	1
Cacomantis passerinus	0	0	0	0	1
Chloropsis aurifrons	1	0	0	0	1
Copsychus malabaricus	0	0	0	0	1
Cypsiurus balasiensis	0	0	0	5	0

Dicaeum erythrorhynchos	1	1	2	0	0
Ducula aenea	1	0	0	0	1
Gallus lafayetii	0	1	0	0	1
Hemiprocne coronata	0	0	0	3	0
Hemipus picatus	0	0	0	1	0
Hirundo daurica	0	0	0	3	0
Hirundo rustica	0	0	0	0	4
Ictinaetus malayensis	0	0	0	1	0
Lanius cristatus	0	0	0	0	1
Megalaima zeylanica	0	0	1	0	1
Merops leschenaulti	1	0	0	0	0
Merops orientalis	1	0	1	0	2
Nectarina zeylonica	1	0	0	0	0
Ocyceros gingalensis	1	0	0	0	0
Pernis ptilorhyncus	0	0	1	0	0
Phylloscopus magnirostris	0	0	0	0	1
Pitta brachyura	0	0	0	0	1
Psittacula krameri	1	0	0	0	0
Pycnonotus cafer	0	0	1	0	1
Pycnonotus luteolus	1	1	0	0	1
Saxicoloides fulicata	0	0	1	0	1
Streptopelia chinensis	1	0	3	0	1
Treron pompadora	1	0	0	0	0

Mammals

Dry mixed evergreen forests

Species	25	29
Macaca sinica	0	1
Semnopithecus priam	0	1
Lutra lutra	1	0
Elephas maximus	1	1
Bos indicus	1	0
Funambulus palmarum	1	1
Ratufa macroura	0	1
Lepus nigricollis	1	0

Moist evergreen forests

Species	30	31	43	53	57	59	61	63	64	65	66	69	70	74	79	80	81	84	87	89	93	97	98	100	103	104	105	106	110	113
Manis crassicaudata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Hipposideros speoris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Kerivoula picta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Macaca sinica	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semnopithecus priam	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Loris lydekkerianus	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canis aureus	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canis familiaris	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
Panthera pardus	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Lutra lutra	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paradoxurus hermaphoditus	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elephas maximus	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0
Bubalus arnee	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	1	1	1	0	1
Bos indicus	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Axis axis	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Cervus unicolor	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0

Muntiacus muntjak	1	0	1	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sus scrofa	1	1	1	0	1	1	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0
Moschiola meminna	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Hystrix indica	0	0	1	0	1	1	0	0	0	0	1	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
Bandicota indica	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mus booduga	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rattus rattus	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vandeleuria oleracea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Funambulus palmarum	0	0	0	0	1	1	1	1	0	0	1	0	0	0	1	0	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1
Ratufa macroura	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Lepus nigricollis	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Thorn forests (scrublands)

Species	**44**	**47**	**50**	**54**	**58**	**60**	**67**	**68**	**75**	**76**	**82**	**85**	**88**	**90**	**91**	**92**	**99**	**101**	**109**	**112**
Manis crassicaudata	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Macaca sinica	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semnopithecus priam	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Canis aureus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Canis familiaris	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0
Felis chaus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Felis catus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prionailurus rubiginosus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prionailurus viverrinus	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herpestes edwardsii	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
Lutra lutra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Paradoxurus hermaphoditus	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Paradoxurus zeylonensis	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viverricula indica	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elephas maximus	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0
Bubalus arnee	0	1	0	1	1	0	0	1	1	1	0	0	0	1	0	0	0	0	1	1
Bos indicus	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	1	0	1	0

Cervus unicolor	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
Muntiacus muntjak	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Sus scrofa	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0
Hystrix indica	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Bandicota indica	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tatera indica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Funambulus palmarum	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1	1	1	1	1	0
Ratufa macroura	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepus nigricollis	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0

Riverine forests

Species	**25**	**26**	**27**	**28**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**45**	**46**	**48**	**55**	**56**	**94**	**107**	**111**
Manis crassicaudata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Suncus murinus	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cynopterus sphinx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Pteropus giganteus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Macaca sinica	0	0	0	1	0	0	1	0	0	0	1	1	1	0	1	0	0	0	1	0	0	0	0	0	0
Semnopithecus priam	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Loris lydekkerianus	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Canis aureus	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	0
Canis familiaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
Felis catus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Panthera pardus	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prionailurus viverrinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Herpestes edwardsii	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	0
Herpestes smithii	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Lutra lutra	1	1	1	1	1	1	0	0	1	0	1	0	0	1	1	1	1	1	0	0	0	1	0	0	1
Paradoxurus hermaphoditus	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	1	0	0	0	0	0	0
Paradoxurus zeylonensis	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0
Viverricula indica	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elephas maximus	1	0	0	0	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1	0	1	0	1

Bubalus arnee	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	0	1
Bos indicus	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Axis axis	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cervus unicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Muntiacus muntjak	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Sus scrofa	0	0	0	0	1	1	0	0	0	0	1	0	1	0	1	1	1	0	1	0	0	1	1	0	1
Moschiola meminna	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1
Hystrix indica	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0
Bandicota indica	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	0	0	0	1	0	0	0	0	0	0
Mus booduga	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Rattus rattus	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Tatera indica	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Funambulus palmarum	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
Ratufa macroura	0	0	1	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0
Lepus nigricollis	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0

Agricultural lands

Species	**49**	**51**	**52**	**62**	**72**	**73**	**83**	**108**
Hipposideros galeritus	1	0	0	0	0	1	0	0
Hipposideros speoris	1	0	0	0	0	0	0	0
Cynopterus sphinx	1	0	0	0	0	1	0	0
Pteropus giganteus	1	0	0	0	0	0	0	0
Pipistrellus coromandra	1	0	0	0	0	0	0	0
Macaca sinica	1	0	1	1	0	0	0	0
Semnopithecus priam	0	0	1	0	0	0	0	0
Trachypithecus vetulus	0	0	1	0	0	0	0	0
Loris lydekkerianus	0	0	0	1	0	0	0	0
Canis aureus	0	0	1	0	0	1	0	0
Canis familiaris	1	0	1	1	1	1	1	0
Felis chaus	0	0	0	0	0	0	0	0
Felis catus	1	0	1	1	1	0	1	0

Prionailurus rubiginosus	0	0	0	1	0	0	0	0
Prionailurus viverrinus	0	0	1	0	0	0	0	0
Herpestes edwardsii	0	1	0	0	0	0	0	0
Lutra lutra	1	0	0	0	0	1	0	0
Paradoxurus hermaphoditus	0	0	1	1	0	0	0	0
Paradoxurus zeylonensis	0	0	1	1	0	0	0	0
Viverricula indica	0	0	1	0	0	0	0	0
Elephas maximus	1	0	1	1	1	1	0	1
Bubalus arnee	1	0	1	0	1	1	0	1
Bos indicus	0	0	0	0	1	1	1	0
Cervus unicolor	0	0	1	0	0	0	0	0
Sus scrofa	0	0	1	1	0	1	0	0
Bandicota indica	0	0	1	0	0	0	0	0
Funambulus palmarum	1	1	0	1	0	1	1	1
Ratufa macroura	0	1	0	0	0	0	0	1
Lepus nigricollis	0	0	0	0	1	0	0	0

Grasslands (Savannah)

Species	**71**	**86**
Trachypithecus vetulus	1	0
Elephas maximus	0	1
Bubalus arnee	0	1
Bos indicus	0	1
Moschiola meminna	1	0

Butterflies

Dry mixed evergreen forest

Species	25	29
Pachliopta aristolochiae	0	1
Papilio polymnestor,	0	1
Tirumala limniace	0	2
Tirumala septentrionis	0	1
Euploea core	1	7
Orsotriaena medus	0	1
Ypthima ceylonica	0	1
Jamides celeno	0	7

Savannah (Grassland)

Species	71	86
Pachliopta hector	0	2
Pachliopta aristolochiae	1	
Papilio domoleus	0	3
Appias paulina	2	2
Catopsilia pyranthe	0	1
Catopsilia pomona	0	1
Eurema hecabe	0	1
Euploea core	0	1
Ypthima ceylonica	1	5

Agricultural lands

Species	49	51	52	62	72	73	83	108
Pachliopta aristolochiae	0	0	1	0	0	0	0	1
Papilio domoleus	0	0	0	1	0	0	0	0
Papilio polymnestor,	0	0	0	2	0	0	0	1
Pathysa nomius	0	0	1	0	0	0	0	0
Leptosia nina	0	0	0	0	0	0	0	5
Delias eucharis	0	0	1	0	0	0	0	1
Catopsilia pomona	0	0	0	1	0	0	0	0
Eurema hecabe	0	0	0	2	0	0	2	1
Parantica aglea	0	0	0	0	1	0	0	0
Danaus chrysippus	0	0	0	0	1	0	0	0
Euploea core	0	0	1	0	1	0	0	0
Junonia lemonias	0	0	0	1	0	0	0	0
Junonia atlites	0	0	0	1	0	0	0	0
Junonia iphita	0	0	0	0	0	0	0	1
Junonia almana	0	0	0	1	0	0	0	0
Surendra vivarna	0	0	0	0	0	0	0	1
Castalius rosimon	0	0	1	0	0	0	0	0
Zizina otis	0	0	0	3	0	0	0	0
Zizula hylax	0	0	1	0	0	0	0	0
Chilades pandava	0	0	2	0	0	0	0	0
Iambrix salsala	0	0	0	2	0	0	0	0
Potanthus sp.	0	0	0	0	0	0	0	1

Riverine forest

Species	25	26	27	28	30	31	32	33	34	35	36	37	38	39	40	41	42	45	46	48	55	94	107	111
Pachliopta aristolochiae							2					1							1	1				1
Papilio crino																								1
Papilio polymnestor,						1		1			1					1		2	1	1				1
Graphium doson									1	1				3										
Pathysa nomius										1				4					1					
Delias eucharis																							1	1
Cepora nerissa										1				1										
Appias albina														1										
Appias paulina					1	2		1					3	1				12	1					
Hebomoia glaucippe						1				1														1
Catopsilia pomona						2				1				2										1
Eurema hecabe					2					1													2	
Tirumala limniace				1	1		1	1	1	1	1			1					1	1				
Parantica aglea																			1					1
Danaus chrysippus									1					2										
Danaus genutia			1	1																				
Euploea core	1		1	2	1		5	4	2	1	2	2	3	3		2			31	3		1		
Euploea klugii																			4					
Cirrochroa thais																								1
Phalantha phantha						1																		
Junonia iphita																		1						1
Junonia almana														1					1					
Moduza procris																			1					
Nissanga patnia																				1				1
Ypthima ceylonica					1			2		1	1							1	1	3				
Rathinda amor														1					1					
Spindasis ictis																			1					
Jamides celeno							3						2											

Syntarucus plinius								1															
Castalius rosimon														1									
Discolampa ethion																							1
Zizina otis														1									
Actyolepis puspa																		2					
Abisara echerius														1									
Tagiades japetus					1	2												1		1			
Ampittia dioscorides										1													
Sarangasa dasahara																							2

Thorn forest (Scrubland)

Species	**44**	**47**	**50**	**54**	**58**	**60**	**67**	**68**	**75**	**76**	**82**	**85**	**88**	**90**	**91**	**92**	**99**	**101**	**109**	**112**
Troides darsius																				1
Pachliopta hector										1								1		
Pachliopta aristolochiae																	2	2	1	
Papilio crino	1																			
Papilio polytes												1								
Papilio polymnestor,															1					
Chilasa clytia												1				1				
Graphium agamemnon															1					
Graphium doson															1					
Delias eucharis																1		1		
Cepora nerissa				1								3				1				
Appias paulina	2									1			1							1
Ixias pyrene	1						2													1
Hebomoia glaucippe										1										3
Catopsilia pyranthe										3										2
Catopsilia pomona							3	1							1					
Pareronia ceylanica		1		1								1				1				2
Eurema hecabe								1		1		1				1	3	7		

Tirumala limniace				1																
Parantica aglea				1														1		
Danaus chrysippus										1										
Euploea core		8	1		3	3		1		1	1			1	1	2	1		1	1
Euploea sylvester		1																		
Cethosia nietneri																				1
Cupha erymanthis		1													1					1
Junonia lemonias																			1	
Junonia iphita				1															1	1
Junonia almana		1														1				
Neptis hylas																		1		
Neptis jumbah							1													
Melanitis phedima		1																		
Orsotriaena medus				1																
Nissanga patnia																	1			
Ypthima ceylonica	2	2	1	4	3				3				2	5		1	7	9	3	
Jamides celeno								1												
Catochrysops strabo								1						3						
Castalius rosimon											2			2						
Zizina otis												2								
Zizula hylax									8											
Megisba malaya														1	2					
Chilades pandava		2		3																
Actyolepis puspa						1														
Hasora tamintas					3															
Tagiades japetus					1															
Tractrocera maevius										1	1									
Ampittia dioscorides																	1			
Halpe ceylonica																				1

Moist evergreen forest

Species	30	31	43	53	57	59	61	63	64	65	66	69	70	74	79	80	81	84	87	89	93	97	98	100	103	104	105	106	110	113
Troides darsius											1															4				
Pachliopta aristolochiae										2		2		1	2													2		
Papilio crino			1				2				2	1																		1
Papilio domoleus																	1													1
Papilio polytes			1					1			1												1							
Papilio polymnestor,		1			1		1	2	1			1	1							1										1
Graphium agamemnon																														1
Graphium doson																1														
Leptosia nina			1							1																				
Delias eucharis																											1	3		
Cepora nerissa			2													4						1						1		
Appias albina													2																	
Appias paulina	1	2	9				4					1	1																	
Ixias pyrene			1	1								1																1		
Hebomoia glaucippe		1					1	1			1	1											1				1			2
Catopsilia pyranthe																														
Catopsilia pomona		2											1			3	2								1			1		1
Pareronia ceylanica																										1				2
Eurema hecabe	2														1										1					
Eurema andersoni					1																									
Eurema blanda																												1		
Tirumala limniace	1																													
Parantica aglea									1																			2		
Euploea core	1		2		1	3		1	1			2			2	1	1				1	2								1
Cupha erymanthis							1					1	1																	1
Cirrochroa thais										2		1																		
Phalantha phantha		1																					1					1		
Junonia iphita			1	1			1																2					3		5
Kallima philarchus				1									1																	

Neptis hylas													1	1		1															
Neptis jumbah							1			1		1										1									2
Dophla evelina							2																								
Vindula erota													2																		
Parthenos sylvia																															
Rohana parisatis				1								1	1																		
Melanitis phedima														1																	
Orsotriaena medus																									1						
Nissanga patnia				2			3						4	3													1				
Ypthima ceylonica	1			2	2			5							2	4	1			1		5	3	1	4	1		7	1	1
Amblypodia anita																1							1								
Rathinda amor								1									1														1
Spindasis schistaceae																											1				
Necaduba sp.							4			1																					
Syntarucus plinius																1															
Castalius rosimon															2													1		1	
Discolampa ethion																															1
Zizina otis																							2								
Zizula hylax													3																		
Megisba malaya				1						1																	1				
Neopithicops zalmora							1																								
Actyolepis puspa				1	1							1																			
Tagiades japetus	1	2																													
Iambrix salsala							1																								
Tractrocera maevius																1															
Sarangasa dasahara													1																		

ANNEX 3: CHECKLIST OF FRESHWATER FISH SPECIES OF MORAGAHAKANDA AREA

Family	Scientific name	Common name
Cyprinidae	*Chela sp.*	
	Devario malabaricus	Giant danio
	Garra sp.	Stone sucker
	Labeo dussumieri	Common labeo
	Labeo fisheri [E,F]	**Mountain labeo**
	Puntius bimaculatus	Redside barb
	Puntius dorsalis	Long snouted barb
	Puntius martenstyni [E]	**Martenstyn's barb**
	Puntius filamentosus	Filamented barb
	Puntius sarana	Olive barb
	Puntius srilankensis [E]	**Blotched filamented barb**
	Puntius cf. *ticto*	Tic-tac-toe barb
	Rasbora caverii	Carverii Rasbora
	Rasbora daniconius	Striped rasbora
	Tor khudree	Mahseer
Cobitidae	*Lepidocephalichthys thermalis*	Common spiny loach
Bagridae	*Mystus vittatus*	Striped dwarf catfish
	Mystus sp.	
Siluridae	*Ompok bimaculatus*	Butter catfish
	Wallago attu [F]	Shark catfish
Cichlidae	*Etroplus suratensis*	Pearl spot
	Etroplus maculatus	Orange chromide
	Oreochromis mossambicus	Tilapia
Osphronemidae	*Osphronemus goramy*	Gaint gourami
Gobiidae	*Glossogobius giuris*	Bar-eyed goby
Belontiidae	*Belontia signata* [E]	Combtail
Mastacembelidae	*Mastacembelus armatus*	Marbled spiny eel
Channidae	*Channa gachua*	Brown snakehead
	Channa striata	Murrel
Bold - endemic to Mahaweli river		
E-endemic species		
F- Fisheries information		
Number of Fish species	29	
Endemic species	4	

ANNEX 4 :CHECKLIST OF AMPHIBIANS OF MORAGAHAKANDA AREA

Family	Scientific name	Common name
Bufonidae	*Bufo melanostictus*	Common house toad
	Bufo scaber	Schneider's toad
Ichthyophidae	*Ichthyophis glutinosus*[E,TR]	Common Yellow-band Ceacelean
	Ichthyophis sp.[E]	Ceacelean sp.
Microhylidae	*Kaloula taprobanica*	Common bull frog
	Microhyla ornata	Ornate narrow mouth frog
	Microhyla rubra	Red narrow mouth frog
	Microhyla sp.	Narrow mouth frog Sp.
	Ramanella variegata	White-bellied pugsnout frog
	Uperodon systoma	Balloon frog
Ranidae	*Euphlyctis cyanophlyctis*	Skipper frog
	Euphlyctis hexadactylus	Six toe green frog
	Fejervarya kirtisinghei[E,TR]	Mountain paddy field frog
	Fejervarya limnocharis	Common paddy field frog
	Hoplobatrachus crassus	Jerdon's bull frog
	Nannophrys marmorata[E,TR]	Kirtisinghe's rock frog
	Nannophrys sp.[E]	Rock frog sp.
	Rana aurantiaca[TR]	Small wood frog
	Rana gracilis[E,TR]	Sri Lanka wood frog
	Sphaerotheca breviceps	Banded sand frog
	Philautus fergusonianus[E,TR]	Ferguson's shrub frog
	Philautus popularis[E]	Common shrub frog
	Philautus regius[E]	Polonnaruwa shrub frog
	Philautus sp. 1[E]	Shrub frog sp.
	Philautus sp. 2[E]	Shrub frog sp.
	Polypedates cruciger[E,TR]	Common hour-glass tree frog
	Polypedates maculatus	Chunam tree frog
E- Endangered		
TR- Threatened		

ANNEX 5: CHECKLIST OF REPTILES OF MORAGAHAKANDA AREA

Family	Scientific name	Common name
Bataguridae	*Melanochelys trijuga*[TR]	Parker's Black Turtle
Testudinidae	*Geochelone elegans*[TR]	Indian Star Tortoise
Trionychidae	*Lissemys punctata*[TR]	Flapshell Turtle
Agamidae	*Calotes calotes*	Green garden lizard
	Calotes ceylonensis[E,TR]	Painted lip lizard
	Calotes liolepis[E,TR]	Whistling lizard
	Calotes versicolor	Common garden lizard
	Lyriocephalus scutatus[E,TR]	Hump snout Lizard
	Otocryptis nigristigma[E]	Black spotted kangaroo lizard
	Otocryptis wiegmanni[E,TR]	Kangaroo lizard
Gekkonidae	*Cnemaspis tropidogaster*[TR]	Roughbelly day gecko
	Cnemaspis podihuna[E,HT]	Dwarf day gecko
	Gehyra mutilata	Four-claw gecko
	Hemidactylus brookii	Spotted housegecko
	Hemidactylus depressus[E,TR]	Kandyan gecko
	Hemidactylus frenatus	Common house-gecko
	Hemidactylus leschenaultii	Bark or Sycamore gecko
	Hemidactylus triedrus	Termite hill gecko
Scincidae	*Lankascincus fallax*[E]	Common lankaskink
	Lygosoma punctatus	Dotted skink
	Mabuya carinata	Common skink
	Mabuya macularia	Bronzegreen little skink
	Nessia bipes[E,TR]	Smith's snakeskink
	Sphenomorphus rufogulus[E]	Redthroat litter skink
Varanidae	*Varanus bengalensis*	Land monitor
	Varanus salvator	Water monitor
Boidae	*Python molurus*[TR]	Common Indian Python
Colubridae	*Ahaetulla nasuta*	Green vine snake
	Ahaetulla pulverulenta	Brown vine snake
	Amphiesma stolatum	Buff striped keelback
	Boiga ceylonensi	Sri Lanka cat snake
	Boiga forsteni	Forsten’s cat snake
	Coeloganthus helena	Trinket snake
	Dendrelaphis bifrenalis	Boulenger’s bronze back
	Dendrelaphis tristis	Common bronze back
	Liopeltis calamaria	Reed snake
	Lycodon aulicus	Wolf snake
	Lycodon osmanhilli[E,TR]	Flowery wolf snake
	Lycodon striatus	Shaw’s wolf snake
	Macropisthodon plumbicolor	The green keelback
	Oligodon arnensis	Banded kukri snake
	Oligodon taeniolata	Russell’s kukri snake
	Ptyas mucosa	Rat snake

Family	Scientific name	Common name
	Sibynophis subpunctatus	Jerdon's polyodent
	Xenochrophis asperrimus[E,TR]	The checkered keelback
	Xenochrophis piscator	Checkered Keelback
Elapidae	*Bungarus caeruleus*	The common krait
	Naja naja	Indian cobra
Cylindrophidae	*Cylindrophis maculata*[E,TR]	Pipe snake
Typhlophidae	*Typhlops sp.*[E]	Blind snake sp.
Viperidae	*Daboia russelii*	Russell's viper
	Hypnale hypnale	Merrem's Hump nose viper
	Trimeresurus trigonocephalus[E]	Green pit viper
E- Endemic		
TR- Threatened		

ANNEX 6: CHECKLIST OF BIRDS OF MORAGAHAKANDA AREA

Family	Scientific name	English name	
Apodidae	*Collocalia unicolor*	Indian Swiftlet	BrR
	Cypsiurus balasiensis	Asian Palm Swift	BrR
	Apus affinis	House Swift	BrR
Hemiprocnidae	*Hemiprocne coronata*	Crested Treeswift	BrR
Bucerotidae	*Ocyceros gingalensis*[TR]	Sri Lanka Grey Hornbill	En
	Anthracoceros coronatus	Malabar Pied Hornbill	BrR
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	BrR
Charadriidae	*Vanellus indicus*	Red-wattled Lapwing	BrR
Accipitridae	*Pernis ptilorhyncus*	Oriental Honey-buzzard	BrR/WV/Va
	Ichthyophaga ichthyaetus	Grey-headed Fish-eagle	BrR
	Spilornis cheela	Crested Serpent Eagle	BrR
	Circus melanoleucos	Pied Harrier	WV
	Accipiter badius	Shikra	BrR
	Ictinaetus malayensis	Black Eagle	BrR
	Hieraaetus pennatus	Booted Eagle	WV
	Spizaetus cirrhatus	Changeable Hawk Eagle	BrR
Anhingidae	*Anhinga melanogaster*	Darter	BrR
Phalacrocoracidae	*Phalacrocorax niger*	Little Cormorant	BrR
Ardeidae	*Egretta garzetta*	Little Egret	BrR
	Casmerodius albus	Great Egret	BrR
	Mesophoyx intermedia	Intermediate Egret	BrR
	Ardeola grayii	Pond Heron	BrR
Ciconiidae	*Ciconia episcopus*	Woolly-necked Stork	BrR
Columbidae	*Columba livia*	Rock Pigeon	BrR
	Streptopelia chinensis	Spotted Dove	BrR
	Chalcophaps indica	Emerald Dove	BrR
	Treron pompadora	Pompadour Green-pigeon	BrR
	Ducula aenea	Green Imperial Pigeon	BrR
Alcedinidae	*Alcedo atthis*	Common Kingfisher	BrR
	Halcyon capensis	Stork-billed Kingfisher	BrR
	Halcyon smyrnensis	White-throated Kingfisher	BrR
Meropidae	*Merops orientalis*	Green Bee-eater	BrR
	Merops philippinus	Blue-tailed Bee-eater	WV
	Merops leschenaulti	Chestnut-headed Bee-eater	BrR
Cuculidae	*Clamator jacobinus*	Pied Cuckoo	BrR
	Cuculus micropterus	Indian Cuckoo	SU
	Cacomantis passerinus	Grey-bellied Cuckoo	WV
	Surniculus lugubris	Drongo Cuckoo	BrR
	Eudynamys scolopacea	Asian Koel	BrR
	Phaenicophaeus viridirostris	Blue-faced Malkoha	BrR
Centropodidae	*Centropus sinensis*	Greater Coucal	BrR
Phasianidae	*Coturnix coromandelica*	Rain Quail	SU
	Galloperdix bicalcarata[TR]	Sri Lanka Spurfowl	En

Family	Scientific name	English name	
	Gallus lafayetii[TR]	Sri Lanka Junglefowl	En
	Pavo cristatus	Indian Peafowl	BrR
Rallidae	*Amaurornis phoenicurus*	White-breasted Waterhen	BrR
Pittidae	*Pitta brachyura*	Indian Pitta	WV
Irenidae	*Chloropsis cochinchinensis*	Blue-winged Leafbird	BrR
	Chloropsis aurifrons	Golden-fronted Leafbird	BrR
Laniidae	*Lanius cristatus*	Brown Shrike	WV
	Lanius schach	Long-tailed Shrike	BrR
Corvidae	*Corvus macrorhynchos*	Large-billed Crow	BrR
	Oriolus xanthornus	Black-hooded Oriole	BrR
	Coracina macei	Large Cuckooshrike	BrR
	Coracina melanoptera	Black-headed Cuckooshrike	BrR
	Pericrocotus cinnamomeus	Small Minivet	BrR
	Pericrocotus flammeus	Scarlet Minivet	BrR
	Hemipus picatus	Bar-winged Flycatcher-shrike	BrR
	Rhipidura aureola	White-browed Fantail	BrR
	Dicrurus caerulescens	White-bellied Drongo	BrR
	Dicrurus paradiseus	Great Racket-tailed Drongo	BrR
	Hypothymis azurea	Black-naped Monarch	BrR
	Terpsiphone paradisi	Asian Paradise- flycatcher	BrR/WV
	Aegithina tiphia	Common Iora	BrR
	Tephrodornis pondicerianus	Common Woodshrike	BrR
Muscicapidae	*Muscicapa daurica*	Asian Brown Flycatcher	WV
	Cyornis tickelliae	Tickell's Blue Flycatcher	BrR
	Copsychus saularis	Oriental Magpie Robin	BrR
	Copsychus malabaricus	White-rumped Shama	BrR
	Saxicoloides fulicata	Indian Robin	BrR
Sturnidae	*Acridotheres tristis*	Common Myna	BrR
	Gracula religiosa	Hill Myna	BrR
Hirundinidae	*Hirundo rustica*	Barn Swallow	BrR
	Hirundo daurica	Red-rumped Swallow	BrR
Pycnonotidae	*Pycnonotus melanicterus*	Black-crested Bulbul	En
	Pycnonotus cafer	Red-vented Bulbul	BrR
	Pycnonotus luteolus	White-browed Bulbul	BrR
	Iole indica	Yellow-browed Bulbul	BrR
	Hypsipetes leucocephalus	Black Bulbul	BrR
Cisticolidae	*Cisticola juncidis*	Zitting Cisticola	BrR
	Prinia hodgsonii	Grey-breasted Prinia	BrR
	Prinia socialis	Ashy Prinia	BrR
	Prinia inornata	Plain Prinia	BrR
Zosteropidae	*Zosterops palpebrosus*	Oriental White-eye	BrR
Sylviidae	*Orthotomus sutorius*	Common Tailorbird	BrR
	Phylloscopus trochiloides	Greenish Warbler	WV
	Phylloscopus magnirostris	Large-billed Leaf Warbler	WV
	Pellorneum fuscocapillum	Sri Lanka Brown-capped Babbler	En

Family	Scientific name	English name	
	Pomatorhinus horsfieldii	Scimitar Babbler	En
	Dumetia hyperythra	Tawny-bellied Babbler	BrR
	Rhopocichla atriceps	Dark-fronted Babbler	BrR
	Chrysomma sinense	Yellow-eyed Babbler	BrR
	Turdoides affinis	Yellow-billed Babbler	BrR
Alaudidae	*Mirafra assamica*	Rufous-winged Bushlark	BrR
	Alauda gulgula	Oriental Skylark	BrR
Nectariniidae	*Dicaeum agile*	Thick-billed Flowerpecker	BrR
	Dicaeum erythrorhynchos	Pale-billed Flowerpecker	BrR
	Nectarina zeylonica	Purple-rumped Sunbird	BrR
	Nectarina asiatica	Purple Sunbird	BrR
	Nectarina lotenia	Loten's Sunbird	BrR
Passeridae	*Passer domesticus*	House Sparrow	BrR
	Dendronanthus indicus	Forest Wagtail	WV
	Motacilla cinerea	Grey Wagtail	WV
	Anthus rufulus	Paddyfield Pipit	BrR
	Ploceus philippinus	Baya Weaver	BrR
	Lonchura striata	White-rumped Munia	BrR
	Lonchura punctulata	Scaly-breasted Munia	BrR
	Lonchura malacca	Black-headed Munia	BrR
Picidae	*Dendrocopus nanus*	Brown-capped Pygmy Woodpecker	BrR
	Chrysocolaptes lucidus	Greater Flameback	BrR
Magalaimidae	*Megalaima zeylanica*	Brown-headed Barbet	BrR
	Megalaima flavifrons	Sri Lanka Yellow-fronted Barbet	En
	Megalaima rubricapilla	Crimson-fronted Barbet	En
	Megalaima haemacephala	Coppersmith Barbet	BrR
Psittacidae	*Loriculus beryllinus*^{TR}	Sri Lanka Hanging Parakeet	En
	Psittacula eupatria	Alexandrine Parakeet	BrR
	Psittacula krameri	Rose-ringed Parakeet	BrR
	Psittacula cyanocephala	Plum-headed Parakeet	BrR
Strigidae	*Ketupa zeylonensis*	Brown Fish Owl	BrR
Caprimulgidae	*Caprimulgus asiaticus*	Common Nightjar	BrR
En- endemic			
BrR - Breeding resident			
WV- winter vagrant			
TR - Threatened			

ANNEX 7: CHECKLIST OF MAMMALS OF MORAGAHAKNDA AREA

Family	Scientific name	Common name
Manidae	*Manis crassicaudata*	Pangolin
Soricidae	*Suncus murinus*	Common musk shrew
Hipposideridae	*Hipposideros galeritus*	Dekhan leaf-nosed bat
	Hipposideros speoris	Schneider's leaf-nosed bat
Pteropodidae	*Cynopterus sphinx*	Short-nosed fruit bat
	Pteropus giganteus	Flying fox
Vespertillionidae	*Pipistrellus coromandra*	Indian pipistrel
	Kerivoula picta	Painted bat
Cercopithecidae	*Macaca sinica* [E]	Sri Lanka toque monkey
	Semnopithecus priam	Grey langur
	Trachypithecus vetulus [E]	Purple-faced leaf monkey
Lorisidae	*Loris lydekkerianus*	Grey slender loris
Canidae	*Canis aureus*	Jackal
	Canis familiaris[D]	Domestic dog
Felidae	*Felis chaus*	Jungle cat
	Felis catus[D]	Domestic cat
	Panthera pardus	Leopard
	Prionailurus rubiginosus	Rusty-spotted cat
	Prionailurus viverrinus	Fishing cat
Herpestidae	*Herpestes edwardsii*	Grey mongoose
	Herpestes smithii	Ruddy mongoose
Mustelidae	*Lutra lutra*	Otter
Viverridae	*Paradoxurus hermaphoditus*	Palm cat
	Paradoxurus zeylonensis[E]	Sri Lanka golden palm cat
	Viverricula indica	Ring-tailed civet
Elephantidae	*Elephas maximus*	Elephant
Bovidae	*Bubalus arnee*[D]	Wild buffalo
	Bos indicus[D]	Domestic hump-backed cattle
Cervidae	*Axis axis*	Spotted deer
	Cervus unicolor	Sambur
	Muntiacus muntjak	Barking deer
Suidae	*Sus scrofa*	Wild boar
Tragulidae	*Moschiola meminna*[E]	Sri Lanka mouse-deer
Hystricidae	*Hystrix indica*	Porcupine
Muridae	*Bandicota indica*	Malabar bandicoot
	Mus booduga	Field mouse
	Rattus rattus	Common rat
	Vandeleuria oleracea	Long-tailed tree mouse
	Tatera indica	Antelope rat
Sciuridae	*Funambulus palmarum*	Palm squirrel
	Ratufa macroura	Giant squirrel
Leporidae	*Lepus nigricollis*	Black-naped hare

Family	Scientific name	Common name
E- Endemic , *D*- Domesticated		
TR- Threatened		

ANNEX 8: CHECKLIST OF BUTTERFLIES OF MORAGAHAKANDA

Family	Scientific name	Common name
Papilionidae	*Troides darsius*[E,TR]	Ceylon Birdwing
	Pachliopta hector	Crimson Rose
	Pachliopta aristolochiae	Common Rose
	Papilio crino	Banded Peacock
	Papilio demoleus	Lime Butterfly
	Papilio polytes	Common Mormon
	Papilio polymnestor	Blue Mormon
	Chilasa clytia	Mime
	Graphium agamemnon	Tailed Jay
	Graphium doson	Common Jay
	Pathysa nomius	Spot Swordtail
Pieridae	*Leptosia nina*	Psyche
	Delias eucharis	Jezebel
	Cepora nerissa	Common Gull
	Appias albina	Common Albatross
	Appias paulina[TR]	Lesser Albatross
	Appias libythea[TR]	Striped Albatross
	Ixias pyrene	Yellow Orange Tip
	Hebomoia glaucippe	Great Orange Tip
	Catopsilia pyranthe	Mottled Emigrant
	Catopsilia pomona	Lemon Emigrant
	Pareronia ceylanica	Dark Wanderer
	Eurema hecabe	Common Grass Yellow
	Eurema andersoni	One-spot Grass Yellow
	Eurema blanda	Three-spot Grass Yellow
Nymphalidae	*Tirumala limniace*	Blue Tiger
	Tirumala septentrionis	Dark Blue Tiger
	Parantica aglea	Glassy Tiger
	Danaus chrysippus	Plain Tiger
	Danaus genutia	Common Tiger
	Euploea core	Common crow
	Euploea sylvester	Double- banded Crow
	Euploea klugii	Brown King Crow
	Ariadne ariadne	Angled Castor
	Cethosia nietneri	Ceylon Lace Wing
	Cupha erymanthis	Rustic
	Cirrochroa thais	Yeoman
	Phalanta phalantha	Leopard
	Junonia lemonias	Lemon Pansy
	Junonia atlites	Grey Pansy
	Junonia iphita	Chocolate Soldier
	Junonia almana	Peacock Pansy
	Kallima philarchus[E,TR]	Blue Oakleaf

Family	Scientific name	Common name
	Neptis hylas	Common Sailor
	Neptis jumbah	Chestnut-streaked Sailor
	Moduza procris	Commander
	Dophla evelina	Red-spot duke
	Vindula erota	Cruiser
	Parthenos sylvia	Clipper
	Rohana parisatis	Black Prince
	Acraea violae	Tawny Costor
	Melanitis leda	Common Evening Brown
	Melanitis phedima	Dark Evening Brown
	Orsotriaena medus	Nigger
	Mycalesis visala	Tamil bush brown
	Nissanga patnia	Gladeye Bushbrown
	Ypthima ceylonica	White Four-ring
	Elymnias hypermnestra	Common Palmfly
Lycaenidae	*Arhopala amantes*[TR]	Large Oakblue
	Arhopala pseudocentaurus[TR]	Centaur Oakblue
	Zesius chrysomallus	Redspot
	Amblypodia anita	Purple Leafblue
	Loxura atymnus	Yamfly
	Rathinda amor	Monkey-puzzle
	Surendra vivarna	Common Acasia blue
	Spindasis ictis[TR]	Common Silverline
	Spindasis schistacea	Plumbeus Silverline
	Nacaduba sp.	
	Jamides celeno	Common Cerulean
	Jamides bochus	Dark Cerulean
	Catochrysops strabo	Forget-me-not
	Syntarucus plinius	Zebra Blue
	Castalius rosimon	Common Pierrot
	Discolampa ethion	Banded Blue Pierrot
	Freyeria trochilus	Grass Jewel
	Zizeeria karsandra	Dark Grass Blue
	Zizina otis[TR]	Lesser Grass Blue
	Zizula hylax	Tiny Grass Blue
	Megisba malaya	Malayan
	Neopithicops zalmora	Quaker
	Chilades pandava	Plains Cupid
	Lampides boeticus	Pea blue
	Chilades lajus	Lime Blue
	Actyolepis puspa	Common Hedge blue
	Abisara echerius	Plum Judy
Hesperiidae	*Hasora chromus*	Common-banded Awl
	Hasora taminatus[TR]	White-banded Awl
	Badamia exclamationis[TR]	Brown Awl

Family	Scientific name	Common name
	Caprona ransonnettii	Golden Angle
	Iambrix salsala	Chestnut Bob
	Tractrocera maevius	Common Grass Dart
	Ampittia dioscorides	Bush Hopper
	Sarangesa dasahara^{TR}	Common Small Flat
	Halpe ceylonica	Ceylon Ace
	Pelopidas sp.	
	Potanthus sp.	
E- Endemic		
TR - Threatened		

ANNEX 9: CHECKLIST OF FLORA OF MORAGAHAKANDA PROJECT AREA

	Key				
	Endemic	**EN**			
	Not Endemic	**NE**			
	Threatened	**TR**			
	Not Threatened	**NT**			
	Medicinal	**ME**			
	Not Medicinal	**NM**			
		Status			
Family	**Botanical name**	**Endemic**	**Threatened**	**Medicinal**	**Local Name**
Acanthaceae	*Andrographis alata*	NE	NT	NM	
Acanthaceae	*Andrographis paniculata*	NE	NT	ME	
Acanthaceae	*Barleria prionites*	NE	NT	ME	Katukarandu
Acanthaceae	*Blepharis madraspatensis*	NE	NT	NM	
Acanthaceae	*Eranthemum capense*	NE	NT	NM	
Acanthaceae	*Justicia adathoda*	NE	NT	ME	Adatoda
Acanthaceae	*Justicia procumbens*	NE	NT	ME	
Acanthaceae	*Lepidagathis fasciculata*	NE	NT	NM	
Acanthaceae	*Monothecium aristatum*	NE	NT	NM	
Acanthaceae	*Rhinacanthus nasutus*	NE	NT	ME	
Acanthaceae	*Rungia repens*	NE	NT	ME	
Acanthaceae	*Stenosiphonium cordifolium*	NE	NT	NM	Bu nelu
Aizoaceae	*Mollugo pentaphylla*	NE	NT	ME	
Amaranthaceae	*Achyranthes aspera*	NE	NT	ME	
Amaranthaceae	*Aerva lanata*	NE	NT	ME	Polpala
Amaranthaceae	*Allmania nodiflora*	NE	NT	NM	
Amaranthaceae	*Amaranthus spinosus*	NE	NT	ME	Katuthampala
Amaranthaceae	*Amaranthus tricolor*	NE	NT	ME	Thampala
Amaranthaceae	*Gomphrena celosioides*	NE	NT	NM	
Anacardiaceae	*Anacardium occidentale*	NE	NT	ME	Kaju
Anacardiaceae	*Mangifera indica*	NE	NT	ME	Amba
Anacardiaceae	*Mangifera zeylanica*	EN	NT	NM	Etaba
Anacardiaceae	*Nothopegia beddomei*	NE	NT	NM	Bala
Anacardiaceae	*Semecarpus nigro-viridis*	EN	NT	NM	Badulla
Anacardiaceae	*Spondias pinnata*	NE	NT	ME	
Annonaceae	*Alphonsea sclerocarpa*	NE	NT	NM	
Annonaceae	*Annona muricata*	NE	NT	ME	Anoda
Annonaceae	*Annona reticulata*	NE	NT	ME	Welianoda
Annonaceae	*Artabotrys zeylanicus*	NE	NT	NM	Kalubambarewel

Annonaceae	*Miliusa indica*	NE	NT	NM	Yabara
Annonaceae	*Polyalthia coffeoides*	NE	NT	NM	Patta-ulkenda
Annonaceae	*Polyalthia korinti*	NE	NT	NM	Ulkenda
Annonaceae	*Polyalthia longifolia*	NE	NT	ME	
Annonaceae	*Uvaria sphenocarpa*	EN	NT	NM	
Apocynaceae	*Alstonia macrophylla*	NE	NT	NM	Hawarinuga
Apocynaceae	*Alstonia scholaris*	NE	NT	ME	Ruk attana
Apocynaceae	*Carissa spinarum*	NE	NT	ME	Karamba
Apocynaceae	*Pagiantha dichotoma*	NE	NT	ME	
Apocynaceae	*Wrightia angustifolia*	EN	NT	NM	
Araceae	*Alocasia macrorrhiza*	NE	NT	ME	Habarala
Araceae	*Amorphophallus paeoniifolius*	NE	NT	ME	Kidaran
Araceae	*Cryptocoryne beckettii*	EN	TR	ME	Athu-udayang
Araceae	*Cryptocoryne walkeri*	EN	TR	ME	Athu-udayang
Araceae	*Lagenandra ovata*	NE	NT	ME	Ketela
Araceae	*Pothos scandens*	NE	NT	ME	Pota wel
Araliaceae	*Schefflera heterobotrya*	EN	NT	NM	
Arecaceae	*Areca catechu*	NE	NT	ME	Puwak
Arecaceae	*Borassus flabellifer*	NE	NT	ME	Thal
Arecaceae	*Calamus rotang*	NE	NT	ME	Wewel
Arecaceae	*Caryota urens*	NE	NT	ME	Kithul
Arecaceae	*Cocos nucifera*	NE	NT	ME	Pol
Arecaceae	*Phoenix pusilla*	NE	NT	ME	Walindi
Aristolochiaceae	*Aristolochia indica*	NE	NT	ME	Maduwel
Asclepiadaceae	*Calotropis gigantea*	NE	NT	ME	Wara
Asclepiadaceae	*Ceropegia candelabrum*	NE	TR	NM	
Asclepiadaceae	*Cosmostigma racemosa*	NE	TR	NM	Kiriwel
Asclepiadaceae	*Gymnema sylvestre*	NE	NT	ME	Mass badda
Asclepiadaceae	*Oxystelma esculentum*	NE	TR	NM	
Asclepiadaceae	*Pentatropis capensis*	NE	NT	NM	
Asclepiadaceae	*Tylophora indica*	NE	NT	ME	
Asclepiadaceae	*Wattakaka volubilis*	NE	NT	ME	Anguna
Asparagaceae	*Asparagus falcatus*	NE	NT	ME	Hathawariya
Asparagaceae	*Asparagus racemosus*	NE	NT	ME	Hathawariya
Asteraceae	*Ageratum conyzoides*	NE	NT	ME	Hulanthala
Asteraceae	*Emilia sonchifolia*	NE	NT	ME	
Asteraceae	*Eupatorium inulifolium*	NE	NT	NM	
Asteraceae	*Eupatorium odoratum*	NE	NT	NM	Podisinno
Asteraceae	*Eupatorium riparium*	NE	NT	NM	
Asteraceae	*Mikania cordata*	NE	NT	ME	Gahalawel
Asteraceae	*Synedrella nodiflora*	NE	NT	NM	
Asteraceae	*Tithonia diversifolia*	NE	NT	NM	Thiththa
Asteraceae	*Tridax procumbens*	NE	NT	NM	

Asteraceae	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya
Asteraceae	*Vernonia zeylanica*	EN	NT	ME	Pupula
Asteraceae	*Xanthium indicum*	NE	NT	ME	Uru kossa
Asteraceae	*Eclipta prostrata*	NE	NT	ME	
Balsaminaceae	*Impatiens balsamina*	NE	NT	ME	Koondalu
Bignoniaceae	*Stereospermum colais*	NE	NT	ME	
Bignoniaceae	*Tecoma stans*	NE	NT	NM	Kelanitissa
Bombacaceae	*Bombax ceiba*	NE	NT	ME	Katuimbul
Bombacaceae	*Ceiba pentandra*	NE	NT	ME	Kotta
Boraginaceae	*Carmona retusa*	NE	NT	ME	Heen tabala
Boraginaceae	*Coldenia procumbens*	NE	NT	NM	
Boraginaceae	*Cordia dichotoma*	NE	NT	ME	Lolu
Boraginaceae	*Cordia monoica*	NE	NT	NM	Lolu
Capparaceae	*Capparis rotundifolia*	NE	NT	NM	Balalpahuru
Capparaceae	*Capparis sepiaria*	NE	NT	NM	
Capparaceae	*Capparis zeylanica*	NE	NT	ME	Wellangiriya
Capparaceae	*Cleome viscosa*	NE	NT	ME	Wal aba
Capparaceae	*Crateva adansonii*	NE	NT	ME	Lunu warana
Caricaceae	*Carica papaya*	NE	NT	ME	Pepol
Celastraceae	*Cassine balae*	EN	NT	NM	Neralu
Celastraceae	*Pleurostylia opposita*	NE	NT	NM	Panakka
Clusiaceae	*Calophyllum bracteatum*	EN	NT	NM	Dombakeena
Clusiaceae	*Garcinia spicata*	NE	NT	ME	Gokatu
Clusiaceae	*Mesua ferrea*	NE	NT	ME	
Colchicaceae	*Gloriosa superba*	NE	NT	ME	Niyagala
Combretaceae	*Terminalia arjuna*	NE	NT	ME	Kumbuk
Combretaceae	*Terminalia catappa*	NE	NT	ME	
Commelinaceae	*Commelina diffusa*	NE	NT	ME	Girapala
Commelinaceae	*Commelina benghalensis*	NE	NT	NM	Girapala
Commelinaceae	*Commelina clavata*	NE	NT	NM	
Commelinaceae	*Cyanotis villosa*	NE	NT	NM	
Commelinaceae	*Murdanna esculenta*	NE	NT	NM	
Connaraceae	*Rourea minor*	NE	NT	ME	Radaliya
Convolvulaceae	*Argyreia populifolia*	EN	NT	ME	
Convolvulaceae	*Cuscuta chinensis*	NE	NT	ME	
Convolvulaceae	*Evolvulus alsinoides*	NE	NT	ME	Vishnukranthi
Convolvulaceae	*Ipomoea mauritiana*	NE	NT	ME	Kiribaduwel
Crassulaceae	*Kalanchoe pinnata*	NE	TR	ME	Akkapana
Cucurbitaceae	*Coccinia grandis*	NE	NT	ME	Kowakka
Cucurbitaceae	*Cucurbita mixima*	NE	NT	ME	Wattakka
Cucurbitaceae	*Trichosanthes cucumerina*	NE	NT	ME	Dumella
Cycadaceae	*Cycas circinalis*	NE	NT	ME	Madu
Cyperaceae	*Bulbostylis barbata*	NE	NT	NM	

Cyperaceae	*Bulbostylis densa*	NE	NT	NM	
Cyperaceae	*Carex lateralis*	NE	NT	NM	
Cyperaceae	*Cyperus cinnamometorum*	NE	NT	NM	
Cyperaceae	*Cyperus compactus*	NE	NT	NM	
Cyperaceae	*Cyperus difformis*	NE	NT	NM	
Cyperaceae	*Cyperus rotundus*	NE	NT	ME	Kalanduru
Cyperaceae	*Cyperus triceps*	NE	NT	NM	
Cyperaceae	*Fimbristylis falcata*	NE	NT	NM	
Cyperaceae	*Fuirena capitata*	NE	NT	NM	
Cyperaceae	*Scleria lithosperma*	NE	NT	NM	
Dilleniaceae	*Dillenia indica*	NE	NT	ME	Hodapollan
Dioscoreaceae	*Dioscorea pentaphylla*	NE	NT	NM	Katuala
Dioscoreaceae	*Dioscorea tomentosa*	NE	NT	NM	Uyala
Dioscoreaceae	*Dioscorea trimenii*	EN	TR	NM	Katuala
Dioscoreaceae	*Trichopus zeylanicus*	NE	NT	ME	
Ebenaceae	*Diospyros affinis*	NE	NT	NM	
Ebenaceae	*Diospyros ebenoides*	EN	TR	NM	Yabara
Ebenaceae	*Diospyros ebenum*	NE	TR	NM	Kaluwara
Ebenaceae	*Diospyros malabarica*	NE	NT	ME	Tibiri
Ebenaceae	*Diospyros oocarpa*	NE	NT	NM	Kalukudumberiya
Ebenaceae	*Diospyros ovalifolia*	NE	NT	NM	Kunumella
Ebenaceae	*Diospyros sylvatica*	NE	NT	NM	Kaluwa
Ebenaceae	*Maba buxifolia*	NE	NT	NM	Jabara
Erythroxylaceae	*Erythroxylum monogynum*	NE	NT	ME	Batakirilla
Euphorbiaceae	*Acalypha indica*	NE	NT	ME	Kuppameniya
Euphorbiaceae	*Antidesma alexiteria?*	NE	NT	NM	
Euphorbiaceae	*Bridelia retusa*	NE	NT	ME	Ketakela
Euphorbiaceae	*Croton aromaticus*	NE	NT	NM	Wal keppettiya
Euphorbiaceae	*Croton laccifer*	NE	NT	ME	Gas Keppetiya
Euphorbiaceae	*Croton officinalis*	NE	NT	NM	
Euphorbiaceae	*Croton thwaitesianus*	NE	NT	NM	
Euphorbiaceae	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna
Euphorbiaceae	*Drypetes gardneri*	EN	NT	NM	Eta wira
Euphorbiaceae	*Drypetes sepiaria*	NE	NT	NM	Weera
Euphorbiaceae	*Euphorbia antiquorum*	NE	NT	ME	Daluk
Euphorbiaceae	*Euphorbia heterophylla*	NE	NT	ME	Kapunkeeriya
Euphorbiaceae	*Euphorbia hirta*	NE	NT	ME	
Euphorbiaceae	*Euphorbia tirucalli*	NE	NT	ME	Nawa handi
Euphorbiaceae	*Fahrenheitia zeylanica*	NE	NT	NM	
Euphorbiaceae	*Flueggea leucopyrus*	NE	NT	NM	Katupila
Euphorbiaceae	*Jatropha curcas*	NE	NT	ME	Wetaendaru
Euphorbiaceae	*Macaranga peltata*	NE	NT	ME	Kenda
Euphorbiaceae	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta

Euphorbiaceae	*Mallotus philippensis*	NE	NT	ME	Hampirilla
Euphorbiaceae	*Mallotus resinosus*	NE	NT	NM	
Euphorbiaceae	*Mallotus rhamnifolius*	NE	NT	NM	
Euphorbiaceae	*Mallotus tetracoccus*	NE	NT	NM	Bukenda
Euphorbiaceae	*Manihot glaziovii*	NE	NT	NM	Walrubber
Euphorbiaceae	*Margaritaria indicus*	NE	NT	NM	Karau
Euphorbiaceae	*Mischodon zeylanicus*	NE	NT	NM	Tammanua
Euphorbiaceae	*Phyllanthus amarus*	NE	NT	ME	
Euphorbiaceae	*Phyllanthus debilis*	NE	NT	ME	
Euphorbiaceae	*Phyllanthus maderaspatensis*	NE	NT	ME	
Euphorbiaceae	*Phyllanthus myrtifolius*	EN	NT	NM	
Euphorbiaceae	*Phyllanthus niriuri*	NE	NT	ME	Pitawakka
Euphorbiaceae	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya
Euphorbiaceae	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka
Euphorbiaceae	*Ricinus communis*	NE	NT	ME	Endaru
Euphorbiaceae	*Sauropus bacciformis*	NE	NT	NM	
Fabaceae	*Abrus precatorius*	NE	NT	ME	
Fabaceae	*Acacia caesia*	NE	NT	NM	Hinguru
Fabaceae	*Acacia chundra*	NE	NT	ME	Diyahinguru
Fabaceae	*Acacia pennata*	NE	NT	NM	
Fabaceae	*Adenanthera pavonina*	NE	NT	ME	Madatiya
Fabaceae	*Albizia chinensis*	NE	NT	NM	Kabalmara
Fabaceae	*Albizia lebbeck*	NE	NT	ME	Kabalmara
Fabaceae	*Alysicarous vaginalis*	NE	NT	NM	
Fabaceae	*Atylosia trinervia*	NE	NT	ME	Aththora
Fabaceae	*Bauhinia racemosa*	NE	NT	ME	Maila
Fabaceae	*Bauhinia tomentosa*	NE	NT	ME	
Fabaceae	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila
Fabaceae	*Cassia auriculata*	NE	NT	ME	Rana-wara
Fabaceae	*Cassia fistula*	NE	NT	ME	Ehela
Fabaceae	*Cassia kleinii*	NE	NT	NM	
Fabaceae	*Cassia occidatalis*	NE	NT	ME	
Fabaceae	*Cassia roxburghii*	NE	NT	NM	Rathuwa
Fabaceae	*Cassia spectabilis*	NE	NT	NM	Kahakona
Fabaceae	*Cassia tora*	NE	NT	ME	
Fabaceae	*Clitoria ternatea*	NE	NT	ME	Katarodu
Fabaceae	*Crotalaria laburnifolia*	NE	NT	ME	Yakberiya
Fabaceae	*Crotalaria pallida*	NE	NT	NM	Andanaheeriya
Fabaceae	*Crotalaria verrucosa*	NE	NT	ME	Andanaheeriya
Fabaceae	*Derris parviflora*	EN	NT	NM	Kala wel
Fabaceae	*Derris scandens*	NE	NT	ME	Kala wel
Fabaceae	*Desmodium heterophyllum*	NE	NT	ME	Maha undu piyaliya
Fabaceae	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali

Fabaceae	*Dichrostachys cinera*	NE	NT	ME	Andara
Fabaceae	*Entada phaseoloides*	NE	NT	ME	Puswel
Fabaceae	*Erythrina variegata*	NE	NT	ME	
Fabaceae	*Gliricidia sepium*	NE	NT	NM	Wetahira
Fabaceae	*Indigofera tinctoria*	NE	NT	ME	
Fabaceae	*Mimosa pigra*	NE	NT	NM	
Fabaceae	*Mimosa pudica*	NE	NT	ME	Nidi kumba
Fabaceae	*Pongamia pinnata*	NE	NT	ME	Gal karada
Fabaceae	*Samanea saman*	NE	NT	NM	Mara
Fabaceae	*Tamarindus indica*	NE	NT	ME	Siyambala
Fabaceae	*Tephrosia purpurea*	NE	NT	ME	Gam pila
Flacourtiaceae	*Flacourtia indica*	NE	NT	ME	Uguressa
Flacourtiaceae	*Hydnocarpus venenata*	EN	NT	ME	Makulla
Flacourtiaceae	*Scolopia acuminata*	NE	NT	NM	Katukenda
Hippocrateaceae	*Salacia oblonga*	NE	TR	ME	Himbutu
Hippocrateaceae	*Salacia reticulata*	NE	TR	ME	Kotala hibutu
Hypoxidaceae	*Curculigo orchioides*	NE	NT	ME	Bimthal
Hypoxidaceae	*Molineria trichocarpa*	NE	NT	NM	Maha bin tal
Lamiaceae	*Hyptis suaveolens*	NE	NT	NM	
Lamiaceae	*Leonitis neptifolia*	NE	NT	ME	
Lamiaceae	*Leucas zeylanica*	NE	NT	ME	Gata tumba
Lamiaceae	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala
Lauraceae	*Alseodaphne semecarpifolia*	NE	NT	NM	
Lauraceae	*Litsea glutinosa*	NE	NT	ME	Bomi
Lauraceae	*Neolitsea cassia*	NE	NT	ME	Kududavula
Lauraceae	*Persea americana*	NE	NT	ME	Alipera
Lecythidaceae	*Careya arborea*	NE	NT	ME	Kahata
Leeaceae	*Leea indica*	NE	NT	ME	Burulla
Liliaceae	*Allium cipa*	NE	NT	ME	
Liliaceae	*Crinum asiaticum*	NE	NT	ME	Tholabo
Liliaceae	*Sensevieria zeylanica*	NE	NT	ME	Niyanda
Limnocharitaceae	*Limnocharis flava*	NE	NT	NM	Diyagowa
Linaceae	*Hugonia mystax*	NE	NT	ME	Bu gettiya
Loganiaceae	*Strychnos nux-vomica*	NE	NT	ME	Goda kaduru
Loganiaceae	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba
Loranthaceae	*Dendrophthoe falcata*	NE	NT	ME	Ehetu
Loranthaceae	*Scurrula parasitica*	NE	NT	NM	
Malpighiaceae	*Hiptage benghalensis*	NE	NT	ME	Puwak gedia wel
Malpighiaceae	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel
Malvaceae	*Abutilon hirtum*	NE	NT	ME	Walanoda
Malvaceae	*Abutilon indicum*	NE	NT	ME	Walanoda
Malvaceae	*Gossypium arboreum*	NE	NT	ME	Kapu
Malvaceae	*Hibiscus eriocarpus*	NE	NT	ME	

Malvaceae	*Hibiscus rosa-sinensis*	NE	NT	ME	
Malvaceae	*Pavonia odorata*	NE	NT	ME	
Malvaceae	*Sida acuta*	NE	NT	ME	Bevila
Malvaceae	*Sida cordata*	NE	NT	NM	
Malvaceae	*Sida cordifolia*	NE	NT	ME	Sudubevila
Malvaceae	*Thespesia populnea*	NE	NT	ME	Gansooria
Malvaceae	*Urena lobata*	NE	NT	NM	Pattaepala
Melastomataceae	*Memecylon capitellatum*	EN	NT	ME	Korakaha
Melastomataceae	*Memecylon umbellatum*	NE	NT	ME	Korakaha
Melastomataceae	*Osbeckia aspera*	NE	NT	ME	Bovitiya
Meliaceae	*Aglaia elaeagnoidea*	NE	NT	ME	
Meliaceae	*Azadirachta indica*	NE	NT	ME	Kohomba
Meliaceae	*Chukrasia velutina*	NE	NT	NM	Barawahik
Meliaceae	*Melia azedarachta*	NE	NT	ME	Lunumidella
Meliaceae	*Munronia pinnata*	EN	NT	ME	Binkohomba
Meliaceae	*Walsura trifoliolata*	NE	NT	NM	Kiri kon
Menispermaceae	*Anamirta cocculus*	NE	NT	ME	Thiththawel
Menispermaceae	*Cissampelos pareira*	NE	NT	ME	
Menispermaceae	*Cyclea burmanni*	NE	NT	ME	Kesibissan
Menispermaceae	*Pachygone ovata*	NE	NT	NM	
Menispermaceae	*Tinospora cordifolia*	NE	NT	ME	Rasakinda
Molluginaceae	*Glinus oppositifolia*	NE	NT	NM	Walpathpadagam
Moraceae	*Artocarpus heterophyllus*	NE	NT	ME	Kos
Moraceae	*Artocarpus nobilis*	NE	NT	NM	Del
Moraceae	*Castilla elastica*	NE	NT	NM	
Moraceae	*Dorstenia indica*	NE	NT	NM	
Moraceae	*Ficus amplissima*	NE	NT	NM	
Moraceae	*Ficus arnottiana*	NE	NT	NM	Kaputubo
Moraceae	*Ficus benghalensis*	NE	NT	ME	Mahanuga
Moraceae	*Ficus caulocarpa*	NE	NT	NM	
Moraceae	*Ficus drupacea*	NE	NT	NM	
Moraceae	*Ficus hispida*	NE	NT	ME	Kotadimbula
Moraceae	*Ficus parasitica*	NE	NT	NM	
Moraceae	*Ficus racemosa*	NE	NT	ME	Attikka
Moraceae	*Ficus religiosa*	NE	NT	ME	Bo
Moraceae	*Plecospermum spinosum*	NE	NT	ME	Thingol
Moraceae	*Streblus asper*	NE	NT	ME	Netul
Moraceae	*Streblus taxoides*	NE	NT	ME	Gongotu
Moringaceae	*Moringa oleifera*	NE	NT	ME	Murunga
Musaceae	*Musa acuminata*	NE	NT	ME	Kesel
Myristicaceae	*Myristica ceylanica*	NE	NT	ME	Malaboda
Myrsinaceae	*Ardisia missionis*	NE	NT	NM	Baludan
Myrtaceae	*Eugenia bracteata*	NE	NT	ME	Tembiliya

Myrtaceae	*Psidium guajava*	NE	NT	ME	Pera
Myrtaceae	*Syzygium cumini*	NE	NT	ME	Madan
Myrtaceae	*Syzygium spathulatum*	EN	TR	NM	Kanu
Ochnaceae	*Gomphia serrata*	NE	NT	NM	Bo keera
Ochnaceae	*Ochna jabotapita*	EN	NT	ME	Mal kera
Oleaceae	*Chionanthus zeylanica*	NE	NT	NM	
Oleaceae	*Jasminum angustifolium*	NE	NT	ME	Walpichcha
Oleaceae	*Jasminum flexile*	NE	NT	NM	
Onagraceae	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla
Orchidaceae	*Cymbidium bicolor*	NE	NT	NM	
Orchidaceae	*Dendrobium macrostachyum*	NE	NT	NM	
Orchidaceae	*Epipogium roseum*	NE	TR	NM	
Orchidaceae	*Habenaria plantaginea*	NE	NT	NM	
Orchidaceae	*Vanda tessellata*	NE	TR	ME	
Oxalidaceae	*Oxalis corniculata*	NE	NT	ME	Heen ambiliya
Pandanaceae	*Pandanus ceylanicus*	EN	NT	ME	Wetake
Passifloraceae	*Passiflora edulis*	NE	NT	ME	
Pedaliaceae	*Martynia annua*	NE	NT	ME	Nagadarana
Periplocaceae	*Hemidesmus indicus*	NE	NT	ME	Iramusu
Piperaceae	*Piper longum*	NE	NT	ME	Gammiris
Piperaceae	*Piper sylvestre*	NE	NT	NM	Walgammiris
Plumbaginaceae	*Plumbago zeylanica*	NE	NT	ME	Elanithul
Poaceae	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana
Poaceae	*Aristida setaceae*	NE	NT	NM	Et-tuttiri
Poaceae	*Bambusa bambos*	NE	NT	NM	Katu-una
Poaceae	*Bothriochloa pertusa*	NE	NT	NM	
Poaceae	*Chloris barbata*	NE	NT	NM	
Poaceae	*Cymbopogon nardus*	NE	NT	ME	Mana
Poaceae	*Cynodon dactylon*	NE	NT	ME	Belathana
Poaceae	*Cyrtococcum trigonum*	NE	NT	NM	
Poaceae	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana
Poaceae	*Dichaetaria wightii*	NE	NT	NM	
Poaceae	*Digitaria longiflora*	NE	NT	NM	
Poaceae	*Digitaria tomentosa*	NE	NT	NM	
Poaceae	*Dimeria avenacea*	NE	NT	NM	
Poaceae	*Echinochloa colona*	NE	NT	NM	
Poaceae	*Eragrostis atrovirens*	NE	NT	NM	
Poaceae	*Eragrostis ciliaris*	NE	NT	NM	
Poaceae	*Eragrostis gangetica*	NE	NT	NM	
Poaceae	*Eragrostis japonica*	NE	NT	NM	
Poaceae	*Eragrostis nutans*	NE	NT	NM	
Poaceae	*Eragrostis riparia*	NE	NT	NM	
Poaceae	*Eragrostis unioloides*	NE	NT	NM	

Poaceae	*Imperata cylindrica*	NE	NT	ME	Illuk
Poaceae	*Ischaemum barbatum*	NE	NT	NM	
Poaceae	*Ischaemum ciliare*	NE	NT	NM	
Poaceae	*Leptochloa neesii*	NE	NT	NM	Ashwawalige
Poaceae	*Oryza sativa*	NE	NT	ME	Wee
Poaceae	*Panicum maximum*	NE	NT	NM	
Poaceae	*Panicum repens*	NE	NT	ME	Etora
Poaceae	*Paspalidium geminatum*	NE	NT	NM	
Poaceae	*Paspalidium punctatum*	NE	NT	NM	
Poaceae	*Paspalum scrobiculatum*	NE	NT	NM	
Poaceae	*Pennisetum purpureum*	NE	NT	NM	
Poaceae	*Sacciolepis indica*	NE	NT	NM	
Poaceae	*Sporobolus diander*	NE	NT	NM	
Poaceae	*Sporobolus tremulus*	NE	NT	NM	
Poaceae	*Stenotaphrum dimidiatum*	NE	NT	NM	
Poaceae	*Zea mays*	NE	NT	ME	Badahinguru
Polygalaceae	*Polygala chinensis*	NE	NT	ME	
Polygalaceae	*Polygala javana*	NE	NT	NM	
Polygonaceae	*Antigonon leptopus*	NE	NT	NM	
Polypodiaceae	*Drynaria quarcifolia*	NE	NT	ME	Beduru
Polypodiaceae	*Hemionites arifolia*	NE	NT	NM	Uruhonda
Pontederiaceae	*Monochoria hastata*	NE	NT	NM	Diyahabarala
Punicaceae	*Punica granatum*	NE	NT	ME	Delum
Rhamnaceae	*Scutia myrtina*	NE	NT	NM	
Rhamnaceae	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel
Rhamnaceae	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya
Rhamnaceae	*Ziziphus rugosa*	NE	NT	ME	Maha eraminiya
Rhizophoraceae	*Carallia brachiata*	NE	NT	NM	
Rhizophoraceae	*Cassipourea ceylanica*	NE	NT	NM	
Rubiaceae	*Adina cordifolia*	NE	NT	ME	Kolon
Rubiaceae	*Benkara malabarica*	NE	NT	NM	
Rubiaceae	*Canthium coromandelicum*	NE	NT	ME	Kara
Rubiaceae	*Canthium dicoccum*	NE	NT	NM	
Rubiaceae	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna
Rubiaceae	*Discospermum sphaerocarpum*	NE	NT	NM	
Rubiaceae	*Haldina cordifolia*	NE	NT	ME	
Rubiaceae	*Hedyotis fruticosa*	NE	NT	ME	Weraniya
Rubiaceae	*Ixora coccinea*	NE	NT	ME	Ratabala
Rubiaceae	*Ixora jucunda*	EN	NT	NM	
Rubiaceae	*Ixora pavetta*	NE	NT	NM	
Rubiaceae	*Knoxia hirsuta*	EN	NT	NM	
Rubiaceae	*Mitragyna parvifolia*	NE	NT	ME	Helamba
Rubiaceae	*Morinda tinctoria*	EN	NT	ME	Ahu

Rubiaceae	*Morinda umbellata*	EN	NT	ME	Ahu
Rubiaceae	*Mussaenda frondosa*	NE	NT	ME	Mussanda
Rubiaceae	*Nauclea orientalis*	NE	NT	ME	Bakmee
Rubiaceae	*Oldenlandia umbellata*	NE	NT	ME	
Rubiaceae	*Ophiorhiza mungos*	NE	NT	ME	Dathketiya
Rubiaceae	*Psilanthus wightianus*	NE	NT	NM	
Rubiaceae	*Spermacoce hispida*	NE	NT	NM	
Rubiaceae	*Tarenna asiatica*	NE	NT	ME	Tharana
Rutaceae	*Acronychia pedunculata*	NE	NT	ME	Ankenda
Rutaceae	*Aegle marmelos*	NE	NT	ME	Beli
Rutaceae	*Atalantia ceylanica*	NE	NT	ME	Yakdehi
Rutaceae	*Chloroxylon swietenia*	NE	NT	NM	Burutha
Rutaceae	*Citrus aurantifolia*	NE	NT	ME	Dehi
Rutaceae	*Citrus reticulata*	NE	NT	ME	Jamanaran
Rutaceae	*Citrus sp.*	NE	NT	ME	Waldehi
Rutaceae	*Clausena indica*	NE	NT	ME	Walkarapincha
Rutaceae	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana
Rutaceae	*Glycosmis pentaphylla*	NE	NT	ME	
Rutaceae	*Limonia acidissima*	NE	NT	ME	divul
Rutaceae	*Murraya koenigii*	NE	NT	ME	
Rutaceae	*Murraya paniculata*	NE	NT	ME	Etteriya
Rutaceae	*Paramignya monophylla*	NE	NT	ME	
Rutaceae	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu
Rutaceae	*Toddalia asiatica*	NE	NT	ME	Kudu miris
Sapindaceae	*Allophylus cobbe*	NE	NT	ME	
Sapindaceae	*Cardiospermum canescens*	NE	NT	NM	Penela
Sapindaceae	*Cardiospermum halicacabum*	NE	NT	NM	Penela
Sapindaceae	*Dimocarpus longan*	NE	NT	ME	Mora
Sapindaceae	*Dodonaea viscosa*	NE	NT	NM	Hupala
Sapindaceae	*Filicium decipiens*	NE	NT	NM	Pihimbiya
Sapindaceae	*Glenniea unijuga*	EN	NT	NM	Wal mora
Sapindaceae	*Harpullia arborea*	NE	NT	NM	
Sapindaceae	*Lepisanthes sanegalensis*	NE	NT	NM	
Sapindaceae	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela
Sapindaceae	*Pometia pinata*	NE	NT	NM	
Sapindaceae	*Sapindus emarginatus*	NE	NT	NM	Gaspenela
Sapindaceae	*Schleichera oleosa*	NE	NT	ME	Kon
Sapotaceae	*Madhuca longifolia*	NE	NT	ME	Mee
Sapotaceae	*Manilkara hexandra*	NE	NT	ME	Palu
Sapotaceae	*Mimusops elengi*	NE	NT	ME	Muna mal
Sapotaceae	*Pouteria campechiana*	NE	NT	NM	Sapadilla
Schizaeaceae	*Lygodium flexuosum*	NE	NT	NM	Pambawel
Scrophulariaceae	*Bacopa monnieri*	NE	NT	ME	Lunuwila

Scrophulariaceae	*Centranthera indica*	NE	NT	ME	Dutusathutu
Solanaceae	*Capsicum annuum*	NE	NT	ME	Miris
Solanaceae	*Datura metel*	NE	NT	ME	Attana
Solanaceae	*Nicotiana tabacum*	NE	NT	ME	Dunkola
Solanaceae	*Solanum indicum*	NE	NT	ME	kalukamberia
Solanaceae	*Solanum melongena*	NE	NT	ME	Elabatu
Solanaceae	*Solanum seaforthianum*	NE	NT	NM	
Sterculiaceae	*Helicteres isora*	NE	NT	ME	Liniya
Sterculiaceae	*Pterospermum suberifolium*	NE	NT	ME	Welan
Sterculiaceae	*Theobroma cacao*	NE	NT	ME	
Tiliaceae	*Berrya cordifolia*	NE	NT	NM	Halmilla
Tiliaceae	*Grewia carpinifolia*	NE	NT	NM	
Tiliaceae	*Grewia damine*	NE	NT	ME	Daminiya
Tiliaceae	*Grewia microcos*	NE	NT	NM	Keliya
Tiliaceae	*Grewia orientalis*	NE	NT	NM	Welkeliya
Tiliaceae	*Grewia rothii*	NE	NT	NM	Boradamaniya
Tiliaceae	*Muntingia calabura*	NE	NT	NM	Jam
Ulmaceae	*Celtis cinnamomea*	NE	NT	ME	Gurenda
Ulmaceae	*Holoptelea integrifolia*	NE	NT	ME	Goda kirilla
Ulmaceae	*Trema orientale*	NE	NT	ME	Gedumba
Urticaceae	*Laportea bulbifera*	NE	NT	NM	Walkahambiliya
Verbenaceae	*Clerodendrum infortunatum*	NE	NT	ME	Pinna
Verbenaceae	*Clerodendrum phlomidis*	NE	NT	ME	Pinna
Verbenaceae	*Gmelina asiatica*	NE	NT	ME	Demata
Verbenaceae	*Lantana camara*	NE	NT	ME	Hinguru
Verbenaceae	*Premna tomentosa*	NE	NT	ME	Boo seru
Verbenaceae	*Stachytarpheta indica*	NE	NT	NM	Balunaguta
Verbenaceae	*Stachytarpheta jamaicansis*	NE	NT	NM	Balunaguta
Verbenaceae	*Stachytarpheta urticifolia*	NE	NT	NM	Balunaguta
Verbenaceae	*Tectona grandis*	NE	NT	ME	Tekka
Verbenaceae	*Vitex altissima*	NE	NT	ME	Milla
Verbenaceae	*Vitex leucoxylon*	NE	NT	ME	Nebada
Verbenaceae	*Vitex negundo*	NE	NT	ME	
Viscaceae	*Viscum nepalense*	NE	NT	NM	
Vitaceae	*Cissus heyneana*	NE	NT	NM	Diyalabu
Vitaceae	*Cissus quadrangularis*	NE	NT	ME	Heeressa
Vitaceae	*Cissus vitiginea*	NE	NT	NM	
Zingiberaceae	*Alpinia biflora*	NE	NT	NM	
Zingiberaceae	*Curcuma zedoaria*	NE	NT	ME	Harankaha
Zingiberaceae	*Zingiber officinale*	NE	NT	ME	Inguru

Summary of Flora

Status		Species count
Endemic, threatened & medicinal		2
Endemic, threatened & not-medicinal		3
Endemic, not-threatened & medicinal		10
Non-endemic, threatened & medicinal		4
Endemic, non-threatened & not-medicinal		14
Non-endemic, threatened & not-medicinal		5
Non-endemic, not-threatened & medicinal		245
Non-endemic, not-threatened & not-medicinal		173
	Total species	456
	Total families	95
	Total endemic plant species	29
	Total threatened plant species	14
	Total medicinal plant species	261

ANNEX 10 – FLORA OF MORAGAHAKANDA PROJECT AREA – SPECIES, LOCATION AND ECOLOGICAL PARAMETERS

		Key:		Group	Status				Species counts		
		AGL	Agricultural lands	**A**	Endemic, threatened & medicinal				2		
		DEF	Dry mixed evergreen forests	**B1**	Endemic, threatened & not-medicinal				3		
		DZ	Dry zone	**B2**	Endemic, not-threatened & medicinal				10		
		EN	Endemic	**B3**	Non-endemic, threatened & medicinal				4		
		GRL	Grasslands (Sanannah)	**C1**	Endemic, non-threatened & not-medicinal				14		
		IZ	Intermediate zone	**C2**	Non-endemic, threatened & not-medicinal				5		
		ME	Medicinal	**C3**	Non-endemic, not-threatened & medicinal				245		
		MEF	Moist evergreen forests	**D**	Non-endemic, not-threatened & not-medicinal				173		
		NE	Not endemic			Total species			456		
		NM	Not medicinal			Total families			95		
		NT	Not threatened			Total endemic plant species			29		
		RVF	Riverine forests			Total threatened plant species			14		
		SCR	Thorn forests (scrublands)			Total medicinal plant species			261		
		TR	Threatened								
					Status						
Location code	Climatic zone	Habitat code	Habitat type	Botanical name	Endemic	Threatened	Medicinal	Local Name	Family	Group	
1	DZ	RVF	Riverine forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
1	DZ	RVF	Riverine forests	*Cryptocoryne beckettii*	EN	TR	ME	Athu-udayang	Araceae	A	
1	DZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	

1	DZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
1	DZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
1	DZ	RVF	Riverine forests	*Cyperus triceps*	NE	NT	NM		Cyperaceae	D	
1	DZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
1	DZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
1	DZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
1	DZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
1	DZ	RVF	Riverine forests	*Leptochloa neesii*	NE	NT	NM	Ashwawalige	Poaceae	D	
1	DZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
1	DZ	RVF	Riverine forests	*Stenotaphrum dimidiatum*	NE	NT	NM		Poaceae	D	
1	DZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
1	DZ	RVF	Riverine forests	*Knoxia hirsuta*	EN	NT	NM		Rubiaceae	C1	
1	DZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
1	DZ	RVF	Riverine forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Monothecium aristatum*	NE	NT	NM		Acanthaceae	D	
2	DZ	DEF	Dry mixed evergreen forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Cordia monoica*	NE	NT	NM	Lolu	Boraginaceae	D	
2	DZ	DEF	Dry mixed evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
2	DZ	DEF	Dry mixed evergreen forests	*Maba buxifolia*	NE	NT	NM	Jabara	Ebenaceae	D	
2	DZ	DEF	Dry mixed evergreen forests	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
2	DZ	DEF	Dry mixed evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Crinum asiaticum*	NE	NT	ME	Tholabo	Liliaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	
2	DZ	DEF	Dry mixed evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Azadirachta indica*	NE	NT	ME	Kohomba	Meliaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	

2	DZ	DEF	Dry mixed evergreen forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
2	DZ	DEF	Dry mixed evergreen forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
2	DZ	DEF	Dry mixed evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
3	DZ	DEF	Dry mixed evergreen forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
3	DZ	DEF	Dry mixed evergreen forests	*Maba buxifolia*	NE	NT	NM	Jabara	Ebenaceae	D	
3	DZ	DEF	Dry mixed evergreen forests	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
3	DZ	DEF	Dry mixed evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
3	DZ	DEF	Dry mixed evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Azadirachta indica*	NE	NT	ME	Kohomba	Meliaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Dichaetaria wightii*	NE	NT	NM		Poaceae	D	
3	DZ	DEF	Dry mixed evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Clausena indica*	NE	NT	ME	Walkarapincha	Rutaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
3	DZ	DEF	Dry mixed evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Aerva lanata*	NE	NT	ME	Polpala	Amaranthaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Gomphrena celosioides*	NE	NT	NM		Amaranthaceae	D	

4	DZ	GRL	Grasslands (Savannah)	*Calotropis gigantea*	NE	NT	ME	Wara	Asclepiadaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Emilia sonchifolia*	NE	NT	ME		Asteraceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Tridax procumbens*	NE	NT	NM		Asteraceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Eclipta prostrata*	NE	NT	ME		Asteraceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Eclipta prostrata*	NE	NT	ME	Kikiridi	Asteraceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Coldenia procumbens*	NE	NT	NM		Boraginaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Capparis sepiaria*	NE	NT	NM		Capparaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Bulbostylis densa*	NE	NT	NM		Cyperaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Alysicarous vaginalis*	NE	NT	NM		Fabaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Sida cordata*	NE	NT	NM		Malvaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Glinus oppositifolia*	NE	NT	NM	Walpathpadagam	Molluginaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Chloris barbata*	NE	NT	NM		Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Digitaria longiflora*	NE	NT	NM		Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Dimeria avenacea*	NE	NT	NM		Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Echinochloa colona*	NE	NT	NM		Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Eragrostis atrovirens*	NE	NT	NM		Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Imperata cylindrica*	NE	NT	ME	Illuk	Poaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Ischaemum ciliare*	NE	NT	NM		Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Panicum repens*	NE	NT	ME	Etora	Poaceae	C3	
4	DZ	GRL	Grasslands (Savannah)	*Paspalum scrobiculatum*	NE	NT	NM		Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Sacciolepis indica*	NE	NT	NM		Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Sporobolus diander*	NE	NT	NM		Poaceae	D	
4	DZ	GRL	Grasslands (Savannah)	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	

4	DZ	GRL	Grasslands (Savannah)	*Spermacoce hispida*	NE	NT	NM		Rubiaceae	D	
5	DZ	DEF	Dry mixed evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
5	DZ	DEF	Dry mixed evergreen forests	*Phoenix pusilla*	NE	NT	ME	Walindi	Arecaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
5	DZ	DEF	Dry mixed evergreen forests	*Pleurostylia opposita*	NE	NT	NM	Panakka	Celastraceae	D	
5	DZ	DEF	Dry mixed evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
5	DZ	DEF	Dry mixed evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
5	DZ	DEF	Dry mixed evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
5	DZ	DEF	Dry mixed evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Flacourtia indica*	NE	NT	ME	Uguressa	Flacourtiaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
5	DZ	DEF	Dry mixed evergreen forests	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Ficus benghalensis*	NE	NT	ME	Mahanuga	Moraceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Ficus benghalensis*	NE	NT	ME	Mahanuga	Moraceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
5	DZ	DEF	Dry mixed evergreen forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
5	DZ	DEF	Dry mixed evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Pentatropis capensis*	NE	NT	NM		Asclepiadaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Asparagus racemosus*	NE	NT	ME	Hathawariya	Asparagaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Emilia sonchifolia*	NE	NT	ME		Asteraceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Tridax procumbens*	NE	NT	NM		Asteraceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	

6	DZ	GRL	Grasslands (Savannah)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Cleome viscosa*	NE	NT	ME	Wal aba	Capparaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Evolvulus alsinoides*	NE	NT	ME	Vishnukranthi	Convolvulaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Bulbostylis barbata*	NE	NT	NM		Cyperaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Euphorbia hirta*	NE	NT	ME		Euphorbiaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Clitoria ternatea*	NE	NT	ME	Katarodu	Fabaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Abutilon hirtum*	NE	NT	ME	Walanoda	Malvaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Pavonia odorata*	NE	NT	ME		Malvaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Sida cordata*	NE	NT	NM		Malvaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	
6	DZ	GRL	Grasslands (Savannah)	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Azadirachta indica*	NE	NT	ME	Kohomba	Meliaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
6	DZ	GRL	Grasslands (Savannah)	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Bothriochloa pertusa*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Chloris barbata*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Digitaria longiflora*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Echinochloa colona*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Eragrostis ciliaris*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Eragrostis gangetica*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Eragrostis japonica*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Eragrostis riparia*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Imperata cylindrica*	NE	NT	ME	Illuk	Poaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Ischaemum barbatum*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Ischaemum ciliare*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Paspalidium punctatum*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Paspalum scrobiculatum*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Pennisetum purpureum*	NE	NT	NM		Poaceae	D	

6	DZ	GRL	Grasslands (Savannah)	*Sacciolepis indica*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Sporobolus diander*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Sporobolus tremulus*	NE	NT	NM		Poaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Spermacoce hispida*	NE	NT	NM		Rubiaceae	D	
6	DZ	GRL	Grasslands (Savannah)	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Limonia acidissima*	NE	NT	ME	divul	Rutaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
6	DZ	GRL	Grasslands (Savannah)	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Phoenix pusilla*	NE	NT	ME	Walindi	Arecaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Maba buxifolia*	NE	NT	NM	Jabara	Ebenaceae	D	
7	DZ	SCR	Thorn forests (scrublands)	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
7	DZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Derris parviflora*	EN	NT	NM	Kala wel	Fabaceae	C1	
7	DZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Dendrophthoe falcata*	NE	NT	ME	Ehetu	Loranthaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Azadirachta indica*	NE	NT	ME	Kohomba	Meliaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
7	DZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	

7	DZ	SCR	Thorn forests (scrublands)	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
7	DZ	SCR	Thorn forests (scrublands)	*Cissus quadrangularis*	NE	NT	ME	Heeressa	Vitaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
8	DZ	DEF	Dry mixed evergreen forests	*Cassia auriculata*	NE	NT	ME	Rana-wara	Fabaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
8	DZ	DEF	Dry mixed evergreen forests	*Molineria trichocarpa*	NE	NT	NM	Maha bin tal	Hypoxidaceae	D	
8	DZ	DEF	Dry mixed evergreen forests	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Dendrophthoe falcata*	NE	NT	ME	Ehetu	Loranthaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Chionanthus zeylanica*	NE	NT	NM		Oleaceae	D	
8	DZ	DEF	Dry mixed evergreen forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Scutia myrtina*	NE	NT	NM		Rhamnaceae	D	
8	DZ	DEF	Dry mixed evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
8	DZ	DEF	Dry mixed evergreen forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
8	DZ	DEF	Dry mixed evergreen forests	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
8	DZ	DEF	Dry mixed evergreen forests	*Cissus quadrangularis*	NE	NT	ME	Heeressa	Vitaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	

9	DZ	DEF	Dry mixed evergreen forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Pleurostylia opposita*	NE	NT	NM	Panakka	Celastraceae	D	
9	DZ	DEF	Dry mixed evergreen forests	*Trichopus zeylanicus*	NE	NT	ME		Dioscoreaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
9	DZ	DEF	Dry mixed evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Drypetes gardneri*	EN	NT	NM	Eta wira	Euphorbiaceae	C1	
9	DZ	DEF	Dry mixed evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
9	DZ	DEF	Dry mixed evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Leptochloa neesii*	NE	NT	NM	Ashwawalige	Poaceae	D	
9	DZ	DEF	Dry mixed evergreen forests	*Scutia myrtina*	NE	NT	NM		Rhamnaceae	D	
9	DZ	DEF	Dry mixed evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
9	DZ	DEF	Dry mixed evergreen forests	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
9	DZ	DEF	Dry mixed evergreen forests	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
10	DZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
10	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	

10	DZ	SCR	Thorn forests (scrublands)	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
10	DZ	SCR	Thorn forests (scrublands)	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
10	DZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Flacourtia indica*	NE	NT	ME	Uguressa	Flacourtiaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	
10	DZ	SCR	Thorn forests (scrublands)	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Azadirachta indica*	NE	NT	ME	Kohomba	Meliaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Plumbago zeylanica*	NE	NT	ME	Elanithul	Plumbaginaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Haldina cordifolia*	NE	NT	ME		Rubiaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
10	DZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
10	DZ	SCR	Thorn forests (scrublands)	*Cissus quadrangularis*	NE	NT	ME	Heeressa	Vitaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Crateva adansonii*	NE	NT	ME	Lunu warana	Capparaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	

11	DZ	SCR	Thorn forests (scrublands)	*Dichrostachys cinera*	NE	NT	ME	Andara	Fabaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Strychnos nux-vomica*	NE	NT	ME	Goda kaduru	Loganiaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	
11	DZ	SCR	Thorn forests (scrublands)	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Walsura trifoliolata*	NE	NT	NM	Kiri kon	Meliaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
11	DZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Leptochloa neesii*	NE	NT	NM	Ashwawalige	Poaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Clausena indica*	NE	NT	ME	Walkarapincha	Rutaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
11	DZ	SCR	Thorn forests (scrublands)	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
11	DZ	SCR	Thorn forests (scrublands)	*Cissus quadrangularis*	NE	NT	ME	Heeressa	Vitaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
12	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
12	DZ	SCR	Thorn forests (scrublands)	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
12	DZ	SCR	Thorn forests (scrublands)	*Drypetes gardneri*	EN	NT	NM	Eta wira	Euphorbiaceae	C1	

12	DZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
12	DZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
12	DZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Strychnos nux-vomica*	NE	NT	ME	Goda kaduru	Loganiaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	
12	DZ	SCR	Thorn forests (scrublands)	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
12	DZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Clausena indica*	NE	NT	ME	Walkarapincha	Rutaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
12	DZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
13	DZ	RVF	Riverine forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
13	DZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
13	DZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
13	DZ	RVF	Riverine forests	*Xanthium indicum*	NE	NT	ME	Uru kossa	Asteraceae	C3	
13	DZ	RVF	Riverine forests	*Cordia monoica*	NE	NT	NM	Lolu	Boraginaceae	D	
13	DZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
13	DZ	RVF	Riverine forests	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
13	DZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	

13	DZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
13	DZ	RVF	Riverine forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
13	DZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
13	DZ	RVF	Riverine forests	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
13	DZ	RVF	Riverine forests	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
13	DZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
13	DZ	RVF	Riverine forests	*Tamarindus indica*	NE	NT	ME	Siyambala	Fabaceae	C3	
13	DZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
13	DZ	RVF	Riverine forests	*Imperata cylindrica*	NE	NT	ME	Illuk	Poaceae	C3	
13	DZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
13	DZ	RVF	Riverine forests	*Stenotaphrum dimidiatum*	NE	NT	NM		Poaceae	D	
13	DZ	RVF	Riverine forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
13	DZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
13	DZ	RVF	Riverine forests	*Mitragyna parvifolia*	NE	NT	ME	Helamba	Rubiaceae	C3	
13	DZ	RVF	Riverine forests	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
13	DZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
13	DZ	RVF	Riverine forests	*Berrya cordifolia*	NE	NT	NM	Halmilla	Tiliaceae	D	
13	DZ	RVF	Riverine forests	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
13	DZ	RVF	Riverine forests	*Vitex negundo*	NE	NT	ME		Verbenaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Barleria prionites*	NE	NT	ME	Katukarandu	Acanthaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Rungia repens*	NE	NT	ME		Acanthaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Calotropis gigantea*	NE	NT	ME	Wara	Asclepiadaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Eclipta prostrata*	NE	NT	ME	Kikiridi	Asteraceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Coccinia grandis*	NE	NT	ME	Kowakka	Cucurbitaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Cyperus cinnamometorum*	NE	NT	NM		Cyperaceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	

14	DZ	GRL	Grasslands (Savannah)	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Aristida setaceae*	NE	NT	NM	Et-tuttiri	Poaceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Chloris barbata*	NE	NT	NM		Poaceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Echinochloa colona*	NE	NT	NM		Poaceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Eragrostis ciliaris*	NE	NT	NM		Poaceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Eragrostis japonica*	NE	NT	NM		Poaceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Eragrostis nutans*	NE	NT	NM		Poaceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Imperata cylindrica*	NE	NT	ME	Illuk	Poaceae	C3	
14	DZ	GRL	Grasslands (Savannah)	*Paspalum scrobiculatum*	NE	NT	NM		Poaceae	D	
14	DZ	GRL	Grasslands (Savannah)	*Sporobolus diander*	NE	NT	NM		Poaceae	D	
15	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
15	DZ	SCR	Thorn forests (scrublands)	*Cassine balae*	EN	NT	NM	Neralu	Celastraceae	C1	
15	DZ	SCR	Thorn forests (scrublands)	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
15	DZ	SCR	Thorn forests (scrublands)	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
15	DZ	SCR	Thorn forests (scrublands)	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
15	DZ	SCR	Thorn forests (scrublands)	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
15	DZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Azadirachta indica*	NE	NT	ME	Kohomba	Meliaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Walsura trifoliolata*	NE	NT	NM	Kiri kon	Meliaceae	D	
15	DZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	

15	DZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Limonia acidissima*	NE	NT	ME	divul	Rutaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
15	DZ	SCR	Thorn forests (scrublands)	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
15	DZ	SCR	Thorn forests (scrublands)	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Crateva adansonii*	NE	NT	ME	Lunu warana	Capparaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
16	DZ	SCR	Thorn forests (scrublands)	*Drypetes gardneri*	EN	NT	NM	Eta wira	Euphorbiaceae	C1	
16	DZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
16	DZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
16	DZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Cassia roxburghii*	NE	NT	NM	Rathuwa	Fabaceae	D	
16	DZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	
16	DZ	SCR	Thorn forests (scrublands)	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Clausena indica*	NE	NT	ME	Walkarapincha	Rutaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	

16	DZ	SCR	Thorn forests (scrublands)	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
16	DZ	SCR	Thorn forests (scrublands)	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
16	DZ	SCR	Thorn forests (scrublands)	*Cissus quadrangularis*	NE	NT	ME	Heeressa	Vitaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Barleria prionites*	NE	NT	ME	Katukarandu	Acanthaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Eclipta prostrata*	NE	NT	ME	Kikiridi	Asteraceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Cyanotis villosa*	NE	NT	NM		Commelinaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Evolvulus alsinoides*	NE	NT	ME	Vishnukranthi	Convolvulaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Fuirena capitata*	NE	NT	NM		Cyperaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Euphorbia hirta*	NE	NT	ME		Euphorbiaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Alysicarous vaginalis*	NE	NT	NM		Fabaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Clitoria ternatea*	NE	NT	ME	Katarodu	Fabaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Desmodium heterophyllum*	NE	NT	ME	Maha undu piyaliya	Fabaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Indigofera tinctoria*	NE	NT	ME		Fabaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Abutilon hirtum*	NE	NT	ME	Walanoda	Malvaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Pavonia odorata*	NE	NT	ME		Malvaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Glinus oppositifolia*	NE	NT	NM	Walpathpadagam	Molluginaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Bothriochloa pertusa*	NE	NT	NM		Poaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Chloris barbata*	NE	NT	NM		Poaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Digitaria tomentosa*	NE	NT	NM		Poaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Eragrostis ciliaris*	NE	NT	NM		Poaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Eragrostis gangetica*	NE	NT	NM		Poaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Eragrostis unioloides*	NE	NT	NM		Poaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Imperata cylindrica*	NE	NT	ME	Illuk	Poaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Ischaemum barbatum*	NE	NT	NM		Poaceae	D	

17	DZ	GRL	Grasslands (Savannah)	*Panicum repens*	NE	NT	ME	Etora	Poaceae	C3	
17	DZ	GRL	Grasslands (Savannah)	*Paspalidium punctatum*	NE	NT	NM		Poaceae	D	
17	DZ	GRL	Grasslands (Savannah)	*Sacciolepis indica*	NE	NT	NM		Poaceae	D	
18	DZ	RVF	Riverine forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
18	DZ	RVF	Riverine forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
18	DZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
18	DZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
18	DZ	RVF	Riverine forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
18	DZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
18	DZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
18	DZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
18	DZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
18	DZ	RVF	Riverine forests	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	
18	DZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
18	DZ	RVF	Riverine forests	*Walsura trifoliolata*	NE	NT	NM	Kiri kon	Meliaceae	D	
18	DZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
18	DZ	RVF	Riverine forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
18	DZ	RVF	Riverine forests	*Bambusa bambos*	NE	NT	NM	Katu-una	Poaceae	D	
18	DZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
18	DZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
18	DZ	RVF	Riverine forests	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
18	DZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
19	DZ	DEF	Dry mixed evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
19	DZ	DEF	Dry mixed evergreen forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
19	DZ	DEF	Dry mixed evergreen forests	*Pleurostylia opposita*	NE	NT	NM	Panakka	Celastraceae	D	
19	DZ	DEF	Dry mixed evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
19	DZ	DEF	Dry mixed evergreen forests	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
19	DZ	DEF	Dry mixed evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
19	DZ	DEF	Dry mixed evergreen forests	*Drypetes gardneri*	EN	NT	NM	Eta wira	Euphorbiaceae	C1	

19	DZ	DEF	Dry mixed evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
19	DZ	DEF	Dry mixed evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
19	DZ	DEF	Dry mixed evergreen forests	*Albizia lebbeck*	NE	NT	ME	Kabalmara	Fabaceae	C3	
19	DZ	DEF	Dry mixed evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
19	DZ	DEF	Dry mixed evergreen forests	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
19	DZ	DEF	Dry mixed evergreen forests	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	
19	DZ	DEF	Dry mixed evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
19	DZ	DEF	Dry mixed evergreen forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
19	DZ	DEF	Dry mixed evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Aerva lanata*	NE	NT	ME	Polpala	Amaranthaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
20	DZ	SCR	Thorn forests (scrublands)	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
20	DZ	SCR	Thorn forests (scrublands)	*Bauhinia tomentosa*	NE	NT	ME		Fabaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Tephrosia purpurea*	NE	NT	ME	Gam pila	Fabaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	
20	DZ	SCR	Thorn forests (scrublands)	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Azadirachta indica*	NE	NT	ME	Kohomba	Meliaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Walsura trifoliolata*	NE	NT	NM	Kiri kon	Meliaceae	D	
20	DZ	SCR	Thorn forests (scrublands)	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
20	DZ	SCR	Thorn forests (scrublands)	*Chionanthus zeylanica*	NE	NT	NM		Oleaceae	D	
20	DZ	SCR	Thorn forests (scrublands)	*Eragrostis ciliaris*	NE	NT	NM		Poaceae	D	
20	DZ	SCR	Thorn forests (scrublands)	*Eragrostis japonica*	NE	NT	NM		Poaceae	D	
20	DZ	SCR	Thorn forests (scrublands)	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	

20	DZ	SCR	Thorn forests (scrublands)	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
20	DZ	SCR	Thorn forests (scrublands)	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
20	DZ	SCR	Thorn forests (scrublands)	*Cissus quadrangularis*	NE	NT	ME	Heeressa	Vitaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Asparagus racemosus*	NE	NT	ME	Hathawariya	Asparagaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Pleurostylia opposita*	NE	NT	NM	Panakka	Celastraceae	D	
21	DZ	SCR	Thorn forests (scrublands)	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
21	DZ	SCR	Thorn forests (scrublands)	*Erythroxylum monogynum*	NE	NT	ME	Batakirilla	Erythroxylaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
21	DZ	SCR	Thorn forests (scrublands)	*Euphorbia tirucalli*	NE	NT	ME	Nawa handi	Euphorbiaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
21	DZ	SCR	Thorn forests (scrublands)	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	
21	DZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Cassia auriculata*	NE	NT	ME	Rana-wara	Fabaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Dichrostachys cinera*	NE	NT	ME	Andara	Fabaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Gomphia serrata*	NE	NT	NM	Bo keera	Ochnaceae	D	
21	DZ	SCR	Thorn forests (scrublands)	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
21	DZ	SCR	Thorn forests (scrublands)	*Chionanthus zeylanica*	NE	NT	NM		Oleaceae	D	
21	DZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Plumbago zeylanica*	NE	NT	ME	Elanithul	Plumbaginaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Canthium dicoccum*	NE	NT	NM		Rubiaceae	D	
21	DZ	SCR	Thorn forests (scrublands)	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	

21	DZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Limonia acidissima*	NE	NT	ME	divul	Rutaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
21	DZ	SCR	Thorn forests (scrublands)	*Cissus quadrangularis*	NE	NT	ME	Heeressa	Vitaceae	C3	
22	DZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
22	DZ	RVF	Riverine forests	*Xanthium indicum*	NE	NT	ME	Uru kossa	Asteraceae	C3	
22	DZ	RVF	Riverine forests	*Coldenia procumbens*	NE	NT	NM		Boraginaceae	D	
22	DZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
22	DZ	RVF	Riverine forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
22	DZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
22	DZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
22	DZ	RVF	Riverine forests	*Bauhinia tomentosa*	NE	NT	ME		Fabaceae	C3	
22	DZ	RVF	Riverine forests	*Tephrosia purpurea*	NE	NT	ME	Gam pila	Fabaceae	C3	
22	DZ	RVF	Riverine forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
22	DZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
22	DZ	RVF	Riverine forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
23	DZ	DEF	Dry mixed evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
23	DZ	DEF	Dry mixed evergreen forests	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
23	DZ	DEF	Dry mixed evergreen forests	*Pleurostylia opposita*	NE	NT	NM	Panakka	Celastraceae	D	
23	DZ	DEF	Dry mixed evergreen forests	*Scleria lithosperma*	NE	NT	NM		Cyperaceae	D	
23	DZ	DEF	Dry mixed evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
23	DZ	DEF	Dry mixed evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
23	DZ	DEF	Dry mixed evergreen forests	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
23	DZ	DEF	Dry mixed evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
23	DZ	DEF	Dry mixed evergreen forests	*Scolopia acuminata*	NE	NT	NM	Katukenda	Flacourtiaceae	D	
23	DZ	DEF	Dry mixed evergreen forests	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
23	DZ	DEF	Dry mixed evergreen forests	*Memecylon capitellatum*	EN	NT	ME	Korakaha	Melastomataceae	B2	

23	DZ	DEF	Dry mixed evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
23	DZ	DEF	Dry mixed evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
23	DZ	DEF	Dry mixed evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
23	DZ	DEF	Dry mixed evergreen forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
23	DZ	DEF	Dry mixed evergreen forests	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
25.1	DZ	RVF	Riverine forests	*Polyalthia longifolia*	NE	NT	ME		Annonaceae	C3	
25.1	DZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
25.1	DZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
25.1	DZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
25.1	DZ	RVF	Riverine forests	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
25.1	DZ	RVF	Riverine forests	*Xanthium indicum*	NE	NT	ME	Uru kossa	Asteraceae	C3	
25.1	DZ	RVF	Riverine forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
25.1	DZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
25.1	DZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
25.1	DZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
25.1	DZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
25.1	DZ	RVF	Riverine forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
25.1	DZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
25.1	DZ	RVF	Riverine forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
25.1	DZ	RVF	Riverine forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
25.1	DZ	RVF	Riverine forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
25.1	DZ	RVF	Riverine forests	*Phyllanthus debilis*	NE	NT	ME		Euphorbiaceae	C3	
25.1	DZ	RVF	Riverine forests	*Phyllanthus maderaspatensis*	NE	NT	ME		Euphorbiaceae	C3	
25.1	DZ	RVF	Riverine forests	*Phyllanthus myrtifolius*	EN	NT	NM		Euphorbiaceae	C1	
25.1	DZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
25.1	DZ	RVF	Riverine forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
25.1	DZ	RVF	Riverine forests	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
25.1	DZ	RVF	Riverine forests	*Crotalaria laburnifolia*	NE	NT	ME	Yakberiya	Fabaceae	C3	
25.1	DZ	RVF	Riverine forests	*Derris parviflora*	EN	NT	NM	Kala wel	Fabaceae	C1	

25.1	DZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
25.1	DZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
25.1	DZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
25.1	DZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
25.1	DZ	RVF	Riverine forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
25.1	DZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
25.1	DZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
25.1	DZ	RVF	Riverine forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
25.1	DZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
25.1	DZ	RVF	Riverine forests	*Polygala javana*	NE	NT	NM		Polygalaceae	D	
25.1	DZ	RVF	Riverine forests	*Ophiorhiza mungos*	NE	NT	ME	Dathketiya	Rubiaceae	C3	
25.1	DZ	RVF	Riverine forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
25.1	DZ	RVF	Riverine forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
25.1	DZ	RVF	Riverine forests	*Cardiospermum halicacabum*	NE	NT	NM	Penela	Sapindaceae	D	
25.1	DZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
25.1	DZ	RVF	Riverine forests	*Sapindus emarginatus*	NE	NT	NM	Gaspenela	Sapindaceae	D	
25.1	DZ	RVF	Riverine forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
25.1	DZ	RVF	Riverine forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
25.1	DZ	RVF	Riverine forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Polyalthia longifolia*	NE	NT	ME		Annonaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Synedrella nodiflora*	NE	NT	NM		Asteraceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
25.2	DZ	DEF	Dry mixed evergreen forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Croton thwaitesianus*	NE	NT	NM		Euphorbiaceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	

25.2	DZ	DEF	Dry mixed evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
25.2	DZ	DEF	Dry mixed evergreen forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
25.2	DZ	DEF	Dry mixed evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Hedyotis fruticosa*	NE	NT	ME	Weraniya	Rubiaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Pometia pinata*	NE	NT	NM		Sapindaceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
25.2	DZ	DEF	Dry mixed evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
25.2	DZ	DEF	Dry mixed evergreen forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
26	DZ	RVF	Riverine forests	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
26	DZ	RVF	Riverine forests	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
26	DZ	RVF	Riverine forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
26	DZ	RVF	Riverine forests	*Ceropegia candelabrum*	NE	TR	NM		Asclepiadaceae	C2	
26	DZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
26	DZ	RVF	Riverine forests	*Drypetes gardneri*	EN	NT	NM	Eta wira	Euphorbiaceae	C1	
26	DZ	RVF	Riverine forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
26	DZ	RVF	Riverine forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
26	DZ	RVF	Riverine forests	*Mallotus resinosus*	NE	NT	NM		Euphorbiaceae	D	
26	DZ	RVF	Riverine forests	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	

26	DZ	RVF	Riverine forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
26	DZ	RVF	Riverine forests	*Phyllanthus myrtifolius*	EN	NT	NM		Euphorbiaceae	C1	
26	DZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
26	DZ	RVF	Riverine forests	*Abrus precatorius*	NE	NT	ME		Fabaceae	C3	
26	DZ	RVF	Riverine forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
26	DZ	RVF	Riverine forests	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
26	DZ	RVF	Riverine forests	*Bauhinia tomentosa*	NE	NT	ME		Fabaceae	C3	
26	DZ	RVF	Riverine forests	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
26	DZ	RVF	Riverine forests	*Cassia spectabilis*	NE	NT	NM	Kahakona	Fabaceae	D	
26	DZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
26	DZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
26	DZ	RVF	Riverine forests	*Indigofera tinctoria*	NE	NT	ME		Fabaceae	C3	
26	DZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
26	DZ	RVF	Riverine forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
26	DZ	RVF	Riverine forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
26	DZ	RVF	Riverine forests	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
26	DZ	RVF	Riverine forests	*Sida acuta*	NE	NT	ME	Bevila	Malvaceae	C3	
26	DZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
26	DZ	RVF	Riverine forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
26	DZ	RVF	Riverine forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
26	DZ	RVF	Riverine forests	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
26	DZ	RVF	Riverine forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
26	DZ	RVF	Riverine forests	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
26	DZ	RVF	Riverine forests	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
26	DZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
26	DZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
26	DZ	RVF	Riverine forests	*Trema orientale*	NE	NT	ME	Gedumba	Ulmaceae	C3	
26	DZ	RVF	Riverine forests	*Clerodendrum infortunatum*	NE	NT	ME	Pinna	Verbenaceae	C3	
26	DZ	RVF	Riverine forests	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	

26	DZ	RVF	Riverine forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
26	DZ	RVF	Riverine forests	*Vitex negundo*	NE	NT	ME		Verbenaceae	C3	
27	DZ	RVF	Riverine forests	*Aerva lanata*	NE	NT	ME	Polpala	Amaranthaceae	C3	
27	DZ	RVF	Riverine forests	*Amaranthus spinosus*	NE	NT	ME	Katuthampala	Amaranthaceae	C3	
27	DZ	RVF	Riverine forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
27	DZ	RVF	Riverine forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
27	DZ	RVF	Riverine forests	*Alstonia scholaris*	NE	NT	ME	Ruk attana	Apocynaceae	C3	
27	DZ	RVF	Riverine forests	*Calotropis gigantea*	NE	NT	ME	Wara	Asclepiadaceae	C3	
27	DZ	RVF	Riverine forests	*Ceropegia candelabrum*	NE	TR	NM		Asclepiadaceae	C2	
27	DZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
27	DZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
27	DZ	RVF	Riverine forests	*Xanthium indicum*	NE	NT	ME	Uru kossa	Asteraceae	C3	
27	DZ	RVF	Riverine forests	*Bombax ceiba*	NE	NT	ME	Katuimbul	Bombacaceae	C3	
27	DZ	RVF	Riverine forests	*Mesua ferrea*	NE	NT	ME		Clusiaceae	C3	
27	DZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
27	DZ	RVF	Riverine forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
27	DZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
27	DZ	RVF	Riverine forests	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
27	DZ	RVF	Riverine forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
27	DZ	RVF	Riverine forests	*Crotalaria laburnifolia*	NE	NT	ME	Yakberiya	Fabaceae	C3	
27	DZ	RVF	Riverine forests	*Crotalaria verrucosa*	NE	NT	ME	Andanaheeriya	Fabaceae	C3	
27	DZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
27	DZ	RVF	Riverine forests	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
27	DZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
27	DZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
27	DZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
27	DZ	RVF	Riverine forests	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
27	DZ	RVF	Riverine forests	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
27	DZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	

27	DZ	RVF	Riverine forests	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla	Onagraceae	C3	
27	DZ	RVF	Riverine forests	*Piper sylvestre*	NE	NT	NM	Walgammiris	Piperaceae	D	
27	DZ	RVF	Riverine forests	*Polygala chinensis*	NE	NT	ME		Polygalaceae	C3	
27	DZ	RVF	Riverine forests	*Canthium dicoccum*	NE	NT	NM		Rubiaceae	D	
27	DZ	RVF	Riverine forests	*Hedyotis fruticosa*	NE	NT	ME	Weraniya	Rubiaceae	C3	
27	DZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
27	DZ	RVF	Riverine forests	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
27	DZ	RVF	Riverine forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
27	DZ	RVF	Riverine forests	*Paramignya monophylla*	NE	NT	ME		Rutaceae	C3	
27	DZ	RVF	Riverine forests	*Harpullia arborea*	NE	NT	NM		Sapindaceae	D	
27	DZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
27	DZ	RVF	Riverine forests	*Solanum indicum*	NE	NT	ME	kalukamberia	Solanaceae	C3	
27	DZ	RVF	Riverine forests	*Solanum seaforthianum*	NE	NT	NM		Solanaceae	D	
27	DZ	RVF	Riverine forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
27	DZ	RVF	Riverine forests	*Berrya cordifolia*	NE	NT	NM	Halmilla	Tiliaceae	D	
27	DZ	RVF	Riverine forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
27	DZ	RVF	Riverine forests	*Trema orientale*	NE	NT	ME	Gedumba	Ulmaceae	C3	
27	DZ	RVF	Riverine forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
27	DZ	RVF	Riverine forests	*Stachytarpheta urticifolia*	NE	NT	NM	Balunaguta	Verbenaceae	D	
27	DZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
28	DZ	RVF	Riverine forests	*Andrographis paniculata*	NE	NT	ME		Acanthaceae	C3	
28	DZ	RVF	Riverine forests	*Uvaria sphenocarpa*	EN	NT	NM		Annonaceae	C1	
28	DZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
28	DZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
28	DZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
28	DZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
28	DZ	RVF	Riverine forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
28	DZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
28	DZ	RVF	Riverine forests	*Drypetes gardneri*	EN	NT	NM	Eta wira	Euphorbiaceae	C1	

28	DZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
28	DZ	RVF	Riverine forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
28	DZ	RVF	Riverine forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
28	DZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
28	DZ	RVF	Riverine forests	*Psidium guajava*	NE	NT	ME	Pera	Myrtaceae	C3	
28	DZ	RVF	Riverine forests	*Ixora jucunda*	EN	NT	NM		Rubiaceae	C1	
28	DZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
28	DZ	RVF	Riverine forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
28	DZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
28	DZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
28	DZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
28	DZ	RVF	Riverine forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
29.1	DZ	DEF	Dry mixed evergreen forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
29.1	DZ	DEF	Dry mixed evergreen forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
29.1	DZ	DEF	Dry mixed evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
29.1	DZ	DEF	Dry mixed evergreen forests	*Phyllanthus myrtifolius*	EN	NT	NM		Euphorbiaceae	C1	
29.1	DZ	DEF	Dry mixed evergreen forests	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Derris parviflora*	EN	NT	NM	Kala wel	Fabaceae	C1	
29.1	DZ	DEF	Dry mixed evergreen forests	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
29.1	DZ	DEF	Dry mixed evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Ficus caulocarpa*	NE	NT	NM		Moraceae	D	
29.1	DZ	DEF	Dry mixed evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Pandanus ceylanicus*	EN	NT	ME	Wetake	Pandanaceae	B2	

29.1	DZ	DEF	Dry mixed evergreen forests	*Ixora jucunda*	EN	NT	NM		Rubiaceae	C1	
29.1	DZ	DEF	Dry mixed evergreen forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
29.1	DZ	DEF	Dry mixed evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Artabotrys zeylanicus*	NE	NT	NM	Kalubambarewel	Annonaceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
29.2	DZ	DEF	Dry mixed evergreen forests	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
29.2	DZ	DEF	Dry mixed evergreen forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Maba buxifolia*	NE	NT	NM	Jabara	Ebenaceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
29.2	DZ	DEF	Dry mixed evergreen forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Hyptis suaveolens*	NE	NT	NM		Lamiaceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
29.2	DZ	DEF	Dry mixed evergreen forests	*Ficus drupacea*	NE	NT	NM		Moraceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Canthium dicoccum*	NE	NT	NM		Rubiaceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Ixora jucunda*	EN	NT	NM		Rubiaceae	C1	
29.2	DZ	DEF	Dry mixed evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	

29.2	DZ	DEF	Dry mixed evergreen forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
29.2	DZ	DEF	Dry mixed evergreen forests	*Berrya cordifolia*	NE	NT	NM	Halmilla	Tiliaceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
29.2	DZ	DEF	Dry mixed evergreen forests	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
30.1	IZ	MEF	Moist evergreen forests	*Mangifera indica*	NE	NT	ME	Amba	Anacardiaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Artabotrys zeylanicus*	NE	NT	NM	Kalubambarewel	Annonaceae	D	
30.1	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
30.1	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
30.1	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
30.1	IZ	MEF	Moist evergreen forests	*Erythroxylum monogynum*	NE	NT	ME	Batakirilla	Erythroxylaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
30.1	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
30.1	IZ	MEF	Moist evergreen forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
30.1	IZ	MEF	Moist evergreen forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
30.1	IZ	MEF	Moist evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	

30.1	IZ	MEF	Moist evergreen forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
30.1	IZ	MEF	Moist evergreen forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
30.1	IZ	MEF	Moist evergreen forests	*Berrya cordifolia*	NE	NT	NM	Halmilla	Tiliaceae	D	
30.1	IZ	MEF	Moist evergreen forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
30.2	IZ	RVF	Riverine forests	*Amaranthus spinosus*	NE	NT	ME	Katuthampala	Amaranthaceae	C3	
30.2	IZ	RVF	Riverine forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
30.2	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
30.2	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
30.2	IZ	RVF	Riverine forests	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
30.2	IZ	RVF	Riverine forests	*Xanthium indicum*	NE	NT	ME	Uru kossa	Asteraceae	C3	
30.2	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
30.2	IZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
30.2	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
30.2	IZ	RVF	Riverine forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
30.2	IZ	RVF	Riverine forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
30.2	IZ	RVF	Riverine forests	*Phyllanthus debilis*	NE	NT	ME		Euphorbiaceae	C3	
30.2	IZ	RVF	Riverine forests	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
30.2	IZ	RVF	Riverine forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
30.2	IZ	RVF	Riverine forests	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
30.2	IZ	RVF	Riverine forests	*Mimosa pigra*	NE	NT	NM		Fabaceae	D	
30.2	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
30.2	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
30.2	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
30.2	IZ	RVF	Riverine forests	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
30.2	IZ	RVF	Riverine forests	*Limnocharis flava*	NE	NT	NM	Diyagowa	Limnocharitaceae	D	

30.2	IZ	RVF	Riverine forests	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
30.2	IZ	RVF	Riverine forests	*Ficus hispida*	NE	NT	ME	Kotadimbula	Moraceae	C3	
30.2	IZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
30.2	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
30.2	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
30.2	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
30.2	IZ	RVF	Riverine forests	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
30.2	IZ	RVF	Riverine forests	*Cardiospermum canescens*	NE	NT	NM	Penela	Sapindaceae	D	
30.2	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
30.2	IZ	RVF	Riverine forests	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
30.2	IZ	RVF	Riverine forests	*Vitex leucoxylon*	NE	NT	ME	Nebada	Verbenaceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Artabotrys zeylanicus*	NE	NT	NM	Kalubambarewel	Annonaceae	D	
31.1	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
31.1	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
31.1	IZ	MEF	Moist evergreen forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
31.1	IZ	MEF	Moist evergreen forests	*Erythroxylum monogynum*	NE	NT	ME	Batakirilla	Erythroxylaceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
31.1	IZ	MEF	Moist evergreen forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
31.1	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
31.1	IZ	MEF	Moist evergreen forests	*Hyptis suaveolens*	NE	NT	NM		Lamiaceae	D	
31.1	IZ	MEF	Moist evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Adina cordifolia*	NE	NT	ME	Kolon	Rubiaceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
31.1	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	

31.1	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
31.1	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
31.1	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
31.2	IZ	RVF	Riverine forests	*Alstonia macrophylla*	NE	NT	NM	Hawarinuga	Apocynaceae	D	
31.2	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
31.2	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
31.2	IZ	RVF	Riverine forests	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
31.2	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
31.2	IZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
31.2	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
31.2	IZ	RVF	Riverine forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
31.2	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
31.2	IZ	RVF	Riverine forests	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
31.2	IZ	RVF	Riverine forests	*Mimosa pigra*	NE	NT	NM		Fabaceae	D	
31.2	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
31.2	IZ	RVF	Riverine forests	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
31.2	IZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
31.2	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
31.2	IZ	RVF	Riverine forests	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla	Onagraceae	C3	
31.2	IZ	RVF	Riverine forests	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
31.2	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
31.2	IZ	RVF	Riverine forests	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
31.2	IZ	RVF	Riverine forests	*Ophiorhiza mungos*	NE	NT	ME	Dathketiya	Rubiaceae	C3	
31.2	IZ	RVF	Riverine forests	*Stachytarpheta jamaicansis*	NE	NT	NM	Balunaguta	Verbenaceae	D	
32.1	IZ	RVF	Riverine forests	*Wattakaka volubilis*	NE	NT	ME	Anguna	Asclepiadaceae	C3	
32.1	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
32.1	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
32.1	IZ	RVF	Riverine forests	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
32.1	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	

32.1	IZ	RVF	Riverine forests	*Cuscuta chinensis*	NE	NT	ME		Convolvulaceae	C3	
32.1	IZ	RVF	Riverine forests	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
32.1	IZ	RVF	Riverine forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
32.1	IZ	RVF	Riverine forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
32.1	IZ	RVF	Riverine forests	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
32.1	IZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
32.1	IZ	RVF	Riverine forests	*Mimosa pigra*	NE	NT	NM		Fabaceae	D	
32.1	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
32.1	IZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
32.1	IZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
32.1	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
32.1	IZ	RVF	Riverine forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
32.1	IZ	RVF	Riverine forests	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
32.1	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
32.1	IZ	RVF	Riverine forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
32.1	IZ	RVF	Riverine forests	*Canthium coromandelicum*	NE	NT	ME	Kara	Rubiaceae	C3	
32.1	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
32.1	IZ	RVF	Riverine forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
32.1	IZ	RVF	Riverine forests	*Lygodium flexuosum*	NE	NT	NM	Pambawel	Schizaeaceae	D	
32.1	IZ	RVF	Riverine forests	*Grewia orientalis*	NE	NT	NM	Welkeliya	Tiliaceae	D	
32.2	IZ	RVF	Riverine forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
32.2	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
32.2	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
32.2	IZ	RVF	Riverine forests	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
32.2	IZ	RVF	Riverine forests	*Eclipta prostrata*	NE	NT	ME		Asteraceae	C3	
32.2	IZ	RVF	Riverine forests	*Phyllanthus myrtifolius*	EN	NT	NM		Euphorbiaceae	C1	
32.2	IZ	RVF	Riverine forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
32.2	IZ	RVF	Riverine forests	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
32.2	IZ	RVF	Riverine forests	*Cassia roxburghii*	NE	NT	NM	Rathuwa	Fabaceae	D	

32.2	IZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
32.2	IZ	RVF	Riverine forests	*Mimosa pigra*	NE	NT	NM		Fabaceae	D	
32.2	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
32.2	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
32.2	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
32.2	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
32.2	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
32.2	IZ	RVF	Riverine forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
32.2	IZ	RVF	Riverine forests	*Hedyotis fruticosa*	NE	NT	ME	Weraniya	Rubiaceae	C3	
32.2	IZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
32.2	IZ	RVF	Riverine forests	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
32.2	IZ	RVF	Riverine forests	*Ophiorhiza mungos*	NE	NT	ME	Dathketiya	Rubiaceae	C3	
32.2	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
32.2	IZ	RVF	Riverine forests	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
32.2	IZ	RVF	Riverine forests	*Vitex leucoxylon*	NE	NT	ME	Nebada	Verbenaceae	C3	
33	IZ	RVF	Riverine forests	*Allmania nodiflora*	NE	NT	NM		Amaranthaceae	D	
33	IZ	RVF	Riverine forests	*Polyalthia longifolia*	NE	NT	ME		Annonaceae	C3	
33	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
33	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
33	IZ	RVF	Riverine forests	*Tithonia diversifolia*	NE	NT	NM	Thiththa	Asteraceae	D	
33	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
33	IZ	RVF	Riverine forests	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
33	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
33	IZ	RVF	Riverine forests	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	
33	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
33	IZ	RVF	Riverine forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
33	IZ	RVF	Riverine forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
33	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
33	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	

33	IZ	RVF	Riverine forests	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
33	IZ	RVF	Riverine forests	*Chukrasia velutina*	NE	NT	NM	Barawahik	Meliaceae	D	
33	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
33	IZ	RVF	Riverine forests	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
33	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
33	IZ	RVF	Riverine forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
33	IZ	RVF	Riverine forests	*Cardiospermum halicacabum*	NE	NT	NM	Penela	Sapindaceae	D	
33	IZ	RVF	Riverine forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
33	IZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
33	IZ	RVF	Riverine forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
33	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
33	IZ	RVF	Riverine forests	*Datura metel*	NE	NT	ME	Attana	Solanaceae	C3	
33	IZ	RVF	Riverine forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
33	IZ	RVF	Riverine forests	*Berrya cordifolia*	NE	NT	NM	Halmilla	Tiliaceae	D	
33	IZ	RVF	Riverine forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
33	IZ	RVF	Riverine forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
33	IZ	RVF	Riverine forests	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
33	IZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
34	IZ	RVF	Riverine forests	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
34	IZ	RVF	Riverine forests	*Polyalthia longifolia*	NE	NT	ME		Annonaceae	C3	
34	IZ	RVF	Riverine forests	*Aristolochia indica*	NE	NT	ME	Maduwel	Aristolochiaceae	C3	
34	IZ	RVF	Riverine forests	*Calotropis gigantea*	NE	NT	ME	Wara	Asclepiadaceae	C3	
34	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
34	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
34	IZ	RVF	Riverine forests	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
34	IZ	RVF	Riverine forests	*Xanthium indicum*	NE	NT	ME	Uru kossa	Asteraceae	C3	
34	IZ	RVF	Riverine forests	*Cordia monoica*	NE	NT	NM	Lolu	Boraginaceae	D	
34	IZ	RVF	Riverine forests	*Capparis rotundifolia*	NE	NT	NM	Balalpahuru	Capparaceae	D	
34	IZ	RVF	Riverine forests	*Cleome viscosa*	NE	NT	ME		Capparaceae	C3	

34	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
34	IZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
34	IZ	RVF	Riverine forests	*Phyllanthus debilis*	NE	NT	ME		Euphorbiaceae	C3	
34	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
34	IZ	RVF	Riverine forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
34	IZ	RVF	Riverine forests	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
34	IZ	RVF	Riverine forests	*Crotalaria verrucosa*	NE	NT	ME	Andanaheeriya	Fabaceae	C3	
34	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
34	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
34	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
34	IZ	RVF	Riverine forests	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
34	IZ	RVF	Riverine forests	*Dendrophthoe falcata*	NE	NT	ME	Ehetu	Loranthaceae	C3	
34	IZ	RVF	Riverine forests	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
34	IZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
34	IZ	RVF	Riverine forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
34	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
34	IZ	RVF	Riverine forests	*Cyrtococcum trigonum*	NE	NT	NM		Poaceae	D	
34	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
34	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
34	IZ	RVF	Riverine forests	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
34	IZ	RVF	Riverine forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
34	IZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
34	IZ	RVF	Riverine forests	*Datura metel*	NE	NT	ME	Attana	Solanaceae	C3	
34	IZ	RVF	Riverine forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
34	IZ	RVF	Riverine forests	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
34	IZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
35	IZ	RVF	Riverine forests	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
35	IZ	RVF	Riverine forests	*Polyalthia longifolia*	NE	NT	ME		Annonaceae	C3	
35	IZ	RVF	Riverine forests	*Alocasia macrorrhiza*	NE	NT	ME	Habarala	Araceae	C3	

35	IZ	RVF	Riverine forests	*Lagenandra ovata*	NE	NT	ME	Ketela	Araceae	C3	
35	IZ	RVF	Riverine forests	*Aristolochia indica*	NE	NT	ME	Maduwel	Aristolochiaceae	C3	
35	IZ	RVF	Riverine forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
35	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
35	IZ	RVF	Riverine forests	*Cordia monoica*	NE	NT	NM	Lolu	Boraginaceae	D	
35	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
35	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
35	IZ	RVF	Riverine forests	*Commelina clavata*	NE	NT	NM		Commelinaceae	D	
35	IZ	RVF	Riverine forests	*Cuscuta chinensis*	NE	NT	ME		Convolvulaceae	C3	
35	IZ	RVF	Riverine forests	*Diospyros affinis*	NE	NT	NM		Ebenaceae	D	
35	IZ	RVF	Riverine forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
35	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
35	IZ	RVF	Riverine forests	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
35	IZ	RVF	Riverine forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
35	IZ	RVF	Riverine forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
35	IZ	RVF	Riverine forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
35	IZ	RVF	Riverine forests	*Ricinus communis*	NE	NT	ME	Endaru	Euphorbiaceae	C3	
35	IZ	RVF	Riverine forests	*Abrus precatorius*	NE	NT	ME		Fabaceae	C3	
35	IZ	RVF	Riverine forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
35	IZ	RVF	Riverine forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
35	IZ	RVF	Riverine forests	*Mimosa pigra*	NE	NT	NM		Fabaceae	D	
35	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
35	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
35	IZ	RVF	Riverine forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
35	IZ	RVF	Riverine forests	*Ficus hispida*	NE	NT	ME	Kotadimbula	Moraceae	C3	
35	IZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
35	IZ	RVF	Riverine forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
35	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
35	IZ	RVF	Riverine forests	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla	Onagraceae	C3	

35	IZ	RVF	Riverine forests	*Pandanus ceylanicus*	EN	NT	ME	Wetake	Pandanaceae	B2	
35	IZ	RVF	Riverine forests	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
35	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
35	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
35	IZ	RVF	Riverine forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
35	IZ	RVF	Riverine forests	*Cardiospermum halicacabum*	NE	NT	NM	Penela	Sapindaceae	D	
35	IZ	RVF	Riverine forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
35	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
35	IZ	RVF	Riverine forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
35	IZ	RVF	Riverine forests	*Vitex leucoxylon*	NE	NT	ME	Nebada	Verbenaceae	C3	
36	IZ	RVF	Riverine forests	*Semecarpus nigro-viridis*	EN	NT	NM	Badulla	Anacardiaceae	C1	
36	IZ	RVF	Riverine forests	*Alstonia scholaris*	NE	NT	ME	Ruk attana	Apocynaceae	C3	
36	IZ	RVF	Riverine forests	*Alocasia macrorrhiza*	NE	NT	ME	Habarala	Araceae	C3	
36	IZ	RVF	Riverine forests	*Lagenandra ovata*	NE	NT	ME	Ketela	Araceae	C3	
36	IZ	RVF	Riverine forests	*Calamus rotang*	NE	NT	ME	Wewel	*Arecaceae*	C3	
36	IZ	RVF	Riverine forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
36	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
36	IZ	RVF	Riverine forests	*Xanthium indicum*	NE	NT	ME	Uru kossa	Asteraceae	C3	
36	IZ	RVF	Riverine forests	*Murdanna esculenta*	NE	NT	NM		Commelinaceae	D	
36	IZ	RVF	Riverine forests	*Cuscuta chinensis*	NE	NT	ME		Convolvulaceae	C3	
36	IZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
36	IZ	RVF	Riverine forests	*Dillenia indica*	NE	NT	ME	Hodapollan	Dilleniaceae	C3	
36	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
36	IZ	RVF	Riverine forests	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
36	IZ	RVF	Riverine forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
36	IZ	RVF	Riverine forests	*Manihot glaziovii*	NE	NT	NM	Walrubber	Euphorbiaceae	D	
36	IZ	RVF	Riverine forests	*Phyllanthus debilis*	NE	NT	ME		Euphorbiaceae	C3	
36	IZ	RVF	Riverine forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
36	IZ	RVF	Riverine forests	*Cassia occidatalis*	NE	NT	ME		Fabaceae	C3	

36	IZ	RVF	Riverine forests	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
36	IZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
36	IZ	RVF	Riverine forests	*Mimosa pigra*	NE	NT	NM		Fabaceae	D	
36	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
36	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
36	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
36	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
36	IZ	RVF	Riverine forests	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
36	IZ	RVF	Riverine forests	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
36	IZ	RVF	Riverine forests	*Melia azedarachta*	NE	NT	ME	Lunumidella	Meliaceae	C3	
36	IZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
36	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
36	IZ	RVF	Riverine forests	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla	Onagraceae	C3	
36	IZ	RVF	Riverine forests	*Pandanus ceylanicus*	EN	NT	ME	Wetake	Pandanaceae	B2	
36	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
36	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
36	IZ	RVF	Riverine forests	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
36	IZ	RVF	Riverine forests	*Ophiorhiza mungos*	NE	NT	ME	Dathketiya	Rubiaceae	C3	
37	IZ	RVF	Riverine forests	*Polyalthia coffeoides*	NE	NT	NM	Patta-ulkenda	Annonaceae	D	
37	IZ	RVF	Riverine forests	*Lagenandra ovata*	NE	NT	ME	Ketela	Araceae	C3	
37	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
37	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
37	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
37	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
37	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
37	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
37	IZ	RVF	Riverine forests	*Phyllanthus myrtifolius*	EN	NT	NM		Euphorbiaceae	C1	
37	IZ	RVF	Riverine forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
37	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	

37	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
37	IZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
37	IZ	RVF	Riverine forests	*Anamirta cocculus*	NE	NT	ME	Thiththawel	Menispermaceae	C3	
37	IZ	RVF	Riverine forests	*Pandanus ceylanicus*	EN	NT	ME	Wetake	Pandanaceae	B2	
37	IZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
37	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
37	IZ	RVF	Riverine forests	*Cardiospermum canescens*	NE	NT	NM	Penela	Sapindaceae	D	
38	IZ	RVF	Riverine forests	*Semecarpus nigro-viridis*	EN	NT	NM	Badulla	Anacardiaceae	C1	
38	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
38	IZ	RVF	Riverine forests	*Schefflera heterobotrya*	EN	NT	NM		Araliaceae	C1	
38	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
38	IZ	RVF	Riverine forests	*Calophyllum bracteatum*	EN	NT	NM	Dombakeena	Clusiaceae	C1	
38	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
38	IZ	RVF	Riverine forests	*Terminalia catappa*	NE	NT	ME		Combretaceae	C3	
38	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
38	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
38	IZ	RVF	Riverine forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
38	IZ	RVF	Riverine forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
38	IZ	RVF	Riverine forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
38	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
38	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
38	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
38	IZ	RVF	Riverine forests	*Neolitsea cassia*	NE	NT	ME	Kududavula	Lauraceae	C3	
38	IZ	RVF	Riverine forests	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
38	IZ	RVF	Riverine forests	*Anamirta cocculus*	NE	NT	ME	Thiththawel	Menispermaceae	C3	
38	IZ	RVF	Riverine forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
38	IZ	RVF	Riverine forests	*Myristica ceylanica*	NE	NT	ME	Malaboda	Myristicaceae	C3	
38	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
38	IZ	RVF	Riverine forests	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla	Onagraceae	C3	

38	IZ	RVF	Riverine forests	*Piper sylvestre*	NE	NT	NM	Walgammiris	Piperaceae	D	
38	IZ	RVF	Riverine forests	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
38	IZ	RVF	Riverine forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
38	IZ	RVF	Riverine forests	*Carallia brachiata*	NE	NT	NM		Rhizophoraceae	D	
38	IZ	RVF	Riverine forests	*Morinda tinctoria*	EN	NT	ME	Ahu	Rubiaceae	B2	
38	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
38	IZ	RVF	Riverine forests	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
38	IZ	RVF	Riverine forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
38	IZ	RVF	Riverine forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
38	IZ	RVF	Riverine forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
38	IZ	RVF	Riverine forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
38	IZ	RVF	Riverine forests	*Filicium decipiens*	NE	NT	NM	Pihimbiya	Sapindaceae	D	
38	IZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
38	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
38	IZ	RVF	Riverine forests	*Mimusops elengi*	NE	NT	ME	Muna mal	Sapotaceae	C3	
38	IZ	RVF	Riverine forests	*Lygodium flexuosum*	NE	NT	NM	Pambawel	Schizaeaceae	D	
38	IZ	RVF	Riverine forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
38	IZ	RVF	Riverine forests	*Berrya cordifolia*	NE	NT	NM	Halmilla	Tiliaceae	D	
38	IZ	RVF	Riverine forests	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
38	IZ	RVF	Riverine forests	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
38	IZ	RVF	Riverine forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
38	IZ	RVF	Riverine forests	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
39	IZ	RVF	Riverine forests	*Semecarpus nigro-viridis*	EN	NT	NM	Badulla	Anacardiaceae	C1	
39	IZ	RVF	Riverine forests	*Pagiantha dichotoma*	NE	NT	ME		Apocynaceae	C3	
39	IZ	RVF	Riverine forests	*Cryptocoryne beckettii*	EN	TR	ME	Athu-udayang	Araceae	A	
39	IZ	RVF	Riverine forests	*Lagenandra ovata*	NE	NT	ME	Ketela	Araceae	C3	
39	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
39	IZ	RVF	Riverine forests	*Gymnema sylvestre*	NE	NT	ME	Mass badda	Asclepiadaceae	C3	
39	IZ	RVF	Riverine forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	

39	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
39	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
39	IZ	RVF	Riverine forests	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
39	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
39	IZ	RVF	Riverine forests	*Mesua ferrea*	NE	NT	ME		Clusiaceae	C3	
39	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
39	IZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
39	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
39	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
39	IZ	RVF	Riverine forests	*Fahrenheitia zeylanica*	NE	NT	NM		Euphorbiaceae	D	
39	IZ	RVF	Riverine forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
39	IZ	RVF	Riverine forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
39	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
39	IZ	RVF	Riverine forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
39	IZ	RVF	Riverine forests	*Crotalaria verrucosa*	NE	NT	ME	Andanaheeriya	Fabaceae	C3	
39	IZ	RVF	Riverine forests	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
39	IZ	RVF	Riverine forests	*Entada phaseoloides*	NE	NT	ME	Puswel	Fabaceae	C3	
39	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
39	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
39	IZ	RVF	Riverine forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
39	IZ	RVF	Riverine forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
39	IZ	RVF	Riverine forests	*Curculigo orchioides*	NE	NT	ME	Bimthal	Hypoxidaceae	C3	
39	IZ	RVF	Riverine forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
39	IZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
39	IZ	RVF	Riverine forests	*Anamirta cocculus*	NE	NT	ME	Thiththawel	Menispermaceae	C3	
39	IZ	RVF	Riverine forests	*Cyclea burmanni*	NE	NT	ME	Kesibissan	Menispermaceae	C3	
39	IZ	RVF	Riverine forests	*Dorstenia indica*	NE	NT	NM		Moraceae	D	
39	IZ	RVF	Riverine forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
39	IZ	RVF	Riverine forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	

39	IZ	RVF	Riverine forests	*Myristica ceylanica*	NE	NT	ME	Malaboda	Myristicaceae	C3	
39	IZ	RVF	Riverine forests	*Ardisia missionis*	NE	NT	NM	Baludan	Myrsinaceae	D	
39	IZ	RVF	Riverine forests	*Ardisia missionis*	NE	NT	NM	Baludan	Myrsinaceae	D	
39	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
39	IZ	RVF	Riverine forests	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla	Onagraceae	C3	
39	IZ	RVF	Riverine forests	*Cymbidium bicolor*	NE	NT	NM		Orchidaceae	D	
39	IZ	RVF	Riverine forests	*Pandanus ceylanicus*	EN	NT	ME	Wetake	Pandanaceae	B2	
39	IZ	RVF	Riverine forests	*Bothriochloa pertusa*	NE	NT	NM		Poaceae	D	
39	IZ	RVF	Riverine forests	*Polygala javana*	NE	NT	NM		Polygalaceae	D	
39	IZ	RVF	Riverine forests	*Monochoria hastata*	NE	NT	NM	Diyahabarala	Pontederiaceae	D	
39	IZ	RVF	Riverine forests	*Benkara malabarica*	NE	NT	NM		Rubiaceae	D	
39	IZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
39	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
39	IZ	RVF	Riverine forests	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
39	IZ	RVF	Riverine forests	*Ophiorhiza mungos*	NE	NT	ME	Dathketiya	Rubiaceae	C3	
39	IZ	RVF	Riverine forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
39	IZ	RVF	Riverine forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
39	IZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
39	IZ	RVF	Riverine forests	*Vitex leucoxylon*	NE	NT	ME	Nebada	Verbenaceae	C3	
40	IZ	RVF	Riverine forests	*Mollugo pentaphylla*	NE	NT	ME		Aizoaceae	C3	
40	IZ	RVF	Riverine forests	*Semecarpus nigro-viridis*	EN	NT	NM	Badulla	Anacardiaceae	C1	
40	IZ	RVF	Riverine forests	*Pagiantha dichotoma*	NE	NT	ME		Apocynaceae	C3	
40	IZ	RVF	Riverine forests	*Cryptocoryne beckettii*	EN	TR	ME	Athu-udayang	Araceae	A	
40	IZ	RVF	Riverine forests	*Lagenandra ovata*	NE	NT	ME	Ketela	Araceae	C3	
40	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
40	IZ	RVF	Riverine forests	*Schefflera heterobotrya*	EN	NT	NM		Araliaceae	C1	
40	IZ	RVF	Riverine forests	*Schefflera heterobotrya*	EN	NT	NM		Araliaceae	C1	
40	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
40	IZ	RVF	Riverine forests	*Eclipta prostrata*	NE	NT	ME		Asteraceae	C3	

40	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
40	IZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
40	IZ	RVF	Riverine forests	*Dioscorea pentaphylla*	NE	NT	NM	Katuala	Dioscoreaceae	D	
40	IZ	RVF	Riverine forests	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
40	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
40	IZ	RVF	Riverine forests	*Phyllanthus debilis*	NE	NT	ME		Euphorbiaceae	C3	
40	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
40	IZ	RVF	Riverine forests	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
40	IZ	RVF	Riverine forests	*Acacia pennata*	NE	NT	NM		Fabaceae	D	
40	IZ	RVF	Riverine forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
40	IZ	RVF	Riverine forests	*Crotalaria pallida*	NE	NT	NM	Andanaheeriya	Fabaceae	D	
40	IZ	RVF	Riverine forests	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
40	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
40	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
40	IZ	RVF	Riverine forests	*Samanea saman*	NE	NT	NM	Mara	Fabaceae	D	
40	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
40	IZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
40	IZ	RVF	Riverine forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
40	IZ	RVF	Riverine forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
40	IZ	RVF	Riverine forests	*Myristica ceylanica*	NE	NT	ME	Malaboda	Myristicaceae	C3	
40	IZ	RVF	Riverine forests	*Pandanus ceylanicus*	EN	NT	ME	Wetake	Pandanaceae	B2	
40	IZ	RVF	Riverine forests	*Piper sylvestre*	NE	NT	NM	Walgammiris	Piperaceae	D	
40	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
40	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
40	IZ	RVF	Riverine forests	*Berrya cordifolia*	NE	NT	NM	Halmilla	Tiliaceae	D	
40	IZ	RVF	Riverine forests	*Clerodendrum infortunatum*	NE	NT	ME	Pinna	Verbenaceae	C3	
40	IZ	RVF	Riverine forests	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
40	IZ	RVF	Riverine forests	*Vitex leucoxylon*	NE	NT	ME	Nebada	Verbenaceae	C3	
41	IZ	RVF	Riverine forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	

41	IZ	RVF	Riverine forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
41	IZ	RVF	Riverine forests	*Pagiantha dichotoma*	NE	NT	ME		Apocynaceae	C3	
41	IZ	RVF	Riverine forests	*Cryptocoryne beckettii*	EN	TR	ME	Athu-udayang	Araceae	A	
41	IZ	RVF	Riverine forests	*Lagenandra ovata*	NE	NT	ME	Ketela	Araceae	C3	
41	IZ	RVF	Riverine forests	*Schefflera heterobotrya*	EN	NT	NM		Araliaceae	C1	
41	IZ	RVF	Riverine forests	*Aristolochia indica*	NE	NT	ME	Maduwel	Aristolochiaceae	C3	
41	IZ	RVF	Riverine forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
41	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
41	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
41	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
41	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
41	IZ	RVF	Riverine forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
41	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
41	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
41	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
41	IZ	RVF	Riverine forests	*Drypetes gardneri*	EN	NT	NM	Eta wira	Euphorbiaceae	C1	
41	IZ	RVF	Riverine forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
41	IZ	RVF	Riverine forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
41	IZ	RVF	Riverine forests	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
41	IZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
41	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
41	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
41	IZ	RVF	Riverine forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
41	IZ	RVF	Riverine forests	*Curculigo orchioides*	NE	NT	ME	Bimthal	Hypoxidaceae	C3	
41	IZ	RVF	Riverine forests	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
41	IZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
41	IZ	RVF	Riverine forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
41	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
41	IZ	RVF	Riverine forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	

41	IZ	RVF	Riverine forests	*Pandanus ceylanicus*	EN	NT	ME	Wetake	Pandanaceae	B2	
41	IZ	RVF	Riverine forests	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
41	IZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
41	IZ	RVF	Riverine forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
41	IZ	RVF	Riverine forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
41	IZ	RVF	Riverine forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
41	IZ	RVF	Riverine forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
41	IZ	RVF	Riverine forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
41	IZ	RVF	Riverine forests	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
41	IZ	RVF	Riverine forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
42	IZ	RVF	Riverine forests	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
42	IZ	RVF	Riverine forests	*Alocasia macrorrhiza*	NE	NT	ME	Habarala	Araceae	C3	
42	IZ	RVF	Riverine forests	*Cryptocoryne walkeri*	EN	TR	ME	Athu-udayang	Araceae	A	
42	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
42	IZ	RVF	Riverine forests	*Aristolochia indica*	NE	NT	ME	Maduwel	Aristolochiaceae	C3	
42	IZ	RVF	Riverine forests	*Gymnema sylvestre*	NE	NT	ME	Mass badda	Asclepiadaceae	C3	
42	IZ	RVF	Riverine forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
42	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
42	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
42	IZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
42	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
42	IZ	RVF	Riverine forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
42	IZ	RVF	Riverine forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
42	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
42	IZ	RVF	Riverine forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
42	IZ	RVF	Riverine forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
42	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
42	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
42	IZ	RVF	Riverine forests	*Strychnos nux-vomica*	NE	NT	ME	Goda kaduru	Loganiaceae	C3	

42	IZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
42	IZ	RVF	Riverine forests	*Aglaia elaeagnoidea*	NE	NT	ME		Meliaceae	C3	
42	IZ	RVF	Riverine forests	*Ficus hispida*	NE	NT	ME	Kotadimbula	Moraceae	C3	
42	IZ	RVF	Riverine forests	*Ficus parasitica*	NE	NT	NM		Moraceae	D	
42	IZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
42	IZ	RVF	Riverine forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
42	IZ	RVF	Riverine forests	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla	Onagraceae	C3	
42	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
42	IZ	RVF	Riverine forests	*Zea mays*	NE	NT	ME	Badahinguru	Poaceae	C3	
42	IZ	RVF	Riverine forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
42	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
42	IZ	RVF	Riverine forests	*Cardiospermum halicacabum*	NE	NT	NM	Penela	Sapindaceae	D	
42	IZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
42	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
42	IZ	RVF	Riverine forests	*Vitex leucoxylon*	NE	NT	ME	Nebada	Verbenaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
43	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
43	IZ	MEF	Moist evergreen forests	*Uvaria sphenocarpa*	EN	NT	NM		Annonaceae	C1	
43	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Argyreia populifolia*	EN	NT	ME		Convolvulaceae	B2	
43	IZ	MEF	Moist evergreen forests	*Dioscorea pentaphylla*	NE	NT	NM	Katuala	Dioscoreaceae	D	
43	IZ	MEF	Moist evergreen forests	*Diospyros oocarpa*	NE	NT	NM	Kalukudumberiya	Ebenaceae	D	
43	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
43	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Derris parviflora*	EN	NT	NM	Kala wel	Fabaceae	C1	
43	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
43	IZ	MEF	Moist evergreen forests	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	

43	IZ	MEF	Moist evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
43	IZ	MEF	Moist evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
43	IZ	MEF	Moist evergreen forests	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
43	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
43	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
43	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
43	IZ	MEF	Moist evergreen forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Lepidagathis fasciculata*	NE	NT	NM		Acanthaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Tylophora indica*	NE	NT	ME		Asclepiadaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Diospyros oocarpa*	NE	NT	NM	Kalukudumberiya	Ebenaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
44	IZ	SCR	Thorn forests (scrublands)	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Cyrtococcum trigonum*	NE	NT	NM		Poaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	

44	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
44	IZ	SCR	Thorn forests (scrublands)	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
44	IZ	SCR	Thorn forests (scrublands)	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
45	IZ	RVF	Riverine forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
45	IZ	RVF	Riverine forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
45	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
45	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
45	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
45	IZ	RVF	Riverine forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
45	IZ	RVF	Riverine forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
45	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
45	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
45	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
45	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
45	IZ	RVF	Riverine forests	*Chionanthus zeylanica*	NE	NT	NM		Oleaceae	D	
45	IZ	RVF	Riverine forests	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
45	IZ	RVF	Riverine forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
45	IZ	RVF	Riverine forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
45	IZ	RVF	Riverine forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
45	IZ	RVF	Riverine forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
45	IZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
45	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
45	IZ	RVF	Riverine forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
46	IZ	RVF	Riverine forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	

46	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
46	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
46	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
46	IZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
46	IZ	RVF	Riverine forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
46	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
46	IZ	RVF	Riverine forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
46	IZ	RVF	Riverine forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
46	IZ	RVF	Riverine forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
46	IZ	RVF	Riverine forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
46	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
46	IZ	RVF	Riverine forests	*Acacia pennata*	NE	NT	NM		Fabaceae	D	
46	IZ	RVF	Riverine forests	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
46	IZ	RVF	Riverine forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
46	IZ	RVF	Riverine forests	*Leea indica*	NE	NT	ME	Burulla	Leeaceae	C3	
46	IZ	RVF	Riverine forests	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
46	IZ	RVF	Riverine forests	*Ficus parasitica*	NE	NT	NM		Moraceae	D	
46	IZ	RVF	Riverine forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
46	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
46	IZ	RVF	Riverine forests	*Dendrobium macrostachyum*	NE	NT	NM		Orchidaceae	D	
46	IZ	RVF	Riverine forests	*Bothriochloa pertusa*	NE	NT	NM		Poaceae	D	
46	IZ	RVF	Riverine forests	*Bothriochloa pertusa*	NE	NT	NM		Poaceae	D	
46	IZ	RVF	Riverine forests	*Drynaria quarcifolia*	NE	NT	ME	Beduru	Polypodiaceae	C3	
46	IZ	RVF	Riverine forests	*Benkara malabarica*	NE	NT	NM		Rubiaceae	D	
46	IZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
46	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
46	IZ	RVF	Riverine forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
46	IZ	RVF	Riverine forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
46	IZ	RVF	Riverine forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	

46	IZ	RVF	Riverine forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
46	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
46	IZ	RVF	Riverine forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
46	IZ	RVF	Riverine forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
46	IZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Lepidagathis fasciculata*	NE	NT	NM		Acanthaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Rourea minor*	NE	NT	ME	Radaliya	Connaraceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Cyperus compactus*	NE	NT	NM		Cyperaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
47	IZ	SCR	Thorn forests (scrublands)	*Diospyros sylvatica*	NE	NT	NM	Kaluwa	Ebenaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Drypetes gardneri*	EN	NT	NM	Eta wira	Euphorbiaceae	C1	
47	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Abrus precatorius*	NE	NT	ME		Fabaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Acacia pennata*	NE	NT	NM		Fabaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
47	IZ	SCR	Thorn forests (scrublands)	*Leea indica*	NE	NT	ME	Burulla	Leeaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Sida acuta*	NE	NT	ME	Bevila	Malvaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Walsura trifoliolata*	NE	NT	NM	Kirikon	Meliaceae	D	

47	IZ	SCR	Thorn forests (scrublands)	*Ficus parasitica*	NE	NT	NM		Moraceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Benkara malabarica*	NE	NT	NM		Rubiaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Mussaenda frondosa*	NE	NT	ME	Mussanda	Rubiaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Laportea bulbifera*	NE	NT	NM	Walkahambiliya	Urticaceae	D	
47	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
47	IZ	SCR	Thorn forests (scrublands)	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
48	IZ	RVF	Riverine forests	*Mangifera zeylanica*	EN	NT	NM	Etaba	Anacardiaceae	C1	
48	IZ	RVF	Riverine forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
48	IZ	RVF	Riverine forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
48	IZ	RVF	Riverine forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
48	IZ	RVF	Riverine forests	*Alocasia macrorrhiza*	NE	NT	ME	Habarala	Araceae	C3	
48	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
48	IZ	RVF	Riverine forests	*Tylophora indica*	NE	NT	ME		Asclepiadaceae	C3	
48	IZ	RVF	Riverine forests	*Calophyllum bracteatum*	EN	NT	NM	Dombakeena	Clusiaceae	C1	
48	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
48	IZ	RVF	Riverine forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
48	IZ	RVF	Riverine forests	*Diospyros oocarpa*	NE	NT	NM	Kalukudumberiya	Ebenaceae	D	

48	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
48	IZ	RVF	Riverine forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
48	IZ	RVF	Riverine forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
48	IZ	RVF	Riverine forests	*Derris parviflora*	EN	NT	NM	Kala wel	Fabaceae	C1	
48	IZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
48	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
48	IZ	RVF	Riverine forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
48	IZ	RVF	Riverine forests	*Leea indica*	NE	NT	ME	Burulla	Leeaceae	C3	
48	IZ	RVF	Riverine forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
48	IZ	RVF	Riverine forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
48	IZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
48	IZ	RVF	Riverine forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
48	IZ	RVF	Riverine forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
48	IZ	RVF	Riverine forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
48	IZ	RVF	Riverine forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
48	IZ	RVF	Riverine forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
48	IZ	RVF	Riverine forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
48	IZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
48	IZ	RVF	Riverine forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
48	IZ	RVF	Riverine forests	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
48	IZ	RVF	Riverine forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
49	IZ	AGL	Agricultural lands	*Mangifera indica*	NE	NT	ME	Amba	Anacardiaceae	C3	
49	IZ	AGL	Agricultural lands	*Annona reticulata*	NE	NT	ME	Welianoda	Annonaceae	C3	
49	IZ	AGL	Agricultural lands	*Areca catechu*	NE	NT	ME	Puwak	*Arecaceae*	C3	
49	IZ	AGL	Agricultural lands	*Borassus flabellifer*	NE	NT	ME	Thal	Arecaceae	C3	
49	IZ	AGL	Agricultural lands	*Caryota urens*	NE	NT	ME	Kithul	*Arecaceae*	C3	
49	IZ	AGL	Agricultural lands	*Cocos nucifera*	NE	NT	ME	Pol	Arecaceae	C3	
49	IZ	AGL	Agricultural lands	*Tecoma stans*	NE	NT	NM	Kelanitissa	Bignoniaceae	D	
49	IZ	AGL	Agricultural lands	*Carica papaya*	NE	NT	ME	Pepol	Caricaceae	C3	

49	IZ	AGL	Agricultural lands	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
49	IZ	AGL	Agricultural lands	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
49	IZ	AGL	Agricultural lands	*Jatropha curcas*	NE	NT	ME	Wetaendaru	Euphorbiaceae	C3	
49	IZ	AGL	Agricultural lands	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
49	IZ	AGL	Agricultural lands	*Gliricidia sepium*	NE	NT	NM	Wetahira	Fabaceae	D	
49	IZ	AGL	Agricultural lands	*Gossypium arboreum*	NE	NT	ME	Kapu	Malvaceae	C3	
49	IZ	AGL	Agricultural lands	*Hibiscus eriocarpus*	NE	NT	ME		Malvaceae	C3	
49	IZ	AGL	Agricultural lands	*Thespesia populnea*	NE	NT	ME	Gansooria	Malvaceae	C3	
49	IZ	AGL	Agricultural lands	*Azadirachta indica*	NE	NT	ME	Kohomba	Meliaceae	C3	
49	IZ	AGL	Agricultural lands	*Artocarpus heterophyllus*	NE	NT	ME	Kos	Moraceae	C3	
49	IZ	AGL	Agricultural lands	*Musa acuminata*	NE	NT	ME	Kesel	Musaceae	C3	
49	IZ	AGL	Agricultural lands	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
49	IZ	AGL	Agricultural lands	*Citrus sp.*	NE	NT	ME	Waldehi	Rutaceae	C3	
49	IZ	AGL	Agricultural lands	*Murraya koenigii*	NE	NT	ME		Rutaceae	C3	
49	IZ	AGL	Agricultural lands	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
49	IZ	AGL	Agricultural lands	*Pouteria campechiana*	NE	NT	NM	Sapadilla	Sapotaceae	D	
49	IZ	AGL	Agricultural lands	*Tectona grandis*	NE	NT	ME	Tekka	Verbenaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Lepidagathis fasciculata*	NE	NT	NM		Acanthaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Uvaria sphenocarpa*	EN	NT	NM		Annonaceae	C1	
50	IZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Aristolochia indica*	NE	NT	ME	Maduwel	Aristolochiaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Mesua ferrea*	NE	NT	ME		Clusiaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	

50	IZ	SCR	Thorn forests (scrublands)	*Albizia chinensis*	NE	NT	NM	Kabalmara	Fabaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Cassia roxburghii*	NE	NT	NM	Rathuwa	Fabaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Tephrosia purpurea*	NE	NT	ME	Gam pila	Fabaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Gossypium arboreum*	NE	NT	ME	Kapu	Malvaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Cissampelos pareira*	NE	NT	ME		Menispermaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Bambusa bambos*	NE	NT	NM	Katu-una	Poaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Cyrtococcum trigonum*	NE	NT	NM		Poaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
50	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
50	IZ	SCR	Thorn forests (scrublands)	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
51	IZ	AGL	Agricultural lands	*Allmania nodiflora*	NE	NT	NM		Amaranthaceae	D	
51	IZ	AGL	Agricultural lands	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
51	IZ	AGL	Agricultural lands	*Borassus flabellifer*	NE	NT	ME	Thal	Arecaceae	C3	
51	IZ	AGL	Agricultural lands	*Cosmostigma racemosa*	NE	TR	NM	Kiriwel	Asclepiadaceae	C2	
51	IZ	AGL	Agricultural lands	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
51	IZ	AGL	Agricultural lands	*Tridax procumbens*	NE	NT	NM		Asteraceae	D	

51	IZ	AGL	Agricultural lands	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
51	IZ	AGL	Agricultural lands	*Carica papaya*	NE	NT	ME	Pepol	Caricaceae	C3	
51	IZ	AGL	Agricultural lands	*Calophyllum bracteatum*	EN	NT	NM	Dombakeena	Clusiaceae	C1	
51	IZ	AGL	Agricultural lands	*Cucurbita mixima*	NE	NT	ME	Wattakka	Cucurbitaceae	C3	
51	IZ	AGL	Agricultural lands	*Euphorbia heterophylla*	NE	NT	ME	Kapunkeeriya	Euphorbiaceae	C3	
51	IZ	AGL	Agricultural lands	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
51	IZ	AGL	Agricultural lands	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
51	IZ	AGL	Agricultural lands	*Allium cipa*	NE	NT	ME		Liliaceae	C3	
51	IZ	AGL	Agricultural lands	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
51	IZ	AGL	Agricultural lands	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
51	IZ	AGL	Agricultural lands	*Adina cordifolia*	NE	NT	ME	Kolon	Rubiaceae	C3	
51	IZ	AGL	Agricultural lands	*Mitragyna parvifolia*	NE	NT	ME	Helamba	Rubiaceae	C3	
51	IZ	AGL	Agricultural lands	*Ophiorhiza mungos*	NE	NT	ME	Dathketiya	Rubiaceae	C3	
51	IZ	AGL	Agricultural lands	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
51	IZ	AGL	Agricultural lands	*Solanum melongena*	NE	NT	ME	Elabatu	Solanaceae	C3	
51	IZ	AGL	Agricultural lands	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
51	IZ	AGL	Agricultural lands	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
51	IZ	AGL	Agricultural lands	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
51	IZ	AGL	Agricultural lands	*Stachytarpheta jamaicansis*	NE	NT	NM	Balunaguta	Verbenaceae	D	
52	IZ	AGL	Agricultural lands	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
52	IZ	AGL	Agricultural lands	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
52	IZ	AGL	Agricultural lands	*Mangifera indica*	NE	NT	ME	Amba	Anacardiaceae	C3	
52	IZ	AGL	Agricultural lands	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
52	IZ	AGL	Agricultural lands	*Spondias pinnata*	NE	NT	ME		Anacardiaceae	C3	
52	IZ	AGL	Agricultural lands	*Alstonia scholaris*	NE	NT	ME	Ruk attana	Apocynaceae	C3	
52	IZ	AGL	Agricultural lands	*Alocasia macrorrhiza*	NE	NT	ME	Habarala	Araceae	C3	
52	IZ	AGL	Agricultural lands	*Areca catechu*	NE	NT	ME	Puwak	*Arecaceae*	C3	
52	IZ	AGL	Agricultural lands	*Caryota urens*	NE	NT	ME	Kithul	*Arecaceae*	C3	
52	IZ	AGL	Agricultural lands	*Aristolochia indica*	NE	NT	ME	Maduwel	Aristolochiaceae	C3	

52	IZ	AGL	Agricultural lands	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
52	IZ	AGL	Agricultural lands	*Tithonia diversifolia*	NE	NT	NM	Thiththa	Asteraceae	D	
52	IZ	AGL	Agricultural lands	*Ceiba pentandra*	NE	NT	ME	Kotta	Bombacaceae	C3	
52	IZ	AGL	Agricultural lands	*Carica papaya*	NE	NT	ME	Pepol	Caricaceae	C3	
52	IZ	AGL	Agricultural lands	*Argyreia populifolia*	EN	NT	ME		Convolvulaceae	B2	
52	IZ	AGL	Agricultural lands	*Kalanchoe pinnata*	NE	TR	ME	Akkapana	Crassulaceae	B3	
52	IZ	AGL	Agricultural lands	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
52	IZ	AGL	Agricultural lands	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
52	IZ	AGL	Agricultural lands	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
52	IZ	AGL	Agricultural lands	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
52	IZ	AGL	Agricultural lands	*Phyllanthus debilis*	NE	NT	ME		Euphorbiaceae	C3	
52	IZ	AGL	Agricultural lands	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
52	IZ	AGL	Agricultural lands	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
52	IZ	AGL	Agricultural lands	*Acacia pennata*	NE	NT	NM		Fabaceae	D	
52	IZ	AGL	Agricultural lands	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
52	IZ	AGL	Agricultural lands	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
52	IZ	AGL	Agricultural lands	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
52	IZ	AGL	Agricultural lands	*Erythrina variegata*	NE	NT	ME		Fabaceae	C3	
52	IZ	AGL	Agricultural lands	*Gliricidia sepium*	NE	NT	NM	Wetahira	Fabaceae	D	
52	IZ	AGL	Agricultural lands	*Tamarindus indica*	NE	NT	ME	Siyambala	Fabaceae	C3	
52	IZ	AGL	Agricultural lands	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
52	IZ	AGL	Agricultural lands	*Persea americana*	NE	NT	ME	Alipera	Lauraceae	C3	
52	IZ	AGL	Agricultural lands	*Careya arborea*	NE	NT	ME	Kahata	Lecythidaceae	C3	
52	IZ	AGL	Agricultural lands	*Abutilon indicum*	NE	NT	ME	Walanoda	Malvaceae	C3	
52	IZ	AGL	Agricultural lands	*Walsura trifoliolata*	NE	NT	NM	Kirikon	Meliaceae	D	
52	IZ	AGL	Agricultural lands	*Anamirta cocculus*	NE	NT	ME	Thiththawel	Menispermaceae	C3	
52	IZ	AGL	Agricultural lands	*Artocarpus heterophyllus*	NE	NT	ME	Kos	Moraceae	C3	
52	IZ	AGL	Agricultural lands	*Castilla elastica*	NE	NT	NM		Moraceae	D	
52	IZ	AGL	Agricultural lands	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	

52	IZ	AGL	Agricultural lands	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
52	IZ	AGL	Agricultural lands	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
52	IZ	AGL	Agricultural lands	*Passiflora edulis*	NE	NT	ME		Passifloraceae	C3	
52	IZ	AGL	Agricultural lands	*Piper longum*	NE	NT	ME	Gammiris	Piperaceae	C3	
52	IZ	AGL	Agricultural lands	*Antigonon leptopus*	NE	NT	NM		Polygonaceae	D	
52	IZ	AGL	Agricultural lands	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
52	IZ	AGL	Agricultural lands	*Benkara malabarica*	NE	NT	NM		Rubiaceae	D	
52	IZ	AGL	Agricultural lands	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
52	IZ	AGL	Agricultural lands	*Morinda umbellata*	EN	NT	ME	Ahu	Rubiaceae	B2	
52	IZ	AGL	Agricultural lands	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
52	IZ	AGL	Agricultural lands	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
52	IZ	AGL	Agricultural lands	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
52	IZ	AGL	Agricultural lands	*Cardiospermum halicacabum*	NE	NT	NM	Penela	Sapindaceae	D	
52	IZ	AGL	Agricultural lands	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
52	IZ	AGL	Agricultural lands	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
52	IZ	AGL	Agricultural lands	*Filicium decipiens*	NE	NT	NM	Pihimbiya	Sapindaceae	D	
52	IZ	AGL	Agricultural lands	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
52	IZ	AGL	Agricultural lands	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
52	IZ	AGL	Agricultural lands	*Theobroma cacao*	NE	NT	ME		Sterculiaceae	C3	
52	IZ	AGL	Agricultural lands	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
52	IZ	AGL	Agricultural lands	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
52	IZ	AGL	Agricultural lands	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
52	IZ	AGL	Agricultural lands	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
52	IZ	AGL	Agricultural lands	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
52	IZ	AGL	Agricultural lands	*Zingiber officinale*	NE	NT	ME	Inguru	Zingiberaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
53	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
53	IZ	MEF	Moist evergreen forests	*Uvaria sphenocarpa*	EN	NT	NM		Annonaceae	C1	
53	IZ	MEF	Moist evergreen forests	*Schefflera heterobotrya*	EN	NT	NM		Araliaceae	C1	

53	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
53	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
53	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Samanea saman*	NE	NT	NM	Mara	Fabaceae	D	
53	IZ	MEF	Moist evergreen forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
53	IZ	MEF	Moist evergreen forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
53	IZ	MEF	Moist evergreen forests	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
53	IZ	MEF	Moist evergreen forests	*Walsura trifoliolata*	NE	NT	NM	Kiri kon	Meliaceae	D	
53	IZ	MEF	Moist evergreen forests	*Pachygone ovata*	NE	NT	NM		Menispermaceae	D	
53	IZ	MEF	Moist evergreen forests	*Tinospora cordifolia*	NE	NT	ME	Rasakinda	Menispermaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
53	IZ	MEF	Moist evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
53	IZ	MEF	Moist evergreen forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
53	IZ	MEF	Moist evergreen forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Citrus aurantifolia*	NE	NT	ME	Dehi	Rutaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
53	IZ	MEF	Moist evergreen forests	*Celtis cinnamomea*	NE	NT	ME	Gurenda	Ulmaceae	C3	

53	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Aristolochia indica*	NE	NT	ME	Maduwel	Aristolochiaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Cordia monoica*	NE	NT	NM	Lolu	Boraginaceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Rourea minor*	NE	NT	ME	Radaliya	Connaraceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
54	IZ	SCR	Thorn forests (scrublands)	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Erythroxylum monogynum*	NE	NT	ME	Batakirilla	Erythroxylaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
54	IZ	SCR	Thorn forests (scrublands)	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Manihot glaziovii*	NE	NT	NM	Walrubber	Euphorbiaceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Samanea saman*	NE	NT	NM	Mara	Fabaceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Tephrosia purpurea*	NE	NT	ME	Gam pila	Fabaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
54	IZ	SCR	Thorn forests (scrublands)	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
54	IZ	SCR	Thorn forests (scrublands)	*Walsura trifoliolata*	NE	NT	NM	Kirikon	Meliaceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	

54	IZ	SCR	Thorn forests (scrublands)	*Vanda tessellata*	NE	TR	ME		Orchidaceae	B3	
54	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
54	IZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
54	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
54	IZ	SCR	Thorn forests (scrublands)	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
55	IZ	RVF	Riverine forests	*Eranthemum capense*	NE	NT	NM		Acanthaceae	D	
55	IZ	RVF	Riverine forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
55	IZ	RVF	Riverine forests	*Lagenandra ovata*	NE	NT	ME	Ketela	Araceae	C3	
55	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
55	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
55	IZ	RVF	Riverine forests	*Cassine balae*	EN	NT	NM	Neralu	Celastraceae	C1	
55	IZ	RVF	Riverine forests	*Pleurostylia opposita*	NE	NT	NM	Panakka	Celastraceae	D	
55	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
55	IZ	RVF	Riverine forests	*Dillenia indica*	NE	NT	ME	Hodapollan	Dilleniaceae	C3	
55	IZ	RVF	Riverine forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
55	IZ	RVF	Riverine forests	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
55	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
55	IZ	RVF	Riverine forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
55	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
55	IZ	RVF	Riverine forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
55	IZ	RVF	Riverine forests	*Margaritaria indicus*	NE	NT	NM	Karau	Euphorbiaceae	D	
55	IZ	RVF	Riverine forests	*Phyllanthus myrtifolius*	EN	NT	NM		Euphorbiaceae	C1	
55	IZ	RVF	Riverine forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	

55	IZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
55	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
55	IZ	RVF	Riverine forests	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
55	IZ	RVF	Riverine forests	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
55	IZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
55	IZ	RVF	Riverine forests	*Ficus hispida*	NE	NT	ME	Kotadimbula	Moraceae	C3	
55	IZ	RVF	Riverine forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
55	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
55	IZ	RVF	Riverine forests	*Pandanus ceylanicus*	EN	NT	ME	Wetake	Pandanaceae	B2	
55	IZ	RVF	Riverine forests	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
55	IZ	RVF	Riverine forests	*Ixora coccinea*	NE	NT	ME	Ratabala	Rubiaceae	C3	
55	IZ	RVF	Riverine forests	*Ixora jucunda*	EN	NT	NM		Rubiaceae	C1	
55	IZ	RVF	Riverine forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
55	IZ	RVF	Riverine forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
55	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
56	IZ	RVF	Riverine forests	*Blepharis madraspatensis*	NE	NT	NM		Acanthaceae	D	
56	IZ	RVF	Riverine forests	*Semecarpus nigro-viridis*	EN	NT	NM	Badulla	Anacardiaceae	C1	
56	IZ	RVF	Riverine forests	*Cryptocoryne walkeri*	EN	TR	ME	Athu-udayang	Araceae	A	
56	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
56	IZ	RVF	Riverine forests	*Gymnema sylvestre*	NE	NT	ME	Mass badda	Asclepiadaceae	C3	
56	IZ	RVF	Riverine forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
56	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
56	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
56	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
56	IZ	RVF	Riverine forests	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
56	IZ	RVF	Riverine forests	*Dillenia indica*	NE	NT	ME	Hodapollan	Dilleniaceae	C3	
56	IZ	RVF	Riverine forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
56	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
56	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	

56	IZ	RVF	Riverine forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
56	IZ	RVF	Riverine forests	*Antidesma alexiteria?*	NE	NT	NM		Euphorbiaceae	D	
56	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
56	IZ	RVF	Riverine forests	*Drypetes gardneri*	EN	NT	NM	Eta wira	Euphorbiaceae	C1	
56	IZ	RVF	Riverine forests	*Margaritaria indicus*	NE	NT	NM	Karau	Euphorbiaceae	D	
56	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
56	IZ	RVF	Riverine forests	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
56	IZ	RVF	Riverine forests	*Acacia pennata*	NE	NT	NM		Fabaceae	D	
56	IZ	RVF	Riverine forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
56	IZ	RVF	Riverine forests	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
56	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
56	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
56	IZ	RVF	Riverine forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
56	IZ	RVF	Riverine forests	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
56	IZ	RVF	Riverine forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
56	IZ	RVF	Riverine forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
56	IZ	RVF	Riverine forests	*Ardisia missionis*	NE	NT	NM	Baludan	Myrsinaceae	D	
56	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
56	IZ	RVF	Riverine forests	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
56	IZ	RVF	Riverine forests	*Carallia brachiata*	NE	NT	NM		Rhizophoraceae	D	
56	IZ	RVF	Riverine forests	*Ixora jucunda*	EN	NT	NM		Rubiaceae	C1	
56	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
56	IZ	RVF	Riverine forests	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
56	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
56	IZ	RVF	Riverine forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
56	IZ	RVF	Riverine forests	*Trema orientale*	NE	NT	ME	Gedumba	Ulmaceae	C3	
56	IZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Andrographis paniculata*	NE	NT	ME		Acanthaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	

57	IZ	MEF	Moist evergreen forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
57	IZ	MEF	Moist evergreen forests	*Annona muricata*	NE	NT	ME	Anoda	Annonaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
57	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
57	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
57	IZ	MEF	Moist evergreen forests	*Gymnema sylvestre*	NE	NT	ME	Mass badda	Asclepiadaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
57	IZ	MEF	Moist evergreen forests	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
57	IZ	MEF	Moist evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
57	IZ	MEF	Moist evergreen forests	*Antidesma alexiteria?*	NE	NT	NM		Euphorbiaceae	D	
57	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
57	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	
57	IZ	MEF	Moist evergreen forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
57	IZ	MEF	Moist evergreen forests	*Phyllanthus amarus*	NE	NT	ME		Euphorbiaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
57	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Sida acuta*	NE	NT	ME	Bevila	Malvaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Plecospermum spinosum*	NE	NT	ME	Thingol	Moraceae	C3	
57	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
57	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
57	IZ	MEF	Moist evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Morinda umbellata*	EN	NT	ME	Ahu	Rubiaceae	B2	
57	IZ	MEF	Moist evergreen forests	*Acronychia pedunculata*	NE	NT	ME	Ankenda	Rutaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	

57	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
57	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Filicium decipiens*	NE	NT	NM	Pihimbiya	Sapindaceae	D	
57	IZ	MEF	Moist evergreen forests	*Pometia pinata*	NE	NT	NM		Sapindaceae	D	
57	IZ	MEF	Moist evergreen forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
57	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
57	IZ	MEF	Moist evergreen forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Blepharis madraspatensis*	NE	NT	NM		Acanthaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus niriuri*	NE	NT	ME	Pitawakka	Euphorbiaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Leea indica*	NE	NT	ME	Burulla	Leeaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	

58	IZ	SCR	Thorn forests (scrublands)	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
58	IZ	SCR	Thorn forests (scrublands)	*Benkara malabarica*	NE	NT	NM		Rubiaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
58	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
58	IZ	SCR	Thorn forests (scrublands)	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
59	IZ	MEF	Moist evergreen forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
59	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
59	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
59	IZ	MEF	Moist evergreen forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
59	IZ	MEF	Moist evergreen forests	*Oxystelma esculentum*	NE	TR	NM		Asclepiadaceae	C2	
59	IZ	MEF	Moist evergreen forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Rourea minor*	NE	NT	ME	Radaliya	Connaraceae	C3	
59	IZ	MEF	Moist evergreen forests	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
59	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
59	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
59	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Acacia pennata*	NE	NT	NM		Fabaceae	D	

59	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
59	IZ	MEF	Moist evergreen forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
59	IZ	MEF	Moist evergreen forests	*Curculigo orchioides*	NE	NT	ME	Bimthal	Hypoxidaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
59	IZ	MEF	Moist evergreen forests	*Walsura trifoliolata*	NE	NT	NM	Kiri kon	Meliaceae	D	
59	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
59	IZ	MEF	Moist evergreen forests	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
59	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
59	IZ	MEF	Moist evergreen forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
59	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
59	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
59	IZ	MEF	Moist evergreen forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
60	IZ	SCR	Thorn forests (scrublands)	*Andrographis alata*	NE	NT	NM		Acanthaceae	D	
60	IZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
60	IZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
60	IZ	SCR	Thorn forests (scrublands)	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
60	IZ	SCR	Thorn forests (scrublands)	*Evolvulus alsinoides*	NE	NT	ME	Vishnukranthi	Convolvulaceae	C3	
60	IZ	SCR	Thorn forests (scrublands)	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
60	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
60	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
60	IZ	SCR	Thorn forests (scrublands)	*Margaritaria indicus*	NE	NT	NM	Karau	Euphorbiaceae	D	
60	IZ	SCR	Thorn forests (scrublands)	*Hugonia mystax*	NE	NT	ME	Bu gettiya	Linaceae	C3	

60	IZ	SCR	Thorn forests (scrublands)	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
60	IZ	SCR	Thorn forests (scrublands)	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
60	IZ	SCR	Thorn forests (scrublands)	*Ziziphus rugosa*	NE	NT	ME	Maha eraminiya	Rhamnaceae	C3	
60	IZ	SCR	Thorn forests (scrublands)	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
60	IZ	SCR	Thorn forests (scrublands)	*Benkara malabarica*	NE	NT	NM		Rubiaceae	D	
60	IZ	SCR	Thorn forests (scrublands)	*Canthium coromandelicum*	NE	NT	ME	Kara	Rubiaceae	C3	
60	IZ	SCR	Thorn forests (scrublands)	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
60	IZ	SCR	Thorn forests (scrublands)	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
60	IZ	SCR	Thorn forests (scrublands)	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
60	IZ	SCR	Thorn forests (scrublands)	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
61	IZ	MEF	Moist evergreen forests	*Mangifera zeylanica*	EN	NT	NM	Etaba	Anacardiaceae	C1	
61	IZ	MEF	Moist evergreen forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
61	IZ	MEF	Moist evergreen forests	*Artabotrys zeylanicus*	NE	NT	NM	Kalubambarewel	Annonaceae	D	
61	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
61	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
61	IZ	MEF	Moist evergreen forests	*Uvaria sphenocarpa*	EN	NT	NM		Annonaceae	C1	
61	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
61	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Fahrenheitia zeylanica*	NE	NT	NM		Euphorbiaceae	D	
61	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
61	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
61	IZ	MEF	Moist evergreen forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
61	IZ	MEF	Moist evergreen forests	*Curculigo orchioides*	NE	NT	ME	Bimthal	Hypoxidaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Neolitsea cassia*	NE	NT	ME	Kududavula	Lauraceae	C3	
61	IZ	MEF	Moist evergreen forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
61	IZ	MEF	Moist evergreen forests	*Walsura trifoliolata*	NE	NT	NM	Kiri kon	Meliaceae	D	
61	IZ	MEF	Moist evergreen forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
61	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	

61	IZ	MEF	Moist evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
61	IZ	MEF	Moist evergreen forests	*Acronychia pedunculata*	NE	NT	ME	Ankenda	Rutaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Atalantia ceylanica*	NE	NT	ME	Yakdehi	Rutaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
61	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Filicium decipiens*	NE	NT	NM	Pihimbiya	Sapindaceae	D	
61	IZ	MEF	Moist evergreen forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
61	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
62	IZ	AGL	Agricultural lands	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
62	IZ	AGL	Agricultural lands	*Mangifera indica*	NE	NT	ME	Amba	Anacardiaceae	C3	
62	IZ	AGL	Agricultural lands	*Annona reticulata*	NE	NT	ME	Welianoda	Annonaceae	C3	
62	IZ	AGL	Agricultural lands	*Areca catechu*	NE	NT	ME	Puwak	*Arecaceae*	C3	
62	IZ	AGL	Agricultural lands	*Cocos nucifera*	NE	NT	ME	Pol	Arecaceae	C3	
62	IZ	AGL	Agricultural lands	*Aristolochia indica*	NE	NT	ME	Maduwel	Aristolochiaceae	C3	
62	IZ	AGL	Agricultural lands	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
62	IZ	AGL	Agricultural lands	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
62	IZ	AGL	Agricultural lands	*Tridax procumbens*	NE	NT	NM		Asteraceae	D	
62	IZ	AGL	Agricultural lands	*Eclipta prostrata*	NE	NT	ME	Kikiridi	Asteraceae	C3	
62	IZ	AGL	Agricultural lands	*Carica papaya*	NE	NT	ME	Pepol	Caricaceae	C3	
62	IZ	AGL	Agricultural lands	*Cuscuta chinensis*	NE	NT	ME		Convolvulaceae	C3	
62	IZ	AGL	Agricultural lands	*Cucurbita mixima*	NE	NT	ME	Wattakka	Cucurbitaceae	C3	
62	IZ	AGL	Agricultural lands	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
62	IZ	AGL	Agricultural lands	*Jatropha curcas*	NE	NT	ME	Wetaendaru	Euphorbiaceae	C3	
62	IZ	AGL	Agricultural lands	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
62	IZ	AGL	Agricultural lands	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	

62	IZ	AGL	Agricultural lands	*Manihot glaziovii*	NE	NT	NM	Walrubber	Euphorbiaceae	D	
62	IZ	AGL	Agricultural lands	*Margaritaria indicus*	NE	NT	NM	Karau	Euphorbiaceae	D	
62	IZ	AGL	Agricultural lands	*Phyllanthus debilis*	NE	NT	ME		Euphorbiaceae	C3	
62	IZ	AGL	Agricultural lands	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
62	IZ	AGL	Agricultural lands	*Atylosia trinervia*	NE	NT	ME	Aththora	Fabaceae	C3	
62	IZ	AGL	Agricultural lands	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
62	IZ	AGL	Agricultural lands	*Gliricidia sepium*	NE	NT	NM	Wetahira	Fabaceae	D	
62	IZ	AGL	Agricultural lands	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
62	IZ	AGL	Agricultural lands	*Tamarindus indica*	NE	NT	ME	Siyambala	Fabaceae	C3	
62	IZ	AGL	Agricultural lands	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
62	IZ	AGL	Agricultural lands	*Limnocharis flava*	NE	NT	NM	Diyagowa	Limnocharitaceae	D	
62	IZ	AGL	Agricultural lands	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
62	IZ	AGL	Agricultural lands	*Abutilon indicum*	NE	NT	ME	Walanoda	Malvaceae	C3	
62	IZ	AGL	Agricultural lands	*Sida cordifolia*	NE	NT	ME	Sudubevila	Malvaceae	C3	
62	IZ	AGL	Agricultural lands	*Cyclea burmanni*	NE	NT	ME	Kesibissan	Menispermaceae	C3	
62	IZ	AGL	Agricultural lands	*Artocarpus heterophyllus*	NE	NT	ME	Kos	Moraceae	C3	
62	IZ	AGL	Agricultural lands	*Artocarpus nobilis*	NE	NT	NM	Del	Moraceae	D	
62	IZ	AGL	Agricultural lands	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
62	IZ	AGL	Agricultural lands	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
62	IZ	AGL	Agricultural lands	*Moringa oleifera*	NE	NT	ME	Murunga	Moringaceae	C3	
62	IZ	AGL	Agricultural lands	*Musa acuminata*	NE	NT	ME	Kesel	Musaceae	C3	
62	IZ	AGL	Agricultural lands	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
62	IZ	AGL	Agricultural lands	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla	Onagraceae	C3	
62	IZ	AGL	Agricultural lands	*Pandanus ceylanicus*	EN	NT	ME	Wetake	Pandanaceae	B2	
62	IZ	AGL	Agricultural lands	*Oryza sativa*	NE	NT	ME	Wee	Poaceae	C3	
62	IZ	AGL	Agricultural lands	*Zea mays*	NE	NT	ME	Badahinguru	Poaceae	C3	
62	IZ	AGL	Agricultural lands	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
62	IZ	AGL	Agricultural lands	*Adina cordifolia*	NE	NT	ME	Kolon	Rubiaceae	C3	
62	IZ	AGL	Agricultural lands	*Mussaenda frondosa*	NE	NT	ME	Mussanda	Rubiaceae	C3	

62	IZ	AGL	Agricultural lands	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
62	IZ	AGL	Agricultural lands	*Aegle marmelos*	NE	NT	ME	Beli	Rutaceae	C3	
62	IZ	AGL	Agricultural lands	*Citrus reticulata*	NE	NT	ME	Jamanaran	Rutaceae	C3	
62	IZ	AGL	Agricultural lands	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
62	IZ	AGL	Agricultural lands	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
62	IZ	AGL	Agricultural lands	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
62	IZ	AGL	Agricultural lands	*Pouteria campechiana*	NE	NT	NM	Sapadilla	Sapotaceae	D	
62	IZ	AGL	Agricultural lands	*Bacopa monnieri*	NE	NT	ME	Lunuwila	Scrophulariaceae	C3	
62	IZ	AGL	Agricultural lands	*Capsicum annuum*	NE	NT	ME	Miris	Solanaceae	C3	
62	IZ	AGL	Agricultural lands	*Nicotiana tabacum*	NE	NT	ME	Dunkola	Solanaceae	C3	
62	IZ	AGL	Agricultural lands	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
62	IZ	AGL	Agricultural lands	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
62	IZ	AGL	Agricultural lands	*Grewia microcos*	NE	NT	NM	Keliya	Tiliaceae	D	
62	IZ	AGL	Agricultural lands	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
62	IZ	AGL	Agricultural lands	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
62	IZ	AGL	Agricultural lands	*Tectona grandis*	NE	NT	ME	Tekka	Verbenaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
63	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
63	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
63	IZ	MEF	Moist evergreen forests	*Antidesma alexiteria?*	NE	NT	NM		Euphorbiaceae	D	
63	IZ	MEF	Moist evergreen forests	*Croton officinalis*	NE	NT	NM		Euphorbiaceae	D	
63	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
63	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
63	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
63	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
63	IZ	MEF	Moist evergreen forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
63	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
63	IZ	MEF	Moist evergreen forests	*Cassia kleinii*	NE	NT	NM		Fabaceae	D	

63	IZ	MEF	Moist evergreen forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
63	IZ	MEF	Moist evergreen forests	*Munronia pinnata*	EN	NT	ME	Binkohomba	Meliaceae	B2	
63	IZ	MEF	Moist evergreen forests	*Tinospora cordifolia*	NE	NT	ME	Rasakinda	Menispermaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
63	IZ	MEF	Moist evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Discospermum sphaerocarpum*	NE	NT	NM		Rubiaceae	D	
63	IZ	MEF	Moist evergreen forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
63	IZ	MEF	Moist evergreen forests	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
63	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
63	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
63	IZ	MEF	Moist evergreen forests	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
64	IZ	MEF	Moist evergreen forests	*Mangifera zeylanica*	EN	NT	NM	Etaba	Anacardiaceae	C1	
64	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
64	IZ	MEF	Moist evergreen forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
64	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
64	IZ	MEF	Moist evergreen forests	*Fahrenheitia zeylanica*	NE	NT	NM		Euphorbiaceae	D	
64	IZ	MEF	Moist evergreen forests	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	
64	IZ	MEF	Moist evergreen forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
64	IZ	MEF	Moist evergreen forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
64	IZ	MEF	Moist evergreen forests	*Curculigo orchioides*	NE	NT	ME	Bimthal	Hypoxidaceae	C3	
64	IZ	MEF	Moist evergreen forests	*Leea indica*	NE	NT	ME	Burulla	Leeaceae	C3	
64	IZ	MEF	Moist evergreen forests	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	

64	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
64	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
64	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
64	IZ	MEF	Moist evergreen forests	*Filicium decipiens*	NE	NT	NM	Pihimbiya	Sapindaceae	D	
64	IZ	MEF	Moist evergreen forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
64	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
64	IZ	MEF	Moist evergreen forests	*Celtis cinnamomea*	NE	NT	ME	Gurenda	Ulmaceae	C3	
64	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
65	IZ	MEF	Moist evergreen forests	*Artabotrys zeylanicus*	NE	NT	NM	Kalubambarewel	Annonaceae	D	
65	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
65	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
65	IZ	MEF	Moist evergreen forests	*Uvaria sphenocarpa*	EN	NT	NM		Annonaceae	C1	
65	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
65	IZ	MEF	Moist evergreen forests	*Diospyros malabarica*	NE	NT	ME	Tibiri	Ebenaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
65	IZ	MEF	Moist evergreen forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
65	IZ	MEF	Moist evergreen forests	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	
65	IZ	MEF	Moist evergreen forests	*Acacia caesia*	NE	NT	NM	Hinguru	Fabaceae	D	
65	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
65	IZ	MEF	Moist evergreen forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
65	IZ	MEF	Moist evergreen forests	*Chukrasia velutina*	NE	NT	NM	Barawahik	Meliaceae	D	
65	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
65	IZ	MEF	Moist evergreen forests	*Cyrtococcum trigonum*	NE	NT	NM		Poaceae	D	

65	IZ	MEF	Moist evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
65	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Mimusops elengi*	NE	NT	ME	Muna mal	Sapotaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
65	IZ	MEF	Moist evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
65	IZ	MEF	Moist evergreen forests	*Laportea bulbifera*	NE	NT	NM	Walkahambiliya	Urticaceae	D	
66	IZ	MEF	Moist evergreen forests	*Artabotrys zeylanicus*	NE	NT	NM	Kalubambarewel	Annonaceae	D	
66	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
66	IZ	MEF	Moist evergreen forests	*Uvaria sphenocarpa*	EN	NT	NM		Annonaceae	C1	
66	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
66	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
66	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
66	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
66	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
66	IZ	MEF	Moist evergreen forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
66	IZ	MEF	Moist evergreen forests	*Alseodaphne semecarpifolia*	NE	NT	NM		Lauraceae	D	
66	IZ	MEF	Moist evergreen forests	*Walsura trifoliolata*	NE	NT	NM	Kirikon	Meliaceae	D	
66	IZ	MEF	Moist evergreen forests	*Walsura trifoliolata*	NE	NT	NM	Kiri kon	Meliaceae	D	
66	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
66	IZ	MEF	Moist evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
66	IZ	MEF	Moist evergreen forests	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
66	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
66	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
66	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
66	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
66	IZ	MEF	Moist evergreen forests	*Dodonaea viscosa*	NE	NT	NM	Hupala	Sapindaceae	D	
66	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	

66	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
66	IZ	MEF	Moist evergreen forests	*Berrya cordifolia*	NE	NT	NM	Halmilla	Tiliaceae	D	
66	IZ	MEF	Moist evergreen forests	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Antidesma alexiteria?*	NE	NT	NM		Euphorbiaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
67	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Cassia roxburghii*	NE	NT	NM	Rathuwa	Fabaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Munronia pinnata*	EN	NT	ME	Binkohomba	Meliaceae	B2	
67	IZ	SCR	Thorn forests (scrublands)	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
67	IZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Jasminum flexile*	NE	NT	NM		Oleaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
67	IZ	SCR	Thorn forests (scrublands)	*Laportea bulbifera*	NE	NT	NM	Walkahambiliya	Urticaceae	D	
67	IZ	SCR	Thorn forests (scrublands)	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	

68	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Tridax procumbens*	NE	NT	NM		Asteraceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Bridelia retusa*	NE	NT	ME	Ketakela	Euphorbiaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Jatropha curcas*	NE	NT	ME	Wetaendaru	Euphorbiaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Cassia roxburghii*	NE	NT	NM	Rathuwa	Fabaceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Dendrophthoe falcata*	NE	NT	ME	Ehetu	Loranthaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Sida acuta*	NE	NT	ME	Bevila	Malvaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Chukrasia velutina*	NE	NT	NM	Barawahik	Meliaceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Adina cordifolia*	NE	NT	ME	Kolon	Rubiaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Mussaenda frondosa*	NE	NT	ME	Mussanda	Rubiaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	

68	IZ	SCR	Thorn forests (scrublands)	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Laportea bulbifera*	NE	NT	NM	Walkahambiliya	Urticaceae	D	
68	IZ	SCR	Thorn forests (scrublands)	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
68	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
69	IZ	MEF	Moist evergreen forests	*Semecarpus nigro-viridis*	EN	NT	NM	Badulla	Anacardiaceae	C1	
69	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
69	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
69	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
69	IZ	MEF	Moist evergreen forests	*Diospyros oocarpa*	NE	NT	NM	Kalukudumberiya	Ebenaceae	D	
69	IZ	MEF	Moist evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
69	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
69	IZ	MEF	Moist evergreen forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
69	IZ	MEF	Moist evergreen forests	*Neolitsea cassia*	NE	NT	ME	Kududavula	Lauraceae	C3	
69	IZ	MEF	Moist evergreen forests	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
69	IZ	MEF	Moist evergreen forests	*Chukrasia velutina*	NE	NT	NM	Barawahik	Meliaceae	D	
69	IZ	MEF	Moist evergreen forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
69	IZ	MEF	Moist evergreen forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
69	IZ	MEF	Moist evergreen forests	*Myristica ceylanica*	NE	NT	ME	Malaboda	Myristicaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Piper sylvestre*	NE	NT	NM	Walgammiris	Piperaceae	D	
69	IZ	MEF	Moist evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	

69	IZ	MEF	Moist evergreen forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Celtis cinnamomea*	NE	NT	ME	Gurenda	Ulmaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
69	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
70	IZ	MEF	Moist evergreen forests	*Calamus rotang*	NE	NT	ME	Wewel	*Arecaceae*	C3	
70	IZ	MEF	Moist evergreen forests	*Eupatorium inulifolium*	NE	NT	NM		Asteraceae	D	
70	IZ	MEF	Moist evergreen forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
70	IZ	MEF	Moist evergreen forests	*Calophyllum bracteatum*	EN	NT	NM	Dombakeena	Clusiaceae	C1	
70	IZ	MEF	Moist evergreen forests	*Euphorbia tirucalli*	NE	NT	ME	Nawa handi	Euphorbiaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	
70	IZ	MEF	Moist evergreen forests	*Mallotus tetracoccus*	NE	NT	NM	Bukenda	Euphorbiaceae	D	
70	IZ	MEF	Moist evergreen forests	*Erythrina variegata*	NE	NT	ME		Fabaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Samanea saman*	NE	NT	NM	Mara	Fabaceae	D	
70	IZ	MEF	Moist evergreen forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
70	IZ	MEF	Moist evergreen forests	*Alseodaphne semecarpifolia*	NE	NT	NM		Lauraceae	D	
70	IZ	MEF	Moist evergreen forests	*Litsea glutinosa*	NE	NT	ME	Bomi	Lauraceae	C3	
70	IZ	MEF	Moist evergreen forests	*Leea indica*	NE	NT	ME	Burulla	Leeaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Anamirta cocculus*	NE	NT	ME	Thiththawel	Menispermaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Cyclea burmanni*	NE	NT	ME	Kesibissan	Menispermaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Ficus amplissima*	NE	NT	NM		Moraceae	D	
70	IZ	MEF	Moist evergreen forests	*Ficus hispida*	NE	NT	ME	Kotadimbula	Moraceae	C3	
70	IZ	MEF	Moist evergreen forests	*Epipogium roseum*	NE	TR	NM		Orchidaceae	C2	
70	IZ	MEF	Moist evergreen forests	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
70	IZ	MEF	Moist evergreen forests	*Piper sylvestre*	NE	NT	NM	Walgammiris	Piperaceae	D	
70	IZ	MEF	Moist evergreen forests	*Acronychia pedunculata*	NE	NT	ME	Ankenda	Rutaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Acronychia pedunculata*	NE	NT	ME	Ankenda	Rutaceae	C3	

70	IZ	MEF	Moist evergreen forests	*Clausena indica*	NE	NT	ME	Walkarapincha	Rutaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
70	IZ	MEF	Moist evergreen forests	*Filicium decipiens*	NE	NT	NM	Pihimbiya	Sapindaceae	D	
70	IZ	MEF	Moist evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Gymnema sylvestre*	NE	NT	ME	Mass badda	Asclepiadaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Emilia sonchifolia*	NE	NT	ME		Asteraceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Eupatorium riparium*	NE	NT	NM		Asteraceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Synedrella nodiflora*	NE	NT	NM		Asteraceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Tridax procumbens*	NE	NT	NM		Asteraceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Vernonia zeylanica*	EN	NT	ME	Pupula	Asteraceae	B2	
71	IZ	GRL	Grasslands (Savannah)	*Cleome viscosa*	NE	NT	ME	Wal aba	Capparaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Commelina benghalensis*	NE	NT	NM	Girapala	Commelinaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Euphorbia hirta*	NE	NT	ME		Euphorbiaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Desmodium heterophyllum*	NE	NT	ME	Maha undu piyaliya	Fabaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Abutilon indicum*	NE	NT	ME	Walanoda	Malvaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Pavonia odorata*	NE	NT	ME		Malvaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Psidium guajava*	NE	NT	ME	Pera	Myrtaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Bothriochloa pertusa*	NE	NT	NM		Poaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Cymbopogon nardus*	NE	NT	ME	Mana	Poaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Echinochloa colona*	NE	NT	NM		Poaceae	D	

71	IZ	GRL	Grasslands (Savannah)	*Eragrostis unioloides*	NE	NT	NM		Poaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Panicum maximum*	NE	NT	NM		Poaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Paspalidium geminatum*	NE	NT	NM		Poaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Paspalum scrobiculatum*	NE	NT	NM		Poaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Pennisetum purpureum*	NE	NT	NM		Poaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Spermacoce hispida*	NE	NT	NM		Rubiaceae	D	
71	IZ	GRL	Grasslands (Savannah)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
71	IZ	GRL	Grasslands (Savannah)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
72	IZ	AGL	Agricultural lands	*Justicia adathoda*	NE	NT	ME	Adatoda	Acanthaceae	C3	
72	IZ	AGL	Agricultural lands	*Mangifera indica*	NE	NT	ME	Amba	Anacardiaceae	C3	
72	IZ	AGL	Agricultural lands	*Annona muricata*	NE	NT	ME	Anoda	Annonaceae	C3	
72	IZ	AGL	Agricultural lands	*Annona reticulata*	NE	NT	ME	Welianoda	Annonaceae	C3	
72	IZ	AGL	Agricultural lands	*Alstonia scholaris*	NE	NT	ME	Ruk attana	Apocynaceae	C3	
72	IZ	AGL	Agricultural lands	*Borassus flabellifer*	NE	NT	ME	Thal	Arecaceae	C3	
72	IZ	AGL	Agricultural lands	*Cocos nucifera*	NE	NT	ME	Pol	Arecaceae	C3	
72	IZ	AGL	Agricultural lands	*Ceropegia candelabrum*	NE	TR	NM		Asclepiadaceae	C2	
72	IZ	AGL	Agricultural lands	*Cosmostigma racemosa*	NE	TR	NM	Kiriwel	Asclepiadaceae	C2	
72	IZ	AGL	Agricultural lands	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
72	IZ	AGL	Agricultural lands	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
72	IZ	AGL	Agricultural lands	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
72	IZ	AGL	Agricultural lands	*Jatropha curcas*	NE	NT	ME	Wetaendaru	Euphorbiaceae	C3	
72	IZ	AGL	Agricultural lands	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
72	IZ	AGL	Agricultural lands	*Margaritaria indicus*	NE	NT	NM	Karau	Euphorbiaceae	D	
72	IZ	AGL	Agricultural lands	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
72	IZ	AGL	Agricultural lands	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
72	IZ	AGL	Agricultural lands	*Cassia occidatalis*	NE	NT	ME		Fabaceae	C3	
72	IZ	AGL	Agricultural lands	*Cassia spectabilis*	NE	NT	NM	Kahakona	Fabaceae	D	
72	IZ	AGL	Agricultural lands	*Gliricidia sepium*	NE	NT	NM	Wetahira	Fabaceae	D	
72	IZ	AGL	Agricultural lands	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	

72	IZ	AGL	Agricultural lands	*Hibiscus rosa-sinensis*	NE	NT	ME		Malvaceae	C3	
72	IZ	AGL	Agricultural lands	*Azadirachta indica*	NE	NT	ME	Kohomba	Meliaceae	C3	
72	IZ	AGL	Agricultural lands	*Tinospora cordifolia*	NE	NT	ME	Rasakinda	Menispermaceae	C3	
72	IZ	AGL	Agricultural lands	*Artocarpus heterophyllus*	NE	NT	ME	Kos	Moraceae	C3	
72	IZ	AGL	Agricultural lands	*Ficus religiosa*	NE	NT	ME	Bo	Moraceae	C3	
72	IZ	AGL	Agricultural lands	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
72	IZ	AGL	Agricultural lands	*Musa acuminata*	NE	NT	ME	Kesel	Musaceae	C3	
72	IZ	AGL	Agricultural lands	*Psidium guajava*	NE	NT	ME	Pera	Myrtaceae	C3	
72	IZ	AGL	Agricultural lands	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
72	IZ	AGL	Agricultural lands	*Jasminum flexile*	NE	NT	NM		Oleaceae	D	
72	IZ	AGL	Agricultural lands	*Drynaria quarcifolia*	NE	NT	ME	Beduru	Polypodiaceae	C3	
72	IZ	AGL	Agricultural lands	*Punica granatum*	NE	NT	ME	Delum	Punicaceae	C3	
72	IZ	AGL	Agricultural lands	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
72	IZ	AGL	Agricultural lands	*Berrya cordifolia*	NE	NT	NM	Halmilla	Tiliaceae	D	
72	IZ	AGL	Agricultural lands	*Muntingia calabura*	NE	NT	NM	Jam	Tiliaceae	D	
72	IZ	AGL	Agricultural lands	*Tectona grandis*	NE	NT	ME	Tekka	Verbenaceae	C3	
73	IZ	AGL	Agricultural lands	*Justicia adathoda*	NE	NT	ME	Adatoda	Acanthaceae	C3	
73	IZ	AGL	Agricultural lands	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
73	IZ	AGL	Agricultural lands	*Alstonia scholaris*	NE	NT	ME	Ruk attana	Apocynaceae	C3	
73	IZ	AGL	Agricultural lands	*Pagiantha dichotoma*	NE	NT	ME		Apocynaceae	C3	
73	IZ	AGL	Agricultural lands	*Borassus flabellifer*	NE	NT	ME	Thal	Arecaceae	C3	
73	IZ	AGL	Agricultural lands	*Calotropis gigantea*	NE	NT	ME	Wara	Asclepiadaceae	C3	
73	IZ	AGL	Agricultural lands	*Cosmostigma racemosa*	NE	TR	NM	Kiriwel	Asclepiadaceae	C2	
73	IZ	AGL	Agricultural lands	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
73	IZ	AGL	Agricultural lands	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
73	IZ	AGL	Agricultural lands	*Cuscuta chinensis*	NE	NT	ME		Convolvulaceae	C3	
73	IZ	AGL	Agricultural lands	*Coccinia grandis*	NE	NT	ME	Kowakka	Cucurbitaceae	C3	
73	IZ	AGL	Agricultural lands	*Cyperus rotundus*	NE	NT	ME	Kalanduru	Cyperaceae	C3	
73	IZ	AGL	Agricultural lands	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	

73	IZ	AGL	Agricultural lands	*Jatropha curcas*	NE	NT	ME	Wetaendaru	Euphorbiaceae	C3	
73	IZ	AGL	Agricultural lands	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
73	IZ	AGL	Agricultural lands	*Manihot glaziovii*	NE	NT	NM	Walrubber	Euphorbiaceae	D	
73	IZ	AGL	Agricultural lands	*Margaritaria indicus*	NE	NT	NM	Karau	Euphorbiaceae	D	
73	IZ	AGL	Agricultural lands	*Ricinus communis*	NE	NT	ME	Endaru	Euphorbiaceae	C3	
73	IZ	AGL	Agricultural lands	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
73	IZ	AGL	Agricultural lands	*Gliricidia sepium*	NE	NT	NM	Wetahira	Fabaceae	D	
73	IZ	AGL	Agricultural lands	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
73	IZ	AGL	Agricultural lands	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
73	IZ	AGL	Agricultural lands	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
73	IZ	AGL	Agricultural lands	*Abutilon indicum*	NE	NT	ME	Walanoda	Malvaceae	C3	
73	IZ	AGL	Agricultural lands	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
73	IZ	AGL	Agricultural lands	*Ficus religiosa*	NE	NT	ME	Bo	Moraceae	C3	
73	IZ	AGL	Agricultural lands	*Oryza sativa*	NE	NT	ME	Wee	Poaceae	C3	
73	IZ	AGL	Agricultural lands	*Morinda umbellata*	EN	NT	ME	Ahu	Rubiaceae	B2	
73	IZ	AGL	Agricultural lands	*Oldenlandia umbellata*	NE	NT	ME		Rubiaceae	C3	
73	IZ	AGL	Agricultural lands	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
73	IZ	AGL	Agricultural lands	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	
73	IZ	AGL	Agricultural lands	*Datura metel*	NE	NT	ME	Attana	Solanaceae	C3	
73	IZ	AGL	Agricultural lands	*Nicotiana tabacum*	NE	NT	ME	Dunkola	Solanaceae	C3	
73	IZ	AGL	Agricultural lands	*Grewia orientalis*	NE	NT	NM	Welkeliya	Tiliaceae	D	
73	IZ	AGL	Agricultural lands	*Clerodendrum infortunatum*	NE	NT	ME	Pinna	Verbenaceae	C3	
73	IZ	AGL	Agricultural lands	*Vitex negundo*	NE	NT	ME		Verbenaceae	C3	
74	IZ	MEF	Moist evergreen forests	*Mangifera zeylanica*	EN	NT	NM	Etaba	Anacardiaceae	C1	
74	IZ	MEF	Moist evergreen forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
74	IZ	MEF	Moist evergreen forests	*Semecarpus nigro-viridis*	EN	NT	NM	Badulla	Anacardiaceae	C1	
74	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
74	IZ	MEF	Moist evergreen forests	*Wrightia angustifolia*	EN	NT	NM		Apocynaceae	C1	
74	IZ	MEF	Moist evergreen forests	*Caryota urens*	NE	NT	ME	Kithul	*Arecaceae*	C3	

74	IZ	MEF	Moist evergreen forests	*Calophyllum bracteatum*	EN	NT	NM	Dombakeena	Clusiaceae	C1	
74	IZ	MEF	Moist evergreen forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
74	IZ	MEF	Moist evergreen forests	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
74	IZ	MEF	Moist evergreen forests	*Samanea saman*	NE	NT	NM	Mara	Fabaceae	D	
74	IZ	MEF	Moist evergreen forests	*Neolitsea cassia*	NE	NT	ME	Kududavula	Lauraceae	C3	
74	IZ	MEF	Moist evergreen forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
74	IZ	MEF	Moist evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
74	IZ	MEF	Moist evergreen forests	*Ficus amplissima*	NE	NT	NM		Moraceae	D	
74	IZ	MEF	Moist evergreen forests	*Ficus benghalensis*	NE	NT	ME	Mahanuga	Moraceae	C3	
74	IZ	MEF	Moist evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
74	IZ	MEF	Moist evergreen forests	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
74	IZ	MEF	Moist evergreen forests	*Piper sylvestre*	NE	NT	NM	Walgammiris	Piperaceae	D	
74	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
74	IZ	MEF	Moist evergreen forests	*Harpullia arborea*	NE	NT	NM		Sapindaceae	D	
75	IZ	SCR	Thorn forests (scrublands)	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
75	IZ	SCR	Thorn forests (scrublands)	*Semecarpus nigro-viridis*	EN	NT	NM	Badulla	Anacardiaceae	C1	
75	IZ	SCR	Thorn forests (scrublands)	*Eupatorium riparium*	NE	NT	NM		Asteraceae	D	
75	IZ	SCR	Thorn forests (scrublands)	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Erythroxylum monogynum*	NE	NT	ME	Batakirilla	Erythroxylaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	
75	IZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Neolitsea cassia*	NE	NT	ME	Kududavula	Lauraceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Careya arborea*	NE	NT	ME	Kahata	Lecythidaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Osbeckia aspera*	NE	NT	ME	Bovitiya	Melastomataceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Cyclea burmanni*	NE	NT	ME	Kesibissan	Menispermaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Cyclea burmanni*	NE	NT	ME	Kesibissan	Menispermaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Ardisia missionis*	NE	NT	NM	Baludan	Myrsinaceae	D	
75	IZ	SCR	Thorn forests (scrublands)	*Psidium guajava*	NE	NT	ME	Pera	Myrtaceae	C3	

75	IZ	SCR	Thorn forests (scrublands)	*Syzygium spathulatum*	EN	TR	NM	Kanu	Myrtaceae	B1	
75	IZ	SCR	Thorn forests (scrublands)	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Imperata cylindrica*	NE	NT	ME	Illuk	Poaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Panicum maximum*	NE	NT	NM		Poaceae	D	
75	IZ	SCR	Thorn forests (scrublands)	*Murraya koenigii*	NE	NT	ME		Rutaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Harpullia arborea*	NE	NT	NM		Sapindaceae	D	
75	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
75	IZ	SCR	Thorn forests (scrublands)	*Vitex negundo*	NE	NT	ME		Verbenaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Amaranthus tricolor*	NE	NT	ME	Thampala	Amaranthaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Asparagus falcatus*	NE	NT	ME	Hathawariya	Asparagaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Crateva adansonii*	NE	NT	ME	Lunu warana	Capparaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Commelina clavata*	NE	NT	NM		Commelinaceae	D	
76	IZ	SCR	Thorn forests (scrublands)	*Evolvulus alsinoides*	NE	NT	ME	Vishnukranthi	Convolvulaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Coccinia grandis*	NE	NT	ME	Kowakka	Cucurbitaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Dioscorea pentaphylla*	NE	NT	NM	Katuala	Dioscoreaceae	D	
76	IZ	SCR	Thorn forests (scrublands)	*Acalypha indica*	NE	NT	ME	Kuppameniya	Euphorbiaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Acalypha indica*	NE	NT	ME	Kuppameniya	Euphorbiaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Euphorbia antiquorum*	NE	NT	ME	Daluk	Euphorbiaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Manihot glaziovii*	NE	NT	NM	Walrubber	Euphorbiaceae	D	
76	IZ	SCR	Thorn forests (scrublands)	*Margaritaria indicus*	NE	NT	NM	Karau	Euphorbiaceae	D	
76	IZ	SCR	Thorn forests (scrublands)	*Dichrostachys cinera*	NE	NT	ME	Andara	Fabaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Sensevieria zeylanica*	NE	NT	ME	Niyanda	Liliaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Cissampelos pareira*	NE	NT	ME		Menispermaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Martynia annua*	NE	NT	ME	Nagadarana	Pedaliaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Panicum maximum*	NE	NT	NM		Poaceae	D	
76	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
76	IZ	SCR	Thorn forests (scrublands)	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
76	IZ	SCR	Thorn forests (scrublands)	*Cissus quadrangularis*	NE	NT	ME	Heeressa	Vitaceae	C3	

76	IZ	SCR	Thorn forests (scrublands)	*Cissus vitiginea*	NE	NT	NM		Vitaceae	D	
79	IZ	MEF	Moist evergreen forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
79	IZ	MEF	Moist evergreen forests	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Rourea minor*	NE	NT	ME	Radaliya	Connaraceae	C3	
79	IZ	MEF	Moist evergreen forests	*Dioscorea pentaphylla*	NE	NT	NM	Katuala	Dioscoreaceae	D	
79	IZ	MEF	Moist evergreen forests	*Croton officinalis*	NE	NT	NM		Euphorbiaceae	D	
79	IZ	MEF	Moist evergreen forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Sida acuta*	NE	NT	ME	Bevila	Malvaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
79	IZ	MEF	Moist evergreen forests	*Psidium guajava*	NE	NT	ME	Pera	Myrtaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
79	IZ	MEF	Moist evergreen forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
79	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Canthium coromandelicum*	NE	NT	ME	Kara	Rubiaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Mitragyna parvifolia*	NE	NT	ME	Helamba	Rubiaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
79	IZ	MEF	Moist evergreen forests	*Harpullia arborea*	NE	NT	NM		Sapindaceae	D	
79	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
79	IZ	MEF	Moist evergreen forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	

79	IZ	MEF	Moist evergreen forests	*Stachytarpheta jamaicansis*	NE	NT	NM	Balunaguta	Verbenaceae	D	
79	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Eranthemum capense*	NE	NT	NM		Acanthaceae	D	
80	IZ	MEF	Moist evergreen forests	*Stenosiphonium cordifolium*	NE	NT	NM	Bu nelu	Acanthaceae	D	
80	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
80	IZ	MEF	Moist evergreen forests	*Bombax ceiba*	NE	NT	ME	Katuimbul	Bombacaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
80	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
80	IZ	MEF	Moist evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
80	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
80	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
80	IZ	MEF	Moist evergreen forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
80	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Hibiscus eriocarpus*	NE	NT	ME		Malvaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
80	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Discospermum sphaerocarpum*	NE	NT	NM		Rubiaceae	D	
80	IZ	MEF	Moist evergreen forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
80	IZ	MEF	Moist evergreen forests	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
80	IZ	MEF	Moist evergreen forests	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
80	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Murraya paniculata*	NE	NT	ME	Etteriya	Rutaceae	C3	
80	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
80	IZ	MEF	Moist evergreen forests	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
80	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
80	IZ	MEF	Moist evergreen forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	

81	IZ	MEF	Moist evergreen forests	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Stenosiphonium cordifolium*	NE	NT	NM	Bu nelu	Acanthaceae	D	
81	IZ	MEF	Moist evergreen forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
81	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
81	IZ	MEF	Moist evergreen forests	*Amorphophallus paeoniifolius*	NE	NT	ME	Kidaran	Araceae	C3	
81	IZ	MEF	Moist evergreen forests	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
81	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
81	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
81	IZ	MEF	Moist evergreen forests	*Mallotus rhamnifolius*	NE	NT	NM		Euphorbiaceae	D	
81	IZ	MEF	Moist evergreen forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
81	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
81	IZ	MEF	Moist evergreen forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
81	IZ	MEF	Moist evergreen forests	*Hibiscus eriocarpus*	NE	NT	ME		Malvaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Cyrtococcum trigonum*	NE	NT	NM		Poaceae	D	
81	IZ	MEF	Moist evergreen forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
81	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Discospermum sphaerocarpum*	NE	NT	NM		Rubiaceae	D	
81	IZ	MEF	Moist evergreen forests	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
81	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
81	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
81	IZ	MEF	Moist evergreen forests	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	

81	IZ	MEF	Moist evergreen forests	*Laportea bulbifera*	NE	NT	NM	Walkahambiliya	Urticaceae	D	
81	IZ	MEF	Moist evergreen forests	*Clerodendrum phlomidis*	NE	NT	ME	Pinna	Verbenaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
81	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
81	IZ	MEF	Moist evergreen forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
82	IZ	SCR	Thorn forests (scrublands)	*Justicia procumbens*	NE	NT	ME		Acanthaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
82	IZ	SCR	Thorn forests (scrublands)	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
82	IZ	SCR	Thorn forests (scrublands)	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
82	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
82	IZ	SCR	Thorn forests (scrublands)	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
82	IZ	SCR	Thorn forests (scrublands)	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
82	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus amarus*	NE	NT	ME		Euphorbiaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
82	IZ	SCR	Thorn forests (scrublands)	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
82	IZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
82	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
82	IZ	SCR	Thorn forests (scrublands)	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
82	IZ	SCR	Thorn forests (scrublands)	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
82	IZ	SCR	Thorn forests (scrublands)	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	

83	IZ	AGL	Agricultural lands	*Mangifera indica*	NE	NT	ME	Amba	Anacardiaceae	C3	
83	IZ	AGL	Agricultural lands	*Cocos nucifera*	NE	NT	ME	Pol	Arecaceae	C3	
83	IZ	AGL	Agricultural lands	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
83	IZ	AGL	Agricultural lands	*Tridax procumbens*	NE	NT	NM		Asteraceae	D	
83	IZ	AGL	Agricultural lands	*Xanthium indicum*	NE	NT	ME	Uru kossa	Asteraceae	C3	
83	IZ	AGL	Agricultural lands	*Tecoma stans*	NE	NT	NM	Kelanitissa	Bignoniaceae	D	
83	IZ	AGL	Agricultural lands	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
83	IZ	AGL	Agricultural lands	*Terminalia catappa*	NE	NT	ME		Combretaceae	C3	
83	IZ	AGL	Agricultural lands	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
83	IZ	AGL	Agricultural lands	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
83	IZ	AGL	Agricultural lands	*Gliricidia sepium*	NE	NT	NM	Wetahira	Fabaceae	D	
83	IZ	AGL	Agricultural lands	*Indigofera tinctoria*	NE	NT	ME		Fabaceae	C3	
83	IZ	AGL	Agricultural lands	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
83	IZ	AGL	Agricultural lands	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
83	IZ	AGL	Agricultural lands	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
83	IZ	AGL	Agricultural lands	*Abutilon indicum*	NE	NT	ME	Walanoda	Malvaceae	C3	
83	IZ	AGL	Agricultural lands	*Sida acuta*	NE	NT	ME	Bevila	Malvaceae	C3	
83	IZ	AGL	Agricultural lands	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
83	IZ	AGL	Agricultural lands	*Chukrasia velutina*	NE	NT	NM	Barawahik	Meliaceae	D	
83	IZ	AGL	Agricultural lands	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
83	IZ	AGL	Agricultural lands	*Moringa oleifera*	NE	NT	ME	Murunga	Moringaceae	C3	
83	IZ	AGL	Agricultural lands	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
83	IZ	AGL	Agricultural lands	*Panicum maximum*	NE	NT	NM		Poaceae	D	
83	IZ	AGL	Agricultural lands	*Citrus aurantifolia*	NE	NT	ME	Dehi	Rutaceae	C3	
83	IZ	AGL	Agricultural lands	*Murraya koenigii*	NE	NT	ME		Rutaceae	C3	
83	IZ	AGL	Agricultural lands	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
83	IZ	AGL	Agricultural lands	*Theobroma cacao*	NE	NT	ME		Sterculiaceae	C3	
83	IZ	AGL	Agricultural lands	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
83	IZ	AGL	Agricultural lands	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	

83	IZ	AGL	Agricultural lands	*Tectona grandis*	NE	NT	ME	Tekka	Verbenaceae	C3	
83	IZ	AGL	Agricultural lands	*Vitex negundo*	NE	NT	ME		Verbenaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Stenosiphonium cordifolium*	NE	NT	NM	Bu nelu	Acanthaceae	D	
84	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
84	IZ	MEF	Moist evergreen forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
84	IZ	MEF	Moist evergreen forests	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
84	IZ	MEF	Moist evergreen forests	*Diospyros oocarpa*	NE	NT	NM	Kalukudumberiya	Ebenaceae	D	
84	IZ	MEF	Moist evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
84	IZ	MEF	Moist evergreen forests	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
84	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
84	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
84	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Cassia spectabilis*	NE	NT	NM	Kahakona	Fabaceae	D	
84	IZ	MEF	Moist evergreen forests	*Hibiscus eriocarpus*	NE	NT	ME		Malvaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Alloteropsis cimicina*	NE	NT	NM	Budeni-tana	Poaceae	D	
84	IZ	MEF	Moist evergreen forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
84	IZ	MEF	Moist evergreen forests	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
84	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Discospermum sphaerocarpum*	NE	NT	NM		Rubiaceae	D	
84	IZ	MEF	Moist evergreen forests	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
84	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
84	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Lepisanthes sanegalensis*	NE	NT	NM		Sapindaceae	D	
84	IZ	MEF	Moist evergreen forests	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
84	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	

84	IZ	MEF	Moist evergreen forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
85	IZ	SCR	Thorn forests (scrublands)	*Alphonsea sclerocarpa*	NE	NT	NM		Annonaceae	D	
85	IZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
85	IZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
85	IZ	SCR	Thorn forests (scrublands)	*Vernonia zeylanica*	EN	NT	ME	Pupula	Asteraceae	B2	
85	IZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
85	IZ	SCR	Thorn forests (scrublands)	*Bridelia retusa*	NE	NT	ME	Ketakela	Euphorbiaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
85	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
85	IZ	SCR	Thorn forests (scrublands)	*Chukrasia velutina*	NE	NT	NM	Barawahik	Meliaceae	D	
85	IZ	SCR	Thorn forests (scrublands)	*Cissampelos pareira*	NE	NT	ME		Menispermaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Panicum maximum*	NE	NT	NM		Poaceae	D	
85	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Mitragyna parvifolia*	NE	NT	ME	Helamba	Rubiaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
85	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
85	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	

85	IZ	SCR	Thorn forests (scrublands)	*Stachytarpheta jamaicansis*	NE	NT	NM	Balunaguta	Verbenaceae	D	
85	IZ	SCR	Thorn forests (scrublands)	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
86	IZ	GRL	Grasslands (Savannah)	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Bridelia retusa*	NE	NT	ME	Ketakela	Euphorbiaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Croton officinalis*	NE	NT	NM		Euphorbiaceae	D	
86	IZ	GRL	Grasslands (Savannah)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
86	IZ	GRL	Grasslands (Savannah)	*Abrus precatorius*	NE	NT	ME		Fabaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Dendrophthoe falcata*	NE	NT	ME	Ehetu	Loranthaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
86	IZ	GRL	Grasslands (Savannah)	*Cyclea burmanni*	NE	NT	ME	Kesibissan	Menispermaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
86	IZ	GRL	Grasslands (Savannah)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
86	IZ	GRL	Grasslands (Savannah)	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
86	IZ	GRL	Grasslands (Savannah)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
87	IZ	MEF	Moist evergreen forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Gymnema sylvestre*	NE	NT	ME	Mass badda	Asclepiadaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Impatiens balsamina*	NE	NT	ME	Koondalu	Balsaminaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	

87	IZ	MEF	Moist evergreen forests	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Dioscorea tomentosa*	NE	NT	NM	Uyala	Dioscoreaceae	D	
87	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
87	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
87	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
87	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Bauhinia tomentosa*	NE	NT	ME		Fabaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Memecylon umbellatum*	NE	NT	ME	Korakaha	Melastomataceae	C3	
87	IZ	MEF	Moist evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
87	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
87	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Discospermum sphaerocarpum*	NE	NT	NM		Rubiaceae	D	
87	IZ	MEF	Moist evergreen forests	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
87	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Lepisanthes sanegalensis*	NE	NT	NM		Sapindaceae	D	
87	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
87	IZ	MEF	Moist evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
87	IZ	MEF	Moist evergreen forests	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
87	IZ	MEF	Moist evergreen forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
87	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
87	IZ	MEF	Moist evergreen forests	*Alpinia biflora*	NE	NT	NM		Zingiberaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	

88	IZ	SCR	Thorn forests (scrublands)	*Dioscorea tomentosa*	NE	NT	NM	Uyala	Dioscoreaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Bridelia retusa*	NE	NT	ME	Ketakela	Euphorbiaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Cassia roxburghii*	NE	NT	NM	Rathuwa	Fabaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Neolitsea cassia*	NE	NT	ME	Kududavula	Lauraceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Sida acuta*	NE	NT	ME	Bevila	Malvaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
88	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
88	IZ	SCR	Thorn forests (scrublands)	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Rhinacanthus nasutus*	NE	NT	ME		Acanthaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
89	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
89	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
89	IZ	MEF	Moist evergreen forests	*Bridelia retusa*	NE	NT	ME	Ketakela	Euphorbiaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	

89	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
89	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
89	IZ	MEF	Moist evergreen forests	*Macaranga peltata*	NE	NT	ME	Kenda	Euphorbiaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
89	IZ	MEF	Moist evergreen forests	*Margaritaria indicus*	NE	NT	NM	Karau	Euphorbiaceae	D	
89	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Derris parviflora*	EN	NT	NM	Kala wel	Fabaceae	C1	
89	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Leea indica*	NE	NT	ME	Burulla	Leeaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
89	IZ	MEF	Moist evergreen forests	*Sida cordifolia*	NE	NT	ME	Sudubevila	Malvaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
89	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
89	IZ	MEF	Moist evergreen forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
89	IZ	MEF	Moist evergreen forests	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
89	IZ	MEF	Moist evergreen forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
89	IZ	MEF	Moist evergreen forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
89	IZ	MEF	Moist evergreen forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
89	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
90	IZ	SCR	Thorn forests (scrublands)	*Anacardium occidentale*	NE	NT	ME	Kaju	Anacardiaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
90	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
90	IZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	

90	IZ	SCR	Thorn forests (scrublands)	*Cassia roxburghii*	NE	NT	NM	Rathuwa	Fabaceae	D	
90	IZ	SCR	Thorn forests (scrublands)	*Derris parviflora*	EN	NT	NM	Kala wel	Fabaceae	C1	
90	IZ	SCR	Thorn forests (scrublands)	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Leonitis neptifolia*	NE	NT	ME		Lamiaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
90	IZ	SCR	Thorn forests (scrublands)	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Panicum maximum*	NE	NT	NM		Poaceae	D	
90	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
90	IZ	SCR	Thorn forests (scrublands)	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
90	IZ	SCR	Thorn forests (scrublands)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
90	IZ	SCR	Thorn forests (scrublands)	*Stachytarpheta jamaicansis*	NE	NT	NM	Balunaguta	Verbenaceae	D	
91	IZ	SCR	Thorn forests (scrublands)	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
91	IZ	SCR	Thorn forests (scrublands)	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
91	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
91	IZ	SCR	Thorn forests (scrublands)	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
91	IZ	SCR	Thorn forests (scrublands)	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
91	IZ	SCR	Thorn forests (scrublands)	*Bauhinia tomentosa*	NE	NT	ME		Fabaceae	C3	
91	IZ	SCR	Thorn forests (scrublands)	*Derris parviflora*	EN	NT	NM	Kala wel	Fabaceae	C1	
91	IZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
91	IZ	SCR	Thorn forests (scrublands)	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
91	IZ	SCR	Thorn forests (scrublands)	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
91	IZ	SCR	Thorn forests (scrublands)	*Cassipourea ceylanica*	NE	NT	NM		Rhizophoraceae	D	
91	IZ	SCR	Thorn forests (scrublands)	*Psilanthus wightianus*	NE	NT	NM		Rubiaceae	D	
91	IZ	SCR	Thorn forests (scrublands)	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	

91	IZ	SCR	Thorn forests (scrublands)	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
91	IZ	SCR	Thorn forests (scrublands)	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
92	IZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
92	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
92	IZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
92	IZ	SCR	Thorn forests (scrublands)	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
93	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
93	IZ	MEF	Moist evergreen forests	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
93	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
93	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
93	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
93	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
93	IZ	MEF	Moist evergreen forests	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
93	IZ	MEF	Moist evergreen forests	*Walsura trifoliolata*	NE	NT	NM	Kiri kon	Meliaceae	D	
93	IZ	MEF	Moist evergreen forests	*Streblus asper*	NE	NT	ME	Netul	Moraceae	C3	
93	IZ	MEF	Moist evergreen forests	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
93	IZ	MEF	Moist evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
93	IZ	MEF	Moist evergreen forests	*Cynodon dactylon*	NE	NT	ME	Belathana	Poaceae	C3	
93	IZ	MEF	Moist evergreen forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
93	IZ	MEF	Moist evergreen forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	

93	IZ	MEF	Moist evergreen forests	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
93	IZ	MEF	Moist evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
93	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
94	IZ	RVF	Riverine forests	*Nothopegia beddomei*	NE	NT	NM	Bala	Anacardiaceae	D	
94	IZ	RVF	Riverine forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
94	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
94	IZ	RVF	Riverine forests	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
94	IZ	RVF	Riverine forests	*Garcinia spicata*	NE	NT	ME	Gokatu	Clusiaceae	C3	
94	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
94	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
94	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
94	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
94	IZ	RVF	Riverine forests	*Tamarindus indica*	NE	NT	ME	Siyambala	Fabaceae	C3	
94	IZ	RVF	Riverine forests	*Tephrosia purpurea*	NE	NT	ME	Gam pila	Fabaceae	C3	
94	IZ	RVF	Riverine forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
94	IZ	RVF	Riverine forests	*Strychnos nux-vomica*	NE	NT	ME	Goda kaduru	Loganiaceae	C3	
94	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
94	IZ	RVF	Riverine forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
94	IZ	RVF	Riverine forests	*Tarenna asiatica*	NE	NT	ME	Tharana	Rubiaceae	C3	
94	IZ	RVF	Riverine forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
94	IZ	RVF	Riverine forests	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
94	IZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
97	IZ	MEF	Moist evergreen forests	*Crateva adansonii*	NE	NT	ME	Lunu warana	Capparaceae	C3	
97	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
97	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
97	IZ	MEF	Moist evergreen forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
97	IZ	MEF	Moist evergreen forests	*Scurrula parasitica*	NE	NT	NM		Loranthaceae	D	
97	IZ	MEF	Moist evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
97	IZ	MEF	Moist evergreen forests	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	

97	IZ	MEF	Moist evergreen forests	*Canthium coromandelicum*	NE	NT	ME	Kara	Rubiaceae	C3	
97	IZ	MEF	Moist evergreen forests	*Ixora pavetta*	NE	NT	NM		Rubiaceae	D	
97	IZ	MEF	Moist evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
97	IZ	MEF	Moist evergreen forests	*Viscum nepalense*	NE	NT	NM		Viscaceae	D	
99	IZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Cosmostigma racemosa*	NE	TR	NM	Kiriwel	Asclepiadaceae	C2	
99	IZ	SCR	Thorn forests (scrublands)	*Gymnema sylvestre*	NE	NT	ME	Mass badda	Asclepiadaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Diospyros ebenoides*	EN	TR	NM	Yabara	Ebenaceae	B1	
99	IZ	SCR	Thorn forests (scrublands)	*Croton aromaticus*	NE	NT	NM	Wal keppettiya	Euphorbiaceae	D	
99	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
99	IZ	SCR	Thorn forests (scrublands)	*Jatropha curcas*	NE	NT	ME	Wetaendaru	Euphorbiaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Crotalaria laburnifolia*	NE	NT	ME	Yakberiya	Fabaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Indigofera tinctoria*	NE	NT	ME		Fabaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Ocimum tenuiflorum*	NE	NT	ME	Madurutala	Lamiaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Careya arborea*	NE	NT	ME	Kahata	Lecythidaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
99	IZ	SCR	Thorn forests (scrublands)	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
99	IZ	SCR	Thorn forests (scrublands)	*Cissampelos pareira*	NE	NT	ME		Menispermaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Pachygone ovata*	NE	NT	NM		Menispermaceae	D	
99	IZ	SCR	Thorn forests (scrublands)	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Cyrtococcum trigonum*	NE	NT	NM		Poaceae	D	

99	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Mitragyna parvifolia*	NE	NT	ME	Helamba	Rubiaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
99	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
100	IZ	MEF	Moist evergreen forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Gloriosa superba*	NE	NT	ME	Niyagala	Colchicaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Dioscorea tomentosa*	NE	NT	NM	Uyala	Dioscoreaceae	D	
100	IZ	MEF	Moist evergreen forests	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
100	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Caesalpinia pulcherrima*	NE	NT	ME	Kaila	Fabaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Careya arborea*	NE	NT	ME	Kahata	Lecythidaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Dendrophthoe falcata*	NE	NT	ME	Ehetu	Loranthaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
100	IZ	MEF	Moist evergreen forests	*Urena lobata*	NE	NT	NM	Pattaepala	Malvaceae	D	
100	IZ	MEF	Moist evergreen forests	*Pachygone ovata*	NE	NT	NM		Menispermaceae	D	
100	IZ	MEF	Moist evergreen forests	*Tinospora cordifolia*	NE	NT	ME	Rasakinda	Menispermaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
100	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Dimocarpus longan*	NE	NT	ME	Mora	Sapindaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	

100	IZ	MEF	Moist evergreen forests	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
100	IZ	MEF	Moist evergreen forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
100	IZ	MEF	Moist evergreen forests	*Stachytarpheta jamaicansis*	NE	NT	NM	Balunaguta	Verbenaceae	D	
100	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Aristolochia indica*	NE	NT	ME	Maduwel	Aristolochiaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Wattakaka volubilis*	NE	NT	ME	Anguna	Asclepiadaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
101	IZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
101	IZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Cassia roxburghii*	NE	NT	NM	Rathuwa	Fabaceae	D	
101	IZ	SCR	Thorn forests (scrublands)	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Limnocharis flava*	NE	NT	NM	Diyagowa	Limnocharitaceae	D	
101	IZ	SCR	Thorn forests (scrublands)	*Pachygone ovata*	NE	NT	NM		Menispermaceae	D	
101	IZ	SCR	Thorn forests (scrublands)	*Jasminum angustifolium*	NE	NT	ME	Walpichcha	Oleaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Canthium coromandelicum*	NE	NT	ME	Kara	Rubiaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Mitragyna parvifolia*	NE	NT	ME	Helamba	Rubiaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Ophiorhiza mungos*	NE	NT	ME	Dathketiya	Rubiaceae	C3	
101	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
101	IZ	SCR	Thorn forests (scrublands)	*Grewia rothii*	NE	NT	NM	Boradamaniya	Tiliaceae	D	
101	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
102	IZ	SCR	Thorn forests (scrublands)	*Vernonia zeylanica*	EN	NT	ME	Pupula	Asteraceae	B2	
102	IZ	SCR	Thorn forests (scrublands)	*Gloriosa superba*	NE	NT	ME	Niyagala	Colchicaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	

102	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Cassia roxburghii*	NE	NT	NM	Rathuwa	Fabaceae	D	
102	IZ	SCR	Thorn forests (scrublands)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Hiptage parvifolia*	NE	NT	NM	Puwakgediyawel	Malpighiaceae	D	
102	IZ	SCR	Thorn forests (scrublands)	*Streblus taxoides*	NE	NT	ME	Gongotu	Moraceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Hemionites arifolia*	NE	NT	NM	Uruhonda	Polypodiaceae	D	
102	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Mitragyna parvifolia*	NE	NT	ME	Helamba	Rubiaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Morinda umbellata*	EN	NT	ME	Ahu	Rubiaceae	B2	
102	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
102	IZ	SCR	Thorn forests (scrublands)	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Grewia carpinifolia*	NE	NT	NM		Tiliaceae	D	
102	IZ	SCR	Thorn forests (scrublands)	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
102	IZ	SCR	Thorn forests (scrublands)	*Stachytarpheta indica*	NE	NT	NM	Balunaguta	Verbenaceae	D	
102	IZ	SCR	Thorn forests (scrublands)	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
103	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
103	IZ	MEF	Moist evergreen forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
103	IZ	MEF	Moist evergreen forests	*Emilia sonchifolia*	NE	NT	ME		Asteraceae	C3	
103	IZ	MEF	Moist evergreen forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
103	IZ	MEF	Moist evergreen forests	*Capparis rotundifolia*	NE	NT	NM	Balalpahuru	Capparaceae	D	
103	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Argyreia populifolia*	EN	NT	ME		Convolvulaceae	B2	
103	IZ	MEF	Moist evergreen forests	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Carex lateralis*	NE	NT	NM		Cyperaceae	D	
103	IZ	MEF	Moist evergreen forests	*Scleria lithosperma*	NE	NT	NM		Cyperaceae	D	

103	IZ	MEF	Moist evergreen forests	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
103	IZ	MEF	Moist evergreen forests	*Diospyros ovalifolia*	NE	NT	NM	Kunumella	Ebenaceae	D	
103	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
103	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
103	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Hiptage benghalensis*	NE	NT	ME	Puwak gedia wel	Malpighiaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Aglaia elaeagnoidea*	NE	NT	ME		Meliaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
103	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
103	IZ	MEF	Moist evergreen forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
103	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
104	IZ	MEF	Moist evergreen forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
104	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
104	IZ	MEF	Moist evergreen forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	

104	IZ	MEF	Moist evergreen forests	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Dioscorea pentaphylla*	NE	NT	NM	Katuala	Dioscoreaceae	D	
104	IZ	MEF	Moist evergreen forests	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
104	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
104	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
104	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Salacia oblonga*	NE	TR	ME	Himbutu	Hippocrateaceae	B3	
104	IZ	MEF	Moist evergreen forests	*Molineria trichocarpa*	NE	NT	NM	Maha bin tal	Hypoxidaceae	D	
104	IZ	MEF	Moist evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Oxalis corniculata*	NE	NT	ME	Heen ambiliya	Oxalidaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Haldina cordifolia*	NE	NT	ME		Rubiaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
104	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
104	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
104	IZ	MEF	Moist evergreen forests	*Solanum seaforthianum*	NE	NT	NM		Solanaceae	D	
104	IZ	MEF	Moist evergreen forests	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Gmelina asiatica*	NE	NT	ME	Demata	Verbenaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
104	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
104	IZ	MEF	Moist evergreen forests	*Cissus vitiginea*	NE	NT	NM		Vitaceae	D	
104	IZ	MEF	Moist evergreen forests	*Curcuma zedoaria*	NE	NT	ME	Harankaha	Zingiberaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Aerva lanata*	NE	NT	ME	Polpala	Amaranthaceae	C3	

105	IZ	MEF	Moist evergreen forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Asparagus falcatus*	NE	NT	ME	Hathawariya	Asparagaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Evolvulus alsinoides*	NE	NT	ME	Vishnukranthi	Convolvulaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Cyperus difformis*	NE	NT	NM		Cyperaceae	D	
105	IZ	MEF	Moist evergreen forests	*Dioscorea pentaphylla*	NE	NT	NM	Katuala	Dioscoreaceae	D	
105	IZ	MEF	Moist evergreen forests	*Dioscorea tomentosa*	NE	NT	NM	Uyala	Dioscoreaceae	D	
105	IZ	MEF	Moist evergreen forests	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
105	IZ	MEF	Moist evergreen forests	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
105	IZ	MEF	Moist evergreen forests	*Euphorbia antiquorum*	NE	NT	ME	Daluk	Euphorbiaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
105	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Bauhinia tomentosa*	NE	NT	ME		Fabaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Ficus arnottiana*	NE	NT	NM	Kaputubo	Moraceae	D	
105	IZ	MEF	Moist evergreen forests	*Ochna jabotapita*	EN	NT	ME	Mal kera	Ochnaceae	B2	
105	IZ	MEF	Moist evergreen forests	*Habenaria plantaginea*	NE	NT	NM		Orchidaceae	D	
105	IZ	MEF	Moist evergreen forests	*Eragrostis ciliaris*	NE	NT	NM		Poaceae	D	
105	IZ	MEF	Moist evergreen forests	*Centranthera indica*	NE	NT	ME	Dutusathutu	Scrophulariaceae	C3	
105	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
105	IZ	MEF	Moist evergreen forests	*Cissus vitiginea*	NE	NT	NM		Vitaceae	D	
106	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
106	IZ	MEF	Moist evergreen forests	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Capparis rotundifolia*	NE	NT	NM	Balalpahuru	Capparaceae	D	
106	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Cucurbita mixima*	NE	NT	ME	Wattakka	Cucurbitaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	

106	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
106	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Abrus precatorius*	NE	NT	ME		Fabaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Flacourtia indica*	NE	NT	ME	Uguressa	Flacourtiaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
106	IZ	MEF	Moist evergreen forests	*Molineria trichocarpa*	NE	NT	NM	Maha bin tal	Hypoxidaceae	D	
106	IZ	MEF	Moist evergreen forests	*Ficus amplissima*	NE	NT	NM		Moraceae	D	
106	IZ	MEF	Moist evergreen forests	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Haldina cordifolia*	NE	NT	ME		Rubiaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
106	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
106	IZ	MEF	Moist evergreen forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
106	IZ	MEF	Moist evergreen forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Holoptelea integrifolia*	NE	NT	ME	Goda kirilla	Ulmaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
106	IZ	MEF	Moist evergreen forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
107	IZ	RVF	Riverine forests	*Aerva lanata*	NE	NT	ME	Polpala	Amaranthaceae	C3	
107	IZ	RVF	Riverine forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
107	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
107	IZ	RVF	Riverine forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	

107	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
107	IZ	RVF	Riverine forests	*Mikania cordata*	NE	NT	ME	Gahalawel	Asteraceae	C3	
107	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
107	IZ	RVF	Riverine forests	*Commelina diffusa*	NE	NT	ME	Girapala	Commelinaceae	C3	
107	IZ	RVF	Riverine forests	*Cyperus difformis*	NE	NT	NM		Cyperaceae	D	
107	IZ	RVF	Riverine forests	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
107	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
107	IZ	RVF	Riverine forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
107	IZ	RVF	Riverine forests	*Manihot glaziovii*	NE	NT	NM	Walrubber	Euphorbiaceae	D	
107	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
107	IZ	RVF	Riverine forests	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
107	IZ	RVF	Riverine forests	*Adenanthera pavonina*	NE	NT	ME	Madatiya	Fabaceae	C3	
107	IZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
107	IZ	RVF	Riverine forests	*Mimosa pigra*	NE	NT	NM		Fabaceae	D	
107	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
107	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
107	IZ	RVF	Riverine forests	*Strychnos nux-vomica*	NE	NT	ME	Goda kaduru	Loganiaceae	C3	
107	IZ	RVF	Riverine forests	*Strychnos trichocalyx*	EN	NT	NM	Gona-karaba	Loganiaceae	C1	
107	IZ	RVF	Riverine forests	*Hiptage benghalensis*	NE	NT	ME	Puwak gedia wel	Malpighiaceae	C3	
107	IZ	RVF	Riverine forests	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
107	IZ	RVF	Riverine forests	*Panicum maximum*	NE	NT	NM		Poaceae	D	
107	IZ	RVF	Riverine forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
107	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
107	IZ	RVF	Riverine forests	*Cardiospermum canescens*	NE	NT	NM	Penela	Sapindaceae	D	
107	IZ	RVF	Riverine forests	*Solanum seaforthianum*	NE	NT	NM		Solanaceae	D	
107	IZ	RVF	Riverine forests	*Holoptelea integrifolia*	NE	NT	ME	Goda kirilla	Ulmaceae	C3	
107	IZ	RVF	Riverine forests	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
107	IZ	RVF	Riverine forests	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
107	IZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	

107	IZ	RVF	Riverine forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
108	IZ	AGL	Agricultural lands	*Achyranthes aspera*	NE	NT	ME		Amaranthaceae	C3	
108	IZ	AGL	Agricultural lands	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
108	IZ	AGL	Agricultural lands	*Cocos nucifera*	NE	NT	ME	Pol	Arecaceae	C3	
108	IZ	AGL	Agricultural lands	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
108	IZ	AGL	Agricultural lands	*Vernonia cinerea*	NE	NT	ME	Monarakudumbiya	Asteraceae	C3	
108	IZ	AGL	Agricultural lands	*Xanthium indicum*	NE	NT	ME	Uru kossa	Asteraceae	C3	
108	IZ	AGL	Agricultural lands	*Argyreia populifolia*	EN	NT	ME		Convolvulaceae	B2	
108	IZ	AGL	Agricultural lands	*Cuscuta chinensis*	NE	NT	ME		Convolvulaceae	C3	
108	IZ	AGL	Agricultural lands	*Ipomoea mauritiana*	NE	NT	ME	Kiribaduwel	Convolvulaceae	C3	
108	IZ	AGL	Agricultural lands	*Fimbristylis falcata*	NE	NT	NM		Cyperaceae	D	
108	IZ	AGL	Agricultural lands	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
108	IZ	AGL	Agricultural lands	*Sauropus bacciformis*	NE	NT	NM		Euphorbiaceae	D	
108	IZ	AGL	Agricultural lands	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
108	IZ	AGL	Agricultural lands	*Desmodium heterophyllum*	NE	NT	ME	Maha undu piyaliya	Fabaceae	C3	
108	IZ	AGL	Agricultural lands	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
108	IZ	AGL	Agricultural lands	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
108	IZ	AGL	Agricultural lands	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
108	IZ	AGL	Agricultural lands	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
108	IZ	AGL	Agricultural lands	*Leucas zeylanica*	NE	NT	ME	Gata tumba	Lamiaceae	C3	
108	IZ	AGL	Agricultural lands	*Sida acuta*	NE	NT	ME	Bevila	Malvaceae	C3	
108	IZ	AGL	Agricultural lands	*Ficus racemosa*	NE	NT	ME	Attikka	Moraceae	C3	
108	IZ	AGL	Agricultural lands	*Ludwigia adscendens*	NE	NT	ME	Beru diya nilla	Onagraceae	C3	
108	IZ	AGL	Agricultural lands	*Eragrostis ciliaris*	NE	NT	NM		Poaceae	D	
108	IZ	AGL	Agricultural lands	*Polygala javana*	NE	NT	NM		Polygalaceae	D	
108	IZ	AGL	Agricultural lands	*Cardiospermum halicacabum*	NE	NT	NM	Penela	Sapindaceae	D	
108	IZ	AGL	Agricultural lands	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
108	IZ	AGL	Agricultural lands	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
108	IZ	AGL	Agricultural lands	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	

108	IZ	AGL	Agricultural lands	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
108	IZ	AGL	Agricultural lands	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
108	IZ	AGL	Agricultural lands	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
109	IZ	SCR	Thorn forests (scrublands)	*Evolvulus alsinoides*	NE	NT	ME	Vishnukranthi	Convolvulaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Trichosanthes cucumerina*	NE	NT	ME	Dumella	Cucurbitaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
109	IZ	SCR	Thorn forests (scrublands)	*Croton laccifer*	NE	NT	ME	Gas Keppetiya	Euphorbiaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
109	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Abrus precatorius*	NE	NT	ME		Fabaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Bauhinia tomentosa*	NE	NT	ME		Fabaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Desmodium heterophyllum*	NE	NT	ME	Maha undu piyaliya	Fabaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Desmodium triflorum*	NE	NT	ME	Heen-undupiyali	Fabaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Tephrosia purpurea*	NE	NT	ME	Gam pila	Fabaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
109	IZ	SCR	Thorn forests (scrublands)	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Cardiospermum halicacabum*	NE	NT	NM	Penela	Sapindaceae	D	
109	IZ	SCR	Thorn forests (scrublands)	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
109	IZ	SCR	Thorn forests (scrublands)	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Helicteres isora*	NE	NT	ME	Liniya	Sterculiaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	

109	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
109	IZ	SCR	Thorn forests (scrublands)	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Bulbostylis densa*	NE	NT	NM		Cyperaceae	D	
110	IZ	MEF	Moist evergreen forests	*Mallotus philippensis*	NE	NT	ME	Hampirilla	Euphorbiaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Albizia chinensis*	NE	NT	NM	Kabalmara	Fabaceae	D	
110	IZ	MEF	Moist evergreen forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Cassia tora*	NE	NT	ME		Fabaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Strychnos nux-vomica*	NE	NT	ME	Goda kaduru	Loganiaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Dactyloctenium aegyptium*	NE	NT	ME	Belathana	Poaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Oryza sativa*	NE	NT	ME	Wee	Poaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
110	IZ	MEF	Moist evergreen forests	*Holoptelea integrifolia*	NE	NT	ME	Goda kirilla	Ulmaceae	C3	
111	IZ	RVF	Riverine forests	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
111	IZ	RVF	Riverine forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
111	IZ	RVF	Riverine forests	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
111	IZ	RVF	Riverine forests	*Pothos scandens*	NE	NT	ME	Pota wel	Araceae	C3	
111	IZ	RVF	Riverine forests	*Ageratum conyzoides*	NE	NT	ME	Hulanthala	Asteraceae	C3	
111	IZ	RVF	Riverine forests	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
111	IZ	RVF	Riverine forests	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
111	IZ	RVF	Riverine forests	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
111	IZ	RVF	Riverine forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
111	IZ	RVF	Riverine forests	*Terminalia arjuna*	NE	NT	ME	Kumbuk	Combretaceae	C3	
111	IZ	RVF	Riverine forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
111	IZ	RVF	Riverine forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
111	IZ	RVF	Riverine forests	*Mischodon zeylanicus*	NE	NT	NM	Tammanua	Euphorbiaceae	D	
111	IZ	RVF	Riverine forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	

111	IZ	RVF	Riverine forests	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
111	IZ	RVF	Riverine forests	*Acacia chundra*	NE	NT	ME	Diyahinguru	Fabaceae	C3	
111	IZ	RVF	Riverine forests	*Albizia chinensis*	NE	NT	NM	Kabalmara	Fabaceae	D	
111	IZ	RVF	Riverine forests	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
111	IZ	RVF	Riverine forests	*Cassia fistula*	NE	NT	ME	Ehela	Fabaceae	C3	
111	IZ	RVF	Riverine forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
111	IZ	RVF	Riverine forests	*Mimosa pudica*	NE	NT	ME	Nidi kumba	Fabaceae	C3	
111	IZ	RVF	Riverine forests	*Pongamia pinnata*	NE	NT	ME	Gal karada	Fabaceae	C3	
111	IZ	RVF	Riverine forests	*Tamarindus indica*	NE	NT	ME	Siyambala	Fabaceae	C3	
111	IZ	RVF	Riverine forests	*Tephrosia purpurea*	NE	NT	ME	Gam pila	Fabaceae	C3	
111	IZ	RVF	Riverine forests	*Flacourtia indica*	NE	NT	ME	Uguressa	Flacourtiaceae	C3	
111	IZ	RVF	Riverine forests	*Hydnocarpus venenata*	EN	NT	ME	Makulla	Flacourtiaceae	B2	
111	IZ	RVF	Riverine forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
111	IZ	RVF	Riverine forests	*Molineria trichocarpa*	NE	NT	NM	Maha bin tal	Hypoxidaceae	D	
111	IZ	RVF	Riverine forests	*Strychnos nux-vomica*	NE	NT	ME	Goda kaduru	Loganiaceae	C3	
111	IZ	RVF	Riverine forests	*Hiptage benghalensis*	NE	NT	ME	Puwak gedia wel	Malpighiaceae	C3	
111	IZ	RVF	Riverine forests	*Aglaia elaeagnoidea*	NE	NT	ME		Meliaceae	C3	
111	IZ	RVF	Riverine forests	*Cissampelos pareira*	NE	NT	ME		Menispermaceae	C3	
111	IZ	RVF	Riverine forests	*Plecospermum spinosum*	NE	NT	ME	Thingol	Moraceae	C3	
111	IZ	RVF	Riverine forests	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
111	IZ	RVF	Riverine forests	*Oxalis corniculata*	NE	NT	ME	Heen ambiliya	Oxalidaceae	C3	
111	IZ	RVF	Riverine forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
111	IZ	RVF	Riverine forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
111	IZ	RVF	Riverine forests	*Nauclea orientalis*	NE	NT	ME	Bakmee	Rubiaceae	C3	
111	IZ	RVF	Riverine forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
111	IZ	RVF	Riverine forests	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
111	IZ	RVF	Riverine forests	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
111	IZ	RVF	Riverine forests	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
111	IZ	RVF	Riverine forests	*Madhuca longifolia*	NE	NT	ME	Mee	Sapotaceae	C3	

111	IZ	RVF	Riverine forests	*Holoptelea integrifolia*	NE	NT	ME	Goda kirilla	Ulmaceae	C3	
111	IZ	RVF	Riverine forests	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
111	IZ	RVF	Riverine forests	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
112	IZ	SCR	Thorn forests (scrublands)	*Miliusa indica*	NE	NT	NM	Yabara	Annonaceae	D	
112	IZ	SCR	Thorn forests (scrublands)	*Carissa spinarum*	NE	NT	ME	Karamba	Apocynaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Eupatorium odoratum*	NE	NT	NM	Podisinno	Asteraceae	D	
112	IZ	SCR	Thorn forests (scrublands)	*Stereospermum colais*	NE	NT	ME		Bignoniaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Carmona retusa*	NE	NT	ME	Heen tabala	Boraginaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Gloriosa superba*	NE	NT	ME	Niyagala	Colchicaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Rourea minor*	NE	NT	ME	Radaliya	Connaraceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Evolvulus alsinoides*	NE	NT	ME	Vishnukranthi	Convolvulaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Dioscorea pentaphylla*	NE	NT	NM	Katuala	Dioscoreaceae	D	
112	IZ	SCR	Thorn forests (scrublands)	*Dioscorea trimenii*	EN	TR	NM	Katuala	Dioscoreaceae	B1	
112	IZ	SCR	Thorn forests (scrublands)	*Maba buxifolia*	NE	NT	NM	Jabara	Ebenaceae	D	
112	IZ	SCR	Thorn forests (scrublands)	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
112	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Phyllanthus urinaria*	NE	NT	ME	Rat pitawakka	Euphorbiaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Abrus precatorius*	NE	NT	ME		Fabaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Bauhinia racemosa*	NE	NT	ME	Maila	Fabaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Flacourtia indica*	NE	NT	ME	Uguressa	Flacourtiaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
112	IZ	SCR	Thorn forests (scrublands)	*Molineria trichocarpa*	NE	NT	NM	Maha bin tal	Hypoxidaceae	D	
112	IZ	SCR	Thorn forests (scrublands)	*Cissampelos pareira*	NE	NT	ME		Menispermaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Eugenia bracteata*	NE	NT	ME	Tembiliya	Myrtaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Syzygium cumini*	NE	NT	ME	Madan	Myrtaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	

112	IZ	SCR	Thorn forests (scrublands)	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
112	IZ	SCR	Thorn forests (scrublands)	*Glycosmis mauritiana*	NE	NT	ME	Dodanpana	Rutaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Pleiospermium alatum*	NE	NT	ME	Tumpat kurudu	Rutaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Manilkara hexandra*	NE	NT	ME	Palu	Sapotaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Lantana camara*	NE	NT	ME	Hinguru	Verbenaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Vitex altissima*	NE	NT	ME	Milla	Verbenaceae	C3	
112	IZ	SCR	Thorn forests (scrublands)	*Cissus heyneana*	NE	NT	NM	Diyalabu	Vitaceae	D	
113	IZ	MEF	Moist evergreen forests	*Polyalthia korinti*	NE	NT	NM	Ulkenda	Annonaceae	D	
113	IZ	MEF	Moist evergreen forests	*Cordia dichotoma*	NE	NT	ME	Lolu	Boraginaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Capparis zeylanica*	NE	NT	ME	Wellangiriya	Capparaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Cycas circinalis*	NE	NT	ME	Madu	Cycadaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Diospyros ebenum*	NE	TR	NM	Kaluwara	Ebenaceae	C2	
113	IZ	MEF	Moist evergreen forests	*Maba buxifolia*	NE	NT	NM	Jabara	Ebenaceae	D	
113	IZ	MEF	Moist evergreen forests	*Dimorphocalyx glabellus*	NE	NT	ME	Wali wenna	Euphorbiaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
113	IZ	MEF	Moist evergreen forests	*Drypetes sepiaria*	NE	NT	NM	Weera	Euphorbiaceae	D	
113	IZ	MEF	Moist evergreen forests	*Flueggea leucopyrus*	NE	NT	NM	Katupila	Euphorbiaceae	D	
113	IZ	MEF	Moist evergreen forests	*Mallotus eriocarpus*	EN	NT	ME	Bulu petta	Euphorbiaceae	B2	
113	IZ	MEF	Moist evergreen forests	*Phyllanthus polyphyllus*	NE	NT	ME	Kuratiya	Euphorbiaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Derris scandens*	NE	NT	ME	Kala wel	Fabaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Salacia reticulata*	NE	TR	ME	Kotala hibutu	Hippocrateaceae	B3	
113	IZ	MEF	Moist evergreen forests	*Strychnos nux-vomica*	NE	NT	ME	Goda kaduru	Loganiaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Hibiscus eriocarpus*	NE	NT	ME		Malvaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Cissampelos pareira*	NE	NT	ME		Menispermaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Plecospermum spinosum*	NE	NT	ME	Thingol	Moraceae	C3	

113	IZ	MEF	Moist evergreen forests	*Hemidesmus indicus*	NE	NT	ME	Iramusu	*Periplocaceae*	C3	
113	IZ	MEF	Moist evergreen forests	*Ventilago madraspatana*	NE	NT	ME	Wembadangawel	Rhamnaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Ziziphus oenoplia*	NE	NT	ME	Heen eraminiya	Rhamnaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Canthium dicoccum*	NE	NT	NM		Rubiaceae	D	
113	IZ	MEF	Moist evergreen forests	*Catunaregam spinosa*	NE	NT	ME	Kukurumanna	Rubiaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Chloroxylon swietenia*	NE	NT	NM	Burutha	Rutaceae	D	
113	IZ	MEF	Moist evergreen forests	*Glycosmis pentaphylla*	NE	NT	ME		Rutaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Toddalia asiatica*	NE	NT	ME	Kudu miris	Rutaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Allophylus cobbe*	NE	NT	ME		Sapindaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Glenniea unijuga*	EN	NT	NM	Wal mora	Sapindaceae	C1	
113	IZ	MEF	Moist evergreen forests	*Lepisanthes tetraphylla*	NE	NT	NM	Kahapenela	Sapindaceae	D	
113	IZ	MEF	Moist evergreen forests	*Schleichera oleosa*	NE	NT	ME	Kon	Sapindaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Pterospermum suberifolium*	NE	NT	ME	Welan	Sterculiaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Grewia damine*	NE	NT	ME	Daminiya	Tiliaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Laportea bulbifera*	NE	NT	NM	Walkahambiliya	Urticaceae	D	
113	IZ	MEF	Moist evergreen forests	*Premna tomentosa*	NE	NT	ME	Boo seru	Verbenaceae	C3	
113	IZ	MEF	Moist evergreen forests	*Cissus vitiginea*	NE	NT	NM		Vitaceae	D	

ANNEX 11 - THREAT OF INVASIVE ALIEN PLANTS (IAP) AND MITIGATION MEASURES

Plants that are non-native, growing aggressively, and often dominating whole native communities and crowding out existing native plants are regarded as Invasive Alien Plants. Once they dominate, the native ecosystem can become degraded for all of its inhabitants, from native plants to insects, birds and animals. Not all non-native plants are invasive. Those considered invasive have the following traits that help them out-compete native plants and dominate an entire plant community.

- Aggressive spread
- Prolifically reproduce
- Adapt to a variety of conditions
- Have few natural controls in their new habitat
- Are difficult to control or eliminate once established

Hence, there will be serious impacts on ecosystem and economic opportunities in the long run. This is highly relevant in the case of reservoir construction and subsequent environmental alterations, especially in riparian and aquatic habitats. Therefore, it is highly recommended to carry out preventive measures as well as control measures to mitigate the possible harmful effects.

The present study has been able to record 10 species of invasive plants in the project area; *Alocasia macrorrhiza* (Habarala)*, Alstonia macrophylla* (Hawarinuga)*, Eupatorium odoratum* (Podisinno)*, Eupatorium riparium, Imperata cylindrical* (Illuk)*, Lantana camara* (Hinguru)*, Mimosa pigra* (Giant mimosa)*, Panicum maximum* (Ratathanakola)*, Tithonia diversifolia* (Thiththa) *and Xanthium indicum* (Uru kossa)*.*

Rationale for Prevention

Preventing invasive species from becoming established can be more cost effective than restoring an injured ecosystem. Controlling established invasive species is costly and difficult, and complete eradication is almost impossible. Prevention can avoid the potentially permanent species losses. Initial changes in ecosystem processes and interactions may be undetectable, depending upon the specific species, prior to devastating impacts of invasions.

The design and successful implementation of preventive actions should be the result of coordinated efforts between both public and private groups in preventing spread of invasive plants in the project area.

Natural pathways for the dispersal of IAP include wind, water, or animals. Areas disturbed by both natural and human causes (roadsides, trails, log landings, and construction zones) are particularly susceptible to invasion and should be targeted for prevention. Unclean construction site vehicles, disturbed soils and accidental movement of seeds of invasive plants into newly opened areas including water bodies provide optimum conditions for invasive plants to become established.

Prevention measures that should be considered are:

1. Minimizing disturbance

Projects planned in relatively intact habitat areas risk being susceptible to an invasive species introduction through disturbance. Project review must include consideration for the likelihood of

facilitating invasions. Placing unnecessary trails, roadways and power lines in large un-fragmented tracts should be avoided in order to maintain ecosystem integrity.

2. Reclaiming/restoring recently altered or newly acquired areas

Heavily disturbed areas are especially prone to invasion; immediate reclamation of these areas is essential. Newly acquired land should be observed for invasive species and, if necessary, quickly treated. Prompt action will discourage the disrupted area from serving as an invasive source for neighboring tracts, especially if the invasive species present is locally unusual or present in large numbers.

3. Developing invasive species expertise

In order to prevent further invasions, land managers must be trained in invasive species identification and inventory. While construction is going on, a group of staff devoted to continual inventory of lands is essential to maintain management and control efficiency.

4. Carefully consider location selection for dumping sites.

Reproductive parts of many invasive plants can withstand seasonal cycles. Identified seeds or other propagules, especially should be destroyed or carefully collected and discarded to prevent re-establishment.

5. Eradicate already established invasive plants.

It is imperative to prioritise the management of existing on-site invasive species to prevent the spread elsewhere within the project area.

6. Look for alternatives.

Examining common practices to determine how alterations may reduce the risk of invasive species introduction is essential in designing ground level activities e.g. use of minimum number of access routes, dumping sites, site offices etc.

7. Introduce best practice guidelines.

It is important to review contracts for opportunities to strengthen preventive measures. Best practice guidelines for environment friendly construction works that may include equipment-cleaning requirements, disturbed habitat remediation guidelines, and other appropriate preventive activities should be introduced.

8. Use of trusted plant species for landscaping.

No invasive species should be used for any of the planning work. Plants native to a site should be selected for use in landscaping of site offices.

9. Dump material carefully.

Dumping requires knowledge of the original source and previous sites of transferred topsoil, fill or other materials brought into a site. Roadside shoulder material, removed during road shoulder

maintenance, can be loaded with weed seeds. If the source of this material supported invasive plants, the contaminated material should not be used in an uninfected area. Other soil or fill material should be used only with a good plan for weed control following placement. A visit to the site of the material's origin may be necessary to evaluate whether use is appropriate.

10. Minimizing soil disturbances

Many invasive plants are capable of colonizing disturbed ground. When ground is disturbed, several measures can prevent unfavorable plant invasion with treatment of fill material and disturbed areas being one such important measure. Other s include the covering, mulching, seeding, or planting of the disrupted area to prevent establishment of unwanted plants. Further, it is important to Monitor the site and mulch, mow or remove weeds to control unwanted plants that appear.

11. Monitoring shorelines following reservoir impoundment.

Invasive shoreline plants, such as *Xanthium indicum* tend to move into exposed shorelines, or become dominant where dried stressed native plant populations have dwindled. Necessary removal action should be taken at correct time.

12. Using fertilizers wisely and control soil erosion

The most commonly used supplemental nutrients in agriculture or landscaping include limiting factors in plant growth, principally nitrogen and phosphorous. High nitrogen levels offer a supreme growth factor for all plants, granting a particular advantage to invasive plants. Many invasive species are adapted to using considerable nutrients for rapid growth therefore excessive fertilizer application is deleterious. Usage of soil tests to prescribe proper levels of fertilizer is important. Introduction of eco-agricultural practices to the catchment area of the reservoir is highly recommended for conserving soil and minimizing the impacts of agricultural inputs. This would be highly beneficial in preventing future invasion of aquatic plants in the reservoir due to eutrophication. However, it is highly recommended to periodically undertake flushing of reservoir to dilute the nutrition level of the water body which can be done twice a year at the start of the rainy seasons.

13. Protecting native plant communities

A key to controlling invasive plants is to protect native plant communities. Where native plant communities have been displaced, invasive plants thrive, especially on bare soil and disturbed ground. Where native communities are still present, non-invasive plants can move into the empty niche created by the removal of invasive species.

14. Providing education and training

Education is a major tool for prevention. Members of both internal and external groups must be informed about invasive species; messages on posters and handouts could prove effective. Distributed materials should include general information, or can call the public's attention to "special alerts." Emphasis should be placed on educating and training site managers and other stakeholders for attitude change and prompt action.

15. Establish a dedicated unit for management of invasive plants in the project area.

Setting up of an IAP management unit with necessary policy and institutional frameworks will definitely benefit the pre-project and post-project scenario related to invasive plants. Necessary ordinations must be established with the Ministry of environment and its line agencies, Department of agriculture, Universities, National Herbarium, IUCN and other relevant agencies for technical collaboration.

ANNEX 12.1 - PROPOSED PLAN OF ACTION FOR SALVAGING AND TRANSPLANTING OF PRIORITY PLANT SPECIES (PPS) AFFECTED BY MORAGAHAKANDA DEVELOPMENT PROJECT.

Choice of plant species:

The selection of priority plant species for translocation was done in the following manner. The data base on flora prepared for Moragahakanda project area was analyzed and the following summary was considered in selecting the plant species.

Group	*Status*	*Species counts*
A	Endemic, threatened & medicinal	2
B1	Endemic, threatened & not-medicinal	3
B2	Endemic, not-threatened & medicinal	10
B3	Non-endemic, threatened & medicinal	4
C1	Endemic, non-threatened & not-medicinal	14
C2	Non-endemic, threatened & not-medicinal	5
C3	Non-endemic, not-threatened & medicinal	245
D	Non-endemic, not-threatened & not-medicinal	173

Among the above plant species, two Group A species considered as the priority 1 species for translocation were ,viz., *Cryptocoryne beckettii* and *Cryptocoryne walkeri.*

Among the Group B1, only *Dioscorea trimenii* was selected for transplanting since this is an important endemic wild crop relative with visible genetic variability over the dry zone landscape and is relative scarce in the area. Other plants of Group B1 were found as healthy populations in the surrounding protected areas that are not going to be affected by the inundation and their survival is more or less ensured.

Additionally 6 other plant species, which are not within the sampling plots, but recorded in random encounters, namely *Dalzellia ceylanica,Zeylanidium sp., Exacum petiolare*, *Lagenandra koenigii, Lagenandra thwaitesii, Cryptoctoryne wendtii* are also recommended for translocation since they are also in an ecologically sensitive state.

Occurrence and identification of plants:

Table: Summary data on sensitive plant species, their occurrence and time schedule for rescue operations.

Botanical name & vernacular name	**Identification features**	**Presently recorded location**	**Recommended site for translocation**	**Recommended time for translocation**
Lagenandra koenigii (Ketela)	Aquatic partly submerged herbs, in stream bank.(50-100cm)	Kambarawa canal & its sub-canals up to inundation area(7^0 37' 26.8" NL	Any similar habitat along the Kambarawa Oya, above the point of upper water limit of Moragahakanda reservoir.	February, 2008, just after rainy season.

		80^0 46' 04.9" EL), Bandane Anicut, Kambarawa Oya.		
Lagenandra thwaitesii (Ketela)	Aquatic partly submerged herbs,in stream bank.(50-100cm)	-do-	-do-	February, 2008, just after rainy season.
Cryptocoryne bekettii (Athiudayan)	**Aquatic submerged herbs(5-10cm)**	-do-	-do-	February, 2008, just after rainy season.
Cryptocoryne walkeri (Athiudayan)	**Aquatic submerged herbs(5-10cm)**	-do-	-do-	February, 2008, just after rainy season.
Cryptocoryne wendtii (Athiudayan)		-do-	-do-	February, 2008, just after rainy season.
Dalzellia ceylanica	Aquatic submerged herb growing attached to stream boulders (1cm).	-do-	-do-	February, 2008, just after rainy season.
Zeylanidium sp		-do-	-do-	February, 2008, just after rainy season.
Dioscorea trimenii (Katuala)	A non-woody climber with an elongated underground yam.	(7^0 39' 28.8" NL 80^0 44' 37.5" EL,) Kambarawa, Galporugolla road leading to Quartz quarry. *Exacum petiolare* (Binara) can also be collected here on rock outcrop.	Above the inundation area in a similar habitat less than 1km from the reservoir upper water level or similar site close to (100m) above the mentioned Kambarawa Oya site	April, 2008, just before the drought period when the plants can be identified from shoots.
Exacum petiolare (Binara)	A herbaceous terrestrial plant (15-25cm)	(7^0 42' 25.5" NL 80^0 46' 13.6" EL), Elahera-	Above the inundation area in a similar habitat less than 1km from the reservoir upper water level	. April, 2008, just before the dry period when the plants can be identified from shoots.

		Kambarawa road on rock outcrop close to earth burrow area of the proposed project office area.	or similar site close to (100m) the above mentioned Kambarawa Oya site.	

The technical personnel who are supposed to be supervising the plant translocation process should be skillful enough to correctly identify the plant species. It is suggested that National Herbarium (Peradeniya), IUCN, Forest Department and Wildlife Department authorities are consulted and relevant officials are involved in this work.

A general guide to transplanting:

The methods used in transplanting native PPS from rescue sites to nearby similar habitats depend on the following factors:

a) Size of Plant.

It is easier to move small plants but mature plants also can be moved. Regardless of plant size, the rule “as much of the plant’s root structure as possible” is an important guideline.

b) Distance Moved.

How far one has to transport a dug plant is certainly a factor in transplanting PPS. Under present conditions, it is necessary to moisten the plant and keep it covered and away from the sun and wind.

d) Digging Techniques

The projection of the plant’s outer most limbs to the earth are a guide in determining to what extent of the rootbill is there a need to dig. A good rule is dig as far from the trunk as possible such that the resulting root ball can be easily extracted and handled. Except *Dioscorea* others are shallow rooted, so it is usually not necessary to dig more than 6-10 inches deep. After determining how large of root ball, insert a sharp pointed shovel into the ground at the determined cut line, cutting the roots cleanly. Make these cuts completely circling the plant. After completing the circle, start inserting the shovel again in the cut and pry up the earth, again completely circling the plant, until the root ball is free from the surrounding soil. Large polythene bags can be used to hold the plant and root ball.

Transporting Guidelines

If possible, move the dug PPS in a closed system. Lacking enclosure, cover the plant from the sun. Moisten the leaves and pour some water around the root ball. Avoid leaving the branches in the hot sun and don’t let the branches get blown by the wind when moving on the road.

Planting Techniques

The relocation site should reproduce as far as possible the site of the extracted plant. Therefore please remember to take note of the site conditions (soil properties, shade and moisture levels) of plant substrate.
Example:

Laginandra – Sand: Mud 50:50 soil in stream bottom
Cryptocoryne - Sand: Mud 50:50 soil in stream bottom
Podostomaceae – on rounded rocks
Dioscorea – well drained soil with some organic matter in shady sites

In the case of terrestrial plants, if the soil in the relocation site is heavy, use soil amendments such as 50-50 mixture of the site's soil with compost. Water carefully and thoroughly.

Dig a hole larger than the root ball of the transplant and deep enough for the top of the root ball to be level with or slightly above the surrounding soil. Be sure that the hole contains loosened dirt on the bottom and around the edges. Fill in the area between the root ball and the hole edge with soil from the hole.

Table: A simple guide to removal of propagules and their transportation.

Botanical name & vernacular name	**Removal of propagules**	**Transport and relocation.**
Lagenandra koenigii **(Ketela)**	• Extract the entire plant with minimum damage to root system. • 10 plants would be adequate.	a) Put in plastic containers with ample moisture and air during the movements. b) Never spend more than 8 hours for the entire operation of extracting and replanting. c) Ensure that plants are not subjected to physical damage during transportation. d) Replanting needs to be carried out in the given locality having most similar micro-environmental conditions of the source site. Always try to replicate the natural population.
Lagenandra thwaitesii (Ketela)	-do-	-do-
Cryptocoryne bekettii (Athiudayan)	-do-	-do-
Cryptocoryne walkeri (Athiudayan)	-do-	-do-
Cryptocoryne wendtii (Athiudayan)	**-do-**	-do-
Dalzellia ceylanica	Remove the entire boulder covered with plants (usually 50cmx50cm). - 3 boulders covered with plants would be adequate.	-Put in a polythene bag and make sure plants are submerged in water during transportation. - follow above b, c & d.
Zeylanidium sp	-do-	-do-
Dioscorea trimenii (Katuala)	-Safely remove a mature yam with some roots. Cut the aerial parts (climbing stem) if it is more than 1m. - 10 individual planting parts would be adequate.	- follow above a, b, c & d.
Exacum petiolare (Binara)	Extract the entire plant with minimum damage to root system. - 5 plants would be adequate.	- follow above a, b, c & d.

Monitoring, evaluation, maintenance and corrective measures:

Observation of replanted plants needs to be carried out in the following manner.

First Month: on daily basis.
Months 2-7: Once a month
Months 8-18: Once every three month.

- If the reintroduced population fails to sustain at least 50% of what was introduced within the first three months, ‘vacant filling’ needs to be carried out.

- Watering need to be done for terrestrial plant species (Binara and Katuala) on daily basis during the first month.

- Adequate physical protection needs to be given to all plants once relocated.

ANNEX 12.2 – FAUNA TRANSLOCATION PROGRAMME FOR MADP

There is a possibility of potential disappearance (local extinctions) of some rare faunal species due to the development Moragahakanda agricultural development project. Less mobile species and fish species that prefer special microhabitat conditions are more vulnerable to local extinctions in the MADP area. Therefore, translocation program is recommended for MADP area.

1.0 Criteria for selecting species for translocation

The following criteria were developed for the selection of species for translocation

1.1 Fresh water Fish species

- Species restricted to Knuckles region and Mahaweli river basin.
  Puntius srilankensis
  Puntius martenstyni
  Labeo fisheri

- Endemic wider distributed species but rare in MADP area
  Belontia signata
  Schistura notostigma

- Currently not endemic but cryptic species may be present among these groups
  Family Bagridae
  Family Siluridae
  Family Heteropneutidae

1.2 Reptiles and Amphibians

Translocation of Common amphibians and reptiles species is a time consuming and costly process. Therefore only rare, endemic as well as unknown species should be translocated.

1.3 Freshwater Crabs

Although *Mahata adonis* and *Oziothelpuza minneriensis* show fairly good distribution, recent taxonomic changes show that some isolated population of known species may be split into new species (Naggs and Bahir 2006). Hence it is important to translocate the aforementioned species.

2.0 Translocation methodology

All the translocation activities should be implemented according to the IUCN Species Survival Commission's – reintroduction guideline to prevent unnecessary hazards. A technical committee including Mahaweli Authority, DWLC, Forest Department, National Zoological Gardens, Veterinary faculty of University of Peradeniya, IUCN and Other Experts should be established.

Proposed translocation plan for selected faunal species

Species with Vernacular Name	Proposed area for collection	Proposed translocation area	Period for implementation
Puntius srilankensis Blotched filamented barb	Inundation area of Kambarawa river	Upper part of the Kambara river up to Illukkumbura	February to August 2008 and 2009
Puntius martenstyni Martenstyn's barb	Do	Do	February to August 2008 and 2009
Labeo fisheri Mountain labeo	Do	Do	February to August 2008 and 2009
Belontia signata Combtail	Do	Do	February to August 2008 and 2009
Schistura notostigma Banded mountain loach	Do	do	February to August 2008 and 2009
Species of family Bagridae	Inundation area of Amban and Kambarawa river	do	February to August 2008 and 2009
Species of Siluridae	do	do	February to August 2008 and 2009
Species of Heteropneustidae	do	do	February to August 2008 and 2009
All endemic amphibians including unknown species	Natural forests in Elagomuwa, Kambara, Thalagoda, Dam site	Immediate catchments	October to December to 2007,2008 and 2009
All endemic reptiles including unknown species	Natural forests in Elagomuwa, Kambara, Thalagoda, Dam site	Immediate catchment	October to December to 2007,2008 and 2009
Mahata adonis	Canals of Elagomuwa area	Canals of immediate catchment	February to August 2008 and 2009
Oziothelpuza minneriansis	Canals of Elagomuwa area	Canals of immediate catchment	February to August 2008 and 2009
All other unknown crab species	Canals of entire inundation area	Canals of immediate catchment	February to August 2008 and 2009

3.0 Species rescue programme for inundation period

Past experience shows that after construction of the dam, during the inundation period a large number of less mobile and small fauna species drown and get killed in water retention areas. In response to this an informal rescue programme was developed in the context of the Randenigala dam construction. It was implemented informal rescue program in Randenigala reservoir inundation period. (Ekanayake Pers.) Based on the previous rescue operations carried out by several institutions, the following steps are recommended for this rescue programme.

- Establish a technical committee (Mahaweli Authority, DWLC, Forest Department, and National Zoological Gardens, Veterinary faculty of University of Peradeniya, IUCN and Other Experts).

- Develop rescue plans through technical committees for rescue efforts. Such a plan could include the following:
    - Identification of priority areas and species for rescue
    - Identification of suitable areas for translocation
    - Identification of appropriate methodology for capture, transportation and release of the species to new sites.
- Identify working group for rescue program (DWLC, Mahaweli Authority, Forest department, University Students, NGOs, Volunteers)
- Commence the rescue programme concurrently with the reservoir inundation process. The reservoir should be filled gradually for providing adequate time to evacuate animal species such as large and medium size mammals and reptiles. This will also help in making the rescue programme a success.

4.0 Estimated budget

Species translocation program (2007 to 2009)– Rs. 500,000 per year
Rescue program – Rs. 500,000 in 2010

ANNEX 13 - RATIONALE AND SPECIFICATIONS FOR ESTABLISHMENT OF A FISH LADDER

When river continuum is interrupted and longitudinal connectivity is blocked by a barrier (dam), the barrier across the watercourse will obstruct the free movement of fish both upstream and downstream. As many of these movements are essential for the breeding of the species, this constraint may cause catastrophic falls in numbers, or complete absence of fish in areas where they were once abundant. (Cowx and Welcomme 1998)

Although the concept of construction of fish passage facilities is new, most environmentally sound dam constructions employ this facility to conserve fish species. (Cowx and Welcomme 1998)

Free movement of fresh water fishes of Amban River is already affected by Elehera anicut. We propose a fish ladder including a pass channel for the following reasons.

The present studies show that two freshwater fish species; *Puntius martenstyn*i and *Puntius srilankensis* restricted to Amban River and Kalu River in knuckles range and *Labeo fisheri* also seem to be restricted to this area. Furthermore current ongoing taxonomic work shows that many more new fish species including other aquatic faunal species may be recorded in the Amban River including Kabmara river systems. Proposed Moragahakanda dam and Kaluganga dam will severely affect the populations of the above three fish species and other important faunal species. The dams would lead to the fragmentation of population of the above three fish species into several subpopulations. Therefore we propose a by pass channel including fish ladder for the proposed Moragahakanda dam including Elehera anicut to facilitate free movement of the above three species including other indigenous freshwater fishes as well as other aquatic fauna.

Elehera anicut fish ladder

Total height of the anicut – approximately 6 metres

Fish ladder – should be 2 metres wide and approximately 30 metres long ladder to by pass the anicut (See figure below). The angle of the ladder should be less than 30^{o} and small resting pools also need 3 metre intervals.

Moragahakanda dam fish ladder and bypass channel

Fish ladder- should be 1m to 1.5m wide and approximately 300m long ladder to by pass the dam. The angle of the ladder should be less than 30^{o} and small resting pools also needs 3m intervals. (See figure below).

By pass channel – it should be constructed along the 200m contour line from upper reaches of fish ladder to upper margin of the reservoir where the Kambara River meets the reservoir to facilitate fishes in migrating to the Kambara River.

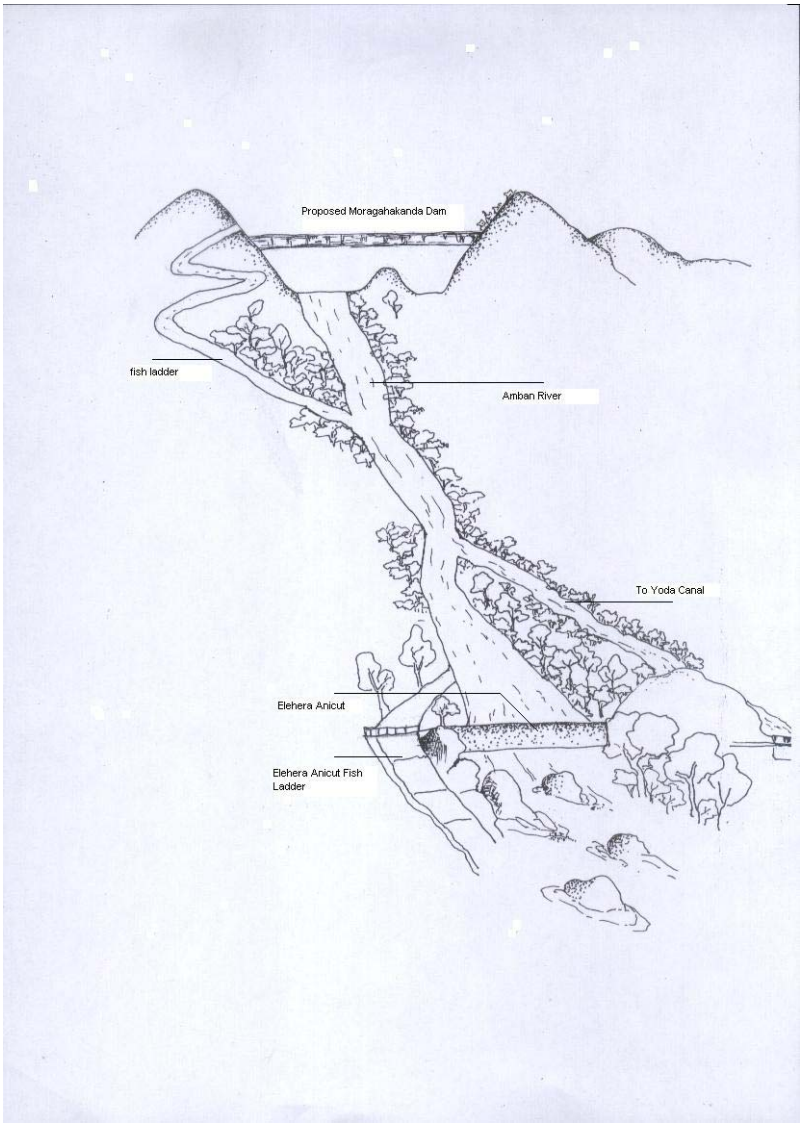


Figure: Moragahakanda dam fish ladder and bypass channel

ANNEX 14 – RAW DATA OF WATER QUALITY – MORAGAHAKANDA PROJECT AREA

Sampling Location	X-cord	Y-cord	F	T. Hard.	pH	TDS	EC	Tot. Alkalinity	SO4	Mg	Fe	Ca	Na	K
1	199088	270908	0.65	372	6.92	435.5	650	364.0	7	57.2	0.03	79.2	11.7	0.24
2	199091	270907	0.69	370	6.92	435.5	640	334.0	6		0.05	67.0	11.7	0.00
3	199109	270909	0.60	365	6.85	412.0	350	167.0	5		0.03	41.0	9.0	
4	198994	270957	0.52	206	6.86	210.0	345	175.0	6		0.06	42.0	8.7	
5	198790	271059	0.51	204	6.87	220.0	345	180.0	7		0.03	30.5	8.6	
6	198807	271118	0.56	207	6.87	220.0	330	176.0	6		0.02	27.0	8.4	
7	198751	271156	0.52	168	6.85	218.4	326	166.0	4	25.2	0.00	26.8	8.7	1.32
8	198755	271361	0.51	187	6.86	265.0	318	202.0	4		0.05	23.0	8.7	
9	198587	271480	0.53	165	6.85	260.0	328	167.0	6		0.07	22.0	11.0	
10	198157	272502	0.44	207	7.02	275.0	415	174.0	17		0.04	23.0	11.5	
11	198188	272548	0.43	208	7.03	275.4	411	173.6	16	31.4	0.06	24.1	11.5	0.54
12	197874	273885	0.68	214	6.42	263.3	393	160.4	15	36.9	0.02	22.8	9.6	0.63
13	193916	273890	0.62	214	6.40		476	142.0	23		0.02	35.0	9.8	
14	197721	274064	0.35	202	6.46	281.4	420	134.4	8	35.0	0.03	36.5	8.1	2.13
15	197045	274205	0.39	126	6.25	182.2	272	126.0	9	21.9	0.03	9.8	12.1	1.04
16	196816	274446	0.30	56	6.96	81.1	121	53.6	1	10.5	0.20	2.1	5.3	1.61
18	196645	274581	0.29	28	6.46	174.9	261	120.8	6	16.2	0.09	35.0	6.8	3.89
19	196019	274763	1.54	168	6.31	341.0	509	148.4	19	28.9	1.40	9.1	14.8	42.10
20	195869	274842	0.45	154	6.29	221.8	331	156.4	7	28.9	0.03	7.5	9.9	1.23
21	195908	274670	0.50	374	6.96	528.6	789	354.0	41	52.7	0.02	72.8	32.7	20.20
22	195933	274649	0.50	364	6.96	510.0	760	350.0	39		0.56	69.0	31.0	
23	195775	274500	0.48	310	7.00	330.0	504	355.0			0.52	65.0	30.0	
24	195752	274494	0.52	210	6.68	330.0	507	245.0	26		0.18	38.0	19.0	
25	195776	274536	0.62	211	6.68	265.0	472	246.0	25		0.07		19.0	
26	195705	274320	0.44	202	6.52	263.3	393	161.2	17	25.4	0.03	20.0	15.2	0.79
27	195640	274176	0.22	195	6.52	263.3	418	165.0	18		0.06	24.0	15.2	
28	195637	274108	0.23	165	6.52	263.3	420	170.0	17		0.06	23.0	19.0	
29	193031	272659	0.52	154	6.45	263.0	403	124.0	19		0.07	13.0	18.0	

30	192876	272303	0.38	128	6.69	211.3	316	107.2	14	20.4	0.13	12.6	17.0	0.57
31	192903	272233	0.38	130	6.68	211.7	318	109.0	14		0.13	10.0	27.0	
32	192792	272803	0.79	186	6.52	302.8	452	137.6	36	42.1	0.04	6.1	27.8	0.58
33	192509	272799	0.12	90	5.82	137.4	205	80.8	9	8.0	0.62	8.3	29.7	0.96
34	192427	272834	0.35	128	6.34	190.0	270	90.0	10		0.52	9.0	32.0	
35	192391	272909	0.34	132	6.45	178.0	260	75.0	11		0.52	11.0	31.0	
36	192283	272952	0.32	128	6.42	187.0		80.0	11		0.49	12.0	33.0	
37	190797	271810	0.49	154	6.47	268.0		90.0			0.08	14.0	31.0	
38	190853	271812	0.49	156	6.22	268.0	400	115.2	23	25.8	0.09	13.5	30.3	0.89
39	190749	271273	0.39	187	6.90	265.0	361	159.0	14		0.09	35.0	20.5	
40	190472	271719	0.31	197	7.41	246.0	362	182.0	3		0.04	58.0	14.0	
41	190477	271686	0.29	196	7.43	241.9	361	188.4	2	26.5	0.05	57.7	12.3	5.63
42	190362	271684	0.32	198	7.39	245.0	370	179.0	6		0.05	56.0	12.3	
43	189726	271281	0.39	380	7.05	336.0	510	289.0	4		0.05	65.0	9.0	
44	189614	271321	0.40	372	7.05	364.5	544	295.6	8	64.5	0.03	66.7	6.7	3.69
45	189553	270863	0.40	385	7.05	356.0	520	300.0	9		0.06	67.0	8.5	
46	190870	272051	0.20	118	6.33	202.3	302	122.0	7	10.4	0.43	16.6	8.7	14.50
47	191181	272605	0.32	156	6.45	240.0	365	134.0	17		0.32	23.0	19.0	
48	191129	273022	0.41	163	6.35	242.0	367	138.0	18		0.23	22.0	18.5	
49	191116	273535	0.39	179	6.56	262.0	380	152.0	17		0.25	27.0	20.5	
50	191085	273899	0.39	187	6.60	272.0	410	154.0	16		0.19	34.0	20.2	
51	191057	274559	0.45	224	6.54	332.0	480	165.0	14		0.17	39.0	22.0	
52	191276	275070	0.24	236	6.50	339.7	507	215.2	8	50.9	0.11	40.3	22.7	1.42
53	191214	275077	0.23	239	6.50	339.7	510	216.0	8		0.11	42.0	22.7	
54	197530	276709	0.23	348	7.48	383.2	580	193.6	3	62.3	0.05	48.7	12.2	1.18
55	197662	276687	0.24	310	7.48	410.0	575	185.0	4		0.05	45.0	12.2	
56	197787	276607	0.24	250	7.15	320.0	503	182.0	6		0.06	41.0	14.0	
57	197870	276549	0.36	334	6.95	312.0	438	177.0	6		0.05	36.0	15.0	
58	200565	278545	0.45	98	6.81	325.6	486	207.6	40	141.5	0.01	19.9	19.9	1.87
59	200709	278644	0.42	122	6.19	145.4	217	98.8	3	14.9	0.07	2.8	11.7	0.16
61	201338	279301	0.42	188	6.87	290.8	434	166.8	5	38.4	0.02	28.0	14.4	0.42
62	201273	279239	0.60	176	7.45	295.0	295	132.0	5		0.02	9.0	15.0	
63	201231	279308	0.59	162	7.37	191.6	286	135.2	4	12.7	0.04	8.7	17.6	2.98

64	198011	275942	0.20	114	6.45	177.5	265	113.2	4	20.0	0.07	29.4	21.0	2.47
65	197907	275837	0.37	148	6.29	201.7	301	133.6	3	27.4	0.04	18.4	26.7	2.29
66	197970	275822	0.34	249	6.25	202.0	340	135.0	5		0.04	14.0	26.7	
67	197884	275691	0.45	251	6.29	210.0	340	126.0	6		0.05	15.0	12.0	
68	197841	275636	0.49	302	6.63	229.1	342	144.8	19	28.8	0.02	14.3	11.0	2.50
69	197622	275329	0.49	280	6.65	220.0	320	150.0	17		0.02	15.0	13.0	
70	197251	275117	0.55	210	6.55	221.0	330	152.0	9		0.02	14.0	14.5	
71	196889	275062	0.48	134	6.29	201.7	301	131.2	10	24.1	0.01	4.6	12.7	0.43
72	196894	274950	0.80	215	6.45	210.0	315	134.0	8		0.02	8.0	12.7	
73	196835	275111	0.64	220	6.45	209.0	320	142.0	9		0.04	10.0	13.0	
74	196801	275085	0.84	160	6.76	203.0	315	152.0	8	31.4	0.00	6.7	13.5	2.82
75	196720	275104	0.75	160	6.68	226.0	310	156.0	9		0.02	9.0	13.5	
76	196359	275394	0.55	32	6.45	376.5	562	299.9	13	58.7	0.03	57.5	12.2	2.04
77	196199	275701	0.39	194	6.34	266.7	398	178.4	10	43.2	0.23	24.6	12.5	2.34
78	195640	276046	0.73	38	10.74	233.8	349	69.2	15	4.1	0.33	4.2	31.1	21.90
79	195562	276058	0.73	62	8.82	233.8	365		14		0.72	46.0	32.0	
80	195018	276186	0.90	262	6.72	364.5	544	251.6	17	40.3	0.80	48.3	28.4	1.40
81	195045	276323	0.72	179	6.65	325.0	365		16		0.52	9.0	28.0	
82	194979	276305	0.73	138	6.43	246.6	368	145.2	18	27.2	0.21	5.9	27.8	0.65
83	194480	276312		280	6.65	246.6	430	156.0	19		0.51	9.0	27.8	
84	193892	276234	0.26	310	6.87	276.0	412	203.2	20	24.3	0.31	55.8	10.3	2.76
85	193784	276013		285	6.86	310.0	430		26		0.30	63.0	13.0	
86	193705	275852		257	6.88	339.0	455		31		0.29	68.0		
87	193288	275489	0.64	244	6.82	471.0	703	307.2	47	51.7	0.08	77.0	27.2	2.02
88	193299	276053	0.24	296	6.85	510.0	709	244.0						
89	193382	276652	0.23		6.85		492	222.0	22	39.0	0.29	49.0		
90	193109	275506	0.65	243	6.87		656						32.0	
91	192733	274947		210	8.00		545	245.0	36	39.0	0.14	51.0		
92	191984	274889		215	6.80	320.0	495	210.0	18	41.0	0.15	39.0		
93	190696	276145	0.22	210	6.88	329.0	490	204.0	18	42.0	0.20	38.0	22.0	3.00

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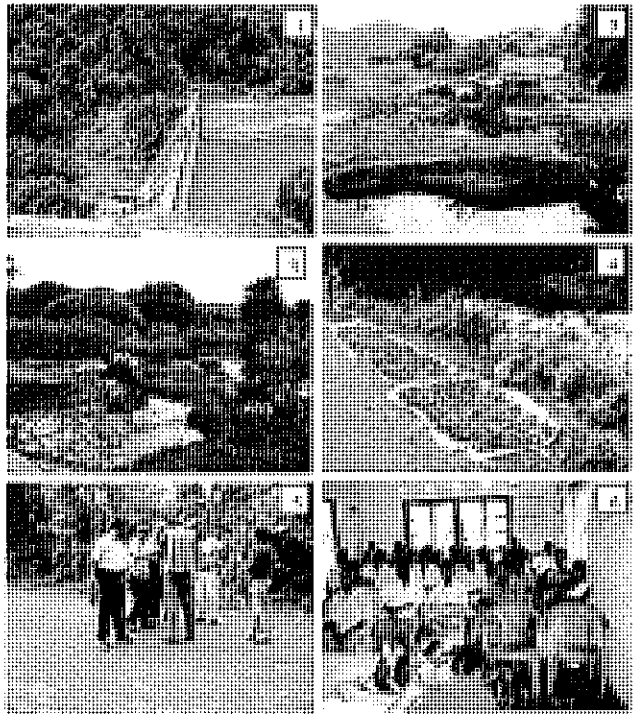
MINISTRY OF MAHAWELI DEVELOPMENT

MAHAWELI AUTHORITY OF SRI LANKA

Final Report (Volume 1 & 2)

Moragahakanda Agricultural Development Project

Comprehensive Watershed Protection Management Plan and Mitigatory Plan



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Cover photographs

By

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1. Nalanda reservoir - dam
2. Brick manufacturing activity at Diyawara Gammana, - Bowatenna upstream
3. Degraded shore of Bowatenna reservoir
4. Mica washing place at dagavilla closer to Amban Ganga
5 Field Discussion closer to Amban ganga at Dagavilla
6 Discussion with villages at Kongahawela

Final Report
(Volume One)

Moragahakanda Agricultural Development Project- Comprehensive Watershed Protection Management Plan

Submitted to
Mahaweli Authority of Sri Lanka

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ABREVATIONS

Accelerated Mahaweli Develoment Program	AMDP
Comprehensive Watershed Management Plan	CWMP
Elahera-Minneriya Yoda Ela	EMYE
Environmental Impact Assessment	EIA
Full Supply Level	FSL
Government Of Sri Lanka	GOSL
Implementing Agencies	IA
Mahaweli Authority of Sri Lanka	MASL
Mahaweli Development Programme	MDP
Man Elephant Conflict	MEC
Mitigatory Plan	MP
Moragahakanda Agricultural Developmental Project	MADP
National Water Supply and Drainage Board	NWSDB
North Central Province	NCP
Participatory Rural Appraisal	PRA
Polgolla Diversion Project	PDP
Project Implementation Team	PIT
Project Management Office	PMO
Project Monitoring & Evaluation	PME
Protected Area	PA
Rural Watershed Committees	RWC
Rural Watershed Committees	RWC
Strictly Protected Area	SPA
Technical Evaluation Committee	TEC
United States Operation Mission	USOM
Village Watershed Management Society	VWMS
Watershed Management Unit	WMU
Watershed Protection Management Plan	WPMP
World Bank Aid	WBA

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Executive summary

VOLUME 1 – COMPREHENSIVE WATERSHED MANAGEMENT PLAN

The Moragahakanda project

The proposed Moragahakanda Development Project comprises a dam and appurtenant works, including a hydropower station. Proposed dam site is located on the Amban Ganga; a major tributary of the Mahaweli Ganga, about 190 km north-east of Colombo, about 2 km upstream of the ancient Elahera anicut, which feeds the Elahera-Minneriya Yoda Ela (EMYE) canal, and about 20 km downstream of Bowatenna dam and power plant.

The study area

The study area of the present consultancy assignment consist of catchments of three reservoirs namely Nalanda reservoir, Bowatenna reservoir & the proposed Moragahakanda reservoir & proposed settlement area at Medirigiriya. In this report it is expected to study impacts of the proposed project on the existing environment. Particularly due to catchment activities within proposed Moragahakanda reservoir the soil erosion may become a significant catchment issue in the future. Therefore it is expected to address this issue in the present report in detail.

Environmental clearance and approvals for the project

Ministry of Agriculture Development, the Project Approving Agency (PAA) of the Moragahakanda Agriculture Development Project issued a project approval letter with conditions in October 2001 and also issued an extension to the project approval with conditions in March 2006). The PAA has granted the above approval for the Moragahakanda Agricultural Development Project (MADP) based on the environmental studies carried out by TEAMS Consultants for MASL (TEAMS, October 1998) & the environment component in the Feasibility Study conducted by LAHMEYER (2001) with some conditions to be fulfilled. Conditions 4.1, 4.2 and 4.4 of the approval letter indicated the details regarding the preparation of comprehensive watershed protection and management plan and Conditions 5.1 to 5.7 indicated the details regarding preparation of detail mitigatory plan to mitigate Adverse Impacts. (Project area including resettlement plan).

The Objectives

The specific objectives of the present consultancy awarded to USJP were to prepare a Comprehensive Watershed Protection Management Plan (CWPMP) and a detail Mitigatory Plan (MP) for the mitigation of Adverse Impacts (Project Area including the settlement area). It is expected to fulfill the above requirement by addressing the conditions on which the approval was granted for the above project. The Volume one of this report; focuses on the comprehensive watershed protection Management Plan and following activities were conducted under the present consultancy:

(i) Formulating an Overall Watershed Protection Management Plan - Identify the components, the specific & individual activities including location, features, extent etc.
(ii) Developing an implementation plan for the above activities
(iii) Computing the cost estimate for each activity
(iv) Preparing a monitoring plan.
(v) Preparing a Mitigatory Plan focusing on mitigating adverse impacts of the above activities

The reports

Under the present consultancy two volumes were produced to meet the conditions mentioned in TOR to fulfill the requirements mentioned in section 1.2 above. The two volumes of the reports are:

1. Comprehensive watershed Management plan
2. Mitigatory action plan

In the preparation of the two volumes of the final report all the existing information on the project site and the study area were screened & major impacts were identified. The two reports were based on the major impacts & how to overcome or mitigate such impacts.

In the preparation of the reports a series of maps were prepared to indicate the location of the impacts & activities. The activities to mitigate the impacts were clearly discussed with the necessary cost estimates according to the TOR. For easy reference the activity chart, cost & time frames were presented in a tabulated form

The watershed management report consist of an overall literature survey for both study components in the form of a synopsis (as mentioned in TOR) to summarize the studies carried out by the previous workers. A photographic survey also was conducted in the study area in order to get the required information on landuse planning process & it was used in the landuse planning process.

The characteristics of the study area and catchment issues

The watershed consists of natural & manmade characteristics. The natural form of the catchment could be changed through human interventions. However the anthropogenic activities could cause environmentally sensitive changes such as soil erosion, pollution of stagnant & running water resources of the watershed. Therefore in order to develop comprehensive watershed management plan, the existing natural characteristics of the watershed should be taken in to account in order to use such information together with different landuse activities to develop comprehensive watershed management plan in an integrated manner.

Catchment characteristics

The elevation of the Moragahakanda catchment varies approximately from 200 msl to 1600 msl, the higher elevation being in the Knucles range. However, the majority of the catchment (nearly 70%) is falling within the elevation range of 200 – 600 msl. Higher variability of elevation has made the catchment highly diverse in its floristic composition.

The slope of the catchment is an essential piece of information for conservation planning. Thus, slope map for the catchment area was derived and reclassified into 7 classes to facilitate conservation planning. However, nearly 65 % of the catchment area is under 30 % slope, hence there is a potential of using the catchment for agricultural activities provided with adequate soil conservation. Nearly 19% of the catchment is within 30 – 60 % while the rest is above 60%.

The spatial distribution of mean annual rainfall over the catchment area varies between 1500 mm to 3500mm. Approximately 50% of the land area of the catchment receives rainfalls of less than 2000 mm per annum. The higher rainfall area coincides with relatively higher elevation range. However, the amount of rainfall is not well distributed over the year and in most of the areas the temporal rainfall variation shows less prominent bimodal distribution pattern.

The soils of Sri Lanka have been classified at great group level for the whole country and series level for some parts. The mapping has been done mainly at great group level. Fourteen great soil groups have been described. Soil map for the catchment area which was extracted from the generalized soil map of Sri Lanka illustrates the major soil groups which are falling in the catchment area and in the proposed settlement area.

The general trend of rock strata of the project site is South to North with minor variations due to geological structures. In contrast, Marble beds are intruded to / interlayered with host rock Garnet Biotite gneiss, which is associated with a major shear zone. There are number of shear zones, faults, folds and lineaments recognizable in the regional scale published geological maps. However in the field it was hard to recognize the boundaries of such features.

Presence of pegmatite, mineral deposits (iron ore, feldspar, vein quartz, phlogopite (mica), fluorite, and iron with copper, Topaz deposits) indicate some pre-historic tectonic activities associated in the area. The boundary of Vijayan complex and Highland complex is close to the western and North western side to the project area.

It was observed that, especially along Sudu Ganga, more marble beds are associated with a shear zone. Underground solution caverns are rich in this area. Especially from Ukuwela to Nagolla, Bowathenna there were some ground subsidence and sink holes. With the fluctuation of groundwater levels of this area, such phenomenon can be expected. As a result of that, most of the houses in this region are severely cracked.

Major part of the catchment area lies within the intermediate zone while the higher elevations towards the central highlands fall within the mid country wet zone. The areas under the intermediate zone of the catchment consist of five ecological subzones (Agro-ecological regions of Sri Lanka, Natural Resources Management Centre, Department of Agriculture, 2003); namely IU1, IM3a, IM3b, IL2 and IL3 while the area falling into mid country wet zone, consist of only one ecological sub zone, namely the WM3b.

In Moragahakanda catchment area the population and housing density will increase with the construction of the reservoir & the infrastructure development of the area. Improper waste disposal have caused water pollution of the reservoirs in many regions of the country. Therefore proper waste management practices are essential to protect

Moragahakanda reservoir from eutrophication & pollution & this aspect will be addressed in the watershed management plan..
The catchment of the Morgahakanda consist of several landuses such as forest, homesteads, poorly & moderately managed tea, coconut and other mixed trees, upland crops, scrubs, non-agricultural lands, grasslands, paddy and negligible extent of bare lands.

Soil erosion

Prioritization of erosion prone areas is a prerequisite for conservation planning. Therefore, spatial representation of soil erosion prone areas is an important management tool for watershed based conservation planning. Therefore, soil erosion hazard within the catchment areas was prepared using inputs such as existing landuse, rainfall amount & erosivity, soil erodibility and slope of the land mentioned above in section 1.5.1. The prepared map was field validated and corrected to represent a more realistic field situation. Three classes were identified based on susceptibility for soil erosion and map depicts the relative soil erosion hazard of the Moragahakanda catchment and it highlights the key areas for implementation of soil conservation programs. In addition it emphasizes the areas that can be considered for landuse changes.

Majority of High hazard class for land slides fall in to Tea cultivated lands. That may be basically due to negligence of maintaining tea lands in the recent past. Anyhow that has to be verified at the field. Majority of moderately hazard class fall into Forest plantation and majority of low hazard also fall in to Tea plantations. As the base data are in 1:50,000 scale, some generalization can be expected. These results were verified with the field visit.

Comprehensive Watershed management plan

The Watershed Development & Management is important as it is of nationally high priority at present. Gradual degradation have affected, irrigation systems, social & agricultural aspects in various ways. The construction of a large number of infrastructure, unsystematic farming activities and the occurrence of natural disasters have caused the deterioration of the limited precious natural resources such as water, soil, flora & fauna quantitatively and qualitatively.

Major Components

Preparation of an Overall Watershed protection Management Plan for Moragahakanda includes the following activities;

(i) To demarcate 100 m reservation (sensitive area/ buffer zone) from the Full Supply Level (FSL) of the reservoir and implement a forest conservation program.
(ii) To develop a process to declare the watershed boundary of the Moragahakanda reservoir.
(iii) To establish conservation measures to minimize soil erosion including reforestation, crop diversification, engineering works etc.
(iv) To establish nurseries to grow plants (timber, fruits and medicinal verities) in the barren lands and homesteads in the watershed area.

(v) To establish mechanism for tree plantation program along stream embankments, river banks, road reservations to improve aesthetic and environmental conditions.

(vi) Preserve the currently available forest cover in the watershed and formulate a program to plant a forest cover in barren land.

The forest cover & conservation activities

The watershed of Moragahakanda reservoir and its command area are situated in the floristic regions twelve, three and two- Knuckles, northern and intermediate lowlands and the dry lowlands, respectively. Agroecologically this area belong to the intermediate lowlands, midlands and uplands and the dry lowlands. Two major natural vegetation formations in the proposed project area are moist monsoon forest and the dry-mixed evergreen forests. Moist monsoon forests are found in the project area lies in the intermediate zone (Matale district) having annual rainfall 1400-2000 mm and dry season of three to six months. This forest formation is characterized by canopy tree species such as *Chloroxylon swietenia* (Burutha), *Berrya cordifolia* (Halmilla), *Vitex altissima* (Milla), *Schleichera oleoso* (Kon) and Syzygium *cumini* (Damba). The proportion of species such as *Haldina cordifolia* (Kolon) *Holoptelia integrifolia* (Godakirilla) *Berrya cordifolioa* (Halmilla) *Mitragyna parvifolia* (Helamba), *Madhuca longifolia* (Mee), *Mangifera zeylanica* (Etamba), *Filicium decipiens* (Pihimbiya), *Phyllanthus* (Karaw) and *Alseodaphne semecarpifalia* (Wewarana), increases in moist places whereas near the water courses there exists a riparian vegetation comprising *Terminalia arjuna* (Kumbuk), *Hydnocarpus* (Makulla), *Myristica dactyloides* (Malaboda) etc.

The downstream area of the proposed project lies mainly in Polonnaruwa district and the natural forest type found in the region is dry-mixed evergreen forest which is the typical dry zone forest dominated by species such as Palu (*Manilkara hexandra*), Wira (*Drypetes sepiaria*, and Burutha (*Chloroxylon swietenia*). The canopy consists of trees such as – *Manilkara* (Palu), *Drypetes* (Wira), *Chloroxylon* (Burutha), *Alseodaphne* (Wewarana), *Berrya* (Halmilla), and *Diospyros* (Kaluwara). *Drypetes* (Wira) forms the sub-canopy of these forests.

The dense forest cover in the catchment should be preserved by the managing agencies, Forest Department or Wildlife Department, to avoid further degradation of the habitats so that these areas would act as wildlife refuge and conservation area for all micro habitats which are required by both fauna and flora. Savanna, scrubland and grasslands are also natural vegetation formations of the area.

Riverine vegetation & fire breaks

The typical riverine vegetation is found on the banks of Amban ganga, Sudu ganga, Kambarawa ganga and other rivers and also small streams in Moragahakanda catchment. The most common tree species found on the river banks are *Terminalia arjuna* (Kumbuk) *Mangifera zeylanica* (Etamba) *Polyalthia longifolia* (Owila), *Madhuca longifolia* (Mee), *Diospyros malabaricum* (Timbiri), *Nauclea orientalis* (Bakmi), *Pongamia pinnata* (Karanda), *Hydnocarpus venenata* (Makulla).

Fires spreading from nearby areas can be controlled to some extent by fire breaks. These are strips kept free of inflammable vegetation or planted with fire resistant plants (e.g.

Hemp, *Agave americana*). For maximum effectiveness, a width of 10 m or more is usually recommended. This is usually done by removing the top layer of vegetation. After a few years, maintenance can be done by way of cultivation, screening or herbicides. Fire resistant plants are those that do not ignite from a flame or other ignition sources.

Conservation of 100m sensitive area

Total sensitive area (100m area around the reservoir) is 5.8 km^2. This area needs to be surveyed and demarcated on the ground. To protect the area, concrete posts should be fixed at a distance of 50 m. It is proposed that 100 m strip from the full supply level of Moragahakande reservoir to be preserved as a reservation and kept under the natural vegetation cover.

It is also recommended that the areas within 100 m reservation that are under different successional stages e.g. scrublands with shrubs, not to be cleared for planting and allow the natural regeneration and succession to take place. However, enrichment planting could be done in the openings or gaps in the site.

Soil conservation

Soil management is the nucleus of the watershed development program. It involves soil restoration, soil improvement, measures to minimize soil degradation. Soil erosion is greatly affected by the amount of intensity of rainfall, topographic features, geological features, properties of soil, ground surface condition, vegetation condition etc

Soil conservation activities in a particular micro-watershed can be categorized as on-farm soil conservation and off-farm soil conservation. Ideally, off-farm conservation should initiate first, but most of the occasions practical difficulties arises mainly social factors. At the inception, it is somewhat difficult to organize and direct dwellers for a common purpose, but easier to start with activities related to their own farmlands. To overcome those difficulties, both on-farm and off-farm can be initiated simultaneously, and as the activities progresses decisions can be made.
Teak plantation is mostly preferred compared to other plantation species in the area and reforestation of government lands could be done under the participatory forestry programmes conducted by the Forest Department.

The methods for preventing water erosion include farming methods adopted by farm households themselves and Civil Engineering methods adopted in community participation.

Experience shows that villagers who have acquired secure tenure are ready to make long-term investments. Also, the villagers will help to protect and manage state forests when they have an incentive to do so. Forest management plans can be formulated jointly by the forest officers and the village representatives paying attention in both production and protection requirements.

Landuse planning

Field observations revealed that there are number of landuses which are managed in hazardous manner, such as cultivation of annual crops in steep lands, use of extra

amounts of pesticides, unsystematic extraction of soils near reservoir for brick making, cultivation of Cardamom in protected areas, uncontrolled felling of trees for timber and for firewood and gemming.. These activities are happening mainly due to lack of any other employment which is leading to poverty. Therefore, in an integrated approach of watershed management a planner must explore the means and ways either to reduce the pressure on land through introduction of other income generating activities, or to provide guidelines which will reduce the hazardous situations.

At present there are 525 families who live on cardamom cultivation in suburban villages without adequate income. However at present Cardamom cultivation is at a decreasing trend, thus restrictions should be continued. Frequent vigilance over the issue is a must. However, farmers who are involved in such cultivation should be introduced to other income generating ventures

Woodlots for firewood can be established to minimize the problem. Moreover, efficient burners which utilize lesser volumes of fuel-wood also can be introduced.

Sub watersheds

The area of the Moragahakanda watershed is 259 sq. km. The total number of Grama Niladari (GN) Divisions in the Moragahakanda watershed area is 40 which can be grouped into 8 sub watersheds for the convenience of planning process in this study.

The sub watersheds were identified based on the following factors;

(i) The total watershed area was categorized into four sub sectors - Inundation area, Lower Catchment area, Middle area and Upper Catchment Area

(ii) Then Sub Watersheds (SW) were identified based on their location, the hydrological & social factors. SW-1 is located in the inundation area. SW 2, 3 & 5 are located in the lower catchment and in the buffer zone. SW 4 & SW - 6 are located in middle catchment and SW-7 & SW-8 are located in upper catchment area.

Adoption of conservation techniques in a watershed could enhance the productivity and minimize the rate of watershed degradation. However, policy reforms, institutional adjustments, long term financing for watershed management, is required to encourage and sustain such enhanced productivity in the long run. In the watershed management planning process, it was focused on sub watershed units for convienience & efficiency.

Watershed Management Unit (WMU), structure & responsibilities

It is recommended to form a watershed management unit for Moragahakanda area at MASL office Naula under the River Basin Management Division.

The following are the main responsibilities of the unit;

(i) Study the existing policies and regulations and formulate concepts, strategies, policies and legislations for integrated watershed management activities.

(ii) Ensure coordination among agencies at central, middle and field level. Take leadership in coordination and implementation activities.

(iii) Resolve watershed management problems and issues at various levels on various aspects – technical, social, legal, financial, administrative etc.

(iv) Increase the capacity of line agencies including training and guiding activities.

VOLUME 2 : MITIGATORY ACTION PLAN

The Existing environment – Moragahakanda catchment

Floral diversity

The watershed of Moragahakande reservoir and its command area are situated in the floristic regions twelve, three and two- Knuckles, northern and intermediate lowlands and the dry lowlands, respectively. Agroecologically this area belong to the intermediate lowlands, midlands and uplands and the dry lowlands. Two major natural vegetation formations in the proposed project area are moist monsoon forest and the dry-mixed evergreen forests. **Table 5.1** illustrates the tree species found in Moragahakanada catchment area. Most of the forest patches in the project area is degraded due to the forest clearance for chena and vegetable cultivation.

The downstream area of the proposed project lies mainly in Polonnaruwa district and the natural forest type found in the region is dry-mixed evergreen forest which is the typical dry zone forest dominated by species such as Palu (Manilkara hexandra), Wira (Drypetes sepiaria, and Burutha (Chloroxylon swietenia).

There are narrow strips of tall forests found along the banks of Amban Ganga, Kambarawa ganga and other streams. *Terminalia arjuna* (Kumbuk) is the most common riverine species. Other species such as *Polyalthia longifolia*, *Madhuca langifolia*, *Diospyros malabaricum* (Timbiri), *Nauclea orientalis*, *Mangifera zeylanica* (Etamba), *Garcinia spicata*, *Diospyros ferrea*, *Homonoia riparia*, *Pongamia pinnata* (Karanda), *Hydnocarpus venenata* (Makulla), and *Vitex leucoxylon* (Nebada), are found in these forests.

Tree savanna or Damana grassland dominated by grass cover and scattered trees is characteristic vegetation formation found in south-east of Moragahakanda upper catchment.

Faunal Diversity

Faunal diversity within the project area is fairly high. This is to be expected as project sites encompases undisturbed forest, scublands and reverine vegetation and abandoned chena land in the area. In addition this area fringe with Knuckles Conservation Area. Aquatic environment is home for a total of 16 fish species including six endemic fish 4 endangered species (Puntius bimaculatus (E), Puntius srilankensis, (E. Puntius martenstyn (E)and. Schistura notostigma (E). Reptilean fauna includes 13 species three endemic and three endangered species. Catotes varsicolor Catotes ceylonensis Hemidactylus spp Five species of Amphibians and 41 species of butterfly fauna can be encountered.. Birds found to be the most abundant vertebrate taxa within the area it provide home for at least 77 avifaunal species and wide array of mammal specie

The major threat coming to biodiversity from the reduction of these forest areas would be

from associated habitats for wildlife. The areas especially located in slopes that extend up to Knuckles Range is home for wide variety of species. The southern end of the project is more vulnerable as it links with Knuckles Conservation Area.
Protected areas

Apart from that, project area is surrounded by a number of important protected areas amely, Knuckles Conservation area, Wasgomuwa, Minneriya Giritale sanctuary and Elahara Sanctuary (Corridor). All these protected areas have been established with Environmental Impact targets and serves as habitats for displaced wildlife under the Accelarated Mahaweli Ganga Development Project. Some of these areas are likely to be effected due to the implementation of the present project. There are number of different categories of protected areas are located just adjacent to the project.
The water requirements

Lahmeyer report documented that the current and possible future needs for **irrigation** water in the Systems H, I/H, M/H, D1, D2 and G in the northern area of the country fed by diversions from the Amban Ganga at Bowatenna, Elahera and Angamedilla. These investigations showed that overall cropping intensity in these areas averages around 155%, varying significantly from year to year, depending upon the availability of water.

In addition to this annual variability, it was found that shortages in water supplies to Systems H, I/H and M/H. It was also noted that there was some potential scope for improvement in use of the currently available water through modification of planting schedules, increase in irrigation efficiencies and greater crop diversification.

At the stage of Lahmeyer (2001) study, it was considered to settle the displaced people from the inundating area of the proposed project & 41 families within the elephant corridore located at the northern part of the project site (**Fig 1.7**) at the proposed settlement area at Medirigiriya. At that initial stage about 756 displaced personal have given their consent to settle at Medirigiriya. However during the progress of this consultancy assignment this situation changed due to new circumstances in the Medirigiriya area as described below:

- Due to CRF problems at Medirigiriya
- Human elephant conflicts
- The proposed settlement location is closer to LTTE area & security problems in the area

GOSL & MASL considered these situations & now it is decided to settle the displaced inhabitants of the project site at Kaluganga left & right banks.

The flora at Medirigiriya area

The settlement areas in Medirigiriyia consist of scrublands, teak plantations, secondary forest near Etambe oya police post, Patalakotuwa, and Gemunupura area. Secondary forest and scrubland near teak plantation (225464 E, 332443 N, 51 m altitude) towards Ambagaswewa (227679 E, 332539 N) showed the typical dry zone species found in secondary forests such as Wira, Ehela, Boradaminya, Katupila, Seru, Keliya, Bolpana, Kuratiya, Maila, Burutha, Palu, Kon, Karamba, and in moist areas Helamba,

Dunumadala, Kolon, Lolu, Kohomba and Hulanhik. This forest patch extends towards Hurulu forest reserve. During the field visits it was revealed that some areas identified for resettlements of families, already occupied by people some years ago and they have constructed the permanent houses.

Wild life

Somawathi Extension National park was established under the accelerated Mahaweli Environmental Project to provide adequate home for displaced wildlife, especially for elephants and also to regulate the floor of the down stream areas. Thus present location at Medirigiriya North will have a tremendous impact on wildlife. It is evident that elephant problems are acute in the said area and it can aggravate the problem.

Kaluganga Left bank and right bank project have impacts on the areas of biodiversity especially on elaphnats. We take measures assuming that there is no severe impact on the region. However, these activities tend to increase the regional conflict and loss of biodiversity in many fold. All the migratory roots and other areas to have a free movement between Moragahakanda catchments and Wasgomuwa lie along the area car marked for Kalu ganga .This will have serious consequences on Wildlife.

Water issues

The proposed resettlement area is located within the water scarecity area predicted by IWMI (Anon 2000). They have no access to surface water during most period of the year & they depend on the ground water resources. Currently water supply to Pubudugama and Ambagasweva are mainly from ground water sources. **Possible water sources**

Some physical, chemical and microbiological water quality parameters were measured in some selected drinking water wells, tube wells and irrigation tanks. Tested chemical parameters of samples indicated that WHO water quality standards and faecal coliform numbers exceeded the WHO drinking water quality standardsTotal coliform number should be zero for WHO drinking water standard. Thus, it is conceivable that unsafe drinking- water is consumed by the inhabitant of the area..

CRF at Medirigiriya (2006)

It has been found that the sudden increasing tendency of renal diseases in the Medigiriya electorate during 2006 compare to 2003 and 2004. Forty three patients in 2004, 98 patients in 2005 and 322 patients in 2006 have been recorded (Medirigiriya base Hospital data 2006). **Fig. 7.6** illustrates the CRF patients in Medirigiriya.

The causative agent or reasons to increase the number of chronic renal failure patients are not well understood at present and there were no definitive causative factor but believed to be due to some form of toxin. In north central province also, the possible initial event could be a toxin mediated renal damage. At present there are no adequate studies to prove this hypothesis.

Impacts

Moragahakanda Agricultural Development Project activities will take away 29.5 km^2 of undeveloped, partially developed and developed lands and a few villages with agriculture, to inundation, infrastructure development and for other project related activities & settlement activities. During construction period the displaced villagers has to be settled in proposed settlement areas; in the left or right banks of Kaluganga as suggested by MASL. As a consequence there will be a concomitant loss of biodiversity of those areas and surrounding lands mainly on wildlife and their habitats creating impacts on the environment and the inhabitants.

The Mitigatory action plan

This report addresses selected impacts of the project to fulfill the requirement of the conditions laid down by the project approval letter as mentioned in TOR. Mitigatory activities for the following impacts will be discussed in the present report.

- Controlled felling in settlements areas.
- Small blocks of forests should be left unclear; this will help to maintain favorable microclimatic conditions in the area.
- Roadside, stream bank and avenue planting in the development areas. Suitable tree species will be planted in these areas to provide shade, improve aesthetic value and amelioration of the environment. Timber, fuel wood and fruit tree species will be planted in homesteads.
- Establishing both fuel wood plantations and conservation forest plantations near settlement.
- Establishment of bank conservation along the Elahera-Minneriya Canal wherever needed, using Bamboo spp. and other species suitable for the task.
- Water quality study in Medirigiriya – the proposed resettlement area

Reservoir. Main and Saddle Dams

- Establishment of a 100 m reservation around the perimeter of the reservoir and enrichment with plants found in the neighborhood;

- Establishment of a nursery for the supply of these plants;

- Resettlement of the 41 families in the proposed elephant corridor and dedication of this corridor to elephant migration. (In order to enrich this habitat which has already been used by humans to a certain extent, the following steps could be taken: planting of grass wherever necessary, eradication of weeds, especially invasive types,

- Enrichment of the habitats in the Wasgamuwa National Park and the Minneriya -Giritale Nature Reserve (should be enriched by way of following activities:
  - resettlement of encroachments where necessary and dedication of all other land to forest/wilderness,
  - rehabilitation of some abandoned reservoirs and other water courses,
  - eradication of invasive weeds,
  - planting of grass, i.e. *Panicum maximum*, etc., where necessary).

Activities to mitigate the effect of the project on the elephant population :

- Establishing of elephant corridor between Wasgamuwa, Minneriya, Giritale Nature Reserves Providing extensions to protected areas.
- measures to minimize adverse impacts on the elephant population by establishing elephant corridors and permanent extensions to protected areas.
- Suitable buffer zones will be set up in the peripheral area under protected areas development programme.
- Relocation of house-hold in the elephant corridor.
- A habitat enrichment programme.
- Declaration of the catchment of the Moragahakanda reservoir.
- The flow of the Amban ganga will be regulated to provide adequate water to maintain the ecological balances of the wetlands in down stream areas.

Habitat enrichment and a comprehensive protected area management system

(should be developed covering wild life reserves, buffer zones, forest reserves and elephant corridors in consultation with the Department of Wild Life Conservation and Department of Forestry).

Identification and declaration of wild life and forest reserves and protected areas (should be completed before the commencement of project activities.)

Downstream Areas (IUCN study)

- The downstream areas should be kept undisturbed as it is a good elephant country. Any development in this area should await a comprehensive study of biodiversity.
- The flow of Amban Ganga should be regulated to provide adequate water to maintain the ecological balance of the wetlands in downstream areas.
- Wherever the vegetation cover is not present adequately the stream bank planting programme proposed for the upper watershed catchment should be carried out.

Mitigatory measures for Soil conservation

Effectiveness of catchment management plan in terms soil erosion control of the Moragahakanda catchment should be studied from the very inception. This type of studies not only identifies the adequacy or inadequacy of the catchment management approach, but also helps to predict the rate of sedimentation of the reservoir, thus forecast storage losses.

Land use recommendations for Morgahakanda catchment were developed by considering long term sustainability of the land and water resources while providing optimum opportunities for the dwellers to utilize the land without degrading the resource potential. Land use options considered were cultivation of other field crops (annual cropping), paddy, tea, export crops, coconut, natural and plantation forestry, horticultural crops and fodder crops. On the other hand, non agricultural uses such as potential areas for urbanization, wild life and other reserves were also considered.

Chapter 1 - General Introduction

1.1 Moragahakanda project

1.1.1 Background

The Moragahakanda dam site was selected during an extensive irrigation and hydropower survey of the country in the mid-1960s (UNDP/FAO/ID, 1968). Then it was incorporated into a 30 year master plan of Mahaweli Development Programme (MDP). The UNDP/FAO/ID (1968) master plan envisaged a concrete gravity dam with incorporated spillway in the main river valley with two saddle dams, the first saddle dam being rock fill and the second earth fill.

Since the FAO/UNDP/ID (1968) survey a number of studies have been made regarding creation of a reservoir including JICA (1979 a & b), and JICA (1988). The last of the afore-mentioned studies, which was essentially an updating of the earlier JICA (1979a, b, c) study, recommended a 72 m high dam (and two saddle dams), forming a reservoir with a normal maximum operating level, or full supply level (FSL), of 195 m msl. The reservoir would inundate an area of around 29.5 km^2. A hydropower plant with 26 MW installed capacity, running as a base load plant, was also recommended.

In 1998 the Mahaweli Authority of Sri Lanka (MASL) issued a project proposal (MASL, 1998) in which it was proposed that a dam of 61 m height would be constructed, forming a reservoir with FSL 184 m msl and a corresponding inundated area of 28.5 km^2. A hydropower plant, similarly running in base load, was also proposed.

MASL subsequently commissioned TEAMS to carry out an Environmental Impact Assessment (EIA) of the configuration of the Project as proposed by MASL (TEAMS, 1998). MASL also commissioned Lahmeyer International to carry out a feasibility study of the Moragahakanda Development Project.(Lahmeyer 2001).

The results of the project optimization studies of Lahmeyer (2001) recommended the following (also see **Appendix 1.0**):

1. A 65 m high dam (and two smaller saddle dams) at Moragahakanda, forming a reservoir with FSL 185 m asl and area of 29.5 km^2;
2. A 20 MW base-load power plant, with a 132 kV transmission line to Habarana;
3. Either a second diversion tunnel from Bowatenna to Lenadora with 25 m^3/s capacity,
4. Accompanied by improvement of the Huruluwewa Feeder Canal or, alternatively, a 70 km canal, the Upper Elahera Canal, with discharge capacity 18 m^3/s extending from just downstream of the Moragahakanda dam to upstream of Huruluwewa and on the streams feeding Nachchaduwa; and
5. A branch extension of the upper left bank canal of the Kaudulla irrigation scheme in System D1 to accommodate around 1,000 families who would be displaced by the Project.

1.1.2 Final Dam configuration

The Technical Evaluation Committee (TEC) of MASL (meeting on 14th Nov. 2006), informed the present consultancy team regarding the decision of MASL to construct the dam according to the recommendation made by the Lahmeyer (2001) as follows (see **Appendix 1 a**):

1. A 65 m high dam (and two smaller saddle dams) at Moragahakanda, forming a reservoir with FSL 185 m asl and area of 29.5 km^2;
2. A 20 MW base-load power plant, with a 132 kV transmission line to Habarana;
3. The second diversion tunnel from Bowatenna to Lenadora with 25 m^3/s capacity accompanied by improvement of Huruluwewa feeder canal is considered.
4. Alternative 70km canal, the upper Elahera canal has not been considered.
5. Accordingly the reservoir outline has to be drawn taken into account that the reservoir High Flood Level (HFL) as 185.m asl & the surface area of 29.5m.
6. 100m area around the circumference of the reservoir has to be drawn accordingly.

Table 1 .1 summarizes the principle features of the proposed construction.

Table 1.1: The principle features of the proposed dam

1	Catchment area	768 km^2
2	Reservoir area	29.5 km^2
3	Gross storage capacity	500 MCM
4	Full supply level	185m (asl)
5	Maximum height of the dam	65 m
6	Surface area of the 100m sensitive area around the proposed reservoir	5.804 km^2

1.1.3 The proposed project site

The Moragahakanda Development Project comprises a dam and appurtenant works, possibly including a hydropower station, at a site some 190 km north-east of Colombo on the Amban Ganga, a major tributary of the Mahaweli Ganga, in the north-eastern part of Central Province close to the border with Eastern Province. This proposed dam site of the survey is located on the Amban Ganga (**Fig. 1.1**), which is a major tributary of the Mahaweli Ganga about 190 km north-east of Colombo, about 2 km upstream of the ancient Elahera anicut, which feeds the Elahera-Minneriya Yoda Ela (EMYE) canal, and about 20 km downstream of Bowatenna dam and power plant (**Fig. 1.2**).

1.1.4 The study area

Fig 1.3 illustrates the study area of the project. The study area consist of catchments of three reservoirs namely Nalanda reservoir, Bowatenna reservoir & the proposed Moragahakanda reservoir (**Fig 1.4**) & settlement area at Medirigiriya (**Fig 1.5 a & b**). It is expected to study impacts of the reservoir catchments on the existing reservoirs. Particularly due to catchment activities within proposed Moragahakanda reservoir the soil erosion may become a significant catchment issue in the future. The effect of settlement at Medirigiriya site also will be addressed.

1.2 Environmental clearance and approvals for the project

Ministry of Agriculture, Forestry, Food and Co-operative Development, the Project Approving Agency (PAA) of the Moragahakanda Agriculture Development Project issued a project approval letter (**Appendix 1.1**) with conditions in October 2001 and Ministry of Agriculture Development issued an extension to the project approval with conditions in March 2006 (**Appendix 1.2**). The PAA has granted the above approval for the MADP based on the environmental studies carried out by TEAMS Consultants for MASL (TEAMS, October 1998) & the environment component in the Feasibility Study conducted by LAHMEYER (2001) with some conditions to be fulfilled. (See **Appendix 1.1 & Appendix 1.2**) for environmental approval letter & the letter for the extension of the approval).Conditions 4.1, 4.2 and 4.4 of the approval letter indicated the details regarding the preparation of comprehensive watershed protection and management plan and Conditions 5.1 to 5.7 indicated the details regarding preparation of detail mitigatory plan to mitigate Adverse Impacts. (Project area including resettlement plan).

The comprehensive Upper Watershed Management Plan should include the individual activity programme, implementation programme, cost estimate and the monitoring plan.

The mitigatory plan for the mitigation of Adverse Impacts also should include mitigatory plan, individual activity programme, implementation programme, cost estimate and the monitoring programme. The individual activity programme should include the items to be carried out and the specific location of the activity.

1.3 Watershed Protection & management

1.3.1 The importance

The Watershed Development & Management is of nationally high priority at present since its gradual degradation has affected adversely the environment, irrigation systems, social & agricultural aspects in various ways. The construction of a large number of infrastructure, unsystematic farming activities and the occurrence of natural disasters have caused for the deterioration of the limited precious natural resources such as water, soil, flora & fauna quantitatively and qualitatively.

Deforestation, resulting in excessive soil erosion, is the major problem observed in analyzing this issue. Due to the removal of tree cover, the top organic soil layer is washed away with the run off of the rainwater, exposing the hard soil layer beneath. During heavy rainfall, the sediment laden water flush away in torrents from upper hilly regions and get deposited in lower regions and in stream embankments, reservoir beds etc. The fertile soil once washed away by rain never returns and it takes very many years the earth surface to be restored to its original position.

The gradual sedimentation of major reservoirs, which has caused to reduce its envisaged output significantly, is one of the crucial problems faced by the Mahaweli Authority of Sri Lanka (MASL) today. The news recently published in media "one third of the capacity of Rantambe reservoir has been reduced due to sedimentation, the penstock and the turbines of Rantambe has blocked with silt due to recent floods" gives warning and

alarming signal for the sustainability of the highly invested irrigation systems.

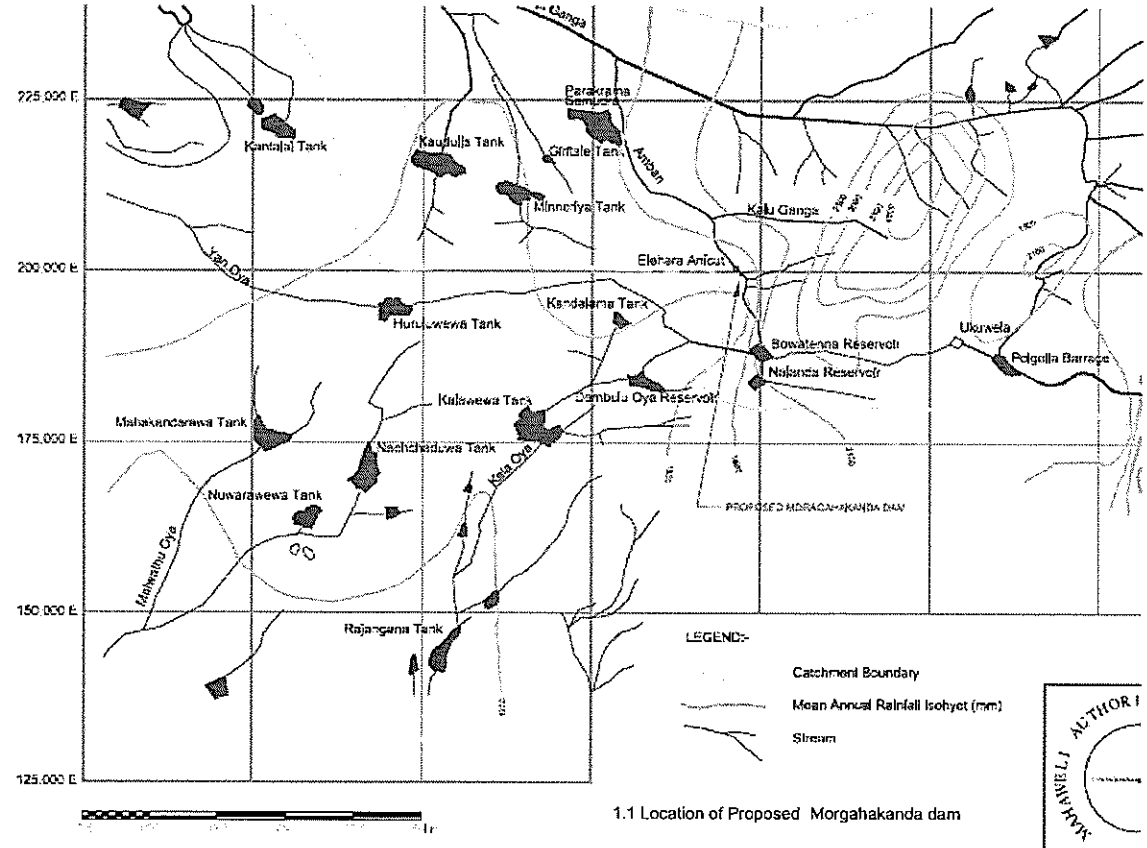
Hence, preparing & implementing a watershed protection & management plan for the Moragahakanda watershed is a timely and precautionary action which definitely will direct and guide for initiating development programs in other watersheds in the country as well.

1.3.2 Lessons from Previous projects

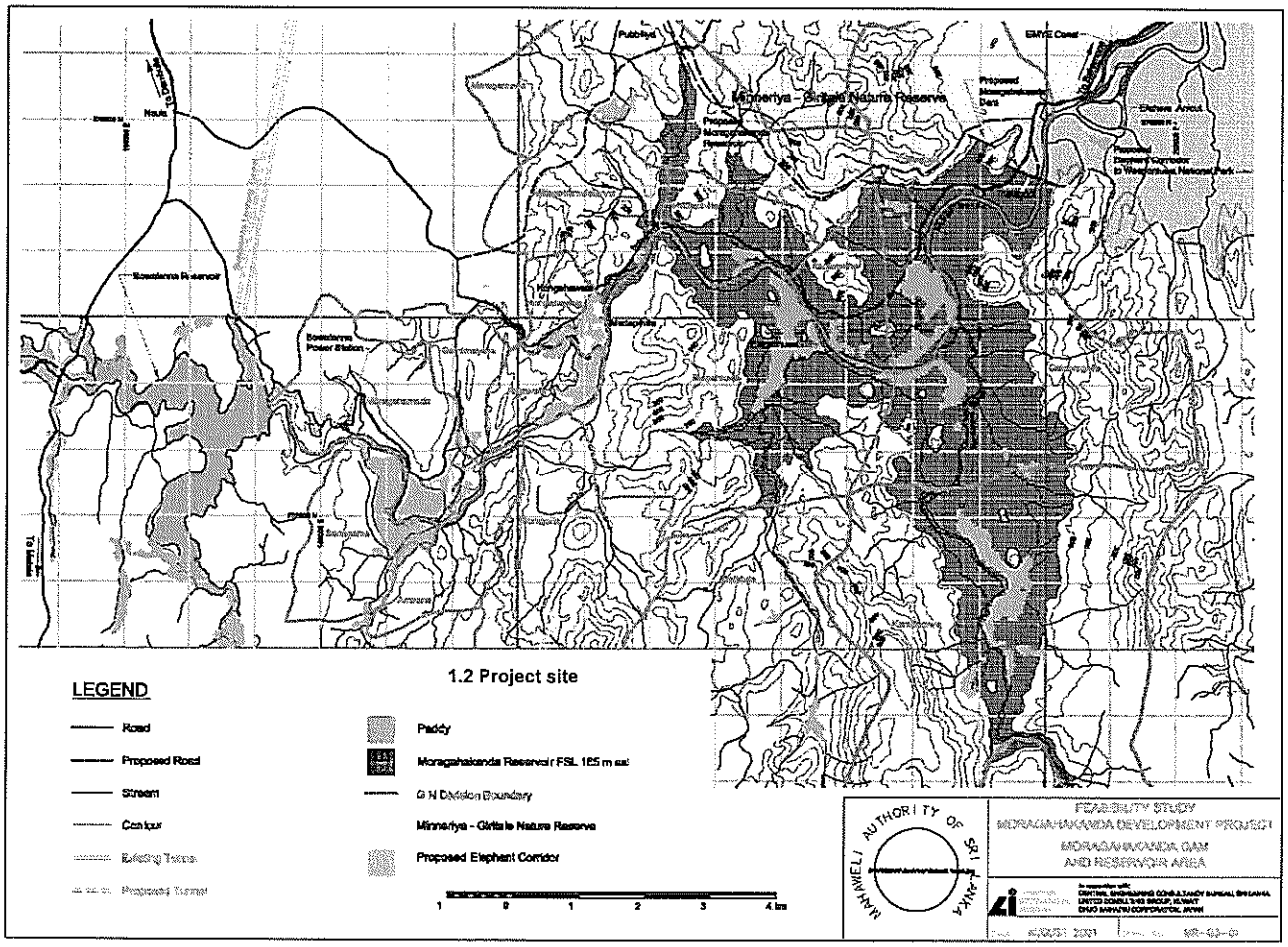
Several watershed development projects have been taken under different development programs launched by the government during the recent past. The Upper Watershed Development program is one of the major projects implemented from 1998 to 2005 with the financial assistance of the Asian Development Bank and the Government of Sri Lanka. The project aimed to address the problems in the watersheds of Uma Oya, Kirindi Oya, Walawe Ganga, and Kalu ganga in Nuwaraeliya, Badulla and Ratnapura districts (Watershed News, August 2001).

Following are the other projects implemented on Watershed (WS) development activities (Proceedings of the workshop on watershed management – 1997);

Project	Project Implemented Agency
(i) FAO WS Management Project (1975)	Department of Agriculture
(ii) Reforestation & WS Mgt Project (USAID 1990)	Forest Department
(iii) Upper Mahaweli WS Mgt Project (GTZ –1987)	MASL
(iv) Forest land Use mapping Project (1989)	MASL
(v) IRDP Projects	Related departments in the districts
(vi) Forestry Sector Development Project (1990)	Forest Department
(vi) Participatory Forestry Project (1993)	Forest Department
(vii) Shared Control Of Natural Resources Project (1992)	IIMI



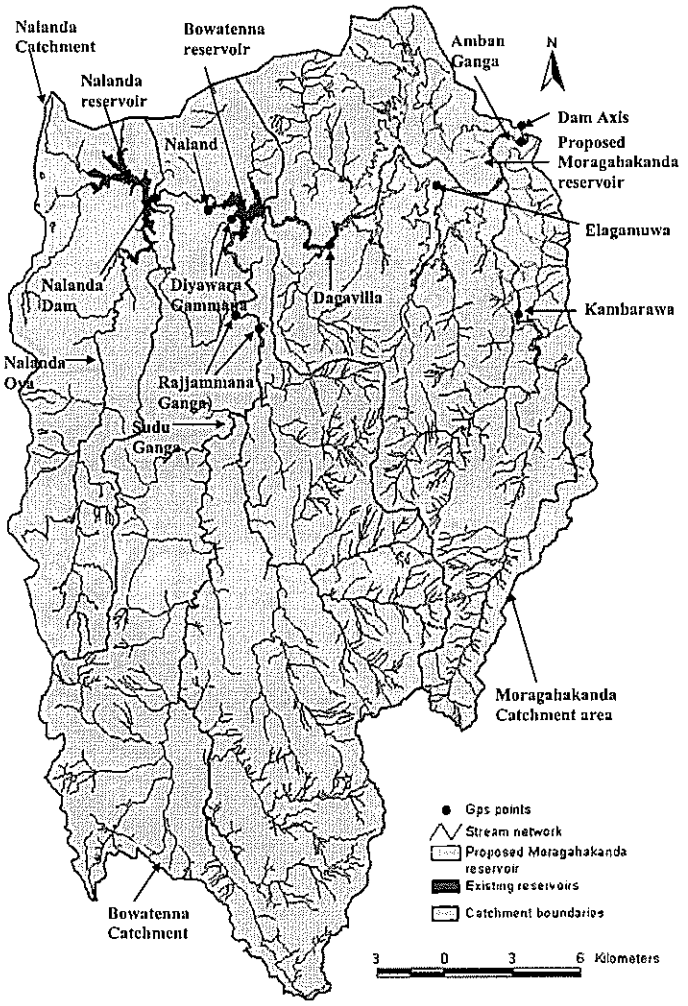
1.1 Location of Proposed Morgahakanda dam



1.2 Project site



USJ	MORAGAHAKANDA DEVELOPENT PROJECT
	Fig 1.3 Study Area of the project
	Comprehensive watershed Protection Management Plan



USJ	MORAGAHAKANDA OEVELOPENT PROJECT
	Fig 1.4 Moragahakanda catchment
	Comprehensive watershed Protection Management Plan

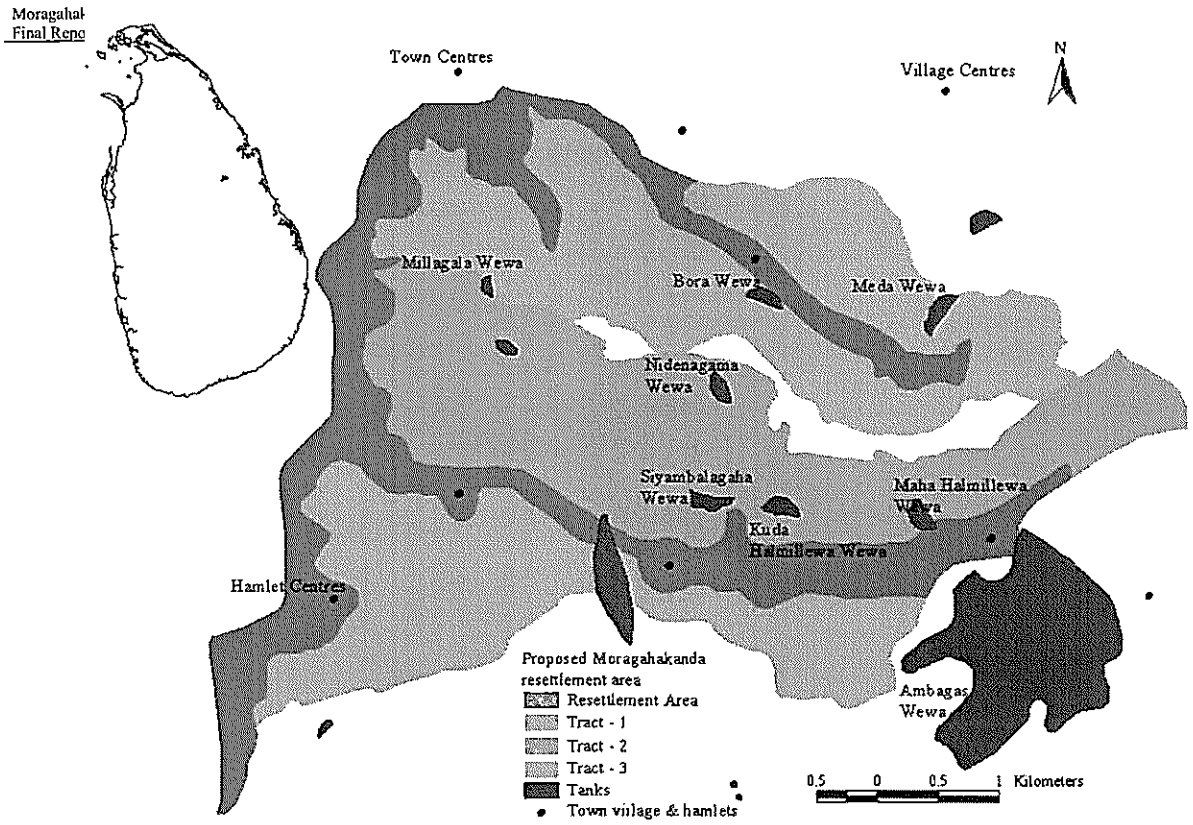


Fig.1.5 a Proposed settlement area in Medirigiriya for Moragahakanda development project (Source : Dam safety & reservoir conservation unit)

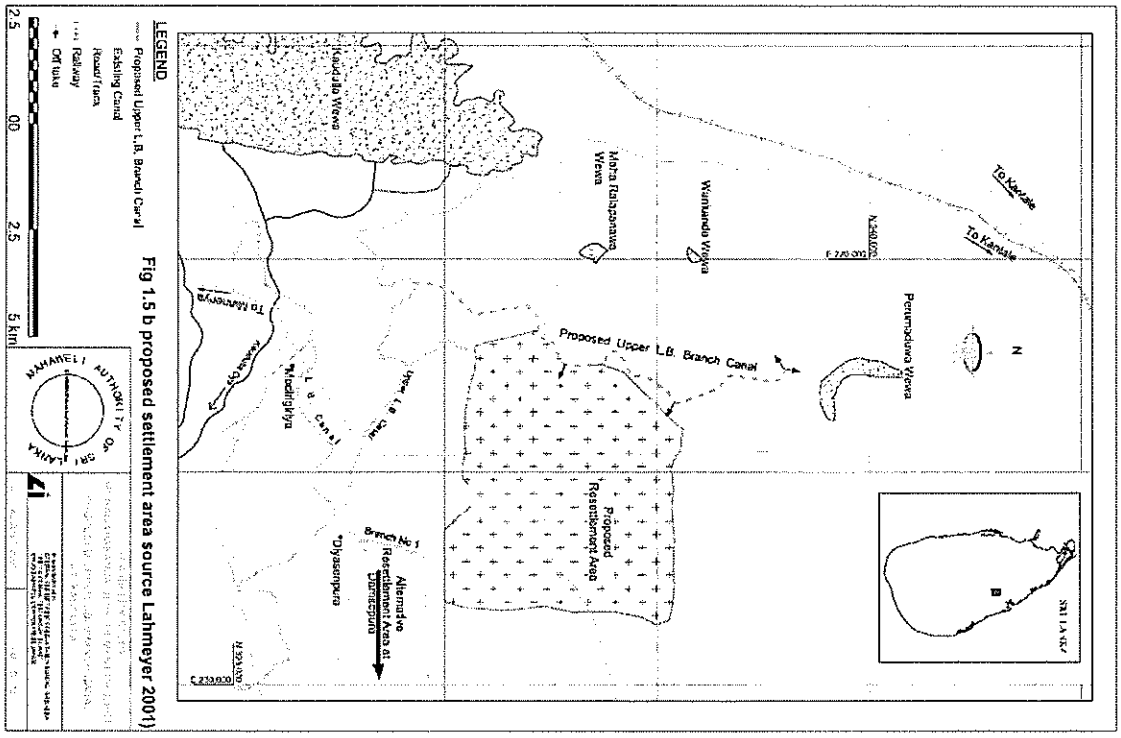


Fig 1.5 b proposed settlement area source Lahmeyer 2001)

1.3.3 Problems faced in implementing previous projects

(i) Lack of clear policy, inadequate rules, regulations, guidelines, and technical literature published focusing on watershed conservation.

(ii) Non availability of responsible leading agency for watershed conservation which has resulted in lack of coordination among relevant agencies

(iii) Inadequate interest & contribution from farmers & villagers on watershed management practices. They engaged in shifting cultivation and utilize ecologically marginal lands without practicing soil conservation techniques. They are reluctant to implement soil management practices mainly due to the following reasons.

- They don't see quick and tangible benefits e.g. tree planting program
- The villagers/ farmers do not observe immediate adverse effects e.g. soil erosion
- High investment for soil conservation activities e.g. additional labor for contour bund forming and maintenance.
- Encroachers, chena cultivators and landless villages do cultivation in leased lands and they are not interested in soil conservation practices or long-term sustainability other than getting higher yield during the season.

(iv) Some instances even though the technology is quite simple & low-cost, still it is neglected. So, it is necessity to enforce the soil conservation practices as a compulsory requirement in upland cultivation.

(v) Many watershed development programs have failed to achieve the anticipated results on account of faulty design of project activities, inappropriate management structure and inadequate technical skills of the project staff. Even in certain cases the progress is satisfactory but the sustainability has become a problem. So continuous process and responsible agency for operation and maintenance is needed.

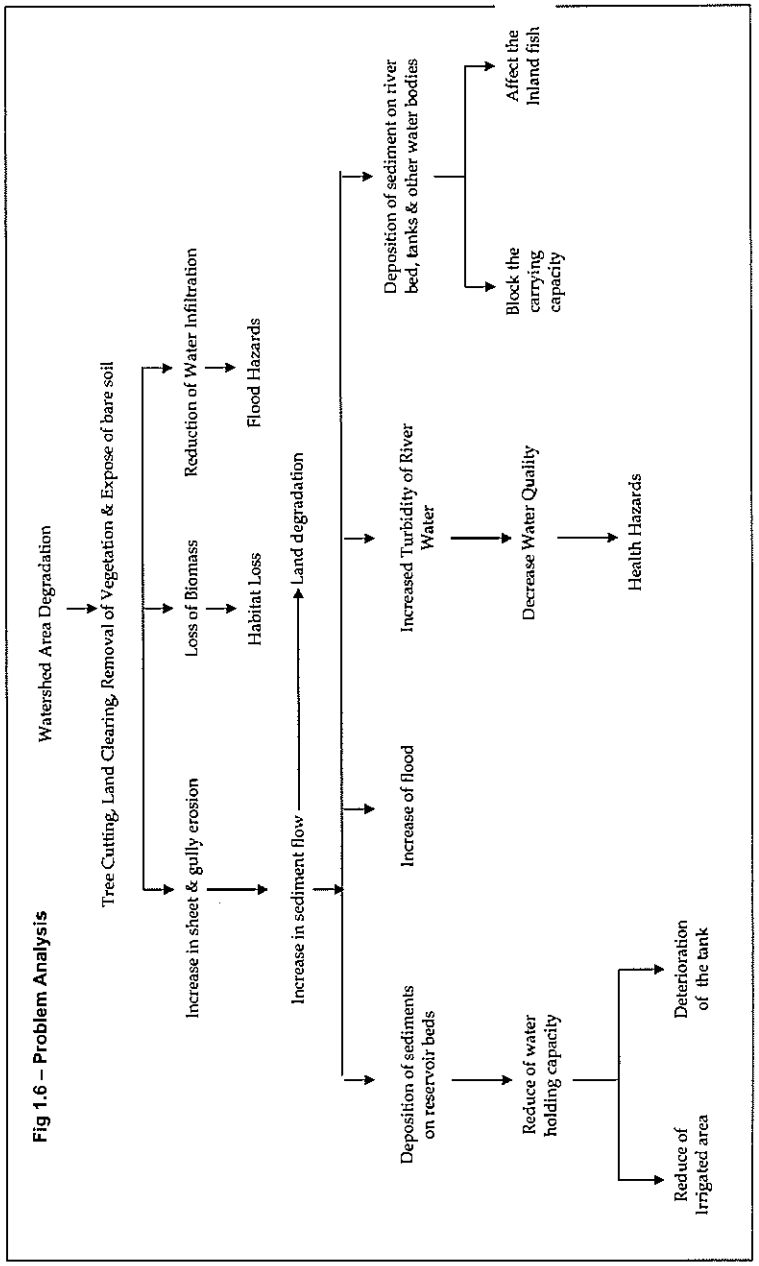


Fig 1.6 – Problem Analysis

1.3.4 Watershed Degradation – Problem Analysis

The major problems observed due to watershed degradation & the problem analysis is illustrated in **Fig 1.6.** It can be seen that many problems are initiated due to soil erosion.

1.3.5 Some of the Recommendations of the Past Projects for long-term solutions

1.3.5.1 Currently available Policy & Legal Frame work

The need for watershed development & conservation are stated under several Acts & Constitutions in the country. Some such regulations are given below;

(i) Mahaweli Authority of Sri Lanka, Act No 23 of 1979 – Section 12 (3)
- to take measures as may be necessary for watershed management and control of soil erosion;

(ii) National Forest Policy (1995)
- The national forest policy emphasizes the need for safe guarding the remaining natural forests for posterity order to conserve biodiversity, soil and waster resources. It also emphasizes the need for increasing the overall tree cover in the country.

(iii) National Land Use Policy – The conclusions of the Land Commission Report (1985)
- Present forest cover should be retained and establish forests where it is needed.
- The report suggest that there are several advantages in using river basin watershed as regional boundaries
- The report emphasizes the need for "integrated water shed management" and recommends the creation of watershed management authority to deal with watershed management issues.

(iv) **Legislations** – There are number of legislations in which there are some scattered provisions on disciplines related to watershed management (Bandaratilake, 1997) Some relevant legislations are;
- Land Development Ordinance (1953) –
  Under Section 227 - the reservation boundaries for natural streams, irrigation canals, reservoir's bunds and other sources are specified.
  Under Section 230 reservations for roads are specified.
  Under Section 231 – the process of eviction of illegal settlers are stated
- National Environment Act (1980)
- Soil Conservation Act No 25 of 1951 and subsequent amendments
- The Agrarian services Act in 1979 and subsequent amendments.

It can be stated that the legislations currently available are adequate to address the issues in the watershed management. But, the common problem in most of the agencies is ineffectiveness in enforcement. However, the necessity of enacting laws and order to conserve watershed areas is emerging and it is still not late to take immediate steps for sustainable development of critical watersheds.

1.3.5.2 The Factors that should be considered in formulating Watershed Development Plan

. The watershed development plan should consist of the following features;

(i) The program should be designed in holistic manner, on scientific base, focusing more on sustainability.
(ii) It should be an integrated program – the multidisciplinary development programs should be integrated to achieve common objective.
(iii) Common Policy – need to develop a common set of guidelines, establish rules, regulations, by-laws etc.

1.3.5.3 The Components of a Watershed protection management Plan ;

- **Participatory approaches in planning and implementation activities** – The watershed development plan should reflect the felt-needs of the community in the area in a holistic manner. So, improved planning techniques should be used for identifying problem areas, through participatory & integrated approach. The views of the community in the area should necessarily be obtained in planning stage and they should be directly involved in implementation stage. This will ensure successful implementation as well as long-term sustainability of the program.

- **Establishment of Project Implementation Team (PIT)** – The PIT is responsible for overall facilitation, coordination and supervision of the program. The role of the PIT includes organizing and training of community in the watershed area and motivates them to implement the project activities.

- **Linking the conservation & production** –The home garden development, private low lands and upland development and common lands such as buffer zone, stream embankments, road reservations etc are included in the watershed protection plan. Strengthening linkages between conservation measures and production/ livelihood system is a key feature of the program. Soil and water conservation measures must necessarily be followed by appropriate production system. Hence, by growing traditional plants (Jack, Mango, Coconut, Cashew, medicinal plants), the tree cover will be increased and useful for the livelihood of the community.

- **Development of forestlands** – These programs will be conducted in consultation with forest department. District Forest Officer is a member of the PIT. Natural forest and protected area will be developed where necessary.

- **Low cost Technology** – Simple, low cost technology will be used for construction of structures for easy operation and maintain. Also high degree of flexibility is needed in the choice of appropriate technologies and it should be based upon the location specific requirements. The conservation measures are implemented through the community in the area; they can earn additional income by engaging work.

- **Replication of successful projects** – The successful and suitable components of the previous watershed development programs are studied and replicated. It is proposed to show such successful projects to the community leaders, involved in planning and implementation of the project.

- **Convergence between watershed project and ongoing Production and Rural Development Projects** – Not all of the felt needs of the watershed community will be able to be financed through the proposed project. Advantage must be taken of the regular ongoing production program of the line departments – Agriculture, Agrarian development, Livestock, Forestry, Inland Fishery etc. Also the extension support through line departments' extension activities should be obtained for effective project implementation.

1.4 Present consultancy assignment

1.4.1 The Objectives

The specific objectives of the present consultancy awarded to USJP is to prepare a comprehensive watershed protection Management Plan and a detail mitigatory plan for the mitigation of Adverse Impacts (Project Area including the resettlement area). It is expected to fulfill the above requirement by addressing the conditions on which the approval was granted for the above project (**Appendix 1.1 & 1.2**). The volume I of the Final Report focuses on the comprehensive watershed protection Management Plan and following activities were conducted.

(i) Formulating an Overall Watershed Protection Management Plan - Identify the components, the specific & individual activities including location, features, extent etc.
(ii) Developing an implementation plan for the above activities
(iii) Computing the cost estimate for each activity
(iv) Preparing a monitoring plan.
(v) Preparing a Mitigatory Plan focusing on mitigating adverse impacts of the above activities

1.4.2 Major Components

1.4.2.1 Preparation of an Overall Watershed protection Management Plan focuses on the following activities;

(i) To demarcate 100 m reservation (sensitive area/ buffer zone) from the Full Supply Level (FSL) of the reservoir and implement a forest conservation program.
(ii) To develop a process to declare the watershed boundary of the Moragahakanda reservoir.
(iii) To establish conservation measures to minimize soil erosion including reforestation, crop diversification, and engineering works etc.

(iv) To establish nurseries to grow plants (timber, fruits and medicinal verities) in the barren lands and homesteads in the watershed area.
(v) To establish mechanism for tree plantation program along stream embankments, river banks, road reservations to improve aesthetic and environmental conditions.
(vi) Preserve the currently available forest cover in the watershed and formulate a program to plant a forest cover in barren land.

1.4.2.1.1 Other Related Individual Activities –

(i) To propose alternative income generating activities for cardamom cultivators in the Knuckles range.
(ii) To formulate strategies and methods to controlled timber felling in the settlement area.
(iii) To identify, establish and declare elephant corridor between Wasgamuwa, Minneriya, and Girtale National Parks.

1.4.2.1.2 Institutional Structure - To establish a Watershed Development & Conservation Unit to manage and coordinate watershed activities under the MASL & thereby develop an inter agency linkages to implement integrated work with other line agencies & NGOs.

1.4.2.2 Preparation of an Overall Mitigatory action plan

1.4.2.2.1 The importance

It is important to identify the impacts of this large scale project particularly due to following important components located within the project site & study area:

- The natural vegetation types in the affected area covering an area of approximately 5450 hectares. This includes natural plant communities in dense forests, sparse and open forests and grasslands. Natural forests in the reservoir area fall under the Moist Monsoon forest type which has a relatively high floral diversity when compared with natural forests found in the command area (TEAMS 1998).
- The forest habitats contribute to the largest proportion of wildlife habitats which includes both fauna & flora of the study area.
- The study area forms fairly good habitat for elephants containing considerable number of fodder species suitable for the animals..
- Study area forms a part of the elephant corridors, through which the elephants travel from Wasgomuwa to Minneriya Giritale Nature reserve (**Fig 1.7**).
- Areas such as Kambarawa, Elahara, Kiri oya, Pubbiliya, and Kongahawela Talagoda located adjacent to the elephant activity areas. These areas are identified as more sensitive areas for human elephant conflict
- Part of the Knuckles conservation area is also located within the study area



Fig 1.7 The study area & location of proposed elephant corridor marked in red dotted circle.

Volume two of this report addresses selected impacts of the project to fulfill the requirement of the conditions laid down by the project approval letter as mentioned in TOR. Mitigatory activities for the following impacts will be discussed in the volume two of this report.

- Controlled felling in settlements areas.
- Small blocks of forests should be left unclear; this will help to maintain favorable microclimatic conditions in the area.
- Roadside, stream bank and avenue planting in the development areas. Suitable tree species will be planted in these areas to provide shade, improve aesthetic value and amelioration of the environment. Timber, fuel wood and fruit tree species will be planted in homesteads.
- Establishing both fuel wood plantations and conservation forest plantations near settlement.
- Establishment of bank conservation along the Elahera-Minneriya Canal wherever needed, using Bamboo spp. and other species suitable for the task.
- Water quality issues in Medirigiriya – the proposed settlement area

1.4.2.2.2 Reservoir. Main and Saddle Dams

- Establishment of a 100 m reservation around the perimeter of the reservoir and enrichment with plants found in the neighborhood;
- Establishment of a nursery for the supply of these plants;
- Settlement of the 41 families in the proposed elephant corridor and dedication of this corridor to elephant migration. (In order to enrich this habitat which has already been used by humans to a certain extent, the following steps could be taken: planting of grass wherever necessary, eradication of weeds, especially invasive types,
- Enrichment of the habitats in the Wasgamuwa National Park and the Minneriya -Giritale Nature Reserve (should be enriched by way of following activities:

  - resettlement of encroachments where necessary and dedication of all other land to forest/wilderness,
  - rehabilitation of some abandoned reservoirs and other water courses,
  - eradication of invasive weeds,
  - planting of grass, i.e. Panicum maximum, etc., where necessary).

1.4.2.2.3 Activities to mitigate the effect of the project on the elephant population :

- Establishing of elephant corridor between Wasgamuwa, Minneriya - Giritale Nature Reserves Providing extensions to protected areas.
- Measures to minimize adverse impacts on the elephant population by establishing elephant corridors and permanent extensions to protected areas.
- Suitable buffer zones will be set up in the peripheral area under protected areas development programme.
- Relocation of house-hold in the elephant corridor.
- A habitat enrichment programme.
- Declaration of the catchment of the Moragahakanda reservoir.

- The flow of the Amban ganga will be regulated to provide adequate water to maintain the ecological balances of the wetlands in down stream areas.

1.4.2.2.4 Habitat enrichment and a comprehensive protected area management system

This should be developed covering wild life reserves, buffer zones, forest reserves and elephant corridors in consultation with the Department of Wild Life Conservation and Department of Forestry.

1.4.4.2.2.5 Identification and declaration of wild life and forest reserves and protected areas

This aspect will be discussed in detail to recommend possible implementation possibilities
1.4.4.2.2.6 Downstream Areas (IUCN study)

- The downstream areas should be kept undisturbed as it is a good elephant country. Any development in this area should await a comprehensive study of biodiversity.
- The flow of Amban Ganga should be regulated to provide adequate water to maintain the ecological balance of the wetlands in downstream areas.
- Wherever the vegetation cover is not present adequately the stream bank planting programme proposed for the upper watershed catchment should be carried out.

1.4.5 Mitigatory measures for Soil conservation

In the volume two of this report, the mitigatory measures for conservation of soil will be recommended.

1.4.6 Implementation programme, Monitoring programme and Cost estimate of the Mitigatory action paln

An implementation program for the mitigatory activities, monitoring program for the implementation of the activities and the cost estimate for the overall mechanism will be incorporated in the report.

1.4.7 Report

The final report consist of two components namely;

1. The Comprehensive watershed Management plan (Volume one) and
2. The Mitigatory action plan (Volume two)

In the preparation of these two volumes all the existing information on the project site and the study area were screened & major impacts were identified. The two volumes were based on the major impacts & how to overcome or mitigate such impacts. In the preparation of the report a series of maps were prepared to indicate the location of the impacts & activities. The activities to mitigate the impacts were clearly discussed with the necessary cost estimates according to the TOR (**Appendix 1.3**). The experts (**Appendix 1.4**) in different disciplines were involved in this assignment & contributions from all the experts were in cooperated.

Chapter 2- Literature Survey

2.1 The Mahaweli Development Programme

River Mahaweli is the longest, largest and the only perennial river traversing the dry zone of Sri Lanka and drains an area of 10448km^2. Irrigation department of Sri Lanka have collected hydrological data of the river over a long period & based on the data analysis, it was realized that utilization of Mahaweli river waters is an important task in upgrading irrigated agriculture in Sri Lanka.

As a result, Government of Sri Lanka (GOSL) initiated feasibility studies to seek the possibility of diverting river Mahaweli and from 1959 to 1962; United States Operation Mission (USOM) conducted a feasibility study on the diversion of river Mahaweli. However this study covered only a portion of the river basin.

In 1968 a Master Plan for the development of the Mahaweli basin was prepared by the UNDP/FAO (1968) and the Irrigation Department for the entire river basin which is termed as Mahaweli Development Program (MDP). This master plan envisaged construction of several dams cum hydro power plants as well as irrigation projects during a period of 30 years. This MDP was planned for the irrigation development of about 365,000 ha and hydro-power development of approximately 500 MW in capacity (Anon 1997). Based on the Master Plan the Government was proceeding with development of the Mahaweli Ganga basin since 1968 in order to fulfill the energy requirements of the country; the food for the expanding population and employment for the people..

The first phase of MDP was the Polgolla Diversion Project (PDP) which was commenced in 1970 & completed in 1978 with the World Bank Aid (WBA). In this PDP, Mahweli river was diverted at Polgolla and on the main Mahaweli River at Polgolla, a gated Barrage was constructed. A 7.9 km. long partly lined rock tunnel from Polgolla to Ukuwela and a hydro-electric power plant at Ukuwela (with an installed capacity of 38 Megawatts) also were constructed. This diversion provided water to Anuradhapura & Polonnaruwa (North Central Province).

As the second step a Dam across the Amban Ganga at Bowatenna was constructed. From Bowatenna a large proportion of water was diverted to develop new lands in the area named as System H. The Water diverted from Polgolla was transferred to Sudu Ganga which in turn fed the Amban Ganga utilizing the Mahaweli waters to develop agriculture & generation of hydro power. The existing reservoirs and canal systems also were enlarged and extended to provide water for cultivators, who were given 1 ha of land per family, to grow two crops annually. This Project was the beginning of a massive development programme to utilize the water of the Mahaweli Ganga for agriculture and generation of hydro-power (see **Fig. 2.1**).

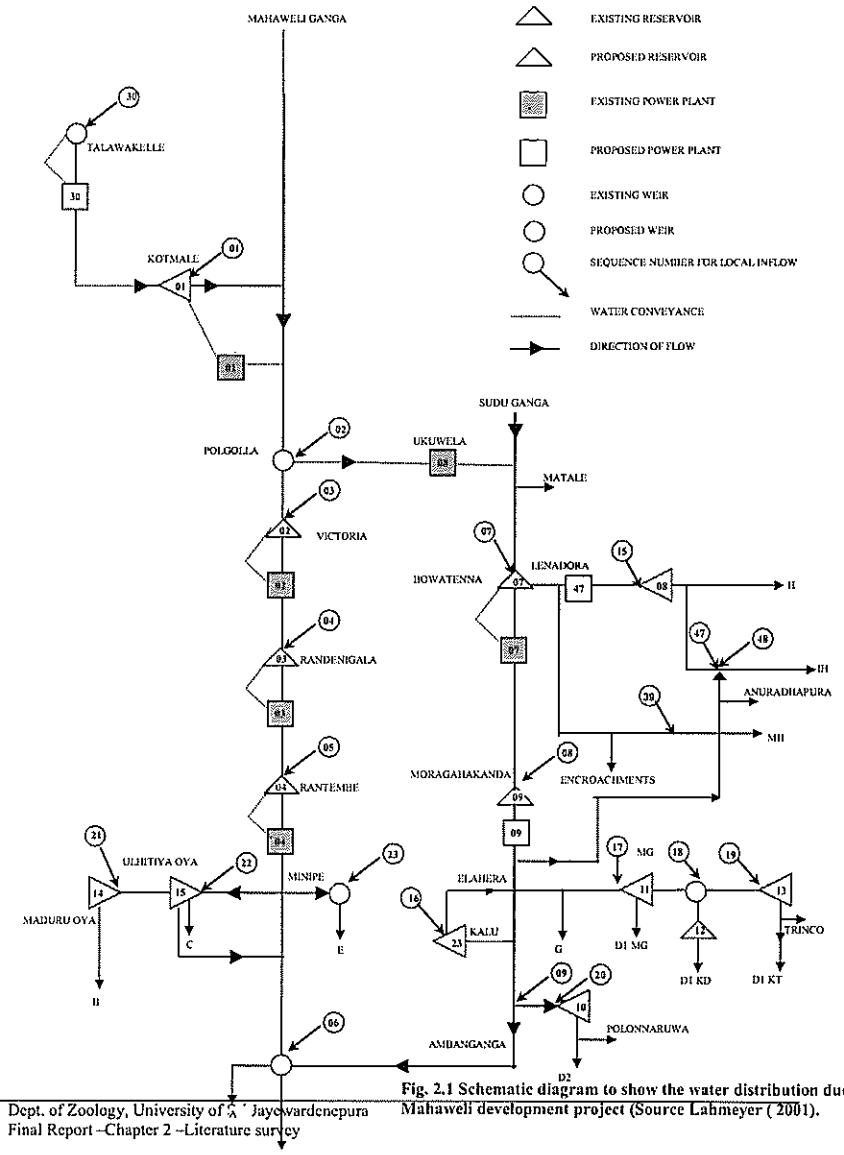


Fig. 2.1 Schematic diagram to show the water distribution due to Mahaweli development project (Source Lahmeyer (2001).

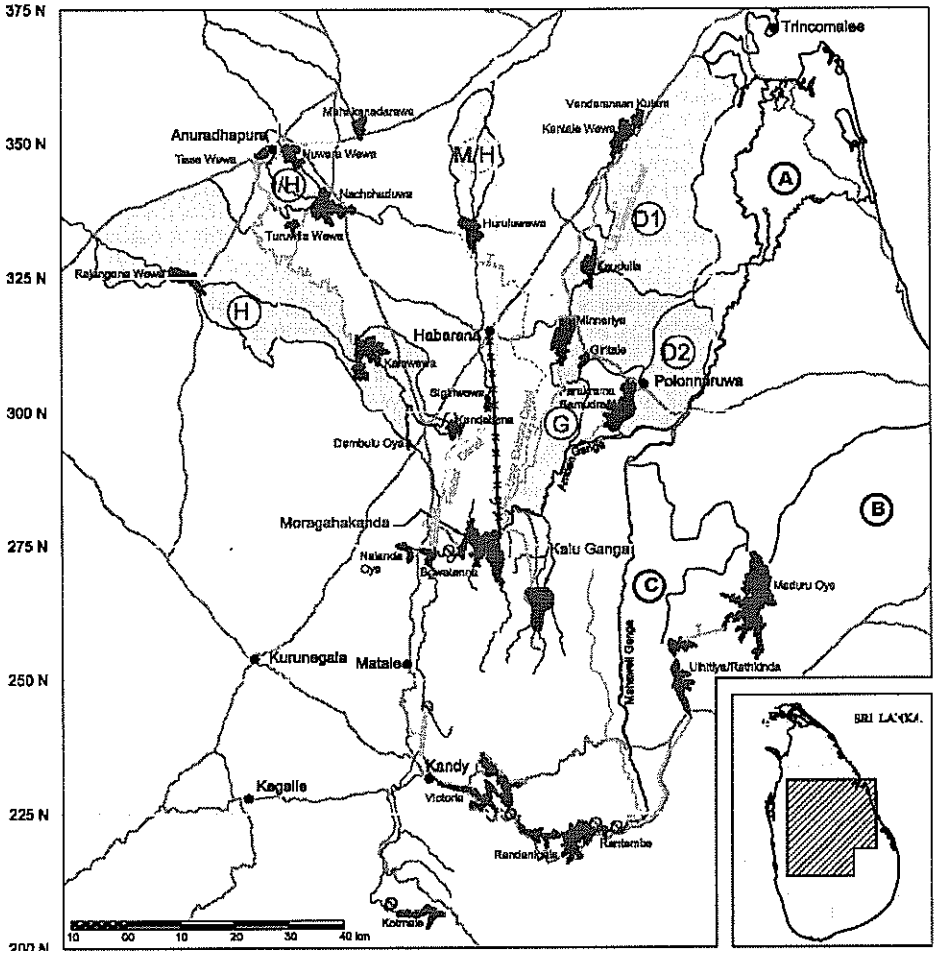


Fig.2.2: The irrigation systems via mahaweli water (Modified from Lahmeyer (2001)

2.1.2 The Accelerated Mahaweli Programme

In 1977, the MDP was considered as too slow to meet the demands of the country & GOSL revised the Master Plan to ensure accelerated development to yield benefits to the country. The revised plan was called Accelerated Mahaweli Development Program (AMDP) and it was aimed to (i) develop 8 irrigation systems from A& D, G, H, 1H and MH and (ii) develop hydro power through the construction of 5 dams; Kotmale, Victoria, Randenigala, Moragahakanda and Maduru Oya. The location of the irrigation systems are illustrated in Fig 2.2.

In order to increase power generation further, Victoria dam was constructed to an increased height. The result was curtailment of the normal diversion of water at Polgolla to 875 mcm per annum on the average. Under AMDP, several large areas were irrigated namely; Systems H, C, D ,G etc. However still there are several other systems to be developed.

2.1.2.1 Irrigation systems

Under AMDP 8 irrigation systems were developed as follows:.

System H is witbin the Kalawewa basin (see fig 2.2) & 21000 ba was being cultivated. With the diversion of Polgolla additional 25000 ha has been brought under cultivation. This area was taken as a model to develop other areas.

System C - The distribution of irrigation water for system C is from the Ulhitiya - Rathkinda reservoir which receives Mahaweli water diverted at Minipe through the Minipe right Bank Trans-basin Canal. The area designated as System C is a strip of land of about 10 km. width extending North from Minipe and Mahiyangane with the Mahaweli Ganga as its Western boundary and lies in the administrative districts of Badulla, Ampara and Polonnaruwa. An extent of 24,000 has been brought under cultivation during the period of 1982-1994. Two new towns were developed at Girandurukotte and Dehiattakandiya.

System B is the area developed below the Maduru Oya reservoir. Some development activities are proceeding on the Left Bank (extent of nearly 12,000ha has been completed). No developments in the right Bank due to security problems.

System G - In this are an old irrigation project was provided with additional water under the Polgolla diversion and an extra 3,500 ha has been brought under cultivation. The new area is adjacent to the previously cultivated areas.

Due to diversion at Polgolla, water for irrigation requirements was insufficient particularly in system H. The occasional breakdown of Ukuwela power station further aggravated this situation. The combined effects of these two caused water shortages in the area reducing the area cultivated. These shortages were acute in Systems H, IH and MH in the Anuradhapura District. **Table 2.1** indicates the area not cultivated in Anuradhapura district during the 10 year period from 1984 – 1994 under some reservoirs (Anon 2001).

Table 2.1: The area not cultivated in Anuradhapura district during the 10 year period from 1984 – 1994 under some reservoirs (Anon 2001)

Reservoir	Kandalama	Kalawewa	Dambulu Oya
Total Irrigable area	4,900 ha	24,000 ha	2160 ha
Water deficit areas in ha	2,100	11,800	586

2.1.2.2 Demand for water

The demand for water in the NCP has increased in recent times not only to meet the above mentioned irrigation deficits but also due to increased needs for industry and human consumption. The National Water Supply and Drainage Board (NWSDB) estimated that by year 2010, the demand for water for human consumption and industry in the greater Anuradhapura would be 15 mcm. There would be increased demands for water in Hingurakgoda, Polonnaruwa as well for both industry and human consumption at Trincomalee where large scale industrial expansion is anticipated (Lahmeyer 2001).

In order to conserve water for irrigation, steps were taken by the Mahaweli Authority to rehabilitate the canal system to reduce conveyance losses in Systems H and G (Elahera Scheme) and to adopt a very tight water management system. However even with such steps it could not solve the problem of water shortage and it was a necessity to increase the water supply to Anuradhapura district.

2.1.2.3 Moragahakanda proposal

In addition to the above water shortages, it was observed availability of excess water in the Amban Ganga which spills over at times over the Elahera Anicut (Weir) & the existing reservoirs were not enough to store this excess water. Therefore to meet the need of water requirements for consumption, irrigation & industry storage efficiency has to be increased & wastage has to be eliminated. Even before the Mahaweli Development Programme work commenced, there were many recommendations to construct Moragahakanda Reservoir, across the Amban Ganga to meet these needs.

As a result, the GOSL through the MASL decided to conduct a feasibility study to construct Moragahakanda reservoir to equitably serve the irrigation, hydro-power, industrial and domestic needs of the population of North Central Province and Trincomalee town in the Eastern Province. Through the initiation of GOSL Lahmeyer international Pvt Ltd, conducted a feasibility study in 2001 to fulfill this requirement (Lahmeyer 2001).

2.1.2.4 The work to be completed under Mahaweli Programme

At present major reservoirs recommended under the Mahaweli Master plan have been completed except the two reservoirs namely; the Moragahakanda and Kaluganga reservoirs across Ambanganga and Kaluganga respectively. With the construction of these two reservoirs it is expected to have more water for irrigation & generation of more hydro-

electricity.

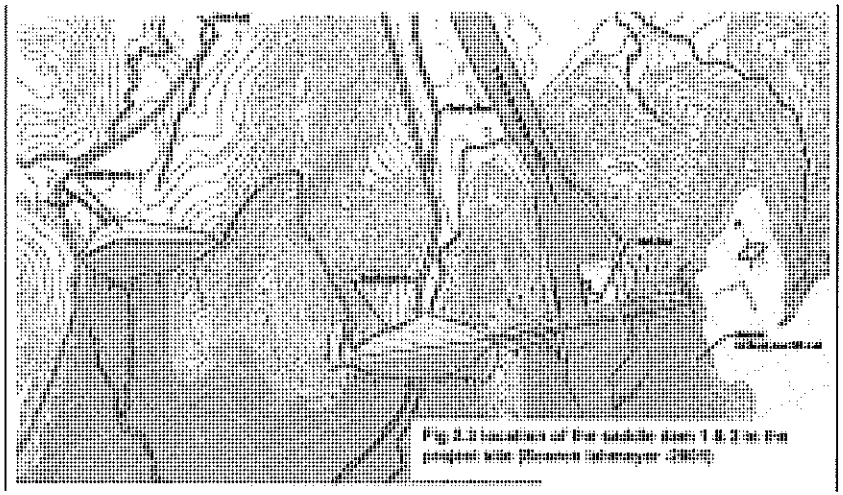
2.2 The Proposed Moragahakanda Project

2.2.1 Background

This proposed site of the survey is located on the Amban Ganga, which is a major tributary of the Mahaweli Ganga about 190 km north-east of Colombo, about 2 km upstream of the ancient Elahera anicut, which feeds the Elahera-Minneriya Yoda Ela (EMYE) canal, and about 20 km downstream of Bowatenna dam and power plant **Fig 1.1** illustrates the stream network closer to proposed dam site and **Fig 1.2** illustrates the project site. The Moragahakanda Development Project comprises a dam and appurtenant works, possibly including a hydropower station.

The Moragahakanda dam site was selected during an extensive irrigation and hydropower survey of the country in the mid-1960s (UNDP/FAO/ID, 1968). Then it was incorporated into a 30 year master plan of Mahaweli Development Programme (MDP).

The UNDP/FAO/ID master plan envisaged a concrete gravity dam with incorporated spillway in the main river valley with two saddle dams, the first saddle dam being rock fill and the second earth fill (**Fig. 2.3**).



Since the FAO/UNDP/ID (1968) survey a number of studies have been made in which the creation of a reservoir at that including JICA (1979) and JICA (1988). The last of the afore-

mentioned studies, which was essentially an updating of the earlier JICA (1979) study, recommended a 72 m high dam (and two saddle dams), forming a reservoir with a normal maximum operating level, or full supply level (FSL), of 195 m msl. The reservoir would inundate an area of around 39 km^2. A hydropower plant with 26 MW installed capacity, running as a base load plant, was also recommended.

In 1998 the Mahaweli Authority of Sri Lanka (MASL) issued a project proposal (MASL, 1998) in which it was proposed that a dam of 61 m height would be constructed, forming a reservoir with FSL 184 m msl and a corresponding inundated area of 28.5 km^2. A hydropower plant, similarly running in base load, was also proposed.

MASL subsequently commissioned TEAMS to carry out an Environmental Impact Assessment (EIA) of the configuration of the Project as proposed by MASL (TEAMS, 1998). MASL also commissioned Lahmeyer International to carry out a feasibility study of the Moragahakanda Development Project.(Lahmeyer 2001).

The results of the project optimization studies of Lahmeyer (2001) recommended a 65 m high dam (and two smaller saddle dams) at Moragahakanda, forming a reservoir with FSL 185 m msl and area, of 29.5 km^2 and a 20 MW base load power plant with 132 km transmission line to Habarana. **Table 2.2** summarizes the data for the proposed Moragahakanda Agricultural Developmental Project (MADP).

2.2.1.1 Recommendations on dam construction

In view of the positive findings of the economic analyses, it was recommended by the Lahmeyer (2001) that the Mahaweli Authority shall undertake the following immediate actions.

1. Detailed Design of Moragahakanda Dam and Second Bowatenna Tunnel or Upper Elahera Canal. The estimated time required for construction of the Moragahakanda and its appurtenant structures is 3.5 years (42 months). If the Project is to come on line in the year 2006, detailed design should be started soon.
2. It should be noted that the tentatively estimated time required for construction of the second Bowatenna tunnel is 4 years; a similar period of time would be required for the Upper Elahera Canal. It would therefore also be necessary to commence work soon on detailed design of whichever conveyance infrastructure is selected.
3. Extension of the Kaudulla LB Branch canal could be completed in a period of two years or less. Further engineering work on this component is therefore not immediately necessary and in any case would be best carried out after a detailed Resettlement Action Plan has been prepared.
4. Similarly, the upgrading and extension of the Huruluwewa Feeder Canal, which could probably be completed in about two years, need not be undertaken.

The decision of MASL is to construct Moragahakanda reservoir as follows:

1 To construct the dam according to the recommendation made by the Lahmeyer (2001).
2 The second diversion tunnel from Bowatenna to Lenadora with 25 m^3/s capacity accompanied by improvement of Huruluwewa feeder canal is considered and alternative 70km canal, the upper Elahera canal has not been considered.
3. Accordingly the reservoir outline has to be drawn taken into account that the reservoir High Flood Level (HFL) as 185.59 msl & 100m area around the circumference of the reservoir as the 100 m sensitive area.

Table 2.2. The key project data for the proposed Moragahakanda reservoir (Source - Lahmeyer International Final Report August 2001).

Project Feature	Unit	Value
Hydrology and Reservoir		
Full supply level	m asl	185.00
Maximum flood level	m as	185.59
Minimum operating level	m asl	155.00
Peak inflow 1:10,000 years return period	m^3/s	4,749
1: 1,000 years return period	m^3/s	3,797
Diversion discharge 1:20 years return period	m^3/s	2,255
Diversion discharge 1:10 years return period	m^3/s	1,974
Main Dam		
Dam type: RCC gravity dam with integrated spillway and bottom outlet		
Crest elevation	m asl	188.00
Crest width	m	8.00
Upstream slope	-	vertical
Downstream slope above level 170.50 m asl	-	1v : 0.10h
Downstream slope below level 170.50 m asl	-	1v : 0.75h
Crest length total including spillway.	m	463.00
Left side crest length	m	159.00
Right side crest length	m	246.50
Maximum height	m	65.00
Saddle Dam No.1		
Dam type: rockfill dam with central clay core		
Crest elevation	m asl	188.00
Crest width	m	8.00
Upstream slope	-	1v : 1.5h
Downstream slope	-	1v : 1.5h
Crest length total	m	361.00
Maximum height	m	42.00
Saddle dam No.2		
Dam type: homogeneous earthfill dam		
Crest elevation	m asl	188.00
Crest width	m	7.00
Upstream slope	-	1v : 3.0h
Downstream slope	-	1v : 2.5h
Crest length total	m	374.00
Maximum height	m	21.00

2.3 Components of the study area & issues

2.3.1 Knuckles region

Knuckles region is separated from the main central highlands by a deeply incised valley referred to as the 'Dumbara Valley'.of the Mahaweli river. There are at least 35 peaks rising above 900m. **Fig 2.4** illustrates the Knuckles region and its forest region covers an area of approximately 21000 ha, which lies in the Kandy and Matale Districts of central Sri Lanka.. According to Bambaradeniya & Ekanayake (2003) its catchment area contributes to about 30% of the water in Victoria, Randenigala and Rantambe reservoirs of the river Mahaweli.

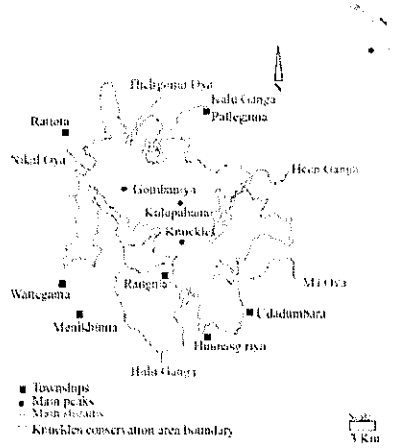


Fig. 2.4 Knuckles region (Source: Bambaradeniya & Ekanayake (2003)

This watershed is important as there are several streams draining east into lower Mahaweli system (eg. Hasalaka Oya. Maha Oya and Heen Ganga), south-west into the upper Mahaweli system (eg. Huluganga), and north-west into the Amban Ganga system (eg.. Teligam Oya and Kalu Ganga). Therefore strict protection is needed for this area in hydrological point of view.

Part of the Knuckles conservation area is located within the south eastern region of the study area of the Moragahakanda project. Due to rich biodiversity & hydrological value of the Knuckles forest region above 1500m range was declared as a climatic reserve in 1873. Then, this area received legal conservation status under the Forest Ordinance, administered by the Forest Department of Sri Lanka.

2.3.1.1 Cardomom cultivation

There are about 80 villages located around the buffer zone of Knuckles. Some villagers in the surrounded hamlets of the Knuckles range initiated cardamom cultivation and the number of farmers and the extent of cultivation were increased rapidly due to high income from the cultivation.

Cardamom cultivation has been carried out for centuries, and cultivation of the crop on a commercial scale was commenced in 1805. The Forest Department had issued permits in 1960 to cultivate cardamom in an extent of only 75 ha. However the area subjected to cultivation of this crop at present has increased up to about 3000 ha. About 50% of the cardamom cultivation is located in areas above 1000m altitude. Although the Forest Department has taken several measures to curtail the cultivation of the crop in the Knuckles forest range, villagers are still continuing the practice, as the crop fetches a high price (Rs. 2000 per Kg of dried cardamom). According to a recent survey conducted by the Forest Department, about 500 blocks of cardamom cultivation, each ranging from 2-200 ha are located within the Knuckles forest reserve. The forest area of approximately 21% of these sites is in a heavily degraded status, while 12% of the sites consist of an open canopy forest. The issue is further aggravated due to the location of about 90 cardamom processing and drying barns located in the Knuckles region, and all these barns are operated with fuel wood gathered from the forest. The latter practice has contributed to further degradation of the forest (sourse : Bambaradeniya & Ekanayake 2003).

According to previous studies, the soil erosion was relatively high in those lands and water absorption capacity was 50% less compared to natural forest. Besides, the felling for trees for firewood for cardamom drying barns had lead to forest destruction rapidly.

In 1993, IUCN prepared a management plan and recommended to gradually terminate cardamom and tea cultivation and as an alternative to grow forest on these lands. But it was found that a large number of villagers had been working on cardamom cultivation as laborers and they did not have way of living if it suddenly stopped. So the program was phased out.

As part of the Knuckles conservation area is located within the study area of the Moragahakanda project, it is important to find out the possibilities to make recommendations for alternative employment opportunities to the persons involved in cardamom cultivation in the study area as it might be a significant impact of the project in future.

2.3.1.2 Spread of invasive alien species

According to (Bambaradeniya & Ekanayake 2003), several species of introduced plants and animals have invaded the Knuckles forest range and pose a threat to natural ecosystems and native wild plants and animals of the area, The common invasive alien plants in the area include Lantana *(Lantana camara),* Koster's *(Clidemlu hirta), wild* sun flower *(Tithonia dirersfolia), and* Mist *(Eupatoriu riparium).* Common invasive alien animals in the area include feral buffalo *(Bubalus bubalis),* feral cats *(Fells ca/its)* and the Guppy fish *(Poecilia*

reticulata). Care must be taken to protect the Knuckles region during Moragahakanda project activities to avoid transmission of invasive species into the conservation area.

2.3.2 Wild life reserves

Under the Environmental Action Plan for the accelerated Mahaweli Development Programme, Wild Life Reserves of different hierarchical levels have been established within an area of over 230,000 ha of high quality wild life habitats to protect the bio diversity and the endangered, endemic fauna and flora (**Table 2.3** - Source: TEAMS 1997).

Table 2.3 Wild life reserves in the study area

	National Park	Area ha
1	Maduru Oya National Park	58,850 ha
2	Wasgamuwa National Park	36,948 ha
3	Somawathi National Park	37,762 ha
4	Flood Plains National Park	17,350 ha
5	Trikonamadu Nature Reserve	25,019 ha
6	Giritale Minneriya Nature Reserve	14,222 ha
7	Victoria Randenigala Rantambe Sanctuary	42,087 ha

2.3.3 Elephant population

The distribution of elephants in Sri Lanka is illustrated in **Fig. 2.5** and the number of elephants recorded in Sri Lanka by various authors is given in **Table 2.4** (source De Silva 1998). Due to settlement schemes, agricultural and irrigation projects have altered the habitats of elephants & disrupted and reduced food and other critical resources. In addition these activities have caused discontinuity of habitat which has isolated surviving herds into small pockets increasing the man-elephant conflict.

Table 2.4. The number of elephants in Sri Lanka as estimated by various authors.

Estimated number	Authoriry
1,500	Norris (1959)
1,600 - 2,200	McKay (1973)
2,500	Schultz (1984)
2,728 - 3,125	Jayewardene (1990)
2,800 - 3,200	Santiapillai & Jackson (1990)
3,000 - 4,000	Olivier (1978)
3,000 - 4,000	Santiapillai (1997)
4,000 - 4500	de Silva & Atapattu (1997)
5,000	Hoffmann (1975)
6,000	Hoffmann (1978)

According to De Silva (1998), there are four recent major irrigation schemes that affected the elephant habitats namely; (a) the GalOya scheme in the east, (b) the Walawe Ganga and (c) the Kirindi Oya schemes in the south and (d) the Mahaweli Ganga scheme in the north-west and north-east. Of the four schemes, the largest and the most ambitious is the Mahaweli Ganga scheme which involved the inter-basin diversion of the Mahaweli waters to the north-west and the north-east through existing irrigation systems. The recent human-elephant conflict in the north- west and northeast are directly due to these schemes.

2.3.3.1 Distribution within the Project Area

Generally the size and the location of the home range of elephants depend on several factors such as availability of water, fodder, shade and other critical mineral resources of the area. Presence of high elephant activity indicates that the targeted area for the reservoir provides most of their requirements. It has been reported that approximately 800 elephants inhabit the Mahaweli areas (TAMS 1981). But field* observation and other information support the argument that the elephant population is much higher than the estimated number (800 heads). According to the experts more than 100 elephants move in and out of the reservoir bed area of Moragahakanda indicating high elephant numbers in the area and the field investigations reveal that elephant activity was particularly high close to Ambanganga, due to regular water supply (TEAMS 1998).

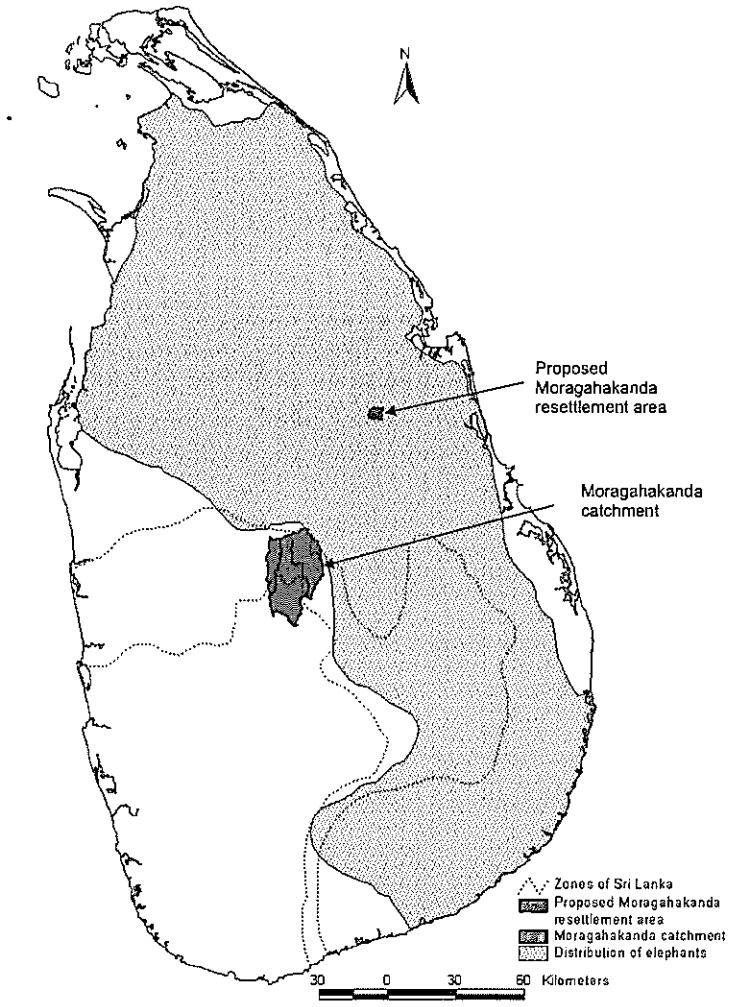


Fig.2.5 Distribution of Elephant in Sri Lanka Modified from De Silva (1998)

2.3.3.2 Man Elephant Conflict (MEC)

Due to reconstruction of abandoned irrigation reservoirs & new reservoirs have intensified the MEC as man has encroached into the elephant habitats. Apart from that, due to LTTE activities, DWC officers have evacuated Wilpattu NP. The army as well as LTTE have laid mines along the periphery and inside the Wilpattu NP park. The gunfire and exploding bombs have driven the elephants away from the park to the villages aggravating MEC. **Fig 2.6** illustrates the elephant mortalities in the country from 1991 to 1995 & **Fig. 2.7** illustrates the human mortalities & property damages caused by the elephants (source of data: De Silva 1998).

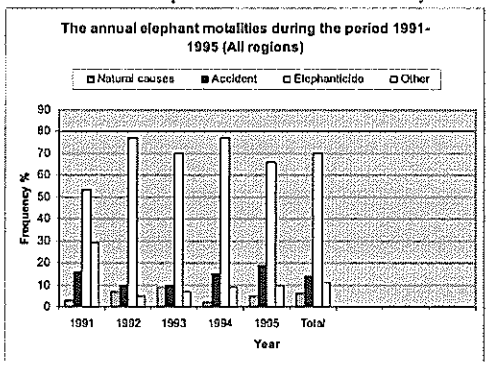


Fig. 2.6 The recorded elephant mortalities in the country

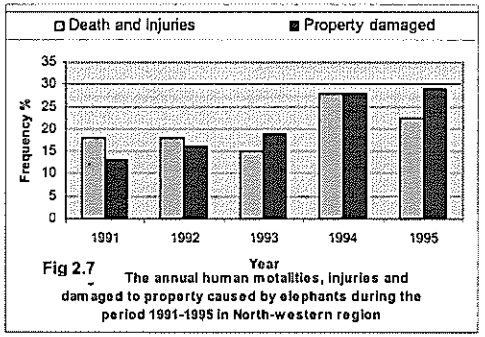


Fig 2.7 The annual human motalities, injuries and damaged to property caused by elephants during the period 1991-1995 in North-western region

Once the dam is constructed Moragahakanda area will form the natural corridor for the elephants to move from Giritale to Wasgamuwa The extent of the corridor will be restricted to the area between the dam and a few settlements to the east about 3-4 km away from the dam site. It may however be noted that elephants are in the habit of visiting these cultivated patches in the settled area even today. The construction of the dam will intensify the elephant-man conflict. Proper measures will have to be taken to avoid escalation of the conflict. There are about 41 households within the proposed corridor which will have to be removed, once the area is gazetted (TEAMS 1997).

According to the interviews made with the inhabitants, it was found that Human-elephant conflict appeared to be more pronounced in Kambarawa, Elahera, Kiri oya, Pubbiliya, Kongahawela, Talagoda and in Medirigiriya proposed resettlement area within the study area of the proposed Moragahakanda project.

2.3.3.3 Migratory routes

Project area forms a part of the corridor through which the elephants travel from Wasgamuwa to Minneriya, Giritale Nature Reserve as this area provides food & other requirements to the elephants especially during the dry months. The exact size and nature of the herds is still questionable. However it has been reported that a semi-permanent herd of 30 to 40 elephants within the proposed nature reserve. These herds cause considerable damage to crops and threaten human lives in adjoining areas.

2.3.4 Medirigiriya settlement area- Chronic Renal failure (CRF)

Dental fluorosis and kidney diseases are commonly observed in many parts of the dry zone of Sri Lanka, notably in the North Central Province. Chronic Renal failure (CRF) has recently shown a marked increase in some areas in the Anuradhapura and Polonnaruwa districts. Geochemically, the groundwater in these areas is generally of the Na /K type with the Cl - sub-type predominating possibly due to the increasing drought conditions and salt build up. The Total Dissolved Solids (TDS) and the electrical conductivity are also correspondingly high. A unique feature of the dry zone is that in a large number of areas, the fluoride levels in the groundwater are higher than the recommended danger levels of the World Health Organization (WHO), and in some wells values as high as 10 mg/l F- have been recorded. The WHO stipulates that a F - concentration of 1.5 mg/l is the upper limit. The abundance of fluoride in the groundwater and the higher intake of water have resulted in dental fluorosis being largely prevalent in children.- It is also presumed that skeletal fluorosis is more common than hitherto believed. Though the incidence of CRF is increasing, the exact cause of the disease is not known to any degree of certainty. Since the affected people are mostly from the farming community, the contamination of drinking water possibly by agrochemicals is considered a possibility. Among the other possibilities are: (a) the use of inferior quality aluminum vessels which may react with fluoride (b) genetic factors (c) alcohol consumption (d) deficiency of some essential trace nutrients (e) excess of a toxic trace element & some organic matter in the water (Source -Dissanayake 2005).

2.4 Impacts of the proposed project

2.4.1 During construction period

2.4.1.1 Displacement of families in the proposed reservoir area to be inundated.

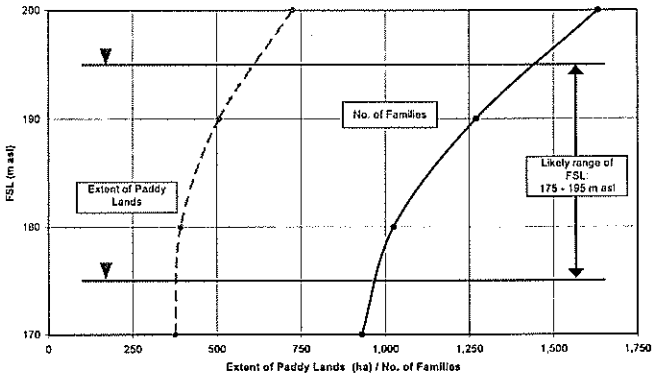


Figure 2.8 : Affected families due to inundation

A household survey and participatory rural assessment (PRA) were already carried out by Anon (2001) with the assistance of the Grama Niladharis of those GN divisions likely to be affected by the Project in order to determine the numbers of persons affected and compensation requirements at FSL 170, 180, 190 and 200 m asl (these are the contour intervals of the available reservoir map). With a reservoir full supply level (FSL) of 185m asl have estimated 1148 families to be displaced (**see Fig. 2.8**).

With the MASL final decision of the dam design, the full supply level of the reservoir will be 185m asl. **Table 2.5** illustrates the displaced house holders by GN division based on data collected in 2006 by Mahaweli Authority based on 185m asl reservoir level. However out of the total number displaced, large proportion has objected to accept the Medirigiriya resettlement package due to existing problems in the area. Most of them have indicated their willingness to settle down at Kaluganga right bank or left bank.

2.4.1.2 Displaced house holds in the elephant corridor

In addition to those households which would be inundated by the Moragahakanda reservoir, 41 households currently resident in the proposed elephant corridor between Wasgomuwa National Park and Minneriya-Giritale Nature Reserve immediately downstream of the dam will have to be resettled.

Table 2.5 House holders by GS division, Family, Type & sex 2006 survey (Source: MASL)

	Main family		Sub Family		Total
GN Division	Female	Male	Female	Male	
Talagoda	42	150	5	22	219

Kumbiyangaha Ela	2	17		2	21
Gam Imayaya	3	7			10
Galboda	11	49	5	9	74
Rajawella	35	205	4	33	277
Elagamuwa	27	148	6	26	207
Koongahawela	10	66	4	14	94
Kadawatha	30	117	6	23	176
Maragamuwa	16	90	3	14	123
Madapihilla	30	99	7	15	151
Galporugolla	7	83	9	15	114
Moragolla	20	58	5	12	95
Millagahamula Tenna	29	108	11	25	173
Kabarawa	35	186	8	33	262
Table Total	**297**	**1383**	**73**	**243**	**1996**

2.4.1.3 Displaced animals

Removal of vegetation cover of the project site will force the migratory species such as elephants, wild boars, and parakeets to migrate to adjacent areas in search of food resulting in crop damage. A complete faunal inventory of the area is essential to see whether there are unknown site specific species. This section of the study will be complimented by the IUCN project which is in progress. An action plan formulated by the IUCN will take care of removal of fauna from the area during construction period.

Inundation of the prime elephant habitats within the full supply level which covers an area of 29.5 km^2 of the Moragahakanda reservoir will cause more than 150 elephants to be displaced. This will create new human elephant conflicts in and around Moragahakanda reservoir catchment.

2.4.1.4 MEC at Medirigiriya

Somawathie national park was established under the Mahaweli Development project and it provides additional habitat for the elephants in and around Somawathie protected area system. However there will be a remarkable human elephant conflict prevailing at the peripheral area of Medirigiriya due to proposed resettling of the displaced people of Moragahakanda development project. It will aggravate the human elephant conflict by reducing the area available for already affected elephants.

2.4.1.5 Clearance of forest

According to Anon (1997) there are about 5480 ha of forest land in the affected area. Of this, total area around 3615 ha of forest lands are located in the reservoir area which includes 30 ha of Eucalyptus plantations. The balance extent of, nearly 1860 ha of forests are within the Command Area. Additional survey on flora of the inundated area would support in preparation

of watershed management plan to mitigate the loss of flora of the area.

Information on the floral diversity, endemic and endangered/threatened plant species and plants with economic value in these forests are also recorded in Anon (1997). Eight endemic plant species have been recorded in the reservoir area and similarly 8 endemic species have been recorded in the command area. No endangered or threatened species were recorded from the reservoir area, but 2 species of endangered/threatened category were found in the command area. These are "Wal Pichcha" and "Kalumediriya". The command area is under that area identified by MASL for development under the Mahaweli Development Programme.

All the plant species identified in these forests including endemic, threatened and endangered species are generally available in other Moist Monsoon and Dry Monsoon Forests in the area. According to the distribution none of the species recorded are exclusive to these localities, (none of the species are endemic to these forests)

The removal of forests may create micro climatic variations in the area (specially temperature) This may be more significant in the command area than in the reservoir area due to the climatic conditions in the dry zone. Removal of forest in the reservoir area may not be very significant due to a large water body being created. The adverse impact on micro climatic conditions could be minimized by adopting a well planned and proper forest clearing system supported by planting homesteads, roads and avenues with suitable trees (Anon 1997).

2.4.2 Impacts after completion of the project

2.4.2.1 Soil erosion

The annual soil loss from an area depends on the rainfall, erodability, length of slope and gradient cropping management and erosion control factors. If the soil loss exceeds soil formation the soil fertility would decrease. This is one of the expected adverse impacts of the proposed development activities if the catchment is not properly managed.

With the construction of the Moragahakanda reservoir the main portion of sediment transported from the upper reaches of the catchment will be trapped in the reservoir. If the Amban Ganga is denied of its normal sediment load in the downstream reaches it would tend to scour its bed and cave its banks. However, as the flow will be very much reduced due to storage in the reservoir these actions will be curtailed (Anon 1997)

Sedimentation on the Moragahakanda reservoir will not have a very significant impact as the sedimentation is not expected to exceed 15 MCM in 100 years (JICA, 1989). This is approximately 1/3 of the dead water storage of 48 MCM. Based on the available information (Lahmeyer 2001), the current rates of erosion and sediment transport in the Upper Amban Ganga basin, there would not be a significant effect on the proposed Moragahakanda reservoir capacity by sedimentation over a 50–year period.

However with the development of stagnant water body with massive infrastructure

development in the project site would improve the human activities within the Moragahakanda catchment. Therefore it is a necessity to develop a proper catchment management plan watershed management plant to minimize the soil erosion in the watershed. A comprehensive watershed management plan is a necessity to mitigate this impact.

2.4.2.2 River bank planting

According to Lahmeyer (2001) accelerated bank erosion exists in the Sudu Ganga, a major tributary entering the upstream Bowatenna reservoir, due to economic activities accompanying development in the area around Matale. Reforestation along the banks of the Sudu Ganga and other tributaries as well as around the perimeter of Moragahakanda reservoir could cause significant impacts in the future. However during the visits of the present study team found that there is no significant soil erosion in this area & also along the banks of the rivers. The river bank vegetation is sufficient at present to avoid any soil erosion & it is not necessary to initiate new program for river bank planting. However there may be some areas along the rivers exposed to soil erosion but still the magnitude of the land extent is insignificant.

2.4.2.3 Contribution of the cardamom cultivation within the knuckles to soil erosion in the catchment

Cardamom cultivation contributes to soil erosion significantly. Therefore recommendation of alternative employment opportunities for those who involve in cardamom cultivation is important to mitigate the soil erosion from the Knuckles conservation area.

2.4.2.2 100m sensitive area around the proposed reservoir

The 100m strip around the proposed reservoir area has to be kept undisturbed from any settlement to protect the reservoir from pollution & eutrophication. Even though there is a provision by legislation to keep this area free of any development activity it has become a difficult task right now with the other existing reservoirs. Effort has to be taken to keep this 100m strip around the reservoir free of any development activity in order to protect the reservoir.

2.4.2.3 Water quality

Water in the Amban Ganga, (which will be stored in the proposed reservoir), has been tested by United States Operations Mission as far back as 1960/1961. The test results indicate low conductivity (<475 US) and Sodium Absorption Ratio (<10). Thus, the water can be considered suitable for irrigation.

However the Hydro-geological studies of the reservoir area have concluded that the reservoir should remain watertight at the finally selected FSL of 185 m asl. Surveys carried out by the Geological Survey and Mines Bureau have indicated that significant mineral resources (feldspar, mica and quartz) exist in the reservoir area, but it is not known to what extent they can be commercially exploited or whether adverse impacts on reservoir water quality or

water tightness might result from mining activities prior to inundation. **Fig 2.9** illustrates the existing geological condition of the proposed reservoir area. Further studies on this aspect will be carried out by the Geological Survey and Mines Bureau.

Water quality of the reservoir will be effected due to thermal stratification of the reservoir. Also proper catchment management practice is essential to avoid nutrient loading effect on the reservoir as in the other deep Mahaweli reservoirs which might lead to eutrophication and blooming (Piyasiri 1995 & 2001).

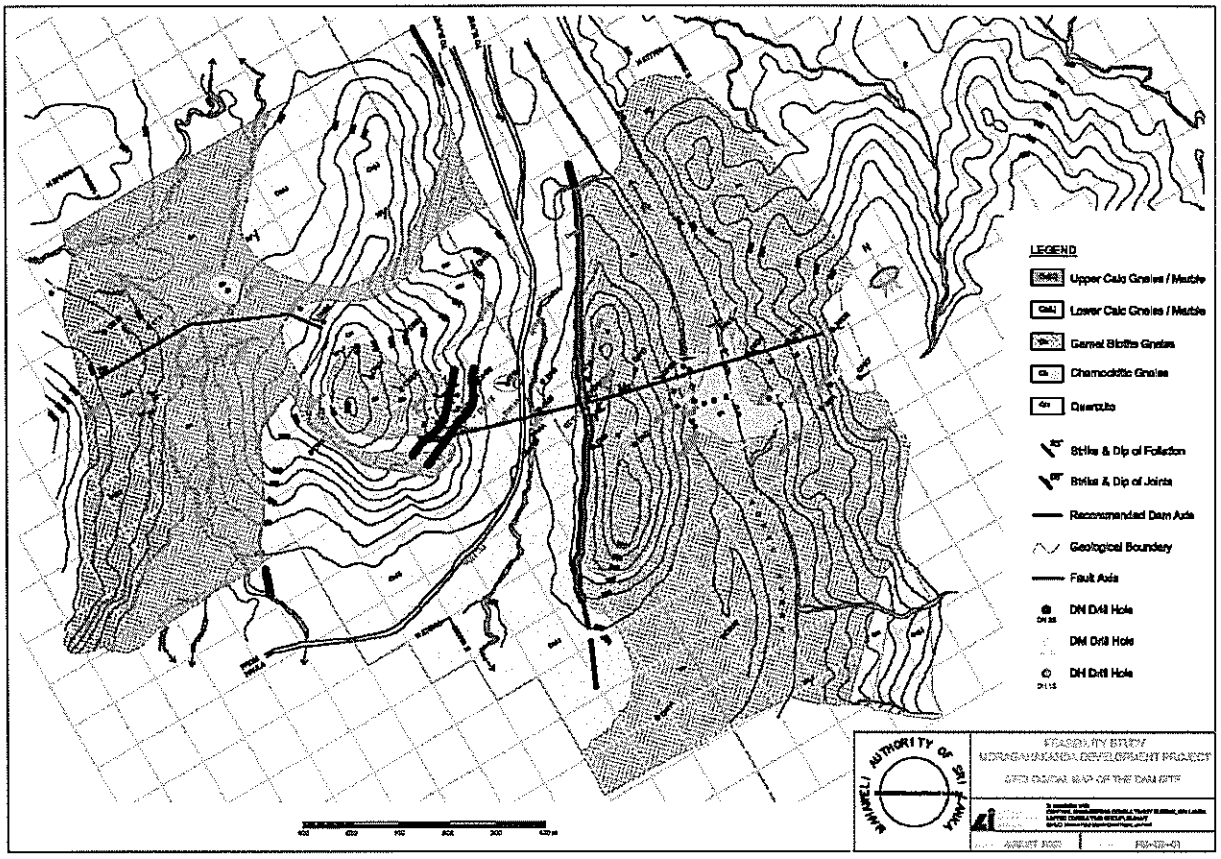


Fig. 2.9 The geology of the proposed inundating area indicating different geological layers. (Source – MASL)

Chapter 3
The study area & catchment issues

3.1 The study area & Moragahakanda catchment

The study area of the present assignment consists of two components; namely; the Moragahakanda catchment area and the proposed settlement area at Medirigiriya. **Fig. 1.3** illustrates the location of Moragahakanda catchment and the proposed Medirigiriya settlement area (**Fig 1.5 a & 1.5b**). However the identified impacts of settlement in Medirigiriya area & the mitigatory activities will be discussed in the report on mitigatory action plan (Volume 2) of this report. The volume 1 of this report focuses mainly on the Moragahakanda watershed area.

The location of the Moragahakanda catchment area and the boundary of the catchment are illustrated in **Fig 1.3 & Fig 1.4**. The extent of the study area is 768 km^2 and it consists of three sub catchments, namely; the Nalanda reservoir catchment, Bowatenna reservoirs catchment and the proposed Moragahakanda reservoir catchment. The boundary of the catchment was digitized & the extent of 100m sensitive area around the catchment was derived using GIS. The area of the 100m sensitive region around the proposed reservoir is 5.8 km^2. Some features of the catchment elements are summarized in **Table 3.1.** A part of the Knuckles conservation area also is located within the lower eastern part of the study area (**Fig. 3.1**).

The watershed consists of natural & manmade characteristics. The natural form of the catchment could be changed through human interventions. However the anthropogenic activities could cause environmentally sensitive changes such as soil erosion, pollution of stagnant & running water resources of the watershed. Therefore in order to develop comprehensive watershed management plan, the existing natural characteristics of the watershed should be taken in to account in order to use such information together with different landuse activities to develop comprehensive watershed management plan in an integrated manner using GIS as a tool.

Table 3.1 Some Basin features of the three sub catchments

	Nalanda	Bowatenna	Moragahakanda
Catchment Area (km^2)	115	380.	283
Reservoir area (km^2)	2.7	1.6	29.5
100m sensitive area (km^2)	2.8	1.3	5.8

3.2 Natural catchment characteristics

3.2.1.1Elevation

The catchment of Morgahakanda reservoir exhibits a wide variability interms of elevation (see **Fig 3.2**). **Table 3.2** illustrates the elevation ranges of Moragahakanda catchment. The elevation varies approximately from 200 msl to 1600msl, the higher elevation being in the Knuckles range. However, the majority of the catchment (nearly 70%) is falling within the elevation range of 200 – 600 msl. Higher variability of elevation has make the catchment highly diverse in its floristic composition. **Fig 3.2** depicts the spatial distribution of the elevation classes and **Table 3.2** illustrates the extent of area under each elevation class within Moragahakanda catchment

Table 3.2 Extent of area in the Moragahakanda catchment under each elevation category

Elevation range (m)	Area (Sq. Km)	% Area
0-200	41.74	5.54
200-350	167.24	22.21
350-600	356.95	47.41
600-1000	136.25	18.1
1000-1500	49.09	6.52
above 1500	1.64	0.22

3.2.2 Slope

The slope of the catchment is an essential piece of information for conservation planning. Thus, slope map for the catchment area was derived and reclassified into 7 classes to facilitate conservation planning. However, nearly 65 % of the catchment area is under 30 % slope, hence there is a potential of using the catchment for agricultural activities provided with adequate soil conservation. Nearly 19% of the catchment is within 30 – 60 % while the rest is above 60%. The **Fig 3.3** illustrates the spatial distribution of slope classes within the catchment and the **Table 3.2** illustrates the extents of land under each class. **Table 3.3** illustrates the land extents under each slope class within the Moragahakanda catchment

Table 3.3 Land extent under each slope class

Slope Class (%)	Area (Sq. Km)	% Area
0-9	229.05	30.53
10-19	135.57	18.07
20-29	124.8	16.64
30-39	101.52	13.53
40-49	39.91	5.32
50-59	13.28	1.77
above 60	105.98	14.13

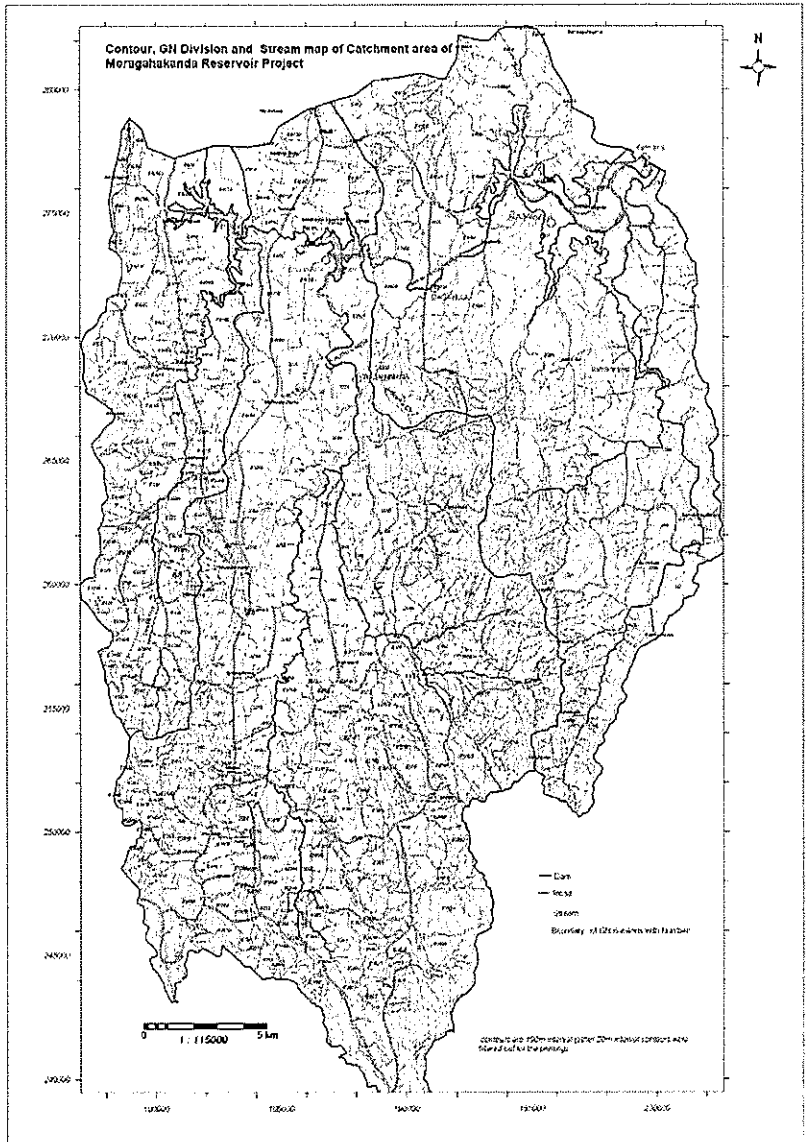


Fig 3.2. The Contours, GN divisions and the stream network of Moragahakanda catchment

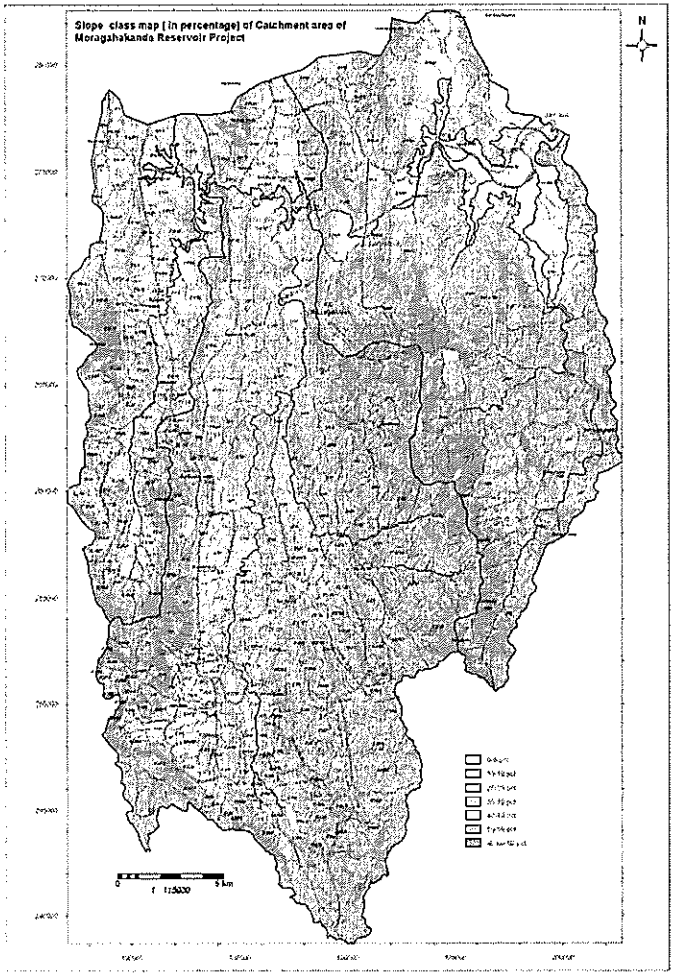


Fig.3.3 Slope classes in Moragahakanda catchment

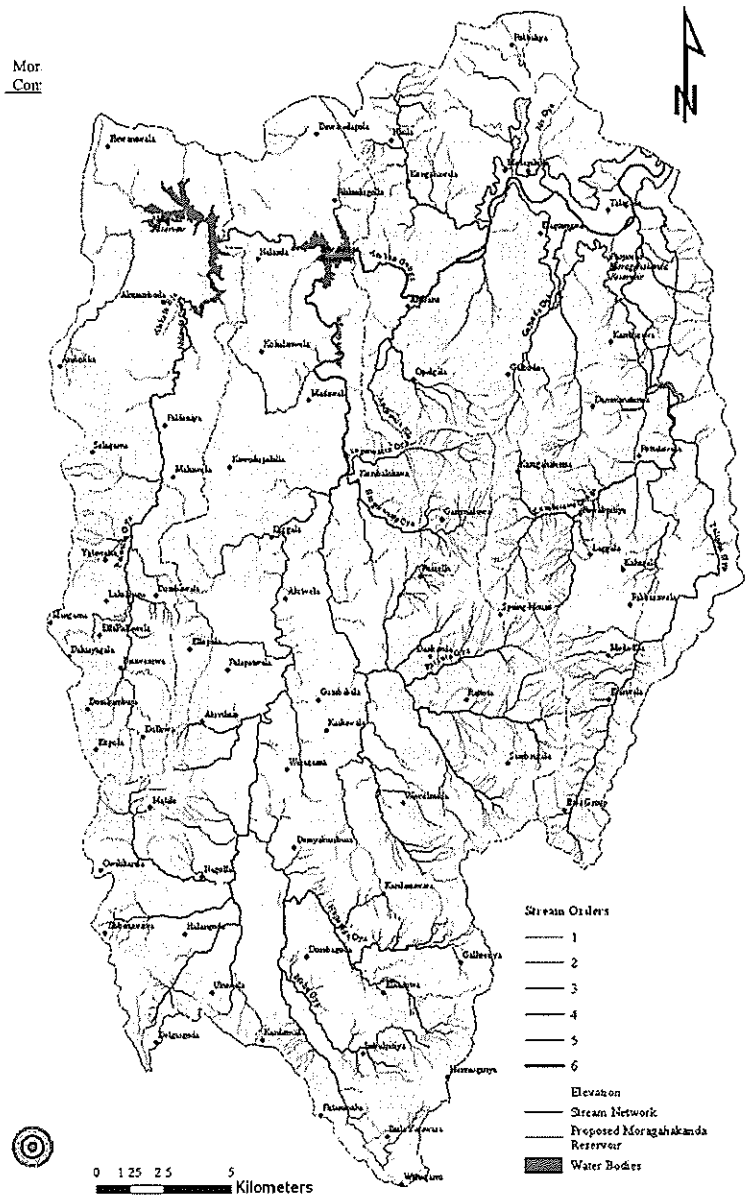


Fig.3.4 Stream network & Stream orders within the Moragahakanda study area

3.2.3 Stream net work

The distribution of stream network is illustrated in **Fig. 3.2** and the stream numbers are analyzed and illustrated in **Fig. 3.4.** Ambangana at which dam construction is proposed belongs to the 6th order river. Therefore it is important to consider water quality of the waters of the reservoir particularly due to mineral resources located within the reservoir bed. **Table 3.4** summarizes the catchment characteristics of proposed Moragahakanda reservoir.

Table 3.4 Catchment Characteristics of Proposed Moragahakanda reservoir
St Order = Stream order (1-6)

		Moragahakanda
Catchment Area (km^2)		768
Reservoir area (km^2)		29.5
Catchment area/ Surface Area (CA/RA).		26.03
Reservoir Volume (V) at (FSL) MCM		500 MCM
Ca/RA effect per MCM (unit volume)		0.057
Perimeter (km)		143.00
Axial length (km)		38.80
Basin Width (km)		19.43
Form Factor		0.56
Compactness Ratio		1.46
Elongation Ratio		0.85
Total length of Stream (km)		1060.1
Total No. of Stream segments within the catchment		1102
St Order 1	No. of Stream segments	804
	Mean length km	0.69
St Order 2	No. of Stream segments	215
	Mean length km	1.1
St Order 3	No. of Stream segments	62
	Mean length km	2.00
St Order 4	No. of Stream segments	18
	Mean length km	4.75
St Order 5	No. of Stream segments	2
	Mean length km	16.20
St Order 6	No. of Stream segments	1
	Mean length km	34.71
Bifurcation Ratio		4.00
Drainage Density (km/km^2)		1.41
Stream Frequency (No./km^2)		1.46
Length of Overland flow (km)		0.35

3.2.4 Rainfall

The spatial distribution of mean annual rainfall over the catchment area varies between 1500 mm to 3500mm. Approximately, 50% of the land area of the catchment receives rainfalls of less than 2000 mm per annum. The higher rainfall area coincides with relatively higher elevation range. However, the amount of rainfall is not well distributed

over the year and in most of the areas the temporal rainfall variation shows less prominent bimodal distribution pattern.

The major rainy season for the catchment commences with the occurrence of second inter-monsoon during October and November. These rains are immediately followed by the northeast monsoon rains that may last until the late February of the following year. By late March the catchment receives the first inter-monsoons and rains occur until April or early May. When the country is under the influence of southwest monsoon during May to September the catchment is not getting considerable rains due to the rain shadow effect. Map depicting mean annual rainfall within the catchment area is illustrated in **Fig3.5.**

3.2.5 Soil types

The soils of Sri Lanka have been classified at great group level for the whole country and series level for some parts. The mapping has been done mainly at great group level. Fourteen great soil groups have been described (Panabokke, 1996). Soil map for the catchment area which was extracted from the generalized soil map of Sri Lanka is illustrated in **Fig 3.6.** The physical properties of major soil groups which are falling in the catchment area and in the proposed settlement area are discussed in the following section.

3.2.5.1 Soils in the catchment area of Morgahakanda reservoir

Catchment area of Morgahakanda consists of six major soil groups, namely Red Yellow Podzolic Soil (RYP), Red Yellow Latosolic Soils (RYL), Reddish Brown Latosolic Soils (RBL), Immature Brown Loam Soils (IBL), Reddish Brown Earths (RBE), Non-Calcic Brown Soils (NCB), Low Humic Glay Soil (LHG) and Alluvials of different textures (**Fig .3.6**)

3.2.5.2 Red Yellow Podzolic Soils

Red Yellow Podzolics are confined to the areas with wetter rainfall regimes within the catchment area. Because of the specific nature of the parent materials from which the Sri lankan soils are derived, namely, meta-sediments of the High Land series of Precambrian rocks, these soils are well structured and less erodible. The predominant texture of the non- eroded surface horizon (A Horizon) is either a sandy loam, sandy clay loam or loam. However, under cultivation, surface horizon tends to become less distinct as a result of erosion and mixing. Illuviation of clay appears to be a dominant process in the development of the RYP soils as seen in the distinct clay coatings on the ped surfaces. They have distinct clay enriched sub surface horizon with the dominant texture being clay loam to clay. These soils are acid in reaction. The base saturation of the sub soil is relatively less, because of the excessive leaching that occurs due to heavy rainfall. Therefore, intensive agriculture on these soils require regular fertilizer application. The acid conditions of these soils affect high value crops and application of lime is the common practice that has been adopted to overcome this problem. In addition to modal group of the RYP of which the most common characteristics are described above, the most prevalent sub-group within the catchment is the sub group with strongly mottled sub soils in the semi wet intermediate zone on undulating and rolling landscape.

Higher structural stability, low susceptibility to erosion, better response to management, higher depth which provide better rooting depth for deep rooted crops, can be considered as favorable characteristics of RYP. In contrast, toxicities of iron, manganese and aluminum, acid reaction and subsequent nutritional imbalance are the few limitations. However these soils can be utilized for annuals or perennials without serious limitations provided that application of liming in case of acidic situations and facilitating drainage in drainage impedances. In case of annual cropping on these soils, terracing would be the ideal conservation measure while higher slopes can be devoted for perennials.

3.2.5.3 Reddish Brown Latosolic soils(RBL)

The Reddish Brown Latosolic soils are prevalent in mid country wetter part and in the section of intermediate zone occurring in the catchment area (**Fig.3.6**). The parent materials on which RBL soils are found are mainly residuum and colluvium from the basic and intermediate rocks of the Khondalite series. There are also a few members associated with quartzites and acid charnokites. The texture of the soil varies from sandy clay loam to clay loam. The structure of the sub surface horizon is well developed and it has the characteristic shiny ped surfaces. The base saturation in the sub soil is between 25 and 35% and which is an intermediate level between RBE and RYP soils. Because of their stable structure, high water holding capacity and permeability, their physical properties could be described as very good for deep rooted crops. In spite of very high potential for agriculture, because of the gentle slopes of the lands on which they occur, large extent of these lands have been developed for homesteads.

3.2.5.4 Immature Brown Loams (IBL)

The immature brown loams are young soils formed on surfaces that have been continuously exposed to erosion. They are generally formed on materials derived from mica schists and other micaceous rocks. They have also been observed to occur at higher elevations on steeply sloping terrain in the mid and up country intermediate zones on materials derived from quartz feldspathic gneisses mixed with charnockitic gneisses. Although there is no clay enrichment in the sub soil, colour and somewhat incipient structural development have been observed in the sub soil layer. The soil depth generally does not exceed 100cm, and the texture is predominantly sandy loam or loam. Numerous un-weathered primary minerals, especially micas can be observed in both surface and sub soil layers. Shallow depth, weakly developed structure and steep slopes on which they occur make this soil highly vulnerable to soil erosion. Hence cultivation of perennial crops to a certain degree may reduce the vulnerability of this soil to erosion. Since the soil moisture holding capacity is low, soil moisture conservation techniques such as lock and spills, mulching, addition of organic material are much needed in these soils.

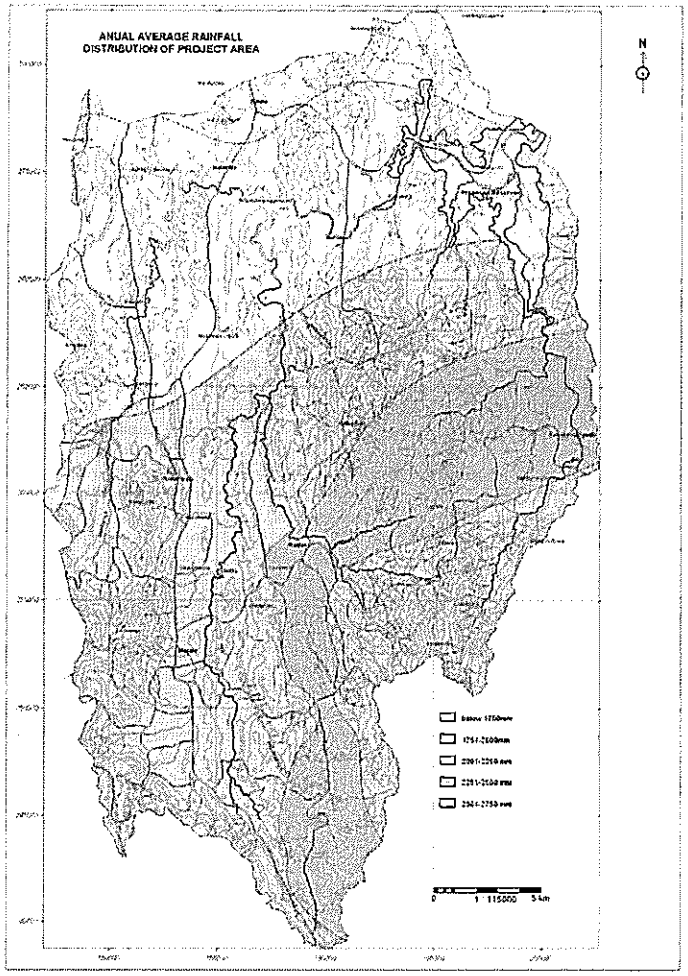


Fig 3.5 Rainfall in the Moragahakanda Catchment

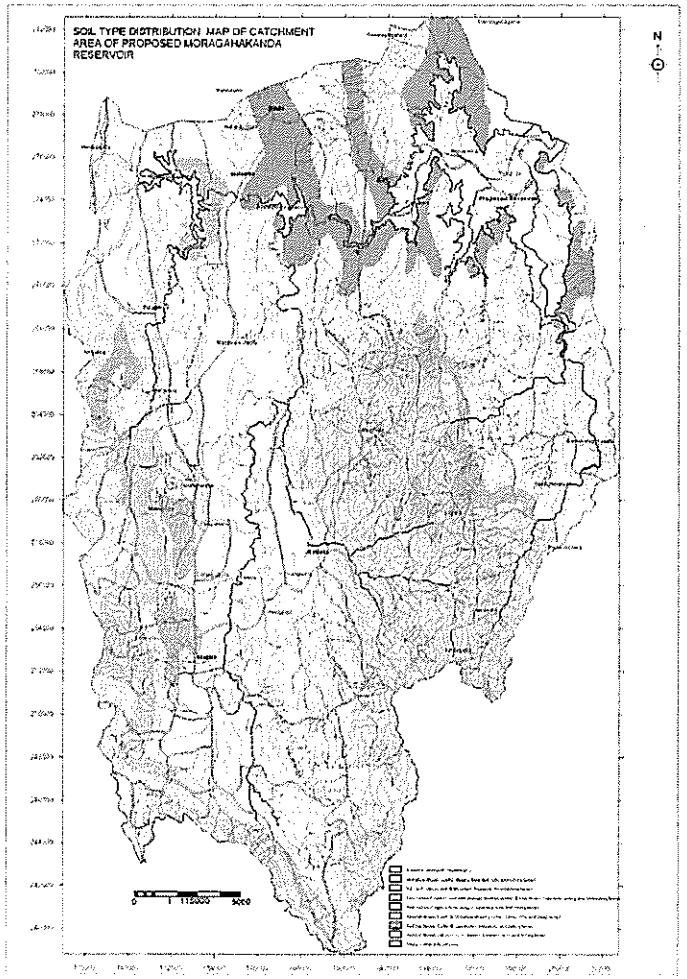


Fig 3.6 soil types in the catchment

3.2.5.5 Reddish Brown Earths (RBE)

The Reddish Brown Earths is the most widespread soil type in the catchment and it occupies about two thirds of the total area of the catchment area. This soil is mainly confined to low country intermediate and dry section of the catchment. The texture of the soils becomes heavier with depth, from sandy clay loam at the surface to clay loam to sandy clay with gravel in the sub surface. This gravelly sub soil horizon is typical in the RBE. The percentage of gravel in the sub surface horizon is about 10-15% while the gravelly horizon, which underlies the sub- surface horizon contains about 50-70% of gravel. Although the amount of gravel in the gravelly horizon creates a large number of macro-pores, the large amounts of clay and find sand that occupy these pores make the horizon compact and massive in structure. Panabokke (1978) and Joshua (1988) showed that the structural stability is of RBE is much lower compared to some of the dominanat soil types in the wet zone. The gravelly horizon of the RBE reduces the effective root zone by limiting the most of the root distribution to the horizons overlying it. One of the dominant processes in the development of RBE soils is clay illuviation. This soil type consists of clay enriched sub soil horizons where water table could develop rapidly due to heavy rainfall or due to excess irrigation and it can cause temporary water logging (anaerobic) conditions which can badly affect most of the upland crops. The RBE soils easily slake under rainfall, making tillage operation difficult during the rainy seasons. Tillage can be performed within small range of moisture content thus it is recommended to reduce the tillage operation to the minimum level during the land preparation activities. The soil dries out very early. Therefore during the dry period the soil appears like rock. Any attempt to use power implements during this period can be disastrous and is costly. Very few studies have been carried out to overcome the problem of the presence of gravelly layer in the sub soil of RBE. The causes, which limit root growth in the gravelly horizon can be eliminated by mechanically disturbing the horizon. Deep ploughing and ripping can be practiced but it is not practically feasible due to high cost. Therefore cultivation practices have to be adapted to shallow rooting and compact horizon below the root zone. Planting of semi-permanent deep rooted crops which could penetrate this horizon could solve this problem. Adopting efficient surface drainage and lowering of water table by sub surface drainage could control the build up of the water table.

3.2.5.6 Low Humic Gley soils (LHG)

By virtue of their position in the landscape, these are essentially hydromorphic soils developed on the local colluvium that has built up during long periods of landscape formation at the foot slopes of the undulating landscape. The Low Humic Gley soils are mainly confined to valley bottoms. These soils are characterized by wetness or gleying throughout the profile or gleying immediately below the surface horizon. They also have textural sub surface horizons which frequently show conspicuous mottling. The normal soil profile consists of a sandy loam to sandy clay loam surface horizon underlain by a sandy clay to clay sub soil horizon. Calcium Carbonate concretions are found in the lower depths of the profile in the drier environments and this situation is more prominent towards the northern direction of the catchment. The depths of occurrence of these carbonate concretions correlate well with the degree of leaching or the dryness of the present climate. The rice is the best-suited crop for this particular group of soil but in

situations where water is limiting or drainage can be improved upland crops are possible.

3.2.5.7 Soils in the proposed settlement area under Morgahakanda project

Proposed settlement of the Moragakanda project is lying north-eastwards to Somawathii. & its surrounds. Predominant soils are RBE, some patches of NCB and alluvials in lowlands.

3.2.5.8 Reddish Brown Earths

RBE occurring in these areas is basically similar to the earlier description (section 5.1.10.1.4), but shallower and somewhat yellow in colour. Since it is sallower, it can pose limitations for crop growth, thus during the allocation of land blocks for beneficiaries, it is prudent to select exact locations based on a semi-detailed soil survey.

3.2.5.9 Non- Calcic Brown soils (NCB)

Non-Calcic Brown soils are occurring in association with RBE. However the extents under NCB are not extensive. These soils are shallow to moderately deep.. The soils belonging to this group are exclusively developed either on colluvium or alluvium derived from acid rocks of Vijayan series that have a low content of ferromagnesian minerals. The soil profile consists of a sandy loam surface horizon underlain by a sandy loam to sandy clay loam sub soil horizons. The clay enrichment in the sub soils leads to temporary water logging conditions during rainy weather affecting most upland crops grown on this soil. The infiltration rates and the hydrologic conductivity of this soil are very high and the water retention characteristics are low. This causes severe moisture stress conditions and consequent crop losses during dry periods are reported to be very high. Since the infiltration rates high and water holding is poor, water use efficiencies can be improved through frequent irrigation of a small amount of water. Moreover, texture is such that retention of nutrients is low, thus split application of fertilizer is recommended. The use of granular type fertilizer can also alleviate high leaching losses of these soils.

3.2.5.10 Alluvial soils

Alluvial soils are mainly restricted to the soils that have formed on aluuvium deposited on more or less flat flood plains as well as in valley depressions. These alluvial have formed under the influence of Mahaweli flood plain. Texture and the drainage of this group vary depending on the location of deposition. The coarser material is deposited on levees of rivers/streams, and the finer textured materials in backswamps and valley basins. Drainage conditions and hence morphologies of the alluvial soils differ greatly. The poorly drained alluvial soils show a predominance of grayish colours with distinct mottling throughout the profile. In the proposed settlement area, better drained soils such are usually brownish or Yellowish brown throughout,
occur. Poorly drained soils are best suited for paddy and better drained soils, with drainage improvement could be diversified for upland crops. However, depth and duration of flooding are the two important factors to be considered in the diversification of alluvial soils.

3.2.6 Geology

3.2.6.1 The geology of Sri Lanka

Sri Lanka was a part of East Gondwana, together with fragments of Antarctica, Australia, India, Madagascar, Mozambique and Tanzania (e.g. Powell et al., 1988; Kröner, 1991; Yoshida et al., 1992; Jacobs et al., 1998). Sri Lanka acted as a bridge through which Antarctica and East Africa can be correlated. It is thus not surprising that Sri Lanka reveals remarkable geological, geochronological and geotectonic similarities with its neighbouring Gondwana fragments.

Sri Lankan geology has received increasing attention in the last two decades. As a result of this, the nomenclature of rock units, definition of geological boundaries and the timing of major metamorphic and tectonic events have changed substantially. The nomenclature of the basement units, as described in the special issue of the Journal of Precambrian Research - volume 66 on 'Tectonic, metamorphic and isotopic evolution of deep crustal rocks, with special emphasis on Sri Lanka', is used throughout this report.

The Proterozoic basement of Sri Lanka exposes substantial parts of the lower continental crust. Four different units were distinguished on the basis of isotopical, geochronological, geochemical and petrological constraints (e.g. Kröner et al., 1991; Cooray 1994; Milisenda et al., 1994)(Fig.2.1).

(1). the Highland Complex (HC);
(2). the Vijayan Complex (VC);
(3). the Wanni Complex (WC) and
(4). the Kadugannawa Complex (KC)

The HC consists mainly of interbeded metapelites, quartzites, marbles, metabasites and charnockites. Calc-silicate gneisses, sapphirine-bearing granulites, cordierite-bearing gneisses and corundum-bearing gneisses are exposed in minor quantities. The VC exposed in eastern Sri Lanka consists of meta-igneous gneisses of tonalitic to leucogranitic composition. Rocks of the KC are seen in the cores of the six doubly plunging synforms, which were named as *'Arenas'* by Vithanage (1972). The dominant rocks of the KC and WC are hornblende-biotite gneisses, granitic, granodioritic and tonalitic associations. Some granulites are exposed in the southern part of VC near Buttala and Kataragama. They comprise rocks similar to those of HC and are interpreted as tectonic nappes namely: Buttala klippe, Kuda Oya klippe and Kataragama klippe (Fig 2.1). The Entire Upper Kotmale Project Area is underlained by Precambrian metamorphic basement of Highland Complex (**Fig.3.7**).

3.2.6.2 General Geology

The Project area is underlain by Highland Complex metamorphic rocks (HC) of Precambrian age. Meta-sedimentary and meta-igneous rocks are observed as intercalated rock units through out the project area. Quartzo-feldspathic gneisses, Garnet-biotite gneisses, Quartzites, Hornblende biotite gneisses, Cordiarite gneisses, Calc gneisses, and crystalline limestone (marble) are considered as metasedimentary rocks whereas Charnockite / Charnoockitic gneisses, Granitic Gneisses are considered as main unit

from the meta-igneous rock
There is a Marble bed across the dam of the proposed project. That may give some difficulties during the construction as Solution cavities may exist in this Marble band (Fig. 3.8).

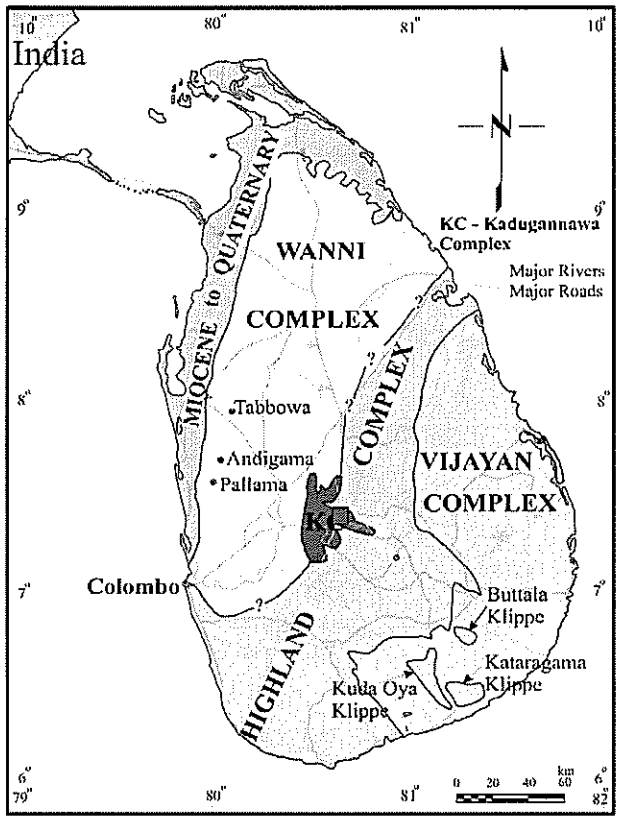
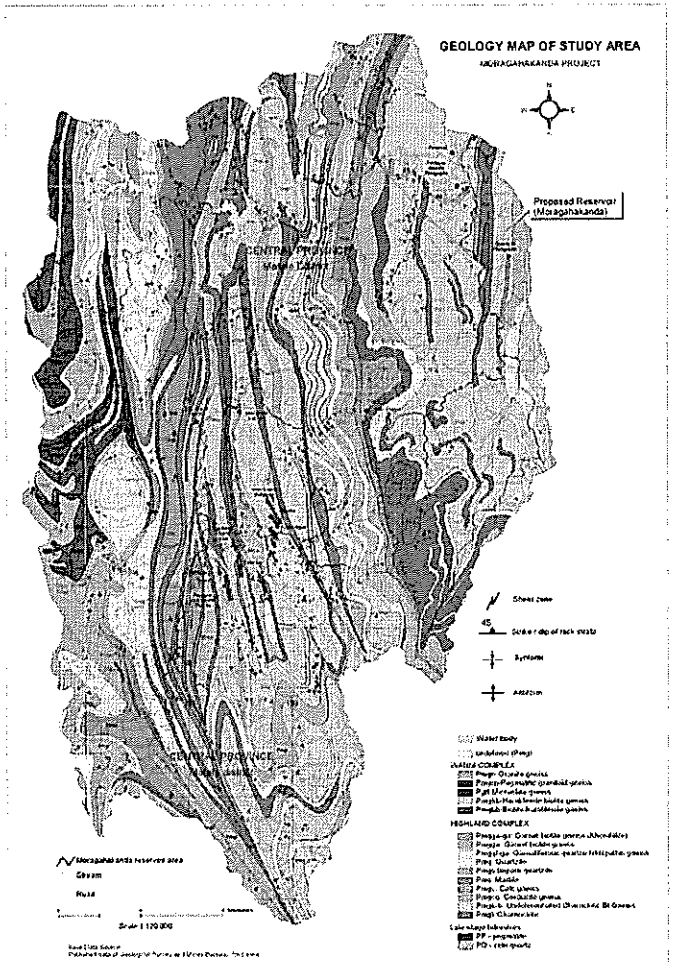


Fig.3.7 : Simplified geological map of the Sri Lanka showing all major litho-tectonic units (after Cooray 1994). The area outlined by the box is the studied area of proposed Moragahakanda Project , which is shown in greater detail in Fig 3.8



3.8 Geology of the study area

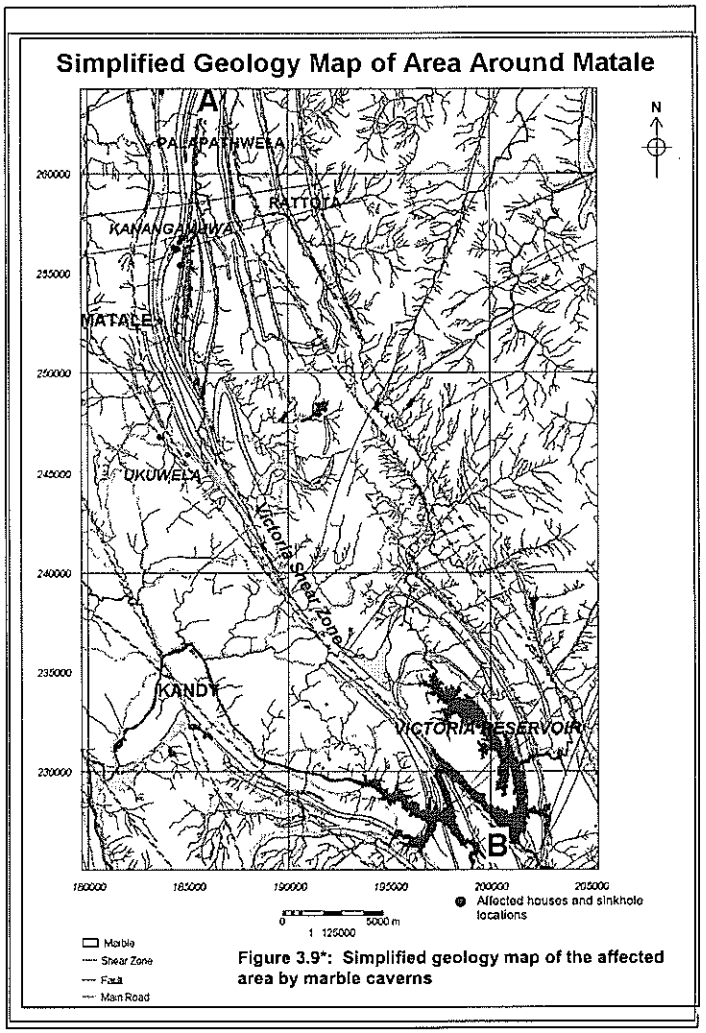


Figure 3.9*: Simplified geology map of the affected area by marble caverns

3.2.6.3 Structural geology of the Project Area

The geological structure of the project area is indicated on the geology (**Fig 3.9**). The general trend of rock strata is South to North with minor variations due to geological structures. In contrast, Marble beds are intruded to / interlayered with host rock Garnet Biotite gneiss, which is associated with a major shear zone. There are number of shear zones, faults, folds and lineaments recognizable in the regional scale published geological maps and in the field it was hardly recognized the boundaries of such features.

Presence of pegmaites, mineral deposits(iron ore, feldspar, vein quartz, phlogopite (mica), fluorite, and iron with copper, Topaz deposits) indicate some pre-historic tectonic activities associated in the area. The boundary of Vijayan complex and Highland complex is close to the western and North western side to the project area.

It was observed that, especially along Sudu Ganga, more marble beds are associated with a shear zone. Underground solution caverns are rich in this area. Especially from Ukuwela to Nagolla, Bowathenna there were some ground subsidence and sink holes (unpublished data of National Building Research Organization). With the fluctuation of groundwater levels of this area, such phenomenon can be expected. As a result of that, most of houses in this region are severely cracked. Those cracks are observed on floors and walls of the houses (**Fig 3.10**).

According to the information of NBRO, more than 500 houses in this belt are in severe condition due to those cracks and subsidence. Apart from that, there are number of faults in the study area. All those structural phenomenon and mineral concentrations give evidence for the neo-tectonic activities in the area.

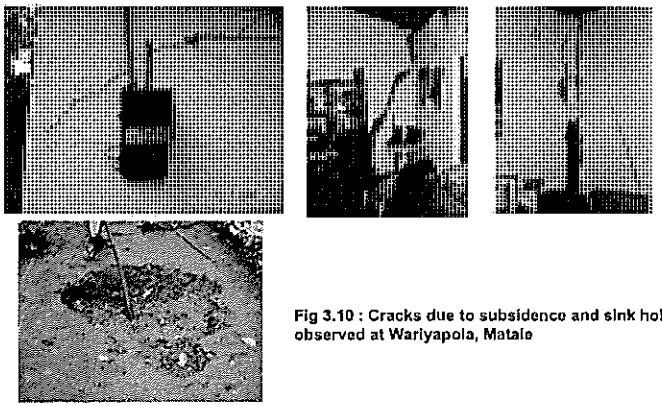


Fig 3.10 : Cracks due to subsidence and sink hole observed at Wariyapola, Matale

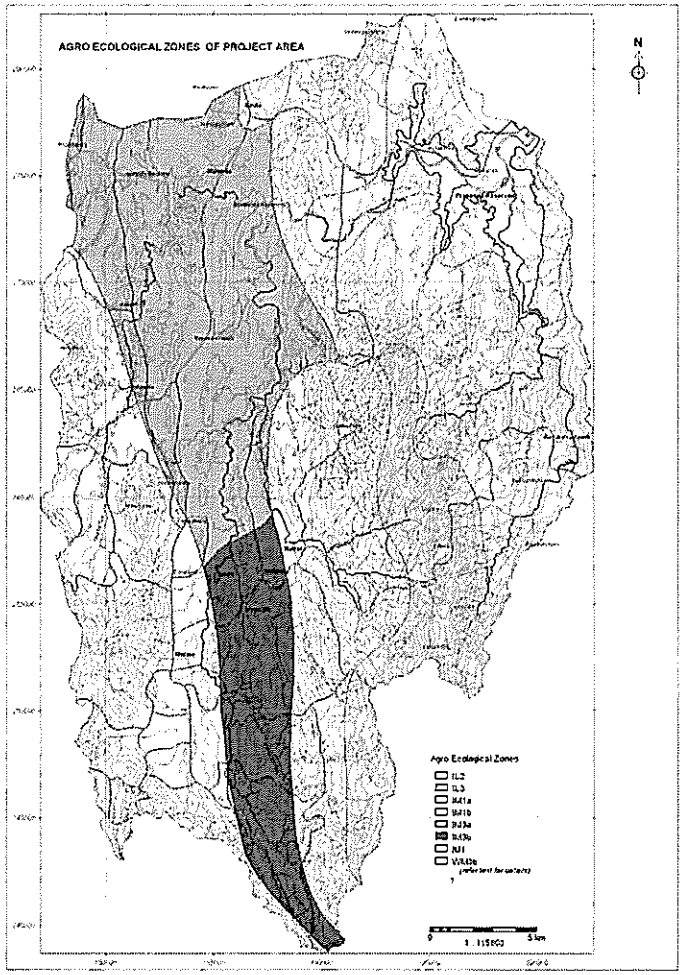


Fig 3.11 Agro ecological zones of the catchment area

3.2.7 Agroecological zones

An agro-ecological region represents a particular combination of the natural characteristics of climate, soil and relief (Panabokke, 1996). When an agro-climatic map, which can be considered as areas where the integrated effect of climate is uniform throughout the area for crop production, is superimposed on soil and terrain the resulting map identifies agro-ecological regions. Thus, each agro-ecological region represents somewhat uniform agro-climate, soils and terrain conditions and as such would support a particular farming system where certain range of crops and farming practices finds their best expression. The Wet zone covers the area, which receives relatively high mean annual rainfall over 2,500 mm without pronounced dry periods. The Dry zone is the area, which receives a mean annual rainfall of less than 1,750 mm with a distinct dry season from May to September. The Intermediate zone demarcates the area, which receives a mean annual rainfall between 1,750 to 2,500 mm with a short and less prominent dry season. As low temperature is an important climatic factor affecting plant growth in the Wet and Intermediate zones of Sri Lanka, a sub-division based on the altitude takes into account the temperature limitations in these two climatic regions. In this delineation, the Low-country is demarcated as the land below 300 m in elevation and the Mid-country with elevation between 300 - 900 m while the Up-country is the land above 900 m elevation. The main distinguishing characteristics of each agro-ecological region are denoted by a 4-character code consisting of letters and a number. Three major climatic zones are indicated by the first upper case letter of the code (W, I and D). The second upper case letter of the code (L, M and U) denotes three categories of elevation. The numerical character in the third place of the code represents a more detailed moisture regime (rainfall and evaporation combined) with a degree of wetness on the scale of 1 to 5 where 1 being the most favorable. The lower case letter in the fourth place indicates a sub-region as determined by rainfall distribution and other physical environmental factors where degree of wetness decreases a > f.

3.2.7.1. Agro-ecological zones within the catchment of Moraghakandu

Agro-ecological zones lying in the catchment area was extracted from the map depicting Agro-Ecological Zones of Sri Lanka (Natural Resources Management Centre, Department of Agriculture, 2003). Information on agro-ecological zones and their spatial distribution is important when deciding crops / Cropping systems for the Project area (**Fig 3.11**).
Major part of the catchment area lies within the intermediate zone while the higher elevations towards the central highlands fall within the mid country wet zone. The areas under the intermediate zone of the catchment consist of five ecological subzones (Agro-ecological regions of Sri Lanka, Natural Resources Management Centre, Department of Agriculture, 2003); namely IU1, IM3a, IM3b, IL2 and IL3 while the area falling into mid country wet zone, consist of only one ecological subzone, namely the WM3b.

3.2.7.2 Ecological subzone IU1

The sobzone covers a part of Knucles range falling within the Morogahakanda catchment and receives the highest rainfall compared to the other areas of the catchment. Landscape is mountainous, steeply dissected, hilly & rolling. Most dominant soils are Red Yellow Podzolics, Mountainous Regosols, Lithosols and occasionally Immature Brown loams are

occurring. At 75% probability annual rainfall expectancy is 2,400 mm. Being in the Knuckles range, this region receives ample amount of rains from North East Monsoons while the contribution from South Western Monsoon rains is also substantial. The distribution of rainfall (**Fig 3.12**) exhibits a stronger *Maha* Season spreading over October to January, while the *Yala* season substancial. Most dominant landuses are Tea, Export Agricultural Crops, Natural and Forest plantations.

3.2.7.3 Agro-ecological sub-zone IM3a

The subzone IM3a is a narrow strip adjacent to Knucles range and villages such as Kaikawala, Dombagoda and Imbulpitiya are falling within this subzone. The landscape is hilly, rolling & steep. Dominant soils are Immature Brown Loam, Reddish Brown Latasolic and Low Humic Glay soils in valley bottoms. Main land uses are mixed home gardens, export agricultural crops and paddy. The annual rainfall expectancy at 75% probability level is 1. 400 mm. The length of the Maha season is shorter compared to the IU1. Although Yala rain is not adequate, with some water conservation techniques a crop can be raised. (**Fig 3.13**).

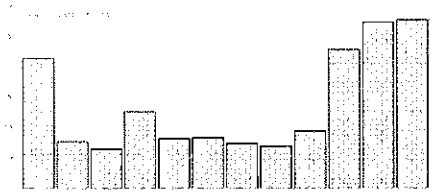


Fig 3.12 Rainfall in IUI

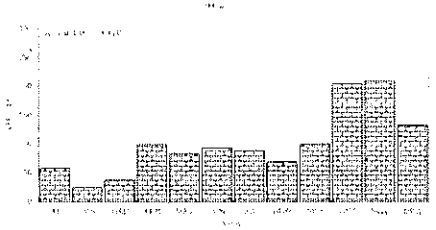


Fig 3.13 Rainfall in IM3a

3.2.7.4 Agro-ecological sub-zone IM3b

The subzone IM3b is falling in areas such as Nalanda, Akuramboda, Kaudupelllela, Medawela and Diggala etc. The landscape is rolling and undulating. The dominant soils are Reddish Brown Latosolic, Reddish Brown Earth and Low Humic Glay soils in valley bottoms. Main land uses occurring in the zone are mixed home gardens, export agricultural crops, rubber, vegetables and paddy. The rainfall expectance at 75% probability is > 1,200 mm per annum. The main rainy season Maha prevails from October to January while during Yala a considerable rainfall occurs only in April (**Fig 3.14**).

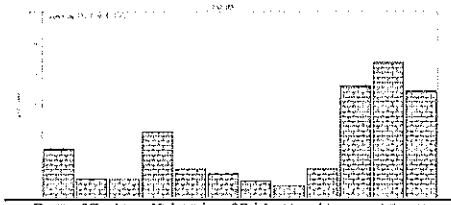


Fig 3.14 Rainfall in IM3 b

3.2.7.5 Agro-Ecological subzone IL2

The surroundings of the villages such as Talagoda, Medpihilla, Elagomuwa and Ambana are falling within this agro-ecological subzone. The landscape varies from rolling and hilly to

undulating in lower elevations. The dominant soils are Reddish Brown Earths, Reddish Brown Latosolics and Low Humic Glay soils. Main landuses are mixed home gardens, paddy, rainfed upland crops and Scrubs. The rainfall at 75% probability is 1,600 mm per annum. IL2 agro-ecological region exhibits a distinctly uni-modal rainfall (Fig 3.15) distribution along with a long and pronounced dry period from April to September. Major rainfall season Maha is an extended season from October to up to late January or early February. Yala season is not effective, thus soil moisture conservation measures play a vital role in farming.



Fig 3.15 Rainfall in IL2 zone

3.2.7.6 Agro-ecological sub-zone IL3

This agro-ecological sub-zone is laying in surroundings of the village Deverapola and in extent this is the smallest sub-zone lying in the catchment. Moreover, the landscape is also comparatively subdued and it is undulating. Dominant soils are Non Calcic Brown, Reddish Brown Earth and Low Humic Glay. Major landuses are coconut, paddy and mixed home gardens. This zone exhibits the lowest rainfall regime (Fig 3.16) within the catchment and the rainfall expectance at 75% probability is > 1,100 mm per annum. The main rainy season Maha is shorter compared to the other zones and the Yala is marginal. Therefore soil moisture conservation measures for any crop, plantation is important.



Fig 3.16 Rainfall in IL3 zone

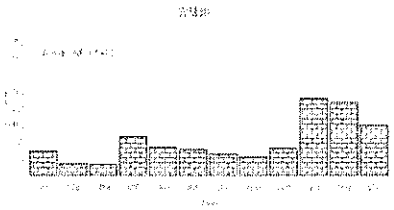


Fig 3.17 Rainfal in WM3b

3.2.7.7 Agro-ecological subzone WM3b

This is the only agro-ecological subzone within the catchment which exhibit rainfall regimes characteristic to the wet zone. Locations such as Ukuwela, Nagolla, Matale, Etipola, Rattota, Elkaduwa and their surrounds are falling into this subzone. Landscape is hilly , rolling, steep and undulating. Dominant soils are Reddish Brown Latosolics, Iinmature Brown Loam and Low HUmic Glay. Dominant landuses are mixed home gardens, export agricultural crops, tea, rubber and paddy. The annual rainfall expectance at 75% is > 1,400 mm. Rainfall distribution is satisfactory, thus farming either with annuls or with perennials poses no serious limitations (Fig 3.17).

3.2.7.8 Ecological zones in proposed settlement area

The proposed settlement area is lying in the agro-ecological sub-region DL1C. The terrain is undulating. Reddish brown earths and Low Humic Glay are the dominant soils. Major landuses are rainfed upland crops, and paddy, scrubland, homesteads and forests. The annual rainfall expectancy at 75% is > 900 mm. This ecological subzone is receiving Northeast monsoons and the effect of South-west monsoonal rains are minimal. Thus, agro-ecological sub-region DL1C supports only Maha crop under rainfed condition while a Yala crop is not possible. Therefore, when settling beneficiaries, requirements of irrigation should be addressed adequately (see Fig 3.18).

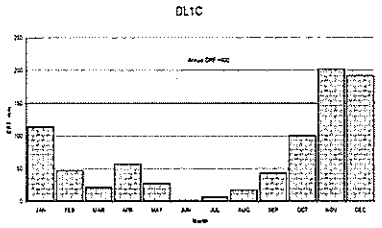


Fig 3.18 Rainfal in DL1C

3.2.8 Potential evapotranspiration

Potential evapotranspiration is a climatic variable which represents the "water demand of the atmosphere", often referred to as water requirement of a conventional crop. Actual crops have different requirements, which are related to crop development and weather conditions. A reasonable estimate of potential evapotranspiration of a particular agro-ecological environment is a prerequisite for efficient management of irrigation water of the given environment. In Sri Lanka, estimation of crop water requirements and irrigation scheduling are being done based on *relatively global* estimates of potential evapotranspiration values, approximated to the nearest point observation of Pan evaporation (Ponrajah,1984). Hence irrigation planners are hindered with lack of reasonable approximations of potential evapotranspiration values for their respective irrigation schemes of which lead to inaccurate planning, resulting low water productivity. Moreover, potential evapotranspiration is an essential input parameter for watershed based hydrological models aiming at prediction of hydrological parameters which are required for designing of proper catchment management plans.

Therefore, the spatial and temporal variability of potential evaporation over the catchment and in the proposed settlement area is given in tabular format. Mean daily PET values for each calendar month, with respect to each agroecological zone falling in the Project area (catchment & the proposed settlement) is given in the **Table 3.5.**

Table 3.5. Mean PET (mm/day) and Standard Deviations for agro-ecological zones lying in the Project area (adopted from the Journal of Soil Science, 2004).

CLIMATIC ZONE	AGRO-ECOLOGICAL REGION		JAN		FEB		MAR		APR	
			MEAN	STD	MEAN	STD	MEAN	STO	MEAN	STD
Wet Zone	Mid	WM3b	2.56	0.19	3.11	0.19	3.35	0.13	2.97	0.12
Intermediate Zone	Up	IU1	2.40	0.09	2.93	0.11	3.27	0.07	2.88	0.12
	Mid	IM3a	2.46	0.08	2.94	0.08	3.24	0.05	2.79	0.13
		IM3b	2.45	0.01	3.16	0.06	3.46	0.08	3.26	0.12
	Low	IL2	2.54	0.44	3.16	0.53	3.65	0.32	3.40	0.38
		IL3	2.55	0.11	3.25	0.05	3.87	0.17	3.40	0.06
		DL1c	2.73	0.32	3.28	0.20	3.89	0.23	3.77	0.33
		DL1e	2.65	0.30	3.05	0.27	3.68	0.24	3.62	0.28

CLIMATIC ZONE	AGRO-ECOLOGICAL REGION		MAY		JUNE		JULY		AUG	
			MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
Wet Zone	Mid	WM3b	2.81	0.14	2.35	0.22	2.58	0.19	2.58	0.22
Intermediate Zone	Up	IU1	2.84	0.10	2.60	0.21	2.76	0.22	2.77	0.22
	Mid	IM3a	2.75	0.08	2.30	0.12	2.49	0.07	2.47	0.08
		IM3b	3.28	0.23	3.14	0.37	3.37	0.34	3.47	0.40
	Low	IL2	3.46	0.28	3.60	0.51	3.84	0.36	3.93	0.41
		IL3	3.38	0.12	3.33	0.15	3.58	0.16	3.74	0.17
		DL1c	4.15	0.48	4.52	0.62	4.65	0.52	4.82	0.61
		DL1e	3.99	0.34	4.30	0.39	4.31	0.37	4.39	0.51

CLIMATIC ZONE	AGRO-ECOLOGICAL REGION		SEP		OCT		NOV		DEC	
			MEAN	STD	MEAN	STD	MEAN	STD	MEAN	STD
Wet Zone	Mid	WM3b	2.69	0.20	2.31	0.13	2.06	0.10	2.15	0.12
Intermediate zone	Up	IU1	2.79	0.16	2.31	0.09	2.06	0.03	2.06	0.07
	Mid	IM3a	2.57	0.09	2.17	0.08	2.03	0.06	2.09	0.05
		IM3b	3.54	0.38	2.80	0.24	2.12	0.05	2.14	0.03
	Low	IL2	3.73	0.42	2.98	0.45	2.51	0.56	2.28	0.44
		IL3	3.59	0.21	2.71	0.18	2.14	0.07	2.12	0.10
Dry Zone		DL1c	4.57	0.56	3.49	0.41	2.50	0.20	2.31	0.16
		DL1e	4.42	0.37	3.15	0.39	2.22	0.23	2.06	0.20

3.3 Man made & integrated factors

Due to population density, infrastructure development, waste generation cause the changes in landuse over the years. These changes in landuse could cause soil erosion, nutrient loading, pesticide leaching into water ways & finaly could deteriorate the quality of water in the water resources of the catchment. Therefore it is important to analyze the magnitude of these anthropogenic activities within the catchment which would help in preparation of watershed management plan.

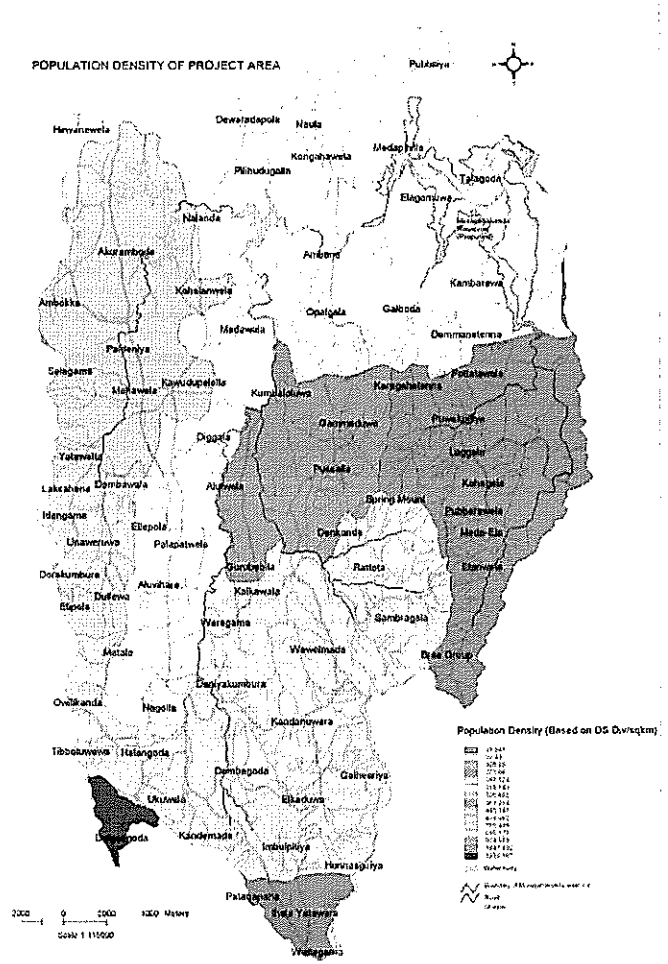


Fig 3.19 Population density in the catchment

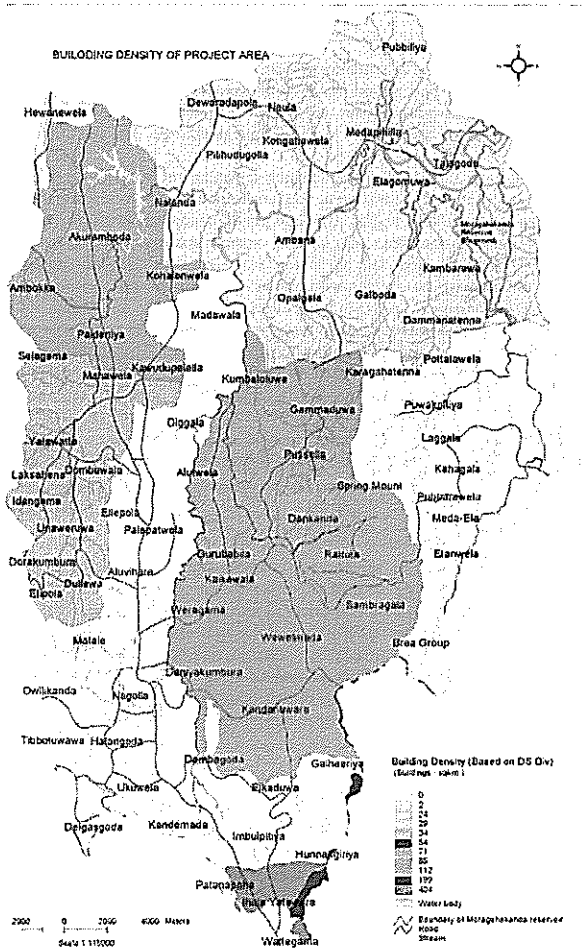


Fig 3.20 Housing density in the catchment

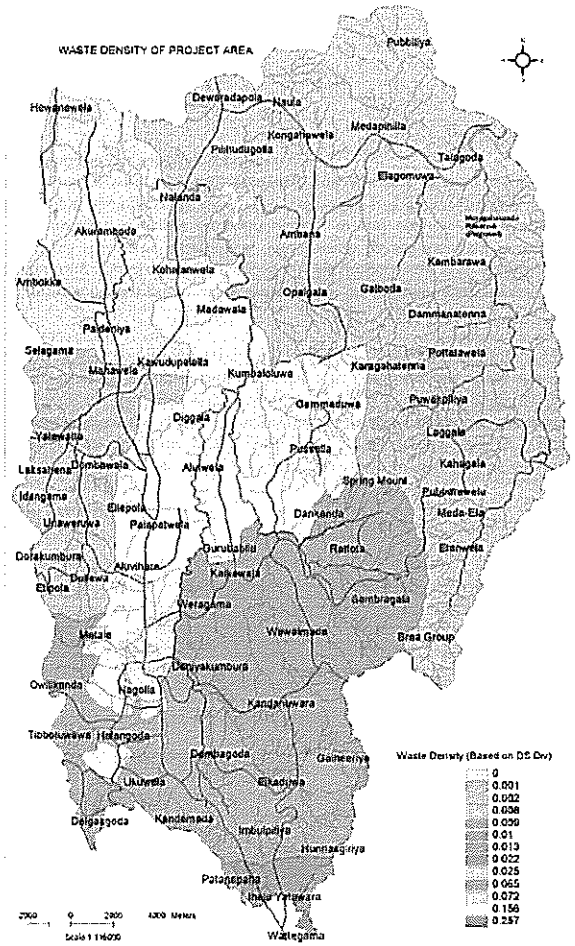


Fig 3.21 Waste generated in the catchmen area

3.3.1 Population, Housing & waste density

Population , housing density & waste generation in the Moragahakanda catchment are illustrated in **Fig. 3.19, 3.20 & 3.21** respectively. The highest population density within the catchment is located in Delgasgoda; 1936 per km^2. The lowest population of 32 per km^2 is distributed in Pottawela, Karagahatenna, Puwakpitiya, Laggala, Kahagala, Pubbarawela, Meda Ela, Etanwela & in Brea group. Within the proposed reservoir area the density is 99 per km^2.

The building structures / housing density is 24 per km^2 within the reservoir area. The highest housing density is indicated within the southern region of the catchment in Patanapaha & in Ihalayatawara region (424 per km^2).

As illustrated in **Fig 3.21**, highest waste generation is also recorded within the southern part of the catchment; in Patanapaha & in Ihalayatawara region with 0.257 Metric tons per km^2 . In the proposed reservoir area the waste generation is low; 0.002 MT per Kg^2 per day.

These figures indicate that at present the waste generation in the catchment area is comparatively low. However it is important to introduce proper waste treatment methods rather than dumping which is the common practice in Sri Lanka. In Moragahakanda catchment area the population and housing density will increase with the construction of the reservoir & the infrastructure development of the area. Improper waste disposal have caused water pollution of the reservoirs in many regions of the country. Therefore proper waste management practices are essential to protect Moragahakanda reservoir from eutrophication & pollution & this aspect will be addressed in the watershed management plan..

3.3.2 Landuse

Landuse is the spatial pattern of activity in a given area arising out of natural or human induced activities during past or at present. Landuses includes agricultural, industrial, residential, commercial, recreational, areas under forestry and wild life and areas used for infrastructure development. The capacity of a watershed to deliver water for downstream use, both surface flow as well as sub-surface is determined by the nature of its landuse. The highest sustainability can be achieved if the watershed is maintained in its natural state either as a forest or as grassland, without external disturbances. Disturbances, either through the cultivation of agricultural crops, deforestation, intensive grazing or any other landuse that accelerates runoff, leads to increase surface runoff and soil erosion while minimizing the longevity of stream flow. Under the local context, population pressure has led to the degradation of watersheds through the clearance of land for cultivation, urbanization, infrastructure development and exploitative logging. The major constraints in ensuring adoption of appropriate watershed management practices have their origin in social factors, institutional inadequacies and an appropriate policy environment.

The catchment of the Morgahakanda consist of several landuses such as forest, homesteads, poorly & moderately managed tea, coconut and other mixed trees, upland crops, scrubs, non-agricultural lands, grasslands, paddy and negligible extent of bare lands. (See present Land Use map of the catchment, **Fig 3.22**). Extents of lands under

each use are given in Table 3.6. The present land use indicates that nearly 75% of the catchment area is covered with some form of perennial system, thus the threat of soil erosion due to landuses is low.

Table 3.6 Landuse categories in the catchment

Landuses	Area (sq. km)	% Area
Water Bodies	11.36	1.51
Associated non agriculture lands	8.12	1.08
Homesteads	100.54	13.40
Moderately Managed Tea	27.97	3.72
Poorly Managed Tea	91.47	12.19
Coconut	32.43	4.32
Mixed tree and other perennials	75.28	10.03
Paddy	58.70	7.82
Sparsely used croplands and other croplands	71.6	9.54
Dense Forest	114.30	15.23
Open Forest	74.08	9.87
Forest Plantation	8.96	1.19
Scrub Land	49.01	6.53
Grass Lands	19.71	2.62
Bare lands	6.55	0.87

3.3.3 Soil erosion

Soil erosion is a three phase phenomenon, consisting of detachment of individual soil particles from soil mass and their transport by erosive agents such as water and wind. Under local context wind erosion is negligible while soil erosion due to water is the main causative factor for land degradation. Soil erosion due to water is either as direct impacts of raindrops or as the effect of running water. The major factors which affect the amount of soil erosion are rainfall characteristics, soils, land cover, topographic factors and land management.

In order to implement a proper conservation plan for the catchment area, effects of above factors occurring within the catchment should be properly assessed and their combined or resultant effect should be ascertained. The erosion hazard mapping is the accepted and most versatile tool to depict the vulnerability to soil erosion under present land use. Therefore input factors such as rainfall erosivity, soil characteristics, land slope and present land uses were spatially analyzed and the soil erosion hazard map for the Moragahakanda catchment area was derived.

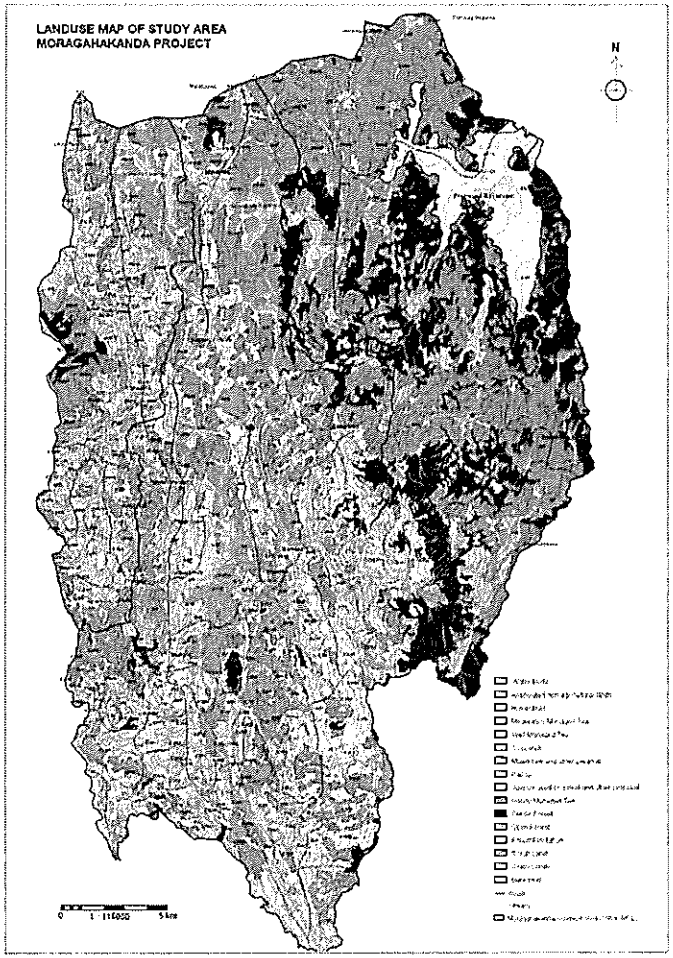


Fig 3.22 Landuse map of the Morgahakanda catchment area

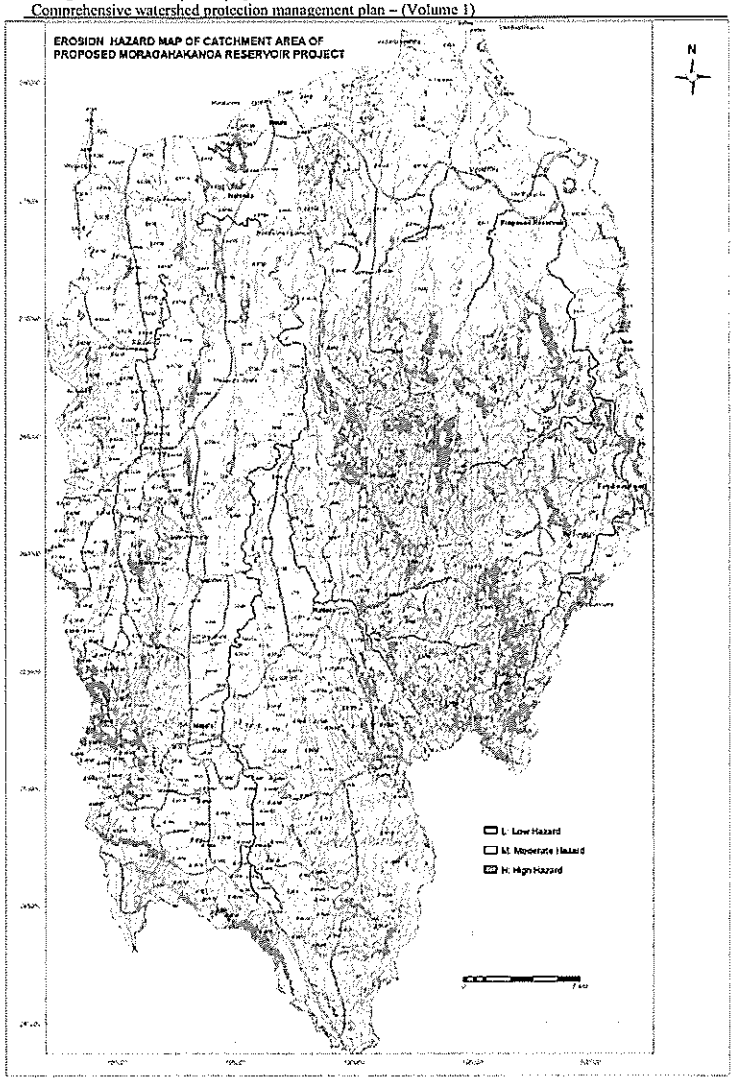


Fig 3.23 Soil erosion hazard classes in Moragahakanda catchment

3.3.3.1 Soil erosion hazard mapping

Prioritization of erosion prone areas is a prerequisite for conservation planning. Therefore, spatial representation of soil erosion prone areas is an important management tool for watershed based conservation planning. Therefore, soil erosion hazard within the catchment areas was prepared using inputs such as existing landuse, rainfall amount & erosivity, soil erodibility and slope of the land. The prepared map was field validated and corrected to represent a more realistic field situation. Three classes were identified based on susceptibility for soil erosion and map illustrated in **Fig 3.23** depicts the relative soil erosion hazard of the Moragahakanda catchment and it highlights the key areas for implementation of soil conservation programs. In addition it emphasizes the areas that can be considered for landuse changes. The **Table 3.7** indicates the extents of lands falling under each soil erosion hazard class within the catchment. However, the soil erosion hazard analysis confirms that the Morgahakanda catchment cannot be considered as a highly erosion prone catchment but as moderately prone, as a whole.

Table 3.7 Soil erosion hazard classes

Soil Erosion Hazard Class	Area (Sq.Km)	% Area
Low Hazard	414.84	59.48
Moderate Hazard	200.59	28.76
High Hazard	81.95	11.75

3.3.3.2 Low erosion hazard areas

Nearly 60% of the lands in Moragahakanda catchment are falling into this class. Low erosion risk in theses areas is mainly due to the effect of mild slope which dominates the other factors pertaining to the area. On the other hand, landuses such as homesteads, lands with perennial systems such as mixed gardens with minor export crops & coconut, scrubs, paddy, and forests occurring in these areas further reduces the soil erosion risk, thus limited interventions in terms of soil conservation would be adequate depending on the percent slope of the land. However annual cropping especially in uplands needs attention and suitable soil conservation activities are a must.

3.3.3.3 Moderate soil erosion hazard areas

The areas falling into this class are scattered in allover the catchment area and totaling around 200 sq.km which represents nearly 30% of the catchment area (Soil erosion hazard map (**Fig. 3.23**). The land uses occurring in this class are, areas with upland cropping and sparsely used croplands, homesteads or other perennial systems with meager land cover, scrubs and marginal tea lands. If suitable landuse changes can be introduced, these lands can be brought under the class of low erosion hazard. Such measures are; improvement of canopy cover with establishment of fruit trees, trees with timber values or with export crops such as coco, palm, pepper, coffee etc. In case of marginal tea lands, rehabilitation with vegetatively propagated tea or diversification with agro-forestry, orchards or forestry can be considered as practical options that reduces the susceptibility for soil erosion. However, in instances where vegetables are grown, strict conservation measures are essential. Conversion of scrub into forest / agro-forestry systems would not only minimize the erosion risk, but also would be more economically

viable.

3.3.3.4 High erosion hazard areas

Extents of lands under this class are nearly 82 sq. km and it is only 12 % o the total catchment. Most of the areas with extremely high soil erosion hazard are towards the southern boundary (Soil Erosion hazard map (**Fig 3.23**) of the catchment and land slope is the key factor for high erosion hazard. The areas are dominantly under sparsely used annual croplands, marginal tea, scrublands in steep slopes. In terms of soil erosion control, this area should be given the highest priority. Although natural vegetation or an agroforestry system would be the best suited landuse for this area, it is not possible to completely rule out the vegetable cultivation, since it forms the main livelihood of the majority of people. Therefore, changing these areas into a perennial landuses should be carried out through phases. One alternative is, for those who are cultivating annual crops in these high erosion hazardous areas should be given suitable lands to do their cultivation, elsewhere while the other option is converting their annual cropping into perennial systems either to an agro-forestry ,orchards, or into forestry. In the latter case project should be able to support for the establishment and maintenance of the perennial system until such time they get an income.

3.3.4 Landslide hazards areas

3.3.4.1 Landslide Hazard in study area

According to the published 1:50,000 landslide hazard data for Matale district by NBRO, this analysis was conducted. Distribution of landslide hazard levels in study area are shown in **Table 3.8** (catchment area of Moragahakanda proposed reservoir). According to that, majority of the area fall in to low hazard category (see **fig 3.24**).

Table 3.8: Distribution of landslide Hazard data in study area

Landslide Hazard Class	Area distribution in %
High Hazard	5.72
Moderately Hazard	40.9
Low Hazard	53.38

(source : base data from NBRO publications)

Table 3.9 shows details of landslide hazard susceptibility data with respect to landuse classes of the area. That show, Majority of High hazard class fall in to Tea cultivated lands. That may be basically due to negligence of maintaining tea lands in the recent past. Anyhow that has to be verified at the field. Majority of moderately hazard class fall into Forest plantation and majority of low hazard also fall in to Tea plantations. As the base data are in 1:50,000 scale, some generalization can be expected. Any how, these results should be verified with the final field visit.

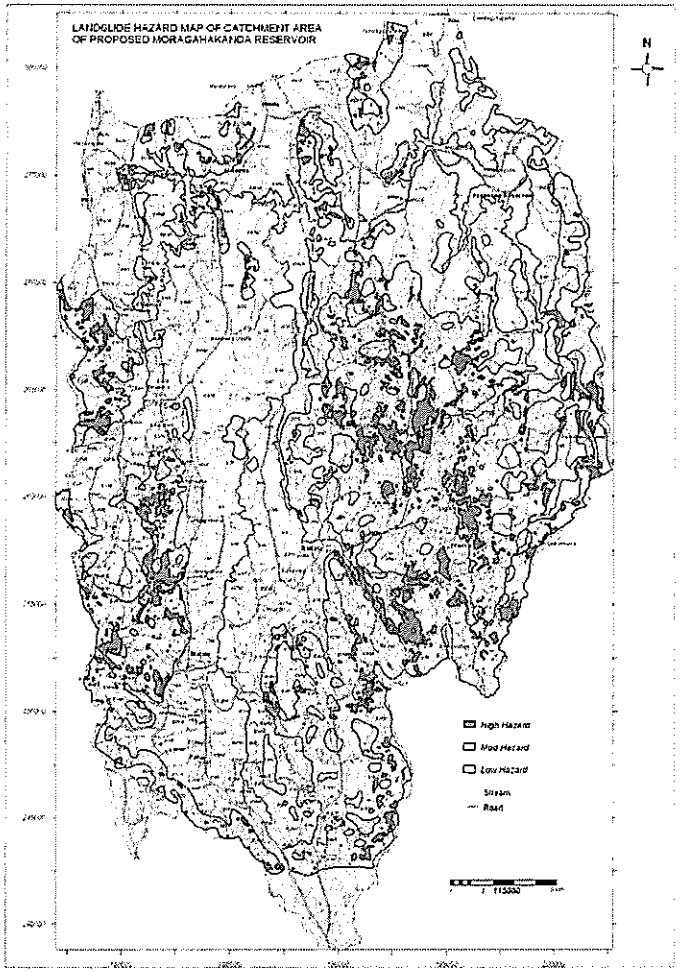


Fig 3.24 Landslide hazard map of Moragahakanda catchment.

Table 3.9: Distribution of landslide Hazard with respect to landuses in study area
(Source : Landslide hazard base data – NBRO)

Landuse Class	Landuse class Distribution %	Landslide Hazard class distribution %		
		High Hazard %	Moderately Hazard %	Low Hazard %
Baran Lands	0.00200	0.0023	0.0014	0.0017
Buildup and Non Agriculture	0.98000	6.2737	1.2293	0.2110
Coconut	0.56000	0.0368	0.1567	0.7527
Dense Forest	6.32000	0.2170	2.1984	8.2945
Forest Plantation	16.96000	4.2997	25.2187	10.3822
Grass Lands	1.33000	2.1124	2.7042	0.2272
Homestead	2.34000	10.3662	3.0013	0.8607
Mixed Trees and Perennials	15.33000	3.0376	7.5573	18.5871
Open Forest	4.95000	3.1774	5.3264	4.0755
Paddy	6.21000	16.9763	6.6128	4.0138
Rubber	8.57000	1.6833	4.2004	10.4094
Scrublands	4.79000	1.2024	1.8847	6.0752
Sparsely used croplands	6.86000	4.1309	7.4284	5.6512
Tea	24.79000	46.4841	16.2074	24.0124

According to hazard class distribution with respect to lithological units, that clearly shows high level of hazard exists with the quartzite and quartzitic rocks (**Table 3.10**).

Table 3.10: Distribution of Hazard class with respect to lithological units

Lithological unit	Area distribution in %	Hazard class distribution in %		
		High Hazard	Moderately Hazard	Low Hazard
Charnockitic Gniesses	38.65652	34.83	46.45	34.18
Granulitic Gniess	16.57283	9.01	10.98	20.84
Hornblende Biotite Gniess	8.86303	2.81	5.46	11.61
Marble	10.26611	0.77	4.02	15.14
Other undeferentiated rocks	0.47735	0.28	0.56	0.45
Quartzite and Quartzitic rocks	25.16417	52.3	32.54	17.79

Table 3.11 shows the GN divisions, which have highest potential for landslide hazards. All above analytical data are based on Landslide Hazard zonation map published by NBRO at the scale of 1:50,000. and field verification is required prior to finalized and according to that only suitable mitigatory measures can be introduced. Anyhow it may be essential to apply long term biological mitigatory measures to reduce the risk due to landslide hazard, as some possible areas are close to the proposed reservoir.

Table 3.11: Highest Landslide Hazard prone GN divisions

GN DIV Number	% of High Hazard in area	GN Division	Divisional Secratariate division
400A	9.54	Divulgaspathana	Laggala-Pallegama
E375D	5.13	Bambarakiriella	Rattota
381C	5.06	Gammaduwa	Ambanganga Korale
385	4.71	Pitawala	Laggala-Pallegama
E383	4.64	Opalgala	Naula
E375E	2.88	Medawetta	Rattota
399	2.81	Pottatawela	Laggala-Pallegama
E408	2.35	Galboda	Naula
386	2.32	Etanwela	Laggala-Pallegama
E343F	2.28	Galudahena	Ukuwela
E375F	2.18	Medamumbura	Rattota

Chapter 4
Photographic survey

This survey is useful to find out the different activities in the catchment which is useful in landuse planning. The survey was conducted in each sub catchment namely; the Nalanda reservoir catchment, Bowatenna reservoir catchment & the proposed Moragahakanda catchment. Fig. 4.1 illustrates the locations visited. The plates indicate different catchment activities & the impacts. In chapter 5, mitigatory activities and the landuse planning mechanism will be described.

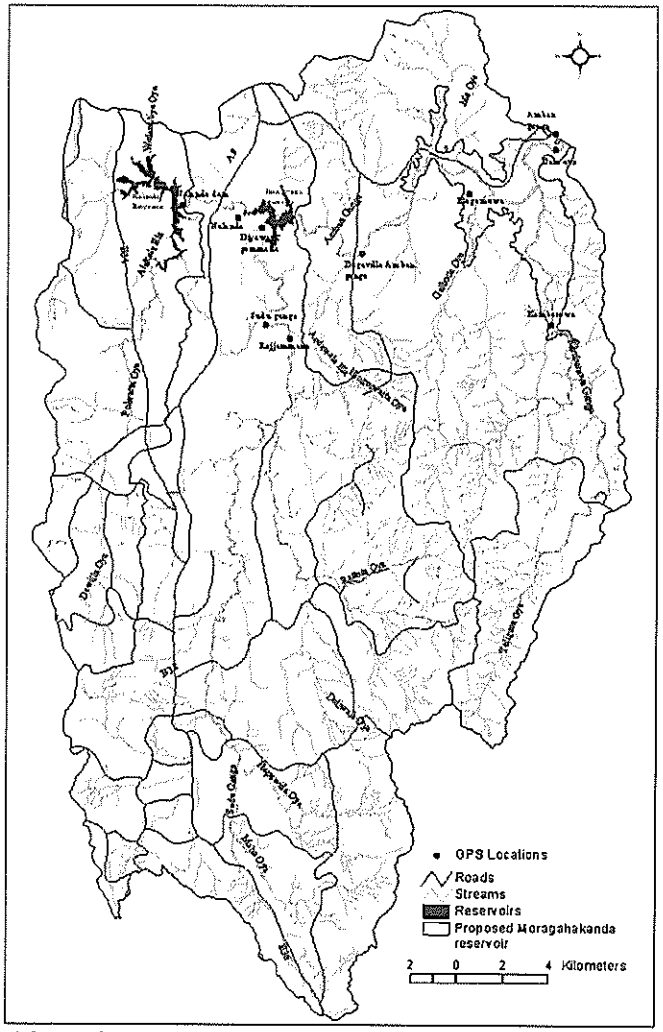


Fig 4.1 Locations of photographic survey

4.1 Nalanda Reservoir



Plate 1. Nalanda left bank (274088 N, 183464 E)



Plate 2. A team discussion on the way to Nalanda reservoir dam (274088 N, 183464 E)



Plate 3. Trunk of the Nalanda Reservoir (274091 N, 183466 E)

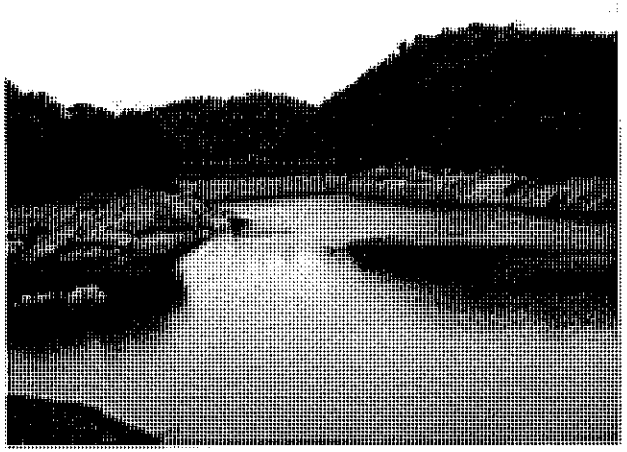


Plate 4. Nalada Reservoir –Dam site (274091 N, 183466 E)

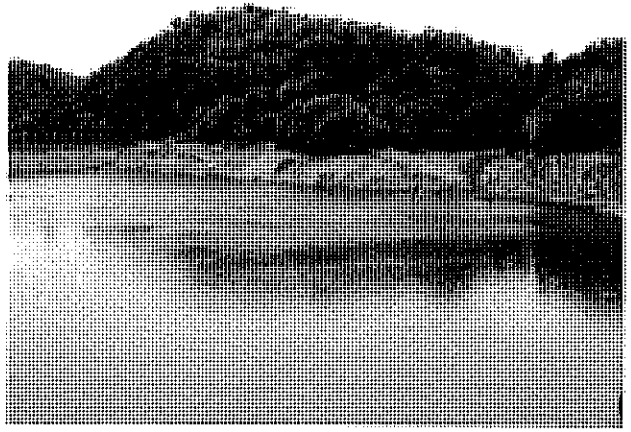


Plate 5. Nalanda reservoir - Right bank (274091 N, 183466 E)



Plate 6. Nalanda reservoir - Upstream (274091 N, 183466 E)



Plate 7. Nalanda reservoir - Dam (274091 N, 183466 E)



Plate 8. Trunk of Nalanda reservoir (274091 N, 183466 E)

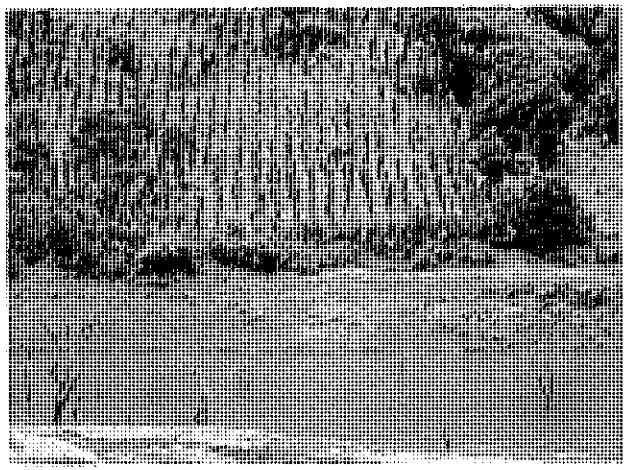


Plate 9. Cultivation at Nalanda reservoir upstream (274091 N, 183466 E)



Plate 10. Home garden at Diyawara Gammana, Bowatenna upstream (273111 N, 186817 E)

4.2 Bowatenna reservoir catchment



Plate 11. Brick's place at Diyawara Gammana, Bowatenna upstream (273111 N, [illegible])



Plate 12. Gravel pit at Diyawara Gammana, Bowatenna upstream (273111 N, 186817 E)

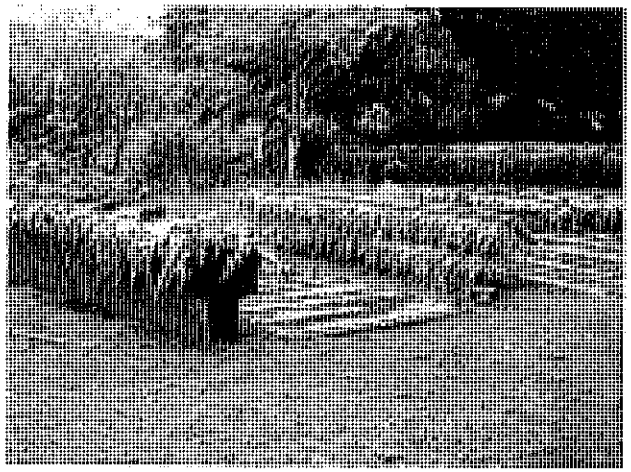


Plate 13. Brick's place at Diyawara Gammana, Bowatenna upstream (273111 N, 186817 E)



Plate 14. Brick's place at Diyawara Gammana, Bowatenna upstream (273111 N, 186817 E)



Plate 15. Brick manufacturing - Diyawara Gammana, Bowatenna upstream (273111 N, 186817 E)



Plate 16. Degraded waters due to brick manufacturing - Diyawara Gammana, Bowatenna upstream (273111 N, 186817 E)

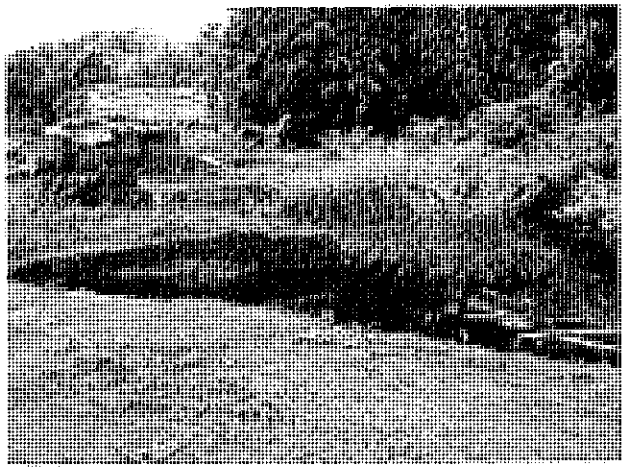


Plate 17. Effect of brick manufacturing activity in the 100m sensitive area - Diyawara Gammana, Bowatenna upstream (273111 N, 186817 E)



Plate 18. Degraded shore due to brick manufacturing activity - Diyawara Gammana, Bowatenna upstream (273111 N, 186817 E)



Plate 19. Sudu Ganga at Rajjamma Bowatenna upstream (268885 N, 187004 E)



Plate 20. Sudu Ganga at Rajjamma Bowatenna upstream (268885 N, 187004 E)

4.3 Moragahakanda catchment



Plate 21. Dagavilla at Amban Ganga, Moragahakanda reservoir area (271966 N, 191138 E)



Plate 22. The working team at Dagavilla closer to Amban Ganga, Moragahakanda reservoir area (271966 N, 191138 E)

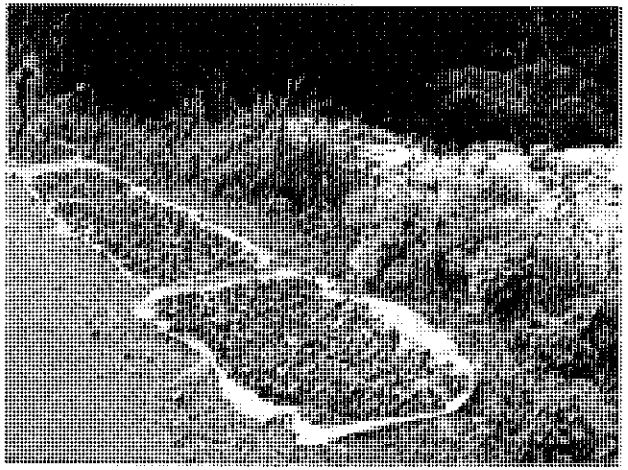


Plate 23. Mica washing place at Dagavilla closer to Amban ganga (271966 N, 191138 E)

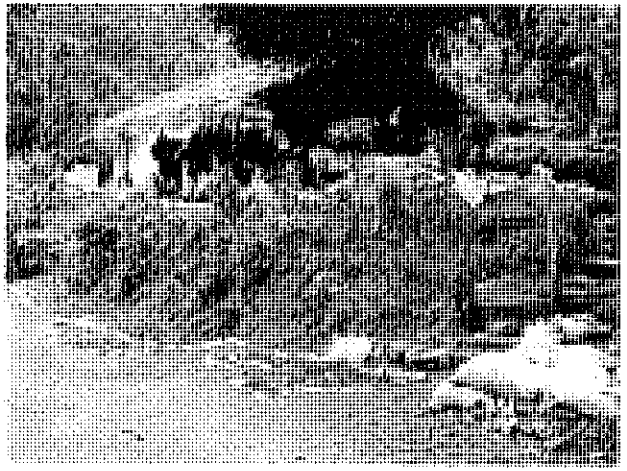


Plate 24. Mica washing place at Dagavilla closer to Amban ganga (271966 N, 191138 E)



Plate 25. Mica washing at Dagavilla closer to Amban ganga (271966 N, 191138 E)

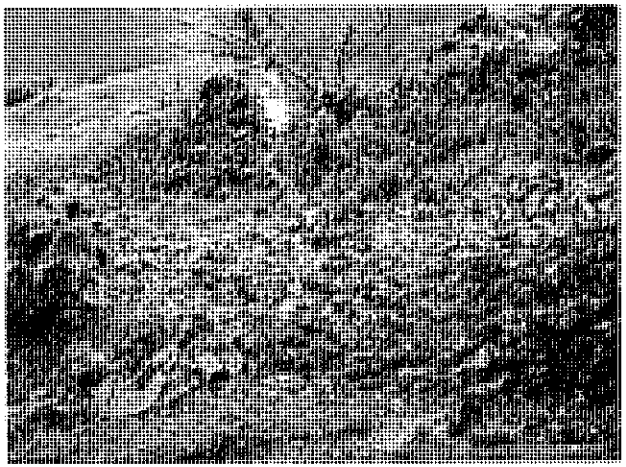


Plate 26. Accumulated waste of Mica at Dagavilla closer to Amban ganga (271966 N, 191138 E)



Plate 27. The people involve in mica industry at Dagavilla closer to Amban ganga (271966 N, 191138 E)

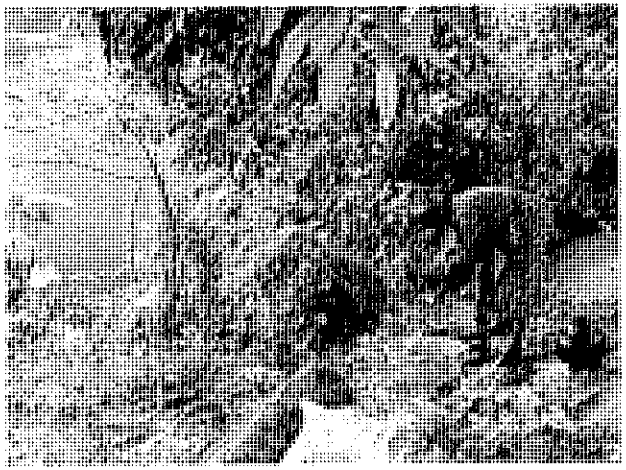


Plate 28. Washing of Mica at Dagavilla closer to Amban Ganga (271966 N, 191138 E)



Plate 29. A hut where mica material stored for preparation - at Dagavilla eloser to Amban Ganga (271966 N, 191138 E)



Plate 30. Discussing with the people at Elagamuwa (274571 N, 195798 E)

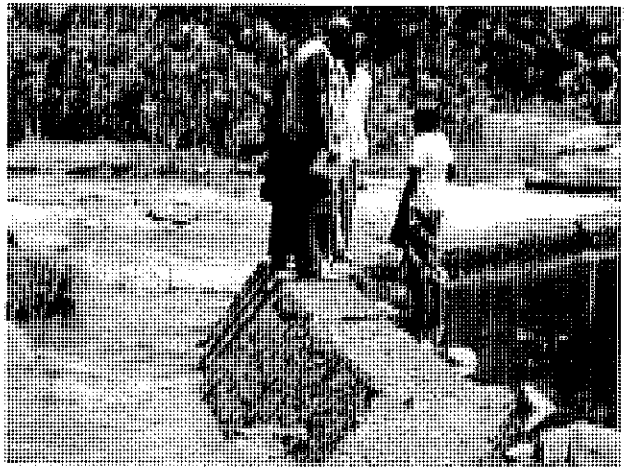


Plate 31. Discussing with the people at Kambarawa (268879 N, 199351 E)



Plate 32. Discussing with the people at Kambarawa (268879 N, 199351 E)



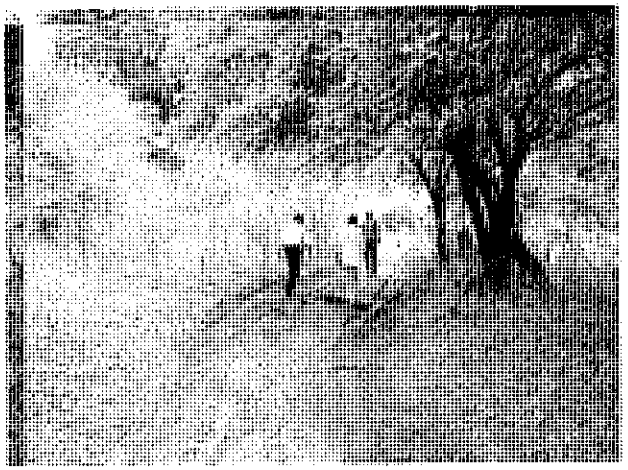
Plate 33. Proposed Moragahakanda dam site (277200 N, 199546 E)



Plate 34. Scrubs land closer to proposed dam site (276539 N, 199553 E)



Plate 35. Scrubs land closer to proposed dam site (276539 N, 199553 E)



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Chapter 5
Upper watershed management plan

5.1. Forest cover of the catchment

5.1.1 Identification of areas under forest covers at present in the Moragahakanda reservoir catchment & recommendation to preserve it.

5.1.1.1 Vegetation type & vegetation cover

Table 5.1 illustrates the tree species found in Moragahakanada catchment area The watershed of Moragahakande reservoir and its command area are situated in the floristic regions twelve, three and two- Knuckles, northern and intermediate lowlands and the dry lowlands, respectively. Agroecologically this area belong to the intermediate lowlands, midlands and uplands and the dry lowlands. Two major natural vegetation formations in the proposed project area are moist monsoon forest and the dry-mixed evergreen forests. Moist monsoon forests are found in the project area lies in the intermediate zone (Matale district) having annual rainfall 1400-2000 mm and dry season of three to six months. This forest formation is characterized by canopy tree species such as *Chloroxylon swietenia* (Burutha), *Berrya cordifolia* (Halmilla), *Vitex altissima* (Milla), *Schleichera oleosa* (Kon) and Syzygium *cumini* (Damba). The proportion of species such as *Haldina cordifolia* (Kolon) *Holoptelia integrifolia* (Godakirilla) *Berrya cordifalioa* (Halmilla) *Mitragyna parvifolia* (Helamba), *Madhuca longifalia* (Mee), *Mangifera zeylanica* (Etamba), *Filicium decipiens* (Pihimbiya), *Phyllanthus* (Karaw) and *Alseodaphne semecarpifolia* (Wewarana), increases in moist places whereas near the water courses there exists a riparian vegetation comprising *Terminalia arjuna* (Kumbuk), *Hydnacarpus* (Makulla), *Myristica dactyloides* (Malaboda) etc.

Drypetes sepiaria (Wira) and *Manilkara hexandra* (Palu) are not common canopy trees in this forest formation. Most of the forest patches in the project area is degraded due to the forest clearance for chena and vegetable cultivation. After the abandonment these lands are colonized by pioneer species such as grasses and scrub vegetation. The degraded areas are not converted back to the closed -canopy forests through natural succession and these could be regarded as scrublands. Species such as *Bauhinia racemosa* (Maila), *Carissa spinarum* (Karamba), *Catunaregam spinosa* (Kukuruman), *Dichrostachys cinerea, Flueggea leucopyrus* (Katupila), *Gmelina asiatica* (Demata), *Grewia orientalis, Hugonia mystax, Ichnacarpus frutescens, Lantana camara* (Gandapana), *Memecylon umbellatum, Phyllanthus polyphyllus* (Kuratiya), *Scutia myrtina, Syzygium cumini* (Damba), *Toddalia asiatica* (Kudumiris) and *Ziziphus oenoplia* were recorded from the scrublands.

Table 5.1 Tree species recorded in Moragahakande catchment during the field survey. LN - Local name, HA - Habit, TS - Taxonomic status, CS - Conservation status; T – Tree; IN - Indigenous, I Introduced, E – Endemic; TR-Threatened; FE - Forest Enrichment Plant RR - Riverine Plant; HV - Home Garden and Avenue Plant. These species could be used in reforestation and enrichment planting in the catchment.

Family	Species	LN	HA	TS	CS	FE	RR	HV
Anacardiaceae	*Anacardium occidentale*	Cadju	T	I	-			3
Anacardiaceae	*Mangifera indica*	Amba	T	I	-			3
Anacardiaceae	*Mangifera zeylanica*	Etamba	T	E	-		2	
Annonaceae	*Polyalthia coffeoides*	Omara	T	IN	-	1		3
Annonaceae	*Polyalthia longifolia*	Ovila	T	IN	-		2	3
Bignoniaceae	*Stereospermum colais*	Dunu Madala	T	IN	-	1		3
Celastraceae	*Pleurostylia opposita*	Panakka	T	IN	-	1		- 3
Clusiaceae	*Garcinia spicata*	Ela Gokatu	T	IN	-		2	
Combretaceae	*Terminalia arjuna*	Kumbuk	T	IN	-		2	
Ebenaceae	*Diospyros affinis*	Kaku Mediriya	T	IN	-	1		3
Ebenaceae	*Diospyros ebenum*	Kaluwara	T	IN	TR	1		3
Ebenaceae	*Diospyros malabarica*	Timbiri	T	IN	-		2	
Euphorbiaceae	*Bridelia retusa*	Ketakela	T	IN	-	1		3
Euphorbiaceae	*Drypetes sepiaria*	Wira	T	IN	-	1		
Euphorbiaceae	*Mischodon zeylanicus*	Tammana	T	IN	-	1		
Fabaceae	*Albizia odoratissima*	Suruya Mara	T	IN	-			3
Fabaceae	*Cassia fistula*	Ehela	T	IN	-	1		3
Fabaceae	*Cassia roxburghii*	Ratu Wa	T	IN	-	1		3
Fabaceae	*Pongamia pinnata*	Karada	T	IN	-		2	
Fabaceae	*Saraca asoca*	Asoka	T	IN	-		2	3
Fabaceae	*Tamarindus indica*	Siyambala	T	IN	-			3
Flacourtiaceae	*Hydnocarpus venelnata*	Makulu	T	E	-		2	
Herinaindiaceae	*Gyrocarpus americalnus*	Hema	T	IN	-	1		
Lauraceae	*Alseodaphne semecarpifolia*	Wewarana	T	IN	-	1		
Logalniaceae	*Strychnos nux-vomica*	Goda Kaduru	T	IN	-	1		3
Logalniaceae	*Strychnos potatorum*	Ingini	T	IN	-	1		3
Meliaceae	*Azadirachta indica*	Kohomba	T	IN	-			3
Meliaceae	*Chukrasia tabularis*	Hulalu Hik	T	IN	-	1		
Meliaceae	*Melia azedarach*	Lunu Midella	T	IN	-			3
Moraceae	*Antiaris toxicaria*	Riti	T	IN	-	1		
Moraceae	*Artocarpus heterophyllus*	Kos	T	I	-			3
Moraceae	*Artocarpus incisus*	Del	T	I	-			3
Moraceae	*Ficus benghalensis*	INuga	T	IN	-			3
Moraceae	*Ficus drupacea*	INuga	T	IN	-			3
Moraceae	*Ficus racemosa*	Attikka	T	IN	-			3
Myristicaceae	*Myristica dactyloides*	Malaboda	T	IN	-		2	
Myrtaceae	*Syzygium cumini*	Madaln	T	IN	-	1	2	3
Rubiaceae	*Haldina cordifolia*	Kololn	T	IN	-	1		
Rubiaceae	*Mitragyna tubulosa*	Helamba	T	IN	-	1		
Rubiaceae	*Nauclea orientalis*	Bakmi	T	IN	-		2	
Rutaceae	*Aegle Marmelos*	Beli	T	I	-			3
Rutaceae	*Chloroxylon swietenia*	Burutha	T	IN	-	1	2	3
Sapindaceae	*Dimocarpus longan*	Mora	T	IN	-	1		
Sapindaceae	*Filicium decipielns*	Pihimbiya	T	IN	-	1		3

Sapilndaceae	*Lepisanthes senegaleInsis*	Gal Kuma	T	IN	-	1		
Sapilndaceae	*Lepisanthes tetraphylla*	Dambu	T	IN	-	1		3
Sapilndaceae	*Sapindus emarginata*	Penela	T	IN	-	1		3
Sapilndaceae	*Schleichera oleosa*	Kooln	T	IN	-	1		3
Sapotaceae	*Madhuca longifolia*	Mi	T	IN	-		2	
Sapotaceae	*Manilkara hexandra*	Palu	T	IN	-	1		
Sapotaceae	*Mimusops elengi*	Munamal	T	IN	-	1		3
Sterculiaceae	*Pierospermum suberifolium*	Welan	T	IN	-	1		
Sterculiaceae	*Sterculia foedida*	Telambu	T	IN	-	1		
Tiliaceae	*Berrya cordifolia*	Halmilla	T	IN	-	1	2	3
Tiliaceae	*Grewia helicterifolia*	Bora Damoniya	T	IN	-	1		3
Ulmaceae	*Holoptelea intergrifolia*	Godakirilla	T	IN	-	1		
Verbelnaceae	*Tectona grandis*	Thekka	T	I	-			3
Verbelnaceae	*Vitex altissima*	Milla	T	IN	-	1		3
Verbelnaceae	*Vitex leucoxylon*	Nebada	T	IN	-		2	

Moist monsoon forest and scrublands are found along the road from Kambarawa to Illukkumbura via Pottatawela, Moragolla, Elagamuwa, Polgahamulatenna, Dammantenna, and Beligoda in the lower and upper catchments of the reservoir.

The downstream area of the proposed project lies mainly in Pollonnaruwa district and the natural forest type found in the region is dry-mixed evergreen forest which is the typical dry zone forest dominated by species such as Palu (*Manilkara hexandra*), Wira (*Drypetes sepiaria*, and Burutha (*Chloraxylon swietenia*). The canopy consists of trees such as – *Manilkara* (Palu), *Drypetes* (Wira), *Chloroxylon* (Burutha), *Alseodaphne* (Wewarana), *Berrya* (Halmilla), and *Diospyros* (Kaluwara). *Drypetes* (Wira) forms the sub-canopy of these forests. The understorey vegetation includes medium sized trees such as *Diospyros ovalifolia, D. ferrea, Feronia acidissima, Xylopia nigricans, Nothapegia beddomei* and shrubs such as *Ochna lanceolata, Tarenna asiatica, Memecylan angustifolium, M. capitellatum, M. umbellatum, Mallotus resinosus, Craton laccifer* and *Dimorphocalyx globellus.*

These are narrow strips of tall forests found along the banks of Amban Ganga, Kambarawa ganga and other streams. *Terminalia arjuna* (Kumbuk) is the most common riverine species. Other species such as *Polyalthia longifalia, Madhuca longifolia, Diospyros malabaricum* (Timbiri), *Nauclea orientalis, Mangifera zeylanico* (Etamba), *Garcinia spicato, Diospyros ferrea, Homonoia riparia, Pongamia pinnata* (Karanda), *Hydnocarpus venenata* (Makulla), and *Vitex leucoxylon* (Nebada), are found in these forests.

Tree savanna or Damana grassland dominated by grass cover and scattered trees is characteristic vegetation formation found in south-east of Moragahakanda upper catchment. Species such as *Careya arborea* (kahata) and *Bridelia retusa* (Kotakela) are present. The common grass species in the savanna is *Aristida setacea, Imperata cylindrica* and *Panicum maximum.*

5.1.1.2 Forest cover to be established, wherever possible using the species prevalent in the area.

The location

The landuse map shows that the dense forest cover in the catchment is about 15% (Fig 3.22). Open forests and scrublands cover another 16% of the catchment. In addition, forest plantations, (1.2%), mixed trees and perennials (4.4 %), coconut (5.6%) and homesteads (14 %) altogether provide another 25% of the land under the tree cover. Therefore, about 56 % of the land area in the catchment is under the natural or man- made forests (plantations, homesteads etc.) in addition to the area coverd by tea (31 %) and grasslands (2.1%) giving the total about 90% of the catchment under some kind of vegetation cover. There are paddy fields (7.7 %), build up and non-agricultural lands (0.5%) and barelands (0.88%) in the catchment.

Management activity

The dense forest cover (25%) around the reservoir & in the catchment (indicated in Fig 3.22) should be preserved by the managing agencies, Forest Department or Wildlife Department in collaboration with Mahaweli authhority, to avoid further degradation of the habitats so that these areas would act as wildlife refuge and conservation area for all micro habitats which are required by both fauna and flora.

Monitoring

Following activities are recommended during construction & operation of the project. Proper monitoring has to be conducted by employing field officers or the Environmental officers employed under the river basin authority or MASL with the required background knowledge

- The removal of forest cover along the 100m reservation should be prevented. The field officers should be employed during the development activity to monitor the preservation of forest cover.

Savanna, scrubland and grasslands are also natural vegetation formations of the area. Scrublands develops after the forest has been cleared or degraded mainly for chena cultivation or cultivation of other agricultural crops. Once the area is abandoned the natural succession is commenced and these areas would convert into the climax vegetation in the area. If the scrublands are not disturbed or degraded further these will gradually be developed into the high forest through natural succession with time. However, this is a slow process and it will takes few decades to convert these back to natural high forest prevailing in the area.

5.1.1.3 Planting the banks and reservations of existing rivers and streams for the protection of river banks and improvement of water flow etc. Approximate area of the Upper catchment 768 km^2

(The approximate length of larger rivers in the catchment is about 175 km. The larger rivers are Amban ganga, Kambarawa ganga, Ambakke ganga, Galbokke oya, Ma oya,

Kalugahaathte oya, and Sudu ganga. In addition the length of small and micro level waterways in the catchment is 225 and 335 km, respectively).

The location

The typical riverine vegetation is found on the banks of Amban ganga, Sudu ganga, Kambarawa ganga and other rivers and also small streams in Moragahakanda catchment. The most common tree species found on the river banks are *Terminalia arjuna* (Kumbuk) *Mangifera zeylanica* (Etamba) *Polyalthia longifolia* (Owila), *Madhuca longifolia* (Mee), *Diospyros malabaricum* (Timbiri), *Nauclea orientalis* (Baktni), *Pongamia pinnata* (Karanda), *Hydnocarpus venenata* (Makulla) (see **Table 5.1**).

In some areas river bank vegetation is confined to a narrow strip and beyond that the land is used for paddy cultivation, other agricultural crops, chena cultivation, home gardens, or urban roads. Therefore in these places the riverine vegetation is disturbed, degraded or not existing. In most places riverbank vegetation in the catchment is intact and very little disturbances or degradation can be seen. Field visits carried out during the rainy season to Kambarawa and Pottatawela area showed that clear water in Kambarawa ganga and this may be mainly due to the closed canopy forest along both banks of the river that prevent the soil erosion.

Issue to be addressed:

However, water in **Amban ganga** was muddy and it proves that soil erosion is taking place mainly from cultivated areas along the river. Planting of indigenous plant species (**Table 5.1**) on riverbanks to prevent soil erosion is not a serious issue except where the banks are exposed due to the development activities. Soil erosion takes place in vegetable gardens and the muddy water flows to Amban ganga. Soil erosion prevention techniques (discussed under mitigaory activity plan – volume 2 of this report) should be introduced in vegetable cultivation areas. In command area it is important to establish the vegetation cover on the banks of newly built canals.

Recommended activity

Species such as *Terminalia arjuna* (Kumbuk) *Mangifera zeylanica* (Etamba) *Polyalthia longifolia* (Owila), *Madhuca longifolia* (Mee), *Diospyros malabaricum* (Timbiri), *Nauclea orientalis* (Bakmi), *Pongamia pinnata* (Karanda), *Hydnocarpus venenata* (Makulla), *Dendrocalamus strictus* (bamboo) could be planted on river and stream banks. Particularly in the potential regions where soil erosion is observed. The field officers employed for watershed management should work with the villages to maintain nurseries for suitable plant species recommended. Mitigatory activity plan in the volume 2 of this report will discuss the mechanism of this activity.

5.1.1.4 Mechanism to prevent fires in the catchment (eg. Planting peripheral areas with fire tolerance species)

The issue

Fire hazard in the catchment is the susceptibility of vegetation to burn if a fire starts. Fire danger becomes extreme when there is a lot of vegetation and brushwood in the forest combined with low relative air humidity, high air temperature and wind speed, and a low moisture content of vegetation and brushwood. These circumstances are often found in scrublands and abandoned chena in the catchment where there is still plenty of grass during the dry months. Flora is seriously affected by fire but most of it recovers. Fauna is also seriously influenced. Most flying, running or burrowing animals will probably escape. Most fires do not occur 'naturally'; usually they are man-made (either by accident or deliberately). People start approximately 80% of all fires while nearly all other fires spread from adjoining land into the forest. Because most fires are man-made, it is important to convey the immense danger involved to as many people as possible. This can be done through publicity actions, warnings near the forest edge, etc.

Recommended activity

- Fires spreading from nearby areas can be controlled to some extent by fire breaks. These are strips kept free of inflammable vegetation or planted with fire resistant plants (e.g. Hemp, *Agave americana*). For maximum effectiveness, a width of 10 m or more is usually recommended. This is usually done by removing the top layer of vegetation.
- After a few years, maintenance can be done by way of cultivation, screening or herbicides. Fire resistant plants are those that do not ignite from a flame or other ignition sources. These plants can be damaged or even killed by fire, however, their foliage and stems do not significantly contribute to the fuel and therefore, the fire's intensity. There are several other significant factors that influence the fire characteristics of plants, including plant moisture, age, total volume, dead material and chemical content.
- MASL in coordination with forest department could organize to distribute leaflets regarding this issue & distribute among villages. Also awareness programs could be initiated.

5.1.1.5 Demarcation of 100 m reservation (sensitive area/ buffer zone) from the Full Supply Level (FSL) of the reservoir and implement a forest conservation program.

5.1.1.5.1 The purpose of 100m sensitive area

100m sensitive area around the reservoir is highly important for the safety of the reservoir and should be declared as forest conservation area. The purpose of establishing a conservation forest in the buffer zone can be summarized as follows:

(i) To protect the reservoir from encroachment. During the field visits it was observed that some families are residing in the buffer zone of the Bowatanna Reservoir. Some of them cultivate vegetables in their home-lands and some engaged self employments such as brick making, poultry farming & cattle raring etc. This has caused for water pollution, sedimentation and other

(ii) adverse effects. The declaration of this area as a forest reserve will minimize the problems.

(iii) After trees are closely grown in this area as a "tree belt", it serves as a filter and minimized sedimentation. The velocity of the water rushed from the catchmnet will be slowed down, it get filtered and the excess nutrients in the runoff get absorbed to the trees in the belt and the debris and silt get traped. Finally, relatively pure water gradually flow in to the reservoir. During ancient period also, tree belts were grown in a similar way, which was called "Potawatiya", and the villagers had a through need to protect it. This tree belt is highly useful and provides food & shelter for animals, birds, insects, bees etc., and adds aesthetic value to the tank and create environmental- friendly atmosphere.

5.1.1.5.2 The extent & suggested activities-

- Total sensitive area (100m area around the reservoir) is 5.804km^2 as indicated in **Fig 5.1**. This area needs to be surveyed and demarcated on the ground. To protect the area, concrete posts should be fixed at a distance of 50 m.

- According to the survey, 279 families live in this area and the extent of their home garden is 84 ha (207 acs). Part of sub watersheds namely SW-1, SW-2 and SW-3 are located in the buffer zone and the people residing in this area has to be removed and settled them in new lands.

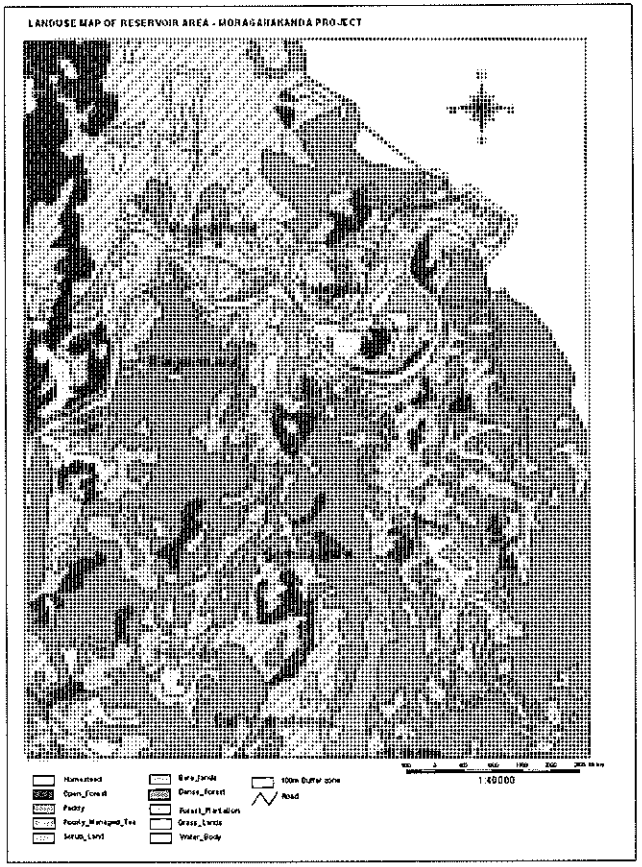


Fig 5.1 The 100m sensitive area around the proposed reservoir & adjacent landuses

5.1.1.5.3 Reforestation in the 100m sensitive area

It is proposed that 100 m strip from the full supply level of Moragahakande reservoir to be preserved as a reservation and kept under the natural vegetation cover. The total extent of lands under the 100 m boundary would be 5.8 km^2 (calculated from digital maps).

The recommended activities

1. Among the various components of buffer zone planting, the major activities are site selection, surveying and mapping, seedling production / nursery management and finally planting and aftercare. This has to be done with the help of the forest department.
2. Guidelines for planting forest buffer zones should be obtained from the Forest Department depending upon the site characteristics such as slope, soil quality and agro-climatic factors.
3. The project should bear the cost of buffer zone planting, and during the initial period maintenance cost also will have to be met by the Project (This will be included under the environmental costs of the project).
4. In view of the long term sustainability of the reservoir as well as the catchment, these buffer zones must be planted with perennial systems ideally with the species of which exhibits some economic returns to the dwellers / society.
5. Medicinal plants, plants with timber value, plants which enhances scenic beauty, protection of immediate bank etc. should be considered when selecting species for the buffer zone. Planting will be of mixed fast growing species selected for quick establishment and usefulness for wood and non-wood products.
6. Reforestation of indigenous species also could be carried out within the 100 m reservation. Some of the area within 100 m might already have natural vegetation cover (forest, scrub etc.) and if it is not disturbed during the construction and the reforestation is not required.
7. However, enrichment planting could be carried out to enrich the biological diversity in the reservation using the species found in the natural forest in the area (see **Table 5.1**). The most abundant indigenous tree species in the area such as Kon, Kumbuk, Thimbiri, Mora, Burutha, Halmilla, Kolon, Helamba, Kohomba, Pihimbiya, Mee, Karaw, Makulla, Dunumadala, Etamba, Malaboda, Panakka, Ela Gokatu, Omara, Ovila, Tamunanna, Suriyamara, Kaluwara, Ehela, Asoka, Siyambala, Hema, Wewarana, Godakaduru, Ingini, Hulanhik, Lunumidella, Riti, Madan, Bakmi, Dambu, Boradaminiya, Godakirilla, Milla and Nebada could be planted in 100 m reservation.
8. It is also recommended that the areas within 100 m reservation that are under different successional stages e.g. scrublands with shrubs, not to be cleared for planting and allow the natural regeneration and succession to take place. However, enrichment planting could be done in the openings or gaps in the site.
9. From the survey it was revealed that the community in the area has agreed to grow these plants and maintain them till they shift to new area. Since, the Moragahakanda constructions will be implemented during next three years or so, it is convenient and economical to implement this tree-planting program in the buffer zone through them.

5.1.5.4 Reservations for Amban Ganga, Bowatenna & Nalanda

5.1.5.4.1 Regulation of Amban Ganga flow to protect down stream regions (Conservation measures necessary to minimize soil loss within the catchment area and prevent excessive erosion from command area due to construction and operation of channel flows should be built in to the conservation plans).

The reservation for Amban Ganga is 60m along the river on both sides & the recommendations for introduction of vegetation cover is discussed in detail under section 5.1.1.3

5.1.5.4.2 100m sensitive area around Nalanda & Bowatenna reservoirs

The sensitive area of the Nalanda reservoir is 2.8 km^2 & for Bowatenna; 1.3 km^2. These areas have to be replanted for the protection of reservoirs. Plates 1- 9 illustrates the sensitive area around Nalanda is directly exposed without any vegetation cover. The steps have not been taken to demarcate the 100m sensitive area around the reservoir.

Recommended activities

- It is recommended that reforestation activities to be introduced to protect the reservoirs from sedimentation & nutrient enrichment. Even in Bowatenna brick industry is practiced along the shore line which affects the Bowatenna reservoir directly (**Plates 10 – 18**). Measures should be taken to protect this region from such activities & the exposed areas should be planted with the recommended tree species as describe in this section.

- Appropriate regulations and mechanisms should be formulated to prevent / prohibit cutting of trees within buffer zones. However non-timber forest products such as fruits, mushrooms etc can be extracted by farmers. Such areas can be divided in to blocks and can be contracted to respective / nearest CBO, NGO, or even to individual farmers. At the completion of the contarcts farmers / CBO's will be given options to extend the contract to further develop the areas.

- Similar to proposed Moragahakanda reservoir , it is recommended to plant all local verities such as Kumbuk, Naa, Mee, Karanda, Timbiri, Attikka which grow strong with deep roots and are susceptible to water. The plants like ratoon, walbeli and creepy and spiky plants are grown in between large plants.

- The trees recommended to plant in this area are all local verities such as Kumbuk, Naa, Mee, Karanda, Timbiri, Attikka which grow strong with deep roots and are susceptible to water. The plants like ratoon, walbeli and creepy and spiky plants are grown in between large plants. Forest department together with MASL should initiate programs to protect this 100m regions of both reservoirs.

5.2 Soil erosion

Soil management is the nucleus of the watershed development program. It involves soil restoration, soil improvement, measures to minimize soil degradation. Soil erosion is greatly affected by the amount of intensity of rainfall, topographic features, geological features, properties of soil, ground surface condition, vegetation condition etc. described in chapter 3.

The major issues

The following are the specific problems emerged due to heavy soil erosion.

- After removing the topsoil layer, the lower hard layer is exposed which has low water holding capacity. This causes to sudden floods immediately after rains and also due to low infiltration the perennial water yield is reduced.
- The adverse effect of the soil erosion is the sedimentation of the reservoirs and streams and thereby the water carrying capacity is reduced and also blocks the hydropower units and other equipment.
- Due to removing of top soil layer in the rain-fed cultivating lands in watershed area, the lands become unfertile and the productivity will be reduced. This causes further increase in the poverty among the people who live in the watersheds.

5.2.1 Investigations Carried out

To clarify the cause of soil erosion and to take any preventive measures, various investigations have been carried out.
In soil-eroded areas, site reconnaissance surveys were conducted and with regard to the area threatened to be eroded in future following detailed investigations were conducted (see chapter 3). But, it is recommended to conduct a detailed investigation when project is implemented.

(i) Preparation of Maps – 1/5000 topographic maps were studied in principle and for detailed study aerial photographs were studied.
(ii) Metrological features – Based on the data of the Metrological Department the rainfall (monthly and annual rainfall) was studied & probable rainfall maps were prepared.
(iii) Topographic and geological features – Since soil erosion is greatly affected by topographic and geological features the field slope and features of soil surface layer were studied. The slope has been classified into 0-8 degrees, 8 to 5, 15 to 30 and above 30. This helps the lands to be identified as areas vulnerable to land slides.
(iv) Present situation of land use & farming situation - The current land use pattern including low land fields, uplands, kind of crops, and quantity of covering were studied. In order to examine the recommendable cropping system and cultivation methods with the erosion prevention of agricultural lands were taken into account, the following data have been collected.
(v) The numbers farm households, average extent of home gardens, population, upland cultivation in crown lands, in private lands, land extent lost due to the demarcation of Forestry boundary.

- The number of streams, average length, land extent subject to sever erosion, mineral availability
- Social Factors – Status of houses – permanent, semi-permanent, temporary, Non availability of toilet facilities, income level, Samurdhi benefits etc.
- Rural Infrastructures – Minor irrigation schemes, irrigated area, area under rain fed cultivation, rural roads, community needs on infrastructure.

5.3 Soil conservation measures

In local context, soil erosion occurs due to rainfall. Soil erosion takes place due to the impact of raindrops and also due to the momentum of the surface runoff. Thus soil erosion can be minimized by reducing the impact of rain drops and by reducing the surface runoff volume and velocity. Different techniques are being used to alter the rate of soil erosion such as changing the nature of the soil surface, changing the land slope & its length and using appropriate agronomic measures.

Under the proposed Moragahakanda development Project soil conservation activities to minimize soil erosion can be discussed under three subheadings namely; soil conservation measures in Morgahakanda catchment, soil conservation in proposed settlement areas and soil conservation to prevent excessive erosion from command area due to construction and operation of channel flows.

5.3.1 Planning soil conservation based on soil erosion hazard map

Planning of soil conservation activities in the catchment area can be performed based on the soil erosion hazard map (**Fig 3.23**). Stepwise order of the activities to be performed is described below.

Implementation of soil conservation activities in the field can be initiated according to a priority which is given in **Table 3.7**. The table indicates the order of susceptibility of micro-watersheds to soil erosion, thus implementation of soil conservation activities in the field can follow the same order (**Table 3.7**).

Soil conservation activities in a particular micro-watershed can be categorized as on-farm soil conservation and off-farm soil conservation. Ideally, off-farm conservation should initiate first, but most of the occasions practical difficulties arises mainly social factors. At the inception, it is somewhat difficult to organize and direct dwellers for a common purpose, but easier to start with activities related to their own farmlands. To overcome those difficulties, both on-farm and off-farm can be initiated simultaneously, and as the activities progresses decisions can be made.

5.3.1.1 On-farm soil conservation activities

On farm soil conservation activities are the activities implemented in farmers fields. However, at the very beginning the suitable cropping system for the particular land should be decided. If the land is falling under high erosion hazard areas (Soil erosion hazard map (**Fig 3.23**) or land slope is more than 60%, the said land/s should be under perennials. If the lands are in moderately or low hazardous areas annual cropping can be

permitted, provided that suitable soil conservation measures are in place (Guidelines for on-farm soil conservation is given in **Appendix 5.1.**

5.3.1.2 Off-farm soil conservation

Off-farm soil conservation is the measures or activities implemented outside the farm block. It covers areas such as gully conservation, river or stream bank protection, roadside protection, conservation of public places, conservation of protected areas and construction of agro-roads and footpaths (Guidelines for off-farm soil conservation is given in **Appendix 5.2)**

5.3.2 Establishing conservation measures to minimize soil losses in the Moragahakanda reservoir catchment (e.g reforestation with timber & fuel wood plantations, crop diversification & engineering works).

5.3.2.1 Reforestation with^ timber and fuel wood plantations,

There are Eucalyptus and Teak plantations in the lower catchment in Millagahamulatenna and Maragamuwa area. Teak and Halmilla have been planted in home gardens in addition to coconut, Jak and cashu trees though these species are damaged by elephants. Mahogany, Lunumidella and Wanasapu also been planted in home gardens. Teak is the most preferred compared to all other plantation species in the area and reforestation of government lands could be done under the participatory forestry programmes conducted by the Forest Department.

5.3.2.2 Crop diversification methods

5.3.2.2.1 Agro forestry program

Agro-forestry is a production system, which originally combines forest production with other agricultural production in order to improve land utilization. Finally, this aims to proper land management, increase farmer family income and continuous production through long term sustainability. So it is recommended to launch an agro-forestry program in suitable available lands in the Moragahakanda watershed area.

5.3.2.2.2 Home Garden Development –

The results show that the extent of home gardens of 3125 families, excluding inundation area, is 2662 acres (1073 ha) which means the average extent per family is 0.85 acre (0.34 ha). Under the watershed management plan following activities are proposed to implement in the homestead areas.

- Systematic homestead development is one of the key activities introduced under the project. So, "Farm Planning" program has to be launched to educate the villagers on how to get maximum output from available resources. The extension officers should provide necessary know-how and work as facilitators on the farm planning process.

Farm planning may seem, at first sight to be a time consuming extension tool but gradually the community will understand the importance of it.

- With the rapid increase in the population, the tree plantation in the limited extent of homelands is essential in order to fulfill the food & timber requirement in the near future. So, under the project it is recommended to grow limited number of plants that can be maintained by the family members easily. For example if the project can assisted to grow 20 number of coconut trees, 5- 10 different varieties of trees like jack, kitul, fruit trees and about 20 number of trees like Teak, Kohomba, Lunumidalla, Halmilla etc. along the boundary of the fence.
- The women are encouraged to grow vegetables and other spices for domastic consumption. The family members are motivated to form soil conservation bunds and develop an environmental-friendly garden by following up under mentioned activities.
  - enhance recycling process – organic matter, water, energy
  - soil protection through mulching or cover crops
  - crop diversification and promoting site specific plants
  - animal husbandry and develop interrelation between plants, animals, water and soil.

5.3.2.2.3 Upland Cultivation

The slash and burn/shifting cultivation, which is more commonly called chena cultivation, is still prevalent in Moragahakanda watershed area. Farmers burn forests in patches (average one hectare) in the beginning, and cultivate agricultural crops such as maize, tomatoes, vegetables etc. without using fertilizer. When the productivity on the land drops normally after a few years they shift into a new land. The discarded lands get regenerated naturally as the secondary forests and recover crop production potential after 10-15 years.

As the population increases, the rest period is shortened or the same land is used throughout but the production capacity is reduced resulting in extends the cultivation interval or desolation. This type of cultivation is common in very many countries and the land area desolated and desertized by this type of cultivation is said to be 6 million ha every year. In Japan, an afforestation method has been introduced which is called "Taungya " system (Tskashi,1991) under which the forestry and agriculture program is implemented simultaneously. The word taungya is derived from Burmese, and it means "hill cultivation" in English or "slash & burn" cultivation in Japanese. It has been reported that taungya system is the most efficient method for teak afforestation. This system has spread to other countries in tropical region such as Indonesia, Thailand, Myanmar etc. extending to several hundred thousand ha of forestland.

The forestry and crop cultivation similar to taungya program will provide timber requirement of the community without felling trees in the natural forest. If the government introduce a long term land tenure system (25 years) for crown lands under upland cultivation to develop timber cum crop lands it would be highly beneficial to both parties.

From the rapid survey it revealed that about 377 acres (152 ha) of crown land and 200 acres (81 ha) of private land are used for upland cultivation by 203 and 366 farmers

respectively. If a well planned, systematic, forestry as well as crop cultivation can be introduced in these lands the farmers income will be enhanced both in short and long terms.

5.3.2.3 Engineering works

5.3.2.3.1 Prevention of excessive soil erosion from command area due to construction & operation of channel flows

The following are the principles of water erosion prevention, and these must be sufficiently taken into account, when establishing a plan.

(i) To promote the ground infiltration of rain water, for lessening the surface runoff water as far as possible.
(ii) To keep the flow velocity of surface run-off water as less as possible.
(iii) To improve drainage canals to allow concentrating water to flow down safely.
(iv) To raise the erosion resistance of the soil.

The methods for preventing water erosion include farming methods adopted by farm households themselves and Civil Engineering methods adopted in community participation.

Farming Method - Increase tree cover by agro-forestation. This program will be carried out in home gardens, private nplands, abandoned chena lands, and the lands in public places such as temples, schools, government office premises.

Implementation of soil conservation techniques. Activities like contour bunding, pebble (rubble) bunding, trenching, gully plugging, tree planting etc. will minimize soil erosion and also enhance in-situ soil moisture.

Design stream discharge - In planning, it is necessary to judge the discharge determining the sectional area of the stream or drainage canal, from the rainfall amount in the covered region. The maximum runoff is determined by using the Rational formulae (1) given below;

$$Qp = \frac{1}{3.6} * Re * A1 \quad \ldots\ldots \quad (1) \qquad\qquad Qp = V \times A2$$

Qp ; Peak runoff (m3/sec)
A1; Catchment area of stream / drainage canal
Re : Average effective rainfall intensity within the time of concentration of flood (mm/hr)
V - Velocity of the water (m/sec) A2- cross section of the stream (m2)
If v> Critical velocity - erosion would occur & protection measures should be done
If v< Critical velocity - siltation would occure
Hence stream is designed by varying section/ protective measures to control the velocity.

5.3.3 Establish mechanism for tree plantation program in forest reserves and along stream embankments, river banks, road reservations to improve aesthetic and environmental conditions.

The Forestry Department has taken various steps to promote tree growing by rural community in the area for the protection of environmentally sensitive areas. The participatory approach, joint forest management, leasehold forestry are some of the strategies implanted by the Forestry Department in the recent past.

Experience shows that villagers who have acquired secure tenure are ready to make long-term investments. Also, the villagers will help protect and manage state forests when they have an incentive to do so. Forest management plans can be formulated jointly by the forest officers and the village representatives paying attention in both production and protection requirements. Landuse planning process

5.4 Landuse planning

5.4.1 Land use recommendations

Land use recommendations for Morgahakanda catchment were developed by considering long term sustainability of the land and water resources while providing optimum opportunities for the dwellers to utilize the land without degrading the resource potential (**Fig 5.2**). Land use options considered were cultivation of other field crops (annual cropping), paddy, tea, export crops, coconut, natural and plantation forestry, horticultural crops and fodder crops. On the other hand, non agricultural uses such as potential areas for urbanization, wild life and other reserves were also considered. Allocation of a particular region to a specific use was decided based on its soil erosion hazard, land slide hazard and the agro-ecological suitability.

The annual cropping can be continued in areas with low soil erosion hazard while the exact crop and time to be planted should be decided based on the agro-ecological environment. The **Appendix 5.4** indicates suitable crops and time of planting for each agro ecological zone occurring in the catchment. However, conservation measures should be implemented during annual cropping according to the guidelines provided in **Appendix 5.2.** Under the above land category existing homesteads and other perennial systems also can be allowed or newly introduced depending on the social needs and market economies prevailing at the time of implementation. Suitable forest trees, fruit trees, export crops and other perennials also should be decided based on ecological suitability and information of provided in **Appendix 5.4.**

Under the land category falling within moderate soil erosion hazard class, it is necessary to phase out existing annual cultivations into perennial systems. Promotional schemes

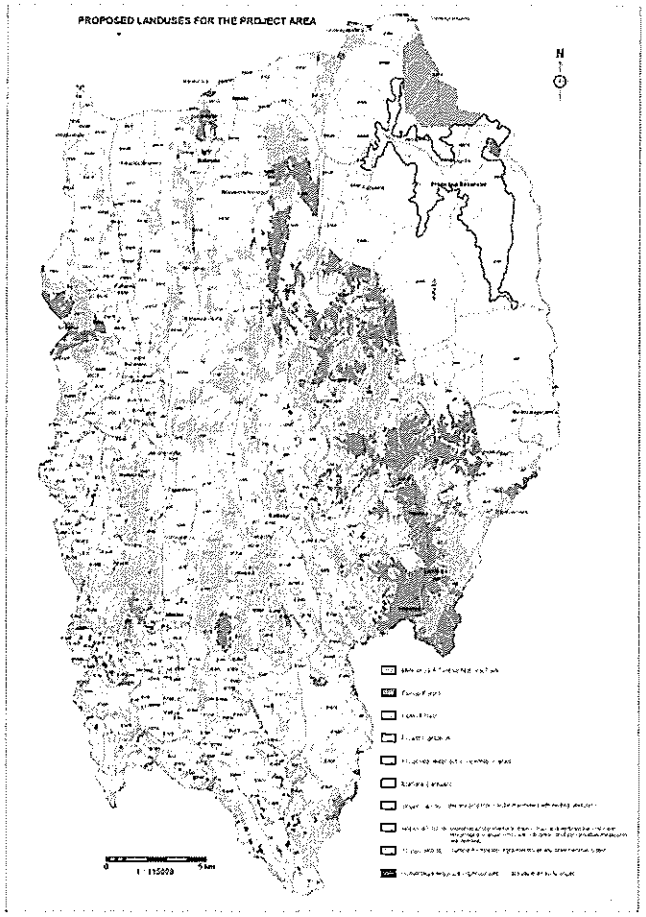


Fig 5.2 Proposed landuse

such as subsidies for perennials should be introduced in these areas. Existing areas with poorly managed tea and moderately managed tea lands should be rehabilitated with vegetative clones and or fill vacancies to obtain required level of ground cover. If so degraded those should be diversified either to agro-forestry or forestry. Enrichment of canopy cover under existing homesteads through introduction of fruit trees, trees with timber value or with export crops such as pepper, cocoa, palm oil, *Kithul*, Arica nut, Coconut, etc depending on climatic (See **Appendix 5.4 & 5.5**), social and economical suitability, will not only reduce the erosion hazard but will increase the household income in the long run. Moreover existing forest cover under lands falling in this class should be protected.

Land area falling into high erosion hazard should be devoted entirely for perennial systems preferably forestry. Upland cropping, dwelling, felling of trees should be avoided. Dwellers should be resettled in suitable locations, and farmers who are cultivating upland crops should be given other suitable lands or they should be introduced into other income generating activities.

5.4.2 Hazardous landuses and suggestions for improvements

Field observations revealed that there are number of landuses which are managed in hazardous manner, such as cultivation of annual crops in steep lands, use of extra amounts of pesticides, unsystematic extraction of soils near reservoir for brick making, cultivation of Cardamom in protected areas, uncontrolled felling of trees for timber and for firewood and gemming.. These activities are happening mainly due to lack of any other employment which is leading to poverty. Therefore, in an integrated approach of watershed management a planner must explore the means and ways either to reduce the pressure on land through introduction of other income generating activities, or to provide guidelines which will reduce the hazardous situations.

5.4.2.1 Cultivation of annuals in steep lands:

Cultivation of annuals in steep lands should be converted to either forestry / agro-forestry with export crops / orchards with perennials. Settlers in these areas should be given alternative lands.

5.4.2.2 Extraction of soil for brick making

Plate 11 to 18 indicate unsystematic extraction of soil for brick making in the upstream periphery of Bowatenna reservoir. At the time of observation there were approximately 15 families living on this venture. However, at present extraction of soils for brick making appears to be unsystematic. Restrictions for brick making should be imposed based on the total (estimated) volume of soils suitable for brick making. However, depending on the availability of good soils for brick making, the extra workforce can be diverted to other ventures such as inland fishing, industries such as handlooms etc.

5.4.2.3 Mechanism to provide alternate employment for those engage in cardamom cultivation in upper area of the knuckle mount

5.4.2.3.1 Alternative Income Generating Activities

At present there are 525 families who live on cardamom cultivation in suburban villages without adequate income. However at present Cardamom cultivation is at a decreasing trend, thus restrictions should be continued. Frequent vigilance over the issue is a must. However, farmers who are involved in such cultivation should be introduced to other income generating ventures such as

- cut flower and foliage, cultivation of medicinal plants, cultivation of ginger, other export crops such as pepper, cocoa, or even other industries handlooms, processing of fruits or tomato etc. .
- The others can participate in forestry and home gardening programs proposed under the project
- For the landless families, new lands can be given in new settlement area. During the field survey, it was revealed that some 200 landless families prefer to shift to new areas.

5.4.2.3.2 Uncontrolled felling of trees for timber and for firewood:

Woodlots for firewood can be established to minimize the problem. Moreover, efficient burners which utilize lesser volumes of fuel-wood also can be introduced.

However strict implementation of existing rules and regulations is a must. Frequent monitoring is essential, thus the problem of mobility of relevant officers must be adequately addressed.

5.5 Coordination of activities (Identification of catchment activities/ catchment issues to manage & coordinate them through MASL)

5.5.1 Identification of Sub Watersheds

The area of the Moragahakanda watershed is 283 sq. km (see **Table 3.1**). The total number of Grama Niladari (GN) Divisions in the Moragahakanda watershed area is 40 which can be grouped into 8 sub watersheds for the convenience of planning process in this study.

Field inspections indicated that smaller watersheds are simpler and easier to manage, particularly when parallel development programs are implemented with active community participation. The GN divisions, total extent and the land extent of 08 sub watersheds located in Naula, Koongahawela and Illukkumbura Agarian Services Center areas are given in **Table 5.2**.and in **Fig 5.3**

The sub watersheds were identified based on the following factors;

(i) The total watershed area was categorized into four sub sectors - Inundation area, Lower Catchment area, Middle area and Upper Catchment Area

Table 5.2 Sub watersheds, extent and locations in Koongahawela Agrarian Services Area

No		Village	Total Area ha	DS Division/ Agrarian services Center	Remarks
SW –1	1.	Galporugolla	1085	Koongahawela	In these GN Divisions more than 90 % of the area is inundated to the reservoir
	2.	Madapihilla	397		
	3.	Kadawatha	126		
	4.	Thalagoda	1345		
	5.	Elagamuwa	1347		
	6	Moragolla	759		
	7	Galaboda	2039		
	8	Kambaraw	2072		
		Sub Total	9170		
SW –2	9.	Koongahawela	105	Naula/ Koongahawela	Lower Catchment area
	10.	Rajawela	163		
	11.	Maruganuwa	724		
	12	Mailgahamulatanna	369		
		Sub Total	1361		
SW-3	13.	Pubbiliya	1709	Naula/ Koongahawela	Lower Catchment area
	14.	Halambagahawatta	925		
	15.	Dambagalla	2159		
	16.	Bambarngahawatta	998		
		Sub Total	5791		
SW –5	1.	Haduwa	527	Naula/ Naula	Lower catchment
	2.	Kanawilahena	298		
	3.	Heduwelu	405		
	4.	Dodamattawela	251		
	5.	Meegahaela	157		
		Sub Total	1638		
SW –4	17.	Moragahamada	474	Naula/ Koongahawela	Middle cachment area
	18	Senagama	306		
	19.	Ambana	203		
	20	.Opalgala	1454		
	21	Andaweala	757		
		Sub Total	3194		
SW –6	6.	Koombiyangaela	326	Naula/ Koongahawela	Middle Cachment area
	7.	Bowatannawela	323		
	8.	Ganinnayaya	330		
		Sub Total	979		
SW –7	1.	Pottatawela	1828	Laggala- Pallegama /Illukkumbura	Upper catchment area
	2.	Dammantanna	251		
	3.	Puwakpitiya	896		
	4.	Diulgaspotana /	1713		
		Sub Total	4688		
SW-8	5.	Kahagala	953	Laggala- Pallegama /Illukkumbura	Upper Catcment area
	6.	Illukkumbura	197		
	7.	Mahalakotuwa	903		
	8.	Madaela	217		
	9.	Ratninda	908		
	10.	Etanwala	4683		
	11.	Pitawela	1002		
		Sub Total	8863		

FIG 5.3 SUB WATERSHEDS BASED ON AGRARIAN SERVICE AREAS

(ii) Then Sub Watersheds (SW) were identified based on their location, the hydrological & social factors (**Table 5.2**). SW-1 is located in the inundation area. SW 2, 3 & 5 are located in the lower catchment and in the buffer zone. SW 4 & SW -6 are located in middle catchment and SW-7 & SW-8 are located in upper catchment area.

5.5.1.1 Procedure adopted in Data collection

The data & information required for preparing Watershed Management Plan were collected through a questionnaire survey in October & November 2006. At first, the questionnaire was discussed in detail with "Krupanisas (Village level Field Officers in the Department of Agrarian Development) at three Agrarian Services Centers and explained them on how to collect the necessary data.& information. Several field level farmer meetings were also conducted to familiarize them on the contents of the questionnaire & data collecting procedure. Since the survey has a strong "action orientation" as the results will be used for planning and implementation of watershed development program, more emphasis was paid to get more accurate and realistic information. The field officers were instructed to call for meetings at village level and after explaining the purpose of the survey, the general views, observations and needs of the majority of the community to be obtained. The extract of the questionnaire & the tabulated data are given in **Appendix 5.6.**

5.5.1.2 General Outcome of the Survey

- According to the survey, the total number of living families in the Moragahakanda watershed area is 5490 with a population is 18,591 people. The eight GN Divisions namely Kambarawa, Galporngolla, Elagamuwa, Talgoda, Kadawatha, Medhaphilla, Moragoda, Galboda will be completely inundated to the reservoir and the number of families lives in these areas is 1245 (**Appendix 5.6**). More than 75% of the land area of Rajawela & Koongahawela divisions will be inundated and a number of 295 families will be displaced. More than 50% of area will be inundated or in the buffer zone in Mailgahamulatanna, Maragamuwa and Pubbiliya divisions and the number of families displaced will be 340. So the total number of families that has to be displaced is 1880. But, the MASL reports state that the number of families to be displaced is 1148 (Lahmeyer, 2001). The recent survey in 2006 carried out by MASL (see **Table 2.5**) indicates that the total number of families displaced as 1996
- Almost all the respondents in the areas under inundation area are ready to leave their homelands but they strongly objected to go to Madirigiriya since the area is dry and unsecured. They earnestly requested to provide them the lands in Naula & Kaluganga area.
- Totally there are 3645 permanent houses, 1039 semi-permanent houses and 357 temporary houses in the watershed area and of which for 589 (11%) families are sans toilets facilities.
- In 11 GN divisions which consists of 608 acres (245 ha) resources of minerals such as graphite is available. In 6 out of 8 GN divisions in the inundation area (SW-1), the minerals are found. But, as a result of excavation of the minerals during past, the earth surface may have been disturbed. Hence, a proper geological survey has been conducted before the construction work of reservoir commenced.

- In the whole watershed area 14 small scale reservoirs and 105 anicuts (weirs) are available and nearly 50% of them has to be rehabilitated. These structures are immensely useful in the temporary storage of water in the catchment areas, to minimize soil erosion from watershed and to reduce sedimentation of the major reservoir. In the watersheds of the ancient, giant tanks (Kala Wewa, Rajangana, Padawiya) also, similar small reservoirs can be seen which are not meant for irrigation but for trapping the silt.
- The total irrigated area under the irrigation schemes is 3568 acres (1439 ha) and the number of families living on farming under the schemes is 3829. In addition, 625 acres (252 ha) are cultivated under the rain fed conditions by 472 farmer families.
- In 9 GN divisions, the NGOs are implementing various programs. Their activities, total investment and future plan were not studied under the survey. However, it is recommended to get their services for the proposed watershed development program. In almost all the villages, the Farmer Organizations, Death-aid Societies are functioning and in some villages the women organizations mainly for saving activities have been formed. Their financial status, functionality, membership etc should be further studied.
- From the total, 3304 families (60%) are Samurdhi beneficiary recipients and another 347 families receive the grant given by the government for helpless families. This is a clear indication that most of the villagers are low-income people. At the farmer meeting in the Pottatawela village in Illukkumbura division, it was revealed that they do not have any income for living. The chena lands that they cultivated for their hand to mouth living have been demarcated and fenced as the forest reserve by the Forestry Department. Most of the villagers had attended the meeting for seeking assistance to get permission to re-start chena cultivation. They lamented that they have been prohibited from entry the forest even for a bundle of firewood by the Forestry Department.
- The non-availability of infrastructure also a problem faced by the villages in the watersheds. During the survey, in 11 divisions the community asked for rural roads of nearly 20 km.

5.5.2 Coordinating Institutional mechanism for the management of activities in the catchment area conducted by all relevant agencies.

5.5.2.1 Process to Declare and Protect the Watershed of the Moragahakanda Reservoir

Historical Background –

- In 1873, British Government declared that the watershed areas above the elevation of 5000 ft (1600 m) should be preserved.
- In 1955, the Land Commission had recommended to demarcate the forest reserves in watershed areas and upper catchment areas.
- The National Environmental Act of 1980 had recommended soil conservation programs, identify and protect critical watershed areas, encourage scientific farming systems, and implement the physical and biological means of soil conservation for effective soil conservation.

- In 1985, the third Land Commission had studied the watershed management and given various strategies and recommendations for its development.
- The importance of conservation of watershed has been stressed in the Land Use Policy, Water Resource policy and the Environment policy.
- In 1998, the Upper Watershed Management project addressed the watershed management problems in holistic manner and achieved a significant outcome.
- In 2002, "Regaining Sri Lanka" emphasized the necessity of community participation in watershed management programs.

In 2003, the MASL, initiated the River Basin approach, and formed a River Basin Division for effective land & water resources of identified basins. This Moragahaknada watershed management program also can be implemented through the River Basin Division.

5.5.2.2 The Policy Framework (Activities that should be followed in Moragahakanda watershed Development Process)

- Rivers take off from mountains, flow down the mountainous and plain terrains and finally flow into the sea. Depending upon the topography of the river basin the river reaches can be classified into two main classes namely Upper Reaches and Lower Reaches. The sediment flowing from upper reaches mainly due to erosion, get deposited in the lower reaches. So, minimizing the soil erosion in the upper reaches is the main activity in the watershed management.
- Based on the elevation and other agro ecological characteristics, the watershed area can be categorized as "Strictly Protected Area (SPA) and Protected Area (PA)". The characteristics such as the steepness, sensitiveness for soil erosion and earth slips, the elevation above mean sea level (1500 m msl) should be identified as SPA.
- The natural parks, conservation forest, buffer zones, river & stream reservations etc has tobe considered as the SPA. No settlement is allowed in this area and in case where anyone lives in these areas at present they should be resettled in new areas.
- In the PA, regulated and restricted cultivation practices are allowed. The villagers in these areas should follow the land and water conservation techniques introduced under the project.
- Maps to the scale 1:10,000 should be prepared and above zones should be demarcated and digitized and database should be prepared at GN division-wise.

- The various policies, rules, regulations stipulated under various acts such as Forestry Act, Environmental Act, Soil Conservation Act, Agrarian act, Wildlife Act should be intensively studied and joint policy frame work should be prepared on watershed conservation and management. Recognize the need to rationalize, remove the policy gaps and minimize overlapping and formulate a Watershed Management Policy, which can be applied throughout the country. In this process, all line agencies should be coordinated and convinced the necessity of holistic approach to achieve the final targets and

objectives. This has to be discussed at ministry level with participation of senior level (Sectaries, Directors) officers of the relevant agencies and formulated by a working group. .

- In the process of land leasing or implementing any development programs (irrigation, roads, building etc) especial care should be taken in conservation activities. Proper scientific planning and implementation practices should be adhered to in these activities.

5.5.2.3 Policy and institutional strategies

Adoption of conservation techniques in a watershed could enhance the productivity and minimize the rate of watershed degradation. However, policy reforms, institutional adjustments, long term financing for watershed management, is required to encourage and sustain such enhanced productivity in the long run. Some areas that require careful study and policy focus to promote watershed management are;

Land regularization:

Farmers' investments on conservation of lands are seriously affected by the lack of ownership of the land. Lands without ownerships are a threat to watershed management Lands with out ownership should only be regularized based on a land suitability assessment. Unsuitable land should not be regularized under any circumstances but the uses should be given suitable lands elsewhere or should be introduced into other alternative employment opportunities

Institutional strategies to share costs and benefits of watersheds:

Under the present context benefits of watersheds are being harnessed by many users but no attention is given to protect and sustainably manage the watershed. Therefore policies and regulations should be formulated to assign a considerable percentage of earnings to conserve the watershed. One best example is; A considerable percentage from generated income through hydro power should be allocated to implementation and maintenance of watershed management activities upstream.

Targeted policies to ease population pressure on critical areas within watersheds

Dwellers in critical areas should be evacuated if a proper catchment management plan to be effective. However, practicability of such activities under local context is not encouraging. Therefore, policies and actions should be there to wean out excess people from subsistence level agriculture and introduce them into other ventures other than agriculture. Such activities may be area specific and thus thorough studies are necessary to understand resource potentials and means of utilizing them in a sustainable manner.

5.5.3 Establishing inter agency coordination through MASL (to integrate the work done by the individual agencies – Stratagy to develop the catchment)

5.5.3.1 Establishment of a Watershed Management Unit & its necessity

5.5.3.1.1The necessity

Under the local context the main public sector institutions responsible for the protection and the management of watersheds include Forest Department, Department of Agriculture, Mahaweli Authority and Department of Wild Life, and Environmental Authority. The Survey Department, Land Commissioners' Department, Agrarian Services Department, Irrigation Department, Water Resources Council and Water Supply and Drainage Board are also linked substantially with watershed management activities. Most of these institutions generally posses adequate skills but they lack appropriate institutional frameworks and financial resources to formulation and implementation of integrated watershed management and associated activities. Coordination among institutions at the central level, regional level as well as the sharing of responsibilities for the activities at the field level is the main constraints for watershed management activities. Therefore formulation of a mechanism or a strategy to coordinate field activities related to catchment management in the project area is a prerequisite for efficient implementation of a catchment management plan.

Although the importance of protecting watersheds has been identified, discussed and addressed in very many occasions at various forums, still, an overall and sustainable program has not been formulated. Also, due to non-availability of joint mechanism and holistic approach, many agencies develop their own regulations, guidelines, work programs and implement them individually. This has resulted in overlapping, formation of gaps, high involvement of cost and confusion among stakeholders, which hinder the overall success of the program. So, there is a strong necessity to establish a "Watershed Management Unit" which plays a leading role in coordinating and monitoring activities to address the following prevailing issues;.

- Coordination between relevant agencies is inadequate and hence they implement individual and isolated programs. Due to lack of cohesion and integrity the desired results cannot be achieved.
- The field level officers are not well conversant or convinced on watershed development activities. They consider this as an extra activity and give low priority. So, the watershed development activities should be integrated into their duties from central level.
- There is a need to improve the KASH (Knowledge, Attitudes, Skills and Habits) of the officers in the line agencies not only on the subject matter but also on the participatory approaches, community organizations, by-laws, rules & regulations etc.

5.5.3.2 Responsibilities of the Watershed Management Division (WMD)

The WMD headed by a Deputy Director -Environmental Development and will be established at the MASL Naula Office under the Natural Resource Development Branch of the MASL Head office. Following are some of the main duties the WMD is entrusted with;

(i) Formulate concepts, strategies and detailed work plan for effective implementation of the proposed watershed management program..
(ii) Ensure coordination among line agencies at district, divisional and field level. Take leadership in coordination and implementation activities.
(iii) Resolve watershed management problems and issues at various levels on various aspects – technical, social, legal, financial, administrative etc.
(iv) Increase the capacity of line agencies including training and guiding activities.
(v) Coordinate with the Natural Resources Management Branch in Head office and get their guidance and support for project implementation.

The WMD should carry out an integrated & holistic program focusing on conservation of agricultural, forestry & wildlife activities. In addition, the livelihood of the community in the area should be enhanced by implementing various strategies on processing and value addition for agricultural products, establishment of marketing system, introduction of alternative income generating activities, training and capacity building on self employment etc.

The WMD will be the cornerstone around which the entire exercise of watershed management activities is undertaken. Overall planning, staff training, costing, guiding, progress monitoring will be implemented by this division. The sub-units should motivate the villagers to undertake watershed activities, prepare the development plan for each micro watershed through PRA sessions, establish community organizations and strengthen them, provide technical guidance and supervision of watershed activities, manage project implementation, adapt low-cost environment friendly technologies, validate and build-up indigenous technical knowledge, monitor and review the overall project implementation and promote community organizations for post-project operation, maintenance and further development of assets created during the period.

5.5.3.3 The Structure & Functions of the Watershed Management Division-

The proposed structure of the Watershed Management Division at the project level is given in Fig 5.4

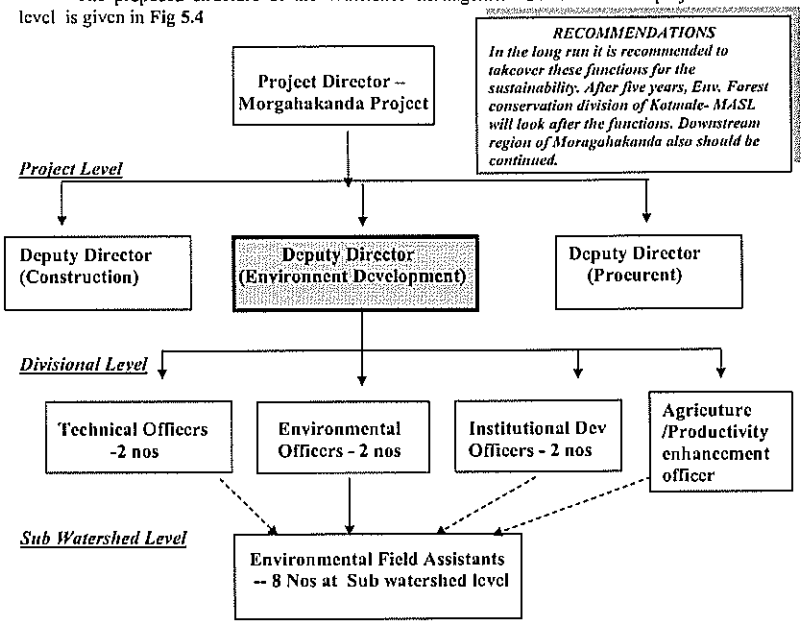


Fig 5.4 Institutional Structure of Watershed Management Division

- **Project Level** - Under the Project Director - Moragahakanda Project , there may be a number of sub divisions and one of them is Environmental Division headed by a Deputy Director (Environment). There should be some supporting staff (one Administrative officer, two clerks, one data entry operator and two office assistants) for the division.
- **Divisional Level** - The watershed area is divided into two main divisions and two Divisional Offices will be established preferably at Naula and Laggala Pallegama (Akarahadiya) area. Three officers (Technical Officer, Environmental Officer and Institutional Development Officer) will be attached to each office. Naula Divisional will cover four sub watersheds (SW-1 to SW-4) & Pallegama divisional office will cover balance four sub watersheds (SW-5 to SW-8). The necessary office facilities, staff, furniture, vehicle and other facilities should be provided.
- **Sub watershed Level** - Eight field officers will be appointed at sub watershed level. Eight Community Centers are proposed to construct and one room of the building can

be used as sub-watershed office. A motorcycle will be provided the field officers to implement the field activities effectively.

5.5.3.4 Proposed Institutional Arrangements : The institutional arrangement at various levels are described below

Fig 5.5 Institutional Arrangements and Linkages at various levels

- **Steering Committee** — *To take Policy decisions*
  - Secretary MASL - Chairperson
  - Heads of line agencies are members
- **District Committee** — *To coordinate line agencies at district level / To Review the monthly progress*
  - District Secretary - Chair the meeting
  - Members – all district heads
- **Watershed Management Division** — *Project Administration & Implementation*
  - Head – Project Director
  - Deputy Director – Environmental
  - Divisional level Officers
- **Sub Watershed Units** — *Coordinate & implement the project activities*
  - Environmental Assistants
  - Sub watershed committee comprised with representatives from the GN divisions
- **Village Watershed Management Society (VWMS)** — *To implement the project activities at village level*
  - Elected members from the village community

- **Watershed Steering Committee at National Level** - This is established under the Secretary to the Ministry of Mahaweli Development and the members are the Secretaries or their representatives of the relevant ministries and departments including environment, finance, forestry, agriculture, irrigation, national planning. All policy decisions are taken by this committee and plays an advisory and overall monitoring role.

- **District level Coordinating Committee** – This committee is headed by the District Secretary/ Government Agent and the Project Director coordinate the activities. All the relevant Divisional Secretaries, relevant District Heads of the Departments, representative from Watershed Management Societies, representatives from NGOs are the members. The committee assembles at two month intervals to review the progress, to coordinate activities with line agencies and to resolve issues in project implementation.

- **Watershed Management Division at Project level**– This division is responsible for implementing integrated activities related to watershed management including soil conservation, land use planning, farming systems, forestry management and water management. In addition this division will implement the social and economical activities such as community organizations, income generating activities, construction of community infrastructure activities, social welfare etc. The officers in this division must have good knowledge on participatory development approaches and competency on community training. Two divisional offices will be established for effective project implementation.

- **Sub Watershed Units**– Eight sub watershed units will be established. A Sub Watershed Management Committee comprising of field officers, representatives from Watershed Management Societies and NGO representatives will coordinate the field level activities. The Environmental Assistant serves as the secretary of this unit and all the project activities are formulated and implemented at this level. This Committee will meet monthly and review the progress, coordinate development activities and attend the matters unresolved at village level.

- **Village Watershed Management Society** – The Watershed Management Societies will be established at the GN level and all the development activities are implemented through them. These Societies are registered under the District Secretary and direct contacts are given to them on development and conservation activities. The Structure of the society is given in Fig 5.5

5.5.3.5 Staff Requirement for the Watershed Management Division

The staff requirement for the WMD would be Deputy Director (Environment), Two Technical Officers, Two Environmental /Agricultural Officers , Two Institutional Development Officers, Eight Field officers with environmental/ agricultural back ground.

5.5.3.6 Village level project implementation

At village (GN) level project is implemented by the Village Watershed Management Society (VWMS) ***(Gramiya Jaladara Kalamanakarana Samithiya)***. All the villagers (one per house hold) are members of the society and youth and women are encouraged to take leadership in the society.

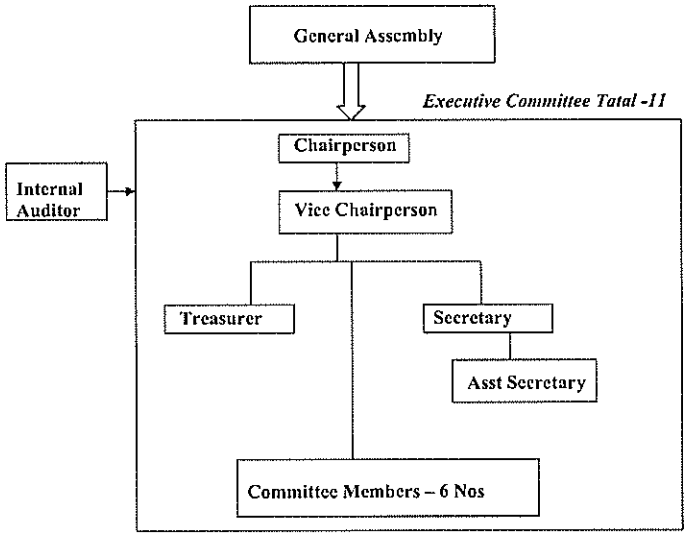


Fig 5.6 The Structure of the Village Watershed Management Society

The Executive Committee (EC) is elected at the General Assembly for a period of one year. The EC should conduct monthly meetings on a fixed date (e.g. first Sunday of the month) and should discuss progress, problems and monthly work plan. The EC members should compulsorily follow the following six golden rules;

(i) ***Transparency*** – Transparency should be maintained in all the project activities, especially in financial matters.
(ii) ***Community Participation & Contribution*** – All the members should actively participate in all the project activities.
(iii) ***Equity*** - all the members, men women, youth should be treated equally
(iv) ***Responsibility & Trust*** The responsibilities and trust entrusted on them should be maintained throughout.
(v) ***Good Governance*** - All the records, reports should b e well maintained. Meetings should be conducted at the schedule dates and consensus of the general assembly be obtained on important matters.

(vi) ***Maintenance after Development*** – A mechanism should be developed for post project implementation activities. Long-term sustainability is the key feature of the program.

Sub watershed Committee – The three key members (Chairperson, Secretary and Treasure of VWMS are members of the sub watershed Committee. All the Chairpersons of the VWMS are members of the Project Watershed Management Committee. The Rules & Regulations and By-laws for each committee should be developed.

Project Implementation Responsibility & Contracts – All the village level activities will be implemented by the VWMS, the sub-watershed level activities by the Sub-Watershed Committee and the Project level activities by the Project Watershed Committee. Following Table shows the recommended implementing responsibility for the main items in the Watershed Development Plan. The watershed development works will be entrusted (contracted) to the community organizations taking the following points into account; (i) to raise the self-reliance and sense of ownership (ii) to develop the skills required for maintenance activities (iii) to gain an additional income.

Table 5.3 Project Implementation Responsibilities

Component/ Item	Activity	Implementation Responsibility
1. Buffer zone Development	Tree planting	VWMS
	Concrete Post fixing	PWMC
2. Soil conservation	On farm	VWMS
	Off farm – Eng work	SWMC
3. Forestry Program	Upland reforestation	VWMS
	Timber farms	SWMC/ PWMC
	Forestry in public places, stream embankments etc	VWMS/ SWMC
4. Production Enhancement & Income Generating Activities	Establishment of nurseries	VWMC
	Home Gardening	VWMC
	Self employments - Agro processing & marketing	VWMC/ SWMC/ PWMC
5 Community Infrastructure Development	Improvement of small tanks & anicuts	VWMC
	Agriculture roads	VWMC/ SWMC
	Drinking water & sanitary facilities	VWMC/ SWMC
6 Wildlife conservation	All activities	PWMC

5.5.3.7 Supporting Facilities to be provided by the project

(i) Office Accommodation - Improvement of project office (Watershed Management Division at Naula) and construct eight Community Centers at suitable locations in sub watersheds. These community centers consist of 10m X 8m Meeting Halls and two rooms - one for the field officer and the other room for the SWMC. For two Divisional Offices it is recommended to rent out two buildings at suitable locations.

(ii) Support facilities for income generating activities – The project will implement rural credit program for income generating activities such as livestock development, inland fishery development, cottage industry development- Kitul Jaggery making, sewing, flower-anturiam cultivation etc.

(iii) Vocational Training – Masonry, Carpentry, Mechanics, Driving, Heavy vehicle Operator training etc. will be given for selected young men and women in the area.

(iv) Promote Marketing Facilities – Setting Pola, Setting Collecting Centers, Make transport arrangement, Establish marketing information system, Improve quality of products.

(v) Social welfare activities - Drinking water, toilet facilities

(vi) Strengthen community organizations

(vii) Purchase water flow measurement equipments and establish flow measuring unit

(viii) Purchase office furniture, vehicles, office equipment etc.

(ix) Wildlife Conservation Program

5.5.3.8 Training & Capacity Building

Awareness Programs
Community Leader Training
Agriculture & forestry Training for community representatives
Staff Training

(i) Awareness Training

- **Media Campaign** - Although the community in the study area are aware of declining productivity of their own land, they don't pay much attention on it. Hence it is necessary to launch an educational and media campaign to make aware the villagers, public officers and school children, the importance of watershed conservation and to convince the long-term ill effects of unsystematic land use. The message should emphasize the land reclamation cost, both on-site and off-site in monitory terms and time consumed for recovery process.

- **Awareness Workshops** - Workshops and Seminars should be held in collaboration with selected Divisional Secretariats', AGA Divisions, Agrarian Service Centers and schools in the Project area. These programs should be targeted to further sensitize the personnel in government sector, Community Organizations, NGO's and to highlight the responsibilities in watershed management activities

(ii) Community Leader Training

- Organization development training – by-laws, rules & regulations, Books maintenance, auditing
- Management Training – Planning, contract management, Resource allocation, Financial Management, leadership, Decision making
- Technical Training – agro-forestry, construction of structures, on farm & off farm activities
- Maintenance training

(ii) Officers Training - - The Project will provide training to field staff in the project & the line agencies, on

- Soil and water conservation, Watershed management, Irrigation management,
- Crop management, Integrated pest management,
- Livestock -Animal husbandry,
- Forestry - Nursery & forest management,

Two overseas training programs have been proposed for selected officers in Asian countries preferably in Asian Institute of Technology, Thailand.

5.5.3.9 The WMU will have to complete the following activities during the initial phase;

- Conduct a Baseline Survey of the project area
- Guide the sub-units to prepare sub watershed plans after conducting PRA sessions. Also it is necessary to study the programs implemented by the NGOS and other organizations in the area, and include their programs into the work plan prepared by the sub-units. Finally, there should be a single work plan available for the entire watershed area.
- Establish community organization & mobilize them to initiate work
- Organize/ conduct training & capacity building programs

5.6 Watershed Development Plan

Table 5.4 illustrates the activity schedule in the Watershed Development Plan. The Plan mainly consists of seven development & conservation activities;

1. 100m wide Reservation Development
2. Implementation of soil conservation measures
3. Forestry Development
4. Farm Production and Income generating activities
5. Community Infrastructure Development
6. Training and Capacity Building
7. Support Facilities

The supporting activities such as training, institutional building, procurement of vehicles, equipment and other office requirements are given in cost tables in Chapter 6.

5.4 Watershed Development Plan

Activity	Development / Implementation Plan							
	Appr. Total available	Development requirement	Year –1	Year - 2	Year - 3	Year - 4	Year -5	Remarks
1. 100m wide Reservation Development								
1.1 Tree Plantation	994 ha	600 ha	80 ha	240 ha	240 ha	40 ha		100m reservations in Moragahakanda (60%), Bowatanna (25%) & Nalanda (15%) ratio
1.1 Moragahakanda Reservoir	584 ha	360 ha	48ha	144ha	144ha	24ha		
1.2 Bowatanna Reservoir	280ha	150ha	20ha	60ha	60ha	10ha		
1.3 Nalanda Reservoir	130 ha	90ha	12ha	36ha	36ha	6ha		
1.2 Fixing Demarcation Posts		6000 Nos	3500 Nos	2500 Nos				
2. Implementation of Soil Conservation Methods								
2.1 . On-farm soil conservation	10000 ha	2500 ha	500 ha	600 ha	600 ha	600 ha	200 ha	Total WS area of Morgahakanda is 25,900 ha & as per land use plan 40% under cultivation (10,000 ha). Assumed 25% of the area for on farm & 15 % of the total length of streams on off-farm soil conservation
2.2 Off-farm soil conservation	735km	100 km	10 km	40 km	40 km	10 km		
3. Forestry Development								
3.1 Upland Forest Conservation	8,000 ha	2500 ha	350 ha	500 ha	650 ha	650 ha	350 ha	*Total extent of open forest, shrubs & bare lands is 8000 ha; Proposed forestry in 30% * Total area available for timber farms 500 ha; Recommend to implement 60% under the project
3.2 Timber farms	500 ha	300 ha	75 ha	75 ha	75 ha	75 ha		
3.3 Tree plantation in reservation	1500 ha	600 ha	150 ha	150 ha	150 ha	150 ha		
4. Farm Production & Income Generating activities								
4.1 Establishment of nurseries		20 units	10 Nos	10 Nos				Selected young farmers 250 nos will be trained on self employment activities
4.2 Home Gardening	2500 ha	1000 ha	200 ha	300 ha	300 ha	200 ha		
4.3 Agro processing & marketing		Activities *	30%	40%	30%			
4.4 Income Generating Activities		Activities		30%	40%	30%		
5. Com. Infrastructure Develop.								
5.1 Rehab. of small tanks	16	16		7 Nos	9 Nos			* The rehabilitation requirement of the irrigation schemes have to be assessed
5.2 Rehab. of small anicuts	110	110		20 Nos	30 Nos	30 Nos	30 Nos	
5.3 Agri. Roads	70 km	25		5 km	10 km	10 km		
5.4 Drinking water & social welfare	Sum	Activities		30%	30%	30%	10%	
5.5 Sanitary Facilities		Activities		20%	40%	40%		

Note - Activities – The activities identified under the program will be implemented in stages

5.4 Watershed Development Plan (Continued)

Activity	Development / Implementation Plan						
	Total Quantity	Year –1	Year - 2	Year - 3	Year - 4	Year -5	Remarks
6. Training & Capacity Building							
6.1 Awareness Training	Item	50%	25%	25%			
6.2 Community Leader Training	Item	40%	30%	30%			
6.3 Mass media Development	Item	50%	30%	20%			
6.4 Training on Agri & Forestry	Item	30%	30%	20%	10%		
6.5 Training on Marketing	Item		30%	30%	20%	20%	
6.6 Income Generating Activities	Item		30%	30%	30%	10%	
6.7 Follow up Program	Item			30%	30%	40%	
6.8 Staff Training (Local)	Item	30%	30%	20%	10%	10%	
6.9 Staff Training (Overseas)	Item		50%	50%			
7 Support Facilities							
7.1 Community Centers/ sub Offices	8 Nos	8 Nos					
7.2 Renovation of WMD	Activities	100%					
7.3 Rent out two bldgs for Div offices	2 Nos	100%					
7.4 Office furniture & equipment	Item	75%	25%				
7.5 Purchasing of 4 WD double cabs	3	100%					
7.6 Truck (4T)	1	100%					
7.7 Motor cycles	15	100%					
7.8 Computers & Accessories	8	75%	25%				
7.9 Training Equipment	Item	75%	25%				
7.10 Met & flow measurement equip	Item		50%	50%			
7.11 Any other	Item			30%	30%	40%	

Wild life conservation costs are included in Table 10.4 under mitigatory activity costs

Chapter 6
Implementation Procedure, Cost Estimates & Monitoring Program

6.1 Implementation Procedure

The Watershed Management Division will attend the following activities during the project period;

(a) **Study the prevailing situation and prepare a Status Report –**
- (i) Study and link the on-going annual programs implemented by the line agencies and the NGOs.– Forestry Department, Agriculture Department, Agrarian Development Department, Livestock department etc and the NGOs.
- (ii) Study and assess the existing situation of the project components -buffer zones, soil erosion hazard areas, reforestation area, community infrastructure etc and prepare a database. The data collected at the Rapid Assessment Survey will be useful in this process.

(b) **Conduct Awareness Training** - Conduct basic awareness programs for Government Officers, NGO representatives and community

(c) **Prepare Guidelines** – Develop guidelines, rules regulations required to follow by the Community Organizations (VWMS, SWMC, DWMC) and initiate in forming them.

(d) **Establish facilities** - Procurement of vehicles, furniture & other things. Construct community centers to establish sub offices.

(e) **Conduct a Baseline Survey of the project area**

(f) **Guide the sub units and villagers to prepare detailed project proposals**

(g) **Prepare detailed action plan**

(h) **Implement the project activities at village level, sub watershed level and project level**

(i) **Conduct Performance Monitoring & Impact Evaluation**

(j) **Launch Maintenance and Aftercare programs**

6.2 Preparation of Action Plan at sub watershed level

The action plans at village level and sub watershed level will be prepared first and then combining them prepare the overall project plan. The sub watershed plans are prepared with direct participation of the local people The recommended procedure for village level & sub watershed level plan preparation is as follows;

(i) Conduct general awareness at village level
(ii) Collect data, information, and proposals through PRA techniques. The subject area covered are;
- Places of excessive soil erosion incurred and remedial measures.
- The areas that can be developed as timber farms, areas need reforestation and the process to develop trees in stream reservations, public places etc.
- Main agricultural products, marketing issues, suggested solutions
- Income generating activities - proposals livestock, inland fishery, home industries such as jaggery making, bee keeping etc.
- Project contribution & community contribution
- Implementation time schedule
- Maintenance procedure

(iii) Carry out field visits with community leaders and assess the proposals made by the community.
(iv) Conduct GPS survey, topographic survey and prepare a detailed proposals
(v) Finalize the activity plan and prepare implementation program with cost estimate.
(vi) Discuss the final Village Watershed Management Plan and submit to the project office.

6.3 Monitoring program

6.3.1 Project Monitoring & Evaluation (M & E) System

1. An Independent Consultant Agency will monitor & evaluate the project activities with reference to the following items;

a. **Baseline Survey** – at the initial stage an independent consultant agency should carry out a Baseline study to assess the existing situation. The parameters should be related to the main components of the watershed development plan.
b. **Impact Assessment** – At the end of the project similar study should be carried out to assess the project impact.
c. **Ongoing Monitoring & Evaluation** - Carry out annual monitoring surveys on the main items in the Watershed Development Plan to determine impact of intervention at a given point of time. This survey results are highly useful in determining whether the project is moving to the correct direction. Suitable modifications can be done if any shortcoming or default is observed.

2. The project staff will carry out the following monitoring and evaluation activities

(i) Monitoring Physical progress & cost – monthly, quarterly and annually based on the work plan. The project staff will prepare monitoring formats to collect the data at the village level and sub watershed level monthly. The project should prepare a simple computerized system for monitoring the physical progress of the project and the financial status of the activities.

(ii) VWMS self evaluation workshop – The Village Watershed Management Committee will evaluate their own activities based on the watershed development plan they prepared at the initial stage. The VWMC will hold a workshop on this evaluation annually with the results to be fed back to their activities.

6.3.1.1 Parameters to be monitored

- Physical and financial targets and milestones throughout the project period.
- Qualitative aspects of the works executed, e.g. percentage of survival, efficacy and maintenance of assets created like gully plugs, contour bunds, check-dams, etc.
- Productive & quantifiable benefits – Production of useful timber & other forest produce, Forest cover, inco me increase
- Mitigatory measures - Prevention of soil erosion and increase in soil productivity through increase of biomass and humus in the soil.

6.3.1.2 Progress Monitoring –

- Monthly Physical & Financial progress review at project level. The PWMD may review the progress of each sub watershed and submit the progress to District Committee. This should be compared with monthly targets in the work plan and take necessary steps to accelerate the work if necessary. The Watershed Committee should help in resolving conflicts and other constraints surfaced during implementation.
- Performance monitoring based on the above indicators.

6.3.1.3 Project Evaluation - Concurrent Evaluation and Impact Evaluation

- The evaluation can be done by internal or external agency. In the evaluation, critical assessment may be made of the relevance of the technological content, involvement of the community, cost/ benefit, maintenance success and other related activities.

The past experience shows that the information/data made available on the progress achieved are very fragmentary, incomplete and sometimes misleading. To avoid that clear indicators should be developed in related to the project objectives and continuous monitoring system should be maintained. The results of an efficient monitoring system would greatly facilitate / improve the final evaluation of the project as well as the preparation of an eventual next project.

6.4 Cost Estimate

The total project cost is estimated at Rs 950 million

Watershed Development Work (Table 6.1) = Rs 750 million

Mitigatory Work (**Table 10.1**) = Rs 200 million

The cost estimates have been based on early 2007 prices indicated by the Forestry department and other government agencies. Estimates of quantities for the watershed development activities are based on the results of the Rapid Assessment Survey and the data computed from maps. Physical contingencies for development work have been estimated at 5%.

The Watershed Management Division at MASL should establish and maintain a separate project account.

Table 6.1 Summary of the Cost Estimate for Watershed Development Program

No	Activity	Unit cost	Quantity	Amount Rs '000
1	**Buffer zone development**			
1.1	Tree Plantation	Rs 125,000 per ha	600 ha	75,000
1.2	Fixing Demarcation Posts	Rs 1200 per post	6,000 nos	7,200
	Sub Total			**82,200**
2	**Soil erosion conservation**			
2.1	On farm soil conservation	Rs 25,000 per ha	2500 ha	62,500
2.1	Off farm soil conservation	Rs 400,000 per km	100 km	40,000
	Sub Total			**102,500**
3	**Forestry Development**			
3.1	Upland forest conservation	Rs 80,000 per ha	2500 ha	200,000
3.2	Timber farms establishment	Rs 80,000 per ha	300 ha	24,000
3.3	Tree plantation in reservations	Rs 80,000 per ha	600 ha	48,000
	Sub Total			**272,000**
4	**Farm Production & Income Gen. Activities**			
4.1	Establishment of Nurseries	Rs 30,000 per unit	20 units	600
4.2	Home Gardening	Rs 30,000 per ha	1000 ha	30,000
4.3	Agro processing & marketing		Sum	15,000
4.4	Income generating activities		Sum	15,000
	Sub Total			**60,600**
5	**Community Infrastructure Development**			
5.1	Village Tanks Rehabilitation	Rs 3,00,000	16 nos	4,800
5.2	Village Anicuts Rehabilitation	Rs 1,00,000	110 nos	11,000
5.3	Agriculture Roads Improvement	Rs 2,00,000 per km	25 km	5,000
5.4	Drinking water facilities		Sum	7,000
5.5	Sanitary facilities		Sum	5,000
	Sub Total			**32,800**

6	**Training & Capacity Building**			
6.1	Awareness Training			4,000
6.2	Community Leaders Training			3,000
6.3	Mass media, video film, hand books, posters etc			6,000
6.4	Training on agriculture & forestry			3,000
6.5	Marketing			3,000
6.6	Income Generation			3,000
6.7	Follow-up			3,000
6.8	Staff Training (local)			7,000
6.9	Staff Training (Overseas)			8,000
	Sub Total			40,000
	Support Facilities (Table 6.2)			51,000
	Project Management Cost		Sum	50,000
	Total			691,100
Physical Contingencies & Price Contingencies ~ 8.5%				58,900
Grand Total				750,000
Total Project Cost Rs 750 million				

Table 6.2 The cost estimate for support facilities

No	Activity	Unit cost	Quantity	Amount Rs '000
1	Community Centers cum Sub watershed office	Rs 15,00,000	8 nos	12,000
2	Renovation of WMD – Naula		Sum	1,500
3	Renting out of two buildings for two divisional offices	Rs 15,000 per month	60 months/ Two bldg	1,800
4	Office Furniture & Equipment		Sum	7,000
5	Double cabs	Rs 3.5 million	3 Nos	10,500
6	Truck (4 Tons)	3 million	1 no	3,000
7	Motor Cycles	Rs 1,50,000	15 Nos	2,250
8	Computers & accessories	Rs 200,000	8 Nos	1,600
9	Training equipment		Sum	4,000
10	Metrological & flow measurement instruments		Sum	5,000
11	Miscellaneous		Sum	2,350
	Total			51,000

6.5 Cost Analysis

6.5.1. 100m wide Reservation Development

(a) Tree Planting
Plants (5m x 5m intervals) including losses, damages, wastages per ha
Required No (say) = 500 Cost 500@ Rs 25 = Rs 12,500
Small plants in between = 500 Nos @ Rs 15 = Rs 7,500

Land clearing,

Excavation of pits, carry to the site, planting, fertilizer application in two times
No. of labor days required = 100
Cost = 100 @ Rs500 = Rs 50,000
Maintenance cost per year -
No of labor days per year - 30; for three years = 90
Cost = Rs 45,000
Total Cost = Rs 115,000
For tools & other = Rs 5,000; Transport & other = Rs 5,000
Grand total per ha = Rs 125,000

(b) Fixing Demarcation posts

Pre-cast concrete posts dimensions 60" x 9" x 6"

30" below the ground and 30" above the ground

Cost for casting, transporting and fixing at 50 m intervals = Rs 1200

6.5.2 Soil Conservation

(a) On farm soil conservation
Average length of hedges/ terraces in a ha = 500 m
Cost per m = Rs 50
Cost per ha = Rs 25,000

(b) Off- farm soil conservation

Average cost of construction 9of structures to minimize embank erosion & wash aways

Cost per km = Rs 4,00,000

6.5.3 Forestry Development

(a) Upland forest conservation

Reforestation in State lands (65% as specified under buffer zone) = Rs 8 0,000

Balance 35% (one third community contribution)

In Private lands Cost = Rs 80,000 per ha

The maintenance cost is borne by the beneficiary

(b) Timber Farms – two third by the project & one-third by the beneficiary

Cost per ha = Rs 80,000

(c) Tree planting in public lands (school, temple premises etc) & stream embankments

Cost per ha = Rs 80,000 (one third beneficiary contribution)

6.5.4 Farm production & Income generating activities

(a) **Establishment of Nurseries**
Cost for material & 50 % of labor = Rs 30,000 per unit
Balance 50% beneficiary contribution

(b) **Home-garden development program**
Cost per ha = Rs 30,000 (plants & 50% of labor cost)
Balance 50% beneficiary contribution

(c) **Agro processing & Marketing - Rs 15 m**

- Food processing, improvement of storage facilities
- Collective purchasing, buy back contracts & marketing arrangements
- Provide common transport facilities and train to produce quality products; minimize wastages
- Mark et-target crop production, value addition etc
- Assist establishment of a marketing information system that links between the Community groups and the Dambulla Market

(d) **Income Generating activities & social welfare - Rs 15 m**

Work Steps

- Study success cases of income generating activities in previous projects
- Discuss with the community groups and discuss the potential, problems and alternatives
- Prepare a work program for income generating activities – the community contribution should be more than 50%
- Identify target group- In selecting beneficiaries, give the preference to women and young farmers
- Conduct training, field visit to see success stories
- Conduct demonstrations / pilot programs and review the success
- Implement the programs
- Feed back

Items;

- Vocational Training for self employment – Carpentry, Mason work, tailoring/ dress making
- Livestock Development
- Inland fish development
- Bee keeping, Making Kitul Jaggery, Mushroom cultivation etc.
- Small scale enterprise development

6.5. 5 Community Infrastructure Development

Village tanks & anicuts rehabilitation & introduce water management programs to increase cropping intensity.

Average cost per tank rehabilitation Rs 300,000

Average cost per anicut rehabilitation Rs 100,000

Agriculture roads cost per km including structures= Rs 200,000

Drinking water supply Sum = Rs 7 m

Sanitary facilities Sum = Rs 5 m

6.5.6 Training & Capacity Building

Work steps;

a. **Identify Training needs**
b. **Prepare Training plan**
c. **Appraise Training Plan**
d. **Implementation**
e. **Feed back**

(a) Awareness Training **- Rs 40,00,000**

i. General awareness at village level
ii. Subject Matter Awareness

(b) Community Leaders Training **- Rs 30,00,000**

a. Organization Development
b. Financial Management
c. Leadership Qualities
d. Subproject Management

(c) Mass media, video film, hand books, posters etc **- Rs 60,00,000**

(d) Training on agriculture & forestry **- Rs 30,00,000**

a. Rice & OFC production
b. Seed Production
c. Crop diversification
d. Forestry programs

(e) Marketing **- Rs 30,00,000**

a. Post harvest Technology
b. Market Information

(f) Income Generation - **Rs 30,00,000**

a. Animal production and health

b. Aquaculture

c. Enterprise development

(g) Follow-up - **Rs 30,00,000**

As & when required

(h) Staff Training (local) - **Rs 70,00,000**

a. Trainers Training

b. Subject Matter Training – Agriculture, Forestry etc

c. Organization al Development & Participatory Approaches

(i) Staff Training (Overseas) - **Rs 80,00,000**

a. **Study Tours** – Preferably Asian Institute of Thailand on watershed Management – 2 batches 15 participants in each

Sub Total - **Rs 40,000,000**

Final Report
(Volume Two)

Moragahakanda Agricultural Development Project-

The detailed mitigatory plan for the mitigation of Adverse Impacts (Project area including resettlement area)

Chapter 7 – Issues relevant to protected areas, Elephant corridors, & water resources

7.0 The catchment area of the proposed reservoir & settlement area

The natural catchment characteristics & man made characteristics of the study area was discussed in detail in the volume 1 of this report.

In this section the existing environment in the catchment area & in the Medirigiriya settlement area will be described with reference to elephant corridors, protected areas & water issues.

7.1. Catchment area of the proposed reservoir

7.1.1 Floral and Faunal Diversity in the reservoir catchment

The floral diversity was discussed in detail in chapter 5. Faunal diversity within the project area is fairly high. This is to be expected as project sites encompasses undisturbed forest, scrublands and reverine vegetation and abandoned chena land in the area. In addition this area fringe with Knuckles Conservation Area. According to TEAMS (1998) aquatic environment is home for a total of 16 fish species including six endemic fish 4 endangered species (*Puntius bimaculatus (E), Puntius srilankensis, (E. Puntius martenstyn (E)and. Schistura notostigma* (E). Reptilean fauna includes 13 species three endemic and three endangered species. *Catotes varsicolor Catotes ceylonensis Hemidactylus* spp Five species of Amphibians and 41 species of butterfly fauna can be encountered.. Birds found to be the most abundant vertebrate taxa within the area it provide home for at least 77 avifaunal species and wide array of mammal speeie including elephants *(Elephas maximis)* Sambhur *(Cerviis unicolor unicolor),* Spotted deer *(Axis axis),* Mouse deer *(Tragulus meeminna),* Wild boar *(Sus scrofa),* Grey langur *(Presbytis entolhis),* Toque monkey *(Macaca shiica),* Prorcupine *(Hystrix indica indica), Grey mongoose (H. edwardii Lanka),* Ruddy mongoose *(H. smithii zeylanicus), Civet cat (Veverricula indica mayori),* Black naped hare *(Lepus nigricollis),* Leopards *(Panthera pardus fusca),* and Indian Pangolin *(Manis crassicaudata.* However Management issues are coming from Elephants of the area. The density of the elephant tend to increase in and around the areas close to Maoragahakanda Dam site. A resident herd of 40-65 elephants inhabit in the area and increased to about 80-100 as rainy season approaches, this tend to reduce disperse in adjoining forest areas.

Endemicity found to be high among the faunal assemblage. In addition to the rich faunal assemblages here, surrounding areas are also support a rich range of wildlife species. As the environment provides wide variety of habitat, it is home for large number of

migratory species especially for migratory birds. In addition to the permanent herds of elephants inhabiting the area, some of the elephant used the area to move from areas such as Kirioya-Wasgomuwa, Pitawalapathana-Illukumbura, Kambarawa Opalgala, Minneriya Giritale Sanctuary and Wasgomuwa west. During the dry season.

7.1.2. Loss of habitats

As described under vegetation cover, the catchments areas of the Moragahakanada Reservoir is having different land use patterns. Forests: sub-montane forests, dry monsoon forest, Wet monsoon and scrub jungles, Agricultural lands, pathanas, home gardens, paddy fields and monoculture etc. These lands are mainly available in watershed areas and area of inundation of the proposed Moragahakanda Reservoir. The major threat coming to biodiversity from the reduction of these forest areas would be from associated habitats for wildlife. The areas especially located in slopes that extend up to Knuckles Range is home for wide variety of species. The southern end of the project is more vulnerable as it links with Knuckles Conservation Area.

7.1.3 Protected areas & Human Elephant conflict

Apart from that, project area is surrounded by a number of important protected areas namely, Knuckles Conservation area, Wasgomuwa, Minneriya Giritale sanctuary and Elahara Sanctaury (Corridor). All these protected areas have been established with Environmental Impact targets and serves as habitats for displaced wildlife under the Accelarated Mahaweli Ganga Development Project. Some of these areas are likely to be effected due to the implementation of the present project.

The largest contiguous system of unused lands are located at the southern flank of the Moaragahakanda reservoir catchments (Northern End of Knuckles Region) covering Kambarawa, Dammanthenna, Puwakpitiya, Illukkumbura etc. where it connects with Knuckles Conservation area. This will extend East words towards Wasgomuwa - Minneriya Giritale sanctuary. There are number of different categories of protected areas located just adjacent to the project area as given in **Table 7.1 & Fig 7.1**

Table 7.1 Different categories of protected areas located adjacent to the project area

No.	PA	Region	Category	=Size(km^2)
1.	Wasgomuwa	Mahaweli	Np	369.00
2.	Mahweli Riverine	Mahaweli	NR	8.2
3	Mineriya Giritale	Mahaweli	NP	66.90
4	Minneriya Giritale (Block 1&2)	Mahaweli	NR	122.8
5	Minneriya-Giritale Block 3&4	Mahaweli	Sancturay	66.94With private lands
6	Sigiriya-	Mahaweli	Sa	50.99
7	Elahara Sanctuary Act as a link to Wasgomuwa	Mahaweli	Sanctuary	State and private

In addition, northern end of the Knuckles Conservation area fringes with the Moragahakanda Reservoir Catchments and used by elephant during certain period of the year mainly in July-August.

Preliminary observation reveled that the area contains wide array of wildlife habitats, different types of vegetation with disturbed forest and home gardens as well. Vegetation types encountered are

- Moist Monsoon forests,
- Dry monsoon forests
- Scrub forest ,
- Grasslands and
- Aquatic ecosystems

Table 7.2 Contiguous system of protected areas in Mahaweli region

Sr.No	PA	Region	Category	=Size(km^2)
1	Wasgomuwa	Mahaweli	Np	369.00
2	Mahweli Riverine	Mahaweli	NR	8.2
3	Polonnaruwa	Mahaweli	SA	15.22
4	Flood plains	Mahaweli	NP	173.50
5	Minneriya Giritale	Mahaweli	NP	66.90
6	Minneriya Giritale (Block 1&2)	Mahaweli	NR	122.8
7	Minneriya-Giritale Block 3&4	Mahaweli	Sanctuary	66.94With private lands
8	Sigiriya	Mahaweli	Sa	50.99
9	Elahara Sanctuary Act as a link to wasgomuwa)	Mahaweli	Sanctuary	State and private
10	Kaudulla National Park	Mahaweli	Np	158.00
11	Somawathi and Its extension	Mahaweli	NP	377.62
12	Trikonamadu	Mahaweli	NR	250
13	Maduru oya	Mahaweli	NP	

Several designated protected areas have been established partly or wholly or adjacent to the overall Moragahakand Agricultural Development Project area. These areas act as home for wide array of fauna and flora. However, majority of the elephant inhabiting overall areas does not confine to the limit or boundaries of these protected area set a side for wildlife. **Fig 7.1** illustrates distribution of elephant areas originally marked in relation to the location of existing protected area net work of the region. This fig illustrates the locations where elephant conflicts occurred. However, these elephants are sharing the range in three different ways.

- Some of the animals that are affected move/range entirely within protected areas available.
- Some of them are covering both Protected area and outside as parts of their range

- Others are completely roaming just out side the protected area set a side for them.

The project does not have serious problem with the elephants that range inside the protected areas already established. The other two groups who range out side the existing protected areas will have a tremendous conflict with settlers and villagers. Preliminary observations and discussions with wildlife officers and villagers indicated that the elephants in the said area have seasonal migration as well.

A large number of protected areas have been established during the past within the Mahaweli Region to provide home for wildlife, catchments conservation and also as measure of mitigation of the Mahaweli ganga Development Programme on the basin. (**Table 7.2 and Fig7.2**). Mahweli areas consist of contiguous system of protected areas

7.2 Issues in proposed settlement area at Medirigiriya

7.2.1 The proposed settlements & recent decisions of MASL

At the stage of Lahmeyer (2001) study, it was considered to settle the displaced people from the inundating area of the proposed project & 41 families within the elephant corridore located at the northern part of the project site (**Fig 1.7**) at the proposed settlement area at Medirigiriya. At that initial stage about 756 displaced personal have given their consent to settle at Medirigiriya. However during the progress of this consultancy assignment this situation changed due to new circumstances in the Medirigiriya area as described below:

- Due to CRF problems at Medirigiriya
- Human elephant conflicts
- The proposed settlement location is closer to LTTE area & security problems in the area

GOSL & MASL considered these situations & now it is decided to settle the displaced inhabitants of the project site at Kaluganga left & right banks. The Moragahakanda eveues prefer those sites as resettlement sites. Therefore present study at Medirigiriya will be considered as a settlement area under the command area of the Moragahakanda reservoir & recommendations will be to mitigate the identified issues in the area. However there is a detailed study in progress for the resettlement in the left & right banks of Kaluganga by another consultancy team.

7.2.2 Flora at Medirigiriya area

The settlement areas in Medirigiriyia consist of scrublands, teak plantations, secondary forest near Etambe oya police post, Patolakotuwa, and Gemunupura area. Secondary forest and scrubland near teak plantation (225464 E, 332443 N, 51 m altitude) towards Ambagaswewa (227679 E, 332539 N) showed the typical dry zone species found in secondary forests such as Wira, Ehela, Boradaminya, Katupila, Seru, Keliya, Bolpana, Kuratiya, Maila, Burutha, Palu, Kon, Karamba, and in moist areas Helamba, Dunumadala, Kolon, Lolu, Kohomba and Hulanhik. This forest patch extends towards Hurulu forest reserve. During the field visits it was revealed that some areas identified for

resettlements of families, already occupied by people some years ago and they have constructed the permanent houses.

7.2.3 Wild life at Medirigiriya settlement area

Somawathi Extension National park was established under the accelerated Mahaweli Environmental Project to provide adequate home for displaced wildlife, especially for elephants and also to regulate the flow of the down stream areas. Thus present location at Medirigiriya North will have a tremendous impact on wildlife. It is evident that elephant problems are acute in the said area and proposed project can aggravate the problem.

Kaluganga Left bank and right bank project have impacts on the areas of biodiversity especially on elephants. However, these activities tend to increase the regional conflict and loss of biodiversity in many folds. All the migratory roots and other areas to have a free movement between Moragahakanda catchments and Wasgomuwa lie along the area ear marked for Kalu ganga .

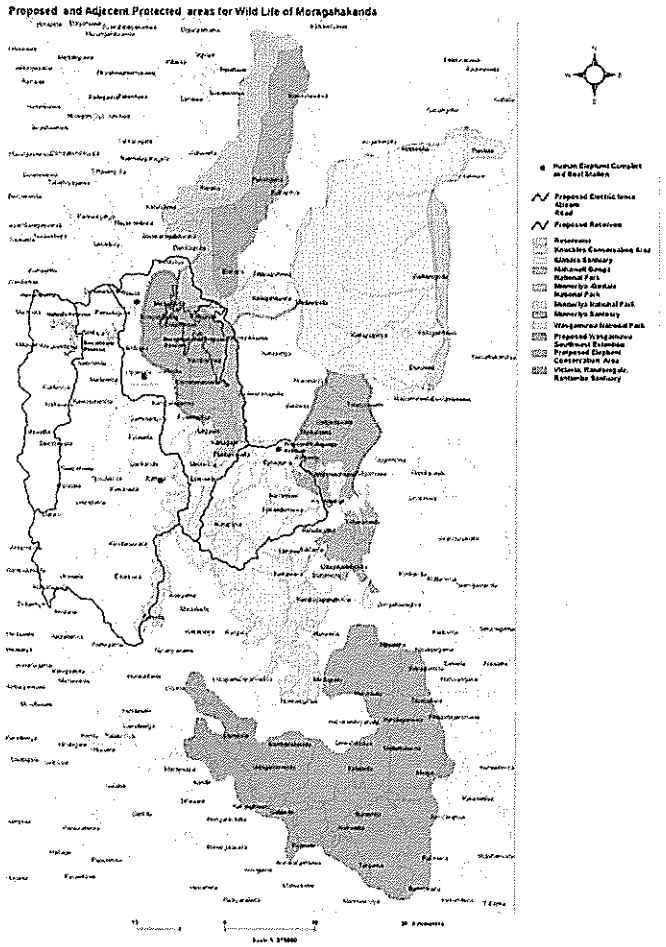


Fig 7.1 Protected areas proposed and adjacent to proposed project site

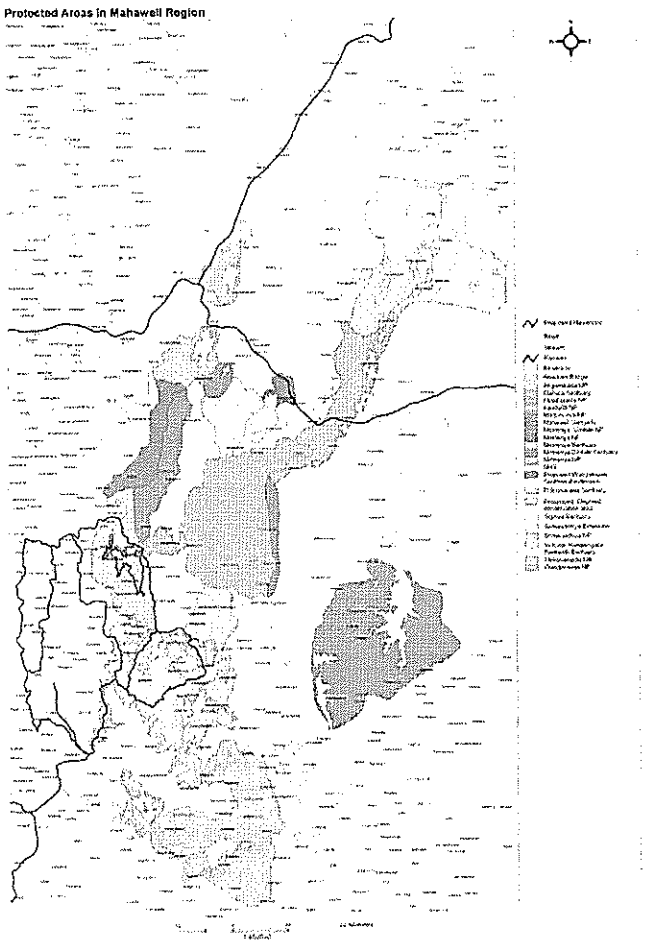
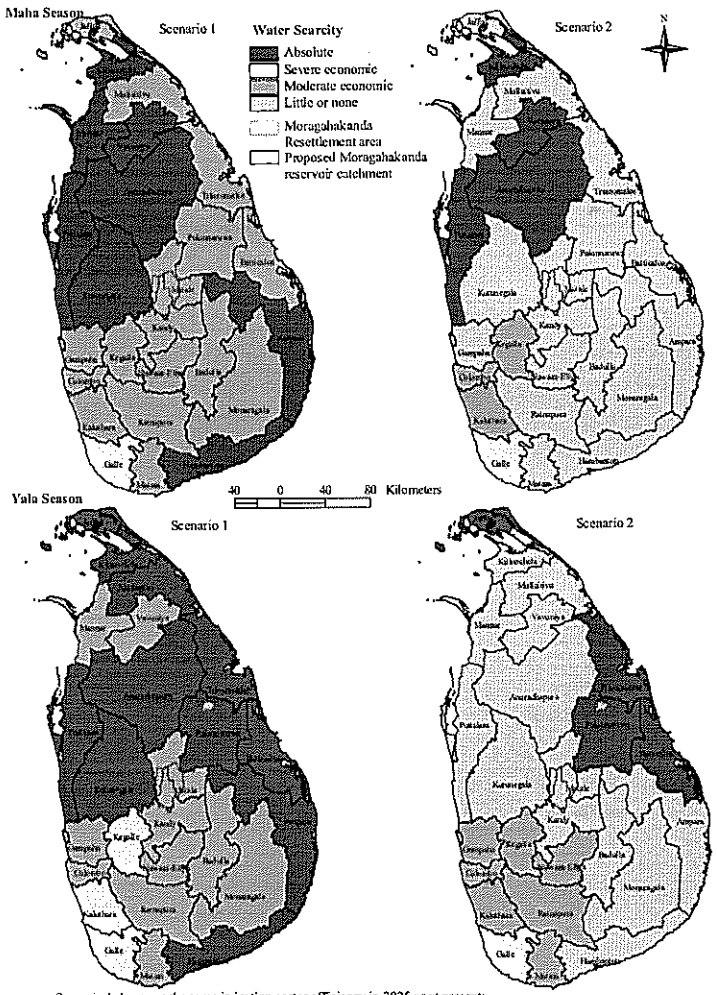


Fig 7,2 Protected areas in Mahaweli region



Scenario 1 Assumes the same irrigation sector efficiency in 2025 as at present;
Scenario 2 Assumes a doubling of irrigation sector effeciency in 2025

Fig 7.3 a Location of proposed Moragahakanda project & the settlement area within the water scarecity regions predicted by IWMI using IFPRI model (Source: Anon 2000)

7. 2. 3 Water issues in the Medirigiriya settlement area

7. 2.3.1 Water requirements

Table 7.3 Basic water requirements

Purpose	Litres per day per person
drinking water	5
sanitation	20
washing up purposes	15
preparation of food	10
Total	50

According to several international organizations the minimum water requirement per person per day is 50 Liters (Sari & Ari 2006). There are many people in the world who do not meet this basic water requirement indicated in **Table 7.3**. In Sri Lanka the availability of water per person per day vary from 65 liters per person per day in Colombo to 19 liters per person per day at Moneragala (Amarasinghe & Mutuwatte1999).

7.2.3.2 Water scarcity

There are two categories of water scarcities namely; Absolute water scarcity (Do not have sufficient water to meet the demands of their agriculture, domestic industrial & environmental sectors) and economic water scarcity (They have resources to meet their future needs but may have financial means to undertake the developments to mobilize these water resources). Absolute scarcity of water is not the case overall of Sri Lanka However due to uneven spatial & temporal distribution of the rainfall over Sri Lanka causes severe shortages in some areas, (e.g. dry zone) which give rise to conflicts among competing water users.

The proposed settlement area in Medirigiriya site falls within the forecasted absolute water scarcity – moderate water scarcity regions during yala & Maha seasons respectively (**Fig 7.3 a**). The proposed settlement is located in Polonnaruwa district, Medirigiriya electorate. There are fifteen families living in Pubudugama at present and there was an initial proposal to settle 756 families from Moragahakanda at Medirigiriya settlement area. However due to recent MASL decision settlement will be done at Kaluganga left & right bank.

7.2.3.3 Water supply situation-

Currently water supply to Pubudugama and Ambagasweva are mainly from ground water sources. **Fig 1.5** illustrates the settlement area at Medirigiriya. Currently water supply to Pubudugama and Ambagasweva are mainly from ground water sources (see **plate 7.1**). Ground water from tube wells and dug wells are used by people in this area. Surface water is not supplied at present to any part of the proposed settlement area. **Table 7.4** & **Table 7.5** illustrate water supply situation at Pubudugama & Ambagaswewa respectively.

Table 7.4 Main features of existing water supply situation in Pubudugama

No	Item	Description	Remaks
1	Population of area Rural-100%	540	Estimated at 2006
2	Surface water abstracted	-	Present study
3	Ground water utilization	324000 l/day	Tube and dug wells
4	Pipe water coverage	0%	Present study
5	Seasonal variation	Wet season Dry season	Wet season –Oct- March Dry season- Apr. to Sep.
6	Industrial water uses	0% domestic requirements	No water use industries
7	Domestic water uses	15% of domestic requirements	
8	Losses and unaccounted for water	25%	
9	Socio-economic factors Family size Income level Community involvement land	 4 Average (Samurdhi) Farmers, temporary employees Own and encroached	Present study
10	Potential future water resources	Ambagasweva and Nidanguma lake	Ground water is not a reliable source (Water quality- Microbiology)
11	Proposed water supply schemes	Ambagasweva integrated water supply scheme	Present report

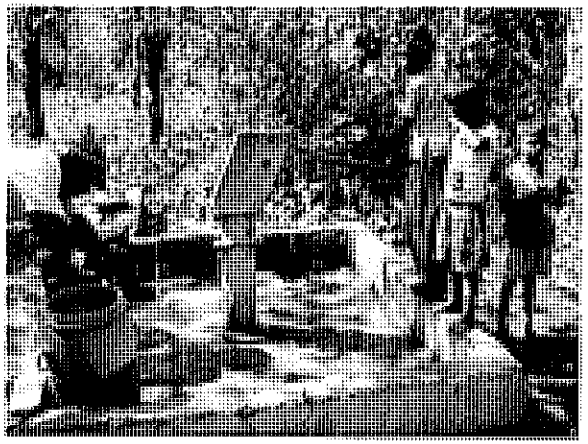


Plate 7.1: Use of ground water resources at Pubudugama

Table 7.5 Main features of existing water supply situation in Ambagasweva area			
No	**Item**	**Description**	**Remaks**
1	Population of area Rural-100%	540	Estimated at 2006
2	Surface water abstracted	-	Present study
3	Ground water utilization	324000 l/d	Tube and dug wells
4	Pipe water coverage	0%	Present study
5	Seasonal variation	Wet season Dry season	Wet season –Oct- March Dry season- Apr. to Sep.
6	Industrial water uses	0% domestic requirements	No water use industries
7	Domestic water uses	15% of domestic requirements	
8	Losses and unaccounted for water	25%	
9	Socio-economic factors Family size Income level Community involvement land	Average (Samurdhi) 4 Farmers, temporary employees Own and encroached	Present study
10	Potential future water resources	Ambagasweva and Nidangama lake	Ground water is not a reliable source (Water quality- Microbiology)
11	Proposed water supply schemes	Ambagasweva integrated water supply scheme	Present report

7.2.3.4 Possible water sources

One possible source of water is Nidanagama wewa (Lake) 1,000 meters to the east. The irrigation department controls and regulates the lake and their use. Water from Moragahakanda to Kaudulu wava and from Kauduluweva to Nidanagamaweva is the best way to provide surface water for this area. Additionally, storage must be considered so that maintenance and any other unforeseen emergencies will not cause a shortage of water. Other possible water source is the rain water harvesting. If the lake water is used, treatment would be required to remove contaminants such as large particles and bacteria.

7.2.3.5 Water quality of wells

Table 7.6 illustrate the water quality of some wells located within resettlement area. The sampling location for water quality of wells are illustrated in **Fig 7.3.** The water quality of the samples collected from other locations are given in **Appendix 7.1**

Some physical, chemical and microbiological water quality parameters were measured in some selected drinking water wells, tube wells and irrigation tanks. Tested chemical parameters of samples were below the WHO water quality standards and faecal coliform numbers exceeded the WHO drinking water quality standards. Total coliform number should be zero for WHO drinking water standard. Thus, it is conceivable that unsafe drinking- water contaminated with soil or faeces could act as a carrier of other parasitic

infections, such as balantidiasis (*Balantodium coli*) and certain helminths. The water quality standard of Sri Lanka is given in **Appendix 7.2.**

Previous reports have documented that groundwater from tube wells, boreholes and dug wells is used by the vast majority of the population in Polonnaruwa district. Groundwater quality is characterized by the presence of high content of iron, bicarbonate (Hard water) and sometimes fluoride content, in addition to low yield from certain aquifers.

Table 7.6 Some water quality parameters analyzed in the proposed settlement area of the Moragahakanda project (in 5 major sampling locations) The water quality datu of the rest are given in Appendix 7.1

Location	pH	Phosphate µg/l	Nitrate µg/l	Conductivity µS/ cm	Hardness mg/l	MPN per 100ml
Pubudugama Well	7.61	770	1.276	620	4.96	460
Ambagasweva (lake)	8.26	1560	2.107	560	5.40	75
Ambagasweva well	8.19	1280	2.889	465	3.30	28
Pubudugama Tube well	7.63	805	0.175	835	7.30	4
Nidanagama Weva (Lake)	8.17	1650	1.974	794	3.60	9

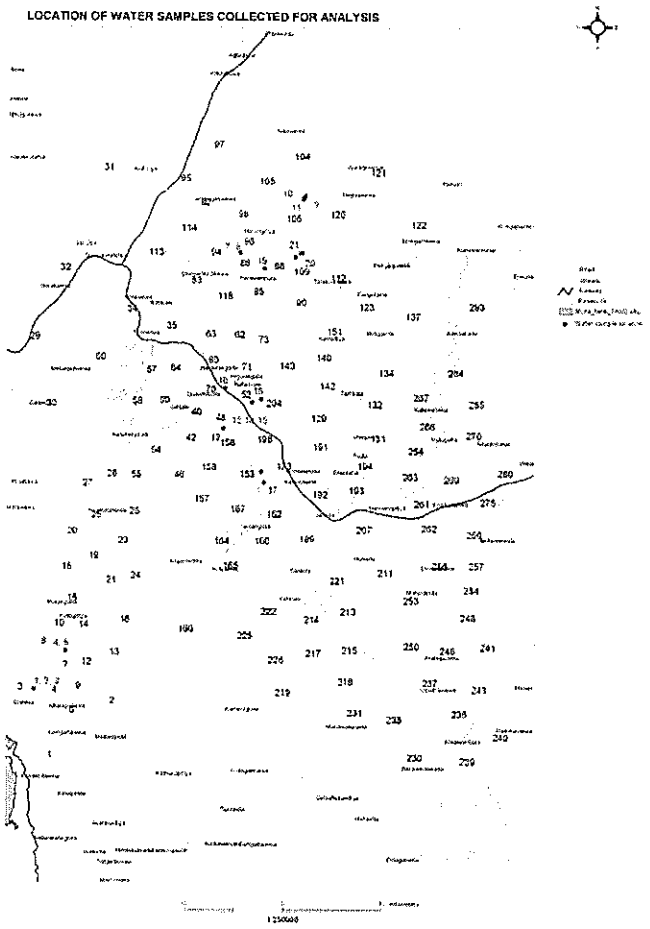


Fig 7.3 b Location of sampling sites for water quality analysis in proposed resettlement area

Table 7.7: Grama Niladari Divisions (GND) in Medirigiriya

No.	GND Name	GND Code no.
1	Abhayapuragama	94
2	Akbarpura	123
3	Aluthwewa	112
4	Ambagaswewa	103
5	Bisobandara	113
6	Bisobandara Gama	100
7	Bisouyana	89
8	Damsopura	110
9	Diggalpura	96
10	Divulankadawala	84
11	Diyasenpura	88
12	Ekemuthugama	104
13	Etambaoya	98
14	Gajabapura	86
15	Ihalagama	109
16	Jayagampura	102
17	Jayathugama	105
18	Kahambiliyawa	90
19	Kavudulugama	91
20	Kavuduluwewa(Ralapanawa)	92
21	Kumudupura	107
22	Kusumpokuna	118
23	Mahasenpura	117
24	Mandalagiriya	115
25	Maniksorowwa	95
26	Medirigiriya	87
27	Meegaswawe	121
28	Nagarapura	101
29	Nelumpokuna	82
30	New Town	93
31	Palliyagodella	122
32	Perakumpura	85
33	Sansungama	125
34	Senarathpura	106
35	Thalakolawewa	111
36	Thissa Amuna	116
37	Thissapura	114
38	Veheragala	124
39	Viharagama	83
40	Wadigawewa	120
41	Wedehapura	99
42	Wedikachchiya	97
43	Wijayapura	108
44	Wijayarajapura	119
45	Yudhaganawa	81

pollution

7.2.3.5.1Chemical indicators of water quality

Water hardness

Water hardness is commonly defined as the sum of the polyvalent cations dissolved in the water. The most common such cations are calcium and magnesium. Generally, waters are classified according to degree of hardness.

According to the classification, the samples collected from resettlement area fall in soft water hardnes category..

Nitrate and nitrite

Nitrate and nitrite are naturally occurring ions that are part of the nitrogen cycle. The nitrate concentration in groundwater and surface water is normally low but can reach high levels as a result of agricultural runoff, refuse dump runoff, or contamination with human or animal wastes. The federal standard for nitrate in drinking water is 10 milligrams per litre (10 mg/l) nitrate-N, or 45 mg/l nitrate-NO_3. In the present study, nitrate concentrations in the area where samples were collected showing that the concentrations were below the water quality standard.

Microbial indicators of water quality

Frequent examinations for faecal indicator organisms remain the most sensitive and specific way of assessing the hygienic quality of water. They should be universally present in high numbers in the faeces of human and worm blooded animals and not should grow in natural water. Water intended for drinking and household purposes must not contain water born pathogens. The most specific bacterial indicator of faecal

from humans and animals is *E.coli*, it follows that *E.coli* or thermo tolerant coliform organisms must not be present in 100-ml samples of any water intended for drinking (WHO Drinking standards). The samples collected from Pubudugama well, Ambagaswava weva, well and Nidanagam weva shows faecal contamination (**Table 7.6**).

7.2.3.6 Chronic Renal Failure disease (CRF)

North central province had been the fertile ground for epidemics of infectious diseases such as malaria and Japanese encephalitis in the past, which were the leading causes of hospitalization in this province. During the past few decades, CRF became the major cause of hospitalization as well as mortality according to the Anuradhapura, general hospital sources (Anuradhapura Medical Journal 2004-2005).

The CRF problem in Medirigiriya is a issue identified by the consultancy team which has to be considered seriously to initiate further research & to recommend immediate suitable precautionary measures for the inhabitants of the area. The number of effected people & number of deaths due to CRF is increasing and greater than many other diseases in the area. Therefore this aspect has to be highlighted for the attention of MASL to initiate long-term indepth research to find out the causes for the CRF.

Table 7.7 illustrates the Gramaniladari Divisions (GND) located within Medirigiriya settlement area indicated in **Fig. 7.7** which illustrates the distribution of CRF within the proposed settlement area at Medirigiriya.

Table. 7.8 Leading causes of mortality, medical unit General Hospital, Anuradhapura- (2001)

Disease	Number of Patients
Chronic renal Failure (CRF)	134
Cerebro Vascular Accidents	115
Pesticide Poisoning	102
Pneumonia	81
Alcoholic liver disease	72
Oleander poisoning	38
Heart failure	36
Chronic lung disease	32
Diabetes	18
Snake bites	08
Malaria	05
Viral encephalities	04

Source- Anuradhapura Medical Journal

7.2.3.6.1 CRF at Anuradhapura

Recently, increasing tendency of chronic renal failure diseases patients were recorded in Anuradhpura. **Tables 7.8 – 7.11 & Fig 7.4 illustrates** the available hospital statistics for information. In the year 2001, Chronic Renal Failure has become the leading cause of death in general hospital at Anuradhapura (**Fig 7.4**), compared to other infectious and

non-communicable diseases. The number of hospital admission and mortality rate of the general hospital, Anuradhapura, due to chronic renal disease has increased during the past ten years compared to the period before 1990 (**Table 7.8 & 7.11**).

Table 7.9 Chronic renal failure- Hospital Mortality and live discharge 2001, General hospital, Anuradhapura.

Year	Live discharge	Death
1993	377	52
1994	479	65
1995	525	79
1996	484	131
1997	396	113
1998	634	132
1999	698	149
2000	708	188
2001	856	184

Table 7.10Age distribution of Chronic renal failure, General hospital, Anuradhapura

Age range (Years)	Number of admission
10-19	01
20-29	03
30-39	24 (8%)
40-49	43 (14%)
50-59	77 (26%)
60-69	68 (22%)
70-79	68 (22%)
>80	12 (04%)

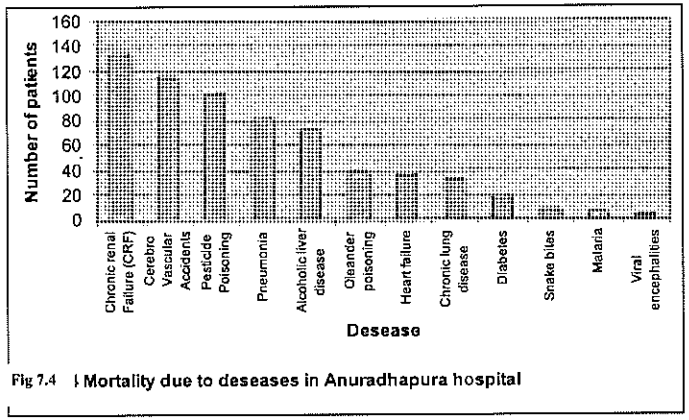


Fig 7.4 Mortality due to deseases in Anuradhapura hospital

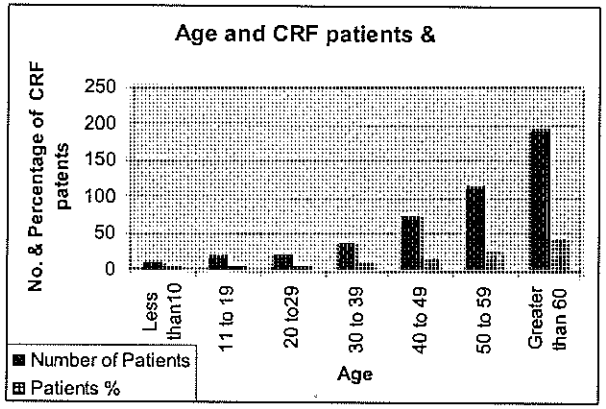


Fig 7.5 Relationship of age & No. of CRF patients in Medirigiriya area

Table 7.11 Chronic renal failure admissions, DDHS areas, Anuradhapura District.

DDHS area	Number of hospital admissions
Padaviya	50
Kebitigollawa	13
Medawachchiya	32
Horowpathana	13
Kahatagasdigiliya	12
Galen bidunuwewa	17
Rambawa	11
Mihintale	08
Nuwaragampalatha (NPE)	27
Nuwaragampalatha (NPC)	24
Outside Anuradhpura district	19
Nochchiyagama	24
Wilachchiya	14
Talawa	18
Rajanganaya	08
Tabuttegama	03
Ipalogama	04
Tirappane	10
Kekirawa	09
Palgala	02
Galnewa	02

Anuradhpura general hospital statistics (2003) indicated that males were more affected than female (3:1) and 92% of them were between 30 to 80 years. The majority of patients are farmers. **Table 7.10 & Fig 7.5** illustrates the age distribution of the patients admitted.

The number of patients presented from the major agricultural areas such as Tabuttegama, Ipalogama, Rajanganaya, Kekirawa, Talawa and Palagala were comparatively low in spite of the higher usage of agrochemicals in these areas, which is against the possibility of agrochemical as the causative agents for chronic renal failure diseases.

Geographical distribution of the chronic renal disease (**Fig 7.7**) shows that the northern part of the province is mainly affected and therefore the role of geological factors, such as the presence of heavy metals and trace elements in the soil also have to be considered in further research.

A descriptive study done (Anuradhapura medical Journal, 2004) recently showed indicates that the majority of patients with chronic renal failure uses well and tube well water and stored water in metallic and aluminium pots. Heavy metals and trace elements such as lead, mercury and cadmium are well establishing actiological agents of chronic renal failure. Itai Itai disease, which is associated with asteomalasia and increased incident of renal calculi, described in Japan is believed to be due to prolonged exposure to cadmium through the contaminated food and water resources.

Balkan Nephropathy is an interesting entity of chronic renal disease that has been endemic in adult population of villagers in Romania, Bulgaria, Bosnia, Croatia and Serbia. Affected areas are all along the tributaries of river Danube, within 50 miles radius from river bends. Their water supply is from shallow wells. It has been recorded that the local farming community between 40 to 50 years of age affected. The presence of trace metals such as cadmium, lead and uranium in the water resources was implicated initially but failed to confirm so far despite of extensive studies.

Table 7.12 Number of kidney patients regularly visit the renal clinic in Medirigiriya base hospital (Data on 28/09/2006

Age	Number of Patients	Patients %
Less than10	10	2.21
11 to 19	18	3.98
20 to29	19	4.2
30 to 39	36	7.74
40 to 49	74	15.48
50 to 59	114	24.55
Greater than 60	193	41.81

Male patients -375 (77%) Female patients – 106 (22.9%)

Table 7.13 Distribution pattern of renal patients in Medirigiriya division (28/09/2006)

Division	No. of patients (28/09/2006)
Meegaswewa	44
Mahathalakolawea	63
Wijepura/Diyasenpura	63
Ambagaswewa	69
Newtown	90
Manikhorowwa	08
Bisobandaragama	24
Bisobandaraya	17
Medirigiriys	27
Divulankadawela	47
Others	11
Total	463

7.2.3.6.2 CRF at Medirigiriya (2006)

It has been found that the sudden increasing tendency of renal diseases in the Medigiriya electorate during 2006 compared to 2003 and 2004. Forty three patients in 2004, 98 patients in 2005 and 322 patients in 2006 have been recorded (Medirigiriya base Hospital data 2006).**Tables 7.11 & 7.12** summarize the hospital statistics. **Fig. 7.6** illustrates the CRF patients in Medirigiriya.

The causative agent or reasons to increase the number of chronic renal failure patients are not well understood at present and there were no definitive causative factor but believed to be due to some form of toxin. In north central province also, the possible initial event could be a toxin mediated renal damage. At present there are no adequate studies to prove this hypothesis.

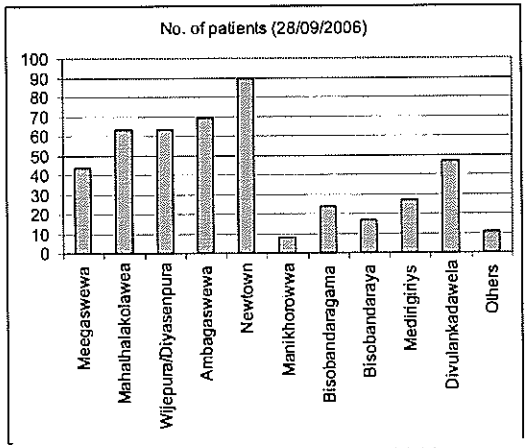


Fig 7.6 The distribution of CRF patients in Medirigiriya proposed resettlement area.

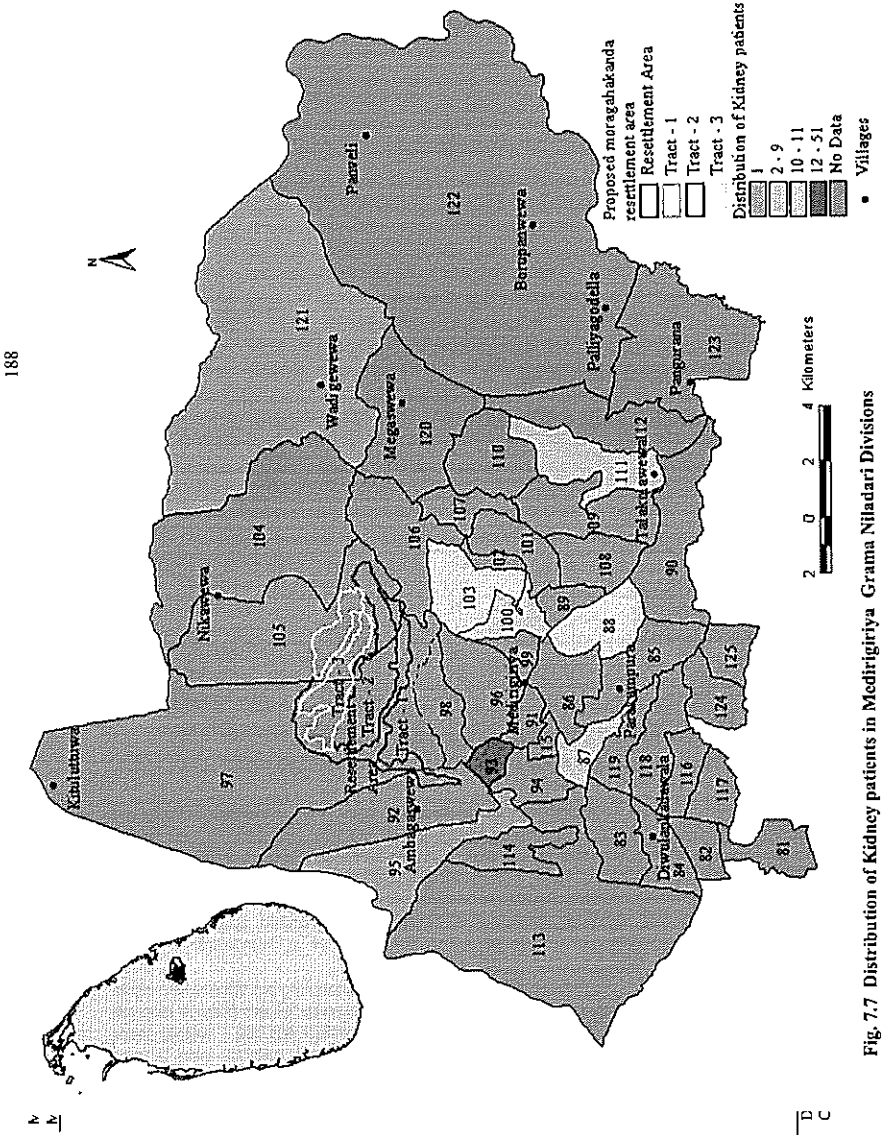


Fig. 7.7 Distribution of Kidney patients in Medirigiriya Grama Niladari Divisions

Chapter 8 – Significant Impacts

8.0 Overview

Moragahakanda Agricultural Development Project activities will take away 29.5 km^2 of undeveloped, partially developed and developed lands and a few villages with agriculture, to inundation, infrastructure development and for other project related activities & settlement activities. During construction period the displaced villagers has to be settled in proposed settlement areas; in the left bank & right banks of Kaluganga as suggested by MASL. As a consequence there will be a concomitant loss of biodiversity of those areas and surrounding lands mainly on wildlife and their habitats creating impacts on the environment and the inhabitants.

As discussed in chapter 7 of this report, project area consist of important components such as protected areas, Knuckles Conservation area, elephant corridors & the important habitats of fauna & flora. As a result there will be impacts on declared protected areas located in and adjacent to project site and the study area due to the proposed project..

In this chapter it is expected to discuss the significant impacts arise due to above activities & special emphasize will be given to address the impacts mentioned in TOR. The impact & the mitigatory activity will be discussed under each issue raised in the TOR with implementation mechanism & the responsible organization. Apart from that other significant new impacts such as Medirigiriya CRF & soil erosion problems in the catchment etc. identified by the team members during the field visits also will be addressed.

Additional issues also will be in- cooperated in this section as the team considers such issues are nationally important.

This section present the information under two sectors, namely; (i) impacts & mitigation towards resettlement area & (ii) impacts & mitigation towards reservoir area

8.1 Impacts in the settlement area

8.1.1.Displaced families

Due to the proposed project a reservoir will be constructed with an inundated area of 29.5 km^2. According to the recent data provided by MASL (**Table 8.1**) the displaced families due to inundation, are 1996. According to the present decision of MASL all evacuees within the project area will be resettled in the left & right banks of Kaluganga. However Medirigiriya study (**Fig 1.5**) area will be considered as a settlement area that will be under the command area of Moragahakanda reservoir..

Table 8.1 House holders by GS division, Family, Type & sex 2006 survey (Source: MASL)

	Main family		Sub Family		Total
GN Division	Female	Male	Female	Male	
Talagoda	42	150	5	22	219
Kumbiyangaha Ela	2	17		2	21
Gam Imayaya	3	7			10
Galboda	11	49	5	9	74
Rajawella	35	205	4	33	277
Elagamuwa	27	148	6	26	207
Koongahawela	10	66	4	14	94
Kadawatha	30	117	6	23	176
Maragamuwa	16	90	3	14	123
Madapihilla	30	99	7	15	151
Galporugolla	7	83	9	15	114
Moragolla	20	58	5	12	95
Millagahamula Tenna	29	108	11	25	173
Kabarawa	35	186	8	33	262
Table Total	**297**	**1383**	**73**	**243**	**1996**

8.1.2 Land clearance & loss of forest blocks

In the settlement area at Medirigiriya (under the command area of Moragahakanda reservoir), for infrastructure development, land clearing has to be done & felling of trees also will occur. Also the blocks of forest in-between the blocks of settlers may have to remove. Construction of new roads also will be necessary for the new developments. (The guide-lines for blocking out of lands are given in **Appendix 5.3**). Therefore loss of forest cover or trees in such areas will cause reduction of vegetation. The new settlers and existing villages may use forest plantation as firewood. Due to activities of the increased population there may be effect along the bank of Elehera Minneriya Canal (EMC). The major impacts of settlement at Medirigiriya would be clearing of land by removal of trees for infrastructure development.

8.1.3 Possible human elephant conflicts due to settlements in Medirigiriya area.

Somawathie extention national park was established under the Mahaweli environment project to mitigate and also to provide additional habitat for the elephants in and around Somawathie protected area system. However there is a remarkable human elephant conflict prevailing at the peripheral area of Medirigiriya. With the completion of Moragahakanda reservoir, with the additional water received by the Medirigiriya area living conditions of people will improve & it is expected more settlers in the area. Therefore additional settling due to Moragahakanda development project will aggravate the human elephant conflict by reducing the area available for already affected elephants.

8.1.4 Impacts on settlers due to water issues at Medirigiriya

The proposed area has water scarcity problems as described in chapter 7. Apart from that a large number of inhabitants has victimized to CRF disease (as described in chapter 7 of

this report) & it is alarming & should not be neglected as the number of CRF patients are increasing at a significant rate. The real cause for CRF is still not known & it could be water, pesticide, geology of the area or any other.

In this area people use ground water mostly for their requirements. However the quality of the ground water also does not meet the WHO standards. Therefore with the future settling the demand for clean water will increase & also the quality of existing water sources in the area has to be tested for suitability for consumption specifically due to sensitive CRF health issues recorded in the area. The new settlers also will face this situation. Therefore much emphasize should be given to this sensitive health issue of the area which comes under the command area of proposed Moragahacanda project..

8.2 Impacts within Moragahakanda catchment (The reservoir. Main and Saddle Dams)

8.2.1. Inundated Forest & effect on bio diversity

Felling of trees has been recommended in clearance of land for the reservoir. There will be some significant impacts from the biomass left from these trees if they were left within the inundated area. Due to decomposing process with time, high quantity of nutrients may get locked up in the bottom of the proposed deep reservoir & may cause depletion of dissolved oxygen in the hypolimnetic region of the reservoir.

8.2.2 Encroachmnet of 100m sensitive area around the reservoir

The problem of encroachment of the 100m sensitive areas of reservoirs is severe even in the existing reservoirs. The significant impacts would be soil erosion as well as nutrient loading into the reservoir at an alarming rate. Kotmale reservoir experienced a thick Microcystis bloom in 1991 before its 5th birthday due to nutrient enrichment. Therefore required measures should be taken prior to construction of the proposed reservoir to minimize or eradicate impacts of settlements and other activities within the 100m sensitive area of the reservoir. To understand the value of this belt description is given below regarding its importance.

8.2.2.1 The importance and establishment of a 100 m reservation around the perimeter of the reservoir and enrichment with plants found in the neighbourhood;

100m sensitive area around the reservoir is highly important for the safety of the reservoir and should be declared as forest conservation area. The purpose of establishing a conservation forest in the buffer zone can be summarized as follows:

(i) To protect the reservoir from encroachment. During the field visits it was observed that some families are residing in the buffer zone of the Bowatanna Reservoir. Some of them cultivate vegetables in their home-lands and some engaged self employments such as brick making, poultry farming & cattle raring etc. This has caused for water pollution, sedimentation and other adverse impacts. The declaration of this area as a forest reserve will minimize the problems.

(ii) After trees are closely grown in this area as a "tree belt", it serves as a filter and minimized sedimentation. The velocity of the water rushed from the catchmnet will be slowed down, it get filtered and the excess nutrients in the runoff get absorbed to the trees in the belt and the debris and silt get traped. Finally, relatively pure water gradually flows in to the reservoir. During ancient period also, tree belts were grown in a similar way, which was called "Potawatiya", and the villagers had a thorough need to protect it. This tree belt is highly useful and provides food & shelter for animals, birds, insects, bees etc., and adds aesthetic value to the tank and create environmental- friendly atmosphere.

8.2.3 Inundation of elephant habitats

Inundation of the prime elephant habitats within the full supply level which covers an area of 29.5 km^2 will be a significant impact.. In Moragahakanda reservoir catchment more than 150 elephants will be affected and very significant new human elephant conflicting areas would be anticipated in and around Moragahakanda reservoir catchment.

8.2.4 Settlement of the 41 families in the proposed elephant corridor and dedication of this corridor to elephant migration.

In addition to those households which would be inundated by the Moragahakanda reservoir, 41 households currently resident in the proposed elephant corridor between Wasgomuwa National Park and Minneriya-Giritale Nature Reserve immediately downstream of the dam will have to be resettled. **Fig 1.7** illustrates the location of the proposed elephant corridore to Wasgamuwa national park.

These displaced families will have to be settled at the Kaluganga right or left bank settlement area.

Chapter 9 – Mitigatory Action Plan

9.1 The importance of mitigatory activities

It is highly important to identify the adverse environmental effects of the proposed Moragahkanda program and mitigatory measures should be taken in advance to overcome them. The project area consists of environmentally important areas such as; protected areas, Knuckles conservation area, elephant corridors & the important habitats of fauna & flora. As a result there will be impacts on declared protected areas located in and adjacent to project site and necessary steps should be obtained to mitigate them. In this regard following sectors have been identified as important areas and hence paid more attention during the consultancy assignment.

(i) Mitigatory activities in settlement area in Madirigiriya
(ii) Mitigatatory activities in Moragahakanda reservoir area & watershed area.
(iii) Downstream areas
(iv) Conservation of wildlife related activities mainly the elephants

9.2 Main Mitigatory Components

9.2.1 Activities within settlement area in Medirigiriya

Careful study has to be carried out in order to quantify the number & type of tree species to be removed in the settlement region at Medirigiriya (**Fig. 1.5**). Forest department has to make proper plan as described below for proposed settlers consulting relevant expertise for this purpose. However the available location plan of survey is illustrated in **Fig 1.5**. Action to be taken to minimize the impact of the loss of forest cover will include the following activities:

9.2.1.1 Strategies and methods for controlled timber felling in the settlement area.

- In many development projects, it has been observed, that the whole area is cleared by using machinery without proper planning and investigation. Hence it is recommended to do a full investigation and do a land survey in the proposed settlement area and plan out the roads, irrigation channels, public buildings, homestead areas, townships etc. by a qualified team of officers. The tree felling and clearing are done only if essential. For example, clearing for a road trace should be done only for the specified width.
- In the other areas, only matured trees are allowed to extract and those trees should be clearly marked before felling. In homestead areas, clearing can be done manually by the selected landholders by which they may preserve valuable trees.

9.2.1.2 Small blocks of forests will be left un-cleared. This will help in maintaining favorable micro climatic conditions in the area

The settlement areas in Medirigiriyia consist of scrublands, teak plantations, secondary forest near Etambe oya police post, Patolakotuwa, and Gemunupura area as described in Chapter 7.2.2. This forest patch extends towards Hurulu forest reserve. During the field visits it was revealed that some areas identified for settlements of families, already occupied by people some years ago and they have constructed the permanent houses.

9.2.1.3 Roadside, stream bank and avenue planting in the development areas.

Suitable tree species will be planted in these areas to provide shade, improve aesthetic value and amelioration of the environment. Timber, fuel wood and fruit tree species will be planted in homesteads. In some areas river bank vegetation is confined to a narrow strip and beyond that the land is used for paddy cultivation, other agricultural crops, chena cultivation, home gardens, or urban roads. Therefore in these places the reverine vegetation is disturbed, degraded or not existing.

The most common tree species found on the river banks are Terminalia arjuna (Kumbuk) Mangifera zeylanica (Etamba) Polyalthia longifolia (Owila), Madhuca longifolia (Mee), Diospyros malabaricum (Timbiri), Nauclea orientalis (Bakmi), Pongamia pinnata (Karanda), Hydnocarpus venenata (Makulla). Planting of indigenous plant species on riverbanks to prevent soil erosion is not a serious issue except where the banks are exposed due to the development activities.

MASL has to form a committee as described in chapter 5.5.3 through VWMS to initiate a planting program along the proposed roads within the settlers area & also along the rive banks. Initiate nurseries to supply required tree species as mentioned above to plant along the road sides, & river banks. Cooperation could be received from the settling community for this planting program. Incentive could be given to the community for their involvement in the process. Responsibility should be taken by MASL & the forest department for implementation of this mitigatory activity.

9.2.1.4 Establishing both fuel wood plantations and conservation forest plantations near settlement.

There are Eucalyptus and Teak plantations in the settlement area observed during site vists. Teak and Halmilla have been planted in home gardens in addition to coconut, Jak and cashu trees though these species are damaged by elephants. Mahagany, Lunumidella and Wanasapu also been planted in home gardens. Teak is the most preferred compared to all other plantation species in the area and reforestation of government lands could be done under the participatory forestry programmes conducted by the Forest Department.MASL & Forest department should initiate these programs to plant fuelwood in the homegardenes of the settlers & to introduce other tree species mentioned above in the forest areas for canservation of the forest region.

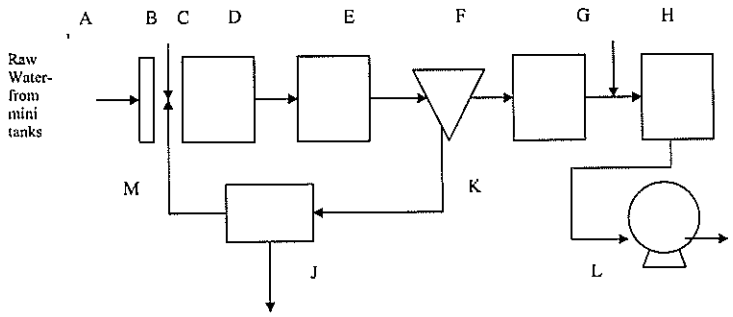
9.2.1.5 Establishment of bank conservation along the Elahera-Minneriya Canal

Most regions along this canal are well preserved with the existing vegetation. Severe erosion areas have not been found during the site visits. However to identify exact regions exposed for soil erosion a long term ground level survey has to be carried out which will not be possible with this short term consultancy. However it has been noticed that larger portion of the banks along Elahera Minneriya canal is covered with healthy reverine vegetation & it is not necessary to implement an additional program for river bank planting. However minor regions exposed to soil regions could be preserved by planting Bamboo spp., Nuga etc and other species suitable for the task. MASL & forest department has to introduce participatory riverbank planting programs to implement this mitigatory activity.

9.2.1.6 Water quality monitoring program

Due to existing CRF desease in the area, monitoring of water quality under the proposed Moragahakanda project should be undertaken as an essential part of the project to provide quality drinking water for consumers. Detail analysis of heavy metals, surface and ground water contamination of chloro and Fluro chemicals and microbiological water quality parameters should be in-cooperated into the water quality management plan of the proposed project to initiate as a precautionary measure for CRF disease in the area and the other areas under the proposed Moragahakanda project. This plan should be prepared by a team of university researchers together with the medical doctors coordinated through MASL. MASL may try to obtain necessary funding through WHO through the government authorities for detailed studies.

9.2.1.6.1 Water Treatment Plant Design and Storage



A. Bar Rack
B. Traveling Screen
C. Coagulant
D. Mixing Tank
E. Flocculation Tank
F. Settling Tank
G. Granular Filtration Tank
H. Chlorine Solution
I. Clear Well
J. Filter Press/Cake Outlet Waste
K. Sludge
L. Pump for Water to Distribution System
M. Filtrate from Filter Press

Fig 9.1 A common flow sheet for the rapid sand filtration treatment process

As described in Table 7.6, the E coli concentrations in the sampled well water are significantly higher in ground water resources used by the inhabitants. Therefore it is necessary to introduce a common water treatment plant to treat the water & distribute to settlers in the area. **Fig.9.1** illustrates a common water treatment mechanism. There are two major types of water treatment plants: rapid sand filtration and lime-soda softening. Flow charts for these processes are illustrated in **Fig 9.1**. Both these techniques purify water to drinking standards, but lime-soda softening incorporates an extra mixer and recombination chamber. This would take up extra space and increase cost, since the rest of the lime soda plant is the same as the rapid sand filtration system.

Water quality data of the present study indicated that the lake water is not hard, that there are no organic chemicals present in the lake, that the MPN (most probable number) of coliform bacteria doesn't exceed 5000 in a 100-ml sample, and less than 20% MPN is feeal matter. Based on above design assumptions, the rapid sand filtration system fits the criteria best, and it can be recommended for the community water supply treatment facility.

Post-chlorination also is applied in this flow chart. The water is initially treated to remove solids, and then it is disinfected just before pumping for distribution. Chlorine is commonly used in water treatment. Its main purpose is to disinfect the water. These include taste and odor control, prevention of algal growths, removal of iron and manganese, among others. Chlorine is used in either its gas or liquid form.

It is recommended to obtain water from nearby Nidanagama lake which is fed by Ambagaswewa via Kaudulu wewa. Therefore, a water treatment facility and storage system must be considered. However, with the completion of proposed Moraganhakanda reservoir, the settlement area will receive water as it will be a command area of the Moragahakanda reservoir.

9.2.2 Moragahakanda Reservoir Area & Watershed Area

9.2.2.1 100 m sensitive area

Establishment of 100m reservation around the perimeter of the reservoir

Total sensitive area (100m area around the reservoir) is 5.804 km^2. This area needs to be surveyed and demarcated on the ground. To protect the area, concrete posts should be fixed at a distance of 50 m.

According to the survey, 279 families live in this area and the extent of their home garden is 84 ha (207 acs). Part of sub watersheds namely SW-1, SW-2 and SW-3 (see Watershed management report Chapter 5) are located in the buffer zone and the people residing in this area has to be removed and settled them in new lands.

Enrichment with plants

It is proposed that 100 m strip from the full supply level of Moragahakande reservoir to be preserved as a reservation and kept under the natural vegetation cover. The total extent of lands under the 100 m boundary would be 5.804 km^2

Among the various components of buffer zone planting, the major activities are site selection, surveying and mapping, seedling production / nursery management and finally planting and aftercare. Guidelines for planting forest buffer zones should be obtained from the Forest Department depending upon the site characteristics such as slope, soil quality and agro-climatic factors. The project should bear the cost of buffer zone planting, and during the initial period maintenance cost of maintenance also will have to be met by the Project.

In view of the long term sustainability of the reservoir as well as the catchment, these buffer zones must be planted with perennial systems ideally with the species of which exhibits some economic returns to the dwellers / society. Medicinal plants, plants with timber value, plants which enhance scenic beauty, protection of immediate bank etc. should be considered when selecting species for the buffer zone. Planting will be of mixed fast growing species selected for quick establishment and usefulness for wood and non-wood products. Chapter 5.1.1.5.3 describe the steps in reforestration of 100m sensitive area.

Reforestation of indigenous species also could be carried out within the 100 m reservation. Some of the area within 100 m might already have natural vegetation cover (forest, scrub etc.) and if it is not disturbed during the constmction and the reforestation is not required. However, enrichment planting could be carried out to enrich the biological diversity in the reservation using the species found in the natural forest in the area (see **Table 5.1**). The most abundant indigenous tree species in the area such as Kon, Kumbuk, Thimbiri, Mora, Burutha, Halmilla, Kolon, Helamba, Kohomba, Pihimbiya, Mee, Karaw, Makulla, Dunumadala, Etamba, Malaboda, Panakka, Ela Gokatu, Omara, Ovila, Tammanna, Suriyamara, Kaluwara, Ehela, Asoka, Siyambala, Hema, Wewarana, Godakaduru, Ingini, Hulanhik, Lunumidella, Riti, Madan, Bakmi, Dambu, Boradaminiya, Godakirilla, Milla and Nebada could be planted in 100 m reservation.

It is also recommended that the areas within 100 m reservation that are under different successional stages e.g. scrublands with shrubs, not to be cleared for planting and allow the natural regeneration and succession to take place. However, enrichment planting could be done in the openings or gaps in the site.

From the survey it was revealed that the community in the area has agreed to grow these plants and maintain them till they shift to new area. Since, the Moragahakanda constructions will be implemented during next three years or so, it is convenient and economical to implement this tree-planting program in the buffer zone through them.

9.2.2.2 Establishment of Suitable nurseries

Establishment of plant nurseries at village level will be immensely useful for watershed development program. The survey reveals that out of 32 GN divisions (Total GN divisions 40 from which 8 are inundated to the reservoir), in 7 divisions private nurseries are maintained by individual people and in 10 divisions the nurseries have been abandoned due to low income. The young people show much interest to establish nurseries if the market can be assured. Hence, under the project, financial & technical assistance should be provided to establish nurseries and buy-back system can be introduced. The recommended work steps are;

- Select suitable young farmers from each GN division. The past experience, land & water availability, education background, self interest are some factors that should be considered in selecting suitable persons.
- They can be given an intensive training on nursery management. The officers in Forestry Department can serve as resource persons and more exposure visits should be organized to enhance their knowledge & skills on nursery management.
- The nurseries should be maintained under supervision of the Agricultural officers. The number of plants required, varieties, time etc should be decided based on the sub watershed plan.

9.2.2.3 Resettlement of the 41 families in the proposed elephant corridor (elephant conservation area) and dedication of this corridor to elephant migration (facilitate elephant movements).

Resettlement of 41 families in the elephant corridor

Somawathi Extension National park was established under the Mahaweli Environmental Project of the Accelerated Mahaweli Ganga Development Programme to provide adequate home for displaced wildlife, especially for elephants and also to regulate the flow of the down stream areas. Thus present location at Medirigiriya North will have a tremendous impact on wildlife. It is evident that elephant problems are acute in the said area and new settlements due to future developments can aggravate the problem.

Kaluganga Left bank and right bank project have impact on the areas biodiversity especially on elaphnats. We take measures assuming that there is no severe impact on the region. However, these activities tend to increase the regional conflict and loss of biodiversity in many folds. All the migratory roots and other areas to have a free movement between Moragahakanda catchments and Wasgomuwa lie along the area car marked for Kalu ganga .This will have serious consequences on Wildlife.

In addition to those households which would be inundated by the Moragahakanda reservoir, 41 households currently resident in the proposed elephant corridor between Wasgomuwa National Park and Minneriya-Giritale Nature Reserve immediately downstream of the dam will have to be resettled. These displaced families will have to be settled at the at the Kaluganga left or right bank settlement area as decided by MASL.

Due to the proposed project a reservoir will be constructed with an inundated area of 29.5 km^2. According to the recent data provided by MASL (**Table 2.5**), the displaced families due to inundation, are 1996. In order to settle the displaced people of the project, MASL has recently decided to settle them at Left or right banks of the Kaluganga.

However, even if this area is considered as a settlement area within the command area of Moragahakanda reservoir, as mitigatory measures for settlement, to overcome existing problems in the area, adequate infrastructure development is strongly recommended to provide comfortable living atmosphere for the settlers. Particularly the basic needs such as clean water, security from LTTE as well as the threats from elephants has to be addressed properly.

Dedication of corridor (elephant conservation area) for elephant migration (movemnts)

This corridor (area) should be manage with the objective of providing requirements for elephants and also enriched with vegetation cover suitable for other wild life. Any habitat manipulation that is required based on scientific information and should be attended. The responsibility of the activity is with DWC & MASL. (see implementation mechanism in Chapter 10).

9.2.2.4 Enrichment of the habitats in the Wasgamuwa National Park and the Minneriya -Giritale Nature Reserve

If any encroachment exists in the area, measures has to be taken to resettle the encroachers leaving the entire land reserved for wild life for the existing fauna by enriching the habitats for their utilization. The Wild life department has to initiate a program to identify such areas encroached by humans & steps should be taken to settle them in suitable areas. The Wild Life Department (WLD) & MASL has to coordinate this process by finding suitable land for encroachers. Manage elephant area concept can be recommended for the area as a suitable options. Land use planning should be in line with the elephant management objectives of the Manage Elephant conservation areas.

These habitats are already been used by humans to a certain extent. Therefore it has become a very important issue to enrich these habitats for elephants & other fauna to minimize the human elephant conflicts. Due to lack of resources elephants tend to move into the regions occupied by villages leading to human elephant conflicts (HEC).

In order to enrich this region which has already been used by humans to a certain extent, the following steps could be taken. The areas which need enrichment have to be identified, mapped or located. Bare region should be planted grasses which have drought resistant qualities and should survive during drought period to provide preferred food. Selection of grasses can be done in consultation with wildlife biologist Habitat enrichment programs have to be introduced by the DWL in coordination with MASL officers for smooth functioning of the programme.

It is equally important to rehabilitate the abandoned reservoirs within the protected area network so as to provide the water and fodder requirement of elephant that would be affected due to inundationin the area. A survey should be conducted by the DWL officers to find out such

water resources & a rehabilitation program has to be introduced in coordination with MASL. The enough food & water for wild life would reduce the movement of elephants from the wild life reserves & thereby can minimize the HEC.

It is important to eradicate the invasive weeds in this wild life reserve which reduce the habitat enrichment. Survey should be conducted by the WLD to locate such areas invaded by such invasive species & measures should be taken to control them. The responsible organizations for this aspect would be the WLD, Agriculture department in coordination with MASL.

9.2.3 Downstream areas

A detailed biodiversity study is in progress for this aspect at present by IUCN.. The downstream areas should be kept undisturbed as it is a good elephant country. Any development in this area should await a comprehensive study of biodiversity.

9.2.4 The regulation of flow of the Amban ganga

The flow of Amban Ganga should be regulated to provide adequate water to maintain the ecological balance of the wetlands in downstream areas. In addition, its flows have to be maintained to provide adequate water for fauna & flora of the region. MASL has to take the responsibility to advice the water management unit to take necessary steps in this regard. Wherever the vegetation cover is not present adequately the stream bank planting programme proposed for the upper watershed catchment should be carried out.

9.2.5 Stream bank planting

Wherever the vegetation cover is not present , the stream bank planting proposed for upper watershed should be carried out.

9.2.6 Mitigation of adverse impacts on flora,

A detailed study of flora has been already conducted & the description of flora in the catchment area is given under chapter 5.1 of this report.

9.2.6.1 Roadside, stream bank and avenue planting in the development areas.

Suitable tree species will be planted along the proposed roads in these areas to provide shade, improve aesthetic value and amelioration of the environment in the area. Timber, fuel wood and fruit tree species will be planted in homesteads.

The approximate length of larger rivers in the catchment is about 175 km. The larger rivers are Amban ganga, Kambarawa ganga, Ambakke ganga, Galbokke oya, Ma oya, Kalugahaathte oya, and Sudu ganga. In addition the length of small and micro level waterways in the catchment is 225 and 335 km, respectively.

In most places riverbank vegetation in the catchment is intact and very little disturbances or degradation can be seen. Field visits carried out during the rainy season to Kambarawa and Pottatawela area showed that clear water in Kambarawa ganga and this may be mainly due to the closed canopy forest along both banks of the river that prevent the soil erosion. However, water in Amban ganga was muddy and it proves that soil erosion is taking place mainly from cultivated areas along the river. Planting of indigenous plant species (**Table 5.1**) on riverbanks to prevent soil erosion is not a serious issue except where the banks are exposed due to the development activities. Soil erosion takes place in vegetable gardens and the muddy water flows to Amban ganga. Soil erosion prevention techniques should in introduced in vegetable cultivations areas (Also see **Appendix 5.2**).

Species such as *Terminalia arjuna* (Kumbuk) *Mangifera zeylanica* (Etamba) *Polyalthia longifolia* (Owila), *Madhuca longifolia* (Mee), *Diospyros malabaricum* (Timbiri), *Nauclea orientalis* (Bakmi), *Pongamia pinnata* (Karanda), *Hydnocarpus venenata* (Makulla), *Dendrocalamus strictus* (bamboo) could be planted on river and stream banks.

9.2.6.1.1 Strategy

The Forestry Department has taken various steps to promote tree growing by rural community in the area for the protection of environmentally sensitive areas. The participatory approach, joint forest management, leasehold forestry are some of the strategies implanted by the Forestry Department in the recent past (Experience shows that villagers who have acquired secure tenure are ready to make long-term investments). Also, the villagers will help protect and manage state forests when they have an incentive to do so. Forest management plans can be formulated jointly by the forest officers and the village representatives paying attention in both production and protection requirements.

9.2.6.2 Reforestation with timber and fuel wood plantations,

There are Eucalyptus and Teak plantations in the lower catchment in Millagahamulatenna and Maragamuwa area. Teak and Halmilla have been planted in home gardens in addition to coconut, Jak and cashu trees though these species are damaged by elephants. Mahogany, Lunumidella and Wanasapu also been planted in home gardens. Teak is the most preferred compared to all other plantation species in the area and reforestation of government lands could be done under the participatory forestry programmes conducted by the Forest Department.

9.2.6.3 Developing the National Forestry Master Plan training centre and enhancing the capacities of the Forest Department,

The proposed plan under this assignment will be a contribution to develop a national forestry master plan. Forestry department has to take an initiative to develop a forestry master plan training center in coordination with MASL. This will enhance the capacities of the forestry department.

9.2.6.4 A detailed survey of inventories endangered medicinal plants and flora

Important medicinal plants in the catchment

An ethno botanical survey and inventory of medicinal plants found in different vegetation types were conducted in Naula Medicinal Plant Conservation Area (MCPA) under the Conservation and Sustainable use of Medicinal Plants Project (1999-2005). Frequency and occurrence of common tree, vines and grass/savanna species in forests/ sparse forests and grasslands were recorded. This study provides information on the occurrence, frequency and distribution of medicinal plants in the north-west of the Moragahakanda reservoir catchment. In addition the ethnobotanical survey provides an annotated list of medicinal plants ranked in order of local importance and frequency of use. The species recorded are given in the **Appendix 4.1**. A detailed study conducted by IUCN on medicinal plants of the project site is in progress & will be submitted to MASL shortly & it will compliment to this study.

9.2.7 Mitigation of adverse impacts on Fauna

9.2.7.1 Establishing elephant corridor (resettling 41 families)

MADP has already recommended area between Wasgamuwa, Minneriya, Giritale Nature Reserves as an Elephant Conservation Area providing extensions to protected areas. This could serve as an elephant corridor for the free movement of elephants in-between Minneriya Girithale nature reserve and Wasgamuwa. To facilitate this activity, 41 families living in this area have to be settled in the left bank of Kaluganga settlement area according to the recent decision of MASL

The abandoned water resources if any in this proposed elephant corridor has to be rehabilitated in order to avoid elephant movements to the Kaluganga area.
An electric fencing is also recommended in southern part of this proposed elephant corridor to avoid elephant movement to the proposed resettlement areas of Left & Right banks of **Kalu ganga.**

9.2.7.2 Settingup of buffer zones in the peripheral area under protected areas development programme.

It is recommended to establish Elephant Area (buffer zones) around the protected areas illustrated in **Fig 7.1 & 7.2** by CWD in consultation with FD and MASL. However steps should also be taken to implant biodiversity conservation centered community development programme as well.

9.2.7.3 Habitat enrichment and a comprehensive protected area management system.

If any encroachment exists in the area, measures has to be taken to resettle the encroachers leaving the entire land reserved for wild life for the existing fauna by enriching the habitats for their utilization. The Wild life department has to initiate a program to identify such areas encroached by humans & steps should be taken to settle them in suitable areas. The Wild Life

Department (WLD) & MASL has to coordinate this process by finding suitable land for encroachers.

These habitats are already been used by humans to a certain extent. Therefore it has become a very important issue to enrich these habitats for elephants & other fauna to minimize the human elephant conflicts. Due to lack of resources elephants tend to move into the regions occupied by villages leading to human elephant conflicts (HEC).

In order to enrich this region which has already been used by humans to a certain extent, the following steps could be taken.

- The areas which need enrichment have to be identified, mapped or located. Bare region should be planted grass, i.e. Panicum maximum, etc., where necessary. Habitat enrichment programs have to be introduced in coordination with MASL officers.
- It is equally important to rehabilitate the abandoned reservoirs in the area. A survey should be conducted by the WLD officers to find out such water resources & a rehabilitation program has to be introduced in coordination with MASL. The enough food & water for wild life would reduce the movement of elephants from the wild life reserves & minimize the HEC.
- It is important to eradicate the invasive weeds in this wild life reserve which reduce the habitat enrichment. Survey should be conducted by the DWC to locate such areas invaded by such invasive species & measures should be taken to control them. The responsible organizations for this aspect would be the WLD, Agriculture department in coordination with MASL.
- Habitat enrichment program has to be introduced to this region in order to provide food & shelter for wildlife. Wild life department in coordination of MASL has to initiate this program.
- The entire protected area management system has to be developed incorporating new concepts of Elephant conservation area, manage Elephant areas, habitat enrichment and buffer zone concept and eco development programme.
- A qualified experience wildlife biologist and protected area planner should deal with this work incorporating all existing information in management planning (should be developed covering wild life reserves, buffer zones, forest reserves and elephant corridors in consultation with the Department of Wild Life Conservation and Department of Forestry).

9.2.7.4 Minimize Loss of habitats

Habitats are an integrated reflection of abiotic and biotic factors that shape the environment of a given land area. A habitat is the sum of environmental conditions in which an organism, population, or community lives. A habitat can be defined for plant and animal communities as the characterizing elements of the biotic environment, together with abiotic factors (soil, climate, water availability and quality, and others), operating together at a particular scale.

In general, it would be the place where an organism normally lives or the environment in which the life needs of an organism are supplied. A habitat is the physical and biological environment used by an individual, a population, a species or perhaps a group of species. A forest ecosystem may constitute the sole habitat of a carnivorous species but frog's

habitat might include both the forest and a reservoir or a steam, and a bark beetle's habitat might only be certain species of trees in the forest.

There are two critical habitat elements that profoundly affect the distribution of animals and to a greater or lesser extent plants. These are vegetation community structure and substrate conditions. The change in vegetation structure is brought about by a number of factors (biotic and abiatic) resulting in characteristic response of its surroundings (abiotic environment), which includes physical factors such as temperature, light, soil, topography, etc.

Natural habitat types such as undisturbed forest (dry-mixed evergreen and moist monsoon), degraded forests, riverine forest, scrublands, and grasslands are found in the Moragahakande catchment. The dense forest in the catchment provides number of habitats for plants, and animals including the herbivores and carnivores. In addition open forest areas and scrublands would provide habitats for birds, small mammals, reptiles. Streams, reservoirs, water holes etc. in the catchment are important habitats for amphibians, fish and other aquatic animals and plants in the region. Therefore it is important to conserve these habitats in the catchment during and after the construction of the reservoir. This would also increase the water yield of the catchment and prevent the soil erosion.

9.2.7.5 Declaration of catchment of Moragahakanda

The boundary of catchment of Moragahakanda is already finalized and in -cooperated into the reports. The official declaration of the catchment boundary & the catchment size has to be done by MASL. This area has to be declared under the DWC in consultation with MASL and FD. The mechanism of the declaration of catchment boundary will be discussed in chapter 10.1.6 under implementation mechanism.

9.2.7.6 The flow of Amban Ganga should be regulated to provide adequate water to maintain the ecological balance of the wetlands in downstream areas.

The flow of Amban Ganga should be regulated to provide adequate water to maintain the ecological balance of the wetlands in downstream areas. In addition, its flows has to be maintained to provide adequate water for fauna & flora of the region. MASL has to take the responsibility to advice the water management unit to take necessary steps in this regard. Wherever the vegetation cover is not present adequately the stream bank planting programme proposed for the upper watershed catchment should be carried out.

9.2.7.7 Activities to mitigate the effect of the project on the elephant population :

The density of the elephants tend to increase in and around the areas close to Maoragahakanda Dam site. A resident herd of 40-65 elephants inhabit in the area and increased to about 80-100 as rainy season approaches, this tend to reduce disperse in adjoining forest areas.

In addition to the permenat herds of elephants inhabiting the area, some of the elephant used the area to move from areas such as Kiri oya-Wasgomuwa, Pitawalapathana-

Illukumbura, Kambarawa Opalgala, Minneriya Giritale Sanctuary and Wasgomuwa west. During the dry season.

9.2.7.7.1 Identification and declaration of wild life and forest reserves and protected areas (*Under the concept of Elelaphnat Conservation area-Manage elephant areas and buffer zone)*

Several designated protected areas have been established partly or wholly or adjacent to the overall Moragahakand Agricultural Development Project area. These areas act as home for wide array of fauna and flora. However, majority of the elephant inhabiting overall areas does not confine to the limit or boundaries of these protected area set a side for wildlife. **Figs 7.1** illustrates the distribution of elephant areas originally marked in relation to the location of existing protected area net work of the region. However, these elephants are sharing the range in three different ways.

- Some of the animals that are affected move/range entirely within Protected areas available.
- Some of them are covering both Protected area and outside as parts of their range
- Others are completely roaming just out side the protected area set a side for them.

The project does not have serious problem with the elephants that range inside the protected areas already established. The other two groups who range out side the existing protected areas will have a tremendous conflict with settlers and villagers. Preliminary observations and discussions with wildlife offers and villagers show that the elephants in the said area show seasonal migration as well.

The Moragahakanda Project will have to address this issue pertaining to elephants and human elephant conflict. With the new project, part of the protected areas are also effected and allocation of land for elephants in simultaneously decreasing. Thus in order to reduce the human elephant conflicts electric fences are recommended as indicated in **Fig 7.1 & 7.2.**

Proposed Wasgomuwa south west extention

The major threat imposed on biodiversity is from the reduction of forest areas and associate habitats for wildlife. The areas especially located in slopes that extend up to Knuckles Range is home for wide variety of species. The southern end of the project is more vulnerable as it links with Knuckles Conservation Area. Therefore the north eastern part of the Knuckles conservation area is proposed as Wasgomuwa south west extention for the movement of elephants, (see **Fig 7.2**). The left & right margins of this extensions are recommended for electric fencing as indicated in **Fig 7.1 & 7.2** to avoid movement of elephants to the Kalu Ganga right bank which is proposed as a settlement area for the evacuees of the proposed projects.

Elephant conservation area around the reservoir

Considering this existing protected area net work & the existing landuses, an area around the proposed reservoir (**Fig7.2 & 5.2**) is proposed as an elephant conservation area in order to minimize impacts of the proposed project on elephants & also to reduce the HEC after the completion of the project. This region could be considered even as a buffer zone around the reservoir. The proposed landuse map (**Fig 5.2** in watershed management report) also indicates this area. The recommended electric fencing also is indicated in the map to avoid the Human Elephant Conflict (HEC). **Fig 7.2** illustrates the locations of HEC in the surrounding area of the proposed project site.

9.2.7.7.2 Measures to minimize adverse impacts on the elephant population by establishing elephant corridors and permanent extensions to protected areas.

As discussed above elephant corridors are recommended in between Minneriya Girithale nature reserve and Wasgamuwa national park Permanent extensions for elephant movements are also recommended in-between Knuckles conservation area and Wasgamuwa; the proposed Wasgomuwa south west extention with electric fencing in the left & right margins (**Fig 7.1**). MASL has to take the responsibility of electric fencing in coordination of DWL. Also the legal declaration process of the proposed protected areas has to be done with prior coordinating committees of both organizations. The mechanisms of implementation of this recommendation will be discussed in detail in chapter 10.3.1.

9.3 Mitigation of soil erosion in catchment

9.3.1 Hydrological Monitoring and Evaluation of Morgahakanda Catchment

Effectiveness of catchment management plan in terms soil erosion control of the Moragahakanda catchment should be studied from the very inception. This type of studies not only identifies the adequacy or inadequacy of the catchment management approach, but also helps to predict the rate of sedimentation of the reservoir, thus forecast storage losses. Following activities are proposed in order to monitor the hydrology of the catchment.

- Review and record discharge measurements in selected locations on stream
- Establishment of few weather monitoring stations within the catchment and keeping records
- Monitoring the river flow
- Monitoring the sediment load
- Obtaining progresses of programs such as soil conservation and landuse changes (if any)

Land use recommendations

Land use recommendations for Morgahakanda catchment were developed by considering long term sustainability of the land and water resources while providing optimum opportunities for the dwellers to utilize the land without degrading the resource potential. Land use options considered were cultivation of other field crops (annual cropping), paddy, tea, export crops, coconut, natural and plantation forestry, horticultural crops and fodder crops. On the other hand, non agricultural uses such as potential areas for urbanization, wild life and other reserves were also considered. Allocation of a particular region to a specific use was decided based on its soil erosion hazard, land slide hazard and the agro-ecological suitability.

The annual cropping can be continued in areas with low soil erosion hazard while the exact crop and time to be planted should be decided based on the agro-ecological environment. The **Appendix 5.4** indicates suitable crops and time of planting for each agro ecological zone occurring in the catchment. However, conservation measures should be implemented during annual cropping according to the guidelines provided in **Appendix 5.1 & 5.2.** Under the above land category existing homesteads and other perennial systems also can be allowed or newly introduced depending on the social needs and market economies prevailing at the time of implementation. Suitable forest trees, fruit trees, export crops and other perennials also should be decided based on ecological suitability and information of provided in **Appendix 5.4.**

Under the land category falling within moderate soil erosion hazard class, it is necessary to phase out existing annual cultivations into perennial systems. Promotional schemes such as subsidies for perennials should be introduced in these areas. Existing areas with poorly managed tea and moderately managed tea lands should be rehabilitated with vegetative clones and or fill vacancies to obtain required level of ground cover. If so degraded those should be diversified either to agro-forestry or forestry. Enrichment of canopy cover under existing homesteads through introduction of fruit trees, trees with timber value or with export crops such as pepper, cocoa, palm oil, *Kithul*, Arica nut, Coconut, etc depending on climatic (See **Appendix 5.4**), social and economical suitability, will not only reduce the erosion hazard but will increase the household income in the long run. Moreover existing forest cover under lands falling in this class should be protected.

Land area falling into high erosion hazard should be devoted entirely for perennial systems preferably forestry. Upland cropping, dwelling, felling of trees should be avoided. Dwellers should be resettled in suitable locations, and farmers who are cultivating upland crops should be given other suitable lands or they should be introduced into other income generating activities.

Mitigatory measures towards Upper watershed protection

Mitigatory measures for upper watershed protection are an integrated effort of holistic watershed management. Activities under the proposed watershed management plan could be broadly categorized in to five main categories / components.

- Promotion of conservation farming systems
- Participatory rehabilitation and protection of forests
- Capacity building and institutional strengthening
- Policy and institutional strategies
- Hydrological Monitoring and Evaluation of Morgahakanda Catchment

9.3.2 Promotion of conservation farming systems

Main livelihood of the majority of dwellers in the catchment area is annul cropping such as cultivation of Chilies, Tomato, Brinjall, Okra, pulses, leafy vegetables, maize etc. According to the most recent data extents under landuse category "Sparsely used croplands and other croplands" where annual cropping is done in highlands within the catchment area is approximately, 72 sq.km. Any conservation plan should draw the adequate attention to this particular landuse as it contributes heavily for the soil erosion within the catchment. Field observations revealed that most of the farmers are not adopting adequate soil erosion control measures into their crop management. Therefore an effective soil conservation program should be implemented on farmers fields based on a proper integrated plan. The areas for launching conservation programs will be given in maps depicting land use recommendations. Key areas that should draw the attention under conservation farming are described under following sections.

- **Land management**

The possible land management practices to conserve soil and water include, zero or minimum tillage and contour ploughing. However, farmers in the area are not adopting zero or minimum tillage practices in vegetable cultivation, but do contour ploughing for preparation of beds.

- **Managing soil properties**

Soil properties could be improved through different management techniques and infiltration and water holding capacity of soils can be enhanced. Methods include mulching, use of composts and organic matter. Although preferred, mulching material does not have to be necessarily grown in the farm itself, organic material found in common places could be used. Similarly compost could be either produced on farm, particularly in low-intensive small farms or brought outside. The Urban Councils / Municipal councils in the project area can undertake to produce compost and urban waste management program and it could be coupled with composting provided that assistance for machinery and technology can be made available by the Project. Suitable areas / sites for installation of composting units could be decided based on the proposed landuses (**Fig 5.2**), and as described in the section of waste management.

- **Adopting appropriate agronomic practices**

Good agronomic practices such as choice of correct variety, planting at correct time with proper spacing, contour planting, adequate fertilizer usage, etc are important to maintain the required ground cover at critical times which would reduce soil erosion. Provincial Department of Agriculture can play a role in awareness creation for the above purpose.

- **Fertility management**

Reducing the overuse of fertilizers and application of correct amount at correct time is an important issue in fertility management. Limited surveys conducted in project areas have shown that some farmers are found to be overusing chemical fertilizers especially for vegetable cultivation. Soil testing and use of straight fertilizer could be practiced to promote effective use of fertilizer. This will not only reduce the cost of production, but also will reduce possible pollution risks at downstream.

The Department of Agriculture provides a service on soil testing and recommending appropriate levels of fertilizers accordingly. This can be coordinated through Agrarian Service Centers as it is being practiced as at present.

- **Promoting the use of organic fertilizer**

Addition of organic fertilizer will improve both physical and chemical properties of the soil. Techniques for the production of farm compost are available particularly with the Department of Agriculture and also with some environmental related NGO's. Thus on-farm compost production could be promoted, particularly in low-intensive small farms that have crop and livestock enterprises. In addition bio-gas plants in farms with livestock could produce rich organic fertilizer in addition to energy. However, bio-gas technology has not been widely adopted, reason being its high initial cost that is not affordable to poor farmer. Thus Project could consider providing subsidies to establish few biogas plants.

- **Promote integrated pest management technologies**

Integrated Pest Management (IPM) is a technology in which the use of pesticides is minimized by promoting insects that are predators of pests and manage pests below economically optimum level. However, local farmer-field level experiences on IPM are mixed with success and failures. Generally IPM in paddy is highly successful; the technology is proven and available with the Department of Agriculture. However, IPM with Chili and other vegetables are available but improvements are to be done. These activities can be implemented with the collaboration of the Department of Agriculture and it is worthwhile allocating financial resources through Project budget lines to further the knowledge on IPM.

- **Weed Management**

Recommendations and extension support material on proper use of agro-chemicals is available in Crop Recommendation Techno-guide, Department of Agriculture.

Correct management of pests and weeds should draw the attention during project implementation to avoid possible pollution threats downstream which can affect human health.

9.3.3 Planning of conservation oriented farming activities

Planning of conservation oriented farming systems occur at two broad stages.

- Watershed level
- Farm level

9.3.3.1 Planning at the watershed level

Planning at watershed level is an essential prerequisite for launching a watershed management plan for a given watershed. This planning process provides a common stage for all watershed management activities ahead to come. During this process, regions can be identified for launching conservation farming, locations where landuse changes are necessary and areas where rehabilitation of forest is required. After identification of areas / regions / clusters for launching conservation oriented faming systems it also should be prioritized based on the susceptibility for the soil erosion. Priority sub-watersheds occurring within the main watershed of Morgahakanda is given in **Table 5.2.**

Farm level Planning

- **Conducting a PRA and baseline surveys**

After deciding the order of plan implementation, planning can be initiated on micro-watershed basis which is equivalent to farm level planning. Participatory Rural Appraisal (PRA) at village level should be conducted at the beginning. Purpose of conducting a PRA is to understand problems, potentials and limitations of the village community in the watershed and to incorporate PRA output when preparing recommendations for development activities. During the PRA following aspects should be known from the community.

Proper understanding of resources potentials and limitations
Availability of human resources
Burning needs of the village as a whole, common issues
Collective efforts on improving access to credit and marketing
Strength of Community based organizations etc.

- **Preparation of Village base maps**

In order to design soil and water conservation systems based on land characteristics, following listed maps should be prepared of which will be useful as planning aids. (These maps are incorporated in to the chapter 3).

- Village survey map
- Drainage and water resources map
- Soil resources map
- Land slope classes
- Existing land use and land suitability map
- Watershed conservation recommendation map

Micro-watershed conservation map should be presented to watershed community to get their views for preparing the implementation plan.

- **Strengthening watershed organizations and institutional network**

Under this activity, the existing organizations should be strengthened for formation of an institutional network for sustainable management of the particular micro-watershed. The watershed organization structure will include following components.

- Small affinity groups
- Village societies
- Watershed associations

Above village level community based organizations can be linked through DS level and the Divisional Secretariat can play a role as the convener role while proposed Project Management Office (PMO) of the Mahaweli can play a role of coordination and facilitation. In the establishment of an institutional network, following government and non-government organizations will be linked through the above Divisional Coordinating Committee (DCC).

- Provincial Department of Agriculture
- Provincial Department of Animal Production and Health
- Provincial Department of Agrarian Development
- Provincial Land Commissioner Department
- Department of Export Agriculture
- Divisional Secretariat
- Forest Department
- Govt. and private sector banks in the Project area
- Non-government organizations in the Project area

These Divisional Coordinating Commitees can be coordinated through a District level "Project Steering Committee" which can be convened by the District secretary.

- **Preparation of land use and land management recommendations**

Land use and land management recommendations for particular micro-watershed will be prepared based on information provided in base maps and output of PRA. However, this particular plan should be prepared in accordance to the master landuse plan (**Fig 5.2**) prepared for the whole watershed. Workshop will be conducted and recommendations will be presented to individuals and organizations involved in watershed development such as the watershed community, the representatives of government and non-government organizations before preparing the final implementation plan.

- **Preparation of the implementation program**

Preparation of the implementation plan includes identification of watershed development activities and assigning responsibilities to relevant individuals and organizations related to watershed development.

- **Establishment of off farm soil and water conservation structures**

Off farm soil conservation structures include leader drains, check dams drop structures, sediment traps, foot paths, ponds etc. (Guidelines are given in **Appendix 5.2**) Suitable structures should be selected through a participatory process and could be established in the field by farmers, affinity groups or by the village. The cost should be born by the Project while farmer can contribute through providing labor.

- **Adoption of on farm soil conservation structures**

On farm soil conservation measures (**Appendic 5.1**) include lateral drains, terraces, lock and spill drains, stone dams, flat forms, tree hedgerows, shrub strips etc. Suitable measures could be selected by a participatory process and established in the field by individual farmers, affinity groups. Subsidies for each farmer can be provided by the Project.

- **Introduction of conservation oriented farming practices**

Conservation oriented farming practices include minimum tillage, contour tillage, contour planting, selective weeding, mulching, organic manure use, controlled irrigation, residue management etc. Introduction of such practices can be done through following programs.

- Farmer awareness programs.
- Training classes.
- Plot demonstrations.

Department of Agriculture can be given the responsibility of training of farmer leaders or training of trainers as and when necessary.

Extension programs on improved farming practices can be provided by relevant Departments (DOA, Dept of Export Agriculture, Agrarian Services etc) to support the promotion of conservation oriented farming systems. Extension activities will include training in the use of appropriate types and amounts of fertilizers, organic manure , compost, promotion of integrated pest management , crop rotation and diversification, livestock farming , minimum tillage techniques, preparation of quality planting material, modern and efficient irrigation techniques and other innovative technological packages. The extension programmes can be initiated immediately following the commencement of the Project and can be formulated the activities aimed at supporting community participation. The programs should be formulated in such a way that it would strengthen community organizations and environmental education. The programs can be based on a detailed social analysis and be targeted at the potential beneficiaries (Guidelines for soil conservation measures are given in the **Appendix 5.1 & 5.2**).

Farmer's contribution for implementation of soil conservation measures would be the labor while the Project will have to provide subsidies to cover-up other expenses.

- **Crop livestock integration for soil conservation**

Crop livestock integration indirectly encourages farmers to establish contour grass strips on their lands, which can be utilized for feeding domestic animals. Suitable farmers for

rearing animals can be selected by a participatory process and provided with animals on a subsidized rate by the project on the recommendation of the Veterinary surgeon in the area.

- **Introduction of alternative income generating activities**

Alternative income generating actives will relieve the pressure on land, thus reduces the chances of land degradation. Activities such as introduction of bee keeping, technology for processing of fruits, tomato etc, introduction of mushroom cultivation, cut and foliages, protected agriculture, and value addition for row products are some of the possibilities that the project can support.

- **Marketing networks**: Proper marketing channels are essential for sustainability of the system. CBO's can play a major role in collecting, storing, transporting and marketing of farm produce.

Farming models

Although models cannot be directly applied to existing farming situations, models are useful for guiding extension agents. In selecting a model many factors which influence sustainable farming such as erosion status and present vulnerability, soil chemical and physical characteristics (soil depth, drainage, fertility etc), land extent of the farm block, availability of other resources (water, labour, capital) should be taken into consideration. Following farming models are suggested based on the land extent and should be considered only for lands with slopes less than 60% in case of annual crop cultivation.

- **Small farm blocks of less than 0.5 ha.**

This type of models is suitable for annual cropping provided that the land slope is less than 60%. Recommended conservation measures are given in **Appendix 5.1**. However, if the land is consist of stones and the land slope is less than 30% mechanical soil conservation measures would be possible. In case of lands with higher slopes (40-60%), measures such as SALT should be incorporated. Trees such as Gliricedia should be cultivated along fences or hedges which can be used for mulching or making compost. Suitable crops based on the agro-ecological environments are suggested in the **Appendix 5.4.**
If the land block is consisting of a homestead also, the recommendation given by the Department of Agriculture can be implemented. Bee Keeping would be an additional income and boxes can be provided by the Project only for farmers who are practicing proper conservation farming along with IPM techniques.

- **Medium farm blocks between 0.5 – 1 ha.**

Land areas with slopes less than 60% can be used for annul cropping (Conservation measures and suitable crops are given in appendix I and IV respectively. If the land is blessed with an adequate water source, incorporation of livestock would enhance the income and strengthen the sustainability of the farming system. Land portion with higher

slopes can be utilized for cultivation of grasses, while lower slopes can be utilized for annual commercial cultivation under irrigation.

However, if water sources are not easily accessible, higher slopes can be used for establishment of perennials either fruit trees or trees with timber values. Establishment of perennials should be done with the onset of rains, and the onsets of rains in different agro-ecological environments within the Project area is given in appendix IV. However, in drier regions such surface water harvesting techniques such as "Eye Brow" system (Dharmasena, P.B. 2000) can be used Suitable fruit trees / timber trees should be decided based on agro-ecological environment (Appendix V).

- Large farm blocks of more than 1 ha.

Composition applicable for medium size farm blocks can be extended to a larger area depending upon the extent of the land. The farming for commercialization should be the aim while maintaining the sustainability of the system as a whole. Value addition for raw products, storage, exploration of marketing channels etc. are essential activities for improving farm productivity.

9.3.4 Policy Framework

9.3.4.1 Policies so far declared on watershed conservation

- In 1873, British Government declared that the watershed areas above the elevation of 5000 ft (1600 m) should be preserved.
- In 1955, the Land Commission had recommended to demarcate the forest reserves in watershed areas and upper catchment areas.
- The National Environmental Act of 1980 had recommended soil conservation programs, identify and protect critical watershed areas, encourage scientific farming systems, and implement the physical and biological means of soil conservation for effective soil conservation.
- In 1985, the third Land Commission had studied the watershed management and given various strategies and recommendations for its development.
- The importance of conservation of watershed has been stressed in the Land Use Policy, Water Resource policy and the Environment policy.
- In 1998, the Upper Watershed Management project addressed the watershed management problems in holistic manner and achieved a significant outcome.
- In 2002, "Regaining Sri Lanka" emphasized the necessity of community participation in watershed management programs.

In 2003, the MASL, initiated the River Basin approach, and formed a River Basin Division for effective land & water resources of identified basins. This Moragahaknada watershed management program also can be linked to that and implemented under Natural Resource Management Division.

9.3.4.2 The Policy Framework - The process that should be followed in Moragahakanda Watershed Conservation Program

- Rivers take off from mountains, flow down to plain terrains and finally flow into the sea. Depending upon the topography of the river basin the river reaches can be

classified into two main classes namely Upper Reaches and Lower Reaches. The sediment flowing from upper reaches mainly due to erosion, get deposited in the lower reaches. So, minimizing the soil erosion in the upper reaches is the main activity in the watershed management.

- Based on the elevation and other agro-ecological characteristics, the watershed area can be categorized as "Strictly Protected Area (SPA) and Protected Area (PA)". The characteristics such as the steepness, sensitiveness for soil erosion and earth slips, the elevation above mean sea level (1500 m msl) should be identified as SPA.

- The natural parks, conservation forest, buffer zones, river & stream reservations etc should be included in the SPA. This area should be surveyed and clearly demarcated in the maps as well as the ground. No settlement is allowed in this area and in case where anyone lives in these areas at present they should be resettled in new areas.

- In the PA, regulated and restricted cultivation practices are allowed. The villagers in these areas should follow the land and water conservation techniques introduced under the project.

- Maps to the scale 1:10,000 should be prepared and above zones should be demarcated and digitized and database should be prepared at GN division-wise.

- The various policies, rules, regulations stipulated under various acts such as Forestry Act, Environmental Act, Soil Conservation Act, Agrarian act, Wildlife Act has to be studied and joint policy frame work should be prepared on watershed conservation and management. Recognize the need to rationalize, remove the policy gaps and minimize overlapping and formulate a Watershed Management Policy, which can be applied throughout the country. In this process, all line agencies should be coordinated and convinced the necessity of holistic approach to achieve the final targets and objectives. This has to be discussed at ministry level with participation of senior level (Sectaries, Directors) officers of the relevant agencies and formulated by a working group.

- In the process of land leasing or implementing any development programs (irrigation, roads, building etc) especial care should be taken in conservation activities. Proper scientific planning and implementation practices should be adhered to in these activities.

9.3.4.3 Policy and Institutional Strategies

Adoption of conservation techniques in a watershed could enhance the productivity and minimize the rate of watershed degradation. However, policy reforms, institutional adjustments, long term financing for watershed management, is required to encourage and sustain such enhanced productivity in the long run. Some areas that require careful study and policy focus to promote watershed management are;

9.3.4.4 Land regularization:

Farmers' investments on conservation of lands are seriously affected by the lack of ownership of the land. Lands without ownerships are a threat to watershed management. Lands without ownership should only be regularized based on a land suitability assessment. Unsuitable land should not be regularized under any circumstances but the uses should be given suitable lands elsewhere or should be introduced into other alternative employment opportunities

9.3.5 Institutional strategies to share costs and benefits of watersheds:

Under the present context, many users are harnessing benefits of watersheds but little attention is given for conservation and sustainable management of the watershed. Therefore policies and regulations should be imposed to provide a considerable percentage of earning to conserve the watershed. For example if 10 percent from the income of hydropower is allocated for watershed management and conservation most of the prevailing problems could be resolved.

Chapter 10 - Implementation Mechanism, Mitigatory Activities, monitoring program and Cost Estimate,

10.1 Implementation Mechanism of Mitigatory Activities in Moragahakanda Reservoir Area & Watershed Area

10.1.1 Mitigatory activities in the Buffer zone

This program will be implemented by the Project Watershed Management Division (PWMD) (Ref – Chapter 5 Institutional Mechanism) with the coordination of Forestry Department. Further encroachment in to the buffer zone should be immediately stopped. During the field visits it was informed that one politician has given land for 40 families in Bowathanna buffer zone and named the village as "Diyawara Gammnaya". Since they don't have competency & facilities for fishing, they engage in brick making which make a severe damage to the reservoir area. The encroachment is gradually increasing and hence it is strongly recommended demarcating the buffer zones in the three reservoirs and fixing the concrete posts as soon as possible. Tree planting in Buffer zone has already stated in Chapter 5 & 6.

10.1.2 Protection & Mitigation of stream embankments

The heavily eroded sections of the stream embankments should be identified by walkthrough surveys and mitigatory measures should be taken to minimize them. Tree planting and civil engineering constructions such as retaining walls, drop walls, rubble cushions etc. have to be constructed to eradicate such adverse impacts. The Gabion construction is an appropriate technology compared to concrete construction mainly due to environmental friendliness, low cost, quick construction and easy maintenance. These programs could be implemented by sub divisions of the watershed Management Division.

10.1.3 Conservation & promotion of rare plant species including Medicinal Plants

The experience from the Naula Medicinal Plant Conservation Project should be studied and suitable program can be implemented in the upper watershed area. Under the lands identified for wood lots, 20 ha (50 acres) can be selected for medicinal plants and can be entrusted to 50 young farmers (school leavers) for implementation. The PWMD should provide the facilities both technology and financial assistance and should organize buy-back contract system with Aurvedic Department. This will pave the way to conserve & mitigate the rare, valuable species of medicinal plants.

10.1.4 Hydrological Flow Monitoring

This component is highly important from hydrological pint of view and should not be limited to the project period. A team of technical officers should be trained on flow monitoring mechanism and should continuously monitor the flow, sediment transport, erosion etc. This activity should be directly carried out at the project level and seasonal monitoring mechanism should be developed for assessment.

10.1.5 Evacuation the people in the isolated villages

During the field studies it was observed that most of the community in the isolated villages willing to go to new settlement areas. This has many advantageous including the followings

(i) The watershed area will become a natural forest and most of the issues discussed such as soil erosion, water pollution, illegal timber felling etc will be minimized.
(ii) The MASL should not invest money for rural infrastructure, especially roads.
(iii) The community gets a lot of social benefits such as health, education, living standards etc.

Hence, it is recommended to study such villages (e.g. In Pottawala area community in three villages requested from the team to make this proposal) and make suitable arrangements to evacuate them from the isolated area and settle in new area. Since, this can be a political issue systematic approach including convincing and facilitating is highly important. This should be discussed at the Steering Committee and the approval of the relevant Minister should be obtained.

10.1.6 Declaration of watershed area

This component has been discussed under Chapter 5 & 6. However, The MASL Head office should take the leadership in this task. A team of competent officers (preferably five in different disciplinarians) should be nominated and form a committee. The available policies stated in Chapter 8 should be studied by the Committee and new guidelines, rules & regulations and by-laws should be developed. The conservation of Moragahakanda Watershed Area should be a pilot program and gradually can be expanded to other watersheds. Especially, when future water needs are concerned, the watershed conservation and mitigations has become a burning issue today and hence more emphasis should be paid by all the officers concerned on this aspect.

10.2. Mitigatory Activities in Settlement area in Madirigiriya

10.2.1 Social facilities & Security for the settlers

As per the initial stages of the project proposal, nearly 800 families were to be settled in the Madirigiriya area. At present this has become a controversial issue; the community displaced is demanding lands from Kaluganga area. The main reasons

they highlighted are climate, security, water quality and isolation. Whether adequate lands are available to settle about 3500 families (including families in isolated villages mentioned under 9.1.5) in the Kaluganaga area is an issue that has to be investigated by the MASL shortly. If not alternative solutions have to be sought. One solution suggested by the team is to provide an incentive to the settlers in Medirigiriya. For example, they can be provided more land (two ha for each family) compared to one ha in other settlement areas. However, social welfare and security should be ensured. At present MASL has decided to settle the displaced villagers at Kaluganga right & left banks.

10.2.2 Land clearing before settlement

The MASL has wide experience on this issue. During the settlement process in System B (Maduru oya) and System C (Ulhitiya), a number of environmental issues were raised by the authorities concerned. Unfortunately, they raised these issues after clearing was attended. Resultantly, 60 feet was cleared for only 16 ft wide road. This mistake should not be repeated. Hence, proper planning, education, know-how is essential before initiating the development work. The officers in MASL Head office should plan this work as a team and implement in a systematic way.

10.2.3 Drinking water quality

This has become a major issue not only to Medirigiriya but to all North Central Province. The Table 7.6 illustrates that the E coli numbers quality of water available for drinking is very high compared to WHO standards. It was found that the number of kidney patients and the death rate due to Chronic Rental Failure (CRF) are increasing at alarming rate. Since this is a national issue, a team of consultants including a medical officer, a water quality scientist and a soil scientist should be appointed by the MASL to investigate the problem & make recommendations to overcome it.

10.3 Mitigatory activities on wildlife conservation

10.3.1 Activity Plan and Budget for Wildlife Conservation

1. Implementing committee must be establish at first to Coordinate and monitor the implementation of the Environmental Management Programme especially Wildlife. Key officers of the different agencies should be the composition
2. **Establishment of Protected Areas**
   This programme should be implemented at different stages. Planning and establishing different types/Categories of Protected areas will take different time frame. Thus to bring the areas under control of the law enforcement agencies, it is recommended to establish Wildlife Sanctuaries under the FFPO. Subsequently, the areas can be zoned under different categories according to a zoning plan. Different types of protected areas such as jungle corridors, Nature Reserves, buffer zones and national park can be established with time. Thus boundary identification encompassing different landuse areas are vital.

3. Boundary survey and demarcation is a must for the establishment of protected areas in the immediate environment of the Project area.
4. To under take surveys and prepare maps according to the government regulations and survey department procedures
5. Base line survey to collect the information on elephants their distribution seasonal movement, food habits and habitat use to identify the best possible areas for elephant conservation and management Programme.
6. Identify the areas suitable for habitat enrichment taking food habits and their seasonal variation into consideration
7. Elephant control measures Short term/ short term drive, Patrolling the areas of conflict with community participation, Payment for vehicle staff and villagers
8. **Staff requirements/infrastrueture:** To provide the needs of the new staff establish there in different location based on the conflicting areas. At least 15 staff member should be mobilized to the area
9. Electric fencing Identification of areas, clearing and erecting of fences with solar power system (150Km)
10. People of the area should be provided with basic requirements to earn an income through conservation as they are victims of the development project. Appropriate training and funds must be made available for them for the task

This program will be implemented by the Wildlife Department with the assistance of the MASL. Some recommended working steps are;

(i) **Establish a Project Committee** –The Project Committee should consist of officers in Wildlife Department and the MASL and the Committee should coordinate all the activities and monitor the progress.

(ii) **Survey & Demarcation** – The surveys should be carried out and the maps should be prepared in accordance with the Survey Department rules & regulations. Accordingly, the boundary survey and demarcation should be carried out and the protected areas closer to the Project area should be established.

(iii) **Develop Protected Areas** - This program should be implemented at different stages. Planning and establishing different types and categories of Protected areas will take different time periods. The areas can be zoned under different categories according to a zoning plan. Different types of protected areas such as Jungle Corridors, Nature Reserves, Buffer Zones and National Parks should be gradually developed.

(iv) **Baseline Survey** – Conduct a Baseline survey to collect the data & information about the wild elephants such as their distribution, seasonal movement, food habits and habitat use. These data will be useful to identify the best possible areas for elephant conservation and management program.

(v) **Habitat Enrichment** - Identify the areas suitable for habitat enrichment considering their food habits and their seasonal variations.

(vi) **Vigilance** – The officers will alert, monitor, supervise and attend the elephant –human conflict incidents. This will be launched with community participation.

(vii) **Staff requirements/infrastructure** – Identify the need for additional staff and make arrangements to recruit them. Since the departmental recruitment procedure is too cumbersome, it is recommended the MASL intervene in to this. Some MASL young farmers in MASL areas can be selected and trained on wildlife activities. So, they will be appointed at village level and work jointly with the community in the area to control or curb the wild elephant menace.

(viii) **Electric Fence** – Construct an electric fence functioning with solar power system The length of the fence is 150Km . (This we will have to check)

10.4 Monitoring Program for the proposed Mitigatory Activities

Continues monitoring and timely attendance for adverse impacts that need mitigation, leads to minimize many problems in the watershed area. The issues that have been identified in the Mitigation Plan are widely varied and hence common approach or monitoring at fixed intervals cannot be defined as in a development program. The monitoring and follow up actions are subject specific, site specific and depends widely on the gravity of the issue. However, precautionary measures will minimize many of the future problems and hence some recommended "**Results Based Monitoring**" activities are described below;

(i) Conservation in buffer zone – Surveying, demarcation, tree planting are the main activities identified under watershed development & mitigation program. The physical & financial progress of these activities should be monitored. Beyond that, more specific supervision and monitoring require to avert encroachment problem. After demarcation the boundary of the buffer zone by fixing concrete pillars, the area should be declared as a forest reserve. The signboards indicating, "prohibited area" should be displayed at the boundary and strict rules and regulations should be imposed on the offenders. The desired results can be achieved only through continuous monitoring and supervision.

(ii) Erosion control in streambeds and embankments – Various activities have been identified to mitigate the erosion control in streambeds and embankments. However, it is necessary to monitor the success of the program and should be assessed whether the desired results could be archived through the implemented program. For example, rubble packing on a particular section of a streambed to minimize bed erosion may bring unexpected results such as embankment erosion and collapse due to sudden submergence or meandering. This can be identified only through monitoring and alternative suggestions should be implemented. The flow depends on various factors such as flow rate, soil type, geographical factors etc and hence anticipated outcome can be achieved only through results based monitoring.

(iii) Stream Flow Measurements- The flow monitoring and data analysis will be useful to assess the stream flow characteristics such cachmnet discharge, peak flow conditions, rainfall discharge relationship, base flow conditions etc. which can be used for future forecast and designs. The sediment rate monitoring will be useful to assess the success of the watershed conservation program. However, it has been observed that by many organizations the climatic and flow data are collected but hardly used for applications. Neither they use the data nor they give it to someone else who can use it. So, it is recommended to analyze and publish data for expansion of the project in future.

(iv) Monitoring of land slide prone areas & conservation areas- The land slide hazard maps have been developed and most of the critical areas have been identified under the consultancy. Hence continuous monitoring and vigilance is required to assess any possible disaster. Especially, the people live in land hazard areas should be educated on possible signs before land hazard incidence and emergency steps that should be followed by them for the safety. The officers involved in these activities should be educated on the precautionary measures through newly established Disaster Management Institution.

The declared forest reserves should be maintained with the assistance of the Forestry department. Land erosion, gully erosion should be monitored and necessary steps should be obtained to minimize them. New encroachments to strictly conserved areas should be completely stopped and monitor whether the inhabitants follow the soil conservation practices introduced under the project.

(v) Water Quality Monitoring in the Settlement area- This is an on-going monitoring program and the results of the previous studies should be used take precautionary measures. The results of the recommended study will be useful to bring long-term results. However, till such time, it is recommended to analyze the prevailing situation in depth and take short-term measures such as educated the community to boil and use the water for drinking, use clay pots instead of aluminum utensils, limited inland fish consumption during dry weather (fish in the tanks when water level is very low resulting contamination concentration is high) at least to curb the drastic situation. Any similar action-oriented research and studies are highly recommended.

(vi) Human- elephant conflict – The project has proposed various activities such as elephant corridors, habitat enrichments, electric fence etc to minimize the problem. However, it cannot be assumed so optimistically and say that the problem will be ended or become to a halt. But to minimize, the performance should be monitored and alternate suggestion should be imposed. For example, who is going to maintain such a long electric fence will be a problem. Will it be another white elephant? Can the so called participatory approach be implemented; Will they contribute 50% of the maintenance cost and balance by the government fund; These has to be planned and recommend

to implement in phases. For example for the first phase one section of the fence is constructed. After monitoring and assessment of the performance next phase can be implemented with necessary modifications.

In general, the recommended procedure for monitoring in mitigatory activities purely based on results and outcome. Always it is necessary to assess the performance of previous activity and implement the next activity with alternatives to overcome the shortcomings observed. Hence, it is necessary to keep the program open and flexible throughout.

Cost Estimate for Mitigatory Activities

The detailed tables are attached & also see **Appendix 6.1** for breakups

Table 10.1 Cost estimate for mitigatory activities

No	Activity	Unit Cost	Quantity	Amount Rs '000	Remarks
1	**Reservoir area & Watershed Area**				
1.1	Demarcation of buffer zone in three reservoirs	Rs 30,000	700 km	21,000	Tree planting & fixing posts included in WSD P
1.2	Civil Eng Construction in river embankments	Rs 400,000	10 km	4,000	Part included in WSDP
1.3	Medicinal Farms	Rs 150,000	20 ha	3,000	50% community contribution
1.4	Flow Monitoring		Sum	4,000	Equipments included in WSDP
			Sub total	**32,000**	
2	**Settlement Area**				
2.1	Water quality Study		Sum	3,000	Consultancy
2.2	Any other study		Sum	2,000	
			Sub total	**5,000**	
3	**Wildlife Conservation**				
3.1	Survey & Demarcation the boundary	Rs 30,000	150 km	4,500	
3.2	Habitat Enrichment	Rs 1,25,000	80 ha	10,000	
3.3	Management Activities		Sum	15,000	
3.4	Electric Fencing	Rs 400,000	150 km	60,000	
3.5	Eco - Development			15,000	Eco tourism, community out reach, training etc
3.6	Construction of office units	Rs 15,00,000	10 units	15,000	
3.7	Protected Area Conservation		Sum	25,000	
3.7	Coordination & Management		Sum	2,500	
		Sub Total		**147,000**	
		Total		**184,000**	
	Physical Contingencies (5%) & Price Contingencies (4%) Total ~9%			**16,000**	
	Grand Total			**200,000**	
Grand Total		**Rs 200 million**			

SUMMARY COST ESTIMATE TABLES OF THE PROJECT

Chapter 10 – Cost Tables

Table 10.2 Overall Financial Program of the Project (Please See Table 6.1 for details of break downs)

Activity	Fund Disbursement Plan						
1. Watershed Development Activities	**Total Cost Rs Mn**	**Year –1 Rs Mn**	**Year – 2 Rs Mn**	**Year - 3 Rs Mn**	**Year - 4 Rs Mn**	**Year -5 Rs Mn**	**Remarks**
1.1. 100m wide Reservation Development – Tree plantation (600ha) Demarcation posts (6000 nos)	82.2	14	33.2	30	5		
1.2. Implementation of Soil Conservation Methods On farm soil conservation – 2500 ha Off farm soil conservation 100km	102.5	16.5	31	31	19	5	
1.3 Forestry Development Upland forest conservation -2500ha Timber farms establishment -300ha Tree plantation in reservations -600ha	272	48	58	68	68	30	
1.4. Farm Production & Income Generating activities	60.6	10.3	20.3	20	10		
1.5. Com. Infrastructure Develop.	32.8		8	11.8	9	4	
1.6. Training & Capacity Building	40	9	13	12.5	3.6	1.9	
1.7 Support Facilities	51	39.25	7.9	1.2	1.2	1.45	
Total	641.1	137.05	171.4	174.5	115.8	42.35	
Project Management Cost	50	10	10	10	10	10	
Physical & Price Contingencies	58.9	12.95	11.6	12.5	12.2	9.65	
Total	**750**	**160**	**193**	**197**	**138**	**62**	
2. Mitigatory Activities							
2.1. Reservation Area & Watershed	32	14	12	3	2.5	0.5	

Area							
2.2 Settlement Area	5	2	1	1	1		
2. 3. Wildlife Conservation	147	47.5	59	26.5	10.5	3.5	
Total	184	63.5	72	30.5	14	4	
Physical & price contingencies	16	3.5	4	3.5	3	2	
Total	**200**	**67**	**76**	**34**	**17**	**6**	
Total Project Cost	**950**	**227**	**269**	**231**	**155**	**68**	

Table 10.3 Financial Program for Watershed Development Activities

Activity	Fund Disbursement Plan						
	Total Cost Rs Mn	Year –1 Rs Mn	Year – 2 Rs Mn	Year - 3 Rs Mn	Year - 4 Rs Mn	Year -5 Rs Mn	Remarks
1. 100m wide Reservation Development							100m reservations in Moragahakanda (60%). Bowatanna (25%) & Nalanda (15%) ratio
1.1 Tree Plantation	75	10	30	30	5		
1.2 Fixing Demarcation Posts	7.2	4	3.2				
Sub Total	**82.2**	**14**	**33.2**	**30**	**5**		
2. Implementation of Soil Conservation Methods							
2.1 . On-farm soil conservation	62.5	12.5	15	15	15	5	
2.2 Off-farm soil conservation	40	4	16	16	4		Embankment erosion
Sub Total	**102.5**	**16.5**	**31**	**31**	19	5	
3. Forestry Development							
3.1 Upland Forest Conservation	200	30	40	50	50	30	
3.2 Timber farms	24	6	6	6	6		
3.3 Tree plantation in reservation	48	12	12	12	12		
Sub Total	**272**	**48**	**58**	**68**	**68**	**30**	
4. Farm Production & Income Generating activities							
4.1 Establishment of nurseries	0.6	0.3	0.3				
4.2 Home Gardening	30	5	10	10	5		

4.3 Agro processing & marketing	15	5	5	5			
4.4 Income Generating Activities	15		5	5	5		
Sub Total	**60.6**	**10.3**	**20.3**	**20**	**10**		
5. Com. Infrastructure Develop.							
5.1 Rehab. of small tanks	4.8		2	2.8			
5.2 Rehab. of small anicuts	11		2	3	3	3	
5.3 Agri. Roads	5		1	2	2		
5.4 Drinking water & social welfare	7		2	2	2	1	
5.5 Sanitary Facilities	5		1	2	2		
Sub Total	**32.8**		**8**	**11.8**	**9**	**4**	

Table 10.3 Financial Program for Watershed Development Activities (Continued)

Activity	Development / Implementation Plan						
	Total Quantity	Year –1	Year - 2	Year - 3	Year - 4	Year -5	Remarks
6. Training & Capacity Building							
6.1 Awareness Training	4	2	1	1			
6.2 Community Leader Training	3	1	1	1			
6.3 Mass media Development	6	3	2	1			
6.4 Training on Agri & Forestry	3	1	1	1			
6.5 Training on Marketing	3		1	1	0.6	0.4	
6.6 Income Generating Activities	3		1	1	1		
6.7 Follow up Program	3			1	1	1	
6.8 Staff Training (Local)	7	2	2	1.5	1	0.5	
6.9 Staff Training (Overseas)	8		4	4			
Sub Total	**40**	**9**	**13**	**12.5**	**3.6**	**1.9**	
7 Support Facilities							
7.1 Community Centers/ sub Offices	12	12					
7.2 Renovation of WMD	1.5	1.5					

7.3 Rent out two bldgs for Div offices	1.8	1.8					
7.4 Office furniture & equipment	7	4	3				
7.5 Purchasing of 4 WD double cabs	10.5	10.5					
7.6 Truck (4T)	3	3					
7.7 Motor cycles	2.25	2.25					
7.8 Computers & Accessories	1.6	1.2	0.4				
7.9 Training Equipment	4	3	1				
7.10 Met & flow measurement equip	5		3.5	0.5	0.5	0.5	
7.11 Any other	2.35			0.7	0.7	0.95	
Sub Total	**51**	**39.25**	**7.9**	**1.2**	**1.2**	**1.45**	
Total	**641.1**	**137.05**	**171.4**	**174.5**	**115.8**	**42.35**	
Project Management Cost	**50**	**10**	**10**	**10**	**10**	**10**	
Physical & Price Contingencies	**58.9**	**12.95**	**11.6**	**12.5**	**12.2**	**9.65**	
Grand Total	**750**	**160**	**193**	**197**	**138**	**62**	

Table 10.4 Financial Program for Mitigatory Activities

Activity	Fund Disbursement Plan						
	Total Cost Rs Mn	Year –1 Rs Mn	Year – 2 Rs Mn	Year - 3 Rs Mn	Year - 4 Rs Mn	Year -5 Rs Mn	Remarks
1. Reservation Area & Watershed Area							100m reservations in Moragahakanda (60%), Bowatanna (25%) & Nalanda (15%) ratio
1.1 Demarcation Buffer zone	21	12	9				
1.2 Civil Const. along the streams	4	1	1	1	1		
1.3 Medicinal Farms	3		1	1	1		
1.4 Flow Monitoring	4	1	1	1	0.5	0.5	
Sub Total	**32**	**14**	**12**	**3**	**2.5**	**0.5**	
2 Settlement Area							
2.1 Water Quality Study	3	2	1				Settlement area
2.2 Other studies	2			1	1		Watershed area
Sub Total	**5**	**2**	**1**	**1**	**1**		
3. Wildlife Conservation							
3.1 Baseline survey	3.5	3.5					
3.2 Survey & Demarcate boundary	4.5	2	2.5				
3.3 Habitat enrichment	10	2	3	3	2		
3.4 Elect Fencing	60	20	30	10			
3.5 Eco system Development	15	5	5	5			
3.6 Construction of Office Units	15	5	10				
3. 7 Protected area Conservation	21.5	6.5	5	5	5		
3.8 Management Activities	15	3	3	3	3	3	
3.9 Maintenance &overheads	2.5	0.5	0.5	0.5	0.5	0.5	
Sub Total	**147**	**47.5**	**59**	**26.5**	**10.5**	**3.5**	
Total	**184**	**63.5**	**72**	**30.5**	**14**	**4**	

APPENDICES

Appendix 1 a
PRINCIPAL PROJECT FEATURES
Moragahakanda Dam and Appurtenant Structures

Appendix 1.0
PRINCIPAL PROJECT FEATURES
Moragahakanda Dam and Appurtenant Structures

Project Feature	Unit	Value
Reservoir		
Maximum flood level	m asl	185.59
Full supply level (FSL)	m asl	185.00
Minimum operating level (MinOL)	m asl	155.00
Area at FSL	km^2	29.5
Volume at FSL	MCM	569.9
Volume at MinOL	MCM	48.6
Active storage	MCM	521.3
Hydrology		
Catchment area	km^2	768
Incremental catchment Bowatenna-Moragahakanda	km^2	256
Mean annual natural flow at dam site[1/]	MCM	776
Mean natural flow at dam site[1/]	m^3/s	24.6
Mean annual 'without-project' flow at dam site[2/]	MCM	884
Mean 'without-project' flow at dam site[2/]	m^3/s	28.0
Mean annual 'with-project' inflow[3/]	MCM	714
Mean 'with-project' inflow[3/]	m^3/s	22.6
1:10,000 year flood peak discharge	m^3/s	4,479
1:1,000 year flood peak discharge	m^3/s	3,797
1:20 year flood peak discharge	m^3/s	2,255
1:10 year flood peak discharge	m^3/s	1,974
Net evaporation loss from reservoir[4/]	mm	768
Mean annual sediment inflow[5/]	$t/km^2.a$	442
Main Dam – Roller Compacted Concrete (RCC) Gravity		
Crest elevation	m asl	188.00
Crest width	m	8.00
Upstream slope	-	vertical
Downstream slope above 170.50 m asl	-	1v : 0.10h
Downstream slope below 170.50 m asl	-	1v : 0.75h
Crest length, including spillway	m	463
Maximum height	m	65
Volume	m^3	368,000
Saddle Dam No. 1 – Rockfill with Central Clay Core		
Crest elevation	m asl	188.00
Crest width	m	8.00
Upstream slope	-	1v : 1.50h
Downstream slope	-	1v : 1.50h
Crest length	m	361
Maximum height	m	42
Volume	m^3	674,000
Saddle Dam No. 2 – Homogeneous Earthfill		
Crest elevation	m asl	188.00
Crest width	m	7.00
Upstream slope	-	1v : 3.00h
Downstream slope	-	1v : 2.50h
Crest length	m	374
Maximum height	m	21
Volume	m^3	273,000

Moragahakanda Dam and Appurtenant Structures

Project Feature	Unit	Value
Spillway (Gated Ogee Weir with Chute and Stilling Basin)		
Safety check discharge	m^3/s	4,085
Design discharge	m^3/s	3,778
Weir crest elevation	m asl	174.00
Top of tainter gates	m asl	185.50
Total width	m	57.50
Clear width of weir crest	m	47.50
Number of bays	-	5
Width of bays	m	9.50
Width of piers	m	2.50
Number of gates	-	5
Dimensions of gates (height/width/radius)	m/m/m	11.5/9.5/8.8
Spillway Chute		
Chute inclination	-	1v : 0.75h
Width of chute	m	57.50
Length of chute	m	60.00
Side wall height	m	7.50
Maximum velocity in chute	m/s	29.00
Maximum specific discharge for safety check flood	$m^3/s.m$	71.04
Stilling Basin (Type: USBR IV)		
Stilling basin width	m	57.50
Stilling basin length	m	83.50
Invert elevation	m asl	124.00
Buffer block dimension (height/width)	m/m	2.00/2.00
Buffer block spacing	m	2.00
End sill height	m	6.00
Bottom Outlet (Low Level Outlet with Gates)		
Number of bottom outlets	-	2
Maximum discharge capacity	m^3/s	140
Discharge capacity at reservoir level 155.00	m^3/s	90
Intake type: bell mouth		
Invert elevation	m asl	137.00
Clear opening at intake	m x m	5.00 X 5.00
Clear opening of bottom outlet at gates	m x m	1.80 X 2.00
Type of service gate: roller gate		
Dimension of service gate	m x m	1.85 X 2.05
Type of maintenance gate: roller gate		
Dimension of roller gate	m x m	1.85 X 2.05
Emergency gate type: stop log		
Dimension of emergency gate	m x m	5.00 X 5.00
Surface Powerhouse at Dam Foot		
Length, including erection bay	m	30.98
Width	m	17.66
Floor elevation	m asl	147.00

Moragahakanda Dam and Appurtenant Structures

Project Feature	Unit	Value
Turbine (Type: Kaplan)		
Number of turbines	-	1
Rated head	m	40
Rated discharge	m^3/s	50
Maximum capacity	MW	21.6
Rated speed	rpm	230.8
Runner diameter	m	2.97
Spiral casing centreline	m asl	133.90
Synchronous Generator / Step-up Transformer		
Power factor	-	0.86
Frequency	Hz	50
Rated generator capacity	MVA	20.9
Maximum generator output	MVA	23.1
Generator efficiency	%	98
Transformer capacity	MVA	22.9
Transformer efficiency	%	99
Average annual energy production (sent-out)6/	GWh	45.0
Tailrace bay		
Length	m	20
Width	m	17
End sill elevation	m asl	137.00
Normal tailwater elevation (50 m^3/s)	m asl	138.50
Maximum tailwater elevation	m asl	145.50
Transmission Line to Habarana Substation		
Capacity	MVA	22.9
Length	km	41.8
Voltage	kV	132
Conductor size	mm^2	240
Conductors per phase	-	1
Number of circuits	-	1
Number of towers	-	167
Access Roads		
New road alignment between Naula and Elahera (asphalt, 6 m)	km	12.9
Improvement existing roads Naula to Elahera (asphalt, 6 m)	km	11.5
Temporary access roads (unpaved gravel, 5 m)	km	6.6
Number of major bridges (length 15 m)	-	1
Number of culverts	-	7

1/ Reconstituted October 1949 to September 1999, with effects of diversion from Polgolla and Bowatenna removed.
2/ Expected average over period 2006 to 2030 in 'without-project' water balance and system simulations.
3/ Expected average over period 2006 to 2030 in 'with-project' water balance and system simulations.
4/ Computed using estimated mean calendar month open-water evaporation and reconstituted monthly precipitation October 1949 to September 1999.
5/ Under present vegetation cover and development in upstream catchment area.
6/ Expected average over period 2006 to 2030 in 'with-project' water balance and system simulations.

Second Bowatenna Tunnel (including Upgrading and Extension of Huruluwewa Feeder Canal)		
Project Feature	**Unit**	**Value**
Approach Channel (Open Cut)		
Length	m	50
Width	m	12
Invert elevation	m asl	233.00
	m asl	185.50
Intake		
Location: 75 m west of existing intake		
Type: Fixed wheel gate, stop logs and trashrack		
Maximum water level	m asl	252.80
Minimum water level	m asl	243.90
Tunnel		
Design discharge	m^3/s	25.0
Total length (80% unlined), of which	m	7,180
- vertical shaft and transition to tunnel	m	50
- transition to penstock	m	30
- adit	m	250
Diameter (shape: circular)	m	4.0
Slope	%	0.03
Design velocity	m/s	2.0
Penstock, Steel		
Diameter	m	2.6
Wall thickness	cm	1.0
Length	m	30
Bypass Control Valve		
Type: Howell Bunger with dissipation chamber		
Diameter	m	1.5
Outlet Canal		
Capacity	m^3/s	25
Length	m	900
Slope	%	0.03
Bed width	m	2.80
Depth of flow	m	2.75
Bank slope	-	1v : 1.5h
Access Road (Unpaved Gravel)		
Length	km	1.0
Huruluwewa Feeder Canal (Upgrading and Extension)		
• Lenadora to Kandalama Bifurcation		
Length (lining and deepening)	km	8
Design discharge (present 8.5 m^3/s)	m^3/s	24
Number of siphons (additional capacity)		1
Number of aqueducts (replacement)	-	1
• Kandalama Bifurcation to Sigirimulla		
Length (lining, widening and deepening)	km	25
Design discharge (present 4.3 m^3/s)	m^3/s	20
Number of siphons (additional capacity)		2
Number of aqueducts (replacement)	-	2
• Yan Oya to Nachchaduwa catchment		
Length (new canal, mainly unlined)	km	7
Design discharge	m^3/s	8.5

Upper Elahera Canal		
Project Feature	**Unit**	**Value**
Type: Lined in fill / unlined in cut		
Design discharge (0 – 68.6 km)	m^3/s	18.0
Design discharge (68.6 – 76.6 km)	m^3/s	8.5
Total length, including	m	76,600
Tunnel no.1	m	4,090
Tunnel no.2	m	3,280
Slope	%	0.01
Side slopes	-	1v : 1.5h
Bed width – lined (0 – 68.6 km)	m	3.9
Bed width – unlined (0 – 68.6 km)	m	7.5
Bed width – lined (68.6 – 76.6 km)	m	2.9
Bed width – unlined (68.6 – 76.6 km)	m	5.6
Number of siphons		1
Number of aqueducts	-	2
Number of road bridges	-	2
Number of cross-drainage structures	-	9

Kaudulla Upper LB Branch Canal Extension		
Project Feature	**Unit**	**Value**
Type: Lined		
Design discharge	m^3/s	11.3
Total length	m	10,300
Slope	%	0.015
Bed width – Section 1 (3,000 m)	m	2.6
Bed width – Section 2 (4,000 m)	m	2.4
Bed width – Section 3 (3,300 m)	m	1.3
Side slopes	-	1v : 1.5h
Number of offtakes	-	2
Number of road bridges	-	2
Number of cross-drainage structures	-	9

APPENDIX 1.1

LETTER OF APPROVAL FROM PROJECT APPROVING AGENCY (IRRIGATION DEPARTMENT) WITH CONDITIONS

APPENDIX 1.2

EXTENSION FOR APPROVAL

APPENDIX 1.3

TERMS OF REFERENCE

Terms of Reference

for

Preparation of a Comprehensive Water shed Protection Management Plan and Preparation of detailed Mitigatory Plan for the Mitigation of Adverse Impacts (Project areas including resettlement Area)

Moragahakanda Agricultural Development Project

DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

MINISTRY OF AGRICULTURE, IRRIGATION AND MAHAWELI DEVELOPMENT

MAHAWELI AUTHORITY OF SRI LANKA

Terms of Reference for Preparation of a Comprehensive Water shed Protection Management Plan and Preparation of detailed Mitigatory Plan for the Mitigation of Adverse Impacts (Project areas including resettlement Area)

1.0 Introduction

1.1 The Project

The Moragahakanda project was identified in an extensive irrigation and hydropower survey the country in the mid-1960s (UNDP/FAO/ID, 1968) and incorporated into a 30 year master plan for the Mahaweli Development Programme (MDP). The dam site selected during the survey located some 190 km north-east of Colombo on the Amban Ganga, a major tributary of the Mahaweli Ganga, in the north eastern part of Central Province close to the border with Eastern Province.

The site is situated about 2 km upstream of the ancient Elahera anicut, which feeds the Elahera-Minneriya Yoda Ela (EMYE) canal and about 20 km downstream of Bowatenna dam and power plant, constructed as part of the first implementation stage of the MDP.

1.2 Previuus Studies

Since the FAO/UNDP/ID (1968) survey a number of studies have been made in which the creation of a reservoir at that site has been investigated, including JICA (1979), (1981) and JICA (1988). The last of the afore-mentioned studies, which was essentially an updating of the earlier JICA (1979) study, recommended a 72 m high dam (and two saddle dams), forming a reservoir with a normal maximum operating level, or full supply level (FSL), of 195 M msl. The reservoir would inundate an area of around 39 km^2. A hydropower plant with 26 MW installed capacity, running as a base load plant, was also recommended.

In 1998 the Mahaweli Authority of Sri Lanka (MASL) issued a project proposal (MASL, 1998) in which it was proposed that a dam 61 m height would be constructed, forming a reservoir with FSL 184 M msl and a corresponding inundated area of 28.5 km^2. A hydropower plant, similarly running in base load, was also proposed. MASL subsequently commissioned TEAMS to carry out an Environmental Impact Assessment (EIA) of the configuration of the Project as proposed by MASL (TEAMS, 1998). MASL also commissioned Lahmeyer International to carry out a feasibility study of the Moragahakanda Development Project. (Lahmeyer International Final Report August 2001). The results of the project optimization studies carried out in the study has led to a recommendation of a 63 M high dam (and two smaller saddle dams) at Moragahakanda, forming a reservoir with FSL 185 M msl and area, of 29.5 km^2 and a 20 MW base load power plant with 132 KM transmission line to Habarana.

2.0 Objectives of the Study

The objectives of the study would be to prepare a comprehensive Water shed protection Management Plan and Preparation of detail mitigatory plan for the mitigation of Adverse Impact (Project Area including the resettlement area).

3.0 Need for the Consultancy Input

An EIA study was conducted for the Moragahakanda Agricultural Development Project by TEAMS Consultants for MASL (TEAMS, October 1998)

Chapter 4 of the EIA Report indicated the environmental impacts, Chapter 5 mitigatory measures, Chapter 6 Monitoring Plan and Chapter 7 Conclusions and Recommendations. Appendix P Project recommendation No. 16 of the Feasibility Study conducted by LAHMEYER International (August 2001) indicated the environment component. Under Item 2 under Principal Environmental Impacts indicates the details of upstream catchment reservoir area, affected people, affected socio economic and social infrastructure, effect due to install of power, down stream reservoir, Irrigation and resettlement areas and construction activities. Under Item 3 Environmental Management Action Plan it indicates the details of the environment management action plan in upstream catchment, reservoir, main and saddle dams (Down stream areas, mineral resources, resettlement areas), conservation areas etc.

Ministry of Agriculture Development, the Project Approving Agency of the Moragahakanda Agriculture Development Project issued a project approval letter with conditions in October 2001 and also issued an extension to the project approval with conditions in March 2006.

Conditions 4.1, 4.2 and 4.4 of the approval letter indicated the details regarding the preparation of a comprehensive water shed protection and management plan and Conditions 5.1 to 5.7 indicated the details regarding preparation of detail mitigatory plan to mitigate Adverse Impacts. (Project area including resettlement plan)

The comprehensive Upper Water shed Management Plan should include the individual activity programme, implementation programme, cost estimate and the monitoring plan. The mitigatory plan for the mitigation of Adverse Impacts should also include mitigatory plan, individual activity programme, implementation programme, cost estimate and the monitoring programme.

The individual activity programme should include the items to be carried out and the specific location of the activity.

4.0 Scope of the Consultancy / Assignment (Specific Task)

The key tasks to be considered under the Assignments are :

A Preparation of Comprehensive Water shed Management Plan

i. Conduct literature survey on studies already carried out (eg. EIA study TEAMS October 1998, Final Report - Moragahakanda Agricultural Development Feasibility Study,

LAHMEYER International August 2001, etc.) in relation to upper water shed) management to identify the gaps and make additional measures to fill the gaps.

ii. Activities mentioned under Condition 4.1

The MASL should develop a comprehensive watershed protection and management plan covering the catchment and command areas, including those aspects identified in EIAR Section 5.9, prior to commencement of any development activity and effectively implement it during and after reservoir construction.

- Activities identified in EIA Section 5.9 (TEAMS)

Moragahakanda Catchment (Watershed) Management

a. Establishing a Water Shed Protection and Development Project to manage and coordinate catchment activities under MASL.
b. National Land Use Planning Programme and photographic survey of the Moragahakanda catchment as the first step in preparing the master plan for catchment development. Preparation of a plan indicating the boundaries of the catchment of the Moragahakanda reservoir at the feasibility stage of studies,
c. 100 meters from the FSL of the Moragahakanda reservoir will be marked on ground and will be preserved as the 100 m reservation. This reservation area will be planted as a conservation cover,
d. The areas under forest cover at present in the Moragahakanda Reservoir catchment will be preserved as forest reservation in the Moragahakanda catchment. The barren land area within the preserved area will be planted with forest cover,
e. Establishing conservation measures to minimize soil losses, in the catchment area of the Moragahakanda reservoir. Measures include reforestation with^ timber and fuel wood plantations, crop diversification and engineering works,
f. Inter Agency coordination has been established to integrate the work done by the individual Agencies with MASL strategy of catchment development.

iii. Activities mentioned under Condition 4.2

Conservation measures necessary to minimize soil loss within the catchment area and prevent excessive erosion from command area due to construction and operation of channel flows should be built in to the construction plans.

iv. Activities mentioned under Condition 4.4

All the measures mentioned in Section 3.1 of the proposed Environment Management Action Plan with respect to the upstream catchment protectioo shall strictly be implemented by MASL and further improvements for the same, where necessary shall be included in order to minimize habitat loss, water pollution and forest exploitation due to
catchment encroachment once the dam is constructed and reservoir is built. Reservations for Aban ganga and Bowatenna shall not be limited to 100m and as much as possible it shall be maintained more than 100m.

4TERMS OF REFERENCE

(Summary of Section 3.1 Lahmeyer International Environmental Management Activity Plan.

a) Following activities to be included in the mitigation towards Upper water shed protection:

- Water Shed Management Plan for the Upper Water Shed.
- Coordinating Institutional mechanism for the management of activities in the catchment area conducted by all relevant agencies.
- The area under forest cover at present to be preserved as forest reservation. Forest cover to be established, wherever possible with the species prevalent in the area.
- Planting the banks and reservations of existing rivers and streams for the protection of river banks and improvement of water flow etc. Approximate area of the Upper catchment 768 km^2

Larger river

Ambanganga
Kambarawa ganga
Ambakke ganga
Galbokke oya
Ma oya
Kalugahaalthlhe oya
Sudu ganga
Approximate length of the larger rivers are above 175 km.
Small and micro level water ways, approximate 225 km and 335 km respectively.

b) Mechanism to prevent fires in the catchment (eg. Planting peripheral areas with fire tolerance species)
c) Soil conservation measures to minimize soil erosion.
d) Mechanism to provide alternate employment for those engage in cardamom cultivation in upper area of the knuckle mount

B. Preparation of detailed mitigatory plan for the mitigation of Adverse Impacts (Project area including resettlement area)

i. Conduct literature survey on studies already carried out (eg. EIA study TEAMS October 1998, Moragahakanda Agricultural Development Project Feasibility Study, LAHMEYER International) in relation to Mitigatory plan, identify the gaps of the mitigation plan and to make additional mitigatory measures to fill the gaps.
ii. Activities mentioned under Condition 5.1

A detailed mitigation plan should be developed for the mitigation of adverse impacts fauna, flora and habitats in line with the mitigation measures identified in the sections 5.4 and 5.5, but not limited to those already identified. The development of this plan will be supported by a detailed bio-diversity study proposed to be undertaken by MASL.

5TERMS OF REFERENCE

- Section 5.4 Flora

Action to be taken to minimize the impact of the loss of forest cover will include the following activities:

i. Controlled felling in settlement areas.
ii. Small blocks of forests will be left un-cleared. This will help in maintaining favourable micro climatic conditions in the area,
iii. Roadside, stream bank and avenue planting in the development areas. Suitable tree species will be planted in these areas to provide shade, improve aesthetic value and amelioration of the environment in the area. Timber, fuel wood and fruit tree species will be planted in homesteads,
iv. Establishing both fuel wood plantations and conservation forests along the Minipe RB Canal.
v. Establishing timber and conservation forests along the Minipe RB Canal,
vi. Developing the National Forestry Master Plan training centre and enhancing the capacities of the Forest Department,
vii. A detailed survey will be conducted to inventories endangered medicinal plants and flora in the detailed feasibility studies,
viii. Suitable nurseries will be established. Endangered medicinal and other flora will be planted in the 100 m reservation and the conservation forest area of Moragahakanda.

- Section 5.5

Following activities to mitigate the effect of the project on the elephant population :

- Establishing of elephant corridor between Wasgamuwa, Minneriya, Giritale Nature Reserves
- Providing extensions to protected areas.

- Suitable buffer zones will be set up in the peripheral area under protected areas development programme.
- Relocation of house-hold in the elephant corridor.
- A habitat enrichment programme.
- Declaration of the catchment of the Moragahakanda reservoir.
- The flow of the Amban ganga will be regulated to provide adequate water to maintain the ecological balances of the wetlands in down stream areas.

iii. Activities mentioned under Condition 5.3

Mitigation should contain measures to minimize adverse impacts on the elephant population by establishing elephant corridors and permanent extensions to protected areas.

iv. Activities mentioned under Condition 5.4

Habitat enrichment and a comprehensive protected area management system should be developed covering wild life reserves, buffer zones, forest reserves and elephant corridors in consultation with the Department of Wild Life Conservation and Department of Forestry.

v. Activities mentioned under Condition 5.6

Identification and declaration of wild life and forest reserves and protected areas should be completed before the commencement of project activities.

vi. Activities mentioned under Condition 5.7

The detailed mitigation plan and the biodiversity study proposed to be undertaken by MASL as stated in section 5.1 of the environmental approval granted on 26.10.2001 shall be complemented with the needful for clearing of forest area for resettlement.

5.8 In order to mitigate loss of flora and possible threat to fauna all the recommendations highlighted in section 3.2 of the Environment Management Action Plan (Feasibility study of Moragahakanda Development Project Appendix P, Environment) shall also be implemented by the PP, MASL.

Section 3.2 Environment Management Action Plan

a. Reservoir, Main and Saddle Dams

- Establishment of a 100 m reservation around the perimeter of the reservoir and enrichment with plants found in the neighbourhood;
- Establishment of a nursery for the supply of these plants;
- Resettlement of the 41 families in the proposed elephant corridor and dedication of this corridor to elephant migration. In order to enrich this habitat which has already been used by humans to a certain extent, the following steps could be taken:

  - planting of grass wherever necessary,

  - eradication of weeds, especially invasive types

- The habitats in the Wasgamuwa National Park and the Minneriya-Giritale Nature Reserve should be enriched by way of following activities:

  - resettlement of encroachments where necessary and dedication of all other land to forest/wilderness,
  - rehabilitation of some abandoned reservoirs and other water courses,
  - eradication of invasive weeds,
  - planting of grass, i.e. Panicum maximum, etc., where necessary.

b. Downstream Areas

- The downstream areas should be kept undisturbed as it is a good elephant country. Any development in this area should await a comprehensive study of biodiversity.
- The flow of Amban Ganga should be regulated to provide adequate water to maintain the ecological balance of the wetlands in downstream areas.
- Wherever the vegetation cover is not present adequately the stream bank planting programme proposed for the upper watershed catchment should be carried out.

c. Resettlement Area

Appropriate measures should be taken to minimise damage to flora/natural landscape in establishing the settlements. Some of these actions would be:

- Controlled felling in settlements areas.
- Small blocks of forests should be left uncleared, this will help to maintain favourable microclimatic conditions in the area.
- Roadside, stream bank and avenue planting in the development areas. Suitable tree species will be planted in these areas to provide shade, improve aesthetic value and amelioration of the environment. Timber, fuel wood and fruit tree species will be planted in homesteads.
- Establishing both fuelwood plantations and conservation forest plantations near settlement.
- Establishment of bank conservation along the Elahera-Minneriya Canal wherever needed, using Bamboo spp. and other species suitable for the task.

5. Responsibilities of the Consultant:

The study team should report to the Executive Director of the River Basin Planning of MASL. They should identify the needs clearly and perform the assignment by liaising all parties concerned in the MASL. The study team should also coordinate its work with the various concerned line Departments of the other GOSL, Ministries particularly their field officers. Whenever possible the team should provide on the job training to the MASL staff.

The study Team needs to pursue the matters at all levels to carry out the study. They should possess the required professional Team and capabilities to perform the study.

The Consultants should also be able to work independently and coordinate the Team to meet the desired objectives.

6. Responsibilities of the MASL

ED (RBP &M) will designate the staff who will coordinate the consultancy and participate in the study whenever necessary.

The following will be provided by MASL.

- Map of the project area including the settlement area.

- Copy of the EIA Report - Moragahakanda Agricultural Development Project-TEAMS 1998.
- Soft copy of the Final Report Feasibility Study of Moragahakanda Development Project, August 2001.
- MASL will make available the reports and other information available with MASL.
- Secure Permission or entry into project area including resettlement area, reservation or restricted areas for conduct of the services.

The MASL would nominate officer/officers to monitor the work carrying out by the Consultant.

7.0 Outputs

A. Comprehensive watershed protection management plan

The major expected outputs from the study would indicate the

i. Upper Watershed Management Plan, covering all the items under A of the Scope of the Consultancy (item I to v).
ii. Specific activity programme covering each item of the Upper Watershed Management plan, indicating specific locations, specific features, extent etc.
iii. Cost estimate of the Watershed Management Plan including the cost estimate of each specific activity.
iv. Implementation programme including the time schedule for each activity of the Watershed Management Plan.
v. Monitoring programme for the Watershed Management Plan covering each specific activity.
vi. Map indicating specific activities of the Watershed Management Plan.

The outcome of the literature review should be expressed in the form of a synopsis. All reports, data and other information should be provided to the MASL on a CD at the conclusion of the study.

1. Main findings of the assignment to be forwarded to MASL at the end of 4th week.
2. Progress Report outlining the progress of the assignment, steps being taken to assignment on line and planned activities at the end of the 8th week.
3. Draft final report should be forwarded to the MASL at the end of the 12th week.

- This should indicate the following details regarding comprehensive Watershed protection Management Plan.

i. Upper Watershed Management Plan.
ii. Specific activity programme covering each item of the Upper Watershed Management plan, indicating specific locations, specific features, extent etc.
iii. Cost estimate of the Watershed Management Plan including the cost estimate of each specific activity,

iv. Implementation programme including the time schedule for each activity of the Watershed Management Plan.
v. Monitoring programme for the Watershed Management Plan covering each specific activity,
vi. Map indicating specific activities of the Watershed Management Plan.

4. The final report should be forwarded to the MASL at the end of 16th week

B. Preparation of the details mitigatory plan for the mitigation of the Adverse Impacts (Project area including resettlement area).

The major expected out puts from the study would include the

i. Detail mitigatory plan for the mitigation of the Adverse Impacts (Project area including the resettlement area.) covering all the items under B (item I to vi) of the scope of the Consultancy,
ii. Specific activity programme covering each item of the mitigatory plan for the mitigation of Adverse Impacts including specific location, specific feathers, extent etc.
iii. Cost estimates of the mitigatory plan for the mitigation of Adverse Impact including the cost estimates of the each specific activity,
iv. Implementation programme including the time schedule for the each activity of the mitigatory plan for the mitigation of Adverse Impacts,
v. Monitoring programme of the mitigation plan for the mitigation of the Adverse Impacts,
vi. Maps indicating specific activities of the detailed mitigatory plan for the mitigation of Adverse Impacts.

Major activities should be written from activity schedule by indicating specific outputs.

The outcome of the literature review should be expressed in the form of a synopsis. All reports, data and other information should be provided to the MASL on a CD at the conclusion of the study.

1. Main findings of the assignment to be forwarded to MASL at the end of the 4th week.
2. Progress report out lining the progress of assignment, steps being taken to assignment on line and planned activities at the end of the 8th week.
3. Draft final report should be forwarded to the MASL at the end of the 12th week.

This should indicate the following details regarding detailed mitigatory plan for the mitigation of the Adverse Impacts.

i. Detail mitigatory plan for the mitigation of the Adverse Impact (Project area including the resettlement area.)
ii. Specific activity programme convey each item of the mitigatory plan for the mitigationof Adsverse Impacts including specific location, specific ..., extent etc.

iii. Cost estimates of the mitigatory plan for the mitigation of Adverse Impact including the cost estimates of the each specific activity,
iv. Implementation programme including the time schedule for the each activity of the mitigatory plan for the mitigation of Adverse Impacts,
v. Monitoring programme of the mitigation plan for the mitigation of the Adverse Impacts
vi. Map indicting specific activities of the detailed mitigatory plan for the mitigation of Adverse Impacts.

4. The final report should be forwarded to the MASL at the end of the 16th week.

Appendix 1 .4

TEAM MEMBERS

Appendix 1 TEAM MEMBERS

TEAM LEADER And Aquatic Ecologist	**Prof Swarna Piyasiri** Dept. of Zoology, Univ. of Sri Jayewardenepura
Landuse & Soil conservation expert	**Mr M A K Munasinghe** **Natural Resources Management Centre, Department of Agriculture (DOA),** **No. 05, Sarasavi Mawatha, Peradeniya**
Institutional Expert	**Mr W M U N Walisundara** Dept. of Agrarian Development. PO Box 537, Colombo 7
GIS Expert	**Mr M I D H Wijewickrama** NBRO office Kandy, 7/1, Boyagama Road, Nanuoya, Pilimathalawa.
Ecologist	**Prof B M P Singhakumara** Dept. of Forestry & Enviornmental Science, Univ. of Sri Jayewardenepura
Wild Life Expert	**Dr U K G K Padmalal** Dept. of Zoology, The Open University of Sri Lanka, Nawala.
Water quality Expert	**Dr M M Pathmalal** Dept. of Zoology, Univ. of Sri Jayewardenepura

Appendix 4.1

Medicinal plant species recorded from Nanla Medicinal Plant Conservation Area in Moragahakande catchment

Appendix 4.1 Medicinal plant species recorded from Naula Medicinal Plant Conservation Area in Moragahakande catchment

Scientific name	Sinhala name
Abarema bigemina	Kalatiya
Abrus precatorius	Olinde
Abutilon asiaticum	wal anoda
Acacia caesia	higaru
Acronychia pedunculata	Ankenda
Adenanthera aglaosperma	kanthal wal
Adenia hondala	anuga
Adenia palmata	hode
Adenia sp	mulawal
Adiantum philippense	kudu pala
Adina cordifolia	kolon
Aeschynomene indica	
Aganosma cymosum	
Ageratum conyzoides	hulanthala
Agrostistachys indica	
Aidia gardneri	Burulla
Ailanthus triphysa	Wal bilin
Alangium salvifolium	agune
Albizia odoratissima	hoori mara
Allamanda cathartica	wal ruk athene
Allophylus cobbe	Cobba
Alphonsea sclerocarpa	
Alpinia sp.	
Alseodaphne semecarpifolia	Wewarane
Alstonia macrophylla	hawari nuga
Alstonia scholaris	Rukattana
Alternanthera sessilis	Me kan pala
Alysicarpus vaginalis	aswanna
Amorphophallus campanulatus	kidaran
Anamirta cocculus	thitha
Andrographis echioidem	wal makul
Andropogon nardus	Mana
Anisomeles indica	wal kollu
Anodendron manubriatum	Garesidul
Anoectochilus setaceus	wanne raje
Anoectochilus setaceus	wane raje
Antiaris toxicaria	Riti
Antidesma zeylanicum	
Aphania bifoliolata	Galmoratu
Apluda mutica	Bambara gediya
Ardisia willisii	balu dan
Argyreia osyrensis	Dabede
Argyreia populifolia	Giri thille
Arisaemea leschenaultii	Wal Kidaram
Aristida setacea	Eth thuthiri

Aristolochia indica	gate kolle
Artabotrys hexapetalus	kirille
Artabotrys zeylanicus	babara gediya
Artocarpus gomezianus	kosgonna
Asparagus falcatus	
Asparagus gonoclados	Hathawariya
Asparagus racemosus	kasi piththan
Astylosanthes fruticosa	
Atalantia ceylanica	eth kaliya
Atalantia rotundifolia	maruwa wal
Atylosia rugosa	wal kollu
Atylosia scarabaeoides	wal kollu
Bambusa bambos	katu une
Bambusa vulgaris	une
Barleria prionitis	katukaredu
Barringtonia racemosa	midalle
Bauhinia racemosa	maila
Bauhinia tomentosa	Pethan
Berrya cordifolia	Halmilla
Biophytum reinwardtii	
Blachia umbellata	
Blechnum orientale	pathan warralla
Blepharis maderaspatensis	Maha nai
Blumea alata	
Blumea densiflora	guss pupule
Bombax ceiba	katu imbul
Borreria hispida	
Bridelia retusa	Kate kala
Calicarpa tomentosa	gul hiburu
Calophyllum inophyllum	Domba
Calophyllum tomentosum	keena
Calotropis gigantea	wara
Canthium coromandelicum	
Canthium dicoccum	
Capparis mooni	sudu wellangiriya
Capparis pedunculosa	Rilakatu
Capparis rotundifolia	Ballankatu
Capparis sepiaria	
Capparis zeylanica	Wal dehi
Carallia brachiata	Dawata
Cardiospermum halicocabum	penele
Careya arborea	andere
Careya coccinea	
Carissa carandas	debare wal
Carissa spinarum	Karamba
Carmona microphylla	hithabala
Carmona retusa	heen dambala
Carrya arborea	Kahata

Casearia zeylanica	wal wareka
Cassia fistula	Ehala
Cassia occidentalis	Pani thore
Cassia roxburghi	
Cassia siamea	Wa
Cassine congylos	
Cassipourea ceylanica	Pana
Catunaregam spinosa	Kukuruman
Cayratia pedata	ambelanga
Ceiba pentandra	imbul
Celtis philipensis	(sudu atteriya)
Centanthera indica	
Centrosema pubescens	Waw latiya
Chionanthus albidiflora	daduha
Chloroxylon swietenia	Burutha
Chulkrasia tabularis	Hulanhik
Cinnamomum zeylanicum	wal kurudu
Cipadessa baccifera	hal babiya
Cissampelos pereira	de kiri midde
Cissus heyneana	wal middey
Cissus latifolia	
Cissus quadrangularis	Heerase
Cissus sp	wal mudupala
Cissus trilobata	
Clausena dentata	
Clausena indica	ettamura
Clausena lanceum	
Cleghornia acuminata	
Cleidion nitidum	
Cleistanthus pallidus	
Cleome viscosa	rammanisse
Clerodendrum infortunatum	Pinna
Clerodendrum serratum	
Coccinia grandis	
Codariocalyx motorius	pranajeewa
Commelina benghalensis	diya mederiya
Commelina ensifolia	pall wanne
Commelina petersii	Mahanamba
Commelina thwaitesii	
Commelina veghalensis	gul diya mederi
Connarus monocarpus	
Conyza floribunda	
Cordia dichotoma	Lolu
Cordia domestica	
Crinum zeylanicum	kole beriya
Crotalaria calycina	yaku hannasse
Crotalaria ferruginea	
Crotalaria rubiginosa	Adene hiriya

Crotalaria sp	
Crotolaria laburnifolia	yak beriya
Croton aromaticus	wal kappetiya
Croton lacciferus	Kappetiya
Cryptocarya wightiana	Bul peththe
Cryptocoryne spiralis	aniudeyan
Cullenia ceylanica	kata made
Curculigo orchioides	bim thal
Curcuma zedoaria	Arankaha
Cyanotis arachnoidea	
Cyanotis obtusata	
Cyanotis sp.	
Cyanotis villosa	
Cycas circinalis	madu
Cyclea burmanii	kahi piththa
Cymbopohgon nardus	Pagirimana
Cyperus rotundus	Kaladuru
Cyrtococcum deccanense	
Cyrtococcum trigonum	ve bodanga
Daedalacanthus montane	Bora damunu
Dalbergia lanceolata	mee yan kalawal
Derris parviflora	Kala wal
Derris scandens	kala wel
Derris trifoliata	meean kalawal
Desmodium heterocarpon	
Desmodium latifolium	diya gode
Desmodium pulchellum	
Desmodium triangulare	Seru
Desmodium triflorum	heen udupiyaliya
Desmodium triquetrum	
Desmodium umbellatum	latiya
Dialium ovoideum	Gal siyambala
Dichrostachys cinerea	anthare
Dimocarpus longan	Mora
Dimorphocalyx glabellus	Vali warene
Dioscorea alata	kiri kodol
Dioscorea intermedia	gonele
Dioscorea oppositifolia	Hirithale
Dioscorea pentaphylla	katu ala
Dioscorea spicata	
Dioscorea tomentosa	uyala
Diospyros albiflora	Ibi kawthu
Diospyros attenuata	Kalu kamberiye
Diospyros ebenoides	keretiya
Diospyros ebenum	eta thibiri
Diospyros malabarica	thibiri
Diospyros oocarpa	Atatibiri
Diospyros oppositifolia	

Diospyros ovalifolia	habarala
Diospyros quaesita	Kalu madiriya
Diospyros sp	ata mura
Diospyros sylvatica	Kadumbariya
Dodonacea viscosa	waralle
Dolichos trilobus	
Dregia volubilis	kiri anuga
Drymoglossum heterophyllum	kasipethi
Drynaria quercifolia	Delpath beduru
Drypetes sepiaria	Weera
Ecbolium viride	
Elaeagnus latifolia	ooru ve
Elephantopus scaber	Athadi
Elettaria cardamomum	anesal
Embelia ribes	wal ambile
Entada pusaetha	
Eriochloa procera	
Erythroxylum moonii	bata kirille
Eugenia bracteata	kiri anuga
Eugenia rotundata	Bora damunu
Eugenia thwaitesii	mee dambe
Eugenia willdenowii	Daduwa
Euonymus walkeri	
Euphorbia antiquorum	daluk
Euphorbia tirucalli	Nawahandi
Euphorbia tortilis	Hinuk
Evolvulus alsinoides	asswane
Fagraea ceilanica	atamburu
Fahrenheitia minor	
Fahrenheitia zeylanica	Pohon
Ficus arnottiana	kawdu bo
Ficus benghalensis	nuge
Ficus callosa	Kiri kaduru
Ficus hispida	kota dimbula
Ficus racemosa	Attikka
Ficus religiosa	bo
Ficus tinctoria	Ahatu
Ficus trimenii	
Filicium decipiens	pihibiya
Fimbristylis eragrostis	
Flacourtia inermis	Ugurasse
Flueggea leucopyrus	garedi dull
Garcinia morella	gokatu
Garcinia quaesita	goraka
Garcinia spicata	Gonne
Gardenia cylindricum	galis
Geniosporum tenuiflorum	
Geophila repens	

Givotia rottleriformis	hadi
Glochidion stellatum	
Gloriosa superba	niyagala
Glycosmis angustifolia	berali pana
Glycosmis mauritiana	
Glycosmis pentaphylla	Bolpana
Glycosmis zeylanicus	
Gmelina asiatica	debate
Goniogyna hirta	katukeene
Grewia bracteata	katu kaliya
Grewia carpinifolia	Bath damunu
Grewia damine	adena hiriya
Grewia hirsuta	
Grewia orientalis	
Grewia rothii	Bora damunu
Grewia tillifolia	
Gymnema sylvestre	Masbadde
Gymnosporia emerginata	karal sabe
Gymnostachyum zeylanicum	
Gyrinops walla	walle wal
Habenaria crinifera	narilatha
Habenaria plantaginea	kelide
Hedyotis fruticosa	
Helicteres isora	kahabiliyua
Hemidesmus indicus	Iramusu
Hemionitis arifolia	Adun madele
Hesperethusa crenulata	
Heterostemma tanjorense	
Hibiscus furcatus	napiriththa
Hibiscus tiliaceus	wal beli
Hiptage benghalensis	kuratiya
Holoptelea integrifolia	gode kirale
Hoya ovalifolia	Gonukakola
Hunteria zeylanica	kupalle
Hybanthus enneaspermus	Seru
Hydnocarpus venenata	hore golla
Ichnocarpus frutescens	
Impatiens oppositifolia	
Imperata arundinacea	iluk
Indigofera hirsyta	Averiye
Ipomoea obscura	gon madu wal
Ipomoea triloba	Wahathalle
Ixora arborea	
Ixora coccinea	Godarathmal
Ixora indica	
Ixora jucunda	
Ixora pavetta	
Jasminum angustifolium	kala picha

Jasminum auriculatum	
Jasminum sambac	gate pichche
Justica sp.	
Justicia procumbens	
Lagenaria siceraria	Diya labu
Lagenaria valgaris	rili guss
Languas galanga	
Lannea coromandelica	bath hik
Leea indica	buralle
Leersia hexandra	Levthane
Leonotis nepetiaefolia	
Lepidagathis fasciculata	
Lepisanthes erecta	
Lepisanthes senegalensis	
Lepisanthes trichocarpa	acharihu wal
Leptochilus decurrens	beduru
Leucas marrubioides	muss kande
Leucas zeylanica	gate thumba
Lindernia antipoda	katu nidi
Litsea glutinosa	bomi
Lygodium flexuosum	
Lygodium scandens	Bambara gediya
Macaranga peltata	Kanda
Macrotyloma uniflorum	
Madhuca longifolia	mee
Maesa perrottetiana	Bulu hulu
Malaxis versicolor	sandaraja
Mallotus eriocarpus	Bulu hulu
Mallotus eriocarpus	nelba
Mallotus repandus	
Mallotus rhamnifolius	boo kappetiya
Mallotus walkerae	hannepota wal
Mangifera zeylanica	atamba
Manilkara hexandra	palu
Marsdenia tenacissima	Muruwa
Maytenus emarginata	kattamberiya
Melastoma malabathricum	Bowitiya
Meliosma pinnata	
Melochia corchorifolia	Galkoora
Memecylon angustifolium	bomiya
Memecylon arnottianum	karatiya
Memecylon capitellatum	wali kaha
Memecylon sylvaticum	
Memecylon umbellatum	habarala
Merremia tridentata	babara gediya
Mesua nagassarium	na
Mezoneurum enueaphyllum	kala hotuwa
Micromelum minutum	wal karapincha

Micromelum zeylanicum	kala ambille
Microstylis rheedii	
Mikania cordata	
Miliusa indicus	
Mimosa pudica	Heen nidikumba
Mimusops elengi	Moone mal
Mischodon zeylanicus	thamanna
Mitragyna parvifolia	halembe
Moghania strobilifera	Waw latiya
Molinera leptostachya	
Mollugo pentaphylla	Bulu hulu
Mollugo stricta	udaththa
Morinda citrifolia	ahu
Morinda umbellata	Kiri wal
Mucuna prurita	Acharyeke
Munronia pinnata	bin kohomba
Murdania zeylanica	gal paderu
Murraya koenigii	karapincha
Murraya paniculata	atteria
Musa sapientum	ati kehel
Mussaenda frondosa	babille
Myristica dactyloides	mala badde
Myristica zeylanica	
Neolitsea cassia	
Neolitsea fuscata	Kududaula
Nothopegia beddomei	Bala
Nothopegia colebrookiana	
Nothopegia foetida	Bala wel
Nothopodytes foetida	
Nothopodytes gardneriana	Panu kirille
Notonia grandiflora	mee yan kalawal
Ochna lanceolata	
Ochna wightiana	Galkoora
Ocimum sanctum	maduru thala
Olax scandens	keratiya
Olax zeylanica	Malle
Oldenlandia corymbosa	wallege sal
Oldenlandia diffusa	ambul pala
Ophiorrhiza mungos	
Opilia amentacea	Atte mudunga
Oryza granulata	
Osbeckia aspera	Heen Bovitiya
Osbeckia octandra	Heen Bovitiya
Oxalis corniculata	ambul ambiliya
Pachygone ovata	
Palaquium hinmolpedda	
Palaquium rubiginosum	
Pamburus missionis	paburu

Panicum sp.	Thane
Panicum sparsicomum	thanne kolle
Paramignya monophylla	Galkoora
Parella asiatica	
Parsonsiaia laevigata	eth agune
Passiflora suberosa	
Pavetta indica	Bulu hulu
Peperomia blanda	
Peperomia pellucida	kaha waralle
Peperomia tetraphylla	Bulu hulu
Peperomia tetraphylla	
Phoenix zeylanica	idi
Phyllanthus debilis	Bim nelli
Phyllanthus emblica	Nelli
Phyllanthus indica	karaw
Phyllanthus niruti	
Phyllanthus polyphyllus	koooretiya
Phyllanthus wheeleri	
Phyllodium pulchellum	ele pita wakka
Pimpinella heyneana	Wal asamodagum
Piper argyrophyllum	ma ussa
Piper sp	Bakamoona wal
Piper sylvestre	mala miris
Pisonia grandis	watha banga
Pleiospermium alatum	Kondu pana
Pleurostylia opposita	pannakka
Polyalthia coffeoides	hilipath habarelle
Polyalthia korinti	kattamberia
Polygala javana	
Polylathia korinti	
Pothos scandens	
Premna obtusifolia	
Premna procumbens	
Psidium guineense	Abul pera
Pterocarpus marsupium	Gammalu
Pterocarpus marsupium	Gammalu
Pterocarpus tomentosa	
Pterospermum suberifolium	kaduru gedia
Pucnospora lutescens	
Pyrrosia pannosa	
Randia dumentorum	kukumahan
Rhinacanthus nasutus	ithithepanngan
Rhinacanthus polonnaruwensis	wal bin kohomba
Rhynchosia hirta	
Rhynchosia rufescens	
Rinorea virgata	dada kirilla
Rourea minor	gode kirinde
Ruellia tuberosa	annukkan

Rungia parviflora	gul paderu
Rungia repens	sulu nai
Saccharum munja	pothu bale
Sageraea thwaitesii	kakelle
Salacia lithosperma	Pohon
Salacia oblonga	Gul hibutu
Salacia prinoides	Hibutu
Salacia reticulata	
Sansevieria zeylanica	niyade
Sapindus emarginata	
Sapindus trifoliatus	Kaha penela
Saraca asoca	Asoka
Sarcostemum brunonianum	kasi piththan
Schefflera stellata	iththa
Schleichera oleosa	kone
Scleria lithosperma	Kudumiris
Scleria terrestris	maha dun malle
Scolopia acuminata	hibuut
Scolopia dulcis	kothale kembiya
Scolopia gaertneri	
Scolopia schreberi	Katu kurudu
Scutia myrtina	Katu pittu
Scutia oblonga	
Sebastiana chamaelea	
Secamone emetica	
Semecarpus coriacea	kuratiya
Semecarpus obscura	
Semecarpus sp	Badulla
Setaria glauca	eethane
Sida cordifolia	babile
Smilax zeylanica	kabarass
Solanum erianthum	hakirille
Solanum melongena	elabatu
Solanum seaforthianum	wali kaha
Solanum sp.	
Solanum verbascifolium	hakirille
Solanum violaceum	thithe thibbatu
Spondias pinnata	
Stachytarpheta indica	Balunaguta
Stachytarpheta indika	Blungutu
Stenosiphonium cordifolium	hampille gorediya
Sterculia balanghus	nawa
Sterculia foetida	thelabu
Stereospermum personatum	dunu madala
Streblus asper	Gate nithul
Streblus taxoides	katu pol
Strobilanthes anceps	Molu
Strombosia ceylanica	ham polonga

Strychnos minor	eta mudunga
Strychnos potatorum	iginiya
Strychnos trichocalyx	debare
Stylosanthus fruticosa	
Suregada lanceolata	
Syzygium aromaticum	
Syzygium assimile	
Syzygium cordifolium	
Syzygium cumini	Damba
Syzygium umbrosum	Heen dambe
Tadehagi triquetrum	
Tarenna asiatica	karene
Tectaria zeylanica	
Tephrosia tinctoria	gul kapetiya
Terminalia belerica	Bulu
Terminalia chebula	aralu
Tetrameles nudiflora	Hama
Teucrium tomentosum	
Thalassia hemprichii	wal kollu
Themeda arguens	
Thespesia lampus	kapuru wal
Thunbergia alata	
Thunbergia fragrans	gotu kolle
Tinospora glabra	thithe kide
Toddalia asiatica	kudu mairs
Tragia hispida	wal kahabilliya
Tragia involucrata	gas kahambiliya
Trema orientale	gadumba
Tribulus terrestris	
Tricalysia dalzelli	paderu
Tricalysia erythrospora	Gal seru
Trichopus zeylanica	Bim pol
Trichosanthes cucumerina	dunmalle
Tylophora tenuissima	kiri panu wal
Unidentified	abull abiliya
Unidentified	Bin abul pala
Urandra apicalis	urukanu
Uvaria macropoda	Bora damunu
Uvaria sphenocarpa	
Ventilago cymosum	gata kula
Ventilago gamblei	Ve badange
Ventilago madaraspatana	bambara karatiya
Vernonia cinerea	dun mallle
Vernonia zeylanica	Pupula
Vicoa indica	Ranmadele
Vigna cylindrica	Waduru ma
Vitex altissima	kata kalla
Walsura piscida	

Walsura trifoliolata	
Wendlandia bicuspidata	havan idele
Wissadula peripiocifolia	vishe duvile
Woodfordia fruticosa	malitha
Xylopia championii	dathkatiya
Xylopia parvifolia	nataw
Zanthoxylum rhesta	kalu kanne
Zehneria thwaitesii	
Zingiber cylindricum	pade higuru
Zingiber zerumbet	wal higuru
Zizyphus mauritiana	
Zizyphus napeca	aladu
Zizyphus oenoplia	Heeneraminiya
Zizypus jujuba	
Zuexine regia	Iraraja

Appendix 5.1

On farm conservation measures

Appendix 5.1: On farm conservation measures

Conservation measures can be broadly categorized into three groups.

1. Mechanical measures
2. Biological measures
3. Agronomic measures

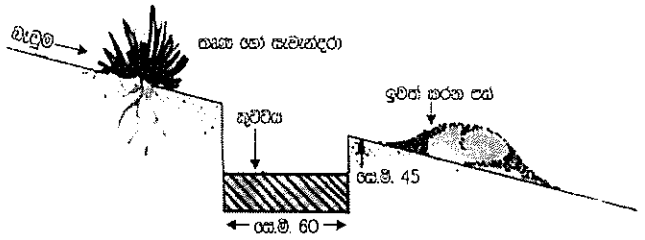
Mechanical measures: The slope and its length is altered through mechanical means, such as construction of terraces, stone bunds & terraces, lock and spill drains and lateral drains.

Biological measures: Different types of plant species are being used. Sloping Agricultural Land Technology (SALT), hedgerows (Acacia decureas, Gliricidia, Pawatta, Endaru ?(?)), strip cropping with close growing crops (eg. Kurakkan, Kollu, or grass), cover crops or forest trees or perennials are used to minimize soil erosion.

Agronomic measures: Different agronomic measures such as mulching, contour planting, minimum or zero tillage, use of compost or organic fertilizer, selective weeding are being used.

Selection of soil conservation measures: Preferably conservation measures should be a combination of biological, agronomic and mechanical measures. However, following factors should be considered during selection of conservation measures.

Land slope
Amount and distribution pattern of rainfall
Availability of rocks / stones within the land
Soil depth and drainage
Availability of financial resources



(I) Mechanical measures

(a) Lock & Spill drains:

Reduce the slope length and make the runoff water in filtered in to the soil. The measure is also effective as a moisture conservation measure; suitable for lands under perennials, but not for lands with annuals; should not be implemented

when the land slope exceeds 40%.

Specifications & points to be considered

- Drain Width - 45 Cm, Depth - 45 Cm
- A lock of earth with 30 cm height should be left at 3 – 4 meter intervals along the drain
- The earth digging out when constructing the drain should be placed on the lower slope at 20 - 25 Cm space from the drain edge.
- In areas where rainfall is low (Agro ecological zones IM3a, IM3b, IL2, IL3 and DL1C, see Agro-ecological map of the catchment) construct drains at a contour, and in areas where rainfall is high (IU1, WM3b) construct at a gentle gradient of 1: 120.
- Connect the drain end to the nearest lateral drain / natural drainage and give a protection either by wood, by stones or by vegetative means to minimize scouring effects.
- Plant a grass strip on upper slope of the drain at 15cm spacing from the drain edge
- After each rainy season remove the collected soils in the drain and spread on upper slope of the drain
- Intervals between two adjacent drains should be based on the land slope and follow the table No. 1.

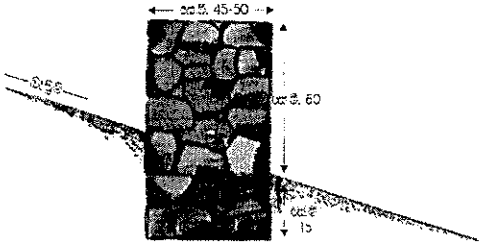
Percent slope	*Distance between two adjacent measures (m)*
0 - 9	*18*
10 - 19	*15 - 18*
20 - 29	*12 - 15*
30 – 39	*9 - 12*
40 – 49	*6 - 9*
50 - 59	*4.5 - 6*

(b). Stone bunds

Stone bunds are constructed by stones, across the land slope. These stone bunds reduce the speed of the runoff water to a minimum. Suitable for lands with stones are easily available and for lands with gentle slope; can be used for lands under annual or perennials.

Specifications & points to be considered

- Width 45 – 50 cm, Height 75 cm of which 15 cm should be the foundation below the soil surface
- Stones should be well packed
- In areas where rainfall is low (Agro ecological zones IM3a, IM3b, IL2, IL3 and DL1C, see Agro-ecological map of the catchment) construct bunds at a contour, and in areas where rainfall is high (IU1, WM3b) construct at a gentle gradient of 1: 120.



- Connect the bund end to the nearest lateral drain / natural drainage and give a protection either by wood, by stones or by vegetative means to minimize scouring effects.
- Intervals between two adjacent bunds should be based on the land slope and follow the table No. 1.

(c). Stone walls

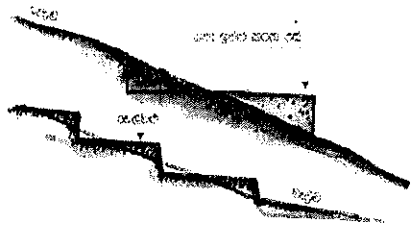
Stone walls are being used to stabilize the side walls of terraces.

Specifications & points to be considered

- Minimum top width – 50 cm
- Foundation – 30 cm
- Width 50 cm till the height < 150 cm, but when height exceeds 150 cm, the base should be 1/3 of the height

(d).Terraces

Terracing reduces the land slope and increases the rate of infiltration. If the soil depth is permitted and properly maintained this is one of the most effective soil conservation measures for annual cropping.



Specifications & points to be considered

- Terraces must be constructed at contours.
- Terrace width should be decided based on land slope and the soil depth

- Terrace face should reverse-sloped at a gradient of 1:20.
- The upper slope of the terrace, there should be a drain at gentle slope (1:120), width 30 cm, depth 15 cm.
- The front slope of the terrace should be strengthened by stone walls in case unstable soils, if not grow a cover crop / creeper
- Add organic matter to the surface of the terrace

(e). Single platforms

Isolated platforms are constructed, thus runoff water makes to infiltrate into the soil. The measure is suitable for perennial cultivation in lands with higher slopes or lands with rocks.



Specifications & points to be considered

- The length of the platform should be 2 m (across the slope), and width is 1 m.
- The surface should be reverse-sloped
- Spaces in between can be grown with a cover crop or grasses
- Spacing should be according to the type / species of the tree

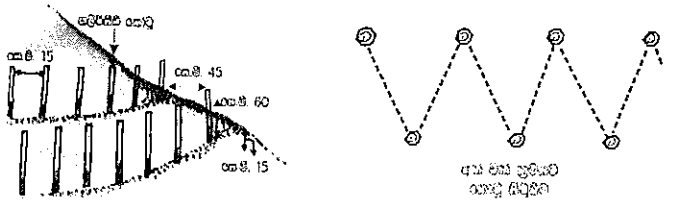
(II). Biological measures

(a). Vegetative bunds / Sloping Agricultural Land Technology (SALT)

This is an effective measure for sloping lands and cost effective method. The method can be used for annual cropping or for perennials.

Specifications & points to be considered

- Hedges are established in two rows at contours, having 45 cm in between two rows
- Within row spacing is 15 cm
- The height should be maintained lower than 60 – 75 cm.
- Species such as Gliricedia, Caliendra can be used for hedges



- Pruned material can be utilized for mulching
- Intervals between two adjacent measures should be based on the land slope and follow the table No. 1.

(b). Grass strips

Grass strips can be established at contours and species such as Vetiver, Citronella, Kurakkan, Kollu, or other suitable grasses can be used. The measure can be effectively used in lands around the slope of 20%.

Specifications & points to be considered

- Intervals between two adjacant measures should be based on the land slope and follow the table No. 1.
- Maintain a grass strip of approximately 30 cm of width.
- Regular pruning is essential.

(c). Cover crops

Cover crops are grown to minimize the effect of rain drops on soil surface, thus to reduce soil erosion. Moreover, cover crops add organic matter to the soil and as result increase the rate of infiltration. If leguminous plant is selected as cover crops it will add nitrogen to the soils, hence it is an additional benefit. Such species are Centrocema, Pureria panaseloides, Calapogonium., Pubesen, Stylo ... (check spellings ??). Cover crops are being used under coconut and rubber plantations. This measure can be effectively utilized in WM3b agro-ecological sub-zone within the catchment area.

(d). Forest trees

Lands with higher slopes (lands slopes of 60% or more) should essentially be cultivated with perennials. As perennials, suitable forest trees with higher timber values can be grown. Suitable forest tree species according to the agro-climatological suitability is given in table 2. During the plant establishment, measures such as lock & spills would be highly beneficial in areas where rainfall distribution is poor (Agro-ecological map, IM3a, IM3b, IL2, IL3 and DL1C).

Table No 2 : Suitable tree species for different agro-ecological sub-zones

(e). Other perennial systems

Other perennial systems such as Export crops (Pepper, Cocoa etc), Coconut, Rubber, fruit trees such as Mango, Pomegranate, Lemon can be grown to minimize the soil erosion in a given area. Although these systems can be implemented in lands with gentle slopes, those are the better landuses for highly sloping lands. The suitable export crops and fruits, depending on the agro-climatic suitability are given in Table No 3.

(III). Agronomic measures

Agronomic measures are used to minimize soil erosion along with other conservation measures.

(a). Mulching : Mulching reduces the impact of raindrops on soils. Mulching not only reduces soil loss but also improve soil fertility and conserve soil moisture. Common mulching materials are paddy straw, decaying leaves, coconut husk, leaves of Gliricidea, grasses, etc. Mulching is most effective in drier areas as a water conservation measure.

(Eg. In proposed settlement area , DL1c)

(b). Planting along contours :Planting of crops along contours will reduce the runoff speed, thus reduces soil erosion.

(c). Minimum Tillage : Activities such as ploughing will enhance soil erosion by loosening the soil. Therefore such activities should be restricted to the areas where it is necessary. This method is practical in perennial cropping.

(d). Selective Weeding : Cleaning of the land increases soil erosion. Therefore, clearing or weeding should be done near the vicinity of the plant base.

(e). Addition of organic matter: Addition of organic matter will increase the structure of the soil, thus improve the porosity. This will increase the infiltration, thereby reduces soil erosion. Moreover, this will increase soil fertility. Addition of organic matter is much more important in proposed settlement area where rainfall distribution is poor.

Appendix 5.2

Guidelines for off-farm conservation

Appendix 5.2: Guidelines for off-farm conservation

a. Natural drainage ways

- Identify natural depressions and drainage ways and leave those to regenerate natural vegetation or encourage growth of perennials.
- Take necessary steps to prevent scouring in natural drainage ways by construction of protected check dams, drop structures and protect the stream banks with appropriate vegetation types. Where it is found that natural drainage lines or ravines are scouring extensively, it is necessary to provide stone check dams to prevent scouring and have such check dams protected on the upper side with a hedge of vetiver grass, mana grass, paspalam or any other grass cover.
- Construct a diverting drain (storm water drain) on the upper ,boundary to intercept the surface runoff from the upper slopes at a grade of 1: 120 and connect the drain into the nearest natural drainage and, their outlets given a vegetative or preferably a stone paved protection to prevent undercutting and waterfall erosion.
- Do stone paving and stepping of vertical down drains to prevent **gulleying** the same.
- In the case of highlands with imperfect drainage conditions, the measures must be combined with a drainage system to improve the drainage condition of the land.

b. Protection and conservation of perennial spout and natural springs

- Identify socially, economically or environmentally important spouts and natural springs
- Leave a circular reservation depending on the importance of the spout, refrain from activities which can degrade or pollute the spring. Promote perennial systems within upstream catchment of the particular spout / spring.
- Leave sufficient reservation (Muhaweli Act ??) for springs and refrain from activities which enhance bank erosion. The owners or occupiers of such lands should maintain the belt (reservation) under perennial vegetation.

c. Requirements of the conservation plan when construction of buildings / houses and other structures

- All constructions shall be in conformity with the natural landscape.
- No obstructions shall be created across natural drainage ways.
- The conservation plan shall have proper storm water management system and protection measures for cut and fill slopes.
- All access roads shall be provided with drainage facilities capable of coping with maximum possible run-off. Drains with slopes exceeding 4 % shall be lined with suitable materials to protect them from scouring and gullying.
- All development work shall conserve the natural drainage network and waterway / water body reservations, and shall minimize cutting and filling operations so as to conserve the natural landform as far as possible and prevent erosion.

- The topsoil (soil within 20 cm from the surface) shall be stripped and carefully heaped during land grading work and returned to the surface after completion of the land grading.

- Surface and ground water as well as the soil shall not be contaminated by sewage or solid waste or any other polluting substance.

d. Road banks, drains affected by earth slips or to be subjected to same during wet weather

- Plant Vetiver grass, Bamboo, Rambuk, Appala or any other tree species suitable for conservation.
- Take appropriate action to establish contour vegetation boarders, hedges or palisades or pegging into soil surface quick growing species such as Gliricidia Dadap, Acadia, Decurens, Bamboo etc.

- If methods used in above fails use engineering methods such as rock walls, gabion walls or artificial drainage systems.

e. Measures for protection of road banks, road drains against erosion

Protection measures for cut slope

- When the road banks are more than 1 m in height, the road bank has to be cut to a slope to retain the slope stable to prevent collapse and soil erosion. If the embankments constitute of hard rock material, then additional treatments are not required.
- The bank has to be cut to a slope depending on the type of soil as directed by the Authorized Officer or the Engineer in charge of the road. However, in any case it shall not be steeper than 4 Vertical to 1 Horizontal 4:1 slope.
- When the vertical height of the cut is greater than 5 m, benching of the slope shall be carried out. The benches shall be cut to 0.5 m horizontal step for every 1.5 m vertical section. The top of the benches so formed shall be planted with carpet grass (Asconopus compresses) of any other suitable short blade grass.
- Where the vertical cut is unstable, gabion walls suitably designed have to be constructed to prevent collapse of banks.
- Where there is no provision for forming the slopes as described in (ii) due to sub structures, or structures, the slopes have to be protected with gabion walls, stone walls, concrete walls or toe walls as directed by the Authorized Officer.
- The road reservation shall be planted with approved trees (species indigenous to the area) without obstructing the vision of drivers and kept as strict reservations.
- Where possible catch drains have to be constructed on the top of the bank, 1 meter away from the edge, to collect the rain water flowing along the slopes and shall be discharged at points to the culverts on the road.

Protection measures for fill slopes

- The road slopes on the fill have to be on 1:1 ½ slope unless otherwise specified by the Authorized Officer or the Engineer in charge. The fill slopes have to be compacted properly and planted with vegetation or grass cover to avoid soil erosion.
- The water flowing along the road shall be taken along the road edge and discharged by constructed chutes, cascades or by culverts or suitable down pipes.
- Suitable approved trees may be planted along the slopes to protect the slopes from slipping and improve drainage and to avoid soil erosion.
- The developer should take measures such as back sloping and systematic compaction of

fill slope to minimize soil erosion during construction. The fill slope shall be given live grass cover of approved species.

Protection measnres for road drains

- Drains will be constructed at the edge of the road to collect and discharge the water from the road surface. Culverts shall be constructed to discharge water at water crossings and to discharge storm water along the road borders. These drains will be stone paved, concrete lined or given a complete cover of carpet grass on the sides and bed of the drains.

Ruad boarders

- Every road already constructed or to be constructed in future in any urban or village area, shall be provided with a margin of two meter width along the entire length of the road as a border or margin. This will be known as a road border or road margin, and will be permanently kept under carpet grass or any other suitable grass or have a stone or concrete pavement. At every 50 meters, there shall be a drain cutting through the road boarder into the road drain to facilitate draining of excess water from the road surface. The edge of the road margin or border will be planted with Vetiver or suitable grasses to prevent breakage of the edges if the margin is not stone paved or concrete.

Appendix 5.3

Guidelines for preparation of Blocking Out Plans in proposed settlement area

Appendix 3 Guidelines for preparation of Blocking Out Plans in proposed settlement area

After selection of suitable areas for upland settlements based on a soil survey, further planning should be carried out based on a contour map prepared for the same area.

a. Decide the extent of land provided for each beneficiary family.
b. Identify natural depressions and main ridges (crests) within the area under concern.
c. Divide the area into individual blocks by providing a drainage way and an access road for each block.
d. Block the land across the main slope direction (as much as possible).
e. If and when the situation permits, placing of roads along the crest is the best option. On the other hand those should be on a gentle slope to prevent same being turned into drainage lines and resultant gully formation
f. Natural drainage lines should not be disturbed by placing blocks, but identify culverts or cross points in case of roads cutting across.
g. Identify common / public places

Appendix 5.4

Suitable crops for different agro ecological zones (Adopted from the publication of the Department of Agriculture " Gramaniladari based crop recommendations , Technical Information, 1990, 2000)

Appendix IV: Suitable crops for different agro ecological zones (Adopted from the publication of the Department of Agriculture " Gramaniladari based crop recommendations , Technical Information, 1990, 2000)

District : Matale
Agro-ecological Zone : IM3a & IM3b
Agrarian Service Area : Palapathwela, Rattota

Maha Season				Yala Season				
Uplands		Low lands		Uplands		Lowlands		Perennials
Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	
Beans	Paddy	Paddy	Paddy	Cucurbits		Paddy	Pepper	
Tomato				Tomato		Beans	Coconut	
Green chilies				Kiri ala		Curry Chilies	Coco,	
Brinjall						Green Chilies	Palm	
						B_onion	Coffee	
						Tomato	Banana	
						Brinjall	Ginger	
						Pulses		
						Okra	Citrus	
						Beet	Pomegranate	
						Cabbage	Papaw	
						May	Mango	
							Guava	

District : Matale
Agro-ecological Zone : IL2
Agrarian Service Area : Kongahawela

Maha Season				Yala Season				Perennials
Uplands		Low lands		Uplands		Lowlands		
Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	
Cowpea Mung bean Maize Soya beans Cucurbits Kurakkan Beans Tomato Green chilies Brinjall		Paddy	Paddy	Gingerly			Paddy Green Chilies B_onion Cowpea Mung bean Soya beans Cucurbits	Banana Citrus Pomegranate Papaw Mango Guava

Agro-ecological Zone : WM3b

Maha Season				Yala Season				Perennials
Uplands		Low lands		Uplands		Lowlands		
Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	
Beans Tomato Green chilies Brinjall Cucurbits Okra Cabbage Sweet Potato Nocol		Paddy	Paddy	Ginger Turmeric		Paddy Kiri ala	Paddy Beans Curry Chilies Green Chilies B_onion Tomato Brinjall Pulses Okra	Banana Coconut Pepper Coco, Coffee Tea Avocado Nutmeg Clove

District :

Agro-ecological Zone : IU1

Maha Season				Yala Season				Perennials
Uplands		Low lands		Uplands		Lowlands		
Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	
Up country vegs		Paddy	Paddy			Kiri ala	Paddy Curry Chilies Tomato Beet Carrot Radish	Tea Cardamom Pears

District :
Agro-ecological Zone : DL1c

Maha Season				Yala Season				Perennials
Uplands		Low lands		Uplands		Lowlands		
Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	
Chilies Red Onion Gingerly Cowpea Mug bean Maize Soya bean Tobacco Cucurbits Manioc Sweet Potato	Chilies B Onion Tomato Curry Chilies Ground nut	Mung bean Cowpea Soya bean Ground nut	Paddy Chilies Soya beans	Gingerly Cowpea Mung bean	Chilies B Onion Red Onion Cucurbits Curry Chilies Mung bean Tomato	Cowpea Ground nut Gingerly	Paddy Chilies B_ onion Red Onion Curry Chilies Beet Tomato Brinjall Cucurbits	Banana (With Irr) Mango Guava Grapes (with Irr) Cashew Citrus Drum sticks Papaw Pine apple (with irrigation) Wood apple Coconut (under the influence of seepage water)

Appendix 5.5
suitable tree species

Table 5.1 Tree species recorded in Moragahakande catchment during the field survey. LN - Local name, HA - Habit, TS - Taxonomic status, CS - Conservation status; T – Tree; IN - Indigenous, I Introduced, E – Endemic; TR-Threatened; FE - Forest Enrichment Plant RR - Riverine Plant; HV - Home Garden and Avenue Plant. These species could be used in reforestation and enrichment planting in the catchment.

Family	Species	LN	HA	TS	CS	FE	RR	HV
Anacardiaceae	*Anacardium occidentale*	Cadju	T	I	-			3
Anacardiaceae	*Mangifera indica*	Amba	T	I	-			3
Anacardiaceae	*Mangifera zeylanica*	Etamba	T	E	-		2	
Annonaceae	*Polyalthia coffeoides*	Omara	T	IN	-	1		3
Annonaceae	*Polyalthia longifolia*	Ovila	T	IN	-		2	3
Bignoiniaceae	*Stereospermum colais*	Dunu Madala	T	IN	-	1		3
Celastraceae	*Pleurostylia opposita*	Panakka	T	IN	-	1		3
Clusiaceae	*Garcinia spicata*	Ela Gokatu	T	IN	-		2	
Combretaceae	*Terminalia arjuna*	Kumbuk	T	IN	-		2	
Ebelnaceae	*Diospyros affinis*	Kaku Mediriya	T	IN	-	1		3
Ebelnaceae	*Diospyros ebenum*	Kaluwara	T	IN	TR	1		3
Ebelnaceae	*Diospyros malabarica*	Timbiri	T	IN	-		2	
Euphorbiaceae	*Bridelia retusa*	Ketaketa	T	IN	-	1		3
Euphorbiaceae	*Drypetes sepiaria*	Wira	T	IN	-	1		
Euphorbiaceae	*Mischodon zeylanicus*	Tammana	T	IN	-	1		
Fabaceae	*Albizia odoratissima*	Suruya Mara	T	IN	-			3
Fabaceae	*Cassia fistula*	Ehela	T	IN	-	1		3
Fabaceae	*Cassia roxburghii*	Ratu Wa	T	IN	-	1		3
Fabaceae	*Pongamia pinnata*	Karada	T	IN	-		2	
Fabaceae	*Saraca asoca*	Asoka	T	IN	-		2	3
Fabaceae	*Tamarindus iIndica*	Siyambala	T	IN	-			3
Flacourtiaceae	*Hydnocarpus venelnata*	Makulu	T	E	-		2	
Herinalndiaceae	*Gyrocarpus americalnus*	Hema	T	IN	-	1		
Lauraceae	*Alseodaphne semecarpifolia*	Wewarana	T	IN	-	1		
Logalniaceae	*Strychnos nux-vomica*	Goda Kaduru	T	IN	-	1		3
Logalniaceae	*Strychnos potatotum*	Ingini	T	IN	-	1		3
Meliaceae	*Azadirachta indica*	Kohomba	T	IN	-			3
Meliaceae	*Chukrasia tabularis*	Hulaln Hik	T	IN	-	1		
Meliaceae	*Melia azedarach*	Lunu Midella	T	IN	-			3
Moraceae	*Antiaris toxicaria*	Riti	T	IN	-	1		
Moraceae	*Artocarpus heterophyllus*	Kos	T	I	-			3
Moraceae	*Artocarpus incisus*	Del	T	I	-			3
Moraceae	*Ficus benghalensis*	INuga	T	IN	-			3
Moraceae	*Ficus drupacea*	INuga	T	IN	-			3
Moraceae	*Ficus racemosa*	Attikka	T	IN	-			3
Myristicaceae	*Myristica dactyloides*	Malaboda	T	IN	-		2	
Myrtaceae	*Syzygium cumini*	Madaln	T	IN	-	1	2	3
Rubiaceae	*Haldina cordifolia*	Kololn	T	IN	-	1		
Rubiaceae	*Mitragyna tubulosa*	Helamba	T	IN	-	1		
Rubiaceae	*Nauclea orientalis*	Bakmi	T	IN	-		2	
Rutaceae	*Aegle Marmelos*	Beli	T	I	-			3
Rutaceae	*Chloroxylon swietenia*	Burutha	T	IN	-	1	2	3
Sapilndaceae	*Dimocarpus longan*	Mora	T	IN	-	1		
Sapilndaceae	*Filicium decipielns*	Pihimbiya	T	IN	-	1		3
Sapilndaceae	*Lepisanthes senegalelnsis*	Gal Kuma	T	IN	-	1		
Sapilndaceae	*Lepisanthes tetraphylla*	Dambu	T	IN	-	1		3
Sapilndaceae	*Sapindus emargilnata*	Penela	T	IN	-	1		3

Sapindaceae	*Schleichera oleosa*	Kooln	T	IN	-	1		3
Sapotaceae	*Madhuca longifolia*	Mi	T	IN	-		2	
Sapotaceae	*Manilkara hexandra*	Palu	T	IN	-	1		
Sapotaceae	*Mimusops elengi*	Munamal	T	IN	-	1		3
Sterculiaceae	*Pterospermum suberifolium*	Welan	T	IN	-	1		
Sterculiaceae	*Sterculia foedida*	Telambu	T	IN	-	1		
Tiliaceae	*Berrya cordifolia*	Halmilla	T	IN	-	1	2	3
Tiliaceae	*Grewia helicterifolia*	Bora Damoniya	T	IN	-	1		3
Ulmaceae	*Holoptelea intergrifolia*	Godakirilla	T	IN	-	1		
Verbelnaceae	*Tectona grandis*	Thekka	T	I	-			3
Verbelnaceae	*Vitex altissima*	Milla	T	IN	-	1		3
Verbelnaceae	*Vitex leucoxylon*	Nebada	T	IN	-		2	

Appendix 5.6

Agro-Socio-economic Survey

Appendix 5.6 Survey Data - Agro-Socio-economic Survey

Moragahakanda Watershed Development Program

		GN Div	No of Families	Population	Home Gar den acs	Upland Culti in Govt		Chena Cul Private		No of Streams		Nursary	Loss lands / F dept		Erosion	R
						Families	Acs	Families	Acs	No	Avg L. Km	Availability	Acs	Families	cont St	
SW-1	1	Kambarawa	260	705	Fully innundated -90% forest Cover							No				
Koon	2	Galporugolla	123	408	Fully innundated -92% cover											
gaha	3	Elagamuwa	196	748	Fully innundated											
	4	Talagoda	205	716	Fully innundated											
	5	Kadawatha	175	562	Fully innundated											
	6	Medapihilla	115	416	Fully innundated											
	7	Moragolla	101	407	Fully innundated		10			-		No	3		-	
	8	Galboda	70	240	Fully innundated		10					No				
		Sub Total	1245	4202												
SW -2	9	Millagahamulatanna	180	564	Above 50% innundated											1
Koon	10	Rajawela	275	1000	Above 75% innundated											2
gaha	11	Koongahawela	89	356	Above 75% innundated											2
	12	Maragamuwa	119	423	Above 50% innundated											1
		Sub Total	663	2343												
SW -3	13	Bambaragahawa	118	375	Below 25% innundated - most are in buffer zone											?
Koon	14	Pubbiliya	121	355	About 50% innundated - most are in buffer zone											1
gaha	15	Halambagahawat	128	467	Buffer zone											
	16	Dambagolla	88	260	Buffer zone											
		Sub Total	455	1457												
SW-4	17	Moragahamada	158	556	147			161		1	3	No			5 str	
Kon	18	Ambana	81	383	92	10	12					No	10		5 str	
gaha	19	Senagama	227	585	197	8	19	14	10	1	100 m	Yes	13		10 acs	
	20	Opalgala	260	846	225	30				1	3	Yes	30	40	5 acs	
		Sub Total	726	2369	661	48	31	175					53			

Survey Data - Agro-Socio-economic Survey
Moragahakanda Watershed Development Program

			No of		Home Gar	Upland Culti in Govt		Chena Cul Private		No of Streams		Nursery	Loss iands / F dept		Erosion	Remarks
		GN Div	Families	Population	den acs	Families	Acs	Families	Acs	No	Avg L Km	Availability	Acs	Families	cont St	
SW-5	21	Iladuwa	173	546	97	32	32	16	16	1	1	No	30	17		
Naula	22	Karawilahena	216	764	200	22	31	6	8	1	1	No	24	13	150	
	23	Iladuwela	124	413	79	12	7	3	3	4	2.5	Yes	12	5		
	24	Dodamattawela	140	430	200	4	6	15	10	1	0.5	No				
	25	Meegahacla	164	519	212	15	30	15	30	2	3	No				FD 90 Acs
		Sub total	817	2672	788	85	106	55	67	9	8					
SW-6	26	Koombiyan Gaha	173	694	193			60	50	3	7	Yes			3 km	20/63 F/P dis
Naula	27	Bowatannawela	172	602	125	2	4	6	5	2	5	Yes	3	4	8 km	
	28	Ganimayaya	154	646	120	20	20	20	10	1	1.5	No			10 acs	10/27 F/P displ
	29	Andawela	293	1224	250	17	15	16	17	2	2	Yes	22	20	1 str	
		Sub Total	792	3166	688	39	39	102	82	8	15.5		25	34		
SW-7	30	Pottawela	31	108	45			4	2	4	4	No	15	15	45 acs	
	31	Dammantanna	43	128				5	10	?		No	50	40		
	32	Puwakpitiya	120	417	150			10	10	4	8	Yes	10	10	5 str	
	33	Dluigaspothana	131	493	10					1	1	No				Road dificulties
		Subtotal	325	1146												
SW-8	34	Kahagala	66	181	65	-		-		-		No	40	12	60 acs	
	35	Illukkumbura	72	219	35	-		-		-		No	100	70	-	
	36	Mahalakoluwa	68	167	35	2*	10*	-		3	6	No	30	20	-	
	37	Medaela	60	209	34	-	-	3	3	5	3	No	50	45	-	
	38	Ratninda	64	193	45	11*	46*	6	8	3	2	No	2	4	12 acs	
	39	Etanwala	62	176	41	20*	75*	3	3	3	4	No			40 acs	
	40	Pitawala	73	91	65	6 *	70*	3	5	3	6	No	50	50	10 acs	
		Sub total	465	1236												
		TOTAL	5488	18591	2137	172	176	366	200							

Survey Data - Agro-Socio-economic Survey
Moragahakanda Watershed Development Program

		GN Div	No of Families	Population	Home Gar den acs	Upland Culti in Govt		Chena Cul Private		No of Streams		Nursary	Loss Iqnds / F dept		Erosion	Remarks
						Families	Acs	Families	Acs	No	Avg L Km	Availability	Acs	Families	cont St	
SW-1	1	Kambarawa	260	705	Fully innundated -90% forest Cover							No				
Koon	2	Galporugolla	123	408	Fully innundated -92% cover											
gaha	3	Elagamuwa	196	748	Fully innundated											
	4	Talagoda	205	716	Fully innundated											
	5	Kadawatha	175	562	Fully innundated											
	6	Medapibilla	135	416	Fully innundated											
	7	Moragolla	101	407	Fully innundated		10			-		No	3		-	
	8	Galboda	70	240	Fully innundated		10					No				
		Sub Total	1265	4202												
SW - 2	9	Millagahamulatanna	180	564	About 15% innundated											100/364 dis
Koon	10	Rajawela	275	1000	Above 75% innundated					1	2		15	10		275/1190 dis
gaha	11	Koongahawela	89	356	Above 75% innundated											20/80 dis
	12	Maragamuwa	119	423	About 30% innundated			15	15	1	2		40	40		119/393 dis
		Sub Total	663	2343												
SW - 3	13	Bambaragahawa	118	375	Below 25% innundated - most are in buffer zone											?
Koon	14	Pubbilliya	144	502	About 50% innundated			80	60	1	1		8	8		121/502 dis
gaha	15	Hatambagahawat	128	467	Buffer zone											
	16	Dambagolla	88	260	Buffer zone			88	45	4	3		75	88		
		Sub Total	478	1604				168	105	5	4		83	96		
SW-4	17	Moragahamada	158	556	147					1	3	No			5 str	
Kon	18	Ambana	81	383	92	10	12					No	10	10	5 str	
gaha	19	Senagama	227	585	197	8	19	14	10	1	100 m	Yes	13		10 acs	
	20	Opalgala	220	845	225	30	15	25	50	1	3	Yes	30	40	5 acs	
		Sub Total	686	2369	661	48	46	39	60	3	6		53	50		

Survey Data - Agro-Socio-economic Survey
Moragahakanda Watershed Development Program

		GN Div	No of Families	Population	Home Gar den acs	Upland Culti in Govt		Chena Cul Private		No of Streams		Nursary	Loss Iqnds / F dept		Erosion	Remarks
						Families	Acs	Families	Acs	No	Avg L Km	Availability	Acs	Families	cont St	
SW-5	21	Haduwa	173	546	97	32	32	16	16	1	1	No	30	17		
Naula	22	Karawilahena	216	764	200	22	31	6	8	1	1	No	24	13	150	
	23	Haduwela	124	413	79	12	7	3	3	4	2.5	Yes	12	5		
	24	Dodamattawela	140	430	200	4	6	15	10	1	0.5	No				
	25	Meegahaela	164	519	212	15	30	15	30	2	3	No				FD 90 Acs
		Sub total	817	2672	788	85	106	55	67	9	8					
SW-6	26	Koombiyan Gaha	173	694	193			60	50	3	7	Yes			3 km	20/63 F/P dis
Naula	27	Bowatannawela	172	602	125	2	4	6	5	2	5	Yes	3	4	8 km	
	28	Gammayaya	154	646	120	20	20	20	10	1	1.5	No			10 acs	10/27 F/P displ
	29	Andawela	293	1224	250	17	15	16	17	2	2	Yes	22	20	1 str	
		Sub Total	792	3166	688	39	39	102	82	8	15.5		25	24		
SW-7	30	Pottatawela	31	108	45			4	2	4	4	No	75	25	5	
	31	Dammantanna	43	128	35			5	10	?		No	50	40		
	32	Puwakpitiya	120	417	150			10	10	4	8	Yes	150	80	100acs	
	33	Diulgaspothana	131	493	10					1	1	No				Road dificulties
		Subtotal	325	1146	240			19	22	9	13		275	145	5	
SW - 8	34	Kahagala	66	181	30	-		30	30	2	2	No	40	12	60 acs	
	35	Illukkumbura	72	219	25	-		8	10	-		No	100	70	-	
	36	Mahalakoluwa	68	167	35	2	10	60	74	3	6	No	30	20	-	
	37	Medaela	60	209	34	-	-	3	3	5	3	No	50	45	-	
	38	Ratninda	64	193	45	11	46	6	8	4	8	No	2	4	12 acs	
	39	Elanwala	62	176	41	20	75	7	8	3	4	No	90	46	40 acs	
	40	Pitawala	73	91	45	6	70	3	5	3	6	No	50	50	10 acs	
		Sub total	465	1236	255			117	138	20	29					
		TOTAL	5491	18738	2632			500	474	54	75.5		491	365		

Appendix 6.1 The cost analysis

Cost Analysis

6.4.1 Buffer zone development

(a) Tree Planting

Plants (5m x 5m intervals) including losses, damages, wastages per ha
Required No (say) = 500 Cost 500@ Rs 25 = Rs 12,500
Small plants in between = 500 Nos @ Rs 15 = Rs 7,500

Land clearing,

Excavation of pits, carry to the site, planting, fertilizer application in two times
No. of labor days required = 120
Cost = 120 @ Rs500 = Rs 60,000
Maintenance cost per year -
No of labor days per year - 40; for three years = 120
Cost = Rs 60,000
Total Cost = Rs 140,000
For tools & other = Rs 10,000; Transport & other = Rs 10,000
Grand total per ha = Rs 160,000

(b) Fixing Demarcation posts

Pre-cast concrete posts dimensions 60" x 9" x 6"

30" below the ground and 30" above the ground

Cost for casting, transporting and fixing at 50 m intervals = Rs 1000

6.4.2 Soil Conservation

(a) On farm soil conservation
Average length of hedges/ terraces in a ha = 500 m
Cost per m = Rs 100
Cost per ha = Rs 50,000

(b) Off- farm soil conservation

Average cost per km = Rs 4,00,000

6.4.3 Forestry Development

(a) Upland forest conservation

Reforestation in State lands (50% as specified under buffer zone) = Rs 8 0,000

In Private lands Cost = Rs 80,000 per ha

The maintenance cost (50%) borne by the beneficiary

(b) Timber Farms

Cost per ha = Rs 80,000

(c) Tree planting in public lands (school, temple premises etc) & stream embankments

Cost per ha = Rs 1,60,000

6.4.4 Farm production & Income generating activities

(a) Establishment of Nurseries
Cost for material & 50 % of labor = Rs 30,000 per unit

(b) Home-garden development program
• Cost per ha = Rs 30,000 (plants & 50% of labor cost)

(c) Agro processing & Marketing - Rs 25 m

(d) Income Generating activities - Rs 40 m

6.4.5 Community Infrastructure Development

Average cost per tank rehabilitation Rs 400,000

Average cost per anicut rehabilitation Rs 200,000

Agriculture roads cost per km = Rs 200,000

Drinking water supply Sum = Rs 20 m

Sanitary facilities Sum = Rs 10 m

6.4.6 Wildlife Conservation

(a) Baseline Surveys including equipments = Rs 35,00,000

(b) Demarcate & establish conservation area boundary

Boundary Survey 150 km @ Rs 30,000 cost Rs 45,00,000

Boundary Demarcation 150 km @ Rs 20,000 Cost Rs 30,00,000

Establishment of protected area & conservation area Sum Rs 50,00,000

Sub Total = Rs 12,500,000

© Habitat Enrichment 80 ha @ Rs 1,25,000 Cost = Rs 10,000,000

(d) Elephant Management Sum = Rs 15,000,000

(e) Electric Fencing 150 km @ Rs 3,00,000 = Rs 45,000,000

(f) Eco- development - Community out reach, Buffer zone Development Sum = Rs 15,000,000

(g) Infrastructure / Staff Requirement Sum = Rs 15,00,000

(h) Coordination, Overheads & Miscellaneous = Rs 25,00,000

Grand Total = Rs 105,000,000

6.4.7 Training & Capacity Building

(a) Awareness Training	- Rs 40,00,000
(b) Community Leaders Training	- Rs 30,00,000
(c) Mass media, video film, hand books, posters etc	- Rs 60,00,000
(d) Training on agriculture & forestry	- Rs 30,00,000
(e) Marketing	- Rs 40,00,000
(f) Income Generation	- Rs 10,00,000
(g) Follow-up	- Rs 60,00,000
(h) Staff Training (local)	- Rs 70,00,000
(i) Staff Training (Overseas)	- Rs 70,00,000
Sub Total	**- Rs 50,000,000**

Appendix 6.2
Sri Lanka forest department circular

Appendix 7.1 Water quality data of 21 sampling locations at proposed Medirigiriya settlement area

Location	Water source	Total Coliform Bacteria(MPN)/100ml	Presence of *E.coli*	Viable Bacteria/ml	Phosphate (µg/l)	Nitrate (µg/l)	Hardness(m. mol^{-1})
Location 1	Elehera Ela				5530	0.044	1.6×10^{-3}
Location 2	Tube well	15	Absent	124	3035	0.148	3.04×10^{-3}
Location 3	A well from the kidney patients home	43	Absent	65	1730	0.115	5.04×10^{-3}
Location 4	Elehera Ela	15	Absent	89	5000	0.153	1.68×10^{-3}
Location 5	Drinking water well	20	Absent	63	2670	0.126	2.72×10^{-3}
Location 6					6500	0.055	2.48×10^{-3}
Location 7	Drinking water well	15	Absent	46	1545	0.088	6.80×10^{-3}
Location 8	A non drinking well				2045	0.093	13.76×10^{-3}
Location 9	Drinking water well	75	Absent	43	1480	0.044	4.72×10^{-3}
Location 10	A well from thekidney patient was recorded	93	Absent	14	1260	0.077	13.36×10^{-3}
Location 11	A tube well	43	Absent	135	1375	0.104	9.92×10^{-3}
Location 12	Thalakolawewa Ela	75	+	60	6140	0.077	1.68×10^{-3}
Location 13	Drinking water well	75	Absent	210	1950	0.109	2.16×10^{-3}
Location 14	An unused tube well	460	Absent	16	3365	0.115	2.0×10^{-3}
Location 15	Drinking water well	1100	+	218	1760	0.209	4.0×10^{-3}
Location 16	Drinking water well	460	Absent	256	2840	0.137	3.52×10^{-3}
Location 17	Parakrama Samudraya	28	Absent	42	3020	0.038	1.68×10^{-3}
Location 18	Drinking water well	460	Absent	184	2725	0.077	4.88×10^{-3}
Location 19	Drinking water well	460	Absent	47	2300	0.165	3.60×10^{-3}
Location 20	Drinking water well Vijeyapura collage	240	Absent	131	2640	0.082	4.48×10^{-3}
Location 21	Drinking water well of a kidney patient's home	1100	+	127	3105	0.148	3.80×10^{-3}

Appendix 7.1

Water quality data of 21 sampling locations at proposed Medirigiriya settlement area

Appendix 1- Proposed Sri Lankan water quality standards

Paramoter	Unit Type of limit	Nature Conservation	Drinking water, with simple treatment	Bathing	Fish and aquatic life	Drinking water with convenient treatment	Irrigation and agriculture	other uses
		Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Category 7
General								
01. Colour (after simple treatment)	Pt mg/l, max	n	20	..	..	100	..	..
02. Total dissolved solids (TDS)	mg/l, max	n	..	..	..	..	500	..
03. Conductivity	dS/m, max	n	..	..	..	..	0.7	..
04. Odour	..	n	unobj	unobj		unobj		
05. Taste	..	n	unobj			unobj		
06. Turbidity	NTU, max	n	5					
07. Sodium absorption ratio (SAR)	..	n	..					
08. Resident sodium carbonate (RSC)	meq/l, max	n	..					
09. Total hardness	as $CaCO_3$,mg/l,max	n	250 des. 600max					
10. pH	..	n	6.0-8.5	6.0-9.0	6.0-8.5	6.0-9.0	6.0-8.5	5.5-9.0
11. Dissolved Oxygen at 25°C	mg/l, min	n	6	5	3	4	3	3
12. BOD (5days at 20°C or 3days at 30°C	mg/l, max	n	3	4	4	5	5	5
13.COD	mg/l, max	n	15	20	15	10		40
Nutrients								
14. Nitrates(NO_3-N)	mg/l, max	n	5	5	5	5	5	5
15. Total Ammonia (NH3-N) - pH<7.5 -pH = 8.0 -pH = 8.5	mg/l, max	n			 0.94 0.59 0.22			 9.1 4.9 1.6
16. Total Phosphate (PO4-P)	mg/l, max	n	0.7	0.7	0.4	0.7	0.7	0.7
Other Substances						200	100	
17. Chlorides(cl)	mg/l, max	n	200					
18. Cyanides (CN)	mg/l, max	n	0.005	0.005	0.005	0.005	0.005	0.005
19. Flourides (F)	mg/l, max	n	1.5					
20. Sulphates (SO4)	mg/l, max	n	250					
Metals								
21. Total Cadmium (Cd)	mg/l, max	n	5		H Cd <60 0.2 60-120 0.8 120-180 1.3 >180 4	5		5
22. Total chromium (Cr)	ug/l, max	n	50		2	50		5

Parameter	Unit Type of limit	Nature Conservation	Drinking water, with simple treatment	Bathing	Fish and aquatic life	Drinking water with convenient treatment	Irrigation and agriculture	other uses
		Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Category 7
23. Total copper (Cu)	ug/l, max	n			H Cu <60 2 60-120 2 120-180 3 >180 4			100
24. Iron (Fe)	ug/l, max	n	300 des. 1000max		300	200		
25. Lead (Pb)	ug/l, max	n	50		H Pb <60 1 60-120 2 120-180 4 >180 7	50		50
26. Manganese (Mn)	ug/l, max	n	1000	1000	1000	1000	1000	1000
27. Mercury (Hg)	ug/l, max	n	1	1	0.1	1	1	2
28. Nickel (Ni)	ug/l, max	n	100	100	H Ni <60 25 60-120 65 120-180 110 >180 150	100	100	100
29. Selenium (Se)	ug/l, max	n	10	10	1	10		
30. Zinc (Zn)	ug/l, max	n	1000	1000	30	1000	1000	1000
31. Boron (B)	ug/l, max	n					500	
32. Total arsenic (As)	ug/l, max	n	10	50	50	10	50	50

33. Aluminium (Al)	ug/l, max	n	200			200	0.5	
Organic micro Pollutants								
34. Phenol index	ug/l, max	n	2	5	1	5	5	5
35. Oil and grease	ug/l, max	n	100	200	10	100		300
36. Anionic surfactants (detergen)	ug/l, max	n	200	300	1000	200	1000	1000
as MBAS								
37. Total Pesticides	ug/l, max	n	10	30	30	30	50	50
Micro organisms								
38. Total ciliforms	MPN 100ml (*P=95%)	n	5000	1000	20,000	5000	1000	
39. Faecal coliforms	MPN 100ml (*P=95%)	n	250des 600 max	50				

[1] It is not required to name any inland waters for this purposes because water for this purposes can be taken from any other uses

category subject to very specific parameter vlues

Abbreviations

n = Nature of baseline values

H = Hardness in terms of $CaCO_3$ in mg/l

des. = Desirable highest level

max = Maximum permissible level

MBSA = Methylene blue active substances

*p=95% = 95% of the samples give a value that is equal to or less than the indicated limit

Appendix 7.3

Chemical indicators of water quality

Appendix 7.3

Chemical indicators of water quality

Water hardness

Water hardness is commonly defined as the sum of the polyvalent cations dissolved in the water. The most common such cations are calcium and magnesium. Generally, waters are classified according to degree of hardness.

According to the classification, the samples collected from resettlement area fall in soft water hardnes category (Chapter-3- 3.3).

Nitrate and nitrite

Nitrate and nitrite are naturally occurring ions that are part of the nitrogen cycle. The nitrate concentration in groundwater and surface water is normally low but can reach high levels as a result of agricultural runoff, refuse dump runoff, or contamination with human or animal wastes. The federal standard for nitrate in drinking water is 10 milligrams per litre (10 mg/l) nitrate-N, or 45 mg/l nitrate-NO_3. In the present study, nitrate concentrations in the area where samples were collected showing that the concentrations were below the water quality standard.

Microbial indicators of water quality

Frequent examinations for faecal indicator organisms remain the most sensitive and specific way of assessing the hygienic quality of water. They should be universally present in high numbers in the faeces of human and worm blooded animals and not should grow in natural water. Water intended for drinking and household purposes must not contain water born pathogens. The most specific bacterial indicator of faecal pollution from humans and animals is *E.coli*, it follows that *E.coli* or thermo tolerant coliform organisms must not be present in 100-ml samples of any water intended for drinking (WHO Drinking standards). The samples collected from Pubudugama well, Ambagaswava weva, well and Nidanagam weva shows faecal contamination (Table 7.2).

Annex 9

MT/SI/08/31/1286

DETAILED GEOLOGICAL STUDY WITH RESPECT TO THE LAND STABILITY OF MORAGAHAKANDA AGRICULTURAL DEVELOPEMNT PROJECT

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November, 2008

EXECUTIVE SUMMARY

According to the condition 4.7 of the second extension to the environment clearance for the proposed Moragahakanda Development Project, the Mahaweli Authority of Sri Lanka (MASL), requested NBRO to perform a detailed geological study with respect to the land stability of the project area.

The objectives are to study the landslide potential of the area, preparation of landslide hazard zonation map along with the development guidelines, and propose mitigation methods, if necessary, to implement the Moragahakanda Development project assuring the safety of its project components and their surroundings against land stability.

The total study area is 115 sq km and the duration of the study was twelve weeks. MASL provided a contour map indicating locations of the project components and a certain amount of geological and data which they have already collected in the past. In addition, NBRO utilized 1:10000 scale topographic maps generated by the Survey Department and 1:100000 scale geology maps generated by the Geological Survey and Mines Bureau and conducted a field survey for collecting additional data.

NBRO's methodology on evaluation of landslide hazard potential is based on the predominance of Bedrock Geology, Surface Deposits, Hydrology and Drainage, Slope Angle Range, Land Use and Land Forms towards initiating or progressing a landslide.

The Project area is predominantly underlain by Quartz, Quartzo-feldspathic gneisses, Khondalite (Garnet Sillimanite), Marble (crystalline limestone), Charnockite/Charnockitic gneisses, and Granitic Gneiss. Most of the ridges found within the study area are almost parallel to the strike and both dip slopes and scarp slopes were observed. A prominent fold was recognized along the Eastern boundary of the catchment. Activated fault fractures and highly weathered lineaments which are commonly associated with large destructive landslides were not observed within the project area.

The project area consists of residual soil only and the presence of colluvium was not observed during the field study. The depth of overburden deposits of the area underlain by and adjacent to the proposed reservoir is about 2 – 3 meters. The surrounding mountains consists residual soil deposits that are less than 2 meters deep.

The average annual rainfall of the study area is 1500 mm to 3500 mm. The drainage characteristics of the sub catchments of the study area indicate low to moderate potential for slope instability.

Slopes within the study area are not steeper than 40^0. More than half of the study area belongs to a flatter terrain and majority among the rest of the slopes also are not steeper than 17^0.

About 63% of the land in the study area is covered by forest. Only about 8% of the land is used for human settlements and home gardens. At a few locations of the study area mica mines and old feldspar mines were also observed. Observations indicate that the human intervention within this project area is very low at present.

The study area is an undulating plane which contributes less towards slope failures. The rest of the land belongs to complex and dissected hilly mountains which has medium contribution towards landslide potential.

No past landslides or any form of unstable features other than surface erosion on modified slopes were observed within the study area during the time of investigation. No visible signs of subsidence such as cracked walls and floors of houses, sink holes and depressed ground surfaces were found within the project area during the time of field investigation. The analysis of data indicates that, about 56% of the project area is safe from landslides and about 43% of the project area consist low hazard potential. Most part of this area will be inundated when the reservoir is filled. About 1% of the area is with medium landslide potential and recommendations have been given in this report for mitigating such areas.

A few karstic features which are shallow and with limited lateral extent were present on the surface of observed marble bands. With the filling of reservoir and the increased water pressure, the extent of these cavities could be increased and close observations are necessary during the maintenance stage of the project.

Planting a tree species with broad leaves and deep roots and protecting all the slope cuts that are higher than 1.5 m along the stretch of the road with a suitable retaining structure, or by reducing the slope gradient are recommended as mitigating measures. The foundation of the dam that crosses the Marble bands and any solution cavities found or identify during the construction work should be grouted. When the reservoir is filled, the periphery of the reservoir should be kept as development or construction free area. Slopes surrounding the project area should be declared as a sanctuary or a forest reservation to further maintain the slope stability potential.

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DETAILED GEOLOGICAL STUDY WITH RESPECT TO THE LAND STABILITY OF MORAGAHAKANDA AGRICULTURAL DEVELOPMENT PROJECT

Background:

The National Building Research Organisation (NBRO) is the national agency involved in landslide hazard zonation mapping and landslide related disaster management activities since 1985. The Ministry of Agriculture Development, the Project Approving Agency for the Proposed Moragahakanda Development Project has issued the second extension to the environment clearance for further, a period of 3 years, subject to terms and conditions. The condition 4.7 of the above mentioned extension indicates that a detailed geological study should be carried out in consultation with the NBRO with respect to the land stability of the project area. Therefore, at the Sub Committee meeting held on January 17, 2008, the Mahaweli Authority of Sri Lanka (MASL) requested NBRO to perform this study. Upon NBRO's request, MASL provided a contour map indicating locations of the project components and a certain amount of geological data which they have already collected in the past. NBRO commenced the detailed geological study on June 11, 2008. The total study area is 115 sq km and the duration of the study was twelve weeks.

Introduction:

The proposed Moragahakanda reservoir and its project components are located within Matale district along the Naula – Elahera road (Map 1). The Project comprises a main dam along with two saddle dams at a site on the Amban Ganga, a tributary of the Mahaweli Ganga, about 2 km upstream of the existing Elahera anicut. The overall aim of the Project is to improve the standard of living and quality of life of those living within Mahaweli Systems H, I/H and M/H, in Anuradhapura district, Anuradhapura city, Mahaweli Systems G, D1 and D2, in Polonnaruwa district and the Trincomalee industrial area. The full supply level of the dam is 185 MSL, the full supply area of the reservoir is 29.5 sq km. and the active storage is 521 MCM.

Objectives:

1. Study the landslide potential of the area where the components of the Moragahakanda development project are located.

2. Preparation of landslide hazard zonation map of the said area along with the development guidelines.
3. Propose mitigation methods, if necessary, to implement the Moragahakanda Development project assuring the safety of its project components and their surroundings against land stability.

Produced Outputs:

1. Landslide hazard zonation map of the project area and guidelines for development in different hazard zones.
2. Report indicating land stability of the project area and recommendations for mitigating any unstable slopes.

Methodology:

NBRO's methodology on evaluation of landslide hazard potential is based on the predominance of Bedrock Geology, Surface Deposits, Hydrology and Drainage, Slope Angle Range, Land Use and Land Forms towards initiating or progressing a landslide. Performing slope stability analysis based on geotechnical data has been excluded from NBRO's mapping programme, since it is uneconomical at the selected scale (1:10 000) of evaluation (NBRO User Manual, 1995). However, the geotechnical data already collected by MASL were incorporated for this analysis.

1: 10,000 scale topographical maps produced by the Survey Department of Sri Lanka (Map 1), geological and geotechnical data already collected by MASL (Appendix C) and the 1:100 000 scale Geological map produced by the Geological Survey and Mines Bureau of Sri Lanka (Map 2) were studied and base maps required for field studies were prepared at the office at 1:10 000 scale.

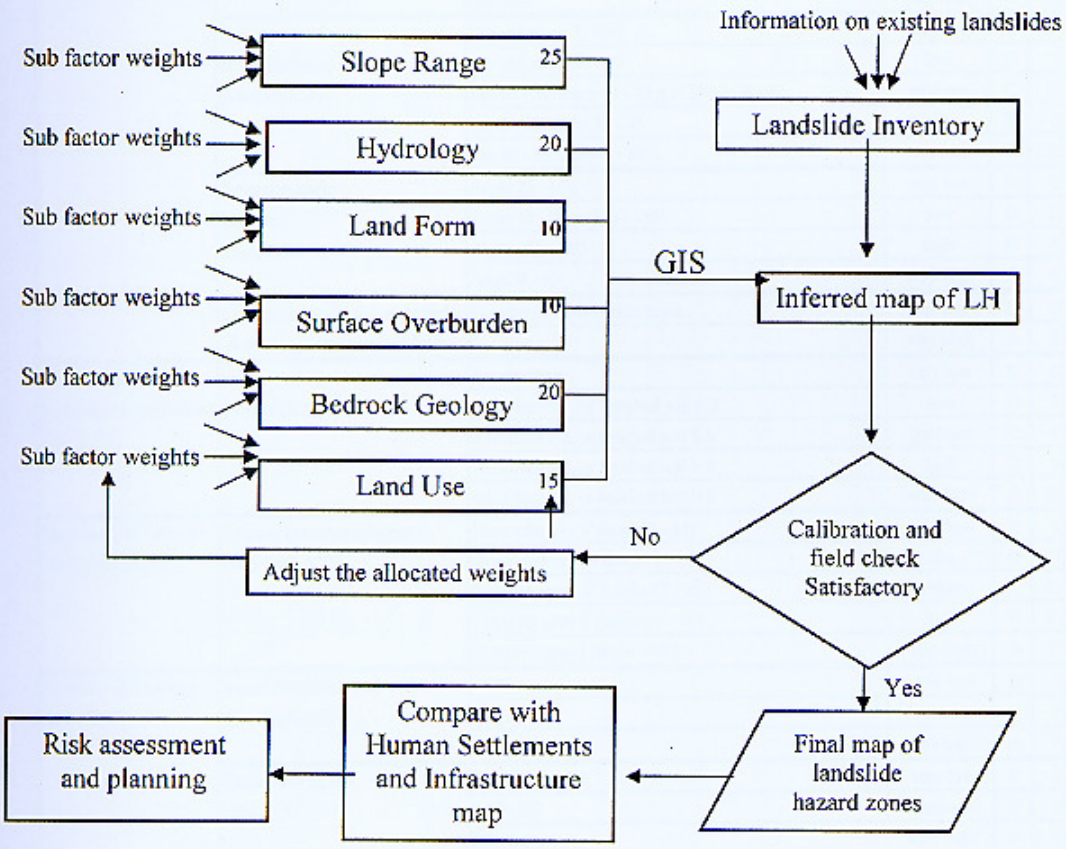
At the field,

- Collecting additional data on past landslides including their precise locations, affected areas, damage caused and the present conditions of the catchment within which the Moragahakanda Project is located.
- Collecting updated contour and land use data to identify expected changes in land use and slope modifications due to implementation of the project

- Collecting additional data on geology, hydrology, soil overburden and land forms to prepare the state of nature maps of each causative factor

were carried out.

Figure 1 Landslide Hazard Evaluation Model



Digital compilation and analysis of the collected data was done at the office and separate maps for Bedrock Geology, Surface Deposits, Hydrology and Drainage, Slope Angle Range, Land Use and Land Forms were prepared (Maps 3 – 8) at 1:10 000 scale.

Contributory factors that are mapped separately and compared based on their potential for creating instability, while considering inter-relations with each other. NBRO has established a set of subjective weights for this approach and these weights can conveniently quantify the relative contribution of each causative factor. Table 1 indicates both numerical and subjective weights used for the evaluation criteria.

The evaluated factor maps were over laid at an ARC GIS platform, integrated landslide potential was determined and the landslide hazard zonation map was (Map 9) prepared.

Major Facotrs (Weight,linguistic, numerical)	Subfacotrs (Weight,linguistic,numerical)	Rating criteria X - Subjective, Y - Linguistiv, Z - Numerical			
		Subfactor elements	X	Y	Z
Bedrock Geology & Geological Structure* (high, B, 20)	Lithology (very high,A,8)	Marble	very low	E	0
		Weathered rock	low	D	1
		Granite,garnet,biotite gneiss,and all others	medium	C	3
		Charnockite,granulite,or bedrock not exposed	high	B	5
		Quartzite	very high	A	8
	Amount and direction of dip (degrees) (medium,C,4)	Dip and scarp 70 - 90	very low	E	0
		Dip and scarp 55 - 70	low	D	1
		Dip 10 - 30, scarp 45 - 55,and interm slopes	medium	C	2
		Dip 0 - 10, scarp 30 - 45	high	B	3
		Dip 30 - 55, scarp 0 - 30	very high	A	4
	Deviation angle (degrees) (high,B,6)	Angle 25 - 120	very low	E	0
		Angle 10 - 25 or 120 - 155	low	D	2
		Angle 155 - 180	high	B	4
		Angle 0 - 10	very high	A	6
	Discontinuities, lineaments,faults, & master joints (very low,E,2)	Decided on case to case basis	very low	E	0
			very high	A	2
Surface deposits (colluvium & residual soi (low,D,10)	soil cover (m) (very high,A,10)	Bare bedrock	very low	E	0
		colluvium < 1, or residual soil < 2	low	D	2
		colluvium 1-3, or residual soil 2-8	medium	C	8
		colluvium 3-8, or residual soil > 8	high	B	9
		colluvium > 8, or residual soil > 8	very high	A	10
Slope range & Category (very high,A,25)	Slope angle range (degrees) (very high,A,25)	Slope category V (angle 0 - 11)	very low	E	5
		Slope category IV (angle 11 - 17)	low	D	7
		Slope category III (angle 17 - 31)	medium	C	13
		Slope category II (angle 31 - 40)	high	B	16
		Slope category I (angle > 40)	very high	A	25
Hydrology & Drainage (high, B, 20)	Relief Amplitude (m) (very high,A,5)	> 350	very low	E	1
		0 - 170	medium	C	2
		170 - 350	very high	A	5
	Basin Area sq.km (high,B,4)	0 - 0.07 or > 0.5	very low	E	1
		0.07 - 0.2	medium	C	2
		0.2 - 0.5	very high	A	4
	Basin Shape (basin area / basin length^2) (high,B,4)	0.6 - 1.0	very low	E	1
		0.3 - 0.6	medium	C	2
		< 0.3	very high	A	4
	Drainage density (km/sq.km) (length of streams/basin area) A - with soil cover (very high,A,5)	A >5 or B > 10	very low	E	1
		A 3-5 or B 6-10	medium	C	2
		A 0-3 or B < 6	very high	A	5
	Proximity to water bodies (low,D,2)	decided on case to case basis	very low	E	0
			medium	C	1
			very high	A	2
Land use & Management (medium,C,15)	Land use & Management (very high,A,15)	JT1,JC,JQ,JWb,W1,S1	very low	E	3
		JT2,JR,JWp,HP,HK,HM,HW,W2,W3,W4,S2,S4	medium	C	8
		HA,G1,G2,S3,N1,N2,N3,N4	very high	A	15
Land Form (low,D,10)	Land Form (very high,A,10)	F11,F12,F31-F35,F43,F91-F92,F94,A10-A13,X1,X2	very low	E	1
		F41,F42,F44-F48,F53	medium	C	3
		F51,F52,F54-F58,X13,X14	high	B	5
		F61,F62,F71-F74,F81-F83,F92,X11,X15	very high	A	10

* mapped when bedrock is exposed

Table 1 Criteria for relative ranking

A schematic diagram of the methodology used for landslide hazard zonation mapping is shown in Figure 1.

Results and Discussion:

1. Bedrock Geology

The Project area is underlain by inter-banded metamorphosed sediments (meta-sedimentary rocks) and Charnokitic gneisses which belong to the Highland series. Quartz, Quartzo-feldspathic gneisses, Khondalite (Garnet Sillimanite), and Marble (crystalline limestone) are the predominant meta-sedimentary rocks observed within the project area whereas Charnockite/Charnockitic gneisses, and Granitic Gneisses are the predominant igneous rocks observed (Map 3). In the field, representatives of both types occur in very close association with each other.

Quartz and Quartzo-feldspathic Gneiss

Quartzites are metamorphosed sandstone and, as their name suggests, are solely made of crystals of quartz. The quartz grain may sometimes appear highly elongated and the rock may contain a significant amount of feldspar. Such rocks are called Quartzo feldspathic gneiss or schist. Weathered schist easily crumbles between fingers. Quartz rocks are highly jointed and fractured and as a result they tend to be broken into slabs or large blocks.

Khondalite (Garnet Sillimanite Gneiss):

These rocks are metamorphosed clays or shales and are characterized by the presence of aluminum rich minerals such as sillimanite and reddish to pinkish garnet (alamandine). Garnet Sillimanite Gneiss weather easily into clay which is coloured in shades of red brown purple and orange with reddish brown spots.

Marble:

Marble and Calc Gneiss bands can be seen through out the project area and they are composed of calcite and dolomite in various proportions. Marble are metamorphosed sedimentary limestones and they vary from course grained to fine grained in texture. Marble, that remain as massive rocks, contributes less towards slope failures but more towards ground subsidence. However, during the period of field study, evidence of ground

subsidence such as cracked walls and floors of houses, sink holes and depressed ground surfaces were not found within the project area.

Charnockite/ Charnockitic Gneiss

Both Charnockite and undifferentiated Charnockitic gneiss are the major rock types that can be seen throughout the study area. They appeared as various sized bands interbeded or interbanded with Quartzite, Marble and Garnet bearing gneisses. Charnockite and Charnockitic Gneiss rocks are also highly jointed and vulnerable to be broken into boulders or slabs.

Pegmatite:

Large bodies as well as small masses of pegmatite are seen within the study area. The rock contains very course grained Potassium Feldspar and Plagioclase and Quartz as major constituents. Biotite rich pegmatite was also common within the area. Most of Biotite rich Pegmatite are concordant to the country rock and appear as pegmatite sills which are igneous structures formed parallel to the bedding plane of the country rock. They may have interbanded along the week zones of basement rock. At a few locations of study area mica mines and old feldspar mines were also observed.

Structural geology of the Project Area

The Highland series rocks are folded into a system of long, parallel folds which is also known as the Thaprobanian folds system. The general directions of these folds lie along North to South and Northwest to Southeast.

Most of the ridges found within the study area are almost parallel to the strike and both dip slopes and scarp slopes were predominant. A prominent fold was recognized along the Eastern boundary of the catchment. Activated fault fractures and highly weathered lineaments which are commonly associated with large destructive landslides were not observed within the project area.

2. Surface Deposits

Most landslides in Sri Lanka involve colluvium and or residual soil (NBRO User Manual, 1995). Therefore, mapping of surface deposits constitutes an important element of the

overall hazard mapping programme. Colluvium is often present over the residual soil on slopes; hence, the impact of these two materials on slope instability cannot be distinguished. However, in residual soils, relict structure, relict joints, relict bedding planes are usually preserved and have a control on causing slope failures. Hence a given thickness of colluvium tends to be more unstable than the same thickness of residual soil. Therefore, these two types of soil are weighted separately in the analysis.

The project area consists of residual soil only and the presence of colluvium was not observed during the field study. The extent and depth of the overburden deposits are estimated visually by examining cuts and exposures. Drilling data provided by MASL were also incorporated in estimation of the spread of overburden. The depth of overburden deposits of the area underlain by and adjacent to the proposed reservoir is about 2 – 3 meters. The surrounding mountains consists residual soil deposits that are less than 2 meters deep (Map 4).

3. Hydrology and Drainage

Since infiltration of rain water contributes to triggering of most Sri Lankan landslides, ability of a watershed or a basin to collect and discharge rain water is considered within the factor of hydrology (NBRO User Manual, 1995).

The average annual rainfall of the study area is 1500 mm to 3500 mm. The following drainage characteristics of the sub catchments of the study area (Map 5, Table 2) indicate its low to moderate potential for slope instability based on only hydrological characteristics.

Relief Amplitude

Difference between the highest and lowest points in a basin is measured and mapped giving attention to the fact that the rate at which the surface water is drained off is governed by this height difference. Table 1 indicates that about 77% of the sub catchments within the study area has relief amplitude either less than 170 m or more than 350 m and indicates the study area has medium to high capacity to quickly drain off the rain water away from the slopes.

Hydrological Map Unit Shape (Basin Shape)

The map unit or basin shape factor is defined by the ratio between basin area / (basin length)^2. Basin length is the distance between the lowest discharge point and the most distant point on the crest line. In a very long basin it takes a longer time to discharge surface water, facilitating infiltration into the slope. Therefore, the shape of a basin also governs the rate at which the surface waters discharges.

Basin ID	Relief Amplitude (m)	Basin Area (sq km)	Basin length (km)	Basin shape	Stream length (km)	Drainage density
1	400	14.60	5.295	0.52	26.41	1.81
2	160	8.99	2.124	1.99	9.07	1.01
3	220	10.36	3.961	0.66	20.87	2.01
4	190	4.70	1.221	3.15	0.00	0.00
5	360	7.32	3.433	0.62	13.11	1.79
6	120	8.38	2.926	0.98	13.43	1.60
7	130	3.39	1.804	1.04	15.82	4.67
8	450	8.33	4.009	0.52	12.16	1.46
9	1010	10.97	5.459	0.37	18.28	1.67
10	740	10.58	6.199	0.28	23.23	2.20
11	420	24.92	7.23	0.48	70.03	2.81
12	200	2.42	0.771	4.06	0.00	0.00
13	80	2.19	1.075	1.89	0.20	0.09

Table 2 Hydrological characteristics of the sub-catchments within the study area

Hydrological Map Unit Area

Since the area of the watershed basin governs the quantity of water flow, this parameter is also included in the evaluation. According to the Table 1 the sub catchments within the study area has larger basin areas and thus higher capacity to drain off rain water lowering the landslide potential of the catchments.

Drainage Density

The total length of stream channels per unit area of a basin is considered to have an impact on landslide initiation. This is defined as the drainage density, which indicates how efficiently surface water is discharged within a basin. Stream channels include man made canals as well. According to the Table 2, 92% of the sub catchments within the selected study area has a low drainage density i.e. less than 3 km/sq km and has lower the capacity of draining surface water away.

Proximity to Water Bodies

Changes in water level of any water retaining bodies such as lakes, reservoirs etc change the pore water pressure conditions in the adjoining slopes, and effect the slope's stability. Hence, the proximity of these water bodies to the considered watershed basin is also included in the evaluation. Since the study area is inclusive of a reservoir, the sub factor, proximity to water bodies, was considered as high for all sub catchments in the study area.

4. Slope Range and Category

Since gravity is the driving force of mass wasting, the steepness of a slope is directly proportional to that slope's potential for failure. Therefore, the slope angle range is considered as an important factor of the current evaluation scheme. Map 6 and the Table 3 indicates that slope within the study area are not steeper than 40^0. More than half of the study area (57.26%) belongs to a flatter terrain and majority among the rest of the slopes (38.55%) also are also not steeper than 17^0. Therefore, the potential of slopes within the study area for failure against the steepness varies from very low to medium.

Slope angle range	Land Area (sq. km)	% Area
$> 40^0$	0.00	0.00%
$31^0 - 40^0$	4.82	4.19%
$17^0 - 31^0$	27.29	23.73%
$11^0 - 31^0$	17.04	14.82%
$0^0 - 11^0$	65.85	57.26%
Total	115.00	100.00%

Table 3 Land area within different slope categories

5. Land Use

Improper land uses such as clear cutting, de-rooting, quarrying, and mining imparts a significant impact on slope failures through facilitating surface erosion and changing the internal stresses in the soil of a slope. Therefore, the contribution of land uses has been incorporated into the mapping methodology giving due consideration to how well the land use is managed or maintained.

Map 7 and the Table 4 indicate that about 63% of the land in the study area is covered by forest, 19.5% are covered by scrub. Only about 7.5% of the land is used for chena and other cultivation and only about 8% of the land is used for human settlements and home gardens. At a few locations of study area mica mines and old feldspar mines were also observed. Those statistics and observations indicate that the human intervention within this project area is very low at present. With the implementation of the Moragahakanda project even the very low settlements will be relocated away from this area and if the surrounding slopes within the studied catchment were declared as a sanctuary or a forest reservation, the slope stability potential in terms of land use will further be increased.

Land Use	Land Area sq km	% Area
Chena / other cultivation	7.50	6.52%
Forest	72.10	62.70%
Settlements / Home Garden	7.88	6.85%
Grassland	0.94	0.81%
Marsh	0.17	0.15%
Paddy	4.57	3.98%
Rock	0.67	0.58%
Scrub	19.49	16.95%
River / Streams	1.68	1.46%
Total	115.00	100.00%

Table 4 Land area utilized for different land use

A new road is being constructed to the North of the proposed reservoir as the existing Naula – Elahera road will be inundated when the reservoir is filled. Along the course of this new

road natural slope has been steepened at several locations (Photo 1). These modified slopes need to be stabilized by either reducing the near vertical gradient to a less steep slope angle wherever possible or by application of a suitable retaining structure. Otherwise, those steep cut slopes will eventually fail when they are left exposed to weathering.

6. Landform

Geomorphology or the shapes of slopes also affect the slopes' stability. A straight or complex slope with higher relief is more susceptible to failure than a terraced slope. A rough or broken rocky slope with gullies is more vulnerable to failure than an undulating to rolling slope. Observations on landforms also contribute to understanding of the slope's geological evolution.

Landform	Land Area (sq km)	% Area
Complex and dissected hills	36.71	31.93%
Complex and dissected mountain slope	23.31	20.27%
Isolated hillocks	3.16	2.75%
Undulating plane	51.81	45.05%
	115.00	100.00%

Table 5 Land area belongs to different Geo morphological features

According to the Table 5 and the Map 8 about half of the study area is an undulating plane. The rest of the land belongs to complex and dissected hilly mountains. Hillocks and undulating planes contribute less towards slope failures whereas Complex and dissected hilly mountains has medium contribution.

7. Past landslides:

No past landslides or any form of unstable features other than surface erosion on modified slopes along the side of the road around Opalgala area were observed within the study area during the time of investigation. The area was especially concerned for the possibility of subsidence. However no visible signs of subsidence such as cracked walls and floors of houses, sink holes and depressed ground surfaces were found within the project area.

8. Evaluated Landslide Hazard Potential

The landslide hazard zonation map prepared by evaluating the contributory factors is shown in Map 9. A larger scale map of the same is provided along with this report and a digital 1: 10,000 scale map of landslide hazard zones is also provided as major outputs of this study.

Hazard Class	Hazard Potential	Land Area (sq km)	% Area
Landslides not likely to occur	Safe area	64.43	56.03%
Landslides can be expected	Low Hazard	49.93	43.42%
Modest level of landslide hazard	Medium Hazard	0.64	0.56%
Total		115.00	100.00%

Table 6 Land area with different landslide hazard potential

According to the Table 6, about 56% of the project area is safe from landslides and about 43% of the project area, which also happens to be where most of the project components are located, consist low hazard potential. Most part of this area will be inundated when the reservoir is filled. The guidelines for development for each landslide hazard zone are listed on page 17 of this report.

Map 9 indicates that there are two significant regions with medium landslide potential. One region (Region I in Map 9) is located along the perimeter of the reservoir in Kambarawa area and the second Region (Region II) is located between Helambagaha watta and Medapihilla, about 350 m to the Northeast of the new road to be constructed.

The Region I is evaluated to be medium landslide potential mainly due to its Geology, undifferentiated Charnockitic gneiss (Map 3), and the present land use type, "Chena and other plantation" (Map 7), the factors which individually assign this region high ratings for landslide potential within NBRO's methodology. The same region was rated as medium landslide potential against its slope angle range of 17^0 to 31^0, the thickness of the residual soil layer which is 2 – 3 m (Map 4) and the hydrological characteristics of the enclosing sub catchment No. 11 (Map 5). The land form, "undulating to rolling plateau", of Region I indicates low landslide potential.

There is a possibility that these slopes to fail with the filling of the reservoir as the pore water pressure among the submerged soil particles will be increased. Depending on the location of Region I, the failure of these slopes does not show a significant impact on the performance of the reservoir. In addition, with the implementation of this project and the relocation of human settlements within the project area, the present land use type is going to be changed and the landslide potential based on the land use type will be reduced from high to low and the possibility of failure may be compensated. The situation can be further mitigated by planting tree species with broad leaves and deep roots within this region as the broad leaf type trees absorbs water and the deep roots act as a natural reinforcement which binds soil particles together.

The Region II is also located in an area underlain by undifferentiated Charnockitic gneiss (Map 3) and therefore is rated as high landslide potential based only on bedrock lithology. In addition, its land form, "complex and dissected hill", its slope angle range of 17^0 to 31^0 (Map 6), the thickness of the residual soil layer which is 2 – 3 m (Map 4) and the hydrological characteristics of the enclosing sub catchment No. 03 (Map 5) assigns this region a medium rating of landslide potential. The land use type of Region II,"forest", indicates low landslide potential. The overall impact of all six contributory factors has evaluated to be medium for the Region II also.

The fact that this Region II is located on either side of a valley close to the newly constructed road shows that failure of this slope may have an impact on the road and its traffic. Therefore, this region also should be protected by planting tree species with broad leaves and deep roots. In addition all the slope cuts that are higher than 1.5 m along the indicated stretch of the road should be supported by a suitable type of retaining structure.

9. Impact of Rain Fall on Slope Instability

The average annual rainfall of the study area is 1500 mm to 3500 mm. Moderate showers of long duration are more dangerous than high intensity showers of short duration because a shower of long duration provides sufficient time for the rainwater to infiltrate to the critical depth in a given slope. Rainfall intensities that are less than the coefficient of permeability of the soil may not saturate the soil below the root zone. Rainfall intensities that are significantly higher than the coefficient of permeability of the soil may also not penetrate through the soil within a given duration due to the runoff.

Evaluation of changing effective stress conditions due to pore water pressure variations is rather a complex problem, especially if they are addressed within the impacts of slope's vegetation and the nature of the sub-soil. Based on the current perception rainfall intensity is considered as an external factor, which is presumed to be more or less uniform within a area of this extent.

10. Water tightness of the dams and reservoir area:

Water tightness of the dam and reservoir area must be considered in view of the following factors.

- Presence of solution cavities in marble, their extent and the degree of interconnection
- Joints, faults, fractures and other such week zones in the hard rock
- Presence of permeable superficial weathering products, depth and character of weathering profile

Solution Cavities in Marble:

The base and the lower half of the left bank of saddle dam No.1 and the left abutment of the saddle dam No. 2 are underlain by Marble. A few bands of marble underlay the reservoir bed and some ridges within the project area. The strike of the marble bands at the dam site tend along a direction that is slightly perpendicular to oblique to the dam axis whereas they lie parallel within the rest of the project area (Map 3). The distances between parallel marble bands observed within the project area are significantly high.

A few karstic features were also present on the surface of observed marble bands. These features appear to be shallow with limited lateral extent. They appear mostly as surface pot holes rather than outlet or inlet of an interconnected deep solution canal system.

An elongated dry cavity about 2 – 2.5 m long, 1 – 1.5 m deep and 30 cm wide was observed at the ground level on an rock outcrop which is located about 300 m down stream of the saddle dam No. 2 (Photo 2) Since the bottom of this cavity is filled with rock debris and soil (Photo 3), its downward continuation could not be estimated. According to the field observations, the cavity appears to be developed along a tight joint plane parallel to the

strike. The oval shape wall of the cavity consists of fresh rock and there are no visible signs of weathering.

NBRO studies on the geo-hazards observed in Matale area, especially along Sudu Ganga, marble beds are associated with a shear zone. Underground solution caverns are rich in this area. Especially from Ukuwela to Nagolla, Bowathenna ground subsidence and sink holes have been observed. With the fluctuation of groundwater levels such phenomenon can be expected. However, within the study area no evidence was found on potential subsidence or sink holes.

Conclusion:

Detailed geological study with respect to the land stability of Moragahakanda agricultural development project indicates that most of the project area has very low landslide potential. No visible signs of any slope failures, such as past landslides of any form except surface erosion on modified slopes along the side of the road around Opalgala area were observed. Signs of subsidence such as cracked walls and floors of the houses, sink holes, and depressed ground surfaces were also not found within the project area during the field investigations.

The analysis of the overall contribution of six causative factors i.e. Geology, Surface deposits, Slope angle range, Hydrology, Land use and Land forms towards causing slope instability was evaluated to be low for most of the project area except for the two regions with medium landslide potential as demarcated as Region I and Region II in the landslide hazard zonation map (Map 9). The medium landslide potential of these two regions can be mitigated by planting tree species with broad leaves and deep roots, and supporting all the slope cuts that are higher than 1.5 m along the indicated stretch of the road with a suitable type of retaining structure.

Care must be taken to protect all the man made steep slopes on the sides along the roads within the project area and any other such steep slopes resulting from left over burrow areas or quarry sites. If those modified steep slopes left exposed to weathering, they are susceptible for failure in the long run.

With the implementation of the Moragahakanda project, if the slopes surrounding the reservoir can be declared as a sanctuary or a forest reservation, the slope stability of the project area will further be increased.

A few karstic features were also present on the surface of observed marble bands. These features appear to be shallow with limited lateral extent. They appear mostly as surface pot holes rather than outlet or inlet of an interconnected deep solution canal system. However, with the filling of reservoir and the increased water pressure, the extent of these cavities could be increased and the leakages may be expected. Therefore, close observations are necessary during the maintenance stage of the project.

Recommendation:

- Region I and Region II as demarcated in the landslide hazard zonation map should be protected by planting a tree species with broad leaves and deep roots.
- All the slope cuts higher than 1.5 m along the stretch of the road shown on the landslide hazard zonation map should be supported by a suitable retaining structure.
- Any other slope modifications that are higher than 1.5 m should be protected with suitable mitigatory methods such as reducing the slope gradient, soil nailing, retaining walls etc based on the conditions specific to the location.
- Any of the earth exposure due to the construction and development work should be covered with suitable material to prevent erosion.
- As the Marble bands cross the dam axis, the foundation of the dam should be grouted to prevent any seepage.
- If the solution cavities found or identify during the construction work, those should be grouted to prevent any further expansion.
- When the reservoir is filled, the periphery of the reservoir should be kept as development or construction free area.
- Slopes surrounding the project area should be declared as a sanctuary or a forest reservation to maintain the slope stability potential
- Implementation of the mitigatory activities listed in the Comprehensive watershed Protection Management Plan and Mitigatory plan is also recommended to maintain the slope stability of the project area.

GUIDELINES FOR DEVELOPMENT FOR EACH HAZARD ZONE DISPLAYED IN THE LANDSLIDE HAZARD ZONATION MAP OF THE MORAGAHAKANDA PROJECT AREA

LANDSLIDE HAZARD POTENTIAL	ZONAL SIGNIFICANCE AND GUIDELINES FOR DEVELOPMENT
Modest level of landslide hazard exists	Moderate levels of landslide danger exists. New construction should be discouraged, and improved land use planning practices should be introduced to halt and reverse the process of slope degradation. All essential construction and remediation, and new projects be subjected to landslide hazard assessment.
Landslides can be expected	Slight danger of landslides exists. Engineered and regulated new construction and well planned cultivation are permitted. Plans for construction should be technically vetted and ceritified.
Landslides not likely to occur	No visible signs of slope instability or danger exist based on present state of knowledge. No blanket limitations need to be imposed particularly on well managed lands and engineered construction. Location specific limitations may become necessary, particularly for areas prone to flooding and erosion.

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Team members:	H.M.L. Indrathilake	- Engineering Geologist
	M.G.M.P AMarathunge	- Geologist
	M.R.N.C. Weerasinghe	- Geologist
	L.R.N.M. Rathnayake	- Geologist
	C.S. Menikpura	- Geologist / GIS specialist
	K.A.D.J Perera	- Data Entry Operator

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R.M.S. Bandara
Head, Landslide Studies and Services Division

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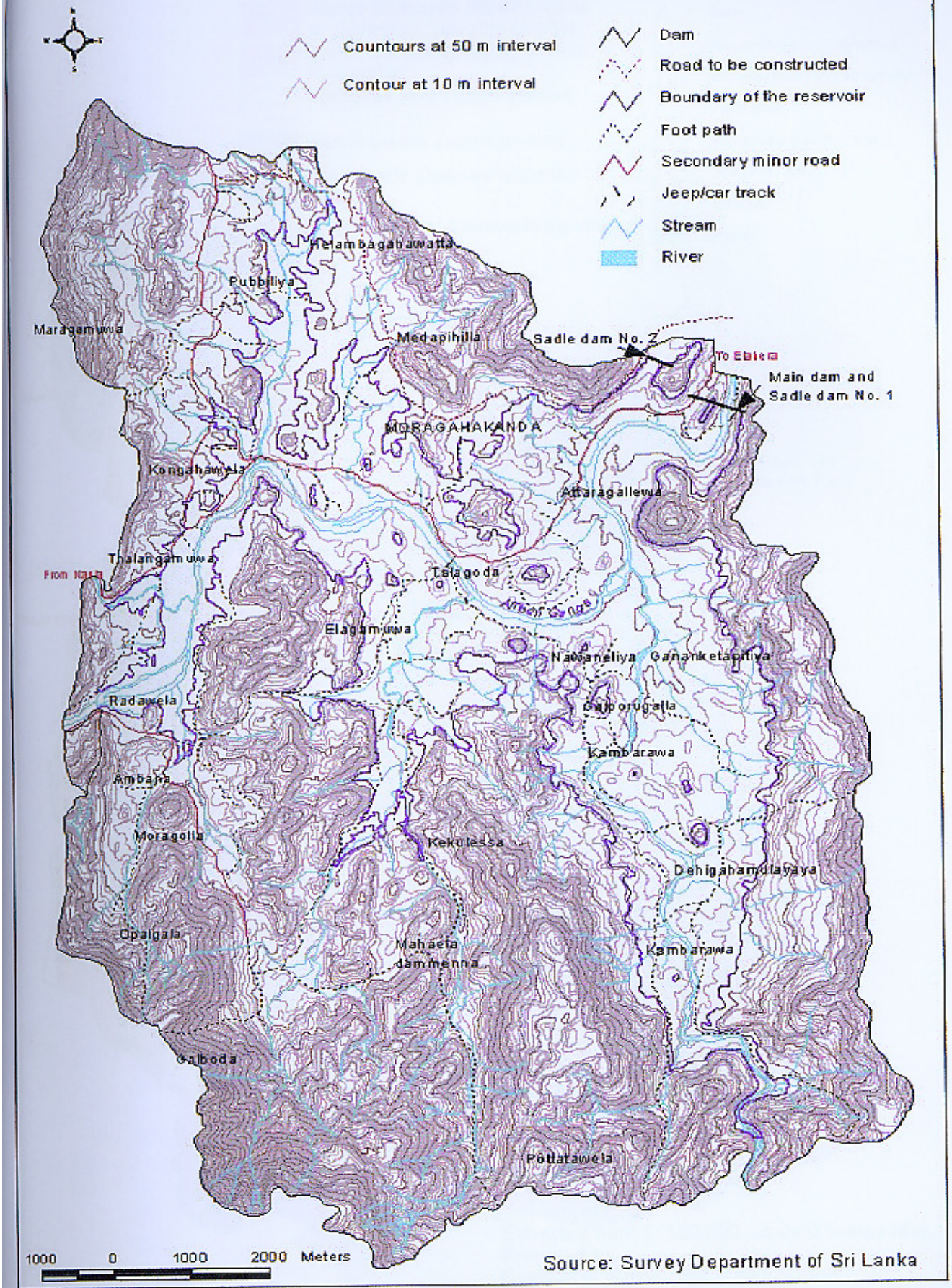
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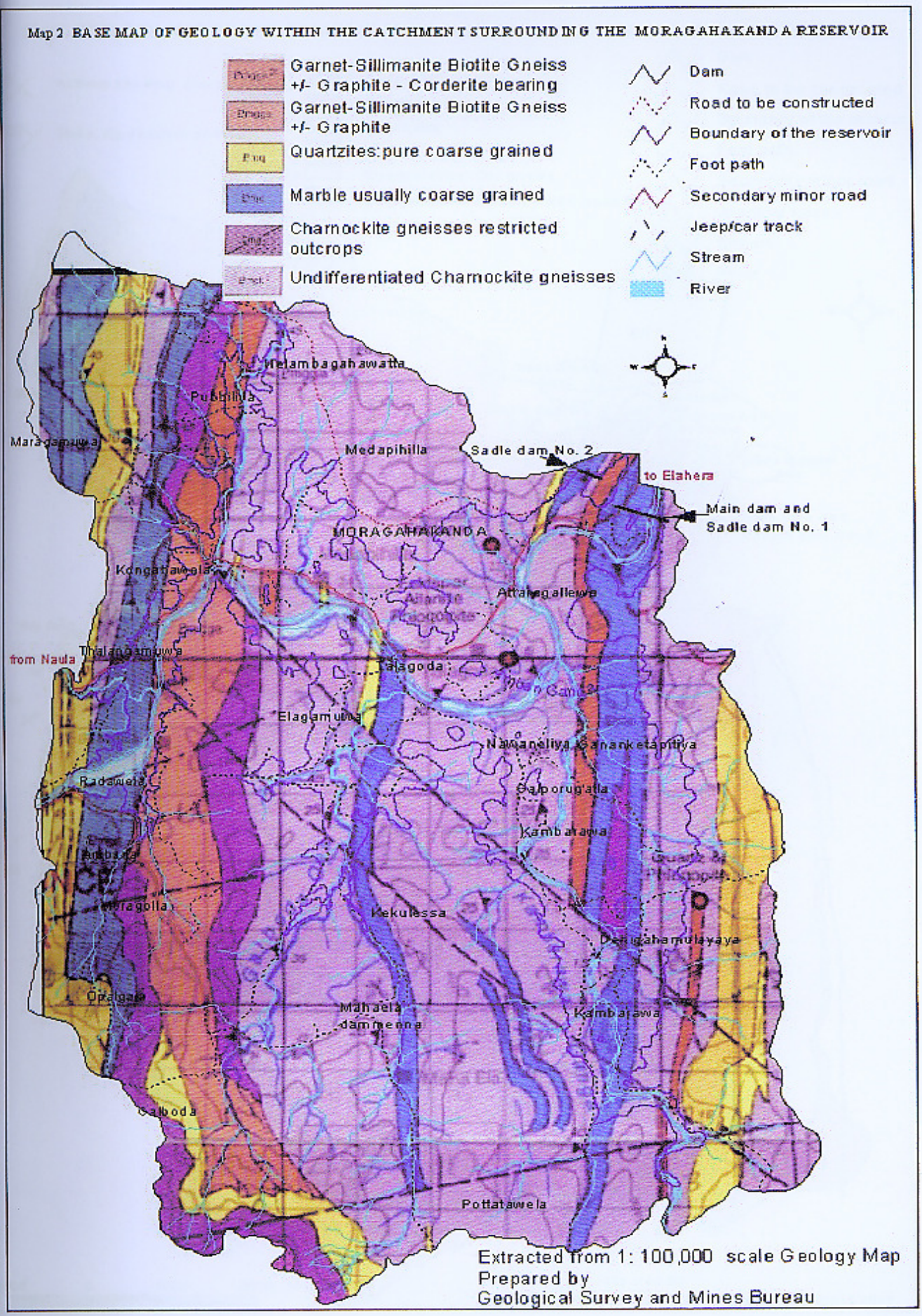
APPENDIX A

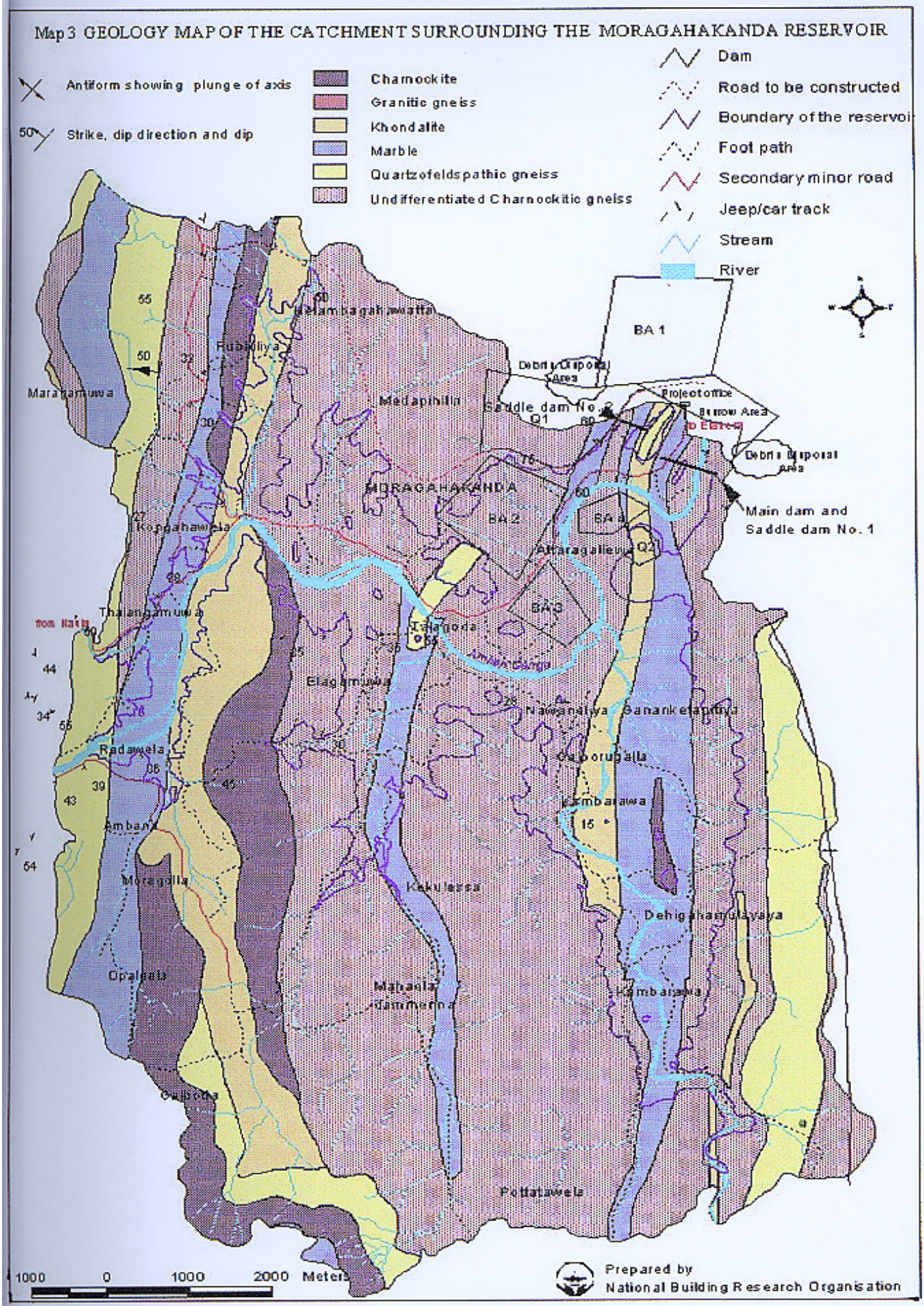
Maps

Map 1 TOPOGRAPHICAL MAP OF THE CATCHMENT SURROUNDING THE MORAGAHAKANDA RESERVOIR

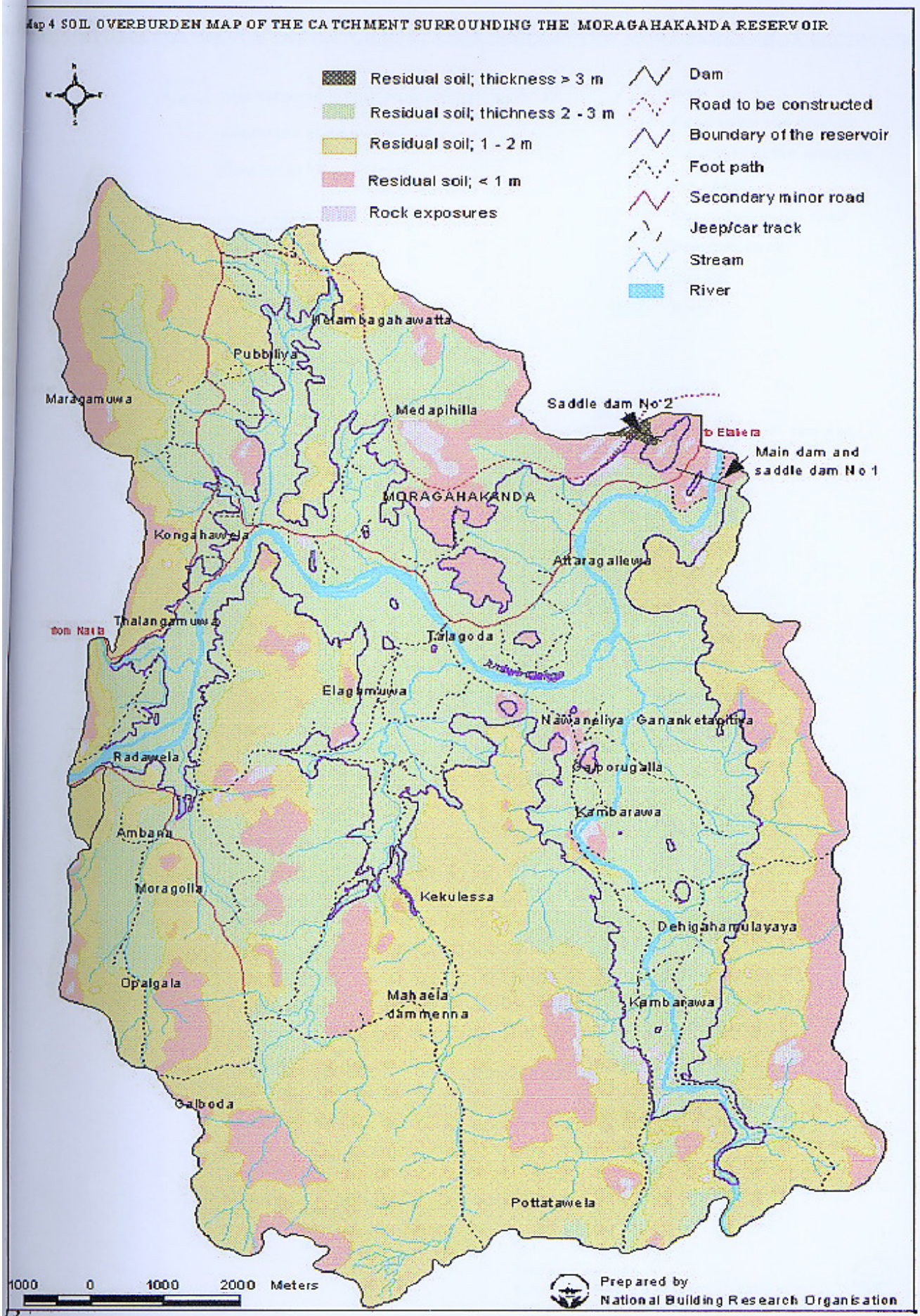


Map 2 BASE MAP OF GEOLOGY WITHIN THE CATCHMENT SURROUNDING THE MORAGAHAKANDA RESERVOIR

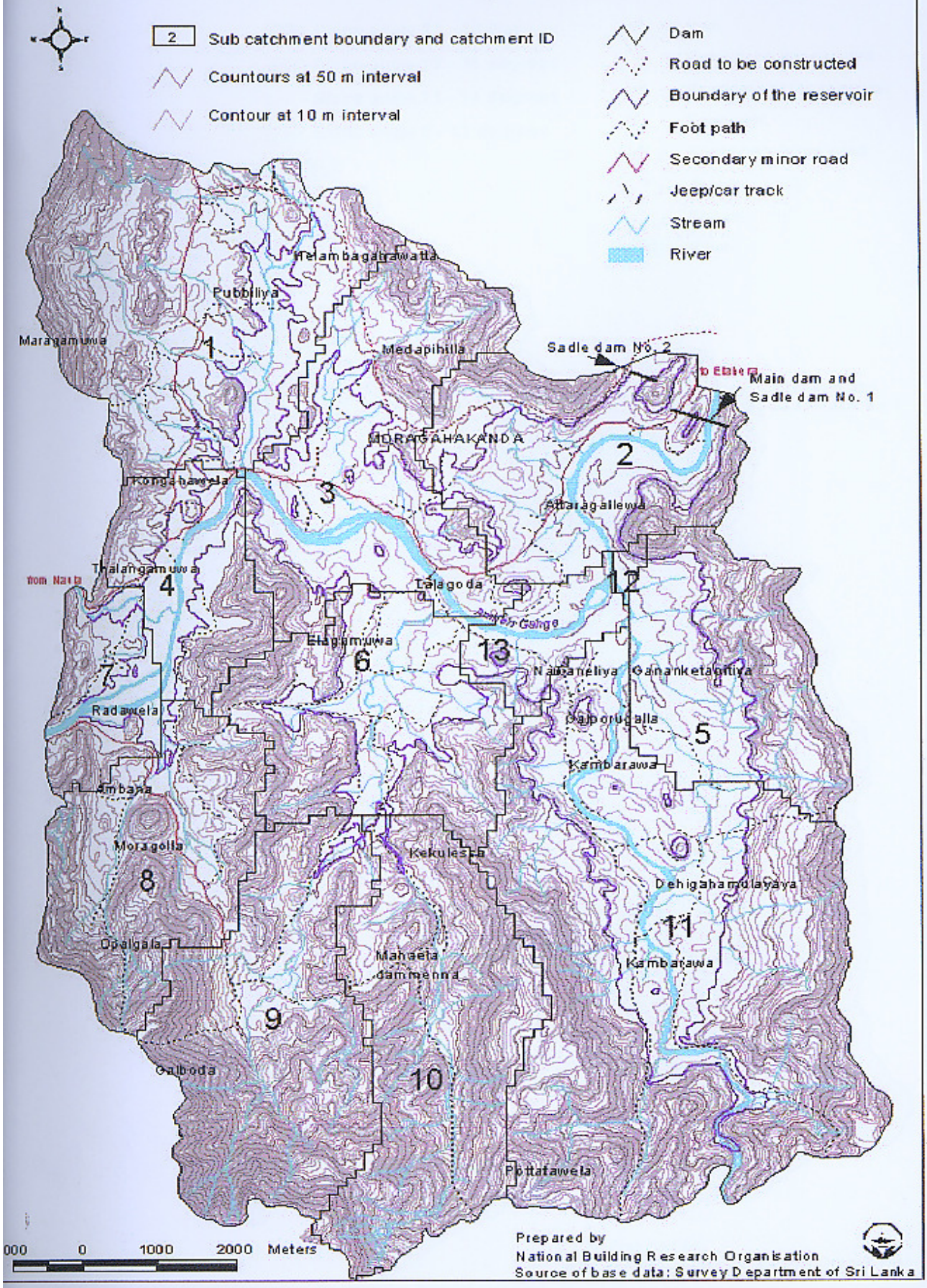



Map 3 GEOLOGY MAP OF THE CATCHMENT SURROUNDING THE MORAGAHAKANDA RESERVOIR
Antiform showing plunge of axis
Strike, dip direction and dip
Charnockite
Granitic gneiss
Khondalite
Marble
Quartzofeldspathic gneiss
Undifferentiated Charnockitic gneiss
Dam
Road to be constructed
Boundary of the reservoi
Foot path
Secondary minor road
Jeep/car track
Stream
River
BA 1
BA 2
BA 3
BA 4
MORAGAHAKANDA
Saddle dam No. 2
Main dam and
Saddle dam No. 1
Debris Disposal Area
Project office
Borrow Area
Medapihilla
Maragamuwa
Koppahawela
Thalangamuwa
Talagoda
Elagamuwa
Nawanaliya
Ganaketapitiya
Radawela
Ambana
Moragalla
Kekulawa
Opalgala
Pottatawela
Kumbaratawa
Dehigahamulayaya
1000 0 1000 2000 Meters
Prepared by
National Building Research Organisation

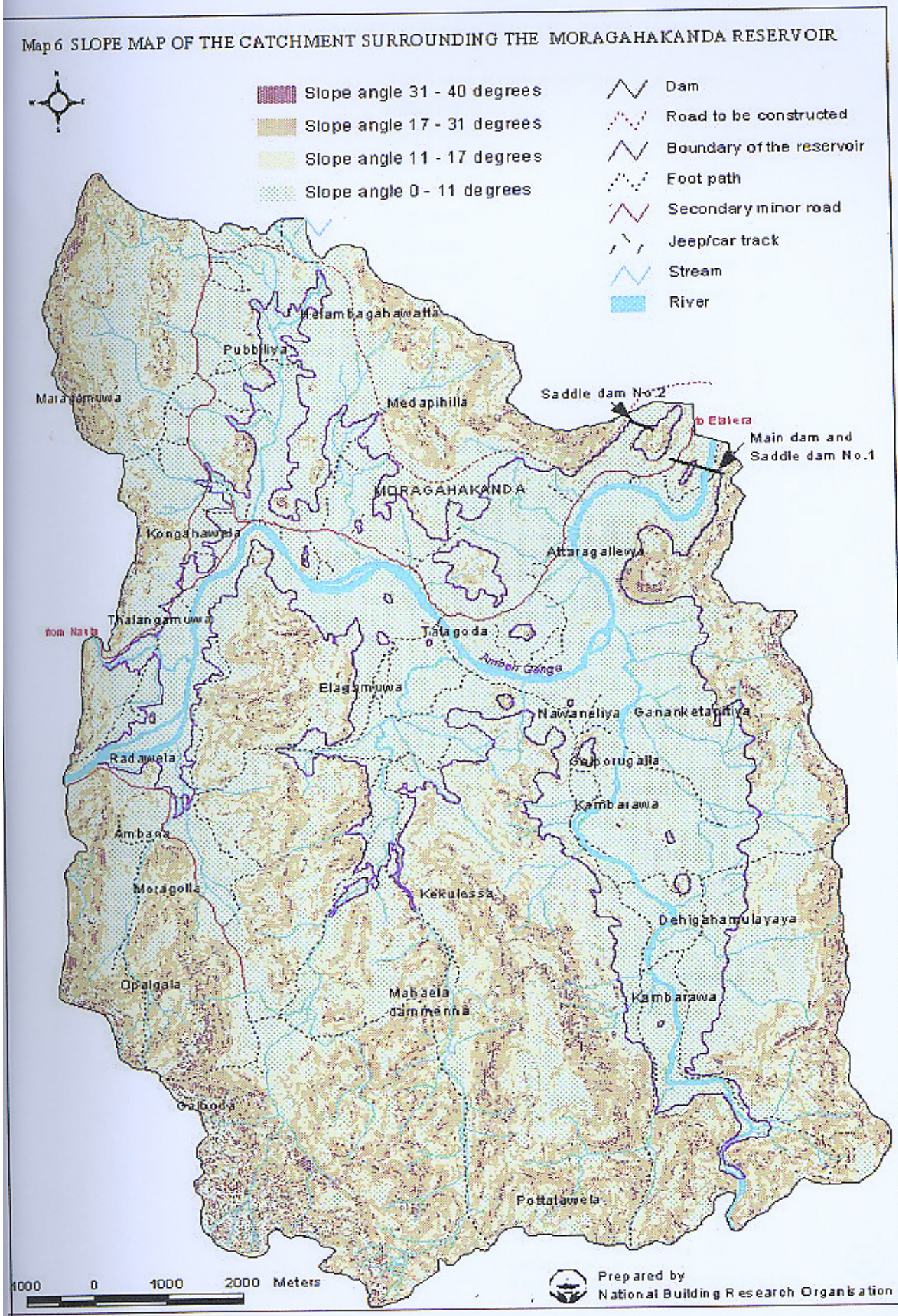
Map 4 SOIL OVERBURDEN MAP OF THE CATCHMENT SURROUNDING THE MORAGAHAKANDA RESERVOIR



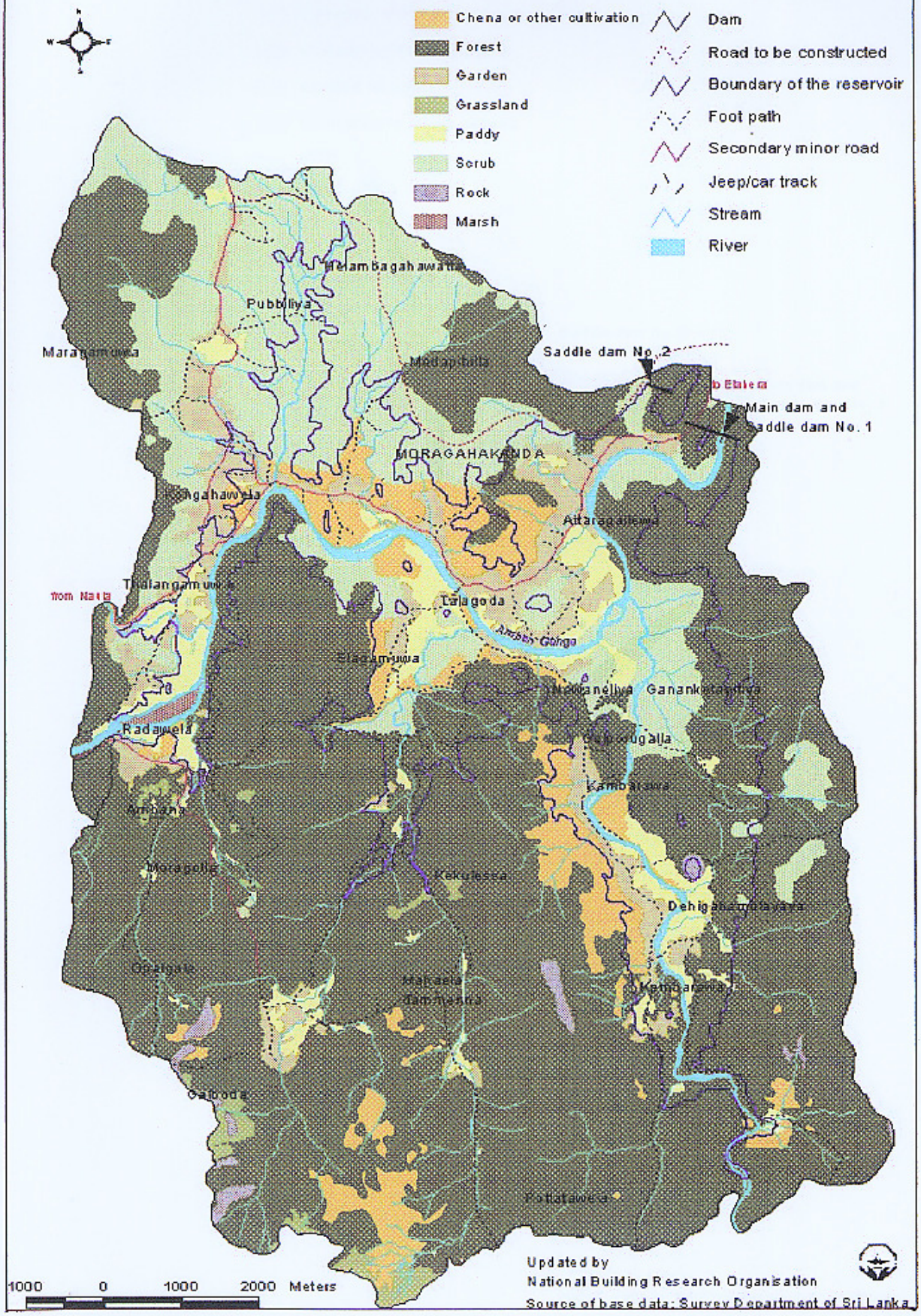
Map 5 HYDROLOGY MAP OF THE CATCHMENT SURROUNDING THE MORAGAHAKANDA RESERVOIR



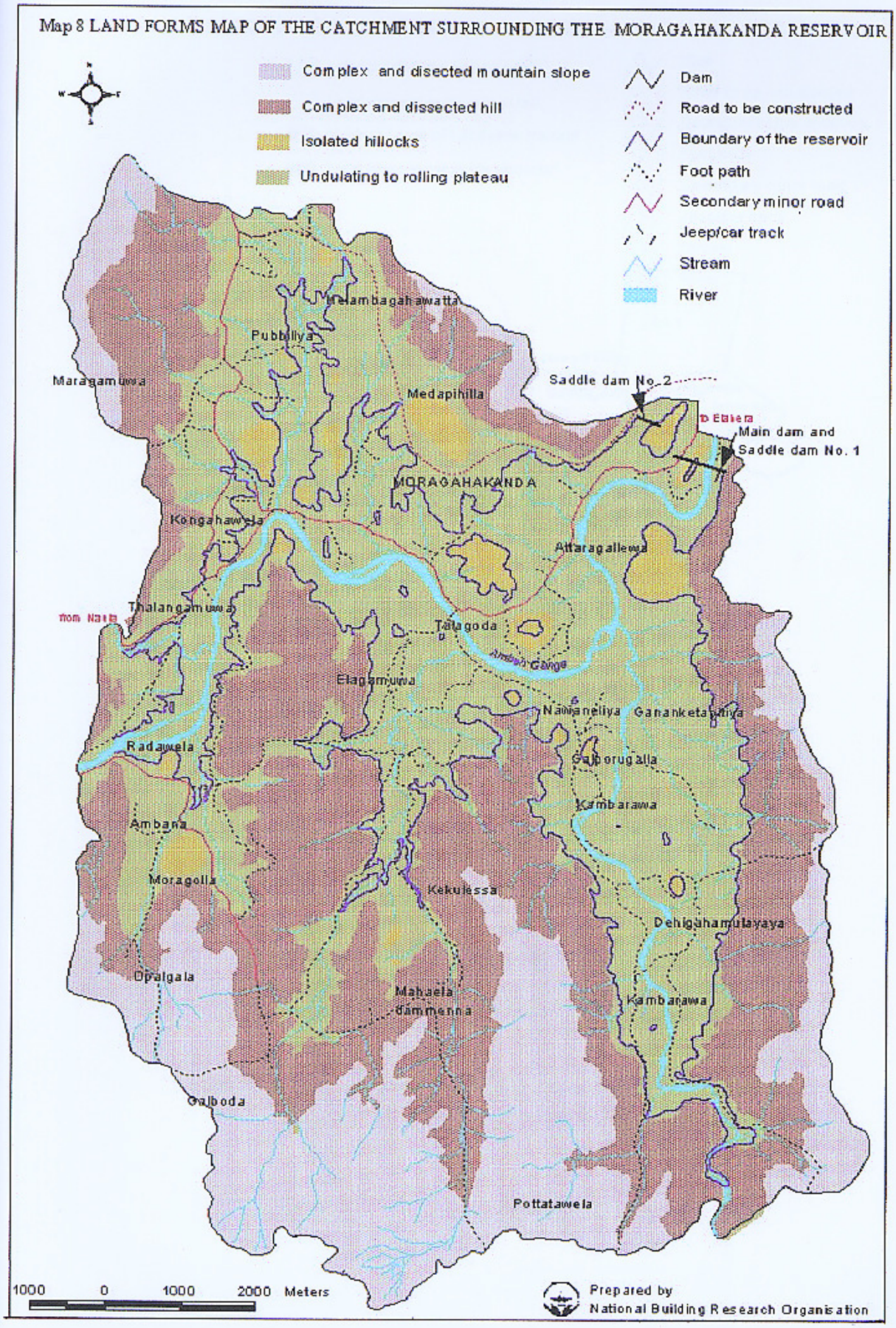
Map 6 SLOPE MAP OF THE CATCHMENT SURROUNDING THE MORAGAHAKANDA RESERVOIR

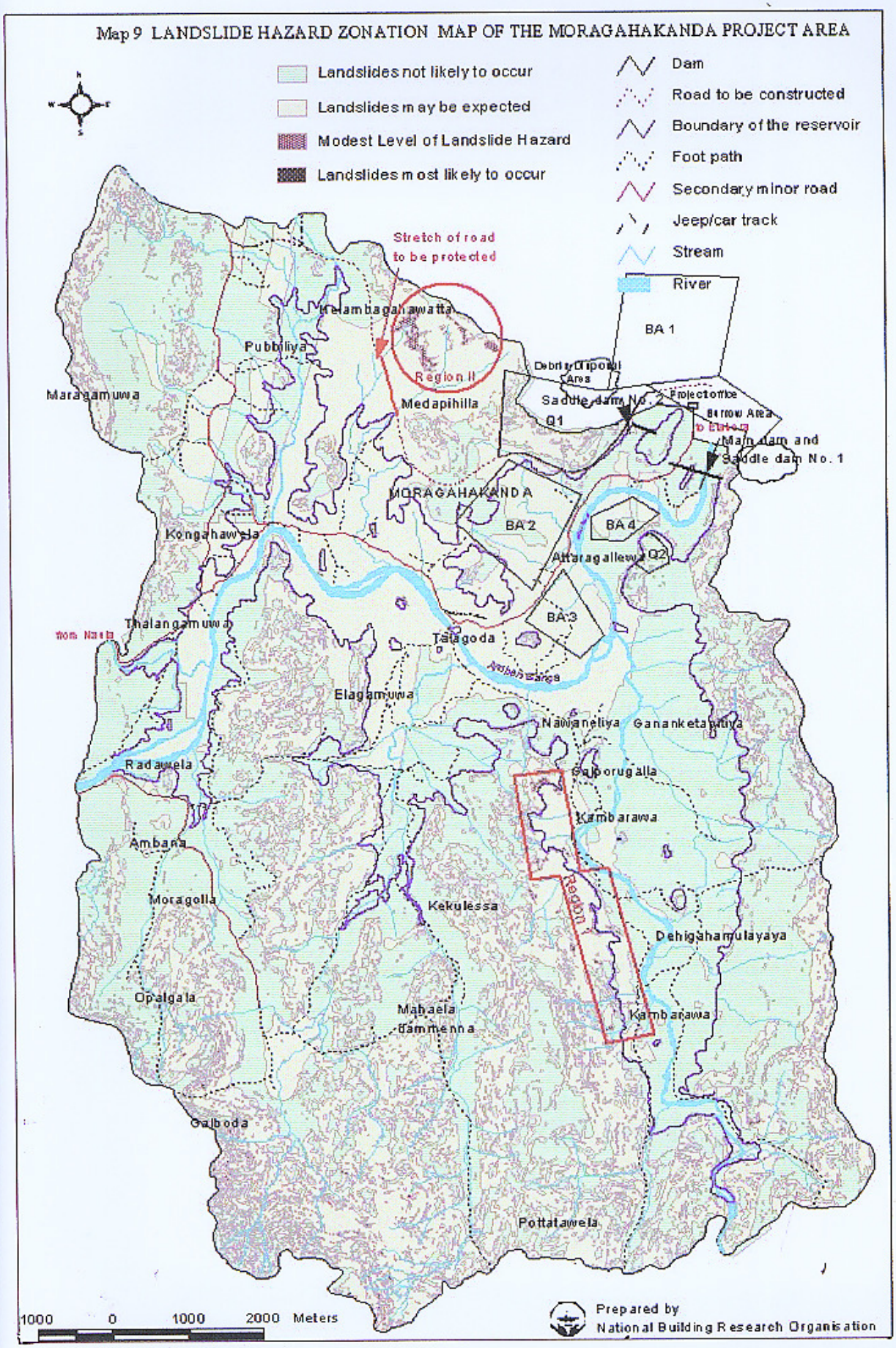


Map 7 LAND USE MAP OF THE CATCHMENT SURROUNDING THE MORAGAHAKANDA RESERVOIR

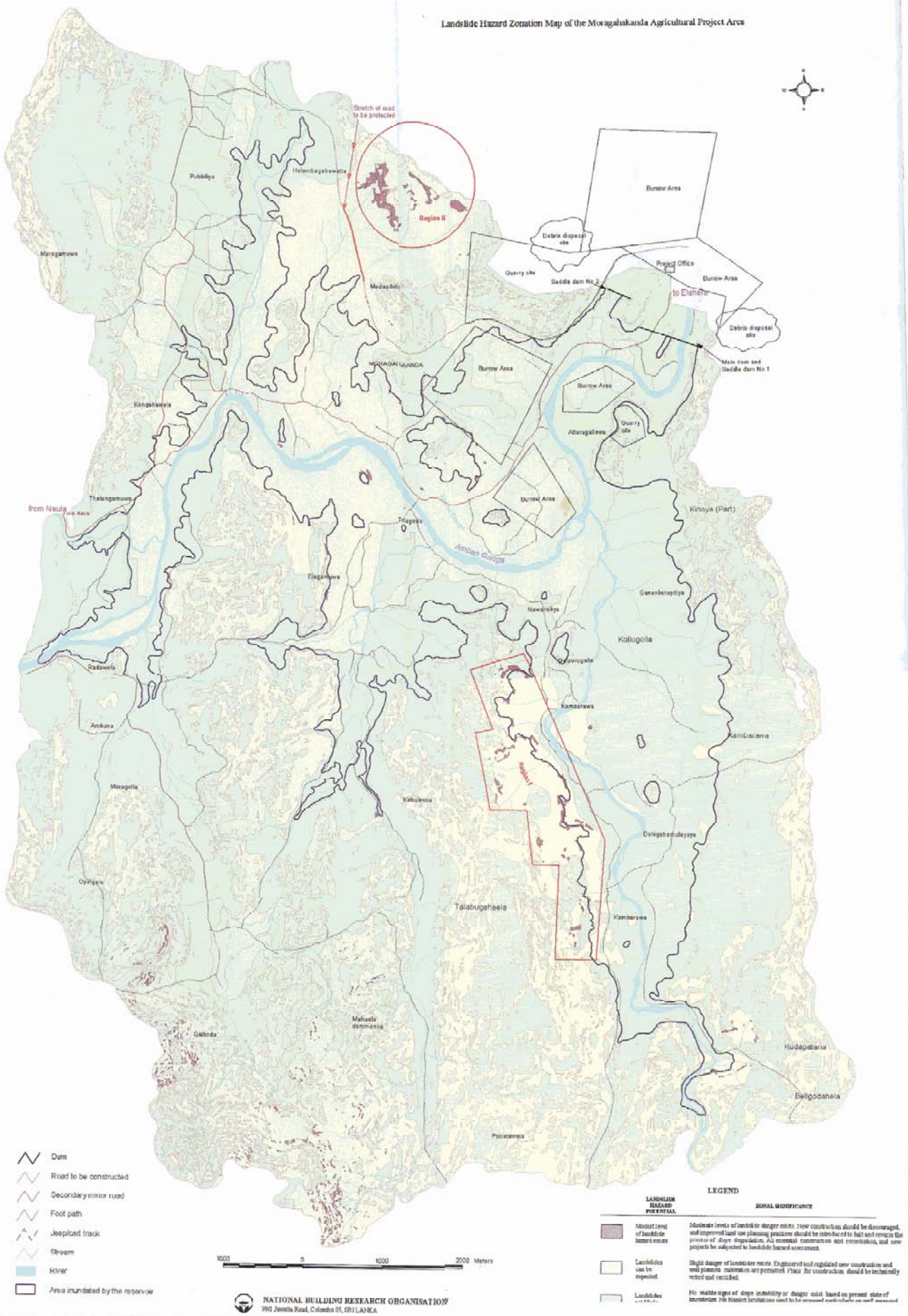


Map 8 LAND FORMS MAP OF THE CATCHMENT SURROUNDING THE MORAGAHAKANDA RESERVOIR




Map 9 LANDSLIDE HAZARD ZONATION MAP OF THE MORAGAHAKANDA PROJECT AREA
Landslides not likely to occur
Landslides may be expected
Modest Level of Landslide Hazard
Landslides most likely to occur
Dam
Road to be constructed
Boundary of the reservoir
Foot path
Secondary minor road
Jeep/car track
Stream
River
Stretch of road to be protected
Region II
Region I
BA 1
BA 2
BA 3
BA 4
Q1
Q2
MORAGAHAKANDA
Debris Disposal Area
Saddle dam No. 2
Main dam and Saddle dam No. 1
Borrow Area
Medapihilla
Kongahawela
Attaragallewa
Thalangamuwa
Talagoda
Elagamuwa
Nawaneliya
Ganaketapitiya
Radawela
Galporugalla
Kambarawa
Ambana
Moragolla
Kekulessa
Dehigahamulayaya
Opalgala
Mahaela
Dammenna
Galboda
Pottatawela
1000 0 1000 2000 Meters
Prepared by
National Building Research Organisation

Landslide Hazard Zonation Map of the Moragahakanda Agricultural Project Area



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APPENDIX B

Photographs



Photo 1 Modified steep slopes along the sides of the newly built road



Photo 2 Elongated dry cavity found on a Marble outcrop



Photo 3 Bottom of the cavity is filled with rock debris and soil

APPENDIX C

References

1:10,000 scale, topographic map sheets. Source: Survey Department of Sri Lanka

1:100,000 scale geology map. Source: Geological Survey and Mines Bureau

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Manual of Landslide Hazard Zonation Mapping, SLR/89/001, National Building Research Organisation, April 1995

Map indicating locations of the project components, Source: Mahaweli Authority of Sri Lanka

Moragahakanda Agricultural Development Plan

Chapter-1

Introduction

The Mahaweli Project was planned to develop 360,000 hectares of land in the dry zone of the North Central and North East of Sri Lanka for Iirrigated Agriculture. The expected project benefits were ; increase food production for import substitution and export , employment generation and power generation for industrial expansion. Under the Accelerated Mahaweli Development Programme started in 1979, four major reservoirs ie., Kotmale, Victoria, Randenigala and Rantambe were built .All these four reservoirs have priority for electricity generation and the purpose of Moragahakanda Reservoir is mainly to increase the agricultural productivity in the existing irrigation schemes –Systems H, I/H, M/H, D1, D2 , G and Huruluwewa feeder canal.

System H

With a total of 51,000 hectares of irrigable land and it is also by far the largest area of Mahaweli systems. Kalawewa and Kandalama , new Dambulu-Oya and Rajangana reservoirs are the storages for the diverted and own catchments yields of water in this system. However, entire area of irrigable land is cultivated in Maha season and only 40 % of the total extent is cultivated in yala season due to inadequate water supply. Further because of the uncertainty of the water in yala season farmers do not like to take a risk and grow high value crops.

System I/H

Lands cultivated under the ancient reservoirs Nachchaduwa, Nuwarawewa, Tissawewa and Basawakkulama comprise System I/H These tanks receive Mahaweli water from Kalawewa in System H. The total irrigable area is 4,100 hectares with a cropping intensity of 164 percent. Farmers concentrate almost entirely on growing paddy in both yala and maha seasons and there is little interest in OFC production.

System M/H

The area grown under the Huruluwewa comprises System M/H. It has an irrigable area of 4,300ha with a cropping intensity of 119 percent at present

System D1

System D1 includes an area of 23100 hectares cultivated under the reservoirs of Giritale, Minneriya, Kaudulla and Kantale.

System D2

Parakrama Samudra feeds an area of 10100 hectares with irrigation water diverted from Amban Ganga at Angamedilla..Having a cropping intensity of 200 percent it is unlikely to benefit much from the Moragahakanda Project

System G

The system G covers an extent of 5,400 hectares of irrigable land. The entire area under System G gets its water from the Elahera Minneriya Yoda Ela through several outlets in its route from Elahera to its terminal at Diyabeduma.

Huruluwea Feeder canal

This is a strip of land along the feeder canal carrying Mahaweli water from the Bowatenna tunnel outlet at Lenadora to Huruluwewa. Although farmers did not have an authority to get water from this canal, they used to tap water from it at their disposal. Later considering the contribution to the national agricultural production Mahaweli Authority has allowed them to irrigate these farms with Mahaweli water. The total extent of the irrigable land in the area is 3027 hectares.

(Pl. refer Map Fig. 1)

Chapter -2

2. AGRICULTURAL PRODUCTION PLAN

2.1 Basic concepts of agricultural development

The basic concepts adopted for effective development of irrigated agriculture in above Mahaweli Systems are

i. to exploit the most effective use of the water considering the required irrigation water distribution

ii. to maximize the irrigation area with available water and to increase cropping intensities

iii. .to increase the farmer income through well planned cropping patterns

2.2 The aspects considered in recommending crops and cropping pattern models are ;

- rain fall and its distribution
- Soil types and soil nutrient status
- net return to labour and capital
- price fluctuation of crop produce
- farmer preference etc.

2.2.1 Rainfall

The entire area comes under Low Country Dry Zone (DL1) agro ecological Zone. The rainfall distribution is bimodal with an average annual rainfall of 1600 mm. The months October , November , December and January receive rainfalls above 200 mm .

2.2.2 Soil types

Great soil groups recognized in the area are Reddish Brown Earths , Low Humic Gley soils and Alluvial soils.

Reddish Brown Earths

About 60 % of the system H and G area is occupied by this soil .These soils are extremely hard when dry, friable to firm when moist and sticky when wet. The soil porosity is about 30-40 % Infiltration rates after one hour can be as high as 25 mm /hour for shallow gravelly soils and 5 to 15 mm for deeper soils. The surface soil texture varies from sandy loam to sandy clay .Most commonly a subsoil horizon with a high proportion of quartz gravel is presenting cultivation of field crops the effective soil depth is determined by this gravel layer.

Low Humic Gley soils

The dominant factor that governs the expression of these soils is the periodically high ground water level. This may be true ground water or a water table that develops on an impermeable stratum during the rainy season. The colour of the surface soil of LHG is dark grayish brown to dark brown and in the sub soil it is grayish to yellowish brown with distinct mottles and gleying. The normal profile consists of a sandy loam to sandy clay loam surface horizon underlain by a sandy clay to clay subsoil horizon. These soils are extremely hard when dry and sticky when wet. The porosity and inflation rates of these soils are low. Due to long years of puddling the LHG soils for paddy cultivation there has been adverse impact on the physical properties of these soils.

Alluvial soils

Alluvial soils occur in narrow strips along natural waterways. The distinct feature of these soils is the presence of soil layers which are related to different depositional histories and not soil forming process. The texture and drainage conditions of these soils are highly variable. Some alluvial soils are moderately well drained and coarse or medium textured, while those associated with depressions and low lying areas are poorly drained grayish , fine to medium textured soils.

2.2.3 Labour

Availability of hired Labour is a major criteria in determining the type of crop grown by the farmers. Because of high cost involved for hiring labour farmers prefer to grow low or moderate labour demanding crops

Low labour demanding crops	-	Rice, Maize
Moderate labour demanding crops	-	Sweet potato, long bean cucumber
High labour demanding crops	-	Papaw, Banana, Chilli, Okra, Thibbatu.

However high labour demanding crops give higher return for the investment

Capital

As the prime objective of the agricultural development is to get higher income for the farmers crops having high return for the investment are always promoted.

High net return (>100,000 Rs/ha) - Papaw, Banana, Thibbatu

Moderate net return(50,000 Rs/ha) - Chilli, Okra, B onion

Low net return Pumpkin, long bean, brinjal

Very low net return -Cucumber, rice, maize.

Crops can be economically ranked according to the three economic factors mentioned above (return to labour, net return and return to capital).However labour demanding level cannot be considered in ranking because it does not reflect directly the crop economy.

Crop	Rating value			
	Return to labour	Net return	Return to capital	Total
Rice	1	1	1	3
B onion	3	3	2	3
Chilli	2	3	2	8
Maize	1	1	1	3
Brinjal	1	2	1	4
Long bean	2	2	2	6
Sweet potato	2	2	3	7
Pumpkin	2	2	2	6
Cucumber	1	1	1	1
Luffa	3	0	3	6
Okra	1	3	2	6
Thibbatu	3	4	3	10
Banana	3	4	3	10
Papaw	3	4	3	10

Papaw , banana and thibbatu are the most economical crops considered in above analysis B'onion , chilli , sweet potato , long beans pumpkin luffa and okra are second economically high value crops while others have a low economic value.

2.2.4 Price fluctuation of crops

A particular farming situation requires suitable crops to cultivate during most appropriate times in order to receive a high price for the produce. Months of achieving highest prices at Economic trade Center Dambulla are given below

Months with highest price	Crops
January	Sweet potato
June	Long bean, sweet potato, brinjal , cucumber, okra, luffa, snake gourd, bitter gourd, tomato, knoll kohl, beet, radish ,cabbage, beans
July	Pumpkin, capsicum
November	Long bean, cucumber, luffa, okra, bitter gourd, snake gourd, cabbage
December	Brinjal, capsicum, tomato, knoll kohl, beet, radish, beans.

2.2.5 Farmer preference

Farmers prefer some crops due to various reasons such as knowledge on the crop cultivation, soil condition, available resources , market price, less risk of pest and disease incidence, availability of seeds etc.

2.3 Proposed cropping patterns

In all Mahaweli Systems paddy is the dominant crop in both yala and Maha Seasons. Other crops cultivation is possible mainly in yala season and System H and G have the highest potential for it.

Cropping Pattern for Mahaweli System H
Cropping Intensity = 2

Maha Crop	Yala Crop	J	F	M	A	M	J	J	A	S	O	N	D
Paddy	Paddy												
Paddy	Vegetables												
Paddy	Soya/ Other pulses												
Paddy	B'onion												
Paddy	Chillie												
Paddy	Maize												
Vegetable	B'onion												
Vegetable	Soya/ Other pulses												
Vegetable	Maize												
Soya/ other pulses	Chillie												
Soya/ other pulses	B'onion												
Maize	Chillie/ B'onion												
Maize	Vegetables												
Banana	continuation												
Papaw	continuation												

Cropping Pattern for Mahaweli System G
Cropping Intensity = 2

Maha Crop	Yala Crop	J	F	M	A	M	J	J	A	S	O	N	D
Paddy	Paddy												
Paddy	Vegetables												
Paddy	Ground nut/ Other pulses												
Paddy	B'onion												
Paddy	Chillie												
Paddy	Maize												
Vegetable	B'onion												
Vegetable	Ground nut/ Other pulses												
Vegetable	Maize												
Pulses	Chillie												
Pulses	B'onion												
Maize	Chillie/ B'onion												
Maize	Vegetables												
Banana	continuation												
Papaw	continuation												

Cropping Pattern for System I/H Cropping Intensity = 2

Maha Crop	Yala Crop	J	F	M	A	M	J	J	A	S	O	N	D
Paddy	Paddy												
Paddy	Vegetables												
Paddy	Soya/ Other pulses												
Paddy	B'onion												
Paddy	Chillie												
Paddy	Maize												
Vegetable	B'onion												
Vegetable	Soya /Other pulses												
Vegetable	Maize												
Maize	Soya/ Other pulses												
Maize	Vegetables												
Banana	continuation												
Papaw	continuation												

Cropping Pattern for System M/H Cropping Intensity -2

Maha Crop	Yala Crop	J	F	M	A	M	J	J	A	S	O	N	D
Paddy	Paddy												
Paddy	Vegetables												
Paddy	Soya/ Other pulses												
Paddy	B'onion												
Paddy	Chillie												
Paddy	Maize												
Vegetable	B'onion												
Vegetable	Soya / Other pulses												
Vegetable	Maize												
Maize	Soya/ Other pulses												
Maize	Vegetables												
Banana	continuation												
Papaw	continuation												

Cropping Pattern for System D1
Cropping Intensity = 2

Maha Crop	Yala Crop	J	F	M	A	M	J	J	A	S	O	N	D
Paddy	Paddy												
Paddy	Vegetables												
Paddy	Ground nut/ Other pulses												
Paddy	B'onion												
Paddy	Chillie												
Paddy	Maize												
Vegetable	B'onion												
Vegetable	Soya / Other pulses												
Vegetable	Maize												
Maize	Ground nut/ Other pulses												
Maize	Vegetables												

Cropping Pattern for System D2
Cropping Intensity = 2

Maha Crop	Yala Crop	J	F	M	A	M	J	J	A	S	O	N	D
Paddy	Paddy												

Cropping Pattern for Huruluwewa Feeder Canal Area
Cropping Intensity = 1.1

Maha Crop	Yala Crop	J	F	M	A	M	J	J	A	S	O	N	D
Paddy	Paddy												
Paddy	Vegetables												
Paddy	Pulses												
Paddy	B'onion												
Paddy	Chillie												
Paddy	Maize												
Vegetable	B'onion												
Vegetable	Pulses												
Vegetable	Maize												
Pulses	Chillie												
Pulses	B'onion												
Maize	Pulses												
Maize	Vegetables												
Banana	continuation												
Papaw	continuation												

Cropping Intensity

Except the Mahaweli System D2 , the other Mahaweli systems do not cultivate their full irrigable extents mainly due to unavailability of adequate supply of water. After the construction of Moragahakanda Reservoir it is expected that all Mahaweli System H, I/H,M/H, D1,D2,G, will be in full operation in both yala and Maha seasons.

System	Irrigable Area (Ha)	Present Cropping Intensity			Planned cropping Intensity		
		Yala	Maha		Yala	Maha	Total
H	32,000	41%	99%	140%	85%	100%	185%
I/H	4,100	77%	87%	164%	85%	100%	185%
M/H	4,300	41%	78%	119%	85%	100%	185%
D1	23,100	79%	92%	172%	85%	100%	185%
D2	10,100	100%	100%	200%	100%	100%	200%
G	5,500	72%	97%	169%	85%	100%	185%
HFC	3,057	20%	29%	49%	50%	60%	110%

2.5 Annual agricultural Production

As a result of increase in cropping intensity an additional **33,847** hectares of irrigable land which are currently in fallow status will be able to cultivate annually . In addition 2000 hectares of new land in System D1 will be developed for irrigated agriculture.

Crop Extents (Hectares)

System	Paddy	Onions	Chilli	Vegetables	Soya	Maize	Other Pulses	Banana
H	43,870	2,500	1,300	4,250	3,300	1,150	950	690
I/H	6,545	25	20	250	250	390	75	10
M/H	6,491	40	125	60	750	400	65	10
D1	41,385	50	200	350	-	400	350	-
D2	20,200	-	-	-	-	-	-	-
G	7,925	175	125	275	-	700	525	175
HFC	1,800	400	140	245	-	200	264	125
D1 (New Area)	2,150	50	125	200	-	575	200	200

Crop Production (M.T)

System	Paddy	Onions	Chilli	Vegetables	Soya	Maize	Other Pulses	Banana
H	245,000	37,500	1,950	85,000	6,600	1,725	1,045	20,000
I/H	36,697	375	30	5,000	375	780	82	290
M/H	36,343	600	187	1,200	1,500	600	71	290
D1	232,276	750	300	7,000	-	600	430	-
D2	113,625	-	-	-	-	-	-	-
G	44,337	2,625	187	5,500	-	1,050	865	5,075
HFC	9,000	6,000	210	4,900	-	300	290	3,625
D1 (New Area)	8,875	500	187	3,600	-	862	220	5,000

Chapter-3

3. AGRICULTURAL EXTENSION PLAN

The National policy framework for the agriculture sector in Sri Lanka aims at a marked transformation of its subsistence agriculture into profitable commercial farming with the ultimate objective of creating a prosperous rural peasantry as an effective partner in the overall process of national development. It is evident that if this is to take place, resulting in higher incomes for farmers, appropriate technologies must be developed and such knowledge disseminated among the farming community. The agricultural extension programme pertaining to the Moragahakanda project envisages to be in line with above objective by providing farmers and farmer organizations with necessary agricultural technology and other support.

The major components of the agricultural development programme are

i. Increased rice production and productivity

ii Crop diversification

iii Homestead development program

iv Community base seed production programmes

v Integration of crop husbandry with livestock and fresh water fish farming

vi. Promotion of agribusiness development and strengthening of agro-enterprises.

3.1 Increased rice production and productivity

Rice is the main crop grown in the project area being the major staple food with high social , cultural , economic and environmental rating. By the year 2020 the rice requirement in the country will 2.63 million metric tons. This is 50 % more than the present production .To increase the domestic production of rice the paddy yield per hectare has to be increased.

Rice has high comparative advantage with the assured water supply, favourable cropping intensity, ideally suited soils and sustainability of productivity assured by experienced farmer community backed by private sector input suppliers , marketers millers and other service providers.

A modernizes system is needed for providing branded quality products to meet specific market demands for high quality rice and rice products produced with in the system both for local consumption and export. Although rice processing with many mills and storage facilities are available, they are yet to be modernized to improve quality.

3.1.1 The main purposes of the agricultural extension programme on rice production are

- Make the project benefited areas as commercial centers for rice and rice based products in the country utilizing the comparative advantages stated above.
- Increase productivity levels from the current 5 tons per hectare to 6 tones per hectare.
- Improve water use efficiency
- Reduce post harvest losses to a minimum and improve product quality to meet market demands
- Assist production of rice based food products popularizing use of such foods.

3.1.2 Extension activities

i. **Rice Production Modal Yaya Programme**

A best recommended package of practices specific to the area in contiguous farmer allotments of 20 to 30 hectares will be carried out in each season in selected blocks. The recommended package of practices includes the soil fertility improvement, use of high quality seeds, integrated weed and pest management etc.

The other specific activities carried out in the yaya are;

A tested and effective performance based, relatively large scale participatory result oriented demonstration programme. (Target to reach yield 200 bushels or more per acre in one acre demonstrations in each yaya is expected)

-Revolving fund for input supply
- Provide "Parachute" seedling trays under subsidized rate
- Integration of all stakeholders support
-Group interaction / Group extension
- IPM field school
- Organic manure production
-Field days and training
- Conduct Yaya competitions and award prizes for winners

ii.. Promotion of use of appropriate agricultural machinery and equipment

This activity will cover land preparation, pest and disease control , harvesting, processing packaging , transport and storage and done with the support of private sector

iii. Promotion of best practices on post-harvest.

Training programmes for farmers, rice millers and extension personnel
Modernization of milling by accessing new technology and credit.

iv Promotion of private sector involvement in secondary processing and value addition . Attract private sector companies already in the industry and other potential companies creating linkages with farmer organizations

3.2 Crop diversification

Mahaweli System H and G have high potential for crop diversification having well drain lands of more than 14,500 and 3200 .hectares respectively. Since other areas of the project are ancient irrigation schemes the lands have been used for continuous paddy cultivation . However due to following constrains the lands cultivated with other crops have been declined in previous years in the country. Some of those constrains are

Inconsistent trade policies and imports leading to low market prices particularly in respect of chilli , onions and pulses.

Erratic and unreliable rainfall and unstable availability of irrigation supply.

Lack of planned production to match market demand.

Lack of reliable and adequate market information.

Limited infra structure facilities for collection , processing, storage and transport

Poor quality and inconsistent supply of seeds and other inputs.

Incidence of pest and diseases

Low level of technology adopted Eg. Fertilizer and irrigation practices.

Poor post harvest practices adopted in handling and marketing operations and lack of attention on quality.

Lack of focus on off season production technology and management.

3.2.1 Extension Activities

In order to overcome these constraints and to ensure consistent performance of OFCs, vegetables and fruits in terms of extents and yields several activities are planned.

These activities include :

i. Big onion true seed production programme

ii. Provision of market information to enable planned production

iii. Productivity and quality enhancement of other field crops, vegetables and fruits through application of integrated innovative technology packages.

iv. Expansion of off season production using agro wells and micro irrigation

v. Promotion of market linked production by promoting contract growing schemes for specific crops by linking farmers and farmer organizations with private sector entities (such as forward sales agreements).

vi. Development of medium, small and micro scale processing and value addition to horticultural and other field crop products by providing technical and credit facilities.

vii. Improvement of quality standards of produce by transferring technology, knowledge and skills

The crop diversification targets for Mahaweli systems are given below :

System	% of other crops of the total extent	
	Maha	Yala
H	10	46
I/H	8	20
M/H	8	30
G	10	36
D1	1.5	5
D2	0	0
HFC	24	74

3.3 Homestead development program

Homestead development programme is expected to uplift the living standards of farmer in Mahaweli area by increasing their income level and train the farmer to self sufficient living system. The objective of this programme is to ensure the food and nutrition security of the people, improve the consumption pattern, cultivation of food according to the family need, and the promotion of environment friendly and traditional agricultural methods.

For that Mahaweli Authority provides 0.2 ha land for each and every settler to make their living areas. Cultivation of every land inches and maximum utilization of family labour is the important in this concept. Under this program, cultivation of vegetables, fruits, yams and herbal plants will be encouraged to meet their daily needs.

3.3.1 Extension activities:

1. Soil conservation and rehabilitation programs
2. To encourage organic manure by establishing compost units
3. Construction of Rain water harvesting systems
4. Distribute planting materials under 50% Mahaweli contribution to encourage cultivation of perennial crops
5. Distribute planting materials under 50% Mahaweli contribution to encourage cultivation of seasonal crops
6. Distribution of vegetable seed kits
7. Supply of milking cow under 50% Mahaweli contribution
8. Supply day old chicks under 50% Mahaweli contribution

9. Conducting training programs for homestead development ,cultivation practices, post-harvest improvement techniques, bee keeping
10. Support for establishment of commercial nurseries
11. Provide bee boxes to improve the bee keeping

3.4 Community base seed production programmes

i) Community base seed paddy production programmes
ii) Community base OFC seed production programmes

At the beginning of cultivation season there is a heavy demand for seed paddy within the Mahaweli system and the other parts of the country. Present mandate of the Department of Agriculture is only producing basic seeds to the seed producers. MASL has planned to fulfill this demand through Mahaweli farmers. Farmers are able to get high income from these programmes.

3.4.1 Extension activities:

- Provide basic seeds under subsidized rate (OFC seeds only)
- Training of seed producing farmers
- Field inspections
- Registration of farmers for seed certification service under MASL funds (Specially paddy farmers)
- Provide seed processing machines to the farmer organizations under subsidized rate.
- Support farmers to vernalize big onion mother bulbs
- Market linkage and coordination / forward agreements

3.5 Integration of crop husbandry with livestock and fresh water fish farming

3.5.1 Livestock farming

Upliftment of the living standards of the people benefited from the Moragakanda Project is expected to strengthen with the integration of the livestock and fresh water fish farming. Having many advantages in addition to the income , such as supply of farm power, manure for crops , source for improvement of nutrition of farm household livestock development in these areas will have a great impact on project benefits. The main focus of livestock development programme will be on dairy industry which has following strengths and opportunities for further exploitation of its potential.

- Land availability
  Although large pasture lands are not available in the project area the homesteads of the settler farmers are available for intensive cattle rearing.

- Labour availability

  In crop production the labour utilization is seasonal and much of farm house hold labour is not used efficiently through out the year. For

instance only 200 man days are used for cultivation of one hectare of paddy in both seasons of the year and the balance labour is available for cattle rearing.

- Availability of good stock of animals
  A large stock of cattle well adapted to dry zone is available in the area which can be upgraded for higher productivity.

- Availability of feed material
  Nearly 80,000 hectares of land in the project benefited area will be cultivated with crops like paddy, maize , soya bean in both yala and maha seasons. Most of the crop residues of these cultivations can be converted into palatable and nutritious animal feed with the application of proper technology. Rice bran , maize and soya can be used in concentrate feed manufacturing.

The major activities proposed are :

i. Improving the genetic potential of existing cattle stock .
ii. Improving the present management practices for higher productivity
iii. Strengthening the capacity of farmer managed dairy societies.
iv. Promotion of value addition of fresh milk
v. Market facilitation.

3.5.2 Fresh water fish farming

Moreover the water fed by the Moragahakanda will raise the water levels and there by increase the capacities of the water bodies in the area for stocking of fresh water fish . This water will be harnessed to increase the fish production in the country while providing a nutritive food for the rural community at a low cost.

The fresh water fish farming development strategy aims on ;

-Increase availability of edible fish fingerlings (seeds) for stocking
-Promotion of organized private sector involvement in fish seed production
-Popularization of ornamental fish and aquatic plants

3.6 Promotion of Agribusiness development and strengthening of agro enterprises.

In an agricultural intensification programme minimizing losses that occur in the process of handling packing processing storage and transport is of extreme importance for maintaining productivity gains achieved during the production phase and it could be nullified if post harvest and marketing operations are not carefully carried out.

At present the post harvest and marketing operations in respect of agricultural and livestock products carried out in the area are no different to those carried out in the rest of the country. Bad handling and poor processing and storage practices have led to appreciable wastage, spoilage and quality loses depriving the farmer of a fair income. Further efforts towards improvement of competitiveness of agricultural products in the area by way of quality enhancement through use of better technology for processing, value addition storage packing and transport as well as activities

related to market development such as provision of regular market information , establishment of market linkages ,conducting of market promotion activities etc have been weak and slow.

In order to alleviate this situation it is essential to adopt measures to improve post harvest practices , processing storage and marketing activities as well as to strengthen existing agro enterprises and to develop new enterprises.

The proposed activities are ;

- Establishment of a "**Specialty center for dry and fresh agricultural produce"** based on wholesale supermarket at Dambulla .
- Improvement and promotion of existing /new micro and small agro enterprises.
- Promotion of private sector investment on agri business.

3.6.1 Establishment of "Specialty center for dry and fresh agricultural produce."

The two economic centers already established in Dambulla and Thambuttegama are merely distribution centers and they do not have any facility for grading, packing and other basic processing. The following facilities will be incorporated with in the center. Post harvest handling and storage of onion , legumes, primary processing and packing for fruits and vegetables, semi processing and preservation of fruits and vegetables, primary processing and packing of fruits and vegetables for super markets , dehydration of fruits and vegetables.

The other infrastructure facilities proposed are ;

Administrative and information center, training center , testing center, workers residential and recreational facilities , banking facilities, sales outlet for inputs etc.

All the services provided by the center will be on cost sharing basis.

3.6.2 Improvement and promotion of existing /new micro and small agro enterprises.

Agriculture in the project area is mainly of primary production nature, but with a potential to develop processing and value addition of its produce. In this regard the role of small and micro enterprises are of significant importance.

There are quite substantial number of micro scale enterprises which are involved in value addition of primary products by milling , processing, grading and packeting. These micro scale enterprises can be improved to run as efficient units if assistance is provided in appropriate manner. The potential micro and small enterprises to develop are ;

- Enterprises for value addition of pulses such as cow pea green gram etc;
  by cleaning, grading, branding, labeling and packaging.
- Enterprises to undertake processing, packeting and labeling of rice , chillies , kurakkan etc.

- Enterprises to undertake production of health foods.
- Enterprises for livestock production
- Enterprises to undertake production of dairy products such as fresh milk , curd and yoghurt.
- Enterprises to undertake processing of fresh water fish.
  Proposed activities for development of Micro and Small scale Enterprises (MSEs)
- Carry out a comprehensive survey of MSEs in the area gathering information types, scale, needs management levels etc.
- Assist preparation of business plans for MSEs.

  Provide information and training on quality factors and timing demands for products.
- Establish effective on the job training programs.
- Assist market development by identifying potential large firms as sub contractors and facilitating sub contract arrangements with such large companies.
- Assist technology transfer to MSEs through the subcontractors/large firms
- Collection , organizing and dissemination of information to MsEs
- Assist adoption of post harvest technology labeling and packaging.

3.6.3 Promotion of private sector investments in the area ;

The strategy of promoting private sector would be …

- provision of necessary information , incentives and facilities for direct investment
  on large scale crop, livestock and fish production and processing enterprises.
- Contract growing of selected crops and livestock by private companies with active cooperation of farmer organizations under forward agreements.

Required External Support to strengthen Extension Service:

1. Introduce newly developed IPM technologies for Other Field Crops (OFC) and horticultural crops.
   (Still in Sri Lanka practice IPM technology for only rice crop)

2. Introduce most suitable efficient micro irrigation system for both highland and lowland
   (Existing micro irrigation technology is not fully socially adoptable)
3. Introduce Post harvest technologies to minimize losses and improve product quality specially in horticultural crops (Existing technology is not socially adoptable)
4. Introduce new high yielding, pest and disease tolerant varieties different range of crops (Chilli, Vegetables, fruits etc) It is necessary to conduct field experiments to test adoptability and performances. Still lacking in suitable chili variety.

Chapter -4

4. Marketing Development

Agricultural marketing is the performance of all activities involved in the flow of agricultural products from the point of initial production to the consumers. For the farming community marketing development is crucial in increasing income through strengthening of their bargaining powers, reduction of intermediaries , timely marketing operations to get a higher price. Marketing development in general will also activate the rural economy by promotion of agro processing industry , increase in the commodity inflow and outflow.

4.1 Major development aspects of marketing

Growing crops in specific areas.

In general, a multiplicity of buyers operate in the producing areas throughout the year and this number is rapidly increased during the harvesting months. It is apparent that numerous marketing intermediaries enter the market when large quantities of produce become consistently available in a concentrated region year after year. This is particularly important in the evolution of marketing system related to paddy, other cereals, pulses, fruits and vegetables.

Growing high consumer demanding crops

Under the large irrigation schemes , such as the proposed Moragahakanda project it is often not possible to completely avoid the seasonal cycle of crop production which coincide with the water issues. The seasonality in crop production invariably results in periodic market gluts. Causing severe price declines , particularly those of perishable produce. To prevent such situation it is proposed to grow variety of crops having high consumer demand. This includes new and non traditional varieties , different age group varieties etc.

Improving product quality

Product quality is a basic market price determinant. One of the factors that determine the quality of the agricultural produce is the quality of seed and planting materials used .While promoting the use of good quality seed and planting material it is expected to improve other pre and post harvest practices to have a good quality product.

Strengthening the farmer bargaining power

The low bargaining power of small farmer cannot control the market price. Therefore production groups will be formed to have high bargaining power.

Provision of market information

Marketing information is vital to ensure the best prices for farm produce as well as production planning.

Provision of marketing credit for farmer organizations.

This is important specially in purchasing paddy. Farmer organizations involved in paddy marketing are supposed to get credit from government banks.

Promotion of forward contracts with , out-growers

Annual fruit and vegetable production with the project

System	**vegetable production (Mt)**	**papaya production (Mt)**	**banana production (Mt)**
H	85,000	2,875	20,010
I/H	5,000	57.5	290
M/H	1, 200	23	290
G	5,500	575	5,075
D1	7,000	-	-
D2	-	-	-
HFC	4,900	402.5	3,480

Chapter-5

5. ENVIRONMENTAL IMPACTS ON AGRICULTURAL DEVELOPMENT AND MITIGATORY MEASURES

The major environmental impacts due to the agricultural development of the Morahahakanda reservoir will be

i. Soil and water pollution due to excessive use of agro-chemicals and chemical fertilizers

ii. .Soil fertility depletion due to continuous cultivation
iii. .Salinity development

5.1.1 Soil and water pollution due to excessive use of agro-chemicals and chemical Fertilizers

The problem is that agro chemicals and chemical fertilizers are widely seen by farmers as crop insurance due to aggressive promotion by private sector. These chemicals not only affects the human health but also the natural habitat. No detailed studies have been conducted to measure levels of pesticides pollutants in run off water from the irrigated areas. However with 2-5 seasonal insecticide sprays applied over large expanses of cultivations , the toxic pollutants almost certainly have a detrimental effect on the ecology of down stream reverine and coastal ecosystems. Further natural enemy complexes of pests are particularly vulnerable to pesticides because of their contact with chemicals on the water surface and on the plant and there for it can disturb the functional relationships and gives pest populations a growth advantage that can result in pest outbreak.

The excessive use of agro chemicals and fertilizers is to be minimized through the Integrated Pest Management (IPM) approach . This approach integrates the domains of ecology and adult education in so called farmer field schools where learning takes place through observation of the agro-ecosystem, experimentation and group discussions.

The proposed IPM programme envisages to educate the farmers for improved understanding of agro-ecological mechanisms and IPM practices and to empower them to conduct experiments and systematic observations to answer their agro ecological questions. The main activities to be carried out are

-Establishment of Farmer Field schools

-Farmer studies and training.

-Establishment of IPM clubs.

5.2 Soil fertility depletion

The long term sustainability of the agricultural productivity of the project area highly depends on the soil fertility . The Moragahakanda Agricultural development plan has high priority in this regard and following activities are planned.

- Promotion of application of organic manure through model yaya where farmers in one contiguous irrigation area involve in high management practices.
- Promotion of application of organic manure through Farmer Field Schools.
- Demonstrations and field days.

5.3 Salinity development

Reasons of salinity development

i.. The presence of large amounts of free water in the upper slopes, both in flood irrigated rice fields and in flowing unlined irrigation canals can force the salt reserves of natural landscape from their storage positions to emerge on the surface as highly saline effluent .

ii. .Felling and burning of forest cover in reservations adjourning to the cultivation area Every hectare of forest cleared can release up to about 3000 kg calcium and 400 kg magnesium as additional supplies of salt to the soil.

iii. Blocking of drainage canals by farmers for obtaining more water to their
fields. Because of these impediments to drainage, the released salts stay in circulation for longer than necessary without being flushed out and causing salinity.

The proposed actions to control salinity development are ;

i. Growing of crops other than paddy in upper slopes (Crop diversification
programme)

ii. .Conservation of forest cover in the area.

iv. .Farmer education for drainage improvement.

Chapter-6

6. AGRICULTURAL DEVELOPMENT IN RESETTLEMENT AREAS.

The total number of families identified for resettlement is about 3000. There are 2000 hectares of land available in Mahaweli D1 system under Kaudulla for resettlement. Rest of the settlers and Kalu Ganga relocated settlers have to be settled in Kalu Ganga (System F). This area will be developed for irrigated agriculture to alienate re-settlers. Each selected farmer will be given 0.6 hectare of land with irrigation facilities and another 0.1 hectare of upland for the homestead.

Farmers will be encouraged to grow mixture of crops in their 0.6 hectare irrigable land. The recommended crops are paddy, maize, pulses fruits and vegetables. It is expected that a farmer will get an average income of Rs 300000.00 annually from his irrigable allotment.

Development of home garden for a supplementary income will be a major activity of the resettlement programme. The expected annual income from the Homestead is Rs 100000.00.
The settlers will be provided necessary technical and other assistance to develop their homesteads. Each new settler will be given seed and planting material worth of Rs 2000

The following are the major concerns in home garden development

1. Soil & water conservation
2. Rain water harvesting
3. Growing a high value crop in a larger potion of the land
4. Rearing livestock
5. Organic farming

Soil and water conservation.
Soil conservation determines the sustainability of land productivity of homesteads and in most of the old irrigation schemes this aspect has been ignored .

Rain water harvesting
Maximum use of rainwater received from north east and south west monsoons will be obtained for cultivation of crops homesteads . This include collection of rain water from house roof and surface runoff.

Growing high value crops
Crops like papaw banana vegetables will be grown comparatively larger portion of the homestead.

Rearing Livestock
Back yard poultry keeping and cattle rearing for dairy will be promoted.

Organic farming
No chemicals are encouraged in homestead farming and application of organic manure will be encouraged.

Establish 02 modal farms in Resettled area:

Resettled people are new comers to the new environment. They will not have idea on suitable crops, cultivation methods, agriculture technology and production techniques. Therefore main objective of establishing modal farm is to train farmers as field school.

Chapter-7

6 IMPLEMENTATION STRATEGY OF THE MORAGAKANDA AGRICULTURAL DEVELOPMENT PROGRAMME

Mahaweli system H, G, D, and Hurulwewa feeder canal is managed by the Mahaweli Authority of Sri Lanka while rest of the project benefited areas are under the national administrative structure. Therefore all the activities proposed for the agricultural development of the Moragahakanda project in Mahaweli Authority managed areas will be carried out by it and in the rest of the areas those activities will be carried out by the Department Of Agriculture and the other relevant line departments and institutions. However Mahaweli Authority and Irrigation Management Division of Department of Irrigation will coordinate specific activities such as Livestock development and Acqua-culture development with Department of Animal Production & Health (DAPH) and National Aquaculture Development Authority (NAQDA) respectively.

Activities proposed above are mostly to serve as demonstrations /models and will be located in areas where the impact would be the greatest and potential for replication or spread of such activity is high. As far as possible a participatory approach is called for in planning ,implementing evaluating and adopting the activities for further dissemination . It is proposed that demonstrations be carried out with the participation of farmers through farmer organizations.

Farmer organizations would organize production and establish partnerships (e.g. through forward contracts) with the organized private sector in Sri Lanka and abroad.

All the infrastructure development activities pertaining to the agricultural development activities in new settlement area in System D1 will be handled by the Mahaweli Authority of Sri Lanka.

With the availability of sufficient water in project benefited areas there will be a tendency of growing more paddy by the farmers. To prevent this situation a very strong monitoring programme is proposed. A monitoring committee headed by the Ministry of Agriculture with other members from relevant departments and agencies will monitor the agricultural development plan at least for five year period.

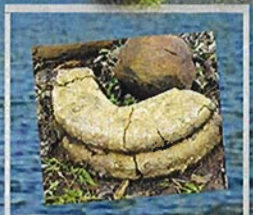
Mahaweli Authority of Sri Lanka and Irrigation Management Division of the Irrigation Department which handle the System I/H, M/H,/D1 and D2 will have monthly progress review meetings separately.

M.A.S.L



මොරගහකන්ද ජලාශ ව්‍යාපෘතිය

පුරාවිද්‍යාත්මක හානි ඇගැයුම් සමීක්ෂණ වාර්තාව

















මධ්‍යම සංස්කෘතික අරමුදල

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මධ්‍යම සංස්කෘතික අරමුදල
212/1, බෞද්ධාලෝක මාවත
කොළඹ 07

2009

පුරාවිද්‍යාත්මක හානි ඇගැයීම

යෝජිත මොරගහකන්ද ජලාශ ව්‍යාපෘතිය

පුරාවිද්‍යා හානි ඇගැයීම

සමීක්ෂණ වාර්තාව

මහාචාර්ය සුදර්ශන් සෙනෙවිරත්න

අධ්‍යක්ෂ ජනරාල්

මධ්‍යම සංස්කෘතික අරමුදල

අධ්‍යක්ෂ ජනරාල්තුමාගේ සටහන

පුරාවිද්‍යා දෙපාර්තමේන්තුවේ අනුග්‍රහයෙන් නිම කළ මෙම පුරාවිද්‍යා බලපෑම් තක්සේරුව මධ්‍යම සංස්කෘතික අරමුදල විසින් ඉටු කරන්නා වූ එක් සේවාවකි. මෙවැනි සමීක්ෂණ මඟින් සුවිශාල මෙහෙයක් රට වෙනුවෙන් ඉටු කිරීමට ලැබීම ඉමහත් ගෞරවයකි. විවිධ භෞතික හා සංස්කෘතික කලාපයන්හි දක්නට ලැබෙන හුරුප, සම්පත් පුද්ගලයන් ප්‍රවර්ධනය නව දත්ත ගබඩාකරණය උරුම කළමනාකරණයට මැදිහත්වීම යන කරුණු මේ සේවාවෙන් ඉටු කරන්නා වූ කරුණු ස්වල්පයකි.

ශ්‍රී ලංකාවේ ඉදිවන්නා වූ සුවිශාල ම ජලාශ ව්‍යාපෘතිවලින් එකක් වන මොරගහකන්ද ජලාශය මඟින් දිස්ත්‍රික්ක ගණනාවකට පානීය ජලය සහ පරාක්‍රම සමුද්‍රය, මින්නේරි වැව, ගිරිතලේ වැව, කවුඩුල්ල වැව සහ කන්තලේ වැව යන සුවිසල් වාරිකර්මාන්ත සඳහා තිරසාර ජලය සැපයීමක් කිරීමට අපේක්ෂා කෙරේ. පරාක්‍රම සමුද්‍රය මෙන් සිව්ගුණයකින් විශාල මෙම ජලාශයෙන් සංවර්ධනය කිරීමට අපේක්ෂිත වගා බිම් ප්‍රමාණය ද අති විශාල ය.

මධ්‍යම පළාතේ මාතලේ දිස්ත්‍රික්කයේ නාඋල ප්‍රාදේශීය ලේකම් කොට්ඨාසයේ ග්‍රාම නිලධාරී වසම් 10ක් පමණ ආවරණය වන පරිදි ඉදිකිරීමට අපේක්ෂිත මොරගහකන්ද ජලාශයෙන් රජරටට ද අතිවිශාල සංවර්ධනයක් සිදුවීම අප රට ලබන මහත් භාග්‍යයකි. මෙවැනි සුවිසල් ව්‍යාපෘතියක පුරාවිද්‍යා හානි ඇගයීමකට ලක්කිරීමට අප වෙත භාරදීමෙන් පුරාවිද්‍යා අධ්‍යක්ෂ ජනරාල් අප ආයතනය වෙත පළකළ විශ්වාසය පිළිබඳ ව ස්තුතිවන්ත වෙමු.

කට්ටක පරිසරයක් තුළ වර්ෂා කාලයක දී වුව ද විද්‍යානුකූල හා විස්තරාත්මක ඵලදායී ගවේෂණයක් ප්‍රබුද්ධිමත් ව ඉටු කළ අප ආයතනයේ සියලු ම පුරාවිද්‍යාඥයින්, තාක්ෂණික නිලධාරීන්, ඡායාරූප ශිල්පීන් හා සේවක මහතුන්ට මගේ ප්‍රශංසාත්මක ස්තුතිය හිමි වේ.

මහාචාර්ය සුදර්ශන් සෙනෙවිරත්න
අධ්‍යක්ෂ ජනරාල්
මධ්‍යම සංස්කෘතික අරමුදල

මොරගහකන්ද ජලාශ ව්‍යාපෘතිය

පුරාවිද්‍යාත්මක හානි ඇගැයුම් ගවේෂණ කණ්ඩායම

උපදේශක හා අධීක්ෂණය

මහාචාර්ය සුදර්ශන් සෙනෙවිරත්න (අධ්‍යක්ෂ ජනරාල් - ම.සං.අ.)

ආචාර්ය පියතිස්ස සේනානායක (ජ්‍යෙෂ්ඨ කථිකාචාර්ය - පේරාදෙණිය විශ්වවිද්‍යාලය)

පර්යේෂණ නිලධාරීන්

ඩී.ඒ.සී. දඹදෙණිආරච්චි - *සම්බන්ධීකරණය*

පී.ආර්.එස්. බණ්ඩාරනායක - *සම්බන්ධීකරණය*

කේ.ජී.කේ. කරුණාරත්න

එම්.ආර්.එම්. කුමාරි

ඩබ්.ඒ.එල්. වික්‍රමආරච්චි (උපාධිධාරී පුහුණු)

ජයම්පත් සේනානායක (GIS සැලසුම් ශිල්පී)

සැලසුම් ශිල්පී

ජිනදාස වැලිකුඹුර

ඡායාරූප ශිල්පී

කුසුම්ප්‍රිය රාජපක්ෂ

කම්කරු සහාය

ඩී.ජී. ප්‍රේමරත්න

එච්.එච්. සාලිය

එම්.ජී. ධනපාල

පටුන

අධ්‍යක්ෂ ජනරාල්ගේ සටහන i
ගවේෂණ කණ්ඩායම ii
පටුන iii
සැලසුම් නාමාවලිය iv

1. හැඳින්වීම

1.1 පිහිටීම
1.2 මොරගහකන්ද ජලාශ ව්‍යාපෘතියේ අරමුණු හා අභිමතාර්ථ
1.3 පුරාවිද්‍යා හානි ඇගයීම් සමීක්ෂණයේ අරමුණු
1.4 පුරාවිද්‍යා හානි ඇගැයීම් සමීක්ෂණ ක්‍රමවේදය
1.5 ස්තුතිය

2. මොරගහකන්ද ප්‍රදේශයේ භූගෝලීය හා ඓතිහාසික පසුබිම

2.1 අධ්‍යයන ප්‍රදේශයේ භූගෝලීය පසුබිම
2.1.1 අධ්‍යයන ප්‍රදේශයේ දක්නට ලැබෙන භූවිද්‍යාත්මක සම්පත්
2.2 අධ්‍යයන ප්‍රදේශයේ ඓතිහාසික පසුබිම
2.2.1 ජනප්‍රවාද
2.2.2 ඓතිහාසික තොරතුරු
2.2.3 පුරාවිද්‍යාත්මක මූලාශ්‍රය

3. ගවේෂණය

3.1 පුරාවිද්‍යාත්මක ස්ථාන
3.1.1. රජාවෙල ශ්‍රී බෙත්තාලෝක විහාරය
3.1.2. රජාවෙල වෙහෙරගොඩැල්ල
3.1.3. මැදකිඳ වෙහෙරගොඩැල්ල
3.1.4. කෝන්ගහවෙල
3.1.5. ඇලගමුව ශිලාමය අවශේෂ
3.1.6. මැදපිහිල්ල වෙහෙරගොඩැල්ල
3.1.7. තලාගොඩ වෙහෙරගොඩැල්ල
3.1.8. කඹිරව
3.1.9. ඇලහැර
3.1.10. ගලබොඩ ඉහළ වලව්ව
3.1.11. දම්මන්තැන්න ගල්ලෙන
3.1.12. මොරගොල්ල තලංගමුව

3.2 හමු වූ පුරාවස්තු
3.2.1. මැටි බඳුන් අවශේෂ
3.2.2. උළු
3.2.3. ගඩොලු අවශේෂ
3.2.4. යබොර අවශේෂ
3.2.5. යකඩ අවශේෂ

4. උරුම ස්ථානවලට සිදුවිය හැකි හානි

5. නිගමන සහ යෝජනා

6. ස්තුතිය

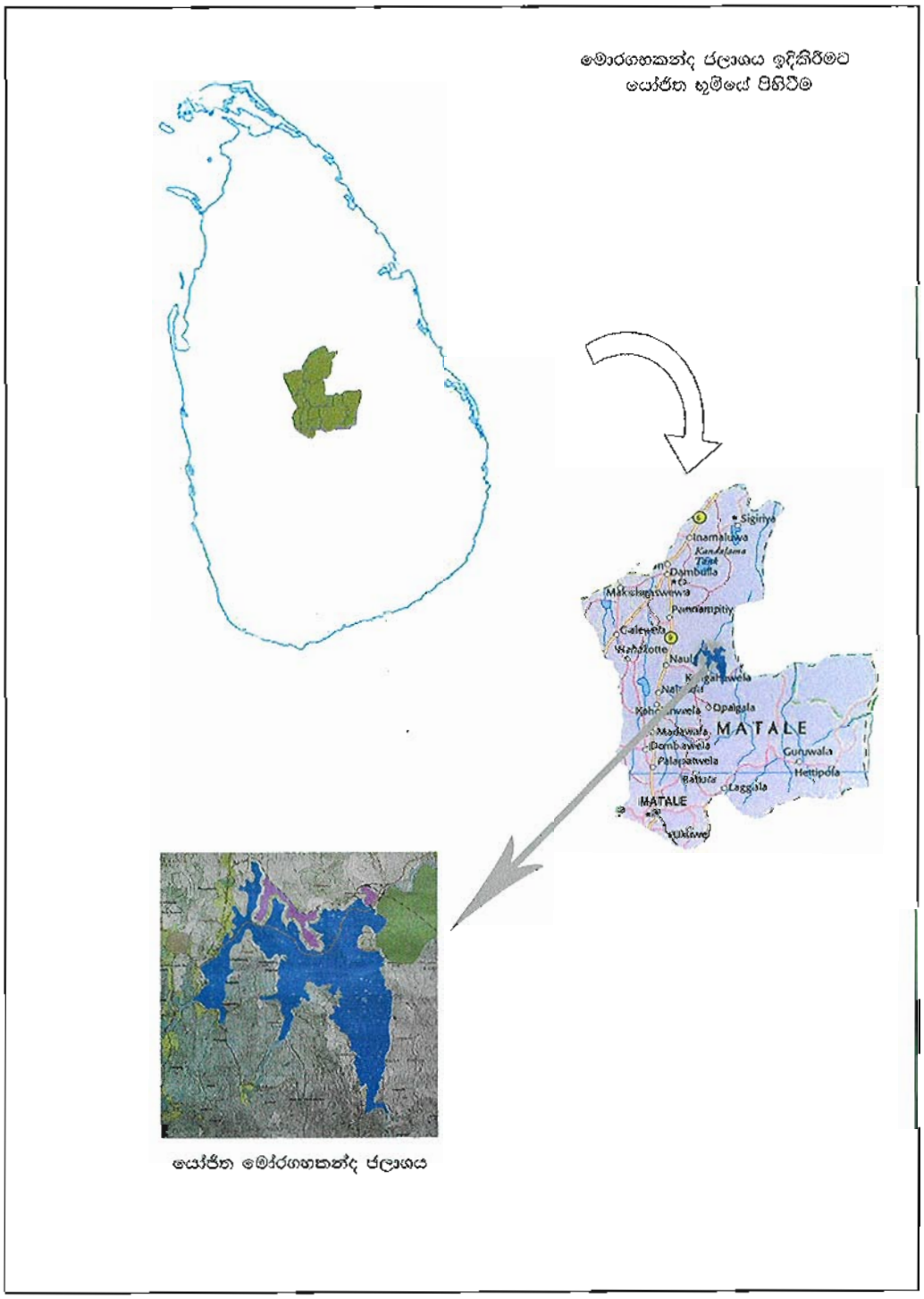
සැලසුම් නාමාවලිය

සැලසුම් අංක 01	-	යෝජිත මොරගහකන්ද ජලාශ ව්‍යාපෘතිය පිහිටි ප්‍රදේශය
සැලසුම් අංක 02	-	යෝජිත මොරගහකන්ද ජලාශ ව්‍යාපෘතිය පිහිටි ප්‍රදේශයට ප්‍රවේශ වන මාර්ග දැක්වෙන සිතියම
සැලසුම් අංක 03	-	යෝජිත මොරගහකන්ද ජලාශ ව්‍යාපෘතියට යට වන ප්‍රදේශ හා ග්‍රාම නිලධාරී වසම් දැක්වෙන සැලැස්ම
සැලසුම් අංක 04	-	යෝජිත මොරගහකන්ද ජලාශ සංවර්ධන ව්‍යාපෘතිය
සැලසුම් අංක 05	-	මැදකිඳ වෙහෙරගොඩැල්ල
සැලසුම් අංක 06	-	මැදපිහිල්ල වෙහෙරගොඩැල්ල බිම් සැලැස්ම
සැලසුම් අංක 07	-	මැදපිහිල්ල වෙහෙරගොඩැල්ල බුදු මැදුර
සැලසුම් අංක 08	-	මැදපිහිල්ල වෙහෙරගොඩැල්ල කැසිකිළි ගල
සැලසුම් අංක 09	-	තලාගොඩ සමස්ත පුරාවිද්‍යා භූමියෙහි සැලැස්ම
සැලසුම් අංක 10	-	තලාගොඩ ස්මාරකයේ සැලැස්ම
සැලසුම් අංක 11	-	තලාගොඩ හුණුගල් පාදමෙහි සැලසුම
සැලසුම් අංක 12	-	කඹරව ගමේ දළ සැලැස්ම
සැලසුම් අංක 13	-	කඹරව බෝධිය අසලින් හමු වූ ශිලාමය පුවරුව
සැලසුම් අංක 14	-	ගලබොඩ වලව්ව
සැලසුම් අංක 15	-	ගලබොඩ වලව්වේ උළුවස්සක්
සැලසුම් අංක 16	-	දම්මන්කැන්න ගල්ලෙනෙහි දර්ශනයක්
සැලසුම් අංක 17	-	මොරගොල්ල පුරාවිද්‍යා තටබුන්
සැලසුම් අංක 18	-	මැදකිඳ (MOK09/03) මැටි බඳුන්
සැලසුම් අංක 19	-	මැදපිහිල්ල (MOK09/06) මැටි බඳුන්
සැලසුම් අංක 20	-	තලාගොඩ (MOK09/07) මැටි බඳුන්
සැලසුම් අංක 21	-	කඹරව (MOK09/13) මැටි බඳුන්
සැලසුම් අංක 22	-	මැදපිහිල්ල (MOK09/06) මැටි භාණ්ඩයක් (පාදමක්?)
සැලසුම් අංක 23	-	තලාගොඩ උළු
සැලසුම් අංක 24	-	මැදකිඳ උළු කැටයක්
සැලසුම් අංක 25	-	මැදපිහිල්ල උළු කැටයක්
සැලසුම් අංක 26	-	මොරගහකන්ද ජලාශ ව්‍යාපෘතියේ හානි අගැයුම් සමීක්ෂණය සිදු කිරීමේ දී හඳුනාගත් පුරාවිද්‍යා ස්මාරක දැක්වෙන සැලැස්ම
සැලසුම් අංක 27	-	මොරගහකන්ද පුරාවිද්‍යා හානි අගැයුම් සමීක්ෂණයේ දී හඳුනාගත් පැරණි ජනාවාස ව්‍යාප්තිය
සැලසුම් අංක 28	-	මොරගහකන්ද ජලාශයට යට වන පුරාවිද්‍යාත්මක ස්මාරක

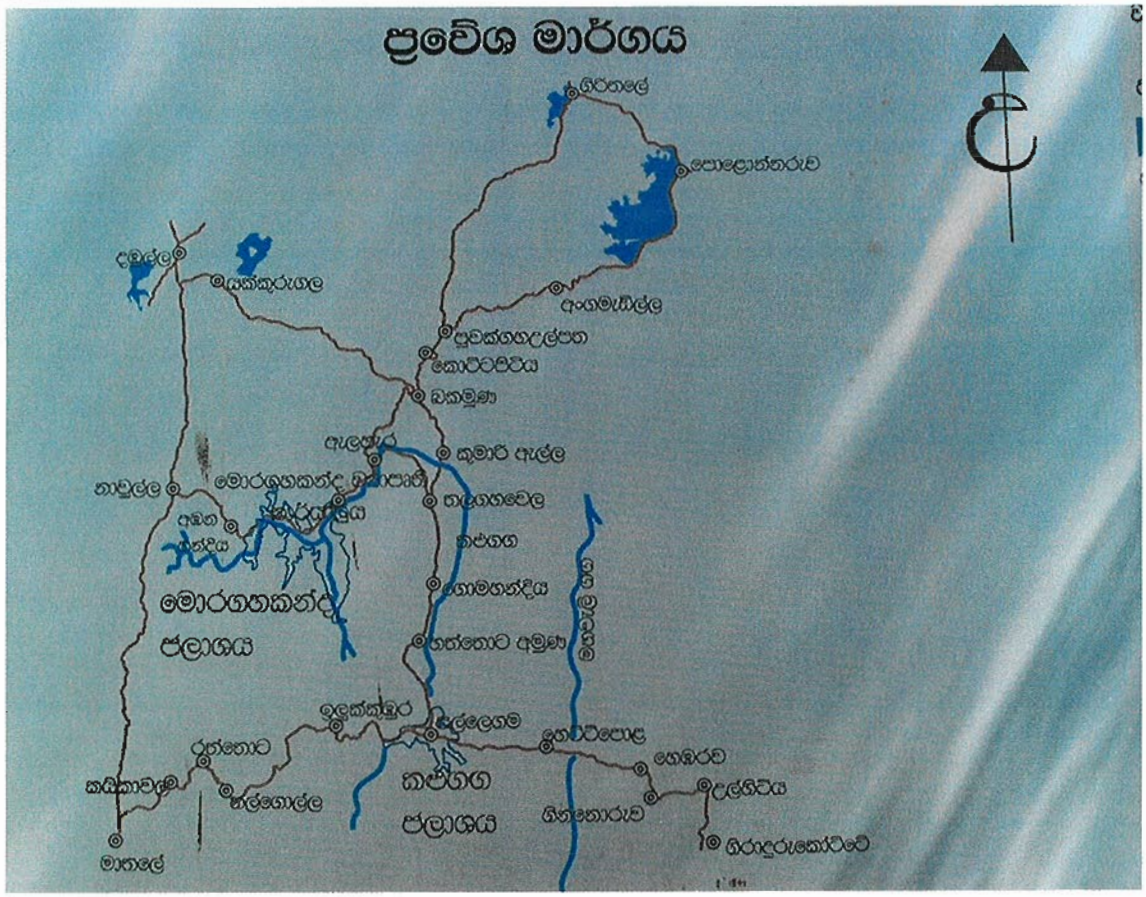
1 හැඳින්වීම

1.1 පිහිටීම

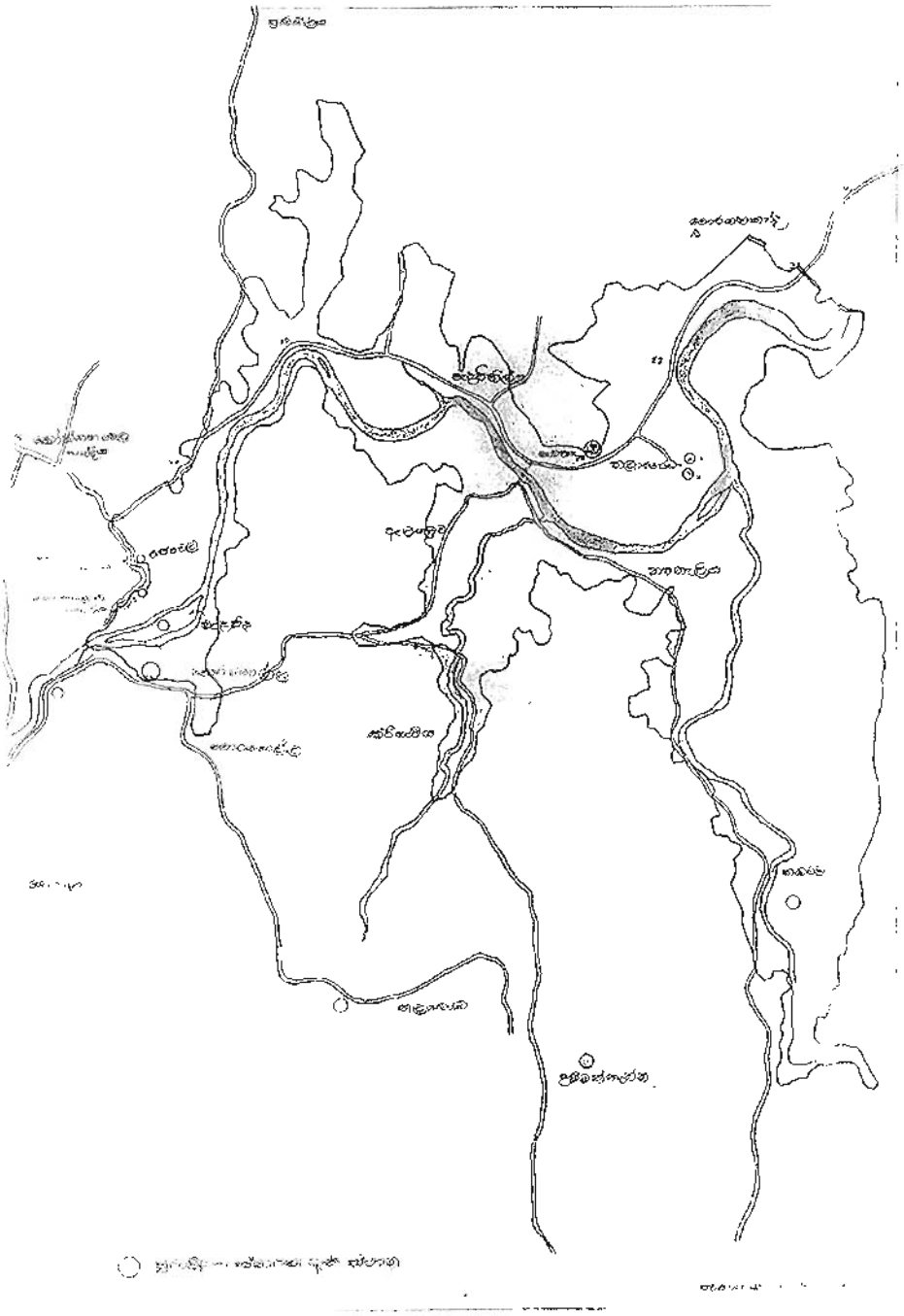
ශ්‍රී ලංකාවේ මධ්‍යම පළාතේ මාතලේ දිස්ත්‍රික්කයේ නාඋල ප්‍රාදේශීය ලේකම් කොට්ඨාසයට යටත් වන ග්‍රාමනිලධාරී වසම් 12ක් ආවරණය වන පරිදි උ.අ. - 7° 35' 21'' - 7° 46' 36'' හා නැ.දේ. - 80° 40' 76'' - 80° 49' 36'' අතර මොරගහකන්ද සංවර්ධන ව්‍යාපෘතියට අයත් වන ප්‍රදේශය පිහිටා ඇත.



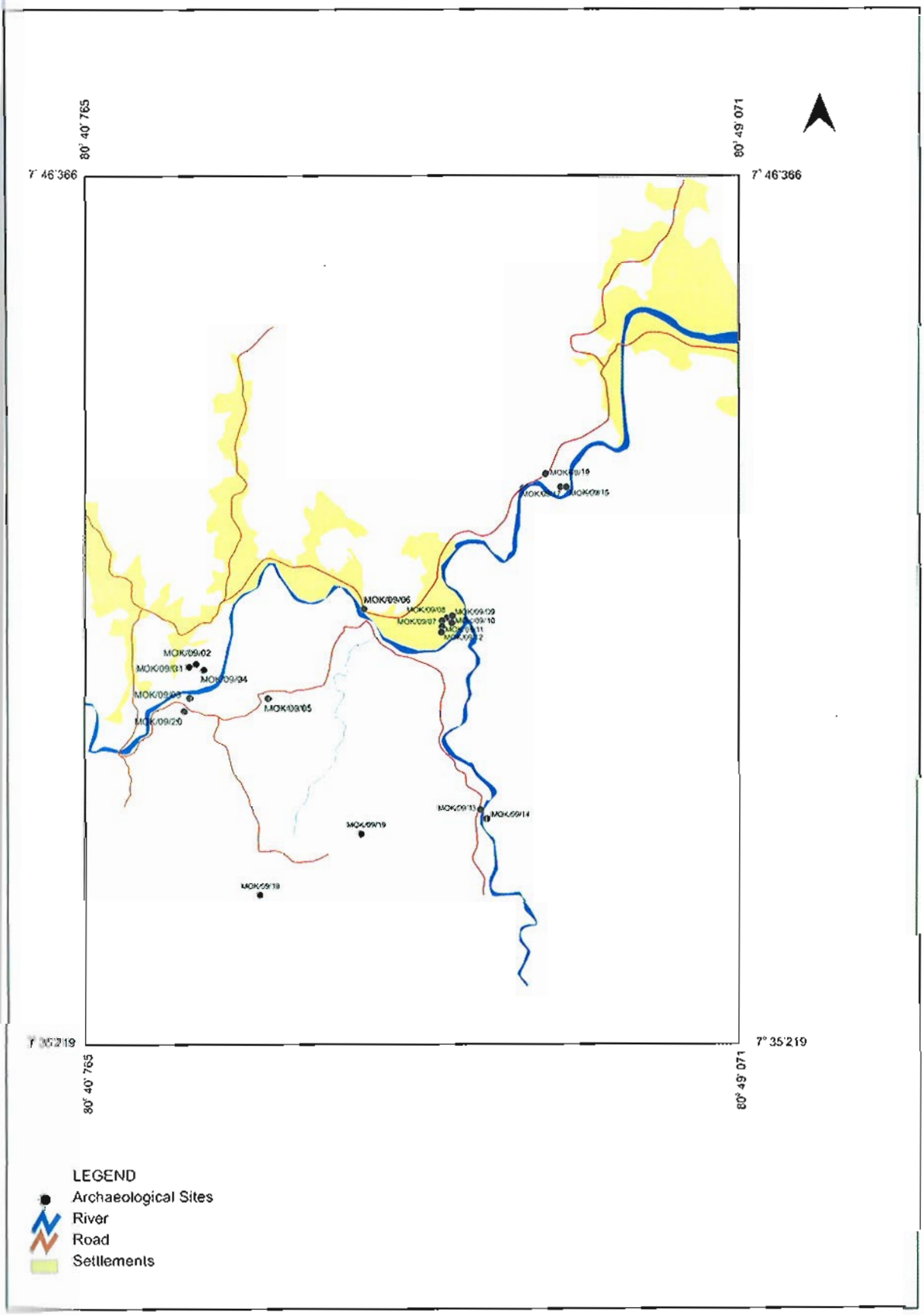
සැලසුම් අංක 01 - *යෝජිත මොරගහකන්ද ජලාශ ව්‍යාපෘතිය පිහිටි ප්‍රදේශය*



සැලසුම් අංක 02 - යෝජිත මොරගහකන්ද ජලාශ ව්‍යාපෘතිය පිහිටි ප්‍රදේශයට ප්‍රවේශ වන මාර්ග දැක්වෙන සිතියම



සැලසුම් අංක 03 - යෝජිත මොරගහකන්ද ජලාශ ව්‍යාපෘතියට යට වන ප්‍රදේශ හා ග්‍රාම නිලධාරී වසම් දැක්වෙන සැලැස්ම



සැලසුම් අංක 04 - *යෝජිත මොරගහකන්ද ජලාශ සංවර්ධන ව්‍යාපෘතිය*

1.2 මොරගහකන්ද ජලාශ ව්‍යාපෘතියේ අරමුණු සහ අභිමතාර්ථ

ශ්‍රී ලංකාව තුළ මෙතෙක් ක්‍රියාත්මක වූ විශාලතම බහුකාර්ය සංවර්ධන ව්‍යාපෘති අතර මහවැලි ව්‍යාපාරයට හිමිවන්නේ ප්‍රමුඛ ස්ථානයකි. එයින් ද මොරගහකන්ද හා කළුගඟ සංවර්ධන ව්‍යාපෘතිය මහවැලි ව්‍යාපාරය යටතේ සිදු කිරීමට නියමිත විශාලතම ජලාශ ව්‍යාපෘතිය වේ.

ශ්‍රී ලංකා මහවැලි අධිකාරිය විසින් මෙම ව්‍යාපෘතිය ක්‍රියාවට නැංවෙන අතර එහි අරමුණු අතර

- ශ්‍රී ලංකාවේ වියළි කලාපයේ හෙක්ටයාර් 81,422ක ප්‍රදේශයකට වාරි ජලය සැපයීම (උමං මාර්ග 2කින් හා ඇළ මාර්ගවලින් සමන්විත ජලවහන පද්ධතියක්)

- අනුරාධපුරය, පොළොන්නරුව, ත්‍රිකුණාමලය හා මාතලේ දිස්ත්‍රික්කවලට පානීය ජලය හා කර්මාන්තය සඳහා අවශ්‍ය ජලය සැපයීමත්

- ජලවිදුලි බලය උත්පාදනයත් (මෙගාවොට් 20ක ස්ථාපිත ධාරිතාවක් ඇති ජලවිදුලි බලාගාරයක්)

ප්‍රධාන අරමුණු වන අතර පාරිසරික සැලසුම්කරණය පිළිබඳ ව වැදගත් යෝජනා කිහිපයක් වේ.

- මොරගහකන්ද ජලාධාර ප්‍රදේශයෙහි ගංගා දොළ රක්ෂිතයන් හෙක්ටයාර් 1365ක පමණ නැවත වන වගා කිරීම

- මොරගහකන්ද ජලාශය වටා මීටර් 100ක රක්ෂිත ප්‍රදේශයක් වෙන් කිරීම හා එහි හෙක්ටයාර් 650ක නැවත වන වගා කිරීම

- ගිරිතලේ - මින්නේරිය ස්වභාවික රක්ෂිතය සහ වස්ගමුව ජාතික වනෝද්‍යානය අතර අලිමංකඩක් වෙන් කිරීම, එම අලිමංකඩ දෙපස විදුලි වැටවල් පිහිටුවීම, අනවසර පදිංචිකරුවන් නැවත පදිංචි කරවීම

- මින්නේරිය - ගිරිතලේ ස්වභාවික රක්ෂිතය සහ වස්ගමුව ජාතික වනෝද්‍යානය සත්ව වාසභූමි වැඩිදියුණු කිරීම් කරන අතර අත්හැර දමන ලද වැව් 4ක් ප්‍රතිසංස්කරණය කිරීම හා ආක්‍රමණශීලී පැළෑටි ඉවත් කර, අලුතින් ශාක හා සත්ත්ව වර්ග වගා කිරීම

යනාදිය ඒ අතර වේ.

ඉහත සඳහන් වන අරමුණු ක්‍රියාවට නැංවීමෙහිලා අපේක්ෂිත ප්‍රතිලාභ ද විශාල ප්‍රමාණයකි. මොරගහකන්ද හා කළුගඟ ව්‍යාපෘතියෙහි ආයෝජන පිරිවැය ඇමෙරිකානු ඩොලර් මිලියන 440කි. මින් ආයෝජන ප්‍රතිලාභ ගණනය කිරීමේ දී 22%ක පමණ ප්‍රතිලාභයක් හිමි වන බව පෙනේ. තව ද සෘජු වශයෙන් ම වන වගා තීව්‍රතාවයේ සාමාන්‍ය අගය 181% දක්වා ඉහළ නැංවෙනු ඇතැයි අපේක්ෂා කෙරේ. ව්‍යාපෘතියෙහි ක්‍රියාකාරීත්වය නිසා හෙක්ටයාරයකට ලැබෙන වී අස්වැන්න ඉහළ යන අතර අතිරේක කෘෂිකාර්මික නිෂ්පාදන ටොන් 123,000ක් වාර්ෂික ව නිපදවනු ඇත. කෘෂිකාර්මික ප්‍රතිලාභයේ මුළු අගය අමෙරිකානු ඩොලර් මිලියන 30,1ක් ලෙස සෘජු ව ප්‍රතිලාභ වශයෙන් ගණන් බලා ඇත.

1.3 පුරාවිද්‍යා හානි ඇගයීම් සමීක්ෂණයේ අරමුණ

ශ්‍රී ලංකා මහවැලි අධිකාරියේ යෝජිත මොරගහකන්ද ජලාශ ව්‍යාපෘතියට යටත් වන ප්‍රදේශයේ පුරාවිද්‍යාත්මක හානි ඇගයීම් සමීක්ෂණයක් සිදු කිරීම මෙහි මූලික අරමුණයි.

1998 අංක 1152/14 දරණ (සංශෝධිත) පුරාවස්තු ආඥාපනතේ 43 (අ) සහ 47 වගන්ති ප්‍රකාර කොන්දේසිවලට යටත් ව කිසියම් සංවර්ධන කටයුත්තකට පෙර එම ව්‍යාපෘතිය හේතුවෙන් පුරාවිද්‍යාත්මක වටිනාකම් ඇති ස්ථාන, ස්මාරක හා පුරාවස්තුවලට කිසියම් හානියක් සිදුවන්නේ ද යන්න පිළිබඳ අගැයීම් වාර්තාවක් සකස් කළ යුතු ය. ඒ අනුව මොරගහකන්ද සංවර්ධන ව්‍යාපෘතිය යටතේ ව.කි. 29.5 ක වපසරියක භූමි ප්‍රමාණයක් ජලයෙන් යටවන බවට සැලසුම් කර ඇත. (සැලසුම් අංක 02 - මොරගහකන්ද ජලාශ ව්‍යාපෘතිය සැලැස්ම)

මෙම සැලැස්ම යටතේ නාඋල ප්‍රාදේශීය ලේකම් කොට්ඨාසයට අයත් ග්‍රාමනිලධාරී වසම් විශාල ප්‍රමාණයක් මෙම සංවර්ධන ව්‍යාපෘතියට යටත් වේ. එම සැලැස්මට අනුව හලාගොඩ, කඩවත, මැදපිහිල්ල, ඇලගමුව, ගල්පෝරුගොල්ල, කඹරව, ගලබොඩ යන ග්‍රාමනිලධාරී වසම්වලට අයත් ප්‍රදේශ සම්පූර්ණයෙන් ම ජලයෙන් යට වෙයි. මිල්ලගහමුලතැන්න, මොරගොල්ල, රජාවෙල, කෝන්ගහවෙල සහ මාරාගමුව යන ග්‍රාමනිලධාරී වසම්වලට අයත් ගම්මාන අඩක් ජලයෙන් යටවන බවට සැලසුම් කර ඇත. මෙම ප්‍රදේශවල පුරාවිද්‍යාත්මක සහ ඓතිහාසික වටිනාකමින් යුත් ස්ථාන, ස්මාරක සහ පුරාවස්තු පිළිබඳ ව අධ්‍යයනය කිරීම මෙම ගවේෂණයේ ප්‍රධානතම අරමුණයි.

1.4 පුරාවිද්‍යා හානි ඇගැයීම් සමීක්ෂණ ක්‍රමවේදය

මෙම ගවේෂණය හුදෙක් සමීක්ෂණයක් පමණකි. ඇවිද බලා මතුපිට හමුවන දත්ත රැස් කරමින් එම දත්ත හමුවන ස්ථානවල ඡායාරූප, සැලසුම් සහ නිරපේක්ෂ පිහිටීම් වාර්තා කරමින් සහ මතුපිටින් ලබා ගත හැකි නියැදි රැස් කිරීමත් ඒවා වාර්තාගත කිරීම, අධ්‍යයනය කිරීම සහ අර්ථ නිරූපණය කිරීමත් මෙම ගවේෂණයෙහි ක්‍රමවේදය ලෙස හඳුන්වමු. ඊට අමතර ව හමු වන පුරාවස්තු සහ පුරාවිද්‍යාත්මක අවශේෂ හදිසි බෙරාගැනීමේ පුරාවිද්‍යාත්මක ක්‍රමවේදය යටතේ ආරක්ෂා කිරීම, සංරක්ෂණය කිරීම සහ පවත්වාගෙන යාම යඳහා සුදුසු ක්‍රියාමාර්ග ඉදිරිපත් කිරීමක් මෙම වාර්තාවෙහි ඇතුළත් වේ.

2. මොරගහකන්ද ප්‍රදේශයේ භූගෝලීය හා ඓතිහාසික පරිසරය

2.1. අධ්‍යයන ප්‍රදේශයේ භූගෝලීය පසුබිම

ඉපැරණි පාෂාණ මූලාශ්‍රයකින් ජීර්ණය වී නිධි සාධනය වූ තැන්පතුවක් ලෙස හැඳින්වෙන උස්බිම් සංකීර්ණයට අයත් භූ විද්‍යා කලාපයක මාතලේ දිස්ත්‍රික්කයේ අපගේ අධ්‍යයනයට ලක් වූ ප්‍රදේශය පිහිටා තිබේ. ත්‍රිකුණාමලය සිට ශ්‍රී ලංකාවේ නිරිතදිගට විහිදී යන අවුරුදු මිලියන 2000 - 3000 ක් පැරණි උස්බිම් සංකීර්ණය ප්‍රධාන වශයෙන් ගානට් සහිත චානොකයිට්ස්වලින් සුපොහොසත් තැන්පතුවකි. නකල්ස් වැනි උද්ගතවල දී නිරාවරණිත මෙම චානොකයිට් පාෂාණය ඒකාකාර නැම් සහිත හුදෙකලා කඳු බව පැහැදිලි ය.

අධ්‍යයනයට ලක් වූ ප්‍රදේශයේ ඇති විශේෂතම භූවිද්‍යා සන්දර්භය හුණුගල් සහිත පාෂාණ තට්ටුවයි (National Atlas of Sri Lanka, pp. 24, 25). සවිවරතා සංගුණකය 0.2% සිට 0.8% දක්වා වූ මෙම පාෂාණය මාතලේ නාඋල ප්‍රදේශයේ සිට ඊශානදිගට ව්‍යාප්ත වන්නකි. මෙහි සුවිශේෂී ගුණාංගය වන්නේ මතුපිට ධාවන ජලය උරාගනිමින් ඇතුළත කුහර යාදාගැනීමේ භූවිද්‍යාත්මක කාර්යයයි. මේ නිසා ප්‍රදේශය ගැන අධ්‍යයනයක දී මෙම සුවිශේෂී ගුණාංගය පිළිබඳ අවබෝධයෙන් සිටීම වැදගත් වේ.

එසේ ම ක්වාට්ස් පාෂාණවල සංකේන්ද්‍රණයක් ද මේ ප්‍රදේශය ආශ්‍රිත ව හමු වේ. එමනිසා පෘථිවි අභ්‍යන්තර උෂ්ණත්වයට හා පීඩනයට ලක් ව මැණික් නිර්මාණය වීමේ හැකියාවක් තිබීම ද කළුගඟ ප්‍රදේශය ආශ්‍රිත ව එවැනි නිධි හමුවීම ද සැලකිල්ලට ගත යුතු ය (National Atlas of Sri Lanka, pp. 24, 25).

භූ විද්‍යාත්මක වශයෙන් මාතලේ ප්‍රදේශයට ඊසාන දිගින් දක්නට ලැබෙන විභේද ගහණය ස්ථානීය අධ්‍යයනයක දී වැදගත් වේ. ඉන් බහුතරයක් වයඹ - ගිනිකොණ දෙසට විහිදුණත් ප්‍රධාන විභේද දෙකක් අධ්‍යයන ප්‍රදේශයෙන් ආරම්භ ව ඊසාන දෙසට විහිදෙනු දක්නට ඇත (Map No. 3.2 (*Geology*) National Atlas of Sri Lanka, p. 25).

මහවැලි ගංගා ද්‍රෝණියට අයත් වන අධ්‍යයන ප්‍රදේශයේ දක්නට ඇති ප්‍රධාන ම ජලධාරය වන්නේ අඹන් ගඟයි. වාර්ෂික ව 1500 - 2000mm ක සාමාන්‍ය වර්ෂාපතනයක් ලබන මෙම ප්‍රදේශයේ ඇති පළල් නිම්න සහිත භූරූප විද්‍යාත්මක පරිසරය පුළුල් ගංගා ද්‍රෝණි නිර්මාණයෙහිලා ඉවහල් වේ (Map No. 3.7 (*Rainfall*) National Atlas of Sri Lanka, p. 35).

පෙර සඳහන් කළ මාබල් පාෂාණ ව්‍යාප්තිය ද විභේද විහිදීම් ද ගංගා ද්‍රෝණි ලක්ෂණ ද සැලකිල්ලට ගත් විට එම ලක්ෂණ ප්‍රදේශයේ අද්‍යතන භෞමික ලක්ෂණ තීව්‍ර කිරීමට හේතු සාධක වූවා පමණක් නොව තත් ප්‍රදේශයේ ගතිකත්වයට ද හේතු වන බව නිසැක ය.

2.1.1. ප්‍රදේශයේ දක්නට ලැබෙන භූ විද්‍යාත්මක සම්පත්

මයිකා -

අධ්‍යයනයට ලක් වූ ප්‍රදේශයේ මයිකා නිධි බහුල ව දක්නට ඇත. විශේෂයෙන් තලාගොඩ ප්‍රදේශයේ අඩි 20ක් පමණ ගැඹුරට මයිකා කැණීම සිදු කෙරෙන බව ක්ෂේත්‍ර අධ්‍යයනයේ දී අනාවරණය විය.

මැණික් -

ඉහත භූ විද්‍යාත්මක විස්තරයේ දී දැක්වූ අන්දමට මෙම ප්‍රදේශයේ බැර ඛණිජ (Heavy Minerals) නිර්මාණය වී ඇති බැවින් කළු ගං නිම්නයේ මැණික් නිධි තැන්පතු දක්නට ලැබේ.

ෆෙල්ඩ්ස්පාර් හා ප්ලුම්ස්පාර් -

තලාගොඩ ප්‍රධාන ව ඇති මෙම ඛණිජ වර්ග දෙක පිඟන් කර්මාන්තයට බහුල ව ගෘහාගන්නකි.

ග්‍රැෆයිට් -

පටු තීරු වශයෙන් ඊසාන නිරිත රේඛා ඔස්සේ අධ්‍යයන ප්‍රදේශය පුරා විහිදී පවතී.

කඔොක් හා ග්‍රැවල් -

ඉදිකිරීම් සඳහා බහුල ව යොදාගන්නා මෙම පස් වර්ග ප්‍රදේශයේ ආර්ථික වටිනාකමින් යුත් භූ විද්‍යාත්මක සන්දර්භයක් වේ.

මෙම ඛණිජ සම්පත් ප්‍රාථමික යකඩ යුගයේ සිට මහනුවර යුගය දක්වා සුවිශේෂ ලෙස වාණිජ රටාවට සම්බන්ධ වූ බවත් එය සෘජු ව පුරා ජනරේඛනය හා ජනාවාස රටාවේ ව්‍යාප්තියටත් පදනමක් වූන් බව පැහැදිලි ය.

2.2. අධ්‍යයන ප්‍රදේශයේ ඓතිහාසික පසුබිම

මාතලේ දිස්ත්‍රික්කය සමස්ත වශයෙන් ගෙන ඓතිහාසික සිද්ධි අධ්‍යයනයක දී භාවිත කළ හැකි/යුතු මූලාශ්‍රය ගණනාවකි.

2.2.1. ජනප්‍රවාද

අපගේ අධ්‍යයනයට ලක් වූ ප්‍රදේශයේ ඓතිහාසිකත්වය අවබෝධ කරගැනීම සඳහා පුරාවිද්‍යා නටබුන් මූලික වශයෙන් උපකාර කරගත හැකි අතර ඒ සඳහා පසුබිම් වශයෙන් මාතලේ ඓතිහාසිකත්වය විග්‍රහ කරගැනීමට සාහිත්‍ය හා පුරාවිද්‍යා යන මූලාශ්‍රයද්වය ම භාවිත කළ හැකි ය. අධ්‍යයන ප්‍රදේශයේ ඓතිහාසික පසුබිම සඳහා පාර්ශ්වික ආධාරයක් සපයන ජනප්‍රවාදය සාමාන්‍ය පරිදි ම අතිශයෝක්තීය බහුල බැවින් ඒ පිළිබඳ අවබෝධයෙන් යුතු ව අධ්‍යයනයට ප්‍රවිෂ්ට වීම වඩාත් සුදුසු වේ.

ජනප්‍රවාදයට අනුව මාතලේ ඓතිහාසිකත්වය රාවණා යුගය දක්වා දිව යන්නකි. වසර 4000කට පෙර මෙරට පාලනය කළ රාවණගේ පාලක මධ්‍යස්ථානය වූ ලංකාපුරය වර්තමාන මාතලේ 'ලග්ගල' ප්‍රදේශය බව පිළිගන්නා ගවේෂකයෝ (පියදාස කේ.ඩී., 73: 1982) ඒ ප්‍රදේශය ආශ්‍රිත ව ඇති රාවණාගල, රාවණාඇළ, සීතාගල, සීතාලෙන ආදී ස්ථාන නාමයන් ඒ අදහස තහවුරු කිරීමට යොදාගනිති (සුමනජෝති පරණගම, 5:1982) . එසේ ම රාම - රාවණා යුද්ධය ඇති වූ ප්‍රදේශය වර්තමාන 'රණමුරේ' ප්‍රදේශය යැයි ජනශ්‍රැතියේ පවතින අතර 'දුනුවිල' යනු ලංකේගලට හී විදීමට භාවිත කළ දුන්න වැදීමෙන් නිර්මාණය වූ විල බව පැවසේ (පියදාස කේ.ඩී., 73: 1982).

බුද්ධකාලයේ දී ශ්‍රී ලංකාවේ වාසය කළ යක්ෂ ගෝත්‍රිකයන්ගේ ජනාවාස පිහිටි ප්‍රදේශයක් වශයෙන් ද මෙම ප්‍රදේශය සැලකේ. ප්‍රදේශයේ දක්නට ඇති ශේෂ කඳු සියල්ල ම පාහේ විජයාගමනය හා සම්බන්ධ යක්ෂ ජනාවාසවලට ජනප්‍රවාද වශයෙන් සම්බන්ධ කොට ඇත. විජය - කුවේණි කථා ප්‍රවෘත්තියට මාතලේ ප්‍රදේශයේ සම්බන්ධකම් දක්වන ජනප්‍රවාදකරුවා යකුන්ගේ පුරය 'ලග්ගල' බවත් ඔවුන්ගේ අත් කැපූ ස්ථානය 'අතකොටලියැද්ද' බවත් දක්වයි. ඒ සමඟ ම බලාපේ, යක්මොවේ, හංවැල්ල, කඩුවෙල වැනි ලංකාවේ විවිධ ස්ථාන ද මෙම මාතලේ ප්‍රදේශය හා සම්බන්ධ කරමින් ජනප්‍රවාද ගොඩනැඟී ඇති බව පැහැදිලි වේ (-එම-). කෙසේ වුව ද මෙම ප්‍රදේශයේ වර්තමානයේ පවා පවතින යක්ෂ ඇදහීම අනෙක් ප්‍රදේශවලට සාපේක්ෂ ව වැඩි වීමත් මෙවැනි ජනප්‍රවාද බිහි වීමේ ප්‍රවණතාව වැඩි කරන්නකි.

වළගම්බා රජු විසින් මාතලේ ඓතිහාසික දඹුලු විහාරය කරවූ බව ජනප්‍රවාදගත ය (සුමංගල ඉනාමළුවේ, 125:1982). ආරම්භකයා ගැන මහාවංසයේ නිශ්චිත සඳහනක් නැති වුව ද එම විහාරයේ ප්‍රතිසංස්කරණ කටයුතු සම්බන්ධයෙන් I පරාක්‍රමබාහු රජු හා නිශ්ශංකමල්ල රජුට අදාළ ව දැක්වේ. එසේ වුව ද දඹුල්ල මහින්දාගමනයේ සිට ම සංඝාවාස වී තිබෙන්නට ඇතැයි පළවන මතය ද (-එම-) ප්‍රදේශයේ ඓතිහාසික අධ්‍යයනයක දී නොසලකා හැරීමට නුපුළුවන.

ජනප්‍රවාදයකට අනුව ගජබා විසින් අල්ලාගෙන ආ සොළීන් 24000ත් මහතලයක් පදිංචි කරවූ ස්ථානය බැවින් මාතලේ වූ බව දැක්වේ (සුමනජෝති පරණගම, 6:1982). ජනාවාස පුරාවිද්‍යාත්මක අධ්‍යයනයක දී ජනප්‍රවාදගත මෙවැනි තොරතුරු පිළිබඳ ව අවධානය යොමු කිරීම වැදගත් ය.

2.2.2 සාහිත්‍ය සහ ඓතිහාසික තොරතුරු

පූර්ව අනුරාධපුර යුගයේ පණ්ඩුකාභය කුමරා රජවීමේ දී තම මාමා වූ ගිරිකණ්ඩශිවහට පාලනය සඳහා භාරදුන් කොටස "මාතුල" ජනපදය වූ බව මූලාශ්‍රයගත අතර (-එම-) එය දඹුලු සෙල්ලිපියක එන "මාටුක ගාමබුජික" යන කොටස (මාතලේ දිස්ත්‍රික්කයේ බ්‍රාහ්මී ශිලාලේඛන, 339:1982) පදනම් කරගෙන "මාතුල" යනු වර්තමාන මාතලේ බව හඳුනාගෙන තිබේ. එසේ ම 'මාතලගමික' යනුවෙන් බ්‍රාහ්මී සෙල්ලිපියක දැක්වෙන්නේ 'මතලගමික' හෙවත් 'මාතල ග්‍රාමයේ' යන්න ම බව විද්වත් මතයයි.

මුල් අනුරාධපුර යුගය තුළ මාතලේ ප්‍රදේශය සම්බන්ධ ව වාර්තා අවස්ථා කිහිපයකින් ම හමු වේ. එම යුගයේ දී මාතලේ දිස්ත්‍රික්කයට වර්තමානයේ අයත් වන ප්‍රදේශ ජනාවාස වීම කෙරෙහි බලපෑ සාධක තුනක් මාතලේ කඩඉම් පොතෙහි දැක්වේ.

> ශ්‍රී මහාබෝධිය සමඟ පැමිණි අටළොස් කුලයක මිනිසුන්ගෙන් කුල දෙකකට අයත් පිරිස
> සොළීකරයෙන් අල්ලා ගෙන ආ පිරිස
> වැද්දන්ගෙන් පැවත එන පිරිස (හුලංගමුව තිස්ස, 31:1982)

වේදිස දේවියගේ පරම්පරාවේ ක්ෂත්‍රියයෝ පැමිණ පදිංචි වූ ප්‍රදේශ අතරින් වන්දගුප්ත පදිංචි වූයේ මාතලේ ප්‍රදේශයේ බව මාතලේ කඩඉම්පොත විස්තර වශයෙන් දක්වා ඇත.

ඉන් අනතුරු ව වළගම්බා රජසමය ගැන සඳහන් කරන මහාවංසය ත්‍රිපිටකය ග්‍රන්ථාරූඪ කිරීම පිළිබඳ ඉතා කෙටි සඳහනක් කරයි. එසේ වුව ද නිකාය සංග්‍රහය දක්වන විස්තර අනුව එම ඓතිහාසික ක්‍රියාදාමය සිදු වූ ස්ථානය ලෙස සැලකෙන්නේ මාතලේ අලුවිහාරයයි.

සංඝතිස්ස රජු, මානවම්ම රජු හා I විජයබාහු රජු සම්බන්ධ ව සමහර අවස්ථාවල විස්තර කෙරෙන මේරුකන්දර මලයරට යනු වර්තමාන මාතලේ ප්‍රදේශයේ උතුරු/නැඟෙනහිර සීමා බව පිළිගැනේ. මහසෙන් රජු විසින් ඇළහැර ප්‍රදේශයේ දියත් කළ වාරිකර්මාන්ත ව්‍යාපාරය ද ඓතිහාසික වශයෙන් වැදගත් වේ.

පොළොන්නරු යුගයේ දී යුද්ධමය ව්‍යාපාරවල දී නිතර සඳහන් වන මේරුකන්දර, මිල්ගාමය, බුද්ගමිය, සාරගාම යන ප්‍රදේශ පිහිටා ඇත්තේ මාතලේ දිස්ත්‍රික්කය තුළ ය.

විශේෂයෙන් I පරාක්‍රමබාහු කුමරු II ගජබා රජුගේ පාලනය පිළිබඳ ඔත්තු සෙවීමට පොළොන්නරුවට යාම, කිත්සිරිමේඝ රජුගේ සේනා පළවා හැරීම, පොළොන්නරුවෙන් නුවර මායාරටට පිටත් ව යෑම, II ගජබා රජුට විරුද්ධ පළමු සටන යනාදී අවස්ථා සම්බන්ධයෙන් මාතලේ ප්‍රදේශය ඓතිහාසික වැදගත්කමක් උසුලයි.

පොළොන්නරුවේ සුවිශේෂී පාලනයක් ගෙන ගිය නිශ්ශංකමල්ල රජතුමා ද මාතලේ ප්‍රදේශයේ යුවරාජ පදවිය දැරූවෙකි. II විජයබාහු යටතේ ලග්ගල ප්‍රදේශයේ සිටිමින් ප්‍රාදේශීය පාලනයක් ගෙන ගිය නිශ්ශංකමල්ල රජු පසු ව සමස්ත ශ්‍රී ලංකාවේ ම පාලකයා බවට පත් වීම මාතලේ ඓතිහාසිකත්වයට සාධක සපයන්නකි.

පශ්චාත් පොළොන්නරු යුගයට අයත් අධ්‍යයන ප්‍රදේශයට අදාළ ඓතිහාසික සාධක විරල වන නමුත් එකල ද දඹුල්ල, වහකොට්ටේ, කිරිඔරුව, සාලගම, මාළිගාතැන්න වැනි ප්‍රදේශ ආශ්‍රිත ව ප්‍රාදේශීය පාලකයින් යටතේ ජන සංකේන්ද්‍රණයක් සහිත වූ බව විද්වත් පිළිගැනීමයි. කෝට්ටේ සමය වනවිට මාතලේ පාලන ප්‍රදේශය කෝට්ටේ රජුගේ උඩරට සාමන්තයා යටතේ පාලනය විය (ඇටඔගස්කඩ ආර්., 21:1996).

ඓතිහාසික යුගයේ දී මාතලේ ජනපදයෙන් බිහි වූ රාජකීයයන් පිළිබඳ සාධක සහිත තොරතුරු ඉදිරිපත් කරන විද්වත්හු පහත රජවරු මාතලේ ජනපදයේ මූලයන් සහිත බව පෙන්වා දෙති .

සේනාසම්මත වික්‍රමබාහු රජු (-එම-, 46-64)
විමලධර්මසූරිය රජු (-එම-, 65-80)
I සෙනරත් රජු (-එම-, 81-93)
I විජයපාල රජු (-එම-, 94-110) - මොහු මාතලේ ගොඩපොළ ප්‍රදේශය රාජධානිය කරගත් රාජකීයයෙකි.

ඔහුගේ මාලිගය පිළිබඳ ප්‍රදේශයේ පවතින ජනකවියක් මෙසේ ය.

පනන්තඩිය නාවරගොඩ ස්‍රුබාවා
මුවන්දෙණිය ගොඩපොළ මාලිගාවා
පත් ඉරු ලෙසට ගල්පඩි ගාවින් ගාවා
කඩා වැටුණි 'ගොඩපොළ' මාළිගාවා (ඇටඔගස්කඩ ආර්., 121:1996)

ගන්නෝරු සටන සඳහා විශාල වශයෙන් හමුදාමය සහයෝගයක් ලබාදුන් ප්‍රාදේශීය නායකයෙකු වශයෙන් විජයපාල රජු ඉතිහාසගත වී ඇත (-එම-, 98). මේ නිසා ම දියෝගු ද මෙලෝ හට ප්‍රබල පරාජයකට මුහුණ දීමට සිදු වූ බව දැක්වේ.

II රාජසිංහ රජු සමඟ අමනාප වූ විජයපාල රජු ගෝවට පැන ගිය පසු මාතලේ ප්‍රදේශය මහනුවර රාජ්‍යයට අයත් මහදිසාවක තත්ත්වයට වැටී එතැන් පටන් 1815 දක්වා ම මහනුවර උඩරට රජු විසින් පත් කරන මහදිසාපතිවරයෙකු විසින් පාලනය විය. අවසාන වශයෙන් 1819 දී ඉංග්‍රීසි පාලනය යටතේ මාතලේ පරිපාලන දිස්ත්‍රික්කය බිහි විය.

1.2.3 පූරාවිද්‍යාත්මක තොරතුරු

මෙරණිතම දකුණු ආසියාතික මානව අවශේෂ නොඑසේ නම් ජනාවාස අවශේෂ සහිත ශ්‍රී ලංකාවේ සමස්ත භූමිය ම ප්‍රාග් ඓතිහාසික හෝ පූර්ව ඓතිහාසික කවර කාලයක් සඳහා හෝ පර්යේෂණමය වටිනාකමක් දරයි.

අධ්‍යයනයට පාත්‍ර වූ ප්‍රදේශය අයත් සමස්ත මාතලේ දිස්ත්‍රික්කයෙන් ප්‍රාග් ඓතිහාසික යුගයට අයත් ජනාවාස අවශේෂ, මානව අවශේෂ ද හමු වී තිබේ. සීගිරිය ආශ්‍රිත අලිගල, පොතාන, උනඑගල යන ස්ථාන පෙරටු ව මෙම ප්‍රාග් ඓතිහාසික අවශේෂ අතට හමු වේ. මානව ඇටසැකිලි, ශිලා මෙවලම්, සත්ත්ව හා ශාක අවශේෂ මෙම ප්‍රදේශවලින් වාර්තා වී ඇත. අධ්‍යයනයට ලක් නොවූ ප්‍රදේශ බහුල තත් ප්‍රදේශයේ ප්‍රාග් ඓතිහාසික ජනාවාස වීමට ඉඩකඩ සහිත ස්ථාන කැලයෙන් වැසී තවමත් තිබෙනවා විය හැකි ය.

මානවයා ශිෂ්ටාචාරමය වශයෙන් දියුණු වන එක් අවස්ථාවක දී ක්‍රමවත් සුසාන විධීන් භාවිත කළ අතර එවැනි අවස්ථාවන් සඳහා සාධක ශ්‍රී ලංකාවේ වියළි කලාපයෙන් බහුල ව හමු වේ. පූර්ව ඓතිහාසික මානවයා පිළිබඳ අධ්‍යයනයකට අවශ්‍ය වන සාධකවලින් පොහොසත් වූ ස්ථාන අතරින් අධ්‍යයන ප්‍රදේශයට ආසන්නයේ පිහිටි ඉඹබන්කටුව සුසාන භූමියට හිමිවන්නේ අද්විතීය ස්ථානයකි. ඊට අමතර ව

රොටවැව
වම්බටුයාය
යටිගල්පොත්ත
දිගම්පතහ
කණ්ඩලම

යන ස්ථානවලින් පූර්ව ඓතිහාසික ජනාවාස අවශේෂ හමු වී තිබේ.

මෙම යුගය හා සම්බන්ධ පුරාවිද්‍යා සාධක රාශියක් මාතලේ දිස්ත්‍රික්කය පුරා විසිර පවතී. ඒ අතරින් වැදගත් ම සාධකය වන්නේ සෙල්ලිපි සාධකයන් ය. මෙම සාධක ආධාර කරගෙන ජනාවාස ව්‍යාප්තිය අධ්‍යයනය කරගත හැකි බැවින් මෙවැනි ගවේෂණයක් සඳහා මහෝපකාරී මාර්ගෝපදේශයක් සෙල්ලිපි මඟින් ලබාගත හැකි ය. අනුර මනතුංග මහතා විසින් ඉදිරිපත් කරන ස්මාරක ස්ථාන අතරින් බොහොමයක් මූල බ්‍රාහ්මී සෙල්ලිපි සහිත ස්ථාන වේ. ඒවා සමස්ත මාතලේ දිස්ත්‍රික්කය පුරා විසිරී තිබීමෙන් පෙනී යන්නේ සමස්ත මාතලේ දිස්ත්‍රික්කය පුරා සැලකිය යුතු ජන ව්‍යාප්තියක් පැවති බවයි.

ඉළුනාපහුර
අලුවිහාරය
ගනේගෙදර
එඬේරගල
දඹුල්ල
පිදුරංගල
ගොම්මොට්ටාව
කළුදිය පොකුණ

යන ප්‍රදේශවලින් මුල් බ්‍රාහ්මී අක්ෂර සහිත ලිපි හමු ව තිබේ. මෙම ලිපි බොහෝ විට සංඝයාට ලෙන් පූජා කිරීම හා සම්බන්ධ ඒවා ය.

"කොළගම ශිවපුත මක්ඨිමයශ ඣතය තිශ දෙවිය ලෙණෙ
ශගශ දිනෙ තිශ දෙවිය ශදෙ මඩනගර දිඩගම විමනග බරිය..."

පරිවර්තනය :- කොළගම ශිවගේ පුත් මජ්ඣිම කුමරුගේ දියණිය වූ තිස්සා දේවියගේ ලෙන සංඝයාට පූජා කළේ.
(අංක 873-1, මාතලේ දිස්ත්‍රික්කයේ බ්‍රාහ්මී ශිලාලේඛන, 340:1982)

(මෙහි ඇති 'කොළ' ශබ්දය වූ කලී ද්‍රවිඩ භාෂාවෙන් යකඩ ලෙස අරුත් ගැන්වෙන බවට මතයක් පවතින බැවින් එය යකඩ වැඩ කළ ගම වශයෙන් නම් කළ බව සිතීමට අවකාශ තිබේ.)

එබැවින් මෙම ලෙන්වල ජීවත් වූ භික්ෂු සංඝයාගේ සිවිපසය ලබාදීම සඳහා ආරාමගම වශයෙන් යැලකිය යුතු ප්‍රමාණයේ ජනාවාස ව්‍යාප්තියක් තත් ප්‍රදේශ ආශ්‍රිත ව තිබිය යුතු බව පැහැදිලි ය.

බ්‍රාහ්මී සෙල්ලිපිවලින් අතීතයේ පටන් මෙම ප්‍රදේශයේ පැවති මැණික් කර්මාන්තය පිළිබඳ ව ද තොරතුරු හමු වේ. ක්‍රි.පූ. 76 - 62 කාලයට අයත් දෙමැදමය ලිපියේ *"මවුඩි රඤඤ මණිකරඟ ශිලඉටක කටය..."*. (මෙහි 'මවුඩි' යනු මහාචූලික මහාතිස්ස රජු ලෙස හඳුනාගෙන ඇති අතර *'මැණික් ගල් කපන්නෝ ගඩොල් සමාන ගල් සඳහා මෙහි පැමිණ මරුමුවට පත් වූහ'* යනුවෙන් මෙය පරිවර්තනය කර ඇති අතර ශිලඉටක යනු මයිකා ලෙස විශ්වාස කෙරේ.) 'පවිනරජ' හෙවත් ප්‍රාදේශීය රජවරුන් පිළිබඳ ඇඹුල්අඹේ ලිපියෙන් තොරතුරු හෙළි වී ඇත. රාජ්‍ය සේවයේ නියුතු දනුග, තොටබොජක, බතබොදක වැනි තවත් දුර්ලභ නිලධාරී නාමයන් දඹුල්ල, කණ්ඩලම, ගොන්මොට්ටාව ප්‍රදේශයෙන් හමු වී ඇති අතර ඒවා පිළිවෙලින් ධනුද්ධර, තොටනායක හා රාජකීය බත්ගෙයි නායකයා ලෙස හඳුනාගෙන තිබේ. අවශේෂ ලිපි අතර පරුමක නාමධාරීන් බහුල වේ. එසේ ම

'ඉමනි දුවෙ ලෙණනි දමිළ තෙරඟ ශදිඟ දය ගඟඟ දිනෙ'

යනුවෙන් තල්ගහගොඩ විහාරය ලිපියෙහි දැක්වෙන තොරතුරු ජනාවාස අධ්‍යයනයක දී බැඳගත් වන්නේ එහි දෙමළ භික්ෂුවක් පිළිබඳ දක්නට ලැබෙන සඳහන නිසා ය.

මධ්‍ය අනුරාධපුර යුගයට අයත් සාධක අතර සුවිශේෂී වන්නේ සීගිරි පර්වතයයි. එවැනි මහා නිර්මාණයක තදානුබද්ධ ප්‍රදේශයේ ජනාවාස ව්‍යාප්තිය හා එම ජනාවාසවල ජීවන මට්ටමේ විශිෂ්ටතා පිළිබඳ දිගින් දිගට සාකච්ඡා කිරීම අනවශ්‍ය ය. සීගිරිය යනු විනෝද උයනක් හෝ තපෝවනයක් හෝ අන්‍යමක් වේවා එය ජනාවාසවලින් හුදෙකලා වූවකැයි සිතීම අයෝග්‍ය වේ. ඒ නිසා සීගිරි කාශ්‍යප සමයේ එනම් ක්‍රි.ව. 5 - 10 යුගවල ද අපගේ අධ්‍යයනයට බඳුන් වූ ප්‍රදේශය ජනාවාස සංකේන්ද්‍රණයක් වූ බව පැහැදිලි ය. මාතලේ ප්‍රදේශයේ පැවති ජනාවාස අතර කොළගම, ගරදිඩාගම වැනි ප්‍රදේශ සෙල්ලිපිවල මෙන් ම සීගිරි ගීවල ද දක්නට ලැබීම විමසා බැලිය යුත්තකි.

"ඍවස්ති, බුද්ගමු වෙහෙරෙ ඍියම්ඡෙට්ඨ නා සගය්මි ලීම්
බලන්නට් ගැහැනින් බැලූ මෝ සිහිගිරි
ඊරිමන් ඡොල් කතුන් ම යත්
කළ ඡොලන්නට් හුන්

ඉහත සීගිරි ගීයෙහි බුද්ගම යනු බුද්ධගාම හෙවත් වර්තමාන මැණික්දෙන ප්‍රදේශය ලෙස හඳුනාගෙන ඇති අතර තවත් ගීයක *'බුද්ගමියේ වැසි කිතග්ගොයි ගී'* යනුවෙන් දැක්වෙන බැවින් මෙම සාධක දෙක ම පදනම් කරගෙන මැණික්දෙන ප්‍රදේශය කවියන් වැනි උගතුන් වාසය කළ ප්‍රදේශයක් ලෙස හඳුනාගැනීම යුක්ති යුක්ත වේ.

අනුරාධපුර යුගයේ පශ්චිම සමයට අයත් නිර්මාණ ද මාතලේ ගවේෂණයක දී හමු වේ. ඒ අතර,

- විදුරාණල
- නාළන්දා ගෙඩිගෙය
- කළුදියාපොකුණ
- මැණික්ගෙදණ
- හුවරගල
- මැවිළ

යන ප්‍රදේශවලින් හමුවන සාධක වැදගත් වේ. මේ යුගයට අයත් දියුණු නාක්ෂණික සාධක වශයෙන් යකඩ උදුන් අවශේෂ කිරිඔය නිම්නයේ අලකොළවැව හා වැවල යන ස්ථානවලින් හමු වීමෙන් (Manjusri Mandalika, 115-120:1990) පැහැදිලි වන්නේ ප්‍රදේශයේ ඒක අවධානා ඔස්සේ අධ්‍යයනය කළ හැකි සංකීර්ණ ජන ශිෂ්ටාචාරයකි.

I පරාක්‍රමබාහු රජුට විදේශ සටන් ව්‍යාපාරවල දී දායකත්වය සැපයූ විරුවන් කිහිපදෙනෙක් ම මාතලේ ජන්මලාභීහු වෙති. ඒ අතර කිත්ති නගරගිරි යනු නුවරගල ප්‍රදේශයේ සිටි පුද්ගලයෙකු වන බව සෙල්ලිපි හා වංශකථා සාධක තහවුරු කරයි. පරාක්‍රමබාහු රජුගේ විදේශ ආක්‍රමණ සඳහා දායකත්වය සැපයූ ලංකාපුර දණ්ඩනාථයන් ද මාතලේ ප්‍රදේශයේ විසූ අයෙකි.

සෙල්ලිපි සාධක අනුව තත් ප්‍රදේශය හා මධ්‍යම රාජාණ්ඩුව අතර පැවති අවියෝජනීය සම්බන්ධය දක්වන අවස්ථා විරල නොවේ.

නිලගම ලිපිය - *"මපුරමු බුදදස දළි මුගලන මහරජ්..."* - II මුගලන් රජු

> මෙහි ඇති 'වහෙරළවිදිවි' යනු වහලුන් නිදහස් කිරීම බවට පළ වී ඇති මතය ද ප්‍රදේශය පිළිබඳ අධ්‍යයනයක දී වැදගත් වේ. (කරුණාරත්න සද්ධාමංගල, 36:1982)

ගැරඬිගල ලිපිය - III කාශ්‍යප රජු කුඹුරක් පූජා කළ බව මෙහි දැක්වේ.

මෙම සෙල්ලිපි සාධක සහිත ප්‍රදේශ වර්තමානය දක්වා ම ජනශූන්‍ය ව නොපැවති බවට ගැරඬිගල ප්‍රදේශය අතීතයේ දී 'අජගරගිරි' ලෙසත් නිලගම ප්‍රදේශය 'නිලගම' වශයෙනුත් ගොම්මොට්ටාව ප්‍රදේශය 'ගෝසීසපබ්බත' යනුවෙනුත් හැඳින්වීමෙන් ම පැහැදිලි වේ.

ආශ්‍රිත මූලාශ්‍රය

මතුංග අනුර, ***මාතලේ දිස්ත්‍රික්කය***, පුරාවිද්‍යා දෙපාර්තමේන්තුව, 2005.

ඉලංගසිංහ මංගල, ***දඹුලු විහාරය***, 1987.

කුමාරතුංග ඩී.ජී., ***ශ්‍රී ලංකාවේ ඓතිහාසික භූමි සිතියම් සංග්‍රහය***, වංශකතා ප්‍රකාශකයෝ, කුරුණෑගල, 2006.

කළුහාණවංශ හිමි කුඩාවැල්ලේ ධීරානන්ද, ***ලංකාවේ ඓතිහාසික භූ සිතියම්***, එම්.ඩී.ගුණසේන සහ සමාගම, 1967.

ඓතිහාසික මාතලේ, (ප්‍රකාශනය) මාතලේ දිසා සංස්කෘතික මණ්ඩලය, 1982.

ඓතිහාසික මාතලේ - පරණගම සුමනජෝති හිමි (පිටු 5 - 13)

මාතලේ දිස්ත්‍රික්කයේ ශිලාලේඛන - සද්ධාමංගල කරුණාරත්න (පිටු 35 - 39)

මාතලේ ඉතිහාසය හැදෑරීමට ඉවහල් වන ඓතිහාසික හා සාහිත්‍ය මූලාශ්‍ර - තිස්ස හුලංගමුව (පිටු 20 - 35)

රංගිරි දඹුලු රජමහා විහාරය හා සංඝාරාම - ඉනාමළුවේ සුමංගල හිමි (පිටු 125 - 127)

ලග්ගල පුරාණය - කේ.ඩී.පියදාස (පිටු 73 - 75)

සිරිවංශ රම්‍ය, ***මාතලේ විහාර වංශය***, සංස්කෘතික කටයුතු දෙපාර්තමේන්තුව, 2009.

ඇටඹගස්කඩ ආර්, ***මාතලේ රාජකීයයෝ***, එස්.ගොඩගේ සහ සමාගම, 1996.

පුරාණ ස්මාරක නාමාවලිය, සංස්කෘතික කටයුතු අමාත්‍යාංශය, 1972.

The Settlement Archaeology of the Sigiriya - Dambulla Region, Ed: Bandaranayake S, Mogren Mats, Epitawatte S, Postgraduate Institute of Archaeology, 1990.

3. පුරාවිද්‍යාත්මක උරුම ස්ථාන

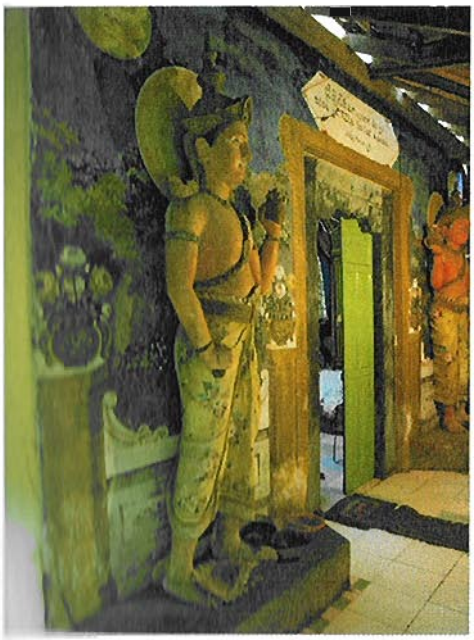
පුරාවිද්‍යා ස්ථානයේ නම : රජාවෙල ශ්‍රී බෙත්තාලෝක විහාරය			
ස්මාරකයේ අංකය : MOK 09/01			
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : කෝන්ගහවෙල	
නිරපේක්ෂ පිහිටීම :	N - 7° 40' 12.8" E - 80° 42' 22.3"	MSL : 200m	
සාපේක්ෂ පිහිටීම : දඹුල්ල - මාතලේ මාර්ගයේ නාඋල හන්දියෙන් වමට හැරී නාඋල - ඇළහැර මාර්ගයේ කි.මී. 5 ක් පමණ ගිය විට කෝන්ගහවෙල ග්‍රාමය හමුවේ. සියලු ම ග්‍රාමීය අවශ්‍යතා සම්පූර්ණ කරන ලද කුඩා මංසන්ධියක් මෙම ස්ථානයේ පිහිටා ඇත. මෙම ස්ථානයෙන් දකුණට හැරී කි.මී. 1 ක් පමණ ගිය විට ශ්‍රී බෙත්තාලෝක විහාරය හමු වේ.			
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : වසර 50 ක් පමණ පැරණි ආවාස ගෙය සහ සිතුවම් සහිත බුදුමැදුර වසර තුන්සියයක් පමණ පැරණි බෝධීන් වහන්සේ			
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්		නැත ✓
සිදුවන හානිය පිළිබඳ විස්තර : ජල යෝජනා ක්‍රමයට යට නොවුණ ද මෙම ස්ථානය ජලාශය ඉදිකිරීමෙන් පසු හුදෙකලා වීමේ අවදානමක් පවතී.			



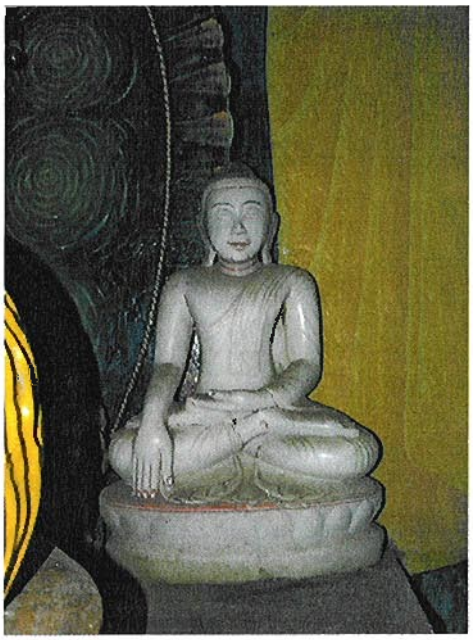
බෝධිය



විහාරගෙයි බිතුසිතුවම්



විහාරගෙයි පිවිසුම් දොරටුව



පෞරාණික බුදු පිළිමයක්

පුරාවිද්‍යා ස්ථානයේ නම : රජාවෙල වෙහෙරගොඩැල්ල			
ස්මාරකයේ අංකය : MOK 09/02			
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : කෝන්ගහවෙල	
නිරපේක්ෂ පිහිටීම :	N - 7° 40' 14.9" E - 80° 42' 27.1"	MSL : 215m	
සාපේක්ෂ පිහිටීම : MOK09/01 ස්ථානයට උතුරු දෙසින් මීටර් 100 පමණ දුරින්			
දැක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : විනාශයට පත් වී ඇති චෛත්‍යයක ලක්ෂණ සහිත ස්මාරකයක් අනුරාධපුර යුගයේ ලක්ෂණ දරණ ගඩොල් අවශේෂ සකස් කරන ලද කළු ගල් ගඩොල් ඇතිරුම			
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්		නැත ✓
සිදුවන හානිය පිළිබඳ විස්තර : ජල යෝජනා ක්‍රමයට යට නොවුණ ද මෙම ස්ථානය ජලාශය ඉදකිරීමෙන් පසු හුදෙකලා වීමේ අවදානමක් පවතී.			



සකස් කරන ලද කළුගල් අවශේෂ සහිත වෙහෙර ගොඩැල්ල



ගඩොල් ඇතිරුම



ගඩොල් අවශේෂ

පුරාවිද්‍යා ස්ථානයේ නම : මැදකිඳ වෙහෙරගොඩැල්ල		
ස්මාරකයේ අංකය : MOK 09/03		
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : කෝන්ගහවෙල
ඇලසුම් අංක : 5		
භූගෝලීය පිහිටීම	N - 7° 39'50.5" E - 80° 42' 23.3"	MSL : 191m

සාපේක්ෂ පිහිටීම :

ඇළහැර නාඋල මාර්ගයේ සිට රජාවෙල දක්වා දිවෙන මාර්ගයෙන් නැඟෙනහිර දෙසට කි.මී.1.5 ක් පමණ ගමන් කිරීමේ දී අඹන්ගඟ හරහා ඇති එල්ලෙන පාලම තරණය කර හතරවටින් ම අඹන්ගඟින් වට වූ අක්කර 35 ක් පමණ වපසරියකින් යුක්ත දූපතේ උස් ස්ථානයේ පුරාවිද්‍යාත්මක නටබුන් දක්නට හැකි ය.

දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ :

විනාශයට පත් වූ චෛත්‍යයක්
විනාශයට පත් වූ ගොඩනැඟිලි පාදමක්
ශිලාමය ප්‍රාකාරයක නටබුන්
ගල් කණු රැක අවශේෂ
මැටි බඳුන් අවශේෂ
උළුකැට / කොටස්

ස්මාරකයකත්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්	✓	නැත	

සිදුවන හානිය පිළිබඳ විස්තර :

ජලාශය ඉදිකළ විට මෙම ස්ථානය ජලයෙන් යට වේ.



උළු තට්ටු



ගඩොල් පාදම්

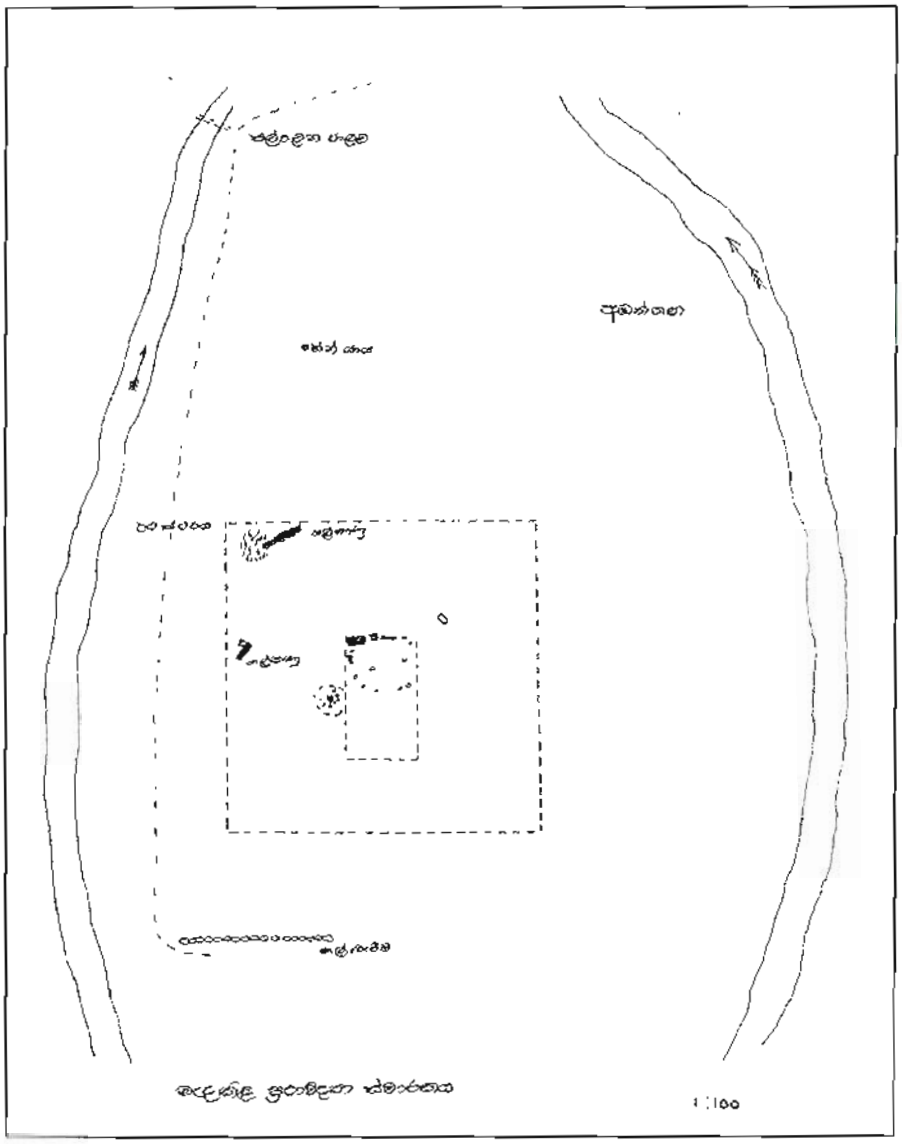


පසින් යට වී ඇති ගල්කණු



ප්‍රාකාරය

විශාල උළු තැන්පතුවක් හමු වීම මඟින් උළු සෙවිළි වහළයක් තිබුණා යැයි සිතිය හැකි මෙම ගොඩනැඟිල්ලට හසුවන ප්‍රදේශය මීටර් 15 x 15 ක පමණ ප්‍රමාණයෙන් යුක්ත වන අතර ස්තූපයක් යැයි සැලකිය හැකි ප්‍රදේශය මීටර් 15 ක පමණ අර්ධ විෂ්කම්භයකින් යුක්ත වේ. සමස්ත තටබුන් සහිත ප්‍රදේශය වර්තමානයේ හේන් ගොවිතැන සඳහා යොදා ගනු ලැබේ.



සැලසුම් අංක 05 - මැදකිඳ වෙහෙරගොඩැල්ල

පුරාවිද්‍යා ස්ථානයේ නම : **කෝන්ගහවෙල බෝධිය අසල ගල් කණුව**			
ස්මාරකයේ අංකය : MOK 09/04			
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : කෝන්ගහවෙල	
භූගෝලීය පිහිටීම	N - 7° 40' 10.5" E - 80° 42' 33.1"	MSL : 204m	
භෞතික පිහිටීම : කෝන්ගහවෙල මංසන්ධියේ සිට රජාවෙල දෙසට ගමන් කරන මාර්ගය උතුරට සීමා වන අතර නැගෙනහිරින් කෝන්ගහවෙල ප්‍රජාශාලාව ද, බටහිර දිශාවෙන් ඉපැරණි බෝධිය ද, දකුණු දිශාවෙන් මඩකුඹරකින් ද සීමා වන ප්‍රදේශයක සේපාල නමැති පුද්ගලයෙකුගේ පෞද්ගලික භූමි භාගයක මෙය පිහිටා ඇත.			
දැනට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : ගල්කණුවක්			
ස්මාරකගතකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්		නැත ✓



මෙතැනට මට්ටමේ සිට සෙ.මී. 60 ක පමණ උසකින් යුත් සෙ.මී. 20 x 20 ප්‍රමාණයේ සමසතරස්‍ර ගල් කණුවක අවශේෂයකි. හාත්පස වෙනත් කිසිදු පුරාවිද්‍යා ස්මාරකයක අවශේෂ දක්නට නොලැබේ. එහෙත් රජාවෙල, වෙහෙරගොඩැල්ල, මැදකිඳ යන ස්ථානවල හමුවන අවශේෂ හා මෙම ගල්කණුව අතර සම්බන්ධයක් තිබූ බව කිව හැකි ය.

පුරාවිද්‍යා ස්ථානයේ නම : ඇලගමුව ශිලාමය අවශේෂ					
ස්මාරකයේ අංකය : MOK 09/05					
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල		ග්‍රාමනිලධාරී වසම : ඇලගමුව		
නිරපේක්ෂ පිහිටීම	N - 7° 39' 49.7" E - 80° 43' 20.4"		MSL : 234m		
සාපේක්ෂ පිහිටීම : නාඋල - ඇළහැර මාර්ගයේ අඹන හන්දියෙන් දකුණට හැරී මොරගොල්ල - කඹරව මාර්ගයේ ඇලගමුව ප්‍රදේශයේ මාර්ගයෙන් දකුණු පස මෙය පිහිටා ඇත.					
දැනට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : සකස් කළ ගල් කුට්ටි					
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?		ඔව්		නැත	✓



ප්‍රදේශයේ තැන තැන විසිරුණු කළුගල් කුට්ටි අතීත මානව ක්‍රියාකාරකම් ලෙස හඳුනාගැනීමට ඇති ඉඩකඩ බොහෝ ය. මෙය කිසියම් ජලපෝෂක අවශ්‍යතාවක් සම්පූර්ණ කරන බව පැහැදිලි ය. මෙම ප්‍රදේශය මොරගහකන්ද ජලාශයට යට නොවන බැවින් ඒ ස්ථානය පිළිබඳ වැඩිදුර අධ්‍යයනය මඟින් නිවැරදි නිගමනයකට එළඹිය හැකි ය.

පුරාවිද්‍යා ස්ථානයේ නම : මැදපිහිල්ල වෙහෙරගොඩැල්ල		
ස්මාරකයේ අංකය : MOK 09/06		
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : කඩවත
සැලසුම් අංක : 6, 7, සහ 8		
නිරපේක්ෂ පිහිටීම	N - 7° 40' 54.2" E - 80° 44' 30.1"	MSL : 183m

සාපේක්ෂ පිහිටීම :

නාඋල - ඇළහැර මාර්ගයේ කඩවත සහ මැදපිහිල්ල ගම් දෙකට සීමා වන ස්ථානයේ මෙය පිහිටා ඇත.

දැනට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ :

කැඩී ගිය ගල් කණු කොටස්
ගඩොල් කැබලි
කෙසිකිළි ගලක්
මැටි බඳුන් අවශේෂ
යකඩ ඇණ අවශේෂ
අත්හැර දමන ලද මෑතකාලීන බෞද්ධ ආරාමයක්

ජලාශගකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්	✓	නැත	

සිදුවන හානිය පිළිබඳ විස්තර :

ජලාශය ඉදිකළ විට මෙම ස්ථානය සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.



ගල්කණු අවශේෂ



බුදුපිළිමය යටවී ඇති ස්ථානය



කෙසිකිළි ගල



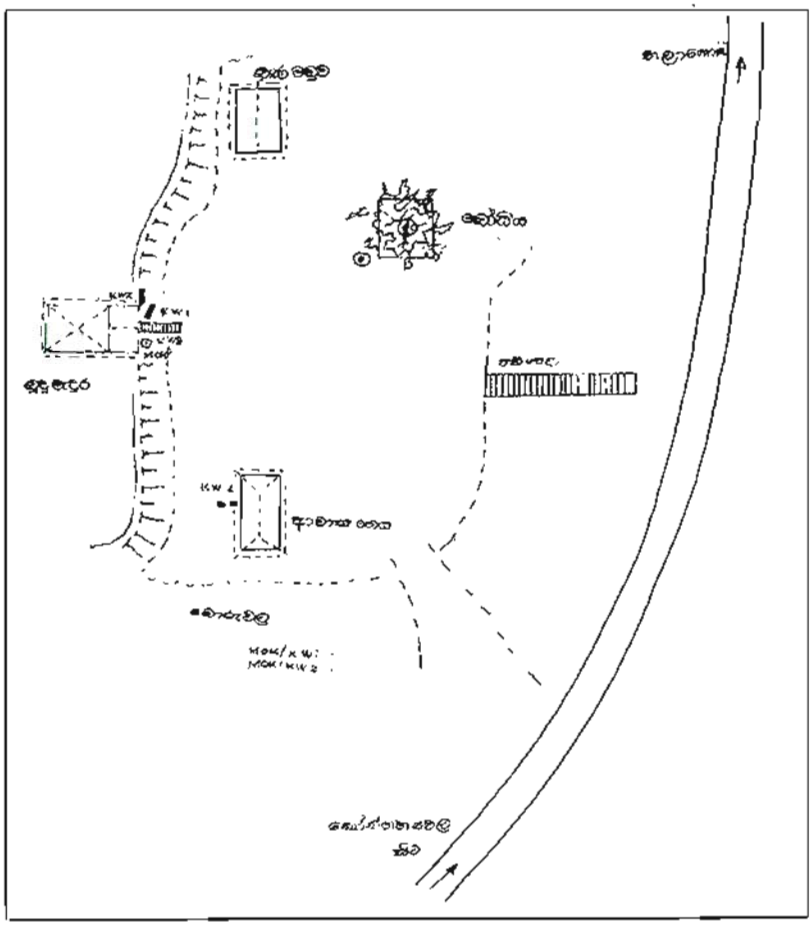
ගරාවැටෙමින් පවතින නව බුදුමැඳුර



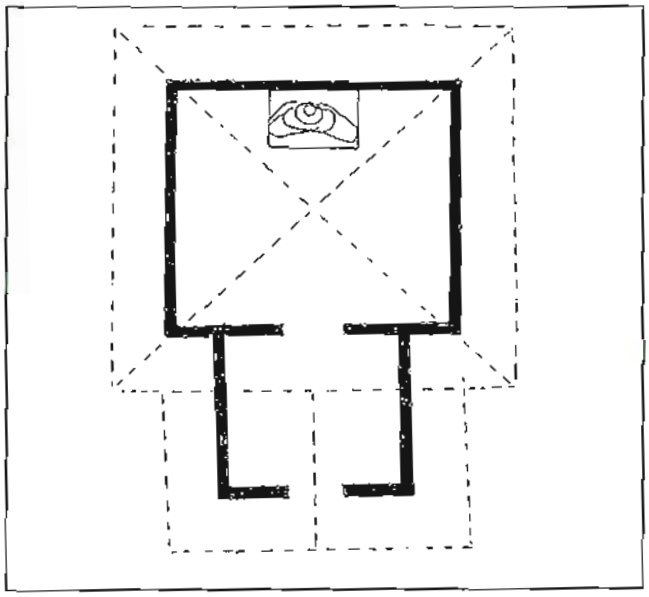


පස් කපන ස්ථානයේ නිරාවරණව වී ඇති සංස්කෘතික සාධක සහිත ස්තර

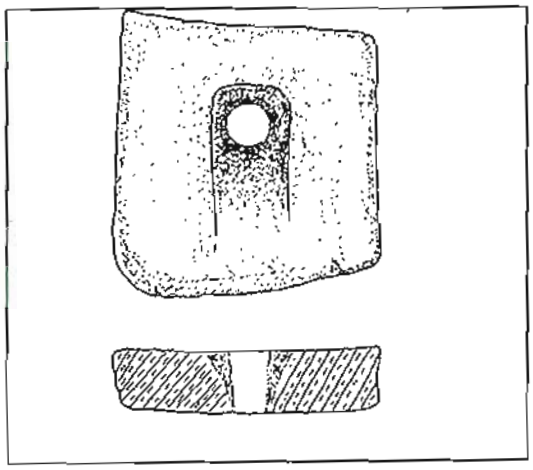
ප්‍රදේශවාසීන් පවසන ආකාරයට මෙම ස්ථානයේ, දැනට විනාශ වී ඇති නව පිළිමගෙය ඉදිකිරීමේ දී ඒ සඳහා සාණ්ඨාර කුලුණක් ඉදිකිරීමට සැලසුම් කර පාදම් කපන අවස්ථාවේ දී තිම වැටී ඇති ශෛලමය බුදු පිළිමයක සිරිපතුල යැයි අනුමාන කළ හැකි කොටසක් දෘශ්‍යගත වී ඇති බව අනාවරණය කරගත හැකි විය. වර්තමානයේ දී පවා මොවුහු මෙම ස්ථානයේ බුදුපිළිමයක අවශේෂ වැළලී ඇති බවට විශ්වාස කරති. ජලාශ ව්‍යාපෘතියට අවශ්‍ය පස් ලබාගැනීම සඳහා කන්ද කපා ඉවත් කිරීමේ දී ස්වභාවික ස්තරය ද සංස්කෘතික ස්තරයන් ද දක්නට ඇත (Profiles).



සැලසුම් අංක 06 - මැදපිහිල්ල වෙහෙරගොඩැල්ල බිම් සැලැස්ම



සැලසුම් අංක 07 - මැදපිහිල්ල
වෙහෙරගොඩැල්ල බුදු මැදුර



සැලසුම් අංක 08- මැදපිහිල්ල
වෙහෙරගොඩැල්ල කැසිකිළි ගල

පුරාවිද්‍යා ස්ථානයේ නම : **තලාගොඩ**					
ස්මාරකයේ අංකය : MOK 09/07					
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල		ග්‍රාමනිලධාරී වසම : තලාගොඩ		
නිරපේක්ෂ පිහිටීම	N - 7° 40' 46.6" E - 80° 45' 32.9"		MSL : 164-165m		
සාපේක්ෂ පිහිටීම : ඇළහැර - නාඋල ප්‍රධාන මාර්ගයේ තලාගොඩ හන්දියෙන් දකුණට හැරී කිලෝමීටර් 2 ක් පමණ ගොස් ගුරුපාර ඔස්සේ වනාන්තරය දෙසට ගමන් කිරීමේ දී මේ නටබුන් ස්ථානය හමුවේ.					
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : නටබුන් වූ ගඩොලුමය ගොඩැල්ලක්					
ස්මාරකගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?		ඔව්	✓	නැත	
සිදුවන හානිය පිළිබඳ විස්තර : ජලාශය ඉදිකළ විට මෙම ස්ථානය සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.					





විශාල ප්‍රදේශයක විසිරී පැවති ආරාම සංකීර්ණයක් බවට හඳුනාගත හැකි සාධක මෙම ස්ථානයෙන් හමු වේ. ඒ අතර නටබුන් ව ගිය සහ නිදන් හොරුන්ගේ ග්‍රහණයට හසු වූ පැරණි ස්මාරකයක අවශේෂ හමු වේ. ගඩොලුමය ගොඩැල්ලක් ලෙස දිස්වන මෙය අනිශයින් විනාශයට පත් වී ඇති ආකාරය දක්නට ඇත.

පුරාවිද්‍යා ස්ථානයේ නම : **තලාගොඩ**					
ස්මාරකයේ අංකය : MOK 09/10					
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල		ග්‍රාමනිලධාරී වසම : තලාගොඩ		
භූ‍ගෝලීය පිහිටීම	N - 7° 40' 46.6" E - 80° 45' 32.9"		MSL : 164-165m		
සාපේක්ෂ පිහිටීම : පෙර සඳහන් කරන ලද ගොඩනැඟිල්ලට උතුරු දෙසින් ඊට සමගාමී ව මෙය පිහිටා ඇත.					
දැනට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : නටබුන් වූ වක්‍රාකාර ගඩොලුමය ගොඩනැඟිල්ලක් ගල්කණු					
ස්මාරකගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?		ඔව්	✓	නැත	
විදාහ හානිය පිළිබඳ විස්තර : ජලාශය ඉදිකළ විට මෙම ස්ථානය සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.					

අනුරාධපුර මුල් යුගයට අයත් බවට අධ්‍යයනය කරනු ලබන ගඩොලු භාවිත කරමින් ගොඩනංවන ලද මෙම ස්මාරකය වක්‍රාකාර බවකින් යුක්ත වන බැවින් ස්තූපයක් ලෙසට අනුමාන කළ හැකි ය. නිදන්හොරුන්ගේ ග්‍රහණයට හසු ව ගොඩදමා ඇති ගඩොලු විශාල ප්‍රමාණයක් තැන තැන විසිරී පවතින අතර ගල්කණු ද හමු වේ.



හඳුනාගත හැකි ස්තූපයක අවශේෂ

පුරාවිද්‍යා ස්ථානයේ නම : තලාගොඩ වෙහෙරගොඩැල්ල			
ස්මාරකයේ අංකය : MOK 09/08			
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : තලාගොඩ	
නිරීක්ෂණ හා සැලසුම් අංක : 9, 10 සහ 11			
භූගෝලීය පිහිටීම	N - 7° 40' 46.8" E - 80° 45' 31.7"	MSL : 164-165m	
භෞතික පිහිටීම : MOK09/10 අංක 1 ට උතුරු දෙසින් හා MOK09/10 ට යාබද ව නටබුන් ව පවතින ශිලාමය ගොඩනැඟිල්ලක අවශේෂ හමු වේ.			
දැනට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : නිරූපිත ගල් කණු 12ක් පාදස්ථලයක කොටසක් මැටි බඳුන් අවශේෂ			
ප්‍රතිග්‍රහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්	✓	නැත
සිදුවන හානිය පිළිබඳ විස්තර : ජලාශය ඉදිකළ විට මෙම ස්ථානය සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.			



පිළිමගෙයක අවශේෂ



නුණුගල් පාදස්ථලයක කොටසක්

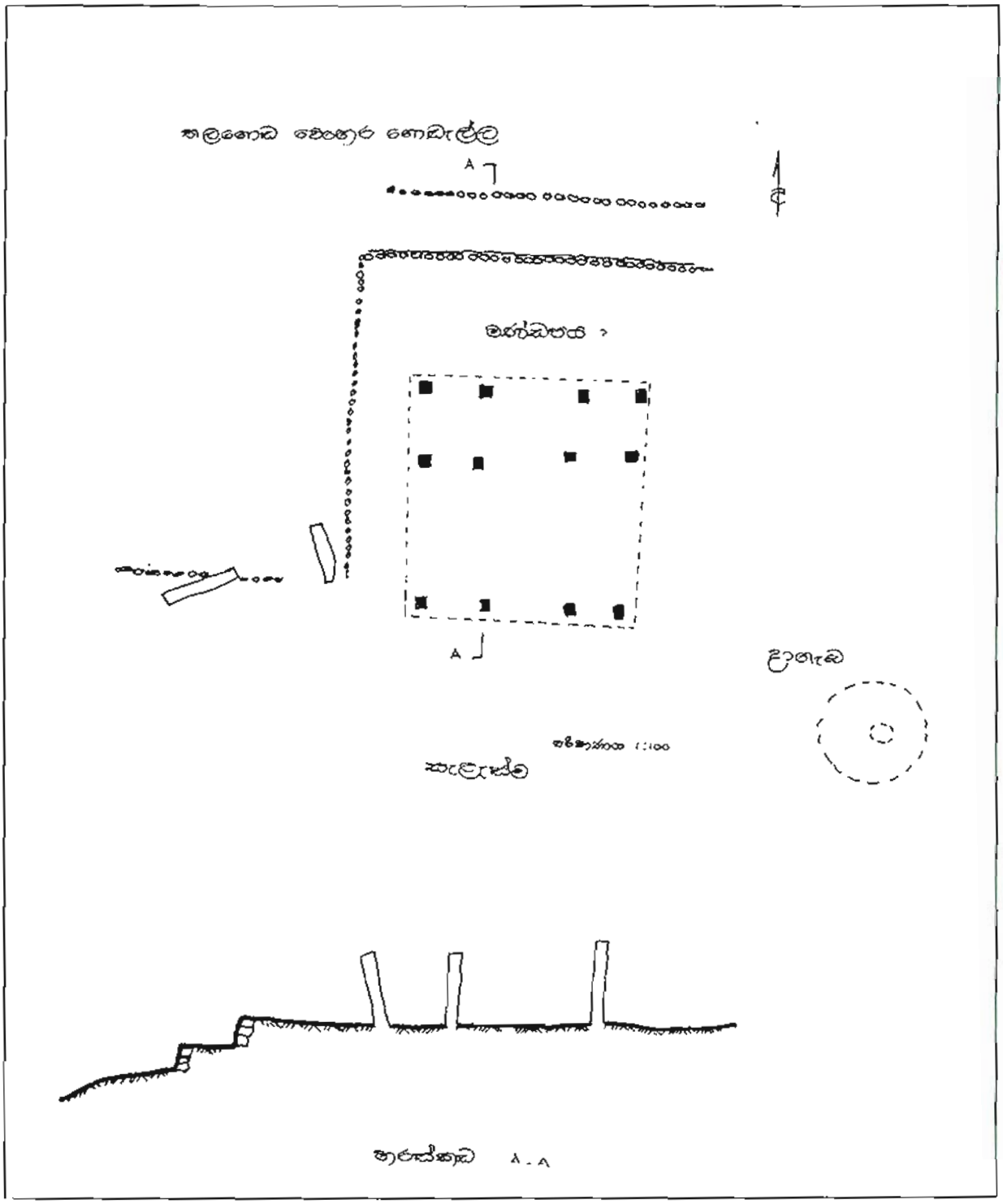


අටට විසිරී ඇති ගල් කණු

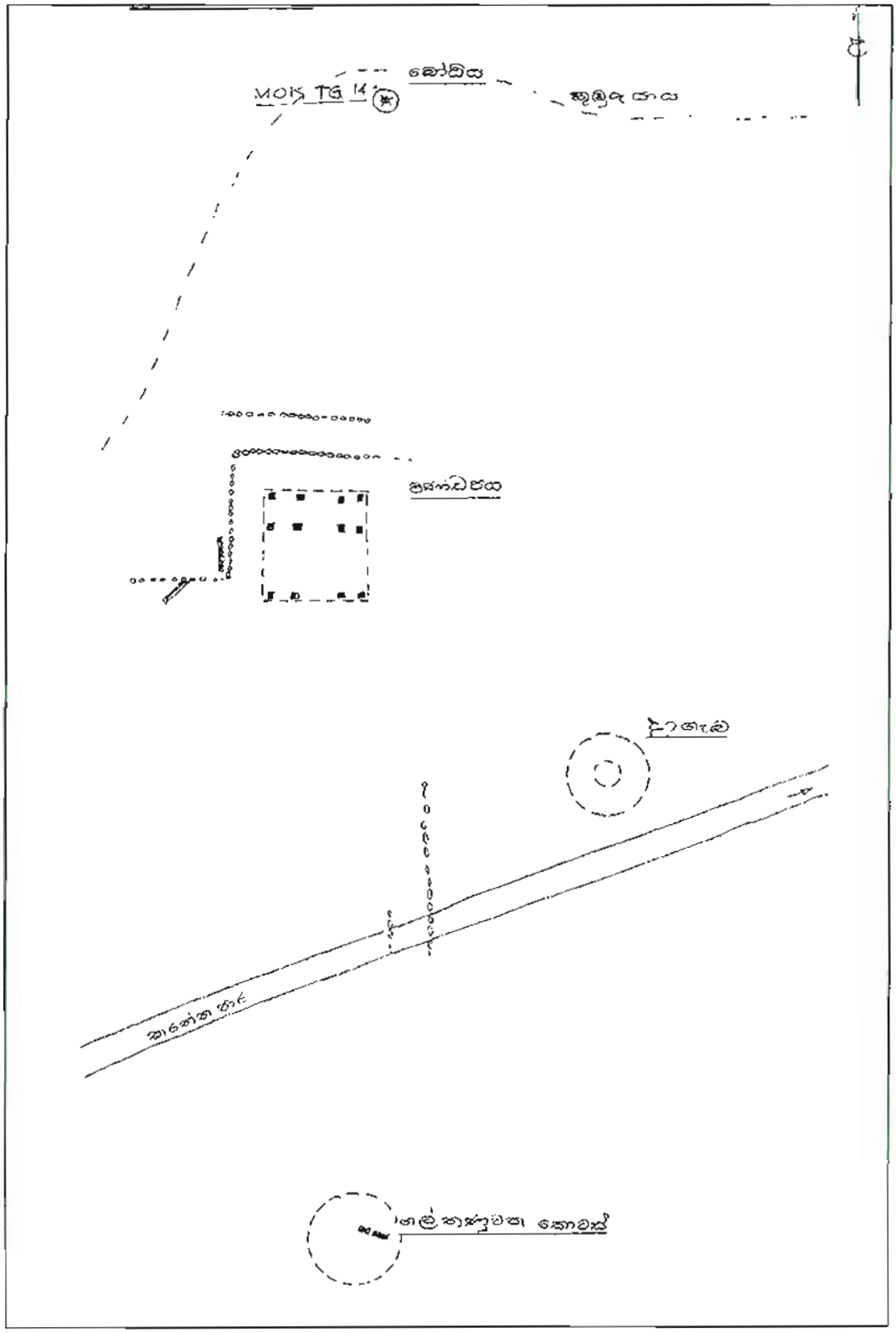


ප්‍රදේශයෙන් හමු වන ගඩොල් අවශේෂ

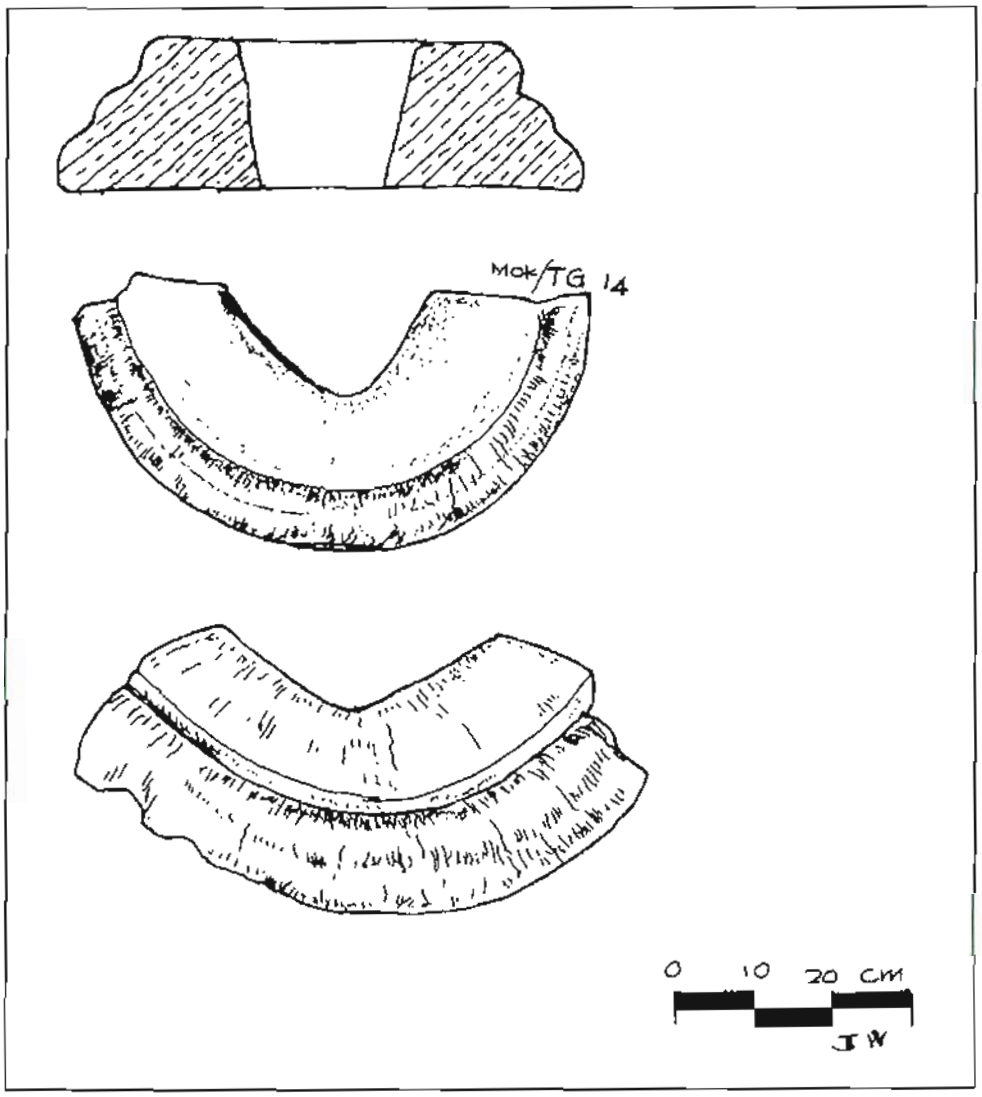
පැත්තක දිග සෙ.මී. 475ක් පමණ වන මෙය සමචතුරස්‍රාකාර ගොඩනැඟිල්ලකි. ගල් කණු 12ක අවශේෂ දැකගත හැකි අතර තවත් කණු 2ක් බිම වැටී ඇත. සමචතුරස්‍රාකාර කණුවක එක් පැත්තක දිග සෙ.මී. 22 ක් පමණ වන අතර ඒවායේ සාමාන්‍ය උස සෙ.මී. 175 කි. මෙම ගොඩනැඟිල්ල මාලක දෙකක පාදමක් මත ඉදි කර තිබේ. හූ දර්ශනය යකස් කිරීම සඳහා මෙම මාලක යොදාගන්නට ඇති බව පැහැදිලි ව හඳුනාගත හැකි ය. පසුගිය වකවානුවේ දී හිටිපිළිමයක කොටසක් මෙම ස්ථානයේ තිබූ බවට ප්‍රදේශවාසීන් දැනුම් දුන්න ද එවැනි අවශේෂයක් අප හට සොයාගත නොහැකි විය. මෙම ගොඩනැඟිල්ලට මීටර් 20 ක් පමණ උතුරු දෙසින් හමු වන පාදස්ථලය පෙර සඳහන් කළ පිළිමයෙහි කොටසක් වීමට බොහෝ ඉඩකඩ ඇත. එම පාදස්ථලයෙහි විෂ්කම්භය සෙ.මී. 65 ක් වන අතර ඝනකම සෙ.මී. 18 කි. මෙම ගොඩනැඟිල්ලට දකුණු දිශාවෙන් ගඩොල් හා ගල් ප්‍රාකාරයක අවශේෂ මතුපිටින් හඳුනාගත හැකි ය. මෙහි පළල සෙ.මී. 100 ක් පමණ වේ. මීට වසර කිහිපයකට පෙර පුරාවිද්‍යා දෙපාර්තමේන්තුව විසින් සිදු කරන ලද පුරාවිද්‍යා ස්මාරක සමීක්ෂණයක දී මෙම නටබුන් ස්ථානය අංක 658 ලෙස නම් කර ඇත. මතුපිටින් හඳුනාගත හැකි දත්තවලට අනුව පබ්බතවිහාර සංකීර්ණයක අවශේෂ ලෙස අනුමාන කළ හැකි ය.



සැලසුම් අංක 09 - තලාගොඩ සමස්ත පුරාවිද්‍යා භූමියෙහි සැලැස්ම



සැලසුම් අංක 10- තලාගොඩ ස්මාරකයේ සැලැස්ම



සැලසුම් අංක 11 - තලාගොඩ හුණුගල් පාදමෙහි සැලසුම

පුරාවිද්‍යා ස්ථානයේ නම : තලාගොඩ ජනාවාස අවශේෂ සහිත ප්‍රදේශය					
ස්මාරකයේ අංකය : MOK 09/09					
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල		ග්‍රාමනිලධාරී වසම : තලාගොඩ		
නිරපේක්ෂ පිහිටීම	N - 7° 40' 47.7" E - 80° 45' 32.9"		MSL : 163m		
සාපේක්ෂ පිහිටීම : MOK09/10, 08 සහ 07 යන ස්මාරක අවශේෂ වලට නැඟෙනහිර දෙසින් හමුවිය.					
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : මැටි බඳුන් අවශේෂ යබොර කැබලි ගඩොල් කොටස්					
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?		ඔව්	✓	නැත	
සිදුවන හානිය පිළිබඳ විස්තර : ජලාශය ඉදිකළ විට මෙම ස්ථානය සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.					



ප්‍රදේශය පුරා විසිරී ඇති ජනාවාස අවශේෂ

මෙම ස්ථානය ආරාමික සංකීර්ණයක් ව පැවති අවධියේ දී අතිශයින් ව්‍යාප්ත වූ ජනාවාස පද්ධතියක් පැවති බවට ප්‍රබල සාධක මැටිබඳුන් අවශේෂවලින් හඳුනාගත හැකි ය. හමුවන මැටිබඳුන් කොටස් දුර්ලභ ලෙස වර්ගීකරණය කර ඇති මැටිබඳුන් අතරට ද අයත් ය.

පුරාවිද්‍යා ස්ථානයේ නම : තලාගොඩ වෙහෙරගොඩැල්ල පුරාවිද්‍යා ස්ථානය					
ස්මාරකයේ අංකය : MOK 09/11					
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල		ග්‍රාමනිලධාරී වසම : තලාගොඩ		
නිරපේක්ෂ පිහිටීම	N - 7° 40' 41" E - 80° 45' 28"		MSL : 165m		
සාපේක්ෂ පිහිටීම : MOK09/10, 08 සහ 07 යන ස්මාරක අවශේෂ වලට ආසන්නයෙන් හමුවිය.					
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : යබොර කැබලි					
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?		ඔව්	✓	නැත	
සිදුවන හානිය පිළිබඳ විස්තර : ජලාශය ඉදිකළ විට මෙම ස්ථානය සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.					

මෙම පුරාවිද්‍යා ස්ථානයේ ස්මාරක ආශ්‍රිත ව යබොර කැබලි විසිරී පැවති ස්ථානය පැරණි ජනාවාසයක් බවට නිගමනය කළ හැකි සාධක හමු වේ. මෙවැනි ස්ථාන මඟින් පැරණි නාගරික ලක්ෂණ හෙළි කෙරේ.

පුරාවිද්‍යා ස්ථානයේ නම : තලාගොඩ වෙහෙරගොඩැල්ල පුරාවිද්‍යා ස්ථානය - මඩිකා සහිත ස්ථානය					
ස්මාරකයේ අංකය : MOK 09/12					
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල		ග්‍රාමනිලධාරී වසම : තලාගොඩ		
නිරපේක්ෂ පිහිටීම	N - 7° 40' 40.6" E - 80° 45' 25.7"		MSL : 157-158m		
සාපේක්ෂ පිහිටීම : තලාගොඩ පුරාවිද්‍යා ප්‍රදේශයට ගමන් කරන අතර ඊට මීටර් 200ක් පමණ මොඛින් හමු වන ස්ථානයකි.					
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : තලාතු මිනිරන්					
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?		ඔව්	✓	නැත	
සිදුවන හානිය පිළිබඳ විස්තර : ජලාශය ඉදිකළ විට මෙම ස්ථානය සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.					

ප්‍රදේශවාසීන් විසින් අඩි 5x5 ප්‍රමාණයේ අඩි 20ක පමණ ගැඹුරකින් යුත් වලක් හාරා මිනිරන් ගොඩගෙන අලෙවි කර ඇති බවක් පැවසේ. ගොඩැල්ලක ස්වරූපයකින් යුක්ත මෙම ස්ථානය පුරා තලාතු මිනිරන් කැබලි විශාල ප්‍රමාණයක් විසිරී පවතියි. තලාගොඩ යන වචනය *තලාතු* යන පදයෙන් බිඳී ආ බවට ඇති මතය සලකා බලන විට සම්පත් ලබාගැනීමේ අරමුණින් මෙම ස්ථානයේ ජනාවාස බිහි කරගැනීමේ ප්‍රවණතාවක් අතීතයේ පැවතියා යැයි අනුමාන කළ හැකි ය. එම නිසා ජනාවාස පුරාවිද්‍යා ක්ෂේත්‍රයෙහි ලා මෙම ස්ථානයෙහි ඇති ආවේණික ගුණාංග වැදගත් වේ.

පුරාවිද්‍යා ස්ථානයේ නම : කඹරව බෝමළුව			
ස්මාරකයේ අංකය : MOK 09/13			
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : කඹරව	
සැලසුම් අංක : 12 සහ 13			
නිරපේක්ෂ පිහිටීම	N - 7° 38' 21.8" E - 80° 45' 59.5"	MSL : 159m	
සාපේක්ෂ පිහිටීම : කඹරව ගංමණ්ඩියේ සිට කි.මී. 1 ක් පමණ ගමන් කිරීමේ දී හමු වන තෙල්ගමු ගඟෙන් එගොඩ මෙම නටබුන් ස්ථානය හමු වේ.			
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : පැරණි බෝධි වෘක්ෂය විශේෂ ශිලාමය අවශේෂයක් මැටි බඳුන් අවශේෂ			
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්	✓	නැත
සිදුවන හානිය පිළිබඳ විස්තර : ජලාශය ඉදිකළ විට මෙම ස්ථානය සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.			



කඹරව බෝමළුව අසල ඇති විශේෂ ශිලාමය අවශේෂය



පුරාවිද්‍යා ස්ථානයේ නම : **කඹරව බෙත්තාලෝකාරාම විහාරය**		
ස්මාරකයේ අංකය : MOK 09/14		
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : කඹරව
සැලසුම් අංක : 12		
නිරපේක්ෂ පිහිටීම	N - 7° 38' 14.2" E - 80° 46' 02.5"	MSL : 169-170m

සාපේක්ෂ පිහිටීම :

කඹරව ග්‍රාමයේ සිට නැඟෙනහිර දෙසින් හමු වන තෙල්ගමු ගඟින් එතෙර ව නැඟෙනහිර දිශාවට මීටර් 50ක් පමණ ගිය විට කුඹුරු යායක් හමු වේ. එතැන් සිට නැවතත් නැඟෙනහිර දිශාවට මීටර් 150ක් පමණ ගමන් කරන විට මෙම විහාරස්ථානය හමු වේ.

දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ :

පැරණි පියගැටපෙළ
බුදුගෙය
සාණ්ඨාර කුලුණු
චෛත්‍යය
බෝධීන් වහන්සේ

මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්	✓	නැත	

සිදුවන හානිය පිළිබඳ විස්තර :

ජලාශය ඉදිකළ විට මෙම ස්ථානය සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.



විහාරස්ථානයේ පියගැට පෙළ

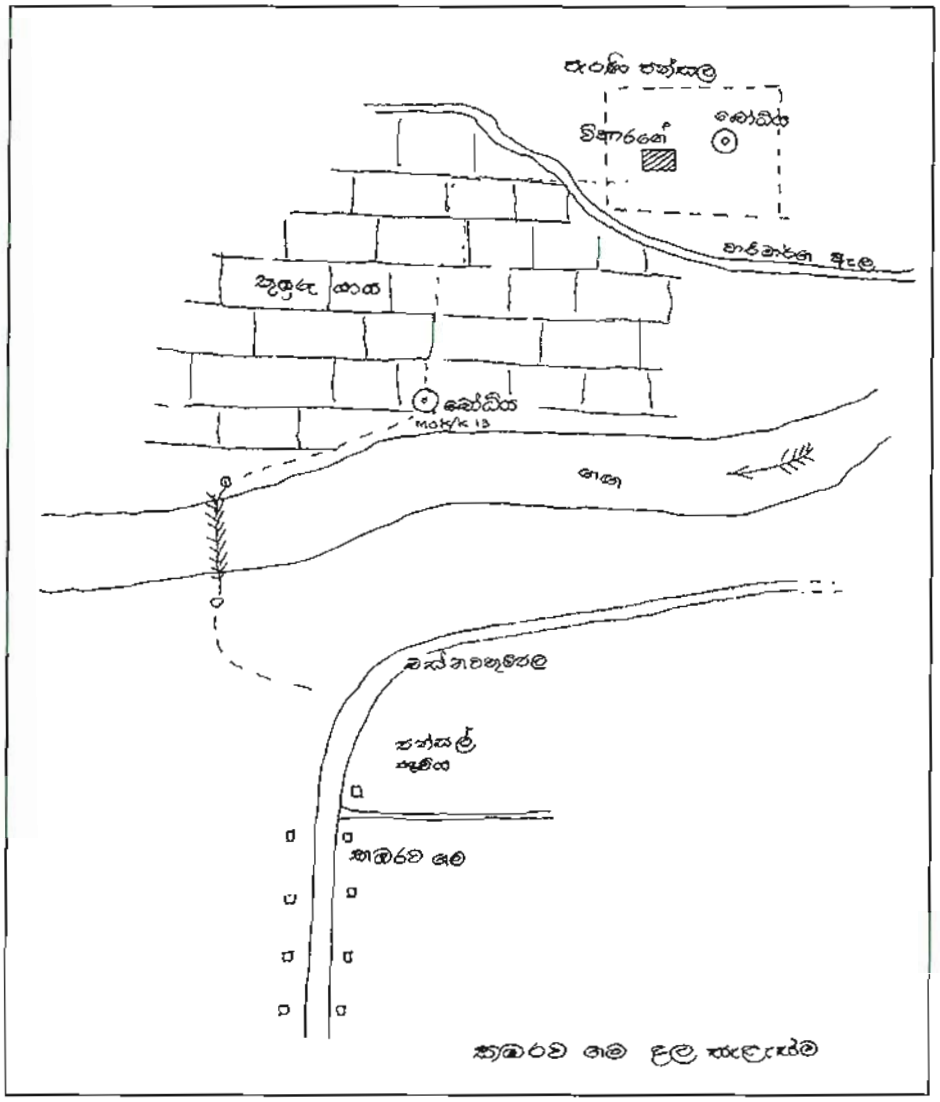


බුදුමැදුර

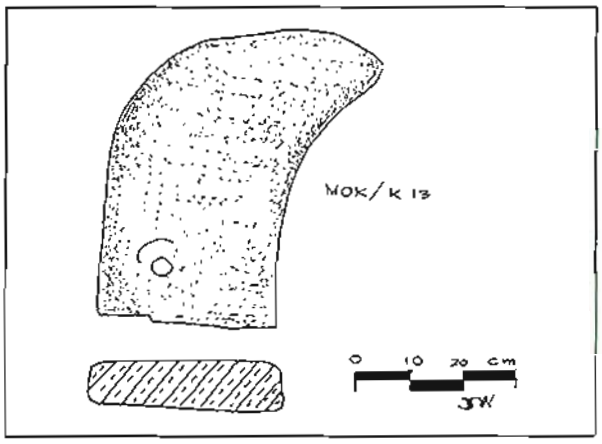


බුදු මැදුරේ දොරටුව

මෙහි ප්‍රතිමාගෘහය 1939 වසරේ දී ඉදිකරන ලද බවට එහි පියගැට පෙළක සටහන් ව ඇත. එක් ප්‍රතිමාවක් සහ සිතුවම් දක්නට ඇති මෙය දැනට අත්හැර දමා ඇති තත්ත්වයක පවතී. පැරණි ස්තූප ගොඩනැඟිල්ලක් පාදක කරගෙන නූතන ස්තූපයක ඉදිකිරීමක් දක්නට ලැබේ. මෙම විහාරය



සැලසුම් අංක 12 - කඹරව ගමේ දළ සැලැස්ම



සැලසුම් අංක 13 - කඹරව බෝධිය අසලින් හමු වූ ශිලාමය ප්‍රවරුව

පුරාවිද්‍යා ස්ථානයේ නම : **ඇළහැර ටැම්ලිපිය**		
ස්මාරකයේ අංකය : MOK 09/15		
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : ඇළහැර
නිරපේක්ෂ පිහිටීම	N - 7° 42' 22.6" E - 80° 46' 53"	MSL : 152m

සාපේක්ෂ පිහිටීම :

ඇලහැර අමුණේ සිට උතුරට කි.මී. 0.75 ක පමණ ගියවිට ප්‍රධාන අඔන්ගඟත් අමුණේ හැරවුමෙන් පසු පරාක්‍රම සමුද්‍රය තෙක් ජලය ගමන් කරන ජලමාර්ගයත් අතර ඇති පවුර මත සෙල්ලිපිය සහිත ගල්කණුව පිහිටා ඇත.

දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ :

ගල්ටැඹක කොටන ලද සෙල්ලිපියක්

මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?		ඔව්		නැත	✓



මෙම ටැම්ලිපිය සහිත කණුවේ උස සෙ.මී. 200ක් වන අතර පළල සෙ.මී. 25 x 25 වේ.

පුරාවිද්‍යා ස්ථානයේ නම : ඇළහැර අමුණ		
ස්මාරකයේ අංකය : MOK 09/16		
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : ඇළහැර
නිරපේක්ෂ පිහිටීම	N - 7° 42' 19.2" E - 80° 46' 58.3"	MSL : 151m
සාපේක්ෂ පිහිටීම : නාඋල - ඇළහැර මාර්ගයේ ඇළහැර හන්දියට ආසන්න ව දකුණු පසින් මෙම ප්‍රධාන අමුණ පිහිටා ඇත.		
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : පැරණි අමුණ		
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්	නැත ✓



අඹන්ගඟ හරස් කොට බැඳ ඇති අමුණෙන් ජලය හැරවුම කර ඇත. ඒ හැරවුමෙන් [illegible] හා මින්නේරිය වැව්වලට යෝධඇළ ඔස්සේ ජලය ගෙන යයි. එම පැරණි හැරවුම [illegible] පසුකාලීන ව වෙනත් හැරවුමක් සකස් කර ඇත. එම හැරවුමට අමතර ව පිහිටි වැඩි [illegible] එම අමුණේ අනෙක් සොරොව්වෙන් නිකුත් වී පරාක්‍රම සමුද්‍රය තෙක් ගමන් කරයි. එම

ජලමාර්ගයට ප්‍රධාන පැන්නුමෙන් ඉවත් වන ජල මාර්ගයට එක් වී පරාක්‍රම සමුද්‍රය තෙක් ගමන් කරයි.

පුරාවිද්‍යා ස්ථානයේ නම : **ඇළහැර පැන්නුම**		
ස්මාරකයේ අංකය : MOK 09/17		
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : ඇළහැර
නිරපේක්ෂ පිහිටීම	N - 7° 42' 32.3" E - 80° 46' 42.4"	MSL : 152m
යාපේක්ෂ පිහිටීම : ඇලහැර අමුණේ සිට කි.මී. 1 ක් පමණ ගිය විට මෙම ප්‍රධාන පැන්නුම හමු වෙයි.		
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : පැරණි අමුණ		

මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්		නැත	✓



අඹත් ගඟ ප්‍රධාන වශයෙන් හරස් කර ඇත්තේ මෙම පැන්නුමෙනි. ප්‍රධාන ගඟ හරස් කිරීම නිසා එහි විශාල ජලකඳ ඇලහැර අමුණ දිසාවට යොමු කර ඇත. එහෙත් එම පැන්නුමෙන් ගලා යන වැඩි ජලය දැනුදු පරාක්‍රම සමුද්‍රය තෙක් ගමන් කරයි.

පුරාවිද්‍යා ස්ථානයේ නම : ගලබොඩ ඉහළ වලව්ව					
ස්මාරකයේ අංකය : MOK 09/18					
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල		ග්‍රාමනිලධාරී වසම : ගලබොඩ		
සැලසුම් අංක : 14 සහ 15					
නිරපේක්ෂ පිහිටීම	N - 7° 37' 26.6" E - 80° 43' 16"		MSL : 263m		
සාපේක්ෂ පිහිටීම : ගලබොඩ මංසන්ධියේ සිට නැඟෙනහිර දෙසට ඇති මාර්ගයේ කි.මී. 1.5 ක් පමණ ගමන් කළ විට මෙම වලව්ව හමු වේ.					
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : පැරණි වාස්තුවිද්‍යාත්මක ලක්ෂණ සහිත වලව්ව					
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?		ඔව්		නැත	✓
සිදුවන හානිය පිළිබඳ විස්තර : මෙය ජලාශයෙන් යට නොවුණ ද ජලාශය ඉදිකළ විට හුදෙකලා භූමියක් බවට පත් වීමේ අවදානමක් පවතී.					

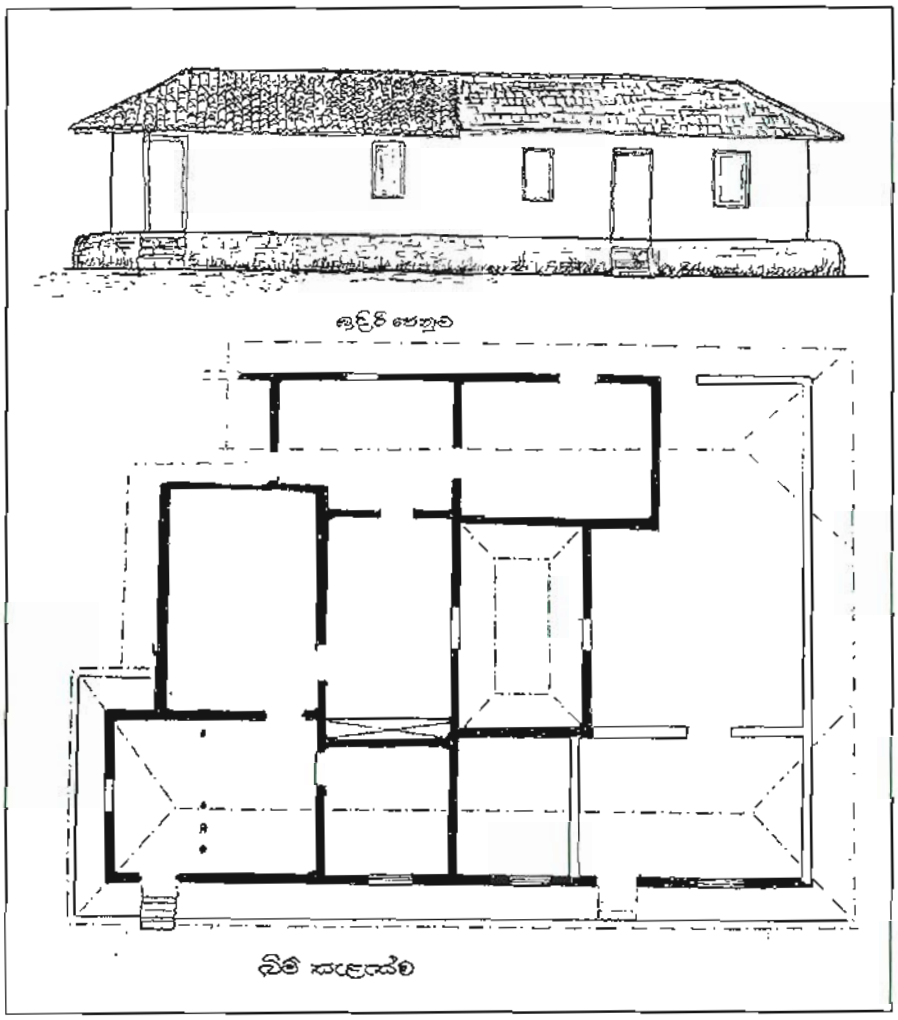


වලව්ව

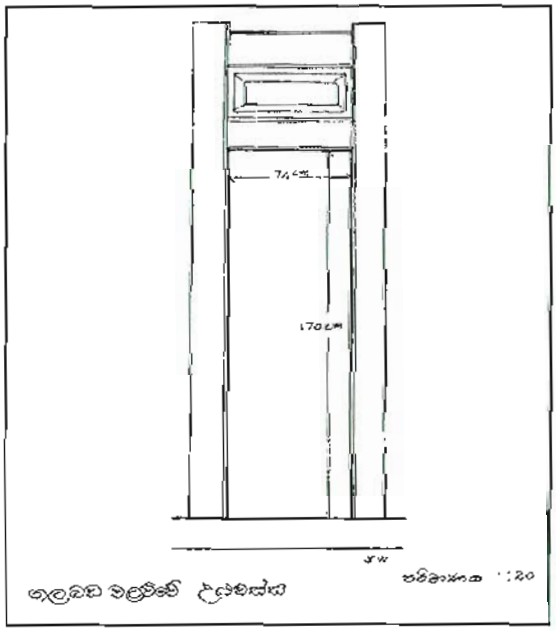


පැරණි උළුවස්ස

ක්‍රි.ව. 1850 දී පමණ මෙම නිවස ගොඩනැඟූ බව දැනට එහි වාසය කරන හතරවන පරම්පරාවට අයත් ඊ.එම්.බී.මුණසිංහ මහතා පවසයි. ගලබොඩ ප්‍රදේශයේ ජීවත් වූ ගම්මුලාදෑනින් සහ කෝරාළවරු මෙම නිවසේ ජීවත් වී ඇත. මෙම නිවස සෙ.මී. 70ක පමණ උසකින් යුත් පාදමක් සහිත ව ඉදිකර ඇති අතර ගල්, හුණු හා වැලි මිශ්‍ර ව තනා හුණු, වැලි හා මැටි මිශ්‍රණයෙන් කපරාරු කළ බිත්තිවල ගණකම සෙ.මී.50 ක් පමණ වේ. පැරණි සිංහල උළුවලින් සෙවිලි කර ඇති අතර පැරණි උළුවහු සහ ජනේල දක්නට ඇත. උළුවස්සක් සෙ.මී. 20 ක් සනකම ඇති අතර



සැලසුම් අංක 14 - ගලබොඩ වලව්ව



සැලසුම් අංක 15 - ගලබොඩ වලව්වේ උළුවස්සක්

පුරාවිද්‍යා ස්ථානයේ නම : **දම්මන්තැන්න ගල්ලෙන**				
ස්මාරකයේ අංකය : MOK 09/19				
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල		ග්‍රාමනිලධාරී වසම : දම්මන්තැන්න	
සැලසුම් අංක : 16				
නිරපේක්ෂ පිහිටීම	N - 7° 38' 10.6" E - 80° 44' 28.8"	MSL : 263m		
සාපේක්ෂ පිහිටීම : ගල්බොඩ සිට නැඟෙනහිර දිසාවට කි.මී. 4 ක් පමණ ගිය විට ඇති ආඬිනැටූගල නම් වූ කඳු මුදුනත මෙම ගල්ගුහාව දක්නට ලැබේ.				
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : කටාරම් සහිත ගල්ලෙන				
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?		ඔව්		නැත ✓
සිදුවන හානිය පිළිබඳ විස්තර : මෙය ජලාශයෙන් යට නොවුණ ද ජලාශය ඉදිකළ විට හුදෙකලා භූමියක් බවට පත් වීමේ අවදානමක් පවතී.				



ගල්ගුහාව සරල කටාරම් සහිත වූවත් පසුකාලීන ව සිමෙන්ති භාවිතයෙන් කටාරමක් හොඳින් සකසා ගෙන ඇත. කටාරමෙහි ශිලාලේඛන දක්නට නොමැත. මෙහි අවට වෙනත් ගල්ගුහා හෝ

(මිය ගිය ශ්‍රේෂ්ඨ) ඇතෙකු ශ්‍රේෂ්ඨ ඇතෙකුට

සාමිසම් අංක 16 - ලිඛිතාරාධනා ගැබ්බෙරෙන්ගේ දිවයනයක්

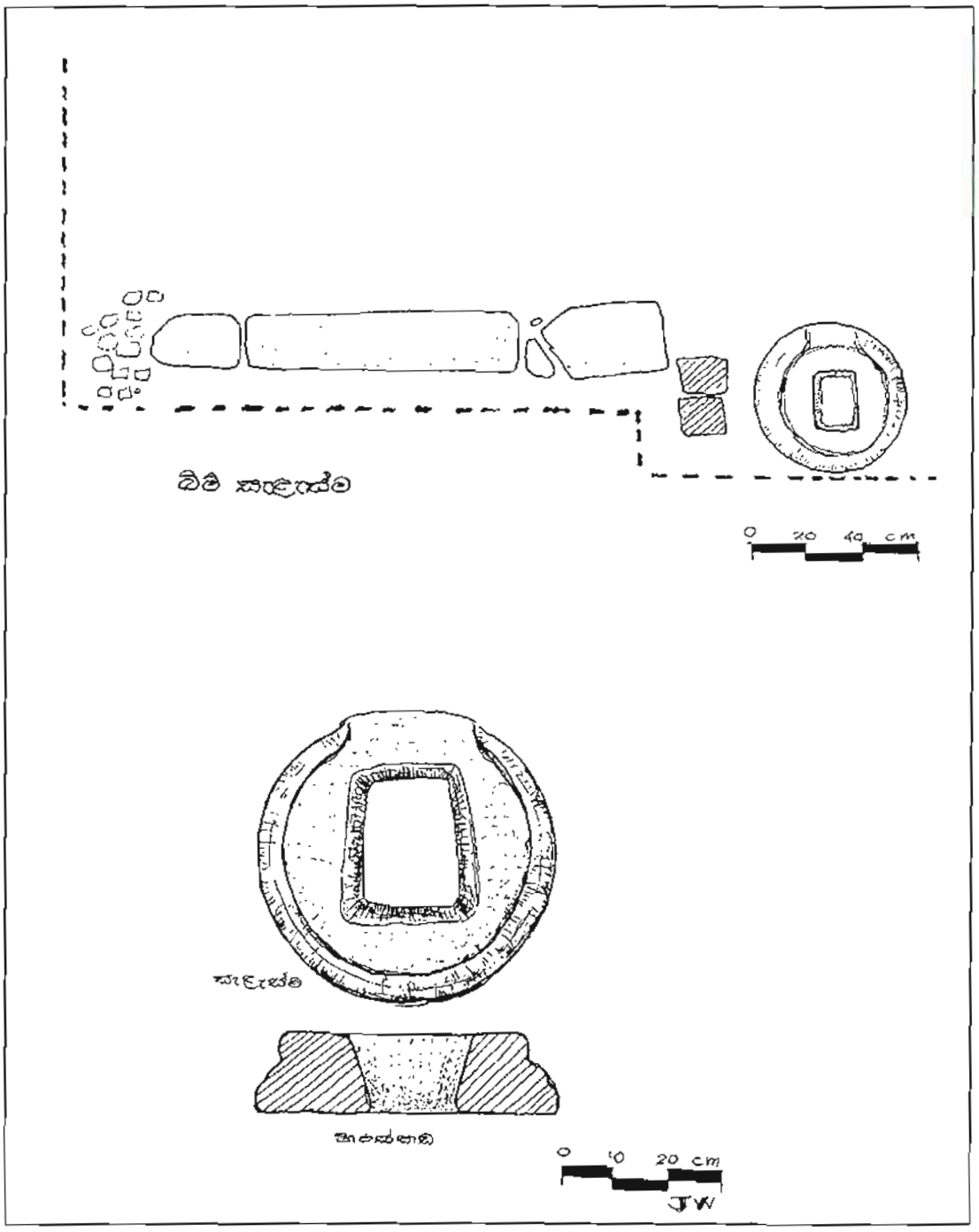
පුරාවිද්‍යා ස්ථානයේ නම : මොරගොල්ල තලංගමුව		
ස්මාරකයේ අංකය : MOK 09/20		
ස්ථානීය පිහිටීම	ප්‍රා.ලේ.කොට්ඨාසය : නාඋල	ග්‍රාමනිලධාරී වසම : මොරගල්ල
සැලසුම් අංක : 17		
නිරපේක්ෂ පිහිටීම	N - 7° 39' 40.6" E - 80° 42' 19.4"	MSL : 185m
සාපේක්ෂ පිහිටීම : මොරගොල්ල - ගල්බොඩ මාර්ගයට උතුරින් එම මාර්ගයේ සිට මීටර් 300ක් පමණ දුරකින් පෞද්ගලික ඉඩමක පිහිටා ඇත.		
දක්නට ලැබෙන ස්මාරක අවශේෂ හා විශේෂ ලක්ෂණ : හුණුගලින් නිම කළ පාදස්ථලය පැරණි ගඩොල් ගල් කණු		
මොරගහකන්ද යෝජනා ක්‍රමයෙන් හානි සිදුවේ ද?	ඔව්	නැත ✓



පාදස්ථලය



ගල්කණු



සැලසුම් අංක 17 - මොරගොල්ල පුරාවිදහා නටබුන්

3.2 පුරාවස්තු

3.2.1 මැටිබඳුන් අවශේෂ

මෙම සමීක්ෂණයේ දී විශාල වශයෙන් මැටිබඳුන් අවශේෂ හමු විය. සෑම නටබුන් ස්මාරකයක් ආසන්නයේ ම විශාල ප්‍රදේශයක විසිරී පැවති මෙම මානව අවශේෂ මඟින් ජනාවාස ව්‍යාප්තිය හොඳින් අවබෝධ කරගත හැකි ය. තලාගොඩ වෙහෙරගොඩැල්ල (MOK09'07, 08, 10), මැදකිඳ වෙහෙරගොඩැල්ල (MOK09/03), කඩවත - මැදපිහිල්ල වෙහෙරගොඩැල්ල (MOK09/06), කඹරව ඛෙත්තාලෝක පුරාණ විහාරස්ථාන (MOK09/14) පුරාවිද්‍යා ස්ථානවලින් විශේෂිත මැටිබඳුන් අවශේෂ හඳුනාගැනීමට හැකි විය. රැස්කරන ලද දත්තවලට අනුව Red ware, Black ware, Black and Red ware (BRW), Buff ware, Grey ware ආදී මැටිබඳුන් වර්ග හඳුනාගැනීමට හැකි විය. එසේ ම මෝස්තර සහිත බඳුන් කැබලි කිහිපයක් ද දත්ත අතර වේ. ගැට්ටේ ස්වභාවයට අනුව ෂෙ.මී. 5ත් - 50ත් අතර විෂ්කම්භයක් සහිත මැටිබඳුන් භාවිත කර ඇති බවට තොරතුරු හමු වේ. සීගිරිය ප්‍රදේශයෙන් හමුවන මැටිබඳුන්වලට බොහෝ සෙයින් සමානත්වයක් පෙන්නුම් කරයි.

රතු බඳුන් (Red ware)

විශාල වශයෙන් කැටයම් සහිත ව හෝ රහිත රතු බඳුන් අවශේෂ හමු වේ. සාමාන්‍ය ජනතාව පරිහරණය කරන ලද භාණ්ඩ වර්ගයක් ලෙසට මෙය හඳුනාගෙන ඇත. ගවේෂණයේ දී අප විසින් හඳුනාගත් සියලු ම පුරාවිද්‍යා ස්ථාන ආසන්නයෙන් මෙම බඳුන් හමු වේ. මතුපිටින් හමු වන අවශේෂ වන බැවින් මේවා මිනිසුන්ගේ විවිධ ක්‍රියාකාරකම් සහ ස්වභාවික තත්ත්වයන් හේතුවෙන් ඉතා හොඳ තත්ත්වයෙන් හමු වන දත්ත ලෙස නිර්ණය කළ නොහැක. ගෙවී ගිය, දිය වී ගිය සහ කුඩා කැබලිවලට කැඩුණු කොටස් හමු වීම එයට හේතුවයි. ආහාර පිසීමට, ආහාර රැස් කිරීමට සහ ආහාර ගබඩා කිරීම සඳහා මෙම භාජන පරිහරණයට යොමු වන්නට ඇතැයි විශ්වාස කළ හැකි ය.

කළු බඳුන් (Black ware)

තලාගොඩ වෙහෙරගොඩැල්ල (MOK09/07) පුරාවිද්‍යා ස්ථානය ගවේෂණයේ දී හමු වූ මෙම අවශේෂ කොටස් බෙහෙවින් ම ජීර්ණය වී ඇති බවක් පෙනේ. කළුබඳුන්වල විෂ්කම්භය ප්‍රමාණයෙන් කුඩා බවක් ඒවායේ ගැට්ටල ස්වභාවයෙන් හඳුනාගත හැකි ය. කැටයම් සහිත හා රහිත කොටස් හමු වේ. ගැට්ටේ කැටයම් සහිත මැටි බඳුන් කැබලි හමු වීම සුවිශේෂී දත්තයකි.

කළු - රතු බඳුන් (BRW)

තලාගොඩ වෙහෙරගොඩැල්ල පුරාවිද්‍යා ස්මාරකය (MOK09/07) අවට ප්‍රදේශයෙන් හමු වන කළු - රතු බඳුන් විශේෂිත බවක් පෙන්නුම් කරයි. ඇතුළත සහ පිටත මෝස්තර සහිත ඉතා දුර්ලභ වර්ගයේ මැටිබඳුන් කැබැල්ලක් මතුපිට ගවේෂණයේ දී හමුවීම මෙම ස්ථානයේ ඓතිහාසිකත්වය වඩාත් තීව්‍ර කරයි. ශ්‍රී ලංකාවේ මැටිබඳුන් වර්ගීකරණයන්ට අනුව කළු-රතු බඳුන් පරිහරණය කිරීම විශේෂිත බවක් පෙන්නුම් කරයි. එමෙන් ම ඇතුළත හා පිටත මෝස්තර සහිත බඳුන් හමු වීම ද දුර්ලභ අවස්ථාවකි. මේ පිළිබඳ ව තවදුරටත් අධ්‍යයනයක යෙදෙන්නේ නම් වඩා වැදගත් පුරාවිද්‍යාත්මක දත්ත අවබෝධ කරගත හැකි ය.

විශේෂිත මැටි බඳුන්

මූඩියක අවශේෂ

තලාගොඩ වෙහෙරගොඩැල්ලෙන් හමු වූ මැටිබඳුන් අවශේෂයක් මූඩියක් ලෙස හඳුනාගත හැකි ය. මෙය ඝනකමින් අඩු කුඩා ගැටියක් සහිත බවක් ද රතුබඳුනක් ලෙස ද හඳුනාගත හැකි ය.

මැටි පාදම් කොටස

මැදපිහිල්ල වෙහෙරගොඩැල්ල ප්‍රදේශයේ විහාරස්ථානයට යාබද ව පස් කපා ඉවත් කරන ස්ථානයෙන් හමු වූ මැටි බඳුන් කැබැල්ල පැරණි මැටිබඳුනක හෝ මැටිපහනක පාදම් කොටසක් ලෙස හඳුනාගත හැකි ය. එය ඝනකමින් වැඩි බඳුනක් හෝ පහනක් විය යුතු අතර රතුබඳුන් නිර්මාණ තාක්ෂණයට අනුව නිර්මාණය කරන ලද්දක් බව පැහැදිලි ය.



මැදකිඳ (MOK09/03) මැටි බඳුන්



මැදපිහිල්ල (MOK09/06) මැටි බඳුන්



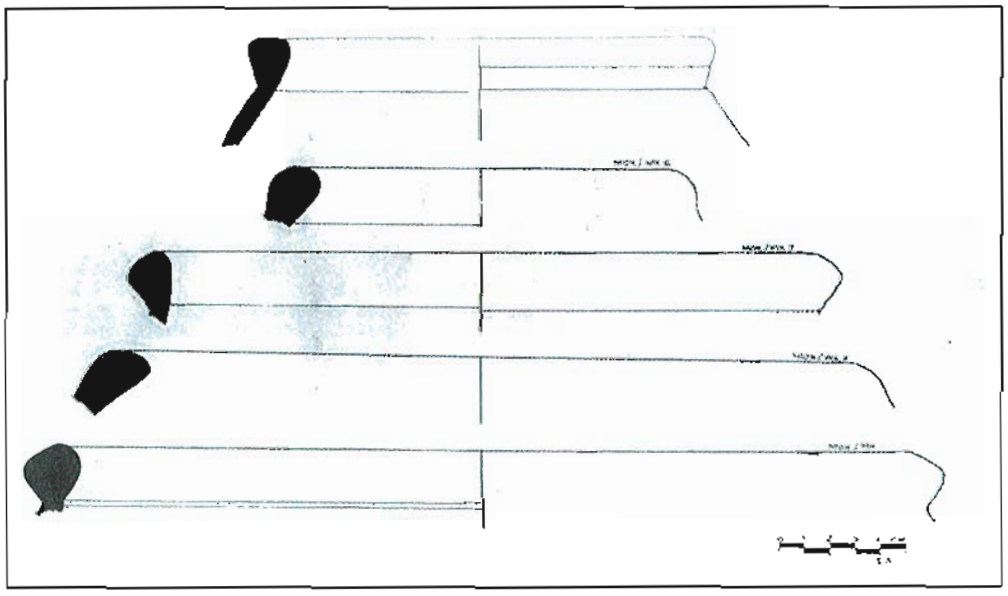
තලාගොඩ (MOK09/07) මැටි බඳුන්



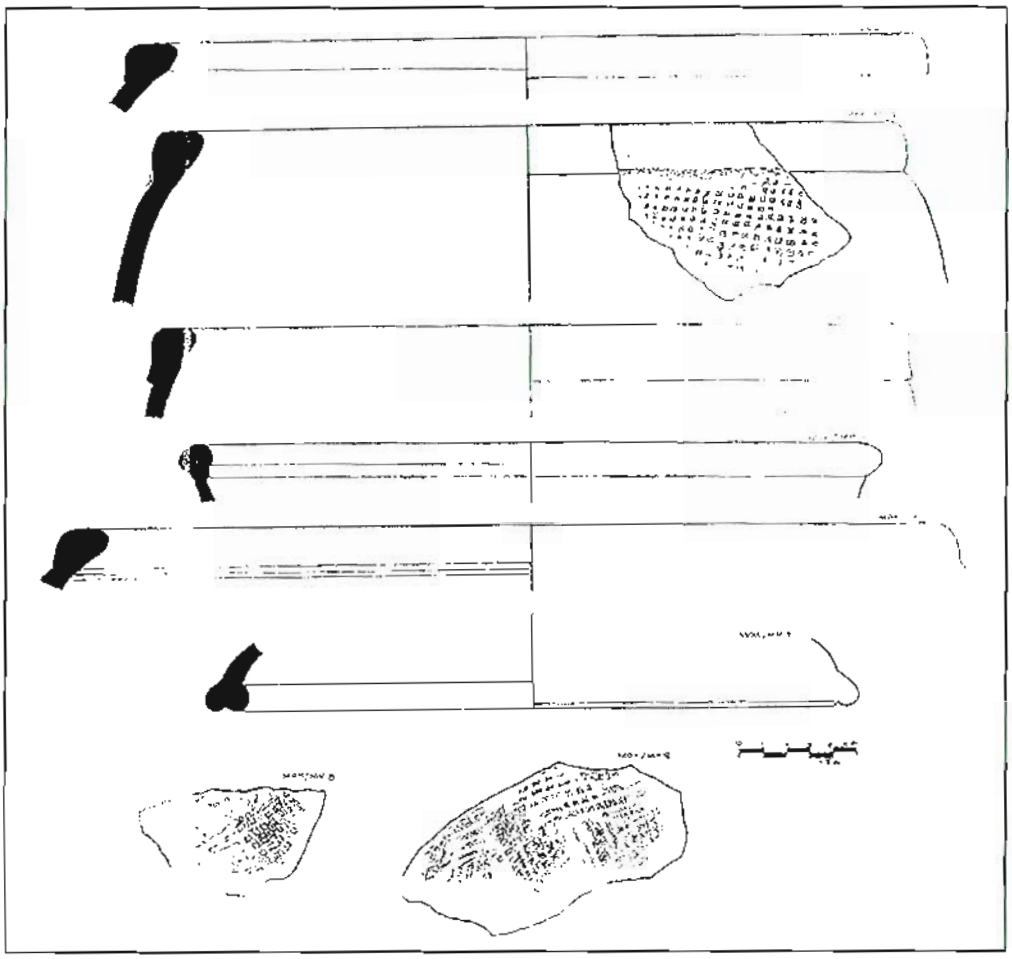
කඹරව (MOK09/13) මැටි බඳුන්



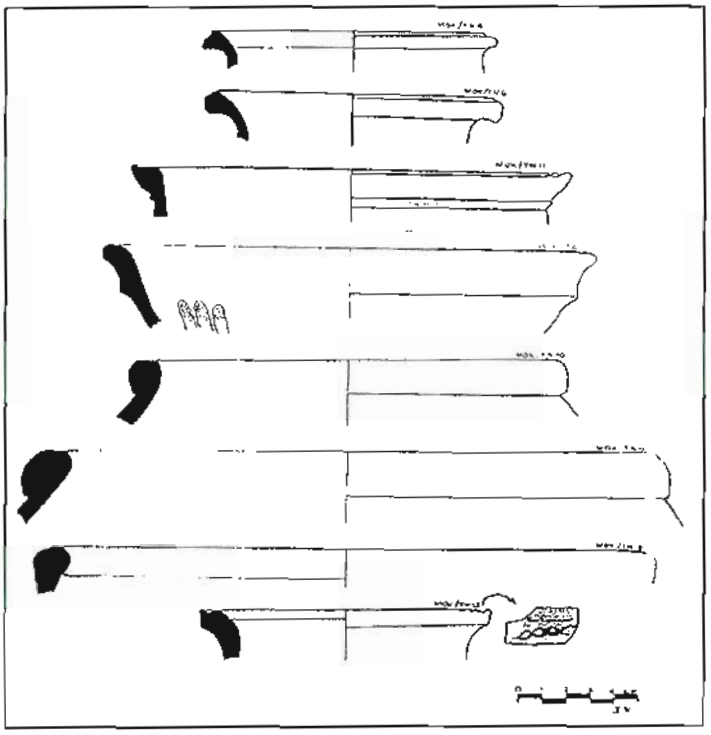
මැදපිහිල්ල (MOK09/06) මැටි භාණ්ඩයක් (පාදමක්?)



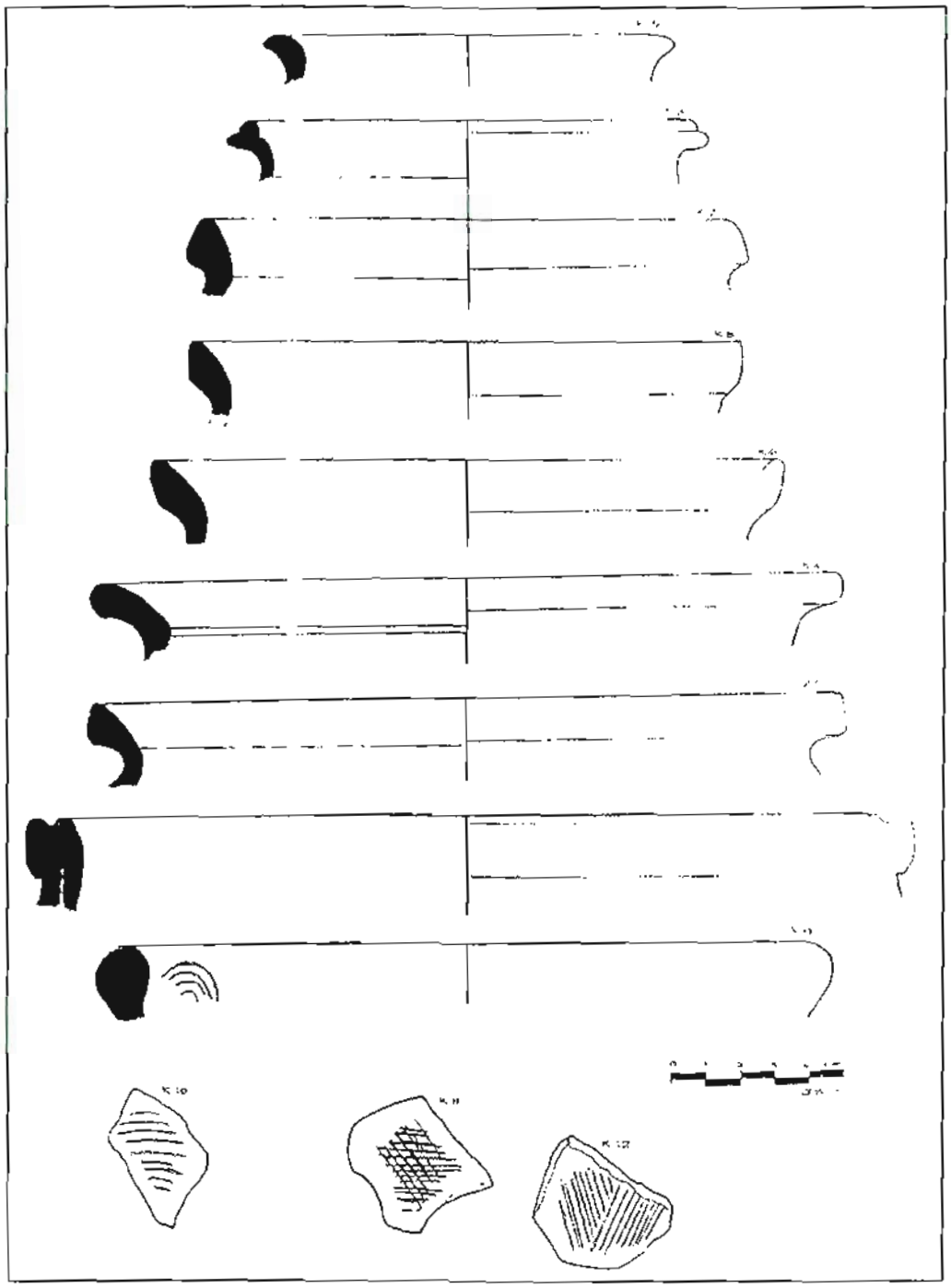
සැලසුම් අංක 18 - මැදකිඳ (MOK09/03) මැටි බඳුන්



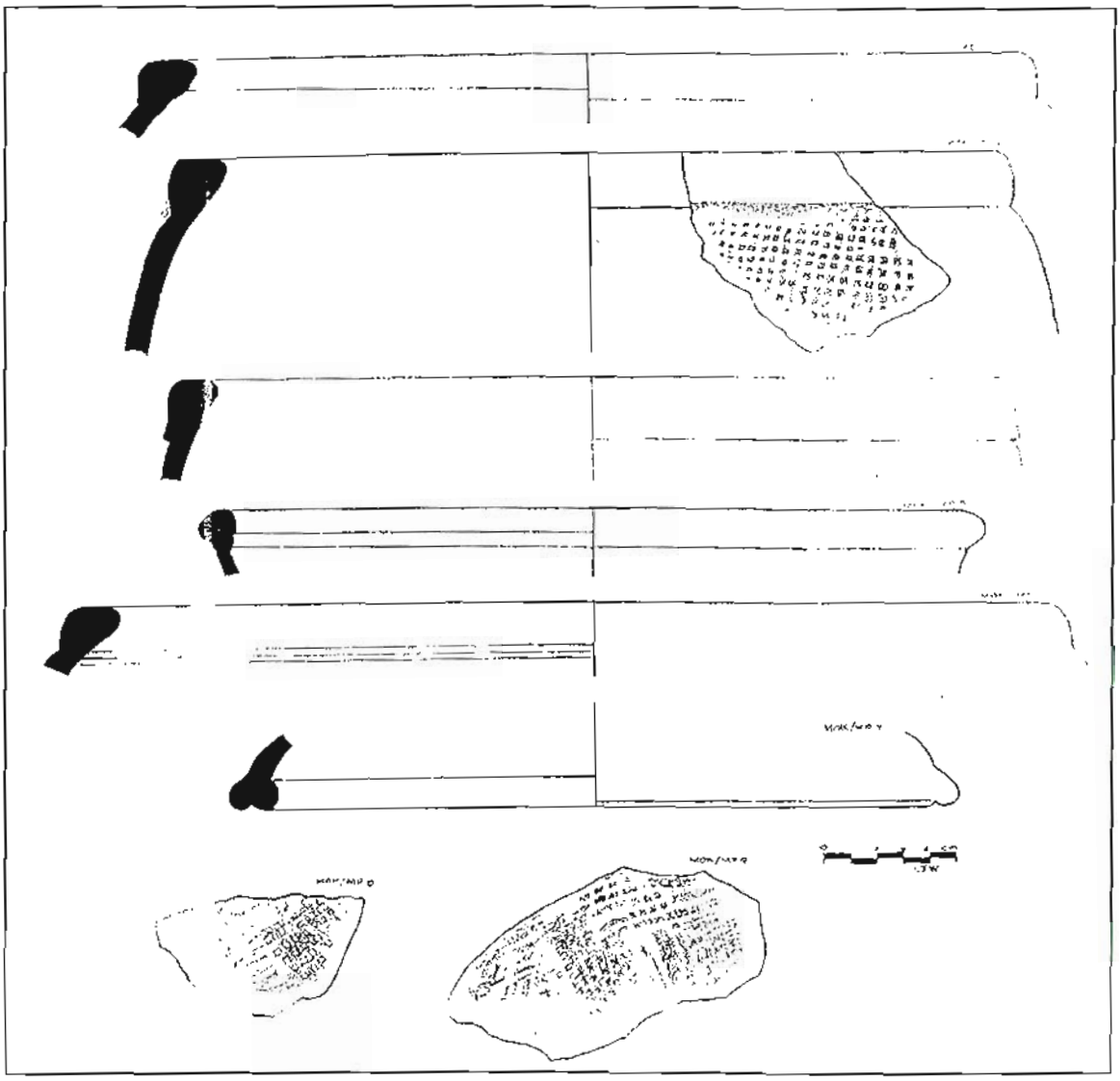
සැලසුම් අංක 19 - මැදපිහිල්ල (MOK09/06) මැටි බඳුන්



සැලසුම් අංක 20 - තලාගොඩ (MOK09/07) මැටි බඳුන්



සැලසුම් අංක 21 - කඹරව (MOK09/13) මැටි බඳුන්



සැලසුම් අංක 22 - මැදපිහිල්ල (MOK09/06) මැටි භාණ්ඩයක් (පාදමක්?)

3.2.2 උළු

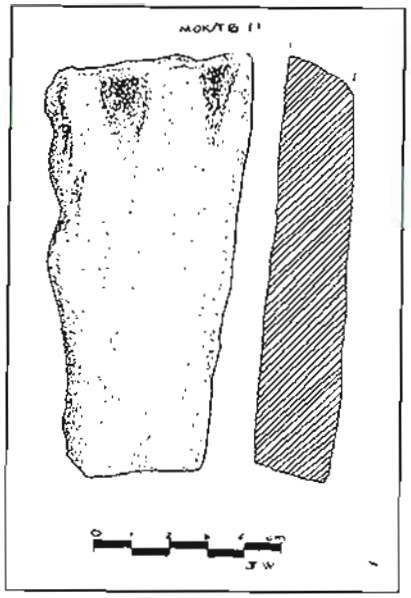
තලාගොඩ වෙහෙරගොඩැල්ල (MOK09/07) සහ මැදකිඳ වෙහෙරගොඩැල්ල (MOK09/03) යන පුරාවිද්‍යා ප්‍රදේශවලින් උළු අවශේෂ හමු විය. ප්‍රභූ පැළැන්තියේ හෝ ආරාමික ගොඩනැඟිලිවල වාස්තුවිද්‍යාත්මක සාධක ලෙස හමුවන උළු අවශේෂ එම ප්‍රදේශයේ ව්‍යාප්ත ව තිබූ ජනාවාස පිළිබඳ තොරතුරු විශාල ප්‍රමාණයක් සපයන සාක්ෂ්‍යයකි. මැදකිඳ වෙහෙරගොඩැල්ලෙන් හමු වූ තට්ටු වශයෙන් තැන්පත් වූ උළුවල හා තලාගොඩ වෙහෙරගොඩැල්ල ප්‍රදේශයේ විසිර තිබී හමු වූ උළු කැබලිවල නිර්මාණ ලක්ෂණ අනුව ඒවා අනුරාධපුර යුගයට අයත් වන බව පැහැදිලි ය. මුදුන් උළු කැබැල්ලක් මැදකිඳ වෙහෙරගොඩැල්ලෙන් හමු වූ අතර එම අවශේෂ ස්මාරකයේ වාස්තුවිද්‍යාත්මක ස්වරූපය හඳුනාගැනීමෙහි ලා ඉවහල් වේ.



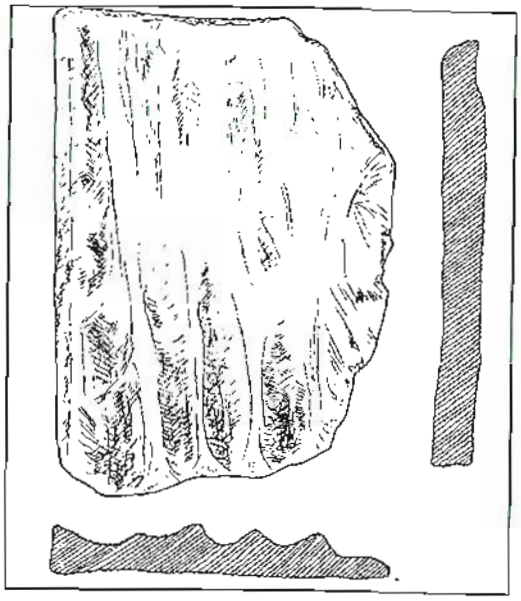
මැදකිඳ ප්‍රදේශයෙන් හමු වන උළු (MOK09/03)



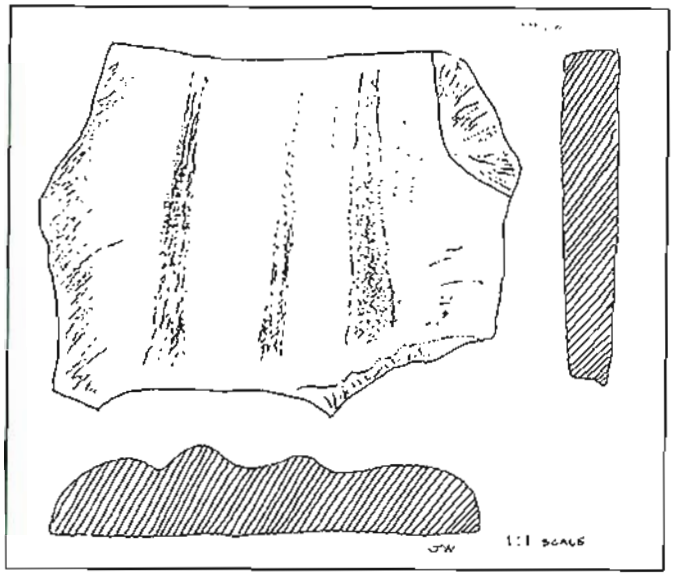
මැදකිඳ උළු (MOK09/03)



සැලසුම් අංක 23 - තලාගොඩ උළු



සැලසුම් අංක 24 - මැදකිඳ උළු කැටයක්



සැලසුම් අංක 25 - මැදපිහිල්ල උළු කැටයක්

3.2.3 ගඩොල්

පැරණි වාස්තුවිද්‍යා ශිල්පයේ දී ප්‍රභූ හෝ ආරාමික ස්ථානවල ගොඩනැඟිලි නිර්මාණය කිරීම සඳහා යොදාගත් ගොඩනැඟිලි ද්‍රව්‍ය අතර ගඩොල් ප්‍රධාන ස්ථානයක් ගනී. අප විසින් ගවේෂණය කළ සෑම පුරාවිද්‍යාත්මක ස්ථානයකින් ම විශාල ප්‍රදේශයක විසිරී ඇති ගඩොල් අවශේෂ හඳුනාගත හැකි වූ අතර ඒවා ප්‍රමාණයන් හා නිර්මාණ තාක්ෂණය අනුව පැරණි අනුරාධපුර ශිෂ්ටාචාරයට සමානත්වයක් පෙන්වයි. ස්වභාවික හා මානව ක්‍රියාකාරකම්වල බලපෑම් මත විශාල වශයෙන් හායනයට ලක් වී ඇති මෙම ගඩොල් පැරණි ස්මාරකවල බිත්ති බැඳීමට, චෛත්‍යවල ඉදිකිරීම් සඳහා හා ප්‍රාකාර ඉදිකිරීම් සඳහා භාවිත කර තිබූ බවට සාධක හමු විය.



රජාවෙල (MOK09/02) ගඩොල්



මැදකිඳ (MOK09/03) ගඩොල්



තලාගොඩ (MOK09/07) ගඩොල්

3.2.4 යබොර

මැදකිඳ වෙහෙරගොඩැල්ල (MOK09/03) හා තලාගොඩ වෙහෙරගොඩැල්ල (MOK09/07) යන පුරාවිද්‍යාත්මක ස්ථාන ආශ්‍රිත ව යබොර කැබලි තැන්පත් ව ඇති බව හඳුනාගත හැකි ය. මැටිබඳුන් අවශේෂවලට වඩා සුළු වශයෙන් හමු වන මෙම යබොර කැබලි ගවේෂිත ප්‍රදේශයේ අතීතයේ යකඩ නිෂ්පාදන තාක්ෂණය පැවති බවට සාධක හෙළි කරයි. යපස් උණු කර යකඩ නිර්මාණය වීමෙන් පසු අපද්‍රව්‍ය ලෙසට උඳුනෙන් බැහැර වන යබොර මේ ආකාරයට හමු වීමෙන් පෙනී යන්නේ මෙම නිෂ්පාදනයට අවශ්‍ය සම්පත් මෙම ප්‍රදේශයෙන් හමුවන බව හෝ වෙනත් ප්‍රදේශයකින් රැගෙන විත් නිෂ්පාදනය කළ බවයි. යබොර හමු වීමෙන් නාගරික නිර්මාණ ලක්ෂණ සනිටුහන් කරන බවත් විදේශීය සබඳතා හෝ දේශීය අවශ්‍යතා සඳහා යොදාගත් බවත් විශ්වාස කළ හැකි ය.



මැදකිඳ (MOK09/03) යබොර

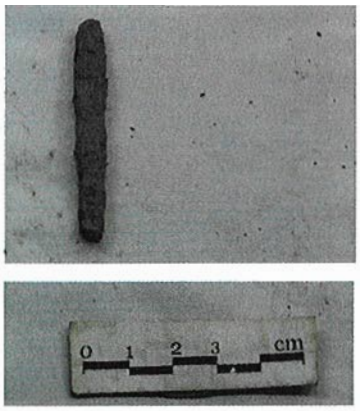


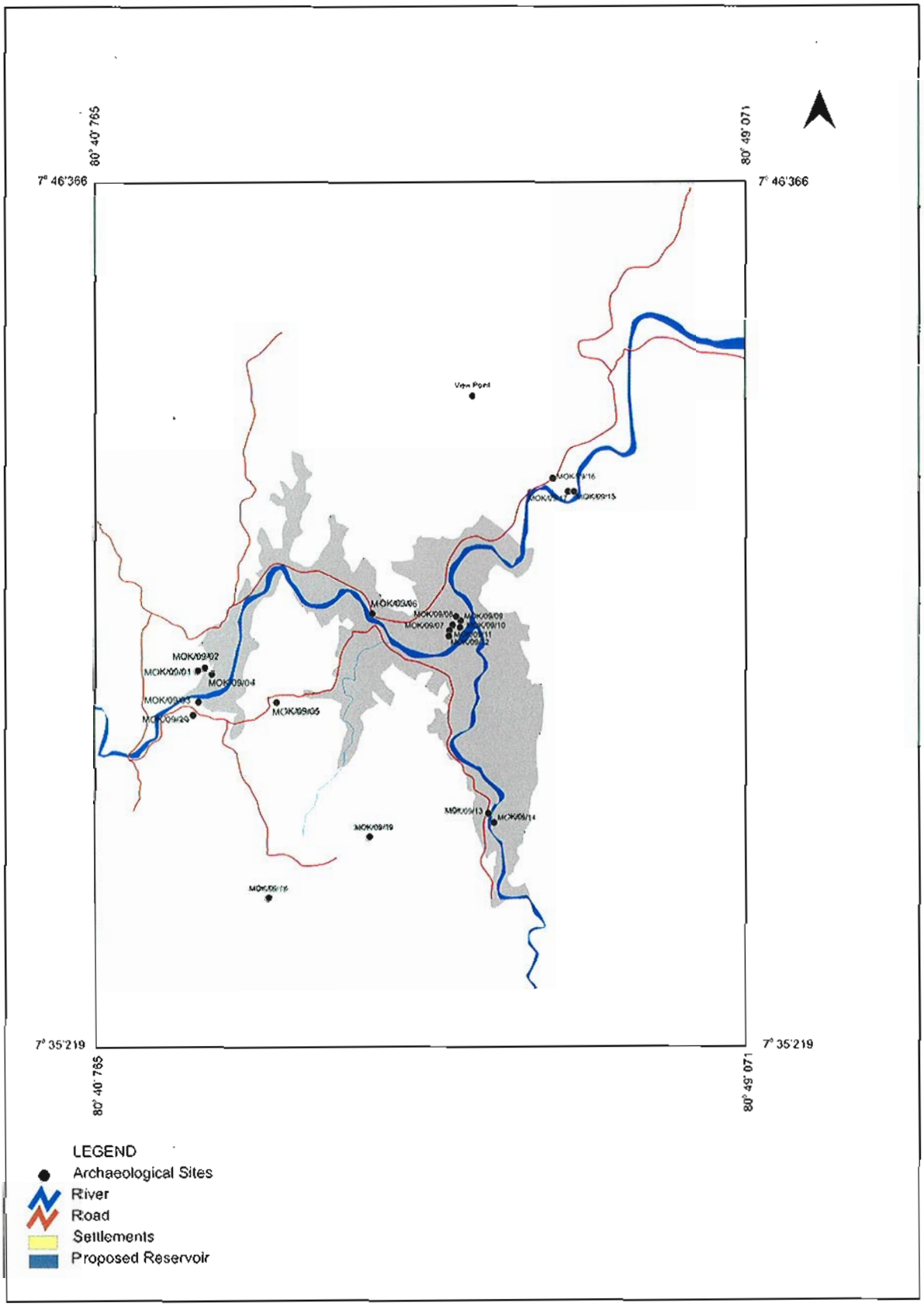
තලාගොඩ (MOK09/03) යබොර

3.2.5 විශේෂ පුරාවස්තු

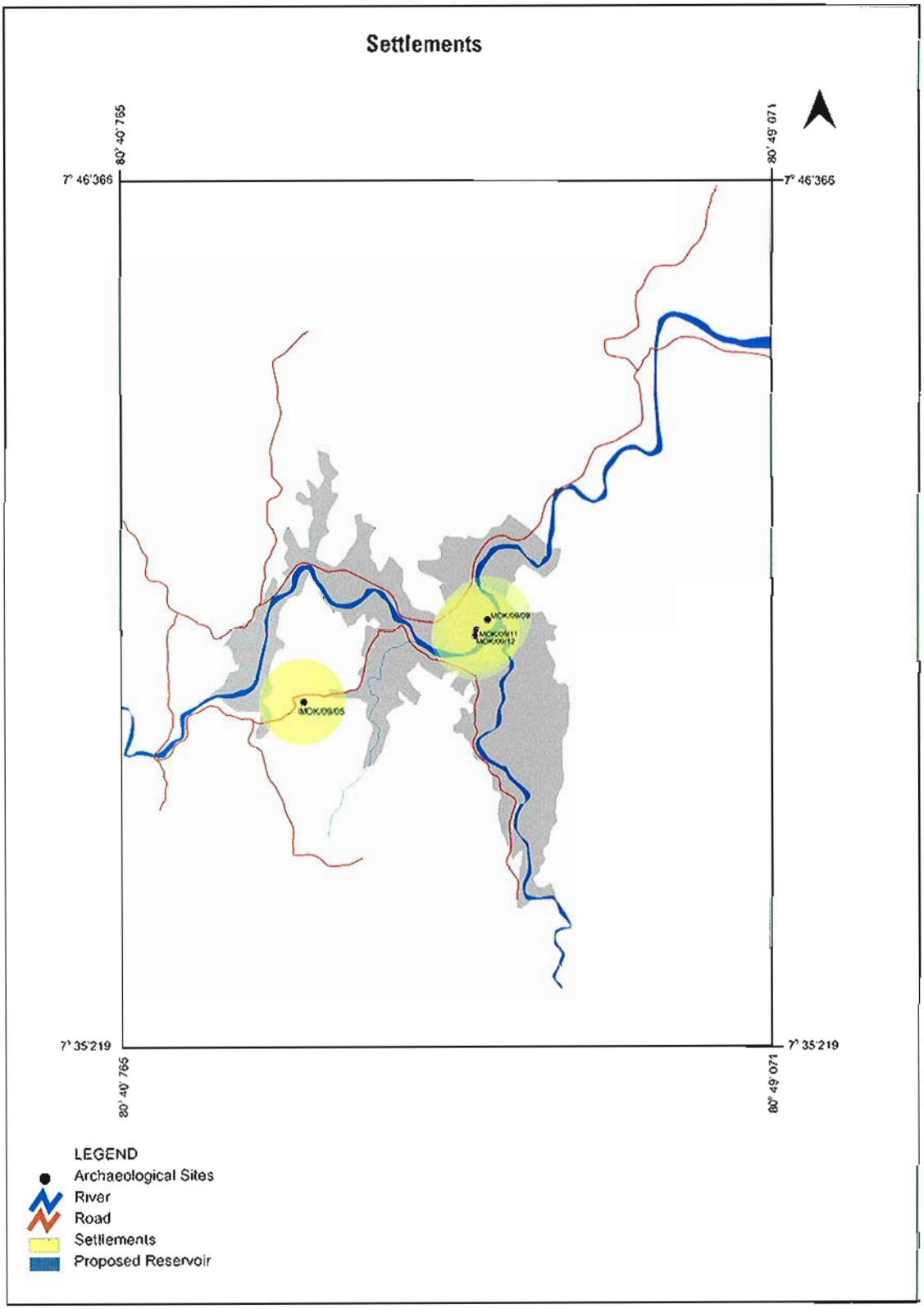
යකඩ ඇණ

කඩවත මැදපිහිල්ල වෙහෙරගොඩැල්ල පුරාවිද්‍යා ස්මාරකය ආශ්‍රිත ව මොරගහකන්ද ජලාශයට පස් ලබාගැනීම සඳහා හාරන ලද පස් කන්දක හරස්කඩ පිරික්සීමෙන් ජනාවාස ස්තරයක තිබූ යකඩ ඇණයක කොටසක් හමු විය. මෙම අවශේෂය උළු සෙවිලි කළ වහලයක පරාල සවි කිරීම සඳහා යොදාගන්නට ඇතැයි අනුමාන කළ හැකි ය. වහල සෙවිලි කර ගොඩනැඟිලි නිර්මාණ තිබූ බවට සාධකයක් ලෙස පෙන්වා දිය හැකි ය.

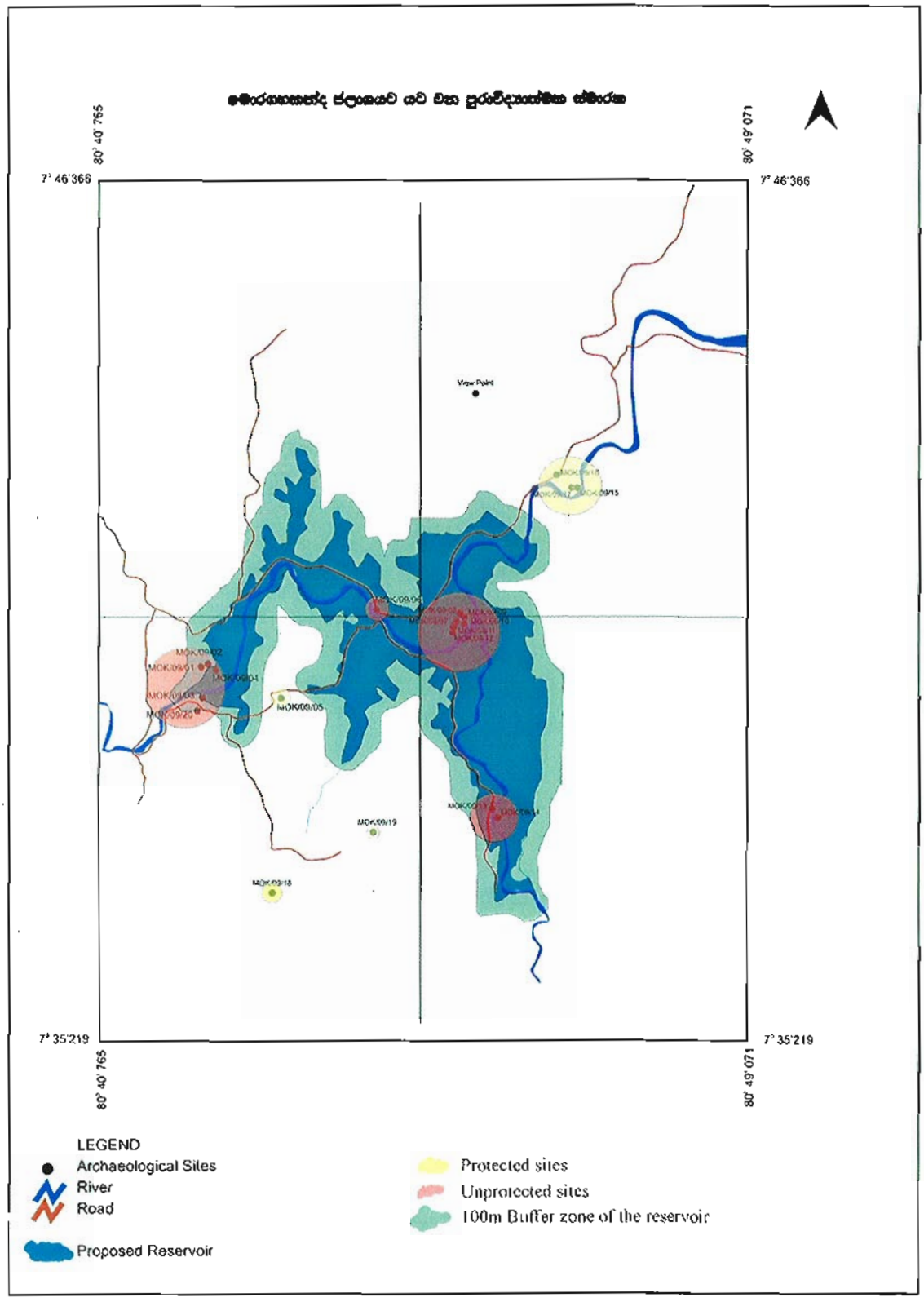




සැලසුම් අංක 26 - මොරගහකන්ද පුරාවිද්‍යා හානි අගැයුම් සමීක්ෂණයේ දී හඳුනාගත් ස්මාරක ස්ථාන



සැලසුම් අංක 27 - මොරගහකන්ද පුරාවිද්‍යා හානි අඟැයුම් සමීක්ෂණයේ දී හඳුනාගත් පැරණි ජනාවාස ව්‍යාප්තිය



සැලසුම් අංක 28 - මොරගහකන්ද ජලාශයට යට වන පුරාවිද්‍යාත්මක ස්මාරක

4. උරුම ස්ථානවලට සිදුවිය හැකි හානි

මොරගහකන්ද ජලාශ ව්‍යාපෘතියට යට වන ප්‍රදේශයේ පුරාවිද්‍යා ගවේෂණයෙන් හඳුනාගත් ඓතිහාසික පුරාවිද්‍යාත්මක ස්ථාන රාශියකි (සැලසුම් අංක 26).

මෙම ස්ථාන අතුරින් ජලයෙන් යට නොවන සම්පූර්ණයෙන් ම ජලයෙන් යට වන, අඩක් ජලයෙන් යට වන සහ ජලයෙන් යට වන ප්‍රදේශය නිසා හුදෙකලා වන ආරක්ෂිත ප්‍රදේශ වශයෙන් කොටස් තුනක් යටතේ හඳුනාගත හැකි විය.

ඒ අතරින් රජාවෙල ශ්‍රී බෙත්තාලෝක විහාරය (MOK/09/01 - MSL 200m), රජාවෙල වෙහෙරගොඩැල්ල (MOK/09/02 - MSL 2156m), කෝන්ගහවෙල (MOK/09/04 - MSL 204m) ආදී පුරාවිද්‍යාත්මක ස්මාරක ජලයෙන් යට වන ප්‍රදේශ නිසා හුදෙකලා වන ආරක්ෂිත ප්‍රදේශ ලෙසට හඳුනාගත හැකි ය.

මැදකිඳ වෙහෙරගොඩැල්ල (MOK/09/03 - MSL 191m), මැදපිහිල්ල වෙහෙරගොඩැල්ල (MOK/09/06 - MSL 183m), තලාගොඩ වෙහෙරගොඩැල්ල (MOK/09/07, 08, 09, 10 - MSL 165, 157, 158m respectively), කඹරව බෝමළුව (MOK/09/13 - MSL 159m), කඹරව බෙත්තාලෝක විහාරය (MOK/09/14 - MSL 169m), මොරගොල්ල තලංගමුව (MOK/09/20 - MSL 185m) ආදී පුරාවිද්‍යා ස්මාරක පිහිටි ප්‍රදේශ සම්පූර්ණයෙන් ම ජලයෙන් යට වේ.

එමෙන් ම අධ්‍යයනයට ලක් වූ සමහර ස්මාරක ජලාශය ඉදිකිරීමෙන් පසු ව වුව ද ජලාශයට යට නොවන බව හඳුනාගත හැකි විය. ඒවා අතර ඇලගමුව (MOK/09/05 - MSL 234m), ඇලහැර ශිලාලිපිය (MOK/09/15 - MSL 152m) වැනි පුරාවිද්‍යාත්මක ස්ථාන හඳුනාගන්නා ලදී.

මේ අනුව අඹන් ගඟ නිම්නයේ මොරගහකන්ද ජලාශය ඉදි වන කොටසේ පහළ වම් සහ දකුණු කාර්තු දෙක තුළ ඇති පුරාවිද්‍යා ස්මාරක ජලාශයට යට වන බව ස්ථිර ව ම ප්‍රකාශ කළ හැකි ය. එසේ ම ප්‍රදේශයේ ඉහළ කොටසේ ජලාශයට යට වන පුරාවිද්‍යාත්මක ස්මාරක ස්ථාන දෙකක් පමණක් හඳුනාගත හැකි ය (සැලසුම් අංක 28). මීට අමතර ව ජලාශයේ රක්ෂිත ප්‍රදේශයට හසු වන පුරාවිද්‍යා ස්මාරක තුනක් ද හුදෙකලා වන පුරාවිද්‍යා ස්මාරක ප්‍රදේශ හතරක් ද මෙම ගවේෂණයේ දී හඳුනාගත් ආකාරය ඉහත සැලසුමෙන් පෙන්වා දී ඇත.

6. නිගමන සහ යෝජනා

මොරගහකන්ද ජලාශ සංවර්ධන ව්‍යාපෘතියට යටත් වන ප්‍රදේශය වර්ග කිලෝමීටර් 29.5 ක් බව සැලසුම් කර ඇත. මෙම ප්‍රදේශය ආශ්‍රිත ව විවිධ අංශ යටතේ හානි ඇගයීම් සමීක්ෂණ සිදු කර ඇත. පුරාවිද්‍යාත්මක හානි ඇගයීම් පිළිබඳ සමීක්ෂණ වාර්තාවක් ලබා දෙන ලෙසට එම ව්‍යාපෘතිය මඟින් කරන ලද ඉල්ලීමකට අනුව මධ්‍යම සංස්කෘතික අරමුදලේ පර්යේෂණ කණ්ඩායම විසින් සිදු කරන ලද ගවේෂණයන්ට අනුව උරුම ස්මාරක සංරක්ෂණය සඳහා පහත සඳහන් යෝජනා සහ අදහස් ඉදිරිපත් කෙරේ.

1. මතුපිට ඇවිද බලා රැස් කර හඳුනාගත් දත්තවලට අනුව මෙම ප්‍රදේශය ඓතිහාසික සහ පුරාවිද්‍යාත්මක වටිනාකම්වලින් යුත් විශාල ජනාවාස සහ නාගරික නිර්මාණ හෙළි කරන ප්‍රදේශයක් බව පෙන්වා දිය හැකි ය. ඒ අනුව නටබුන් ස්ථාන ආරක්ෂා කිරීම සඳහා සංරක්ෂණයක් සිදු කළ යුතු බව අපි යෝජනා කරමු.

ස්මාරක සංරක්ෂණයට පෙර ස්මාරක හමුවන ස්ථාන ආශ්‍රිත ව විස්තරාත්මක ගවේෂණයක් කොට පර්යේෂණාත්මක කැණීමක් (Test Excavation) සිදු කොට අවශ්‍ය සියලු දත්ත නිවැරදි වාර්තාකරණයකින් පසු ජලයෙන් යටවන ප්‍රදේශවල හමුවන ස්මාරක හදිසි බේරාගැනීමේ පුරාවිද්‍යාත්මක ක්‍රමවේදය (Rescue Archaeology) යටතේ තිබූ තැනින් ගලවා ඉවත් කොට සුදුසු වෙනත් උස් ස්ථානයක නැවත ස්ථාපිත කිරීමෙන් පුරාවිද්‍යා ස්මාරකයට සිදු වන හානිය අවම කරගත හැකි බව යෝජනා කරමු. මෙම ව්‍යාපෘතිය නිසා අවදානමට ලක් ව ඇති පුරාවිද්‍යා ස්මාරක ලෙස මැදකිඳ වෙහෙරගොඩැල්ල (MOK09/03) තලාගොඩ වෙහෙරගොඩැල්ල (MOK09/07) කඩවත මැදපිහිල්ල වෙහෙරගොඩැල්ල (MOK09/06) යන ස්ථාන ඉහත සඳහන් ක්‍රමවේදය යටතේ සංරක්ෂණය කිරීම වඩාත් සුදුසු ය. එහෙත් ප්‍රදේශයේ විනාශ වී යන ජාතික උරුමයන් ගණනය කළ නොහැකි මිල කළ නොහැකි වටිනාකමකින් යුක්ත ය.



මැදකිඳ වෙහෙරගොඩැල්ල (MOK09/03)



තලාගොඩ වෙහෙරගොඩැල්ල (MOK09/07)



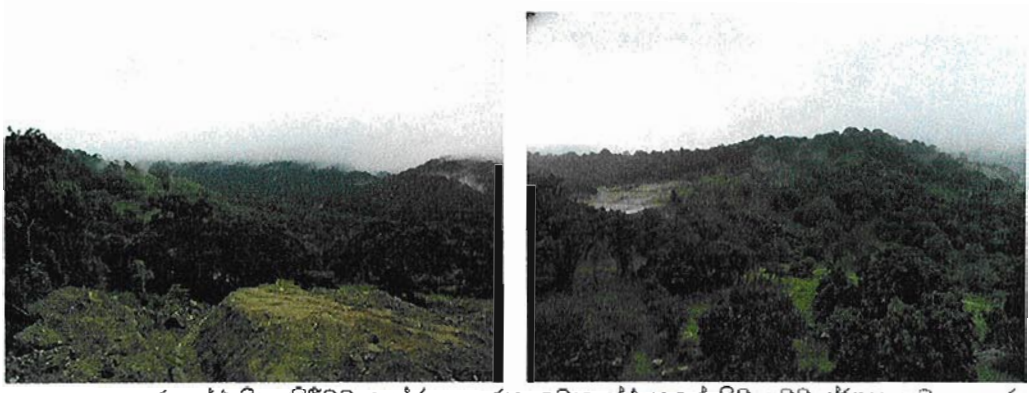
ජනාවාස පුරාවිද්‍යාත්මක අවශේෂ



මැදපිහිල්ල වෙහෙරගොඩැල්ල (MOK09/06)

2. සාමාන්‍ය ජනතාව සහ නාගරික නිර්මාණ ලක්ෂණ පිළිබඳ ව තොරතුරු හඳුනාගැනීම සඳහා ජනාවාස පුරාවිද්‍යාව (Settlement Archaeology) යටතේ තෝරාගත් ස්ථාන කිහිපයක කැණීම් සිදු කොට දත්ත එක්රැස් කිරීම අනාගත අධ්‍යයන සඳහා බෙහෙවින් වැදගත් වේ.

3. ඉහත සඳහන් ක්‍රමවේදයන් යටතේ සංරක්ෂණය කිරීමට යෝජනා කරන ස්මාරක කැණීම් කිරීමේ දී හමුවන සියලු දත්ත සහ ගවේෂණ ජනාවාස පුරාවිද්‍යාව යටතේ ස්ථාන කිහිපයක් කැණීම් කර ලබාගන්නා පුරාවිද්‍යාත්මක අවශේෂ ක්ෂේත්‍ර කෞතුකාගාරයක් නිර්මාණය කොට තැන්පත් කිරීමට යෝජනා කරමු.



කෞතුකාගාරය ස්ථාපිත කිරීමට යෝජනා කරනු ලබන ස්ථානයේ සිට අවට දර්ශනය වන අයුරු

4. මෙම ව්‍යාපෘතියට යට වන ප්‍රදේශයේ ස්ථානගත වී තිබූ පුරාවිද්‍යා ස්මාරක තිබූ තැන් ජලාශය ජලයෙන් පිරුණු පසු හඳුනාගත හැකි වන ආකාරයට විනාශයට පත් නොවී කාලාන්තරයක් පවතින ද්‍රව්‍යයකින් (කළුගල්, තිරුවානා හෝ කිරිගරුඬ) ජල මට්ටමෙන් ඉහළට පෙනෙන ස්තම්භයක් හෝ ස්මාරකයක් ස්ථාපිත කර ඒ මත සුදුසු ප්‍රමාණයෙන් තඹ හෝ නොදිරන ද්‍රව්‍යයකින් පත් ඉරුවක ස්ථානීය නාමය සඳහන් කිරීම සුදුසු බව අපේ හැඟීමයි. මෙය අනාගත පරපුරට හඳුනාගත හැකි ස්මාරකයක් වනු නොඅනුමාන ය. ඓතිහාසික, පුරාවිද්‍යාත්මක, වාස්තුවිද්‍යාත්මක, කලාත්මක, සංස්කෘතික සහ භූ දර්ශනමය වටිනාකම් සියල්ලෙන් යුක්ත මෙම ස්මාරක ජලයෙන් යට වීමෙන් එම වටිනාකම් සියල්ල විනාශයට පත් වේ. මෙම තත්ත්වය අවම කරගනු වස් මෙවැනි සංකල්ප ඉදිරිපත් කිරීමට අදහස් කරමු.

5. මෙම කාර්යයන්හි දී පුරාවිද්‍යා දෙපාර්තමේන්තුව, මධ්‍යම සංස්කෘතික අරමුදල, පුරාවිද්‍යා පශ්චාත් උපාධි අධ්‍යයන ආයතනය සහ සියලු ම ජාතික විශ්වවිද්‍යාලවල පුරාවිද්‍යා අධ්‍යයනංශ සහභාගී කරගනිමින් වඩා ක්‍රමවත් සහ කඩිනම් පර්යේෂණයක් කිරීමට සිදු වන්නේ මොරගහකන්ද සංවර්ධන යෝජනා ක්‍රමය තවත් වසර 7කින් පමණ සම්පූර්ණයෙන් ම නිම කර අවසන් කිරීමට සියලු කටයුතු සූදානම් වෙමින් පවතින බැවිනි. මේ පිළිබඳ ව අප මොරගහකන්ද ජලාශ ව්‍යාපෘතියේ ව්‍යාපෘති අධ්‍යක්ෂ සහ පරිසර සංරක්ෂණ හා ජලාධාර කළමනාකරණ අංශ ප්‍රධානී සමඟ සාකච්ඡා කිරීමේ දී ඉදිරි වර්ෂ 3ක් ඇතුළත මෙම පුරාවිද්‍යා පර්යේෂණ සඳහා කාලය වෙන් කර දිය හැකි බව වාචික ව ප්‍රකාශ කරන ලදී. එමෙන් ම මේ සඳහා වැය වන සියලු ම වියදම් ප්‍රතිපාදන ශ්‍රී ලංකා මහවැලි අධිකාරිය මඟින් ලබාදීමට එකඟ බවත් පූර්ණ සහයෝගය ලබා දෙන බවත් ඔවුන් විසින් අප වෙත දන්වන ලදී. මෙවැනි විශාල ව්‍යාපෘතියක ඉතා සුළු වියදම් ප්‍රතිශතයක් ලෙසට මේ සඳහා යන වියදම ගණනය කළ හැකි බව තවදුරටත් ප්‍රකාශ කළ ඔහු පුරාවිද්‍යාත්මක කාර්යයන්හි දී අප ආයතන මඟින් කඩිනමින් ක්‍රමවත් යෝජනාවලියක් සහිත වැඩපිළිවෙලක අවශ්‍යතාව අවධාරණය කළේ ය.

6. කොතුකාගාරයක් ස්ථාපිත කිරීම සඳහා දැනට මොරගහකන්ද ජලාශ ව්‍යාපෘති නිලධාරී නිලනිවාස ඉදිකර ඇති ස්ථානය ආශ්‍රිත ව සුදුසු භූමියක් යෝජනා කරන ලෙස ද දන්වන ලදී. එමෙන් ම හදිසි බේරාගැනීමේ පුරාවිද්‍යාව යටතේ ගලවා ඉවත් කොට එම ස්මාරක සංරක්ෂණය කිරීම සඳහා සුදුසු භූමිය ද යෝජනා කරන ලෙසත් එම කටයුතු සඳහා අවශ්‍ය සියලු ම පහසුකම් සහ වියදම් මහවැලි අධිකාරිය මඟින් දරන බවත් අප වෙත දන්වන ලදී.

ස්තුතිය

රටේ අත්‍යවශ්‍ය සංවර්ධන කටයුතු හමුවේ බැනසී යන පුරාවිද්‍යාත්මක උරුමය ආරක්ෂා කරගැනීමේ අරමුණු ඇති ව දියත් කෙරෙන ගවේෂණයක දී පුරාවිද්‍යා ගවේෂණ නිලධාරීන්ට එවැනි කාර්යයක් හුදෙකලා ව සිදු කිරීම අසීරු ය. එහි දී විවිධ පාර්ශ්වයන්ගේ සහයෝගය අත්‍යවශ්‍ය වේ. අප විසින් සිදු කළ මෙම ගවේෂණයේ දී ද විවිධ පුද්ගලයින්ගෙන් හා ආයතනවලින් ලද සහයෝගය නොවන්නට මෙවන් සාර්ථක ගවේෂණයක් සිදු කිරීමට අපට අසීරු වනු නොඅනුමාන ය.

මොරගහකන්ද ජලාශ සංවර්ධන යෝජනා ක්‍රමයට අදාළ හානි ඇගයුම් සමීක්ෂණය සිදු කිරීමේ ගවේෂණ කාර්යය මධ්‍යම සංස්කෘතික අරමුදල වෙත ලබාදුන් පුරාවිද්‍යා දෙපාර්තමේන්තුවට සහ මෙම කාර්යය අප වෙත පවරමින් ආරම්භයේ සිට ම උපදෙස් ලබාදෙමින් අධීක්ෂණය කළ මධ්‍යම සංස්කෘතික අරමුදලේ අධ්‍යක්ෂ ජනරාල් මහාචාර්ය සුදර්ශන් සෙනෙවිරත්න මහතාට ද ප්‍රථමයෙන් ම අපගේ ස්තුතිය පුදු කර සිටිමු.

මෙම පුරාවිද්‍යා ගවේෂණයේ දී මූලික ස්ථානීය අවබෝධය ලබාගැනීමේ සිට විශාල සහයෝගයක් දැක් වූ මාතලේ නාඋල ප්‍රාදේශීය ලේකම්තුමා ඇතුළු කාර්යාලීය සේවක මණ්ඩලයට අපගේ කෘතඥතාව හිමි වේ.

මහවැලි අධිකාරිය යටතේ දියත් වන මෙම ජලාශ ව්‍යාපෘතියේ මූලික පුරාවිද්‍යා හානි ඇගයුම් ගවේෂණයේ දී මහවැලි අධිකාරියේ මොරගහකන්ද ප්‍රාදේශීය කාර්යාලයේ කාර්ය මණ්ඩලය අප වෙත ලබා දුන් සහයෝගය ප්‍රශංසා කටයුතු ය.

සමස්ත ගවේෂණ භූමියෙන් විශාල ප්‍රමාණයක් වනාන්තරයෙන් වැසී තිබෙන මෙමප්‍රදේශයේ වන සත්ත්ව තොරතුරු පිළිබඳ ව දැනුවත් කරමින් එම ස්ථානවලට ප්‍රවේශ වීමේ ආරක්ෂිත ක්‍රියාමාර්ග සලසා දුන් වනජීවී සංරක්ෂණ කාර්යාලයේ නිලධාරී මහතුන්ට ද,

මොරගහකන්ද ව්‍යාපෘතියට අයත් ප්‍රදේශයේ ග්‍රාමනිලධාරී මහතුන්ට සහ එම ගම්වාසීන්ගෙන් ලැබුණු සහයෝගය ස්තුතිපූර්වක ව සිහිපත් කරමි.

සංවර්ධන යෝජනා ක්‍රමය හේතුවෙන් විනාශයට පත් වන විහාරස්ථානවල විහාරාධිපති හිමිවරුන් විසින් ලබාදුන් ඓතිහාසික තොරතුරු ගවේෂණය සාර්ථක කරගැනීමේ දී ඉවහල් වූ බව සඳහන් කරනු කැමැත්තෙමු.

GIS සැලසුම් සකසා ගැනීමේ දී අවශ්‍ය GPS උපකරණ, පරිගණක යන්ත්‍ර සහ මානව සම්පත් ලබා දීමට කටයුතු කළ පුරාවිද්‍යා පශ්චාත් උපාධි ආයතනයේ මහාචාර්ය ගාමිණී අධිකාරි මහතාට ද පොත්පත් පිරිශීලනය සඳහා අවශ්‍ය සහයෝගය ලබාදුන් එම ආයතනයේ පුස්තකාල කාර්ය මණ්ඩලයට ද,

මෙම ගවේෂණ කාර්යය සිදු කිරීමේ දී හාණ්ඩ හා අවශ්‍ය නිලධාරීන්, සේවක පිරිස ලබාගැනීම සඳහා මධ්‍යම සංස්කෘතික අරමුදලේ ආසන්නතම ව්‍යාපෘතිය ලෙස සීගිරිය ව්‍යාපෘතියේ ව්‍යාපෘති කළමනාකාර මහතාගේ ලැබුණු සහයෝගය ද අතිශයින් වැදගත් ය.

මෙම ගවේෂණ ව්‍යාපෘතිය සාර්ථක ව කරගෙන යාම සඳහා ආරම්භයේ සිට ම විශාල සහයෝගයක් සහ මඟපෙන්වීම් ලබා දුන් මධ්‍යම සංස්කෘතික අරමුදලේ අධ්‍යක්ෂ (සංවර්ධන) ආචාර්‍ය මල්දෙණිය මහත්මියට, පරිපාලන කාර්යයන්හි දී සහයෝගය දුන් අධ්‍යක්ෂ (පාලන) ආර්.කේ. ජයවීර මහතාට, මූල්‍යමය ප්‍රතිපාදන ලබාදුන් අධ්‍යක්ෂ (මුදල්) සරත් පතිරණ මහතාට, ප්‍රවාහන නිලධාරී ඩී. එදිරිසිංහ මහතාට ද අතිශය කෘතඥ වෙමු.

ගවේෂණ කණ්ඩායම
පුරාවිද්‍යා හානි ඇගැයුම් ඒකකය
මධ්‍යම සංස්කෘතික අරමුදල



මධ්‍යම සංස්කෘතික අරමුදල

Resettlement Implementation Plan
For
the Moragahakanda Agriculture Development Project



Democratic Socialist Republic of Sri Lanka

Ministry of Irrigation & Water Resource Management

Mahaweli Authority of Sri Lanka

July 2010

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Moragahakanda Agriculture Development Project

Resettlement Implementation Plan

July 2010

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6.	Ms. E.K.M.C. Egodage	Physical Planner

iv. **Abbreviation**

APS	-	Affected Persons
CV	-	Chief Valuer
CBO	-	Community Based Organization
CEA	-	Central Environment Authority
CCGS	-	Community Consultative Groups
DSD	-	Divisional Secretary's Division
EIAR	-	Environment Impact Assessment Report
FSL	-	Full Supply Level
GRC	-	Grievance Redress Committees
GND	-	Grama Niladari Divisions
GOSL	-	Government of Sri Lanka
HH	-	Household
IOL	-	Inventory of Losses
IEE	-	Initial Environment Examination
L.T.	-	Low Tension
LDO	-	Land Development Ordinance
MDB	-	Mahaweli Development Board
MDP	-	Mahaweli Development Programme
MASL	-	Mahaweli Authority of Sri Lanka
NIRP	-	National Involuntary Resettlement Policy
PAA	-	Project Approving Agency
PRA	-	Participatory Rural Appraisal
PAF/S	-	Partly Affected Family
RCC	-	Roller Compacted Concrete
RIP	-	Resettlement Implementation Plan
RAP	-	Resettlement Action Plan
RDA	-	Road Development Authority
SIAR	-	Social Impact Assessment Report
WFP	-	World Food Programme

v. DEFINITIONS OF TERMS

- ***Compensation****:* Cash or payment-in-kind to which the affected persons are entitled, in order to replace the lost assets, resources or income, at the time it needs to be replaced.
- ***Cut-Off Date:*** Date of completion of the census and assets inventory of persons affected by the Project. Persons occupying the Project area after the Cut-off date are not eligible for land entitlements in the first phase.
- ***Development Projects:*** Projects aimed at providing infrastructure and /or productive assets or, projects aimed at protecting natural recourses.
- ***Entitlement:*** A variety of measures including compensation, income restoration and interim support, transfer assistance, relocation and other benefits that are due to affected persons, depending on the nature or their losses, to improve their economic and social base.
- ***Entitlement matrix:*** Identifies categories of eligible persons and the specific entitlements for each category.
- ***Host population:*** Households and Communities residing in or near the area to which affected persons are to be relocated, and who as a result may be affected by the resettlement.
- ***Income restoration:*** Re-establishing income sources and livelihoods of affected persons.
- ***Inventory of losses:*** Complete and accurate count of the persons, households, land, business and other assets on the land that is affected by the project.
- ***Involuntary Resettlement :*** The unavoidable displacement of people arising from development projects that creates the need for rebuilding their livelihood, income and asset bases in another location. It includes impacts on people whose livelihood and assets may be affected without displacement.
- ***Major Projects:*** Projects with more than one hundred (100) affected families.
- ***Project affected persons (households):*** Any person, who as a result of the implementation of a project, losses the right to own, use, or otherwise benefit from a built structure, land (residential, agricultural or pasture), annual or perennial crops and trees, or any other fixed or moveable asset, either in full or in part, permanently or temporarily.
- ***Rehabilitation:*** Re-establishing and improving incomes, livelihoods and social systems.
- ***Relocation:*** Moving affected persons and their moveable assets, rebuilding housing and improvements to land and public infrastructure in another location.
- ***Replacement cost:*** The method of valuation of assets that helps determine the amount sufficient to replace lost assets and cover transaction costs. In applying this method of valuation, depreciation of structures and assets should not be taken into account. For losses that cannot easily be valued or compensated for in monetary terms – such as, access to

public services, customers and suppliers; to fishing, grazing or forest areas – attempts are made to establish access to equivalent and culturally acceptable resources and earning opportunities.

- **land in rural areas,** replacement cost is defined as the pre-project or pre-displacement value, whichever is higher, of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.
- **land in urban areas,** replacement cost is the pre-displacement value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
- **houses and other structures,** replacement cost is the cost of materials to build a replacement structure with a space and quality similar to or better than those of the affected structure, or to repair a partially affected structure, plus the cost of any labour and contractor fees, plus the cost of any registration and transfer taxes. In determining the replacement cost, depreciation of the asset and the value of salvaged materials are not taken into account, nor is the value of benefits to be derived from the project deducted from the value of an affected asset.

- ***Resettlement:*** The involuntary physical or socio – economic displacement of persons caused by a project which covers all facets including the compensation, relocation and rehabilitation measures to mitigate the effects of displacement.
- ***Resettlement Budget:*** A detailed breakdown of all the costs of a Resettlement Action Plan phased over the implementation period.
- ***Resettlement effect:*** Loss of physical and non-physical assets, including homes, communities, productive land, income earning assets and sources, substance, resources, cultural sites, social structures, networks and ties, cultural identity and mutual help mechanisms.
- ***Settlement:*** Voluntary movement of people to a new site where they re-establish their livelihoods as in the case of the Mahaweli Scheme.
- ***Social preparation:*** Process of consultation with affected persons undertaken before key resettlement decisions are made: measures to build their capacity to deal with resettlement, taking into account existing social and cultural institutions.

- ***Resettlement Implementation Plan:*** Time bound action plan with the budget setting out resettlement strategy, objectives, entitlement, actions, responsibilities, monitoring and evaluation.
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x. Executive Summary.

1. Background of the Project and Goals & Objectives

a. Background

This Project which was a project identified under the survey of Irrigation & Hydro Power Potentials of the Mahaweli Ganga & the Adjoining River Basins during the 04 year period of 1965- 1968 by a UNDP/FAO team with Sri Lankan counterparts is yet to be completed. This is a key project in the "*Mahinda Chinthana Policy*" of year 2005 and hence the government decided to commence work on this project in year 2007.The Project is located in the Naula Divisional Secretary's division of Matale district of Central Province. The proposed reservoir will be constructed across Amban Ganga at a place called Moragahakanda with a water storage capacity of 570 MCM. At present, the construction work of the deviated road and Saddle dam No. 2 has begun.

With the construction of this reservoir & other peripheral works, around 1581 nos of families & fair extent of developed lands will be directly affected. In order to resettle these Affected Persons (APS) and to compensate their losses and also to fulfill the Part 4C of the National Environment Act No 72/22, a Resettlement Implementation Plan (RIP) is formulated with a view to minimize the adverse effects of resettlement and restoration & upliftment of livelihood of the APS.

The RIP deals with acquisition & compensation, relocation/resettlements and economic rehabilitation processes of the APS of the Moragahakanda Project, inclusive of other entitlements. The policy frame work of the RIP is based on National Involuntary Resettlement Policy (NIRP) and related enactments on land acquisition and land alienation. In addition, MASL has incorporated certain other provisions in terms of the powers & functions vested by the Mahaweli Authority Act of Sri Lanka No.23 of 1979. Besides, the land alienation and compensation policies adopted by MASL during the period of Accelerated Mahaweli Development Program were also taken into consideration for the preparation of RIP. The data contained in the RIP are based on the findings of the socio economic surveys carried out by MASL in the years 2006 & 2008 and from the Acquisition Surveys (under Section 2 of Land Acquisition Act) done by the Survey Department in the year 2009. The RIP was compiled by the officials of MASL with the assistance of a Resettlement Consultant who had closely associated with the resettlement activities of the Accelerated Mahaweli Development Program.

The main stakeholders of the project namely, Divisional Secretaries of Naula/ Elahera/Laggala Pallegama/ Medirigiriya, District Secretaries of Matale/ Polonnaruwa, officials of Ministry of Lands and Land Development, Land

Commissioner General, Chief Valuer, respective Grama Niladaris (GNs) in the Project area , other relevant officials of the affected institutions , Buddhist priests and community leaders of the affected area were also consulted during the preparation of RIP.

b. Goals & Objectives.

The principle aim of the RIP is to address the social impacts and ensure the successful restoration and improvement of the living standards, income earning capacity and production levels of project affected households.

The main objective of the RIP is to mitigate the Socio-economic impacts of the Project.

2. Resettlement Impacts.

Out of several Socio Economic Surveys, 1581 nos of families have been identified from Tank-Bed Area, Road deviation, elephant corridor, Electricity Transmission line and Branch channel Trace of Kaudulla LB Extension Area.
As the majority of the APS are occupied in the Agriculture Sector, it will be most appropriate to involve them in the same sector, even in the resettlement areas. This would be the best means of restoration of their livelihood as land is an income resource to them.
The extent of the affected area is of 4153ha.(including Tank Bed, Road Deviation, Elephant Corridor, Electricity Transmission line & Branch Channel trace of Medirigiriya) of which the percentage of developed extent is 31% whereas only 29% is under the tenure ship and the balance constitutes state lands.
There are 1679 nos of structures affected by the project. Out of 1581 nos of families, 161 nos are vulnerable families who need special assistance. There are few social infrastructure facilities which will be affected by the project, which are currently being serving both affected & non affected persons.

3. Legal Frame Work for Land Acquisition and Resettlement

The Land Acquisition Act of 1950 with amendments is a the statutory law which empowers the GOSL to acquire private land required for public purposes. The projects under the Accelerated Mahaweli Development Programme also made use the same provisions of this Act to take over the private lands for the developments. The compensation paid for APS of those projects was not attractive as depreciated value was paid for the structures. However, the

Circular No 4/2008 issued by the Ministry of Lands and Land Development has additional provisions to pay enhanced benefits to the APS of this nature. Further, the NIRP guidelines which were effective from year 2002, have been applied in the resettlement planning of this project. The land alienation policy will be in line with

the Land Development Ordinance & the Crown Land Ordinance. Furthermore, MASL has fixed a cut-off date of 2008.01.20 for the entitlement criteria of lands.

Based on the above policies / guidelines, following assistance schemes will be introduced for the income restoration and livelihood improvements of the APS.

- Training
- Employment opportunities in the Project
- Special assistance to vulnerable families
- Job restoration grants
- Business grants to owners of business establishments
- Ex-gratia payment for households opted for System 'D'

In addition, a Revolving Fund will be established for micro-financing facilities for needy people.

An Entitlement Matrix has been prepared for different categories of APS incorporating all above benefits.

4. Relocation Options

The lands in System 'F' &'D' have been identified for the re-settlement of the APS. The System 'F' is located in Matale District close to the Moragahakanda Reservoir and System 'D' is located in Polonnaruwa District under the Kaudulla LB Extension Area. Generally 80% of the APS have opted to System 'F' whereas 20% have given the choice to System 'D'. Only 03 households requested lands at Ambana Area Centre which is close to the Moragahakanda Reservoir. In the host area of System 'F', there are 358 HH living at present whereas 628 HH live in Kaudulla Extension Area.

The HH occupying the homestead & farmstead areas in the new settlement area will be accommodated to the same individuals as much as possible with less disturbances to them.

5. Economic Rehabilitation & Income Restoration.

For the long-term sustainability and economic rehabilitation of the APS, the following new ventures will be introduced / encouraged:-

i) Off-farm activities, like fish farming, gem mining
ii) Establishment of small scale agro based industries.
iii) Market oriented crop diversification.
iv) Hi-tech agriculture.
v) Involvement in other income generating activities during off seasons
vi) Establishment of service provider entities.

6. Consultation & Grievance Redress Mechanism

The Consultations and awareness programs have been conducted amongst the project affected people during last 02 years. This process will be continued until the APS are resettled in new settlement areas. After the resettlement in the new areas, the respective Resident Project Manager will continue these programs during the balance part of Resettlement process through the several types of Committees proposed in the RIP.

7. Institutional Arrangement for Implementation of RIP.

Basically, MASL as the Executing Agency is responsible for the implementation of the Land Acquisition & Resettlement. A Project Director's (PD) Office has been established at the field for efficient implementation of the programme. The Acquisition and Resettlement Division (A&R Division) of this office will carry out the acquisition and initial functions of the resettlement activities.

Gradually, these resettlement activities will be handed over to respective RPMS and A & R Division will confine only to the acquisition process until its completion. Several Community Consultative Groups (CCGs) will be established at the project for the facilitation of proper implementation of A & R activities.

The land acquisition and resettlement will be monitored both internally by MASL and externally by an independent body with the objective of receiving feed back to the project management on the implementation and identifying problems, failures & successes.

8. Implementation Schedule.

The dam construction will span over a period of 5 1/2 years and the resettlement activities will be completed one year before the dam construction is over. Hence, acquisition & compensation process will be completed prior to the commencement of resettlement activities.

9. Investment Budget.

The total Investment Budget for Land Acquisition and Resettlement covers following components:

i) Cost of Compensation
ii) Cost of Electricity supply restoration for isolated villages.
iii) Cost of Resettlement and relocation.
iv) Cost of Training and Income restoration
v) Cost of Agriculture Extension.
vi) Cost of Monitoring and Evaluation
vii) Cost of Institutional Development

As a total, the total budget of resettlement and compensation is expected Rs. M 3283.102.

10. Issues Partly Covered or Not Covered at all.

There may be few issues either partly covered or not covered al all in this RIP. Such issues will be dealt on individual basis when they are confronted during the implementation of the RIP.

Summary of Recommendations

1. Owners of acquired land and properties will be entitled for compensation package under Circular No. 4/2008 issued by the Ministry of Lands and Land Development.

2. The sizes of farmsteads & homesteads will be 0.6 ha. & 0.2 ha. respectively in System 'F' or 'D'.

3. The Households and sub families occupying the affected area prior to the cut off date (20.01.2008), will be entitled for farmsteads & homestead in System 'F or 'D'.

4. The business community running the establishments prior to the cut off date (20.01.2008), will be entitled for business premises in new service centers of System 'F', 'D' or Ambana.

5. The affected temples will be provided 0.8 ha of highland for re-establishment of such temples in System 'F' or 'D'. All affected temples will be entitled for a farmstead. If the extent of paddy land acquired is above 0.8 ha, such temples will be entitled for an additional farmstead. All affected temples will be entitled for materials worth of Rs. 200,000 for reconstruction of temples.

6. The Ande owners above 0.2 ha extent of paddy land will be entitled for a farmstead & homestead in System 'F' or 'D'. Owners of such acquired paddy land above 0.4 ha will be entitled for farmsteads & homesteads in System 'F' or 'D'. The Ande owners whose extent of land is below 0.2 ha will be entitled for a compensation payment for the loss of Ande right plus an additional 2/3 of the compensation payment.

7. The salvage materials and trees (except in 100m buffer zone) of acquired properties will be released to the households free of charge.

8. The households who will opt to System 'D' are entitled for an ex-gratia payment of Rs. 50,000/=.

9. A paddy land owner whose extent of land is 0.4 ha or a highland agricultural land owner whose land extent is above 0.8 ha and who is living outside the project area will be entitled for a farmstead & a homestead in System 'F' or 'D' or compensation payment plus an additional 2/3 of the compensation payment maximum up to Rs. 2 million.

10. The resettler families in new settlements will be entitled for a shifting allowance of Rs. 10,000/=, housing allowance of Rs. 20,000/= and latrine allowance of Rs. 5000/=.

11. Each main family and a sub family will be entitled to two lorry loads & one lorry load of transport facilities respectively.

12. The persons who lose their jobs due to the project activities will be entitled for Rs. 3000/= per month upto a maximum period of 06 months.

13. All Vulnerable HH numbering 161, will be entitled for Rs. 25,000/= each as a income restoration grants. The Vulnerable HH (elderly & disabled) numbering 14 (out of the above 161 nos), will be entitled for a living allowance of Rs. 3000/= per month over a maximum period of 18 months.

14. A Revolving Fund valuing Rs. 25 million will be established for micro financing of the small scale businessmen and entrepreneurs.

15. All informal businessmen will be paid Rs. 10,000/= each as an ex-gratia payment.

16. Special training programmes will be conducted for the APS

17. Priority will be given to the APS in employing for project construction activities.

18. Affected public utilities will be re-established as necessary.

19. Special assistance schemes have been accommodated for encroachers, rented households and households occupying houses in leased lands.

CHAPTER ONE

1. Introduction and Project Background

1.2 Mahaweli Development Program

The development of the Mahaweli Ganga was preceded by a UNDP sponsored comprehensive study (UNDP/FAO/ID, 1968) of the land and water resources of the Mahaweli and its tributaries. The study identified the construction of several reservoirs across the Mahaweli river and its branches to store water for irrigation and generation of hydropower. Main objectives of the Mahaweli Development Programme (MDP) are given below:

i) Development of 365,000 ha. of land with irrigated water;
ii) Crops diversification;
iii) Generation of 620 MW of hydro-power;
iv) Direct and indirect employment generation (approximately 1 million persons);
v) Flood control in downstream area;
vi) Increase of agriculture produces; and
vii) Development of Agro-based industries.

The implementation of Mahaweli development program was commenced in late 1960s with the commencement of Polgolla barrage. The multi billion anxious programme was planned to complete within 30 years at the beginning.

The work on the Accelerated Mahaweli Development Programme (AMDP) was commenced in 1978. At that time, Headworks of Polgolla Diversion Project had been completed and work was proceeding on the development of irrigation infrastructure in System 'H'. Under Accelerated Mahaweli Development Programme, it had been decided to construct four large multi-purpose reservoirs across the Mahaweli Ganga and construction was completed by the end of the decade. Upstream reservoir projects were given priority for power generation as then Government need to increase the electricity generation for expansion of the industries.

The Moragahakanda dam is to be constructed across Amban Ganga a major tributary of the Mahaweli for supply of water to downstream area was not taken up in the accelerated programme as it was not the priority at that time. The present Government's one of the main policies is to maintain the food security in the country which will be partly fulfilled by this Project. Accordingly, the Government of Sri Lanka (GOSL) has now decided to construct both reservoirs of Moragahakanda and Kalu Ganga which are the last two reservoirs to be built under the Mahaweli tributaries for provision of additional water for irrigation, drinking and industries in North Central Province, part of Central Province and part of Eastern Province as they have been identified as present priorities.

1.3 Surroundings of Moragahakanda Project and its Location

The reservoir dam is located 190 km. North-East of Colombo on the Amban Ganga, a major tributary of the Mahaweli Ganga. The site is located about 2 km. upstream of the ancient Elahera anicut, which feeds the Elahera-Minneriya Yoda Ela (EMYE) canal, and about 20 km. downstream of Bowatenna dam.

Two mountain ridges, one running in North-East direction and the other in North West – South East direction, divide the Amban Ganga catchment from the upper Mahaweli Ganga catchment. The general elevation of these divide is around 500 m.asl. They contain some high peaks such as Hunnasgiriya (1,514 m) and Guruluhela (813 m). The mountain range that separates the Amban Ganga catchment from the Kala Oya basin in the north runs in North South and South West –North East directions. The general elevation of this part is about 400 m.asl.

In its upper reaches, the Amban Ganga is known as the Sudu Ganga and flows into nearly North -South direction up to Bowatenna. A tributary of the Amban Ganga known as Nalanda Oya joins the Sudu Ganga at this point. The catchment area of the Amban Ganga at Bowatenna reservoir is 512 km^2. Beyond Bowatenna, the Amban Ganga flows into East -West direction bypassing Elahera and Angamedilla until it reaches the Mahaweli Ganga. The catchment of the Amban Ganga at Moragahakanda dam site is 768 km^2. Several major tributaries drain the right bank catchment of the Amban Ganga below Bowatenna. They are the Galaboda Oya, Kambarawe Ganga and Kalu Ganga. The Kalu Ganga reaches into Amban Ganga below the Moragahakanda proposed dam site. The catchment area on the left bank between Bowatenna and Moragahakanda is limited with compared to right bank. There are no major tributaries at left bank of the catchment. The right bank tributary, Kambarawa Ganga, is the major source of water in the catchment between Bowatenna and Moragahakanda.

In the upper catchment of Amban Ganga above Bowatenna, Tea, Rubber and Coconut plantations exist in the hilly area at equal proportions. In the valleys, paddy cultivation is practiced. There is very little forest cover in this part of the catchment except in high mountain ridges above 800m. In the lower catchment between Bowatenna and Moragahakanda, it seems to be scattered population living in the villages that covered with shrub and forest area.

1.3.1 Project rationale and objectives

i) All the reservoir projects under Mahaweli Development Programme are having hydro-power stations to meet the growing demand for electricity. In view of heavy expenditure incurred on the establishment of the hydro-power stations and in order to maximize generation of hydropower from the power stations below Polgolla, it has been decided to limit the diversion of water at Polgolla. The result was curtailment of average diversion at Polgolla to 875 MCM per annum. Owing to the curtailment in diversion at Polgolla, the water for irrigation requirement has been found insufficient particularly in System H. In addition to this, there were severe shortages of water especially during the Yala season (April to September). The shortages have been

acute in Systems H, IH, and MH in Anuradhapura District. There were repeated requests for additional water to these areas.

ii) The demand for water in the NCP has increased in recent times not only for irrigation deficits, but also for increased needs for industrial and domestic consumption. The National Water Supply and Drainage Board has estimated that the demand for water for domestic consumption and industrial in the greater Anuradhapura by the year 2010, would be 15 MCM. There would be increased demand for water in Hingurakgoda, Polonnaruwa as well as in Trincomalle areas where large-scale industrial expansion is anticipated.

iii) The Amban Ganga basin has been the centre for major diversions of water from the zone of abundance from the central-south eastern part of the country to the areas of water scarcity in the north-central plains. During ancient times, two major diversions of water were made from the Amban Ganga at Elahera and Angamedilla. In the recent times, Mahaweli Development Programme (MDP) has introduced a major diversion of water from the Mahaweli basin to Amban Ganga basin. It was observed from the historic data for last 50 years that the total annual inflow in Amban Ganga at Elahera varies from1356 MCM in 1954 to 287 MCM in 1988. The average annual inflow at Elahera is 776 MCM and that including Polgolla Diversion is 1145 MCM. The historic records indicate that the average of 462 MCM spills over the Elahera anicut and 736 MCM over the Angamedilla anicut annually, which goes to waste. The only storage reservoir presently available in the Amban Ganga basin is the Bowatenna reservoir, which has a storage capacity of only 52 MCM and a live storage of 35 MCM. Thus, it is necessary to have a larger reservoir across the Amban Ganga for regulating and storing the average annual inflow of 1145 MCM, in order to minimize wastage and provide an efficient water management system to accommodate all requirements of the population. The proposed Moragahakanda Reservoir envisaged regulating and storing this inflow in Amban Ganga. This would facilitate cultivating additional 5,154 ha. of existing land in Maha and 21,208 ha. in Yala, in North-Central Province which at present, remain uncultivated every year, thereby increasing the cropping intensity from 1.55 to 1.85.

iv) Several studies had been conducted on water resources of the Mahaweli Basin and there were proposals recommending construction of Moragahakanda reservoir across the Amban Ganga to store water for irrigation, hydro-power, and the future needs industrial and domestic purposes. The water-spread area at present is not much inhabited and inundation of the reservoir area would not cause much hardship. Hence, the Mahaweli Authority of Sri Lanka assigned the Consultant, Lahmeyer International GmbH, Germany to study the feasibility of the Moragahakanda Development Project. The Consultant has recommended that the Moragahakanda Development Project is feasible for implementation.

v) The current average cropping intensity in the irrigation Systems H, I/H, M/H, G, D1 and D2 is around 1.55. Raising the average cropping intensity to 1.85 or higher will certainly require the provision of additional water supplies from the Amban Ganga, even with the improvements in irrigation efficiencies and the increases in the proportion of less water-consuming crops (other field crops – OFCs – rather than

paddy) which can be reasonably expected to be achieved over the coming 25 to 30 years.

Likewise, the requirements for domestic and industrial water supplies which is about 90 Mcm. in the year 2030 in the Districts of Matale, Anuradhapura, Trincomalee and Polonnaruwa, will increase rapidly as the population grows and development of these areas proceeds. In particular, it is to be expected that the proportion of the rural population turning from groundwater sources, which are becoming increasingly polluted with harmful chemical and bio-chemical constituents or simply exhausted, to treated surface water will also increase, leading to further demands for water from the tanks and canals fed by extractions from the Amban Ganga and its tributaries.

vi) Extensive investigations were undertaken of the current and possible future needs for irrigation water in the above-mentioned irrigation areas fed by diversions from the Amban Ganga at Bowatenna, Elahera and Angamedilla. These investigations showed that overall cropping intensity in these areas averages around 155% (see Table 1.1), varying significantly from year to year, depending upon the availability of water.

Table 1.1 : Average Cropping Intensities (1995 – 1999)

Mahaweli System	**Irrigable Area (ha)**	**Cropping Intensity (%)**		
		Maha	**Yala**	**Total**
H	31,425	99	41	140
I/H	4,100	87	77	164
M/H	4,300	78	41	119
HFC*	3,057	29	20	49
D1	23,100	92	79	172
D2	10,100	100	100	200
G	5,400	97	72	168
Total	**81,482**	**93**	**62**	**155**

* Huruluwewa Feeder Canal

vii) It was found that shortages in water supplies to Systems H, I/H and M/H, frequently occurred when the existing Bowatenna tunnel also running at its full capacity of around 28 m^3/s. With the implementation of Moragahakanda Project, more water could be diverted to System H, I/H and M/H as Moragahakanda reservoir Project could provide water to System G, and D/1 independently.

1.3.2 Benefits

i) Improved availability of irrigation water within Systems H, I/H, M/H, G and D1 to enable cropping intensities to increase from 1.55 to 1.85.

ii) Cultivation of additional 5154 ha. Of existing land in Maha Season and 21,208 ha. Land in Yala season in North Central Province.

iii) Increase of 66,000 MT. of Paddy production annually.

iv) Hydro-power plant of installed capacity of 15 MW.

v) Production of 3000 MT. of Inland fish annually.

vi) Direct and Indirect Employment generation – 1642 and additional Mandays – 1198700.

vii) Catering for increased demand of domestic and industrial water from the present level of 32 MCM to 92 MCM by year the 2030.

viii) Improvement of livelihood of people in Project benefited area.

1.3.3 Specific Issues to be addressed

i) Displacement and Relocation of 1581 households.
ii) Environmental impact
iii) Acquisition of 4153 ha. of land (includes all affected areas such as Tank bed, Road deviation, elephant corridor & branch channel trace of system D)
iv) Riparian rights of downstream farmers

Environmental approval for the Project was given by Project Approving Agency (PAA, namely Ministry of Agriculture Development and Agrarian Services) and the Central Environmental Authority (CEA) on 26 Oct. 2001 while stipulating several recommendations to be implemented by MASL. One of the recommendations of EIA is to prepare the Resettlement Implementation Plan (RIP). Memorandum of Understanding (MOU) has been signed by MASL with Irrigation Department and the District Secretary of Polonnaruwa on Riparian rights of downstream farmers. Acquisition of land in the Project affected area has been identified and commenced the acquisition procedure by MASL.

1.3.4 Project Period

Project period is defined as from 2011 – 2015, 05 years period.

1.4 Resettlement Planning activities and Preparation of Inventory of Losses

1.4.1 Methodology

Data has been collected through primary and secondary data particularly using literature surveys on available documents at MASL and other Government agencies. 04 Socio-economic surveys were conducted during the past 10 years period. MASL conducted transit walk-surveys through interviews with the people in the area. In

addition, Officials of Project Director's office have conducted number of programmes using participatory rural appraisal (PRA) methods.

1.4.2 Socio Economic Surveys and other Studies

i) The PMU Socio-Economic Census – 1996, Survey conducted in the Project was to identify the families and land that will be affected for the reservoir area of 195m.asl – (FSL) + 100 m. Buffer Zone line. At the Survey, it was identified that 2325 Households of 20 G.N. Divisions will be affected. The objective of the Survey was to identify the number of lands, families and their Socio-economic conditions.

ii) The Socio-economic survey conducted in 2006 by MASL identified that 1996 HH will be affected which included 6684 persons in 14 G.N. Divisions. It was taken 186m.asl (HFL) + 100 m. Buffer Zone of the reservoir survey was aimed for the detail study on affected HH, population, Socio-economic conditions, land holding, tenure, land use pattern etc. This was a fairly comprehensive study, most inputs were taken from this to RIP.

iii) The Socio-economic Survey was conducted in the year 2007 to identify the affected area, its land resources and socio-economic condition of the families of proposed elephant corridor which is located at Kirioya GN Division in Elahera DS of Polonnaruwa district, where the affected number families will be 57 while 04 village boutiques will be affected.

(iv) Fresh Socio-economic survey was conducted in 2008–September/October period to identify the exact number of HH, population, vulnerable families, public and commercial establishments and religious institutions and affected local infrastructure along with Inventory of losses survey after demarcation of 186 m.asl. + 100 meter perimeter Boundary on the ground by Survey Department. It was identified that 1515 HH, and 4907 persons will be affected in the tank bed area in11 G.N. Divisions of Naula DS Division. The findings were made use in the preparation of RIP.

v) A JICA study was conducted in 1988 as part of the feasibility study in respect of settlement planning and resettlement in new agriculture development projects and the resettlement programme in the Moragahakanda Reservoir Project

1.4.3 Data Base

Data Base was prepared based on all information and data collected from questionnaire surveys. The data collected from each HH was focused to all aspects of household population, Socio-economic condition, land, tenure and usage and their choice of new settlement sites.

1.4.4. Updated Social Impact Assessment (SIA) Report

This fulfilled the additional data needed for designing of RIP which was supplementary to initial SIA Report of 2006.

1.4.5. Inventory of Losses (IOL)

In June 2006 and September 2008, Moragahakanda Project Director's Office of MASL with the assistance of Grama Niladari conducted a house to house survey to undertake the Inventory of Losses of all households, commercial establishments, institutes of common facilities and community services and religious institutes affected by land acquisition. This is intended to detect the inventory of actual losses which was aimed for the preparation of RIP. When the year 2006 IOL survey was conducted, perimeter boundary has not been demarcated on ground and therefore, actual numbers of households and structures have not been identified. But survey conducted in September / October 2008, acquisition boundary was land-marked by Survey Department.
Hence, actual numbers of households and structures were taken into account for finalization of I.O.L.

1.4.6. Methodology of the preparation of Inventory of Losses

Data on all structures, land, trees, electricity and telecommunication lines were taken into account in each GN Division by a questionnaire survey and it was updated, based on preliminary Acquisition survey report sent by the Superintend of Surveys-Matale.

1.5. Resettlement Implementation Plan (RIP)

Draft RIP was prepared by MASL in May 2007 without the total list of structures, compensation rates, resettlement site plans and costs. This first Draft was prepared in November 2008 to fulfil the requirements of National Involuntary Resettlement Policy Guidelines, particularly:

- Involuntary resettlement should be avoided or minimized as much as possible;
- Affected people to be assisted to re-establish their life and improve the quality of life;
- Affected people should be involved in the selection of sites, livelihood restoration programmes, compensation and development;
- Replacement land to be given as option for compensation in the case of loss of land;
- Replacement cost will be given as compensation for the acquisition of land, structures and other assets;
- Resettlement should be planned with the participation of affected people;
- Common and community facilities to be provided;
- Vulnerable groups should be fairly assisted; and
- Those who do not have title for their land to be fairly treated.

1.6. Goals, Objectives and Principles of RIP

1.6.1 Goals

The principle aim of the RIP is to address the social impacts and ensure the successful restoration and improvement of the living standards, income earning capacity and production levels of project affected households.

1.6.2 Objectives of the RIP

The main objective of the RIP is to mitigate the Socio-economic impacts of the Project.

- Provide Policy and Procedure guidelines for land acquisition;
- Payment of compensation;
- Policy and Procedure on Resettlement programme;
- Income and livelihood restoration programmes for the affected people

1.6.3 Land Acquisition and Resettlement Principles

Land acquisition and resettlement of the Affected Persons (APS) will be carried out in accordance with the NIRP (2002) guidelines. NIRP's main objective is to avoid or minimize the involuntary displacement and ensure the affected people that their assets will be replaced, income restored and enjoy the share of benefits, in accordance with the following guidelines:

- Land acquisition will be minimized as far as possible. This should be done in consultation with the affected people.
- Replacement land to be either homesteads and farmsteads or commercial/ industrial lots.
- Compensation to be paid at market value for the trees , crops and land to be acquired.
- Replacement value to be paid for all structures such as residential, commercial, industrial etc…
- New centers such as Town Centers, Area Centres and Village Centres and Irrigation systems are to be developed with related infrastructure facilities.
- MASL will handle the land acquisition, payment of compensation, resettlement of the APS including grievance redress mechanism and resolution of disputes.

1.6.4 Land Acquisition Guideline

The land acquisition procedure is governed by the Land Acquisition Act (LAA)of 1950 and its subsequent amendments. The Act deals with all steps to be followed during the process of acquisition of property.

1.6.5 Resettlement Process

Resettlement process will be conducted according to the policy framework of national involuntary resettlement policy (NIRP)

i. . Demarcation of Boundary
ii Socio Economic assessment
iii. Preparation of Inventory of lost Assets and RIP
iv. Resettlement site selection
v. Implementation of RIP
vi. Monitoring & Evaluation

1.6.6 Resettlement Planning Principle

The preparation of this RIP has been based on the following resettlement planning principles.

i) Defining entitlements and eligibility, resettlement planning and implementation used dependable and accurate data reflecting the precise impacts on APS so that appropriate entitlement policies and rehabilitation measures can be developed.
ii) The policy framework assessment of existing policies and the need for new policies to meet the needs of all affected persons, including non titled persons, women and other vulnerable groups.
iii) Defining income restoration measures and how they will be structured.
iv) Based on the entitlement and the eligibility policy, prepare an entitlements matrix by categories of APS solving their entitlement benefits and measure for compensation and income restoration.
v) To identify and meet the needs of vulnerable groups. Strengthening institutional capacity and staffing the field resettlement unit with suitably qualified full time resettlement officers and acquiring officers and organizing community level resettlement support groups.
vi) Determine accurate budget that the actual cost of land acquisition, resettlement and rehabilitation and how they will be financed.
vii) Defining and accurate time frame that how land acquisition and resettlement will get into the overall project schedule.

1.7 Composition of RIP

According to the NIRP objectives, Resettlement Implementation Plan was prepared for all activities covered by the Moragahakanda Reservoir Project.

The policy objectives and organizational structure adopted while preparation of RIP is in line with Sri Lanka National Involuntary Re-settlement Policy (NIRP) of 2002.

1.7.1. Cut-off Date

Based on the experience gained from the past resettlement programs carried out under the Mahaweli development program , due to non-declaring a cut-off date, people used to encroach the land in the project area after the commencement of the project claiming entitlement of land. With this experience, the necessity of declaring a cutoff date for the resettlement has emerged, in fairness to the people who really lose their land because of the Moragahakanda Development Project.

As such, MASL has declared a cut-off date for this project for the entitlement of new lands for encroachers & sub families of the affected main families as on 20th January. 2008. The entitlement for new lands will be determined by the Electoral Register maintained by the District Secretary/ Assistant Election Commissioner. The persons who encroached lands in the Project area after the cut-off date are not entitled to compensation or any other form of resettlement assistance in the 1st phase of the resettlement program. But they will be considered in the 2nd phase of the resettlement program. MASL distributed the entitlement assurance letters to all entitled persons by 30th June 2009.

CHAPTER TWO

2.0 Resettlement Impact

2.1. Measures to Minimize Land Acquisition and Losses

The impact of involuntary resettlement and land acquisition was minimized by considering the alternative considerations of the dam height in the latest Feasibility Report prepared by Lahmeyer in 2001.

Alternative A. - The original design was for a dam with its Full Supply Level (FSL) at 195m asl. In 1995, the estimated number of families to be relocated from the reservoir bed was 2,325 (PMU Socio-economic Census). It can be assumed that by 2010 this number would have increased somewhat.

Alternative B. - The present design has a 185m FSL, which will currently require the relocation of 1515 families from the reservoir bed (1,148 estimated in 2002) and 57 from the elephant corridor (41 in 2002). Thus, the lower dam height now selected will result in an approximately 50% reduction in the number of people who will have to be resettled.

Table 2.1 Alternative Considerations of the Dam Height

Alt.	Environmental Impact	Social Impact
A.	Large area of productive land and forest to be inundated.	Major resettlement requirement. Approx. 2,325 affected families.
B.	Reduced area of inundation.	Reduced resettlement requirement. Approx. 1515 affected families.

Source: Prepared based on the Feasibility Study in 2000/2001

2.2. Status of the affected Area (Socio Economic Condition)

The Socio Economic Survey conducted in September/October 2008 has revealed that total number of affected households including sub-families will be 1572 whereas 2006 survey indicated that the number of families to be 1996. This is due to the reason that 2006 survey was conducted before the perimeter boundary line was marked on the ground but when the 2008 survey was conducted, 186 HFL+ 100 meter buffer zone was land marked on the ground and people are aware whether they will be affected or not and 12 Grama Niladari (GN) divisions will be affected by the Project.

1581 No. of households (inclusive of 9 families from the proposed branch channel of Kaudulla left bank extension area) will be affected which consist of 5155 persons including 1308 main families and 273 sub-families. (refer Table 2.2 for details) 1697 Structures will be affected which included 1547 Houses, 79 commercial buildings, 13 Combined resident & boutiques, 45 Public Buildings and 13 Religious buildings.. 01 Regional Hospital, 01 Agrarian Service Centre, 01 Co-operative Rural Bank, 01 Samurdhi Bank, 03 Sub-Post Offices, 03 Schools, 03 Pre-schools, 01 Public Library and 05 Buddhist Temples and 33 km. of Electricity Line (LT) including 05

Transformers and 05 km. of Telecommunication line will be affected by the Project. (refer Table 2.3 & 2.4 for details)

2.2.1. Tank-bed area

1515 HH will be affected in the Tank-bed area of 11 Grama Niladhari Divisions of Naula Divisional Secretary's Division which consists of 1248 Main families and 267 Sub-families. More details are given under Table 2.1. 142 HH will be partly affected at 05 GN Divisions in the Tank-bed area. These 142 HH will lose part of their properties including agricultural land and home gardens that will affect their livelihood. Therefore, it has been identified that these families will also to be relocated in new settlement areas.

2.2.2. Road Deviation

09 HH will be affected in Kongahawela and Millagahamullatenna GN Divisions for the construction of Naula – Elahera Road deviation.

2.2.3. Proposed Elephant Corridor

57 HH will be affected for proposed Elephant corridor at Kiri Oya GN Division which consists of 51 Main families and 06 Sub-families. The proposed Elephant corridor has been identified and recommended by EIA Report.

2.2.4. Transmission Line

A transmission line of 16.2 Km of length will be constructed to transmit the hydro electricity generated by the Moragahakanda power station which will be connected to the proposed Naula Sub Station. This construction will be carried out with the minimum disturbances to the people and no any house/structure will be affected. Within the 132m reservation, about 385 long term trees & 159 medium term trees will be affected. From the lands to be acquired for this construction, it has been identified almost all the lands are privately owned properties, and the number of the affected landowners is 22[1].This is the only route with minimum damages to erect the transmission line. It has been decided after considering several alternative routes.

2.2.5. Proposed Branch Channel – Medirigiriya

The proposed branch channel of system D is about 17 km of length will be constructed to facilitate irrigation water to resettlement area of system D. This channel construction starting from the Kaudulla Main Irrigation canal will end up in the Bandarawewa Unit. It traverses through the Nabadawewa and Dahamwewa Units. This construction will be carried out with minimum disturbances to houses/ structures in the Kauduluwewa GN division, and at this study stage, it is expected 9 households[2] will be affected. However, the alignment of the branch canal will be reviewed in the detailed design stage to minimize the number of affected households.

[1] Since the census survey for the transmission line was conducted after finalizing the draft RIP report, the scale of the affected land will be described separately in Section 2.2.4 unless it is specified.

[2] Since 9 households to be affected by the branch canal was identified after the finalizing the draft RIP, the scale and socio-economic status of the affected households will be described separately in Section 2.12 unless it is specified.

Table 2.2 - No. of Households affected

Ser. No.	GN Division	Tank-bed	Deviation of roads	Partly affected	Elephant corridor	Sub Total
1	Elagamuwa	203	-	-		203
2	Medapihilla	150	-	-		150
3	Kadawatha	186	-	-		186
4	Thalagoda	221	-	-		221
5	Galporugolla	113	-	-		113
6	Kambarawa	267	-	-		267
7	Kongahawela	23	07	18		48
8	Millagahamulathenna	92	02	17		111
9	Moragolla	02	-	51		53
10	Maragamuwa	11	-	12		23
11	Rajawela	96	-	44		140
12	*Kirioya				57	57
	Total	**1364**	**09**	**142**	**57**	**1572**

Note: This Table does not include 9 households to be affected by the branch canal in System D1. Details of these HH are shown in the Table no 12.6.

*This GN division is located in Elahera DS division of Polonnaruwa District

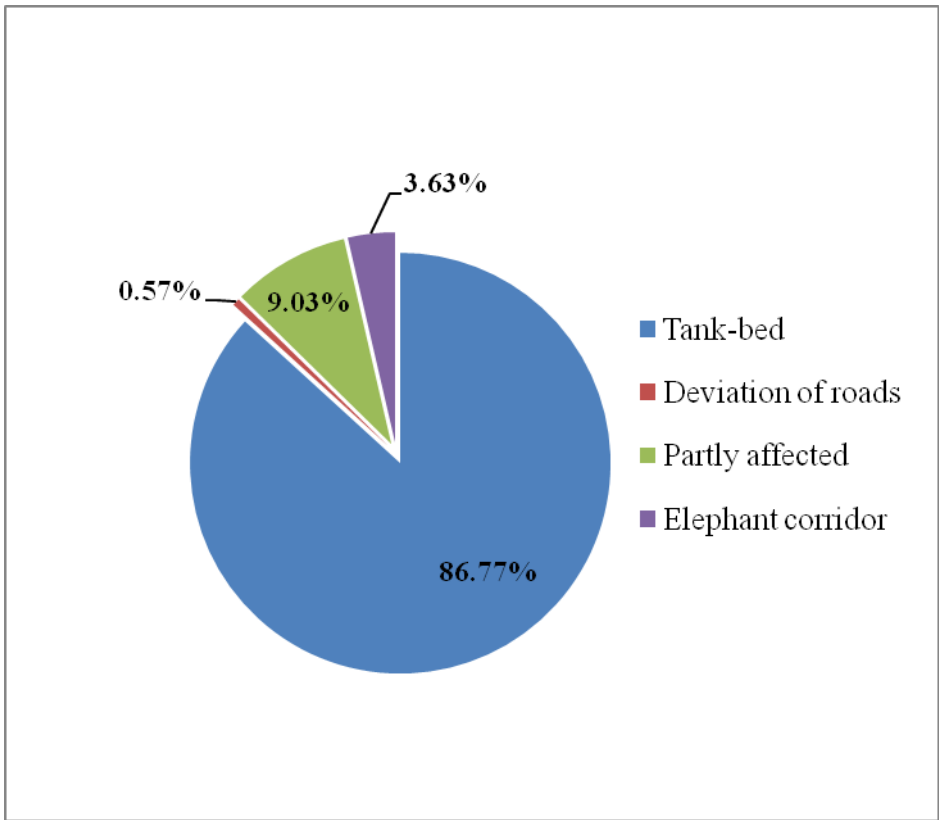


Figure 2.1- No of affected households

Table 2.3 – No. of Structures affected

Ser.No.	Description	No. of Structures
1	Houses	1547
2	Commercial Buildings	79
3	Combined Residences & Boutiques	13
4	Public Buildings	45
5	Religious Buildings	13
	T O T A L	**1697**

Figure 2.2- No. of Structures affected

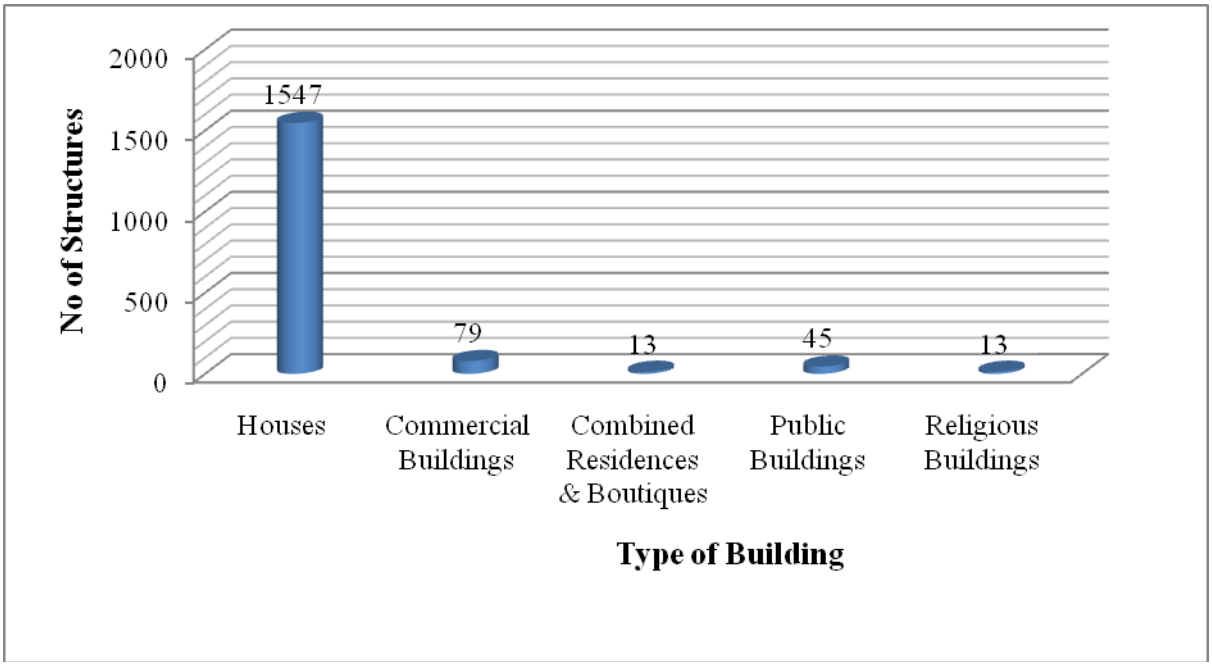
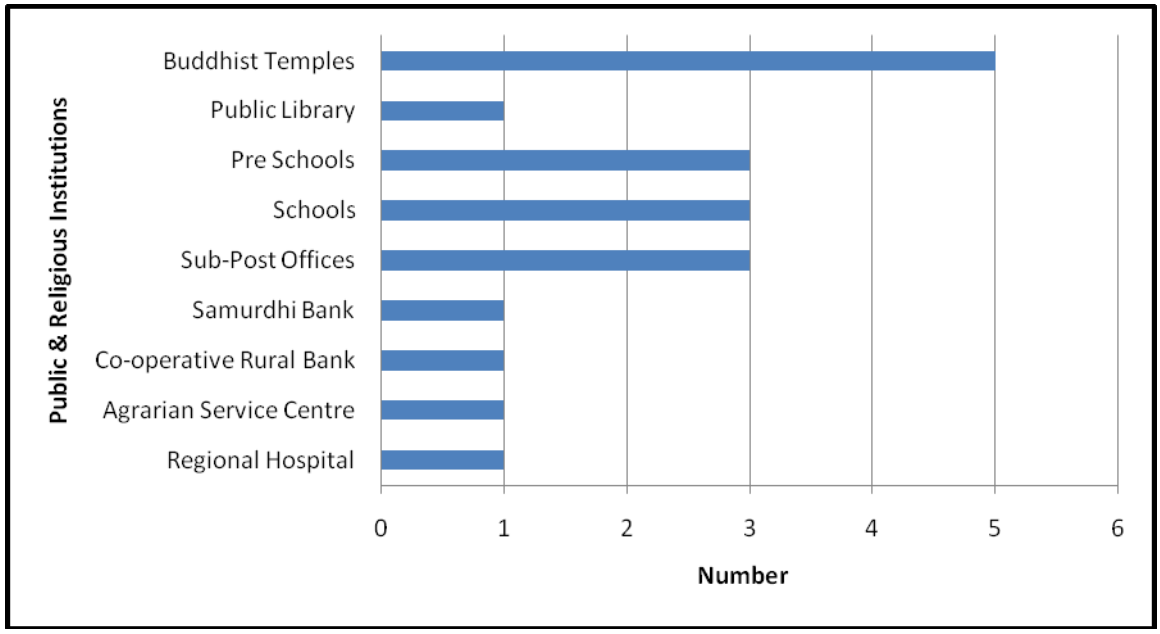


Table 2.4 –Public & Religious Institutions Affected

Ser.No.	Description	No. of Complexes
1	Regional Hospital	01
2	Agrarian Service Centre	01
3	Co-operative Rural Bank	01
4	Samurdhi Bank	01
5	Sub-Post Offices	03
6	Schools	03
7	Pre Schools	03
8	Public Library	01
9	Buddhist Temples	05
	T O T A L	**19**

Figure 2.3 - Public & Religious Institutions Affected



2.3. Land Use and Settlement Pattern, Tenure and Land Size

An extent of 4148 ha. of land will be acquired for Tank-bed area, road deviation and elephant corridor. The HH occupied in those areas own private agricultural lands and home gardens and leased agricultural land and home gardens. It was identified that few HH occupied the encroached land and rented houses. Part of the area is covered by scrub jungle and forest.
All these constitute 31% of the total extent. Land tenure and land size are related to the geographical conditions, threat of wildlife and development potentials etc…(refer Table No 2.5)

2.3.1. Land Use Pattern

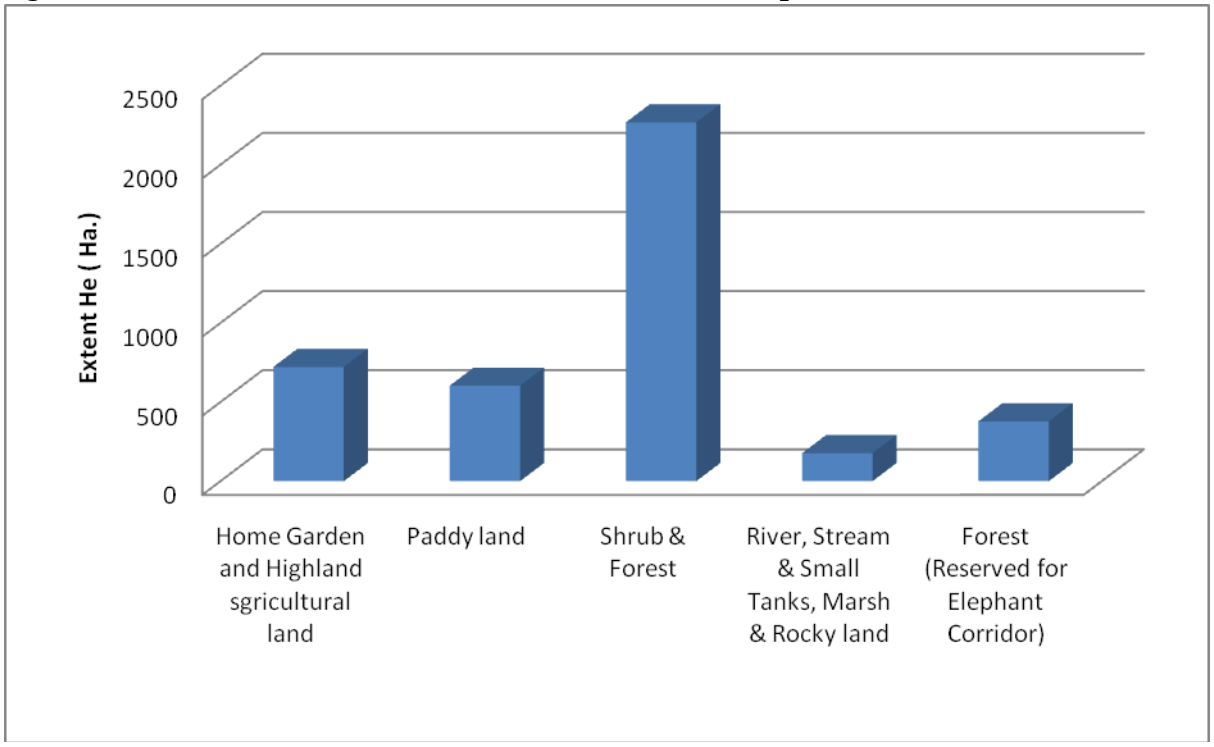
Out of the extent of 4,148 ha. of land (including the affected areas of Tank Bed, Elephant Corridor & Road deviation) , shrub jungle and forest cover constitute of 2,268 ha and 177 ha of River, Stream, Marshy & Rocky land . The significant feature of the situation is 69% of the land area is covered by shrub jungle, forest, and stream, River, marshy and rocky land in the affected area and while only 31% land is partially developed. (refer Table No 2.5)

There are no urban and industrial land users within the affected area. At the same time, the lands to be acquired are from the residential land users and the amount of compensation payment for the lands as well as for the loss of income will be minimal than that of urban areas. Hence there is no serious impact on the national economy.

Table 2.5 - Land Use Pattern in the reservoir area and Elephant corridor

Category	**Ha.**	**%**
Home Garden & Highland agricultural land	722	17
Paddy land	603	14
Shrub & Forest	2268	56
River, Stream & Small Tanks, Marsh & Rocky land	177	04
Forest (Reserved for Elephant Corridor)	378	09
TOTAL	**4148**	**100%**

Figure 2.4 - Land Use Pattern in the reservoir area and Elephant corridor



From the above land use data, following key indicators could be established.

- Land Household Ratio : 4148/1581 = 2.7 ha
- Household: Home garden Ratio :722/1581 = 0.46 ha

On the same basis, from the Tables 2.5 & 2.3, number of buildings per ha:

1697/722 = 2.35 Say 2-3 building/ha

The above indicators show that the area concerned (project area) represents rural characteristics. Generally, in Sri Lanka, the building ratio in urban areas is around 40 per Ha and in the rural areas around 10 per Ha. Having a building ratio of 2-3 per ha in the project are will show that the damages caused by the acquisition of land and property is not significant.

2.3.2. Settlement Pattern

Twelve Grama Niladhari Divisions consisting of only villages will be affected by the project whereas no Urban or Semi-Urban areas have been identified in the Project area. Only 02 small village bazaars have been identified during the surveys which are located at Kongahawela and Kadawata. People are mostly living in villages with inadequate infrastructure facilities. As a result of the proposed Moragahakanda Development Project and prolonged delays in the commencement of same, other infrastructure development have not taken place over the last 30 years.

2.3.3. Land Tenure and Farm Size

According to the Table No 2.6, 25% own below 0.6 ha. and 39% own 0.6 – 1 ha. of land. 28% own 1-2 ha. and 7% own 3-5 ha. of land and only 1% own above 5 ha of land in the Project area. This scenario shows that around 50% of the property losers in Moragahakanda project are able to obtain an almost equivalent size of land to that of the lost land. Even though the extent of new land would differ from the original land size, the recipient of new land will be able to earn a higher income through their new lands supported by better infrastructure facilities.

The total private land to be acquired under the Project is 829 ha. while 388 ha. of land occupied by the HH are state leased land. An extent of 108 ha. of land are encroachments while an extent of 2445 ha. of land comprised of shrub jungle and forest cover. (Refer Table no 2.8)

Table 2.6 – Land Tenure and Farm Size

Ser.No.	Description	No. of HH.	%
1	Owned below 0.6ha.	329	25
2	Owned 0.6 – 1 ha.	525	39
3	Owned 1 – 2 ha.	370	28
4	Owned 3 – 5 ha.	97	7
5	Owned above 5 ha.	9	1
	TOTAL	**1330**	**100**

2.3.4. Ownership of Households

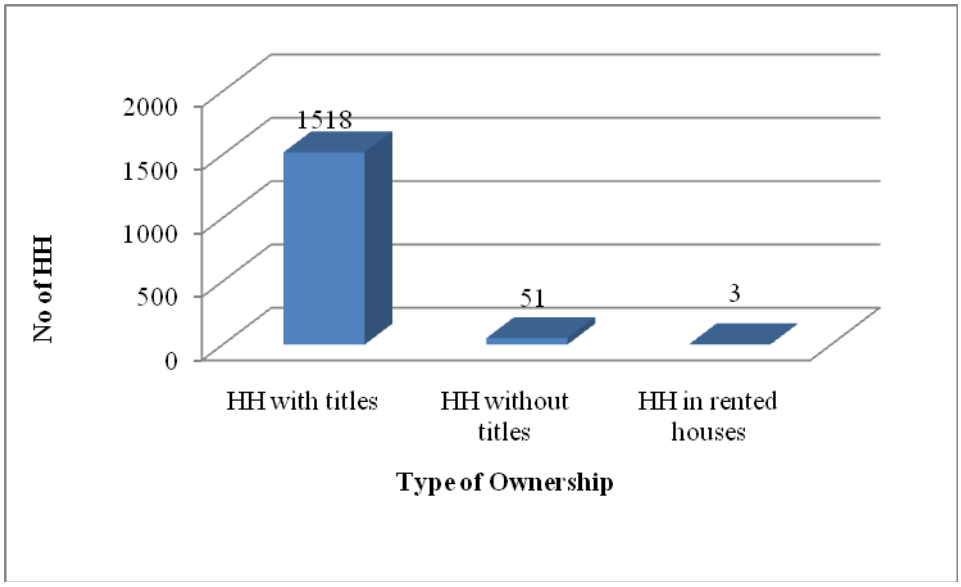
There are 97% Legal Title Households whereas 3% occupies without any kind of title and 0.1% rented Households who are affected by the Project (refer Table no 2.7). As the number of legal title holders are very high it is of paramount importance to follow the formal acquisition procedure and payment of compensation.

Table 2.7 - Ownership of Households

Ser.No.	Description	No. of HH.	%
1	HH with titles	1518	97
2	HH without titles	51	3
3	HH in rented houses	3	0.1

	TOTAL	**1572**	**100.00**

***Figure 2.5* - Ownership of Households**



2.3.5. Encroachments

An extent of 108 ha. of land comprising 73 ha. of highland and 35 ha. of Paddy are encroached in the 11 GN Divisions in the Project area. (Refer Table no 2.8)

2.3.6. a) Agricultural Properties and Home Gardens

As per Table no 2.5, an extent of 722 ha. of highland agricultural land and home gardens and 603 ha. of paddy land will be affected that included praveni land, private deeds, Jayaboomi deeds, L.D.O. permits, long-term leases under State Land Ordinance, annual permits, rented lands and encroached lands in the Project.

2.3.6. b) Definition of Land Title

- **Private Deed:** The private deeds are registered in the Land Registry under the Act of registration of documents. It can be transferred to any person as a sale or lease or rent on agreed prize and terms by both parties before a Notary Public under his attestation.
- **Jayaboomi/Jaya Bhoomi Deeds:** They are issued under Land Development Ordinance for agricultural and residential purposes with certain conditions. This can be transferred to specified persons described in the schedule of Land Development Ordinance.
- **L.D.O Permit:** it is issued under Land Development Ordinance for a certain period which can be transferred to specified persons described in the schedule of Land Development Ordinance.
- **Long Term Leases:** they are issued under State Land Ordinance for commercial, residential or any other purpose described under the Act. Lease period is 30 years with certain conditions. Long term lease can be transferred to any person with the approval of the concerned authority.

– **Annual Permit:** it is a legal document which allows the permit holder to use the state land mainly for agriculture purposes for a one year period. A small levy needs to be paid. Mostly it is available in the dry zone and rural areas.

2.3.7. Ownership of Houses

1368 nos of single ownership houses, 149 nos of joint ownership houses, 01 no of house on leased, 03 nos of rented houses, 13 nos of houses on encroached lands and 13 nos of unspecified houses will be affected.

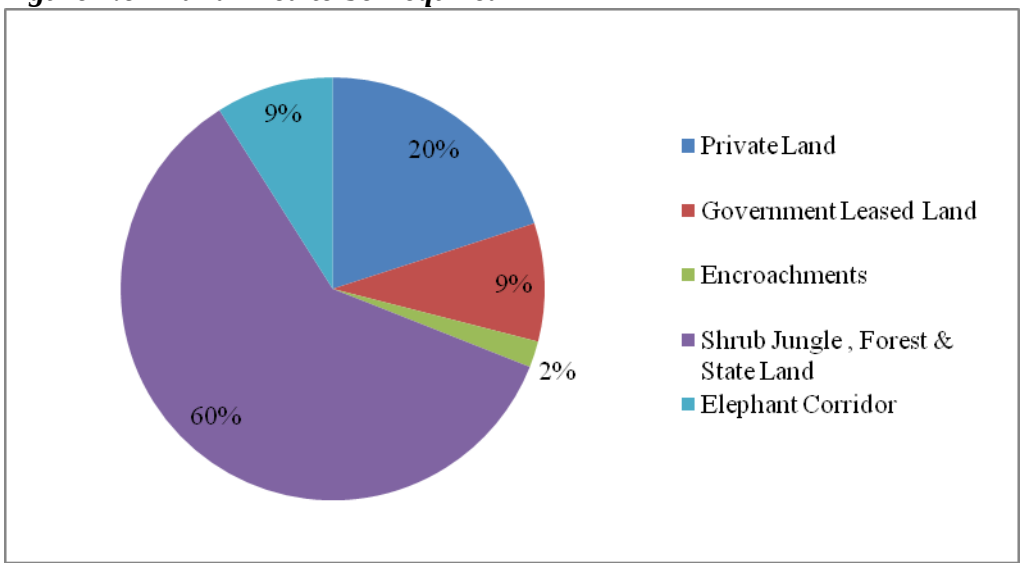
2.3.8. Loss of Land

An extent of 3770 ha. of land in the Tank Bed area and 378 ha. of land for Elephant Corridor will be acquired that includes 829 ha. of privately owned land, 388 ha. of Government leased land occupied by APS, 108 ha. of encroachments and 2445 ha. of shrub jungle, forest, stream and river, marsh and rocky land.

Table 2.8 – Land Area to be Acquired

Ser. No.	Description	Ownership Status	Ha.	%
1	Private Land	HH	829	20
2	Government Leased Land	HH	388	09
3	Encroachments	HH	108	02
4	Shrub Jungle , Forest & State Land	State	2445	60
5	Elephant Corridor	State	378	09
	Sub Total		**4148**	**100**

Figure 2.6– Land Area to be Acquired



2.3.9. Ande Cultivators and owners of Paddy land

703 nos of Ande Cultivators (share cropper) and 841 nos of Paddy land owners will be affected.

The composition of affected Ande cultivators in terms of land size and percentage of each category are given in Table 2.9. This indicates that only a 46% of Ande farmers cultivate more than 0.2 ha of land whereas 54% of Ande farmers cultivate less than 0.2 ha of land.

The composition of paddy land owners in terms of land size and percentage of each category are given in Table 2.10. This indicates that only a 43% of paddy land owners cultivate more than 0.2 ha of land whereas 57% of paddy land owners cultivate less than 0.2 ha of land.

Table 2.9 – Ande Cultivators

Ser.No.	**Description**	**No. of owners.**	%
1	Ande farmers below 0.2 ha.	382	54
2	" " below 0.4 ha.	233	33
3	" " below 0.8 ha.	78	11
4	" " above 0.8 ha.	10	2
	TOTAL	**703**	**100**

Table 2.10 – Owners of Paddy Lands

Ser.No.	**Description**	**No. of Owners.**	%
1	Owners below 0.2 ha.	475	57
2	Owners below 0.4 ha.	234	28
3	Owners below 0.8 ha.	120	14
4	Owners above 0.8 ha.	12	1
5	**TOTAL**	**841**	**100**

2.4. Demographic Profile of the Affected Persons

Table 2.11 - Demographic Profile of the Affected Persons

Ser. No.	Category	Group	Total	%
1	Age	Below 18 years	1419	27.8
		19 – 39 years	1952	38.2
		40 – 60 years	1360	26.6
		Above 61 years	379	7.4
		Total Population	**5110**	100
2	Gender	Male	2631	52
		Female	2479	48
		Total Population	**5110**	100
3	Marital Status of Households	Married	1403	89
		Unmarried	06	0.5
		Divorced	04	0.5
		Widow	159	10
		Total	**1572**	100
4	Religion	Buddhist	1571	99.9
		Hindu	--	--
		Islam	01	0.1
		Catholic	--	--
		Total	**1572**	100
5	Ethnicity	Sinhalese	1571	99.9
		Tamil	--	--
		Muslim	01	0.1
		Total	**1572**	100
6	Monthly Income (District Poverty line is Rs. 2919.00 Per month)	Below Rs. 2919/=	141	10
		Rs. 2920 – 5000/=	264	18
		Rs. 5000 – 10,000/=	491	35
		Above Rs. 10,001/=	543	37
		Total	**1439**	100

Note: includes only the Tank Bed, Elephant Corridor & Road Deviation.

2.4.1. Population Profile of Affected People and Overview

A total number of 1,572 families will be affected that includes 1,299 main families and 273 sub-families. The population is 5,110 in these 1,572 families. The gender distribution among the APS located in 12 G.N. Divisions is 52% male and 48% female. The Project area is located in the Naula Divisional Secretary's division in the District of Matale where the total population is 28,157 (Source: 2001 Census Survey, Census and Statistics Dept.) The total affected population is 4,907 of the population of Naula Divisional Secretary's division that is equivalent to 17.5%. The 203 persons or 57 families will be affected by proposed elephant corridor in Elahera Divisional Secretary's Division of Polonnaruwa district.

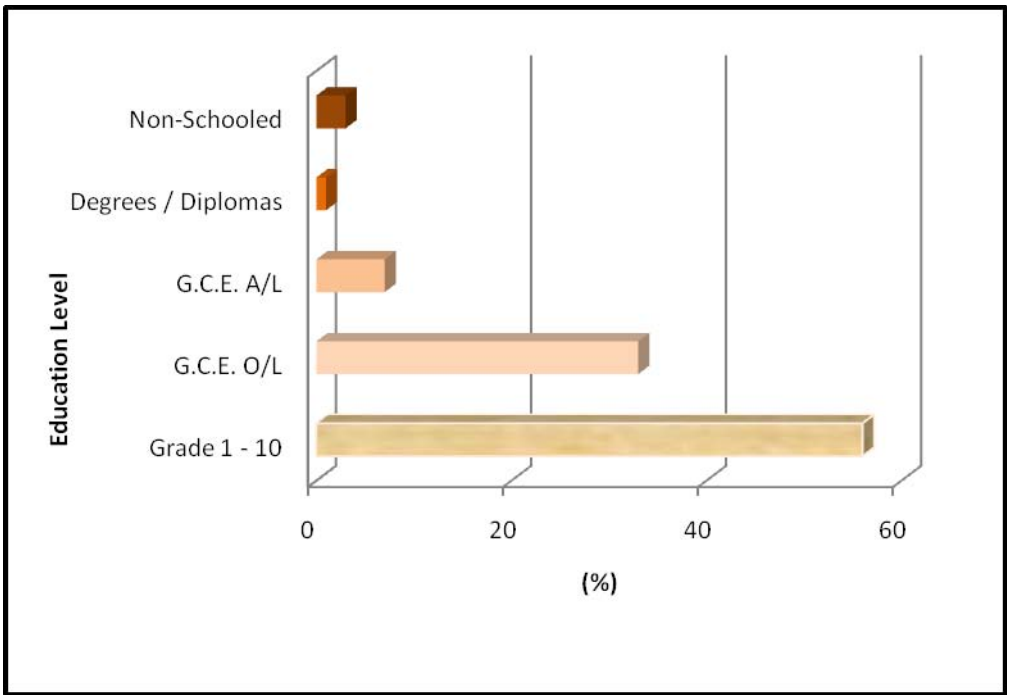
2.4.2. Educational level of heads of households (HH)

The Socio-economic Survey has revealed that 56% of the HH have lesser qualification than GCE (O/L) whereas 44% of the HH have qualifications above GCE (O/L). Refer Table 2.12 for details.

Table 2.12 – Educational Background of HH

Ser.No.	Description	No. of HH.	%
1	Grade 1 – 10	870	56
2	G.C.E. O/L	520	33
3	G.C.E. A/L	115	07
4	Degrees / Diplomas	19	01
5	Non-Schooled	48	03
	T O T A L	**1572**	100

Figure 2.7– Educational Background of the HH



2.4.3. Occupational Background of Heads of Households

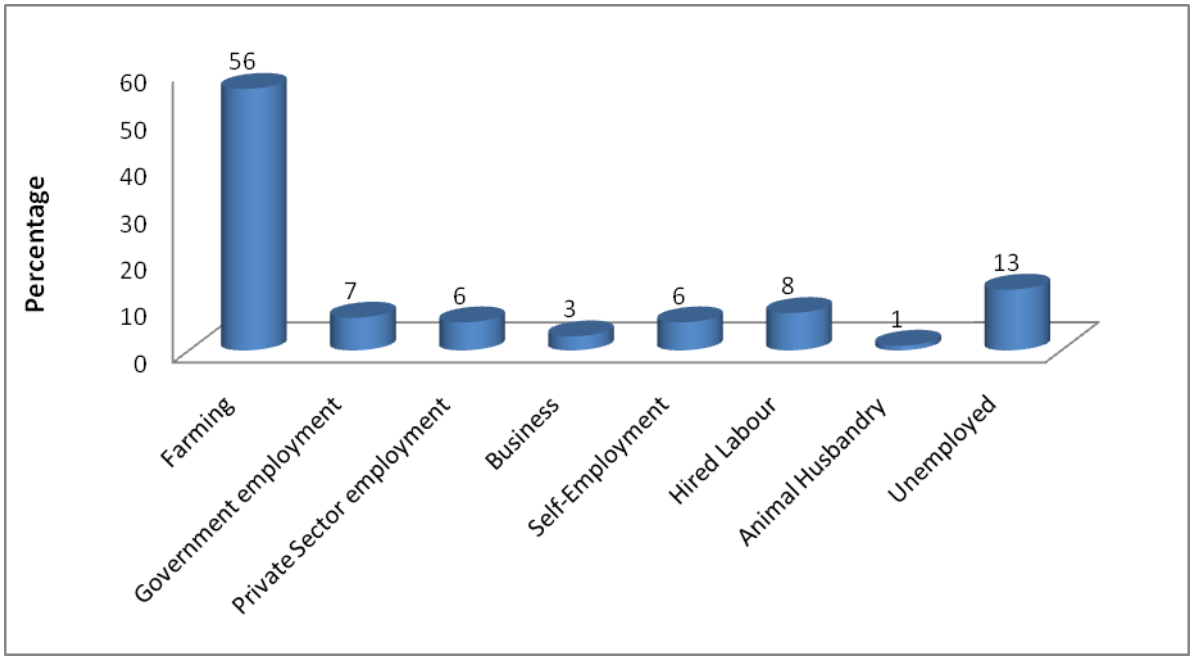
56% of the HH belong to farmer community which is 887 and the highest occupation in the area. This scenario indicates that land resource is the main livelihood of the population and they mainly depend on the productivity of the land. Other significant feature is the number of unemployed which is 209 (13%), which comprises mainly elderly HH and women HH who depend on income from others.

The job categories are given in Table 2.13.

Table 2.13 – Occupational Background of HH

Ser.No.	Description	No. of HH.	%
1	Farming	887	56
2	Government employment	116	07
3	Private Sector employment	94	06
4	Business	50	03
4	Self-Employment	88	06
5	Hired Labour	122	08
6	Animal Husbandry	06	01
7	Unemployed	209	13
	T O T A L	**1572**	100

Figure 2.8– Occupational Background of HH



2.4.4. Family Size & Age

Average family size is 4 persons per family. 354 no of HH or 23% falls on to the category of 02 persons per family. 1106 nos or 73% falls on to the category of 5-6 persons per family. 55 nos or 4% falls on to the category of 6-8 persons per family.

This situation reveals the scarcity of labour in the family for agriculture purposes in the Project area.

Out of the total population of 5010, 28% (1419) belong to the age below 18 years. 65% (3312) belong to age group of 19-60 years. This indicates that the higher percentage of population can contribute to the development of the area. The population above 61 years is 7% or 379 which is equivalent to the national average (Census of Population and Survey 2008, Department of Census and Statistics).

2.4.5. Ethnicity & Religion

1571 HH belong to Sinhala community whereas only one family belongs to Muslim community whose religions are Buddhism and Islam respectively. This position will not lead to any social or cultural disturbances during the resettlement process.

2.4.6. Marital Status of Households

The 1403 (89%) HH are married in the Project area whereas unmarried and divorced HH are only 1%. Widows (male/female) are fairly high and its percentage is 10.

2.4.7. Severely Affected Families

The Severely Affected Families (SAF) are those whose all properties are affected or disruption of livelihood is caused due to the displacement by the Project. The 1572 HH will be resettled and livelihood will be re-established in the new resettlement area.

2.4.8. Vulnerable Households

During the Socio-economic survey, 12 elderly HH, 06 women HH, 02 disabled HH and 141 HH below poverty line, were identified in the Project area and its percentage is around 11. These HH are presently dependent on their relatives as well as through Samurdhi assistance [3] . During the resettlement process the vulnerable groups will be given an allowance more than the district poverty line figure.

2.5. Income and Expenditure

The district poverty line (Matale district) is Rs. 2919/= per month for the month of September 2008, determined by the Census & Statistics Dept. 141 HH (10%) have fallen into this category. The number of households fallen above the district poverty line is 90%. Refer Table No 2.11 for details.
The monthly average expenditure is Rs, 2517/= whereas the highest expenditure incurred by 194 HH is Rs. 5940/= per month, of which percentage is 12.

2.5.1. Agricultural Loans

The agricultural loans received by the APS are mostly the farmer community for their agricultural activities. 75% of the loans have been taken from the State Banks while 25% from Private Banks. Higher percentage (51%) of loan amount is in the range of Rs. 10,001 – 25,000 and the second largest category is in the range of Rs. 25,001 – 50,000 – (49%). The loan recovery is fairly low and average recovery rate is 25%.

[3] Samurdhi/Samudi (prosperous) assistance is a special governmental monetary assistance for those who are under the poverty line. The authority decides the amount provided based on the recipients' income pattern.

2.5.2. Poverty of the People and Samurdhi recipients

The 10% (141 HH) of the HH are below the District Poverty line (District Poverty Line is Rs. 2,919/= per month for September 2008 – Source: Census and Statistics Dept.) whereas number of Samurdhi recipients are 277.

2.6. Industrial and Commercial Establishments

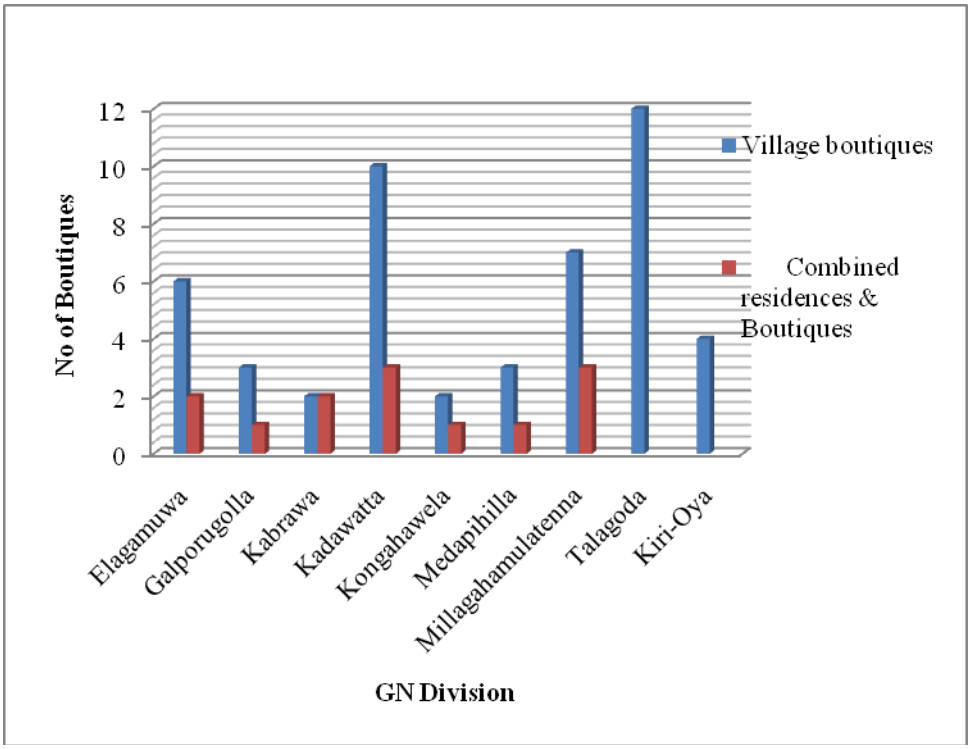
Total number of 92 Commercial Establishments will be affected which includes 49 boutiques, 22 rice mills, 8 combined rice mills and boutiques and 13 combined residences and boutiques whereas 88 are located in Tank-bed area and 04 are located at elephant corridor. The total land area occupied by these establishments is 02 Acres & 43 perches and the floor area is 37,350 Sq. feet. These Commercial Establishments are located in 9 GN Divisions. These establishments have been housed in 60 permanent buildings, 16 semi-permanent buildings and 16 temporary buildings.

2.6.1. Profile of Commercial Establishments

49 village boutiques and 13 combined residences & boutiques are managed by family members themselves will be affected.

	Village boutiques	Combined residences & Boutiques
Elagamuwa	06	02
Galporugolla	03	01
Kabrawa	02	02
Kadawatta	10	03
Kongahawela	02	01
Medapihilla	03	01
Millagahamulatenna	07	03
Talagoda	12	--
Kiri-Oya	04	--
Total	**49**	**13**
	===	==

Figure 2.9- Distribution of Commercial establishments by GN division



2.6.2. Profile of Industrial Establishments boutiques

22 Rice Mills and 08 combined Rice Mills / boutiques will be affected in 06 GN divisions in the Project area. These are mainly, village type small rice mills which are used by the villagers for processing of paddy.

	Rice Mills	Combined Rice Mills/Boutiques
Elagamuwa	05	01
Galporugolla	07	02
Kambarawa	08	02
Kadawatta	--	02
Millagahamulatenna	--	01
Thalagoda	02	--
Total	**22**	**08**
	===	==

2.7. Buildings

1,679 buildings will be affected particularly 1,547 houses, 79 Commercial buildings, 13 combined residences and boutiques, 45 public buildings and 13 buildings belong to Temples in the Project area.

Table 2.14 – Buildings

Ser. No.	Description	No. of HH.	%
1	Houses	1547	90
2	Commercial Buildings	49	3
3	Combined commercial & Residences buildings	13	1
4	Combined Industrial & residence buildings	08	1
5	Industrial buildings	22	
6	Public Buildings	45	3
7	Temples	13	1
	TOTAL	**1697**	**100**

2.7.1. i) Type of Buildings – (Permanent / Impermanent)

Permanent materials

- Roof - Tiles, Asbestos or other types of sheets.
- Walls - Brick with cement plastering or cement Blocks.
- Floor - Cemented or Terrazzo.

Impermanent materials

- Roof - Cadjans, straw or other grass types
- Walls - Mud, timber planks or wattle and daub
- Floor - Mud or timber planks

762 permanent, 741 semi-permanent and 69 temporary buildings will be affected by the Project. All buildings belonging to Government Institutions are permanent and semi-permanent whereas private individuals are having permanent, semi-permanent and temporary buildings.

2.7.1. ii) Definition of Building Types

- Permanent Buildings

A. Roof, Walls and Floor with permanent materials.

- Semi-Permanent Buildings

A. Roof and Floor with permanent materials and walls with impermanent materials.
B. Roof and Walls with permanent materials and floor with impermanent materials.
C. Walls and Floor with permanent materials and roof with Impermanent materials.

- Temporary Buildings

A. Roof, Walls and Floor with temporary materials.

2.7.2. Ownership of Residential Buildings

1517 buildings are in single and joint ownership status in private land whereas 13 buildings are in encroached lands, 03 rented buildings and 01 building in leased land will be affected by the Project.

2.7.3. Use of Buildings

1547 buildings for residential, 79 for commercial, 13 for residential and commercial, 45 for public purposes, 13 for religious purposes are being used at present. Refer Table No 2.15 for details.

2.7.4. Floor Area of Buildings

662,650 Sq. feet of permanent buildings, 396,807 Sq. feet of semi-permanent buildings and 13,250 Sq. feet of temporary buildings which are located in private, leased, encroached and state lands will be affected by the Project.

2.7.5. Premises used for both Residential and Commercial Purposes

13 nos of Combined Residences and Boutiques are located in the Project. Generally this type of business is a secondary income to the families of those who are running the business, and more often they are un-successful on both in respect of agricultural & commercial point of view. For an example, at the field survey it was revealed that during the harvesting season, the commercial ventures are generally kept closed as they are being engaged in agricultural activities. As such it is prudent to allocate them either commercial or agricultural lots according to their dependency and their preferences.

2.7.6. Period of Residence

1350 nos of HH are over 25 years, 103 are 15-25 years, 33 are 10-15 years, 40 are 5-10 years and 12 are 1-5 years of residence in the Project area. 02 HH are residing after the cut-off date.

Accordingly, nearly 98% are residents of the area before the cutoff date. Hence , there should be a formal acquisition & payment of compensation procedures and allocating alternative lands on their preferences. For the others alienation of land will be considered on an individual basis during the 2nd phase of resettlement process.

2.8. Social Impacts

18% of population (5,110) of Naula D.S. Division will be displaced and resettled elsewhere. They will be moved out from present places to Laggala – Pallegama D.S. Division of Matale District and Medirigiriya D.S. Division of Polonnaruwa District.
These host areas are also similar to that of the original places in respect of social and economic environment and hence the social impacts on them due to the resettlement process would be minimized. However it is imperative to implement new income restoration & improvement programs to uplift their living standards.

2.8.1.Loss of Livelihood

It is expected that affected HH will have to face severe hardships and disruption of livelihood during the resettlement process of the project. 56% of affected HH are depending on agriculture. The children of the affected HH will also likely to face some draw backs by having to change their schools. This aspect too will be addressed during the post settlement phase.

2.8.2. Disruption of Social Relationship

The APS who are living in the Project area with their relatives and friends over the years will lose their relationships which they have established over the years with the neighborhood due to the resettlement in the host areas. However, as the majority would be resettled in clusters in the nearby host area according to their preferences, it is believed that the disruption of social relationship will not be so grave.

2.8.3.Attitude of the People

The people expressed their concerns over the implementation of the Project with mixed reactions. People of low income grades indicated the willingness to resettle elsewhere while high income families are reluctant to move out from present places without additional benefits. However, 80% of the affected HH have given their willingness to move into new settlements in the proposed Kalu Ganga Development area which is closer to their presently inhabited area in the same district. Other 20% have chosen System 'D' (Medirigiriya) in Polonnaruwa district and 03 HH have opted to Amban village in Naula DS Division. It is believed that the affected HH opted for System 'D' has given their preference to this location in anticipation of additional benefits.

2.8.4. Impacts due to inundation of public roads

The Naula – Elahera road will be submerged for a length of 09 km from 9^{th} to 18^{th} km. The Naula Elahera road falls into provincial road network which is providing access via Elahera to Polonnaruwa,via Elahera, Hettipola, Girandurukotte to Mahiyanganaya and proposed Kalu Ganga resettlement area. Stretches of rural roads leading to Pubbiliya from Kongahawela Junction & Koongahawela to Rajawela will be inundated and alternative accesses will be provided instead.

2.9. Public Facilities

It has been revealed at the Surveys that several public facilities will be affected by the proposed reservoir project, such as schools, post offices, rural banks, community halls etc. Most of these buildings are located at Kongahawela Grama Niladari Division (GND) in Naula Divisional Secretary's Division (DSD). The Socio economic survey reveals that the most of the beneficiaries of services by the above institutions are the

APS of the project. Some of the facilities from the above institutions are presently enjoying by the people living in the surrounding areas.

2.9.1. Schools

i) Severely affected Schools

03 nos of schools are located in the tank-bed areas which are as follows:

- Elagamuwa Maha Vidyalaya
- Kabarawa Junior School
- Elagamuwa Primary School

Total number of students attending these 03 schools is 920 out of which 829 students are from the villages of tank-bed area and 91 students are from the villages outside the tank-bed area.

ii) Partly affected schools

Kongahawela Maha Vidyalaya is located just outside the buffer zone where 80% of the students are from the villages of tank-bed area. Total student population is 453 and 20% of the students are from the surrounding villages.

2.9.2. Pre-School

03 nos of Pre-schools will be affected by the Project, namely Tharindu, Medapihilla and Perakum Pre-schools at Millagahamulatenna, Medapihilla and Kadawatte GND respectively. The total number of students attending these Pre-schools is from the villages of tank-bed area.

2.9.3. Sub-Post Offices

It has been identified that 03 nos of Sub-Post Offices will be affected at Kongahawela, Kabarawa and Kadawatte located at respective GND.

2.9.4.Banks

01 no of Samurdhi Bank and 01 no of Co-operative Rural Bank will be affected at Kongahawela and Kadawatte GND respectively. Part of the customers of Samurdhi Bank at Kongahawela will not be affected whereas the beneficiaries of Co-operative Rural Bank will be totally affected. Therefore, Samurdhi Bank should be relocated at Ambana area centre for the use of remaining beneficiaries.

2.9.5. Agrarian Service Centre

The Agrarian Service Centre at Millagahamulatenna GND under the Dept. of Agrarian Services will be affected which is servicing the people of the villages of Tank-bed area as well as unaffected villages. 1994 beneficiaries of this Centre are living in the villages of unaffected area mainly, Bambaragahawatte, Halmbagahawatte, Dambagolla, Moragahamada, Ambana, Opelgala, Pubbiliya and Senagama. Therefore, this centre will be

relocated at Ambana Area Centre to cater to the people in the surrounding area.

2.9.10. Hospital

Kongahawela Hospital will be affected by the Project. There are 07 buildings with 03 wards at the hospital. All are permanent buildings and well maintained. Some of the beneficiaries of this hospital are living in surrounding villages. Therefore, the hospital will be relocated at Ambana Area Centre.

2.10. Loss of Community Facilities and Temples

Several community facilities will be affected by the Project which are being utilized by the affected and unaffected communities.

2.10.1. Community Halls

The Community Hall at Medapihilla GND will be affected by the reservoir. This is a permanent building. As the all users of this facility are affected by the project, there is no need for the replacement of the facility in the vicinity.

2.10.2. Public Library

The Public Library at Kongahawela will be affected, whereas most of the beneficiaries will not be affected. Therefore, this public library will be relocated at Ambana Area Centre.

2.10.3.Play Ground

Kongahawela Public Play Ground and its building will be affected by the Project which is being used by both affected as well as unaffected people. New Play Ground will be provided at Ambana Area Centre.

2.10.4. Cemeteries

The Cemeteries used by the affected and unaffected communities will be re-established in surrounding areas if they are submerged.

2.10.5. Public Pola

Kongahawela Pola will be affected which is used by the people in the area for trading their farm products and purchase of household goods for their day to day life. This will be relocated at Ambana Area Centre.

2.10.6. Water Supply Schemes

There are two Water Supply Schemes at Kongahawela where one Scheme supplying water to central area of the bazaar and the other one supplying water to the community in the surrounding area. Both Schemes will be affected by the project. In addition, there are 21 Tube Wells servicing the community in GN Divisions of Medapihilla, Talagoda, Moragolla, Kongahawela, Rajawela, Elegamuwa, Kabarwa, Kosgaha-ela and Akkara Panaha.

2.10.7. Buddhist Temples

05 nos of Buddhist Temples will be affected namely, Nigrodaramaya, Sri Pushparamaya, Sri Nandaramaya, Deerananda Buddhist Temple and Kettalokaramaya in GN Divisions of Galporugolla, Talagoda, Elagamuwa,

Kadawatha and Kabarawa respectively. These temples will be relocated in the new settlement areas in maintaining the original status quo of the villages.

2.10.8. Community Organizations

It was identified that 87 community organizations as described below are in existence in the Tank Bed Area with total membership of 2,605.

i)	Farmer Organizations	- 25
ii)	Death Donation Societies	- 27
iii)	Women's Organizations	- 02
iv)	Community Development Society	- 01
v)	Samurdhi Society	- 13
vi)	Sports Clubs	- 02
vii)	Sanasa/Sarvodaya and Praja Mula Organizations	- 17
	Total	**- 87**
	====	

Around 50% of the APS are members of the Community Organizations.

2.11. Local Infrastructure

2.11.1 Access Roads

The following access roads will be affected by the Project which has been constructed by Pradeshiya Sabha, Naula:

i) Kongahawela – Rajawela road
ii) Kongahawela – Athgala road
iii) Kongahawela – Cemetery road
iv) Kambarawa Village road
v) Galporugolla Village road
vi) Ganankatapiya Village road
vii) Elagamuwa Village road
viii) Moragolla Village road
ix) Galboda – Dammantenna road
x) Rajawela Village road
xi) Kadawata Village road
xii) Talagoda village road
xiii) Medapihilla Village road
xiv) 10th Km Post Village road

With the construction of Naula – Elahera road deviation, access provided by above roads to the respective locations could be reached except Rajawela. Hence, a separate access road will be provided to Rajawela village.

2.11.2. Electricity Lines and Transformers

33 km. of Electricity lines and 05 Transformers will be affected. The Electricity lines will have to be re-laid to cater to the unaffected areas, namely:

i) Pubbiliya;
ii) Halambagahawatte;
iii) Opelgala;
iv) Senagama;
v) Moragahamada;
vi) Kumbiyangaha Ela;
vii) Ganimayaya;
viii) Bowatenna Watte;
ix) Ambana; and
x) Dewaradapola.

2.11.3. Telecommunication

Mostly C.D.M.A. telephones are used by the APS where fixed line connections are not available. Mobile phones also used by the APS. The details of telephone facilities are as follows:

Type	Nos.
With wiring	29
Without wiring	213
Mobile	34
Total	**276**

2.12. Socio-economic Statistics of Affected Area of Branch Canal of Kaudulla LB Extension Area

As described in Section 2.2.5 on p. 14, 9 potential resettlers' households affected by the branch canal in System D1 were identified in addition to 1572 households in Moragahakanda affected area. The socio-economic data of the affected households are as follows:

- **GN Division – Kauduluwewa**
- **Total No of Families – 09**
- **Total Population – 45**

Table 2.15 – Householders by sex

Male headed Families	Female headed families	Total No of families
07	02	09

Table 2.16 – Samurdhi Recipient & Non Recipient Families

Recipient Families	Non - Recipient Families	Not declared	Total No of Families
04	04	01	09

Table 2.17 – Population by Sex

Sex	No. of Persons	%
Male	24	54
Female	21	46
Total Population	45	100

Table 2.18 – Age Distribution by Gender

Age group (year)	No of Persons		Total No of Persons	%
	Male	Female		
0-4	1	2	3	7
5-9	6	0	6	15
10-14	1	3	4	10
15-19	1	1	2	5
20-24	2	1	3	7
25-29	0	1	1	2
30-34	2	1	3	2
35-39	6	8	14	29
40-44	1	0	1	2
45-49	1	0	1	2
50-54	0	1	1	2
60-64	1	0	1	2
above 65	2	3	5	12
Total	24	21	45	100

Table 2.19 – Type of Occupation

Type of occupation	No of Persons	%
Skilled - Full time	1	2
Unskilled -Full time	8	18
Unskilled -Part time	3	7
Un Employed	2	4
Under Employed	6	13
Student	10	22
Elderly	4	9
Children	3	7
Housewife	8	18
Total	45	100

Table 2.20 – Employed Population by Employment Category

Employments Category	No of persons	%
Farming	1	6
Private- permanent	1	6
Private- temporary	1	6
Business	2	11
Non Agricultural labour	12	67
Self Employment	1	6
Total	18	100

Table 2.21 Ownership of Buildings by Usage

Usage	No of buildings by Ownership			Total	
	Single	Joint ownership	Other	No.	%
Residential	6	1	1	8	89
Under construction	0	1	0	1	11
Total	6	2	1	9	100

CHAPTER THREE

3. Land Acquisition, Resettlement Policy and Strategies:

Land and property acquisition for the Moragahakanda Development Project including tank bed area, access road, road deviation, and dam sites and elephant corridor will be undertaken within the frame work of Land Acquisition Act in 1950 with its amendments. All acquisition works of Accelerated Mahaweli Programme have been completed under this Act. The acquisition policy and procedure is governed by this Act. Present Resettlement policy of Mahaweli Authority of Sri Lanka (MASL) meets the standards of NIRP while Resettlement strategies implemented under the Accelerated Mahaweli Programme for Victoria / Kotmale and other Mahaweli Systems were not conformity with the NIRP.

The Land Acquisition Act specifies the valuation according to market values. That is the amount that the land might be expected to have realized if sold by a willing seller in the open market as a separate entity on the date of publication of the Section 7 notice. For structures this means the depreciated value. However, the Valuation Officer has the latitude to specify what the market value should be. This principle was prevailed during the last few decades. However, due to mass objection of affected people of Southern Highway Development Project, Road Development Authority was compelled to pay replacement value for the property acquired to the project. The Ministry of Land and Land Development has issued a Circular on new policy of payment of compensation on 20.08.2008 **(4/2008)** and regulation for compensation on compensation based on Gazette No 1585/7 and dated 2009.01.20 Accordingly, Government has decided to pay replacement value for the property acquired. Therefore, Chief Valuer is responsible to make the valuation according to the Government's policy. This policy benefits the affected persons. The approved payment will be:

- Replacement value for structures;
- Market value for land, trees and crops;
- Cost for attending section 09 inquiry;
- Cost for selection of alternative sites;
- Cost for transportation to new sites;
- Cost incurred for publicity of commercial establishments;
- Cost for fixing of furniture;
- Cost for traveling where relevant;
- Cost for loss of business;
- Cost for working capital for re-establishment of business;
- Cost for assessment tax and rent; and
- Cost incurred by claimant for acquisition of land

Calculation methods will be applied by the Chief Valuer who is the authority of valuation in Sri Lanka.

The replacement cost means, the cost of construction of a new building of similar nature on the exact date of acquisition of the particular premises by a publication of the acquisition notice.
Under the provision of Land Acquisition Act (LAA) of 1950 as amended in 1979, provides for compensation for lands, structures and crops. Further, LAA it has not addressed the resettlement issues. Therefore, year 2001, GOSL issued a policy guideline on National Involuntary Resettlement to address resettlement issues.

3.1 Land Acquisition Act

3.1.1. The Land Acquisition Act and Land Acquisition Procedures

Table 3.1 provides a flow chart illustrated the various types involved in land acquisition on the basis of the current law and practice.

The minimum average time frame for each stages provide in Column (1) of the Table. The following of the main sections and clauses of the land acquisition act that will be applied to the project.

Table 3.1 Flow Chart for land acquisition under the Land Acquisition Act of 1950 as amended by No. 8 of 1979.

Table 3.1 - Acquisition Procedure

Time Frame (Weeks)	Section	Activity
12	02	Preparation of application for the land to be acquired for the described purpose by the executing agency and submit to land & land dev. Ministry through line ministry. Land minister issue the section 2 order.
	03	Surveying of lands, preparation of advance tracing / send to Acquiring Officer / Secretary to the Land Ministry.
		If there is a loss, payment will be made under Section 02.
17	04	To inform the claimant of the land, which will be acquired, objection inquiry and make the decision.
02	05	Approval given by the Minister of Land and publication of Gazette Notification.
	06	After publication of Section 05 Gazette Notification issues to survey the land and land surveyed by Survey Department.
	07	Publication of Gazette Notification and Calling for claimants for the inquiry
	09	Ownership inquiry for payment of compensation.
4	10	Decision of the ownership and informed to the claimants.
4	17	Award of compensation & payment.
4	38	Possession will be taken of land after payment of compensation.
Total 71=======	38A	If necessary possession can be taken under 38 A after publication of Section 02. But interest
18 (Months)		should be paid until such time compensation will be made.

3.1.2 Process of Acquisition

i. Section 2 Notices

The Ministry of Irrigation & Water Resource Management informs the Ministry of Land and Land Development (My/L&LD) about the need for land acquisition. My/L&LD directs the Acquiring Officers of the respective districts in which the land to be acquired lies, to issue notice under Section 2 of LAA.

The Acquiring Officer submits Section 2 survey requisition to Superintendent of Survey of respective districts. The Section 2 notice publicized in prominent places in the area. The notice includes:

- Be in Sinhala, Tamil and English of the land to be acquired; and
- Specify how claimants can make written objections to the acquisition and a period of objection or claims or damages to be submitted.

The Grama Niladari informs the affected people in advance of the survey activities. Section 2 Notice is the authorization for the marking boundary line of each affected land in the Project.

ii. Preparation of Advance Training

Surveyors of Survey Department follow the boundaries of each affected property with the assistance of Grama Niladari of the respective G.N. Division. The following details are recorded by Surveyors:

- Name of land owner;
- Name of occupant;
- Ownership status; and
- Nature of land (highland, paddy land or garden).

The land owners participate in the survey by providing information and observing the Boundaries that are recorded by the Surveyors. Finally, Survey Superintendent (SS) provides the advance training and Tenement list to D.S./Acquiring Officer. The Section 4 of LAA provides the owner to make objections for acquisition. The Section 5 of LAA provides the nullifying such objections. It takes considerable period for this process.

iii. Notice of Acquisition

The Acquiring Officer issues notice under Section 7 of LAA which indicates that the property under consideration are to be acquired.
The Notice included:

- Description of the land to be acquired;
- Reasons for acquisition;
- Claims for compensation to be made to Acquiring Officer;

- Direct every person interested in the land to be acquired to appear personally or by an agent duly authorized in writing before the Acquiring Officer, the nature of interest for the land, particulars of his claim for compensation, the amount of compensation and the details of compensation of such amounts.

iv. Submission of Claims

The claimant makes a verbal or written claim to the Acquiring Officer. To avoid stress for APS, the Community Consultative Groups (CCGs) should assist the APS in preparing their documents and making their claims. Officers of Acquisition and Resettlement Division should conduct the awareness programmes for APS on compensation entitlements on Circular No. 4/2008 on 20.08.2008 by Ministry of Land and Land Development. APS make aware by the Community Development Officer of the Project that details and method of claims to be submitted to Acquiring Officer.

v. Valuation of affected properties and award of compensation

At the Section 9, Inquiry, ownership is determined by the Acquiring Officer and he makes his decision under Section 10.1.A of LAA. A copy of the 10.1.A submits to Valuation Department for valuation of the property acquired. The Valuation Officer visits the property and takes a condition report of the said property. Based on condition report, he prepares a valuation report (determination of valuation) and submits to Acquiring Officer. C.V. determines valuation on the instruction of Circular No. 4/2008 of 2008-08-20 and Gazett No1585/7 dated on 2009.01.20 which is the replacement value for structure, market value for land, trees and crops and other compensation entitlements. The Acquiring Officer makes the award to claimant if he/she accepts it. Money should be remitted to his Bank Account by a cheque.

Vi Appeals and Grievances

If the claimants are dissatisfied over the compensation, he may make an appeal to the Board of Review. But this is a time consuming process, therefore every possible steps to be taken to resolve the issue by CCGs. There may be ownership disputes occur among the number of claimants for one property. CCGs also resolve this type of disputes as far as possible.

Owner of the land and property can make an appeal to the appeal board in writing which includes name and address of the claimant, name of the acquiring officer who made the decision on compensation payment, ownership status of the acquired land and the amount of compensation that he claims.

The appeal should be sent to the chairman of the appeal board. Appeal to be made to the board within 21 days after issuing of section 17 notice under acquisition ordinance. Claimant should submit name of the witness to the appeal board with his appeal. He should submit documentary evidence also to

the board. Then appeal board will fix a date for hearing of the appeal within 6 months. Appeal board Summon claimant and witnesses for the hearing of the appeal given them 21 days notice. A lawyer can appear before the appeal board on behalf of the claimant. Appeal board can finally determine the compensation amount and declare the decision. If claimant is not satisfied with the decision of the appeal board he can make the appeal to Supreme Court. This appeal should prepare by an attorney at law and should be certified and submitted to the court within 21 days of the decision made by the appeal board. Supreme court makes the decision after hearing the case as other cases.

Appeal board consists of 16 members, which includes 8 lawyers and 8 valuers. The chairman should be a lawyer and deputy chairman should be either a lawyer or Valuer appointed by the president of the country. In practice 16 member appeal board consists of 8 retired judges of higher courts and 8 senior retired valuers from valuation departments, particularly retired chief valuers.

3.1.3 Inadequacies of the land acquisition procedures, organization structure and improvements required

The National Involuntary Resettlement Policy (Schedule IV) has identified some inadequacies of the land acquisition procedure. Other inadequacies have become apparent during preparation of this RIP and these are also identified and addressed below. The land acquisition act has not provided provisions for emergency acquisition with specific time bound.

i) Under the Land Acquisition Act the onus is entirely on the affected persons to prove ownership, demonstrate clear title, gather all the information and submit at the inquiry. These persons are frequently ill equipped to deal with the various officials and documents. MASL has organized PRA to guide and assist affected people to appraise necessary information, preparation and make their claims to the Acquiring Officers.

ii) Surveying of land under the present system has to be completed by a Government Surveyor and Valuation by the Chief Valuer. The 02 surveys (Section 2 and Section 5) to be completed by the Surveyors of Survey Department as perimeter surveys is in preparation of advance tracing under Section 2 and preparation of preliminary plan under Section 5 of Land Acquisition Act. They are Government Officers who have other assignments and are not readily available specially to meet the implementation schedule of this kind of development projects. The result is that these two activities significantly delay the land acquisition process. In the Accelerated Mahaweli Development Programme, private Surveyors were deployed to expeditiously deal with the surveys.

iii) In most projects responsibility for land acquisition such as dealing with land title issues, identification of alternative land and paying compensation are handled by different agencies.

iv) Affected persons faced serious delay in the land acquisition and payment of compensation processes. Inquiries go on for a number of days.

Divisional Secretaries conduct inquiries but they are often inexperienced in interpreting legal documents and deciding on complicated ownership issues.

v) No provision has been laid down in the Land Acquisition Act for payment under emergency situation such as payment of way leave for clearing of sites for construction.

vi) The Divisional Secretary that initiated the inquiry rarely completes it. This affects the continuity of the acquisition work thereby delaying the process for the following reasons

* The Divisional Secretary belongs to transferable services.
* The Divisional Secretary is not in a position to handle legal issues such as land titles due to lack of professional and trained staff.
* The Divisional Secretary's duties are varied specially after decentralization of administrative functions resulting low priority for this type of activities.

3.1.4 Inadequacy of Organization structures and Proposed Improvements

i) MASL

A) Present Organization Structure.

This organization structure is showed in **'Organization Structures - Annex No x-i.**

B) Inadequacy of Present Organization Structure

I. Absence of separate division for Resettlement & Land Acquisition
II. Inadequate number of young officers for acquisition, payment of compensation and resettlement activities.
III. Planning of resettlement activities are done by the land use planning unit of the River Basin Management Division. But there is no separate division to coordinate these works.
IV. Presently there is a resettlement unit under the project director at field. But it don't have adequate facilities and officers for effective works.

C) Proposed Improvements

I. Training of new young officers
II. It is proposed to established separate Acquisition & Resettlement division at the project level to expedite the acquisition. 06 Numbers of Acquiring Officers will be appointed under the purview of Mahaweli Authority of Sri Lanka (MASL) as heavy work loads have to be completed within the schedule time with land acquisition such as ownership inquiries and award of

compensation for the claimants. As in the Accelerated Mahaweli Development Programme, there is a need to appoint special full time Acquiring Officers to attend to all acquisition matters with regard to Moragahakanda Project. It has been noticed that number of Land Officers are attached to MASL who can be Gazette as Special Acquiring Officers and entrust them to do the acquisition works in the project.

III. The present Acquisition and Resettlement division in the Project office should be strengthened with the necessary staff and resources that will lead to easy access to the affected people.

ii) Survey Department

A) Present Organization Structure.

This organization structure is showed in **'Organization Structures - Annex No x-ii.**

B) Inadequacy of Present Organization Structure

I. Absence of a separate unit to undertake survey works in the MASL/Moragahakanda Project
II. Inadequate numbers of surveyors assigned for survey works under Moragahakanda Project
III. No proper coordinating and progress review system for survey works undertaken by Survey Department.

C) Proposed Remedial Measures

I. An adequate number of surveyors to be assigned from the Survey Department on full time and priority basis to this project for smooth implementation and expedite the survey works.

II. Failing above, private Surveyors to be deployed under the supervision of Survey Department.
III. With a view to ensure smooth implementation and expedition of survey activities, establish a proper coordinating mechanism with the participation of MASL and Survey Department for co-chairing of survey meetings in respect of coordination & review of progress

iii) Valuation Department

A) Present Organization Structure.

This organization structure is showed in **'Organization Structures - Annex No x-iii".**

B) Inadequacy of Present Organization Structure

I. Absence of a separate division for MASL/Moragahakanda Project valuation activities.
II. Inadequate numbers of valuation officers assigned for valuation activities under MASL/Moragahakanda Project
III. No proper coordinating and progress review system for valuation activities undertaken by Valuation Department.

C) Proposed Remedial Measures

i. The acquisition process can be improved if valuation related field activities are done just after the acquisition surveys .

ii. Employ licensed valuers under the supervision of the Chief Valuer to attend to these activities.

iii. Establish a coordination mechanism in the MASL with the participation of Valuation Department for smooth implementation of valuation activities in respect of coordination, monitoring and review of progress.

iv) Funds and Payment of Way Leave

The funds for compensation will be provided by the Ministry of Lands on the request of Mahaweli Authority of Sri Lanka through the Ministry of Irrigation & Water Resource Management.
The present Land Acquisition Act has no provision to deal with payment of way leaves. As such Divisional Secretariat- Naula is unable to make way leave payments to the APS timely. Therefore, an administrative arrangement should be introduced by the MASL for payment of way leave for immediate evacuation of APS. In the case of payment of way leave for private and leased lands a notification has to be made by MASL to the relevant Acquiring Officer for the deduction of such payments from the final payment of compensation. Payment of way leave for encroachments of State land will be the final settlement.

v) Notification under Section 04

The publication of Section 04 notice of land acquisition will result an unnecessary delay in land acquisition procedure in this type of projects where no alternative proposals for the project is available. However in order to avoid this type of unnecessary delays it is possible to modify the Act by deleting this provision. (Section 04 notice)

3.2 Legal Frame Work for Alienation of Land

3.2.1 Land Development Ordinance (1935)

- By virtue of this ordinance and subsequent amendments farmer families are entitled for agricultural highland, homestead and irrigable land.

- During the last 02 decades lands were not allocated to the farmer families on Land Kachcheri basis. Almost all allocations made were regularizing encroachments with the approval of the Cabinet from time to time. Last

approval was granted on 15th June 1995 to regularize the encroachments that have taken place on or before this date.

- In general, the leased period for permit under the Land Development Ordinance (LDO) is 30 years. Permit holders are entitled to request Jayaboomi Deeds which are considered as grants with few conditions.

- The provisions of this Ordinance and its amendments, can be used for alienation of land for Moragahakanda APS and issue the deeds.

- Selection of allottees of Moragahakanda Project will be carried out by MASL through public inquiries as in the case of Land Kachcheris. The selection list of allottees will be approved by the MASL.

3.2.2 State Land Ordinance

- Originally this Ordinance was named as Crown Land Ordinance. The provisions of the Ordinance is to allocate lands other than for agriculture purpose and issue deeds such as commercial & industrial purposes and religious, government & other institutions.
- There is also provision in the Ordinance to issue long term lease for a period of 30 years and to issue state grants after fulfillment of certain conditions. Generally, the commercial allotments will be allocated through auctions.
- The Ordinance has provisions to allocate commercial & industrial lots under preferential leased basis under special circumstances. The affected persons of commercial ventures in the Project should be given lands under preferential leased basis.

- Commercial and industrial land allottees affected by Moragahakanda Project will be selected under Section 21/2 of State Land Regulations.

3.3 National Environmental Act

Under the provision of Part IV C of the National Environmental Act No.72/22 of 24th June 1993 and No.859/14 of 23rd February 1995 the Central Environmental Authority (CEA) approval is required for a resettlement implementation plan for a project causing involuntary resettlement exceeding 100 families other than for resettlement affected by emergency situations.

The CEA further requires an assessment of the important impacts of relocating families and other community groups summarized with sufficient detail adequately explaining the situation arising from such relocations. This assessment should identify anticipated problems, proposed mitigation measures, estimated cost involved and recommended entitlement package. This assessment should be based on information such as views of the affected parties, census & and other related data,

interviews with community leaders and site visits or field surveys. It should be clearly demonstrated that every possible action has been taken to avoid

relocating house holds and businesses where re-location is unavoidable and following issues must be addressed in relation to each alternative action.

- Number of households to be re-located and their socio-economic status. A distinction should be made between rented properties and owned properties.

- Provision of adequate safe sanitary and affordable housing for the displaced parties through discussion and agreed with them. This should include the price ranges, size of house (No. of rooms etc.), location relative to present houses and accessibility, anticipated loss of employment caused by acquisition of business, industrial or domestic premises necessitating relocation and actions taken to compensate affected parties.

- Number of commercial and industrial ventures to be relocated giving their descriptions, size of premises, No. of employees, revenues, sales and special needs such as water and power.

- Availability of sites for relocating displaced businesses and the cost /benefit analysis of relocating them.

- Acquisition of property and relocation to be conducted in accordance with the existing laws and regulations such as an Urban Development Law No.14 of 1978 and resources to be made available for compensating all residentially and commercially displaced without discrimination.

- The financial and other incentive programs to be developed in consideration with other potential sources of assistance available to the displaced people to minimize the impact regardless whatever the other properties are with them.

3.4 Resettlement Policies

3.4.1 National Involuntary Resettlement Policy (NIRP):

- Involuntary resettlement should be avoided or reduced as much as possible by reviewing alternatives to the project as well as alternatives within the project.

- Where involuntary resettlement is unavoidable, affected people should be assisted to re-establish themselves and improve their quality of life.

- Gender equality and equity should be ensured and adhered to through out the Project.

- Affected persons should be fully involved in the selection of relocation sites, livelihood compensation and development options at the earliest opportunity.

- Replacement land should be an option for compensation in the case of loss of land; in the absence of replacement land, cash compensation should be an option for all affected persons.

- Compensation for loss of land, structures, other assets and income should be based on full replacement cost and should be paid promptly. This should include transaction costs.

- Resettlement programme should be planned and implemented with full participation of the provincial and local authorities.

- To assist those affected to be economically and socially integrated into the host communities, participatory measures should be designed and implemented.

- Common property resources and community and public services should be provided to affected people.

- Resettlement should be planned as a development activity for the affected people.

- Affected persons who do not have documented title to land should receive fair and justifiable treatment.

- Vulnerable groups should be identified and given appropriate assistance to substantially improve their living standards.
- Project Executing Agencies should bear the full costs of compensations and resettlement.

3.4.2 Application of NIRP by MASL for Moragahakanda Project

i) People unavoidably displaced will be compensated and assisted so that their economic and social future would be much favorable with this project as it would have been in the absence of this project.
ii) This project will pay compensation for land, trees and crops at market value and structures at full replacement value with no deductions for depreciation, according to Circular No. 4/2008 by Secretary, Ministry of Land and Land Development.
iii) HH will be assisted with the allocation of farmstead in settlement areas of Systems ‘F’ or ‘D’ of Mahaweli development area with irrigation facilities. After the completion of Kalu Ganga Reservoir settlers of System “F” will receive irrigation water both Yala & Maha

seasons. Until such time water requirement for agriculture purposes will be through annual rainfall supplemented with waters in village tanks. During the period of construction of Moragahakanda Reservoir people are free to cultivate their agricultural lands in the tank bed area as well as the new lands allocated to them.

The settlers in System "D" will be provided with irrigation water from village tanks fed by Kaudulla Reservoir.

The new agricultural lands will be given at Ambana Junction where no irrigation water is available and they could cultivate highland crops with the rain water and ground water.

iv) All APS will be given same size of land irrespective of their land ownership, including the encroachers.

v) A suitable assistance scheme will be introduced for house construction.

vi) All APS who belong to vulnerable group (e.g. female – headed, elderly and disabled households), with incomes below the poverty line and severely affected households will be entitled to cash grants for livelihood restoration and other special assistance schemes which include house construction.

vii) All resettled HH will receive food assistance for 12-18 months.

viii) All APS will be made aware of the project scope impacts and implementation schedule and about their entitlements. They will have opportunities to express their concerns about the resettlement program.

ix) Partly affected HH who do not opt to move out from the present locations but due to the disturbance of livelihood will be reasonably assisted with income restoration programmes.

x) Those affected HH who owned Shops and Industrial Buildings will be provided with commercial plots to establish their new ventures at new service centers in Systems 'F' or D' according to their choice.

xi) The land will be allocated to the Religious Institutions at the new service centers for re-establishment of such Institutions.

Suitable assistance will be provided to religious institutions to build their religious places.

xii) The APS who reside outside the affected area but will lose more than 0.8 ha. of highlands and 0.4 ha. of paddy land will be entitled to receive homestead and farmstead in System F or D.

xiii) All infrastructure facilities will be provided in the new settlement areas whereas Ambana Area Center will be upgraded to cater to the isolated villages.

xiv) The total cost of resettlement and compensation will be included in the RIP and total cost of the project.

3.5 International Entitlement Policy

3.5.1 Loss of Agricultural Land

i) In conformity with current international practices, the households will be classified according to the percentage of land lost for the determination of entitlement and rehabilitation assistance. The overall principles will be that title holders with total land holding of 0.4 ha. or less, who lose

more than 10% of their total land holdings and titled holders with total land holdings of more than 0.4 ha. who lose more than 25% of their total land holdings will be classified as severely affected families and entitled to additional rehabilitation assistance.

ii) Title holders who lose less than 10% (with total land holding of 0.4 ha or less) or less than 25% (with total land holding of 0.4 ha) of their total land holding whose production levels are not severely affected by the loss of land will be classified as marginally affected and offered cash compensation only, payable at the time of land acquisition.

iii) Title holders who lose more than 10% (total land holdings of 0.4 ha. or less) or more than 25% (with total land holdings larger than 0.4 ha.) of their total land holdings or whose production levels are severely affected by the loss of land leading to the remaining land holdings not being economically viable will be offered a choice of assistance with the identification and purchase of replacement land or cash compensation. In addition they will receive income restoration and other rehabilitation assistance as classified in Section V below.

iv) Title holders loosing more than 75% of any affected land parcel or land holdings and title holders whose parcel is severed due to land acquisition will have the option to relinquish the reminder of that parcel or land holdings if they faced that the remaining portion of land after acquisition is small to be cultivated or other use. The partly affected families (PAF's) will also be entitled to compensation and income restoration as severely affected families if they meet the criteria for SPAFS as defined in (C) above.

v) Title holders will be compensated for all permanent land losses at market value and marginal impact will be compensated in cash on individual basis.

3.6 Special Policy of MASL for Moragahakanda Project

3.6.1 A) Unit of Land Alienation

The approved unit of land per family is determined by the Central Provincial Council for the district of Matale, taking into consideration of the land availability in the Province as well as respective districts coming under the purview of the Provincial Council. Accordingly, it has been 0.4 ha. (1 acre) of irrigable land, 0.2. (1/2 an acre) of highland agricultural land and 0.05 ha. (20 perches) of residential land are given to a family unit in the district of Matale. However, per capita land unit is 131 perches whereas per capita agricultural land unit is 41 perches in the Island according to the Census & Statistics Department. This data revealed that decreasing in trend of land unit per person in the country and therefore, available land should be carefully allocated among the eligible families. Taking all these factors into consideration, the under mentioned land unit has been decided by the MASL. However, the unit of land decided by the MASL was based on economical viability and the availability of the land in the area. The Agriculture Division of MASL will prepare a comprehensive Agricultural Development Plan in order to gain maximum income from above unit of land per family.

MDB and MASL have adopted special policies on land alienation for resettles and settlers in early stages of Mahaweli Development Programme, particularly; decision was taken to allocate 01 ha. of irrigable land and 0.2 ha. of homestead in Systems B,C & H. during the period of Accelerated Mahaweli Development Programme. Subsequently due to high demand and scarcity of land (particularly the irrigable land in the Mahaweli administration areas) MASL has taken a policy decision to reduce the size of the land parcel. In the case of Moragahakanda Development Project, the land parcel is 0.6 ha. of irrigable and 0.2 ha of homestead for a farmer family.

3.6.1 B) Entitlement Criteria

Households who own houses with title land will have the entitlement of replacement value for structures, market value for land, trees and crops, with 0.2 ha. homestead and 0.6 ha. of farmstead in System ‘F’ or ‘D’ according to their choice. The socio-economic survey identified 80% of respondents opted to System ‘F’ and 20% to System ‘D’. 150 Sq.m. (06 perches) of land will be allocated as commercial plot. In the case of an affected industrial site, a new industrial plot will be provided, depending on the size and nature of the industry. They will be given an opportunity to select more suitable relocation site according to their choice. This approach would minimize the social disruption and adverse social impact on the resettlement process.

The estimated development cost of 0.6 ha. is Rs. 1,177,200/= in System 'F' and Rs. 1,108,200/= in System 'D' at present value. This would be the most attractive compensation that APS will receive from MASL.

The APS will be assisted in the relocation process and be paid all eligible compensation for land, structures, trees and crops, shifting allowance and transport allowance in advance, prior to the commencement of handing over of the land for the construction of the new house. If land is acquired under Section 38A of LAA and compensation payments are delayed, an interest will be payable at 7% per annum. The irrigation infrastructure development facilities will be completed before the relocation of HH.

APS will be resettled in clusters according to the existing settlement pattern of villages and the social infrastructure facilities, such as water, electricity, access roads etc., will be provided before they are resettled. Other common facilities, such as Schools, Health centers, Post offices, Pre-schools and Banks etc… will also be provided to the national standards. Community Centres and religious places will also be relocated at the new village where the people had enjoyed similar facilities in the affected villages.

3.6.2.1.1. Compensation, Assistance and Land Entitlements

i) Affected HH are to be provided lands in Systems 'F' or 'D' according to their preferences.
ii) Establishment of small scale income generating schemes.
iii) Professional and technical assistance to re-invest compensation and set up businesses at new service centers in Systems 'F', 'D' and Ambana.
iv) Training on skill developments for 01 person in each household.
v) Ande Farmers will be compensated for all permanent land losses according to their share of Ande arrangement with the land owners. Generally, the arrangement is 75% for the Ande farmer and 25% for the land owner or vice versa. Marginal impacts will be compensated by cash. An Ande farmer who cultivates an extent of paddy land 0.2 ha or above will be entitled to one homestead and one farmstead in Systems 'F' or 'D'. in the case of an Ande farmer who cultivates an exten of paddy land below 0.2 ha will be paid an ex-gratia payment equivalent to 2/3 additional compensation amount of Ande right.
vi) In order to increase the productivity of the remaining lands of both fully affected and partly affected HH, an agricultural extension services programme covering supply of agricultural implements and technical guidance will be provided.
vi) An Agricultural plot and a homestead will be given to an absentee land owner. In case of a refusal of land by such an absentee land owner will be paid an ex-gratia payment equivalent to 2/3 additional compensation amount subject to a maximum amount of RS. 2 Million.
viii) Tenant farmers who have Temporary leased arrangements with the title holders will be entitled to cash compensation payments.
ix) The encroachers on private / state agricultural lands of an extent of 0.8 ha or above before the cutoff date will be entitled for homesteads and farmsteads in system "F" or "D". In addition they will be entitled for

the losses of crops and for any development costs of the land. The encroachers on private / state agricultural lands of an extent of below

0.8 ha will receive compensation for the replacement cost of such development and market value of crops & trees.

x) The households who have no permanent income sources, such as Government or Private Sector employments , businesses etc. will be entitled to homesteads and farmsteads in Systems 'F' or 'D'.

xi) All affected households will be entitled to receive alternative income restoration assistance.

xii) A person who has a leased hold right on an affected land will be entitled to compensation on the leased hold right.

xiii) Community Consultative Groups (CCGs) will be established in each affected Grama Niladari Division to assist and provide advice during the resettlement process. The functions and the responsibilities of the CCGs are given in Section 8.2.9.

xiv) The all above entitlement packages are applicable to Moragahakanda affected families such as reservoir bed area, deviated road trace, electricity transmission line, elephant corridor, branch channel trace in Kaudulla extension area and host area of Medirigiriya & Kaluganga .

3.6.2. A. Entitlement Based on Tenure.

i) Households with Title

HH with Title for their land will be entitled for 0.2 ha of homestead and 0.6 ha of farmstead in System 'F' or 'D'. They will be paid compensation for acquired land and property and in addition are entitle for 02 lorry loads of transport allowance, shifting allowance, housing and latrine allowance.

ii) Households without Title

The HH who were located at State lands without Title before the cut-off date (20.01.2008) will be entitled for a 0.2 ha of homestead and 0.6 ha of farmstead as in the case of households with the Title. They will be paid compensation at replacement value for structures and market value for trees and crops. They are also eligible for shifting allowance, transport allowance (two lorry loads), housing and latrine allowance.

iii) Sub families

The sub families married before the cut-off date are eligible for 0.2 ha of homestead and 0.6 ha of farmstead in System 'F' or 'D' according to their choice. They will be given shifting allowance, transport allowance (one lorry load), housing and latrine allowance.

iv) Ande Cultivators

There are two types of Ande cultivators affected, namely:

A) Those who own homesteads (house) and Ande paddy lands in the affected areas.

B) Those who are residing outside the Project but Ande paddy lands in the affected areas.

Category 'A' is entitled for 0.2 ha of homestead and 0.6 ha of farmstead in System 'F' or 'D' as a result of the displacement of the residence and have no right for entitlements of lands because of the loss of Ande.

Category 'B', is entitled for 0.2 ha of homestead and 0.6 ha of farmstead in System 'F' or 'D' if the extent of the affected Ande land is 0.2 ha. or above and they are solely depending on the income from Ande land. If the extent is less than 0.2 ha, they will be entitled for an ex-gratia payment equivalent to 2/3 of the compensation payment. Further they will be considered for employment opportunities in the project on priority basis, income generation programmes, and skill development training for members of such families.

v) Land owners who are residing outside the Project

The land owners whose land will be affected but their residences will not be affected are entitled for compensation for the land acquired. These land owners fall in to two categories namely paddy and highland agriculture land owners. The past experience in the Mahaweli settlements has revealed that though this category of APS were provided with lands in the Mahaweli Development area, they have leased out these lands and it has resulted a negative impact on the development. Further, it has resulted disputes among the resettlers and the leased land holders. Therefore, it has been decided not to allocate new lands to the absent land owners who don't opt to receive lands in System "F" or "D". Instead they will be entitled to an ex-gratia payment equivalent to 2/3 of the compensation payment subject to a maximum of Rs. 2 Million. Those absent land owners who claim new lands in System "F" or "D" need to have a minimum of 0.4 ha. paddy land or 0.8 ha. highland agricultural land affected, for them to be entitled for 0.2 ha of homestead and 0.6 ha of farmstead in System 'F' or 'D'.

vi) Sub-families in encroached lands (State)

The sub-families residing with their parents or relatives in encroached lands and married before the cut-off date will be entitled to 0.2 ha of homestead and 0.6 ha of farmstead in System 'F' or 'D'.

vii) Tenants

The tenants who are living in rented houses before the cut-off date and the sub-families who have married before cut-off date will be entitled only for homestead each in System 'F' or 'D'. The size of plot will depend on the nature of the occupation. The recommendations for such kind of allocations will be made by CCGs.

viii) Leased Landholders

If there are Leased landholders whose residences will not be affected and their other leased lands will be acquired and their livelihood is solely dependent on

that land will be entitled to either an ex-gratia cash payment equivalent to 2/3 compensation subject to maximum of Rs. 2 Million of leasehold rights for acquired land or 0.2 ha of homestead and 0.6 ha of farmstead in System 'F' or 'D' only if the acquired leased paddy land is above 0.4 ha or leased highland agricultural land is above 0.8 ha. They are also entitled for compensation for acquired land.

xi) Business Establishments

The affected owners of business establishments are entitled for business sites in new service centers in System 'F' or 'D' or Ambana. They are also entitled for compensation under loss of business. Further, compensation entitlement for land and structures will be paid to the owners. APS who have their business premises at rented or leased buildings will be entitled for new business sites with a house plot and compensation for loss of businesses. Owners of such buildings will be entitled for compensation.

x) Combined Businesses and Residences

There are some business establishments operated in the same premises of residences of APS. This category of APS will be entitled for either a combination of homestead and farmstead or homestead and commercial plot depending on their economic dependence either from agricultural or trading activities.

The type of award will be recommended by the Community Consultative Group during the resettlement process. They will be entitled for compensation for loss of properties and businesses.

xi) Temporary Accommodations

The APS who will be resettled in System 'D' will need temporary accommodation facilities until such time they construct their new houses / temporary hut at the new homesteads allocated to them. They will be provided with facilities such as water, electricity, cooking and toilet facilities and cooked meals for first two days.

3.6.2.B. Displacement Support

a) Shifting allowance

The APS will be provided with the shifting allowance of Rs.10,000/= at the time shifting to System 'F' or 'D'.

b) Housing assistance

Rs.20,000/= worth of Building materials will be provided as housing assistance to all allotees at their new settlements. These materials will be provided in 02

installments based on the progress of construction. In addition Rs.5000/= worth of materials will be provided for the construction of a toilet.

c) Transport allowance

All main households will be provided with the transport allowance of 02 lorry loads to new settlement sites and sub-families and others are entitled for 01 lorry load of transport allowance.

d) Technical assistance

Technical and professional assistance will be provided to all APS' as and when they require at the new settlement on their requests.

e) Release of salvage materials and trees

The salvage materials of the buildings and trees of the acquired lands are to be released free of charge to the owners of such properties. The trees within the 100M. buzzer zone will be protected for the prevention of soil erosion to the reservoir and those will not be released.

3.6.2.C Plot allocation

The allocation of plots will be carried out in consultation with APS and their community leaders to relocate themselves according to their choice, and all allocations of plots will be completed prior to one year before the impounding of the reservoir.

3.6.2. D. Plan for House Construction

MASL will assist the resettlers with the preparation of housing plans, if they request. However, the amount of compensation received by APS will have to be considered when preparation of such plans.

3.6.2. E Assistance Schemes

All resettled HH will receive food assistance for a period of 12-18 months in general on following basis.

- In the case of farmer families their entitlement would be up to a maximum period of 18 months
- All other resettlers would be entitled up to a maximum period of 12 months.

3.6.2.F Special assistance schemes for vulnerable groups

The women households, disabled households, households over 60 years will be assisted in construction of their houses at the new settlements. Special scheme will be introduced for housing construction. Households below the poverty line will be assisted to improve their living conditions and income generation capacities at new locations. The assistance schemes proposed for vulnerable groups are given in sub item No. 6.4.8. of Chapter 6.

3.6.2.G) Assistance for loss of employment

Employment opportunities for those who lose employment will be an allowance of Rs.3000/= per month up to maximum of 6 months period or until a new employment is found.

3.6.2.H Environment restoration programmes

The System 'F' & 'D' will be developed to accommodate the resettlement of affected families in a fairly vast area covered with light & scrub jungle. This will cause certain impacts on the environment by way of soil erosion, destruction of water resources and disturbance to wild life. In order to mitigate these impacts, the recommendations of the EIA will be carried out together with the Project implementation. In addition, community forests will be established and the reserved land will be protected by means of fencing to prevent encroachments in the settlement areas.

3.6.3 Loss of Trees and Crops

Construction work will be planned as far as possible, allowing harvesting of crops before the land is acquired. Where the crops cannot be harvested or the destruction of crops is unavoidable, a suitable cash compensation will be paid, based on type of crops at their market values. In the case of removal of trees for urgent construction compensatory measures will be adopted by means of Way Leave clearance. The trees and crops falling out side the Way Leave will not be disturbed until such areas are formally acquired.

3.6.4 Loss of House Plots, Houses, and other privately owned structures.

i) Owners of houses and other structures such as sheds, stores, tobacco barns, wells, water tanks, retaining walls and fences will be compensated at the replacement cost. This will include title holders / leased holders and tenants in Private / State lands and encroachers occupying state lands. Furthermore, the structures that are partly affected will be entitled for compensation at the replacement cost.

ii) Owners will have the right to salvage materials free of charge from the affected structures. The value of salvaged materials will not be deducted from the final compensation amount.

iii) For partial loss to recognize injurious effect, if the remaining land and the property are not considered for development, that portion of land will be acquired.

iv) All types of relocated households will be entitled to trees, free of charge for vacating the premises at the stipulated time. All compensation entitlements will be paid before the APS are required to move out from the

affected area, if the particular land plot would not subject to a Court procedure.
v) Displaced households and owners of commercial establishments will be allocated homesteads / farmsteads / commercial plots as appropriately in Systems 'F' or ' D'.

vi) The structures built by the tenants on the rented lands in terms of the lease agreement will be compensated in cash at the replacement cost. Such tenants will be entitled to a homestead and in addition either a farmstead, commercial or industrial plot in the System 'F' or 'D' depending on the type occupation and income level and with the recommendation of the CCGs.

vii) Relocated households will be entitled to shifting allowance.

viii) Encroached HH will be entitled to receive a homestead and a farmstead, subject to the eligibility criteria by the cut-off date, in Systems 'F' or 'D' and compensation for their own structures at replacement cost and market value for trees and crops.

ix) The relocation of households at a particular unit in the resettlement area are to be made at their choice in clusters so as to maintain their composition in the original locations. The resettlement assistance will be provided so as to maintain social and economic integration with the host communities by allowing the host communities also to have access to such assistance as much as possible. The infrastructure facilities available in the new settlements will be common to both communities.

x) All other affected persons of road deviation, elephant corridor, electricity transmission line, new branch channel trace in Kaudulla extension area and the affected host communities in resettlement areas will be entitled to the same entitlements.

3.6.5 Temporary Losses

In general, the private and leased lands which would be required for construction purposes will be acquired by MASL. Any damages to the land and the property therein will be compensated by means of Way Leave clearance.
In special cases where the concerned land is located outside the affected area, such lands will be utilized for the project activities temporarily on a mutually agreed basis by an agreement and an adequate compensations will be paid for the damages to be sustained. The land will be returned to the owner after implementing the proper reclaiming activities.

3.6.6 Loss of Commercial and Industrial Establishments and Restoration of Income

i) All business ventures subjected to acquisition will be entitled to a compensation payment equal to 03 years of future income as per Land Acquisition Act. The C.V. will determine the exact loss of income and the

compensation amount. The commercial buildings & related structures too will be compensated at the replacement cost.

ii) The business owners who maintain their business establishments and the residences at the same premises will be entitled for separate homesteads and commercial plots at the service centers of the new settlements of System 'F' or 'D'. Those HH who will lose their above properties will be entitled to either a combination of homesteads & farmsteads or a combination of homesteads & commercial plots or industrial lands in the system F or D depending on the income level of the respective occupation, as recommended by the CCGs.

iii) HH of Informal sector businesses that are affected will be entitled to a house plots and commercial/industrial plots in new service centers, to receive livelihood restoration grants and to receive assistance to develop their ventures.
Already affected persons of road deviation, elephant corridor, electricity transmission line, new branch channel trace in Kaudulla extension area and the affected host communities in resettlement areas will be entitled to same entitlement as all other APS.

3.6.7 Special Assistance to Vulnerable Households

The vulnerable households such as female-headed, elderly , disabled and households with Income below poverty line are entitled for special assistance on the recommendations of the CCGs.

i) Relocated vulnerable households will be entitled to have their new houses built for them by MASL, if requested, on the recommendations of the CCGs.

ii) Those HH will be entitled to an income restoration grant and homesteads & farmsteads at same village with their relatives. In addition, special development programs will be drawn up to develop their lands. However, such assistance will be provided on individual basis on the recommendations of the CCGs. .

All vulnerable households in the tank bed area, road deviation, elephant corridor, electricity transmission line, new branch channel trace in Kaudulla extension area and the resettlement areas will be entitled to above assistance.

3.6.8 Employment Opportunity

The APS will be given priorities for the employment opportunities in the project constructions.

3.6.9 Displacement Support

In addition to the compensation for lost properties, affected families will be entitled for the following supports.

i) Shifting allowance, housing and latrine allowance.

ii) Income restoration grant.

iii) Employment allowance.

iv) Temporary accommodation allowance

Refer sub section 3.6.2, 3.6.6 and 3.6.8 of chapter 03 for details.

3.6.10 Income Restoration and Rehabilitation

In addition to the provision of displacement support, certain categories of APS would need following special assistance and measures for them to be resurrected in case of any mental stresses, creation awareness on resolving various issues/ disputes amongst them and facilitating that process during the resettlement program. The types of issues/disputes and remedial measures would be as follows:

i) Counseling on project impacts, preparation of compensation claims, resettlement options and sites development.

ii) Counseling on saving schemes and cash management.

iii) Assessment of current economic activities and potentials in the new settlement areas for improvements of these activities as well as alternative income earning opportunities.

iv) The project will facilitate the establishment of small scale income generating schemes for the affected families.

v**)** Assistance to gain access to National and Local Poverty Alleviation and Credit programmes. Details of income restoration programme are described in Chapter 06.

vi) One person from each affected household will be entitled to skills and vocational training that would help in obtaining employment or establishing self-earnings. The eligible persons from severely affected families will be given priorities on the recommendation of CCGs on above training programmes.

vii) Those who will receive agricultural lands are entitled to agricultural extension services provided by MASL.

viii) General information dissemination and awareness programmes will be carried out amongst the APS on construction schedules, acquisition data, valuation, compensation, grievance resolution mechanism and employment opportunities in the project .

ix) with the establishment of CCGs in the settlement areas, the performance of severely affected and vulnerable groups will be monitored and evaluated by the MASL regularly with the assistance of the former, in order to determine what additional or corrective measures needed for the improvement of quality of life of any backward families.

3.7 Affected public utilities, community facilities and religious institutions

Affected public utilities, community facilities and religious places will be replaced in new settlement areas and in the locality of the Project in consultation with affected communities and the relevant authorities. These include electricity, water supply, telecommunication, education, health and postal facilities, cemeteries and religious places.
The religious places will be re-established from the funds received as compensation deposited with the Public Trustee. In addition, Rs.200000 will be given for the construction of 01 resident building.
In addition to above facilities, any affected social infrastructure facility will be restored in the new settlement areas where necessary, in consultation with the community.

3.8 Damages caused during construction

MASL will ensure that extreme care will be taken to avoid damages to public & private properties during constructions. In the event of any such damages it will be restored immediately by the constructor to the satisfaction of the affected parties. In the case of damages to crops & trees outside the Way Leave it will be compensated by the constructor. The temporarily affected lands will be reclaimed to the original conditions as far as possible.

3.9 Public Utilities shared by affected & non affected persons.

MASL will relocate the public utilities shared by affected & non affected persons in consultations with the respective authorities at the nearest existing service center.

3.10 Recommendations of Environment Impact Assessment Report

The report specifies several recommendations with regard to updating of feasibility study in areas such as geology & minerals, destruction of forest, threats on wildlife and adverse effects on resettlements.

The recommendations on resettlements of the Project specifies:-

3.10.1 Public awareness programme should be launched immediately after the Cabinet approval is received for the Project.

3.10.2 The intended area of resettlement should be gazetted very early and protected from encroachers.

3.10.3 The elephant corridor is narrow, at the Naula – Elahera road crossing and very close to the dam. Therefore, all precautions should be taken to minimize the disturbance to wildlife. Temporary Construction Camps including residential quarters should be located away from the 100m buffer zone.

3.10.4 Other buildings which could be used for administrative and residential purposes, may be located at Elahera. Since, the present cart tract will be developed as the diversion road skirting the reservoir. Elahera is likely to develop as a junction town and planning of the Elahera township should be the Project's responsibility.

3.10.5 Acquisition proceeding can be expedited, but delays in surveys and payment of compensation have been experienced in the past. All efforts must be made to pay the compensation made faster progress in establishing themselves in the new areas.

3.10.6 Part payments of compensation should be minimized. Experience with Kotmale and Victoria resettlers indicate that the affluent farmers who received timely compensation made faster progress in establishing themselves in the new areas.

3.10.7 Settlement staff should be associated from the earliest stage of the resettlement phase. Block Manager and 4 Unit Managers should be made responsible for activities in the command area.

3.10.8 The affected population must be medically screened prior to resettlement to identify nutritional status, communicable diseases and diseases that may accelerate due to stress in the conditions in the resettlement areas.

3.10.9 Project affected families, who enjoy a two-season cultivation, should be encouraged take up settlement in the command area.

3.10.10 A more realistic grant must be given to the resettlers for house construction.

3.10.11 Permanent householders in the affected area who do not wish to move into distant resettlement areas should be provided homesteads in the vicinity. The categories who would prefer such an option will be traders, miners, professionals etc.

People eligible for resettlement but opt to either stay in the vicinity or move to a location of their choice should be given a special resettling allowance in addition to compensation awarded.

3.10.12 All borrow sites which are outside the inundation area should be landscaped to avoid erosion. The outcome should be aesthetically sound.

3.10.13 A cut – off date for settling in the area should be decided to avoid adventurers who take up residence from making claims for resettlement.

3.10.14 Encroachers must be screened for eligibility of settler benefits and treated accordingly.

3.10.15 The use of local officials (i.e. Grama Niladhari etc.) should be consulted and their assistance obtained in developing and executing the resettlement plan.

It does not require project executing agencies to address key resettlement issues such as :

- Exploring alternative project options that avoid or minimize impacts on people.
- Compensating those who do not have title to land
- Consulting affected people and costs on resettlement options
- Providing for successful social and economic integration of the affected people and their hosts
- Paying for full replacement cost of all structures
- Full social and economic rehabilitation of the affected people

Table 3.2 - Review of Policy & Practice in Sri Lanka in comparison with Donor Policies.

Policy of Asian Development Bank	Policy of National Involuntary Resettlement
• Involuntary resettlement should be avoided where feasible. • Where population displacement is unavoidable, it should be minimized by exploring all viable project options. • People unavoidably displaced should be compensated and assisted, so that their economic and social future would be generally as favorable as it would have been in the absence of the project. • People affected should be informed fully and consulted on resettlement and compensation options. • Existing social and cultural	• Involuntary resettlement should be avoided or reduced as much as possible by reviewing automotives to the project as well as alternatives within the project. • Where involuntary resettlement is unavoidable, affected people should be assisted to re-establish themselves and improve their quality of life. • Gender equality and equity should be ensured and adhered to throughout the policy. • Affected persons should be fully involved in the selection of relocation sites, livelihood compensation and development options at the earliest opportunity. • Replacement land should be an option for compensation in the case of loss of land;

Policy of Asian Development Bank	Policy of National Involuntary Resettlement
institutions of resettlers and their hosts should be supported and used to the greatest extent possible, and resettlers should be integrated economically and socially into host communities. • The absence of a formal legal title to land by some affected groups should not be a bar to compensation; particular attention should be paid to households headed by women and other vulnerable groups, such as indigenous peoples and ethnic minorities, and appropriate assistance provided to help them improve their status. • As far as possible, involuntary resettlement should be conceived and executed as a part of the project. • The full costs of resettlement and compensation should be included in the presentation of project costs and benefits. • Costs of resettlement and compensation may be considered for inclusion in Bank loan financing for the project.	in the absence of replacement land cash compensation should be an option for all affected persons. • Compensation for loss of land, structures, other assets and income should be based on full replacement cost and should be paid promptly. This should include transaction costs. • Resettlement should be planned and implemented with full participation of the provincial and local authorities. • To assist those affected to be economically and socially integrated into the host communities, participatory measures should be designed and implemented. • Common property resources and community and public services should be provided to affected people. • Resettlement should be planned as a development activity for the affected people. • Affected persons who do not have documented title to land should receive fair and just treatment. • Vulnerable groups should be identified and given appropriate assistance to substantially improve their living standards. • Project executing Agencies should bear the full costs of compensation and resettlement.

3.11 Entitlement Matrix

The entitlement matrix recommended in Table 3.3 describes the various compensation and entitlement policies that will be applied to all projects affected persons and groups, such as the APS in the reservoir bed area, road deviation, elephant corridor, electricity transmission line, branch canal construction in Kaudulla LB extension area and resettlement area of Medirigiriya and Kaluganga.

Table No 3.3. Entitlement Matrix

No.	Type of property affected	Entitlement Categories	Type of Entitlement
1)	**Residential lands and buildings of residential families**		
1.1)	Home gardens and buildings	Privately owned lands (for main and sub-families residing before the cut-off date)	1) Compensation for lands, trees and cultivations based on market values. 2) Compensation based on replacement cost (including material and labour cost) of the existing buildings & other Constructions. 3) Permission to utilize re-usable building materials removed from demolished buildings and trees grown on the lands at free of cost. However, removal of trees from 100m buffer zone will not be allowed. 4) ½ acre homestead and 1 ½ acre of agricultural lands with irrigation facilities for those who volunteer to resettle in Systems F or D 5) Additional benefits provided by the MASL (See Sections 3.13). 6) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
1.2)	Residential lands and buildings	Land owners under Government Land Grants (Main and Sub-families)	1) Compensation for lands, trees and cultivations based on market values. 2) Compensation based on replacement cost of the existing building & other constructions. 3) Permission to utilize re-usable building materials removed from demolished buildings and trees grown on the lands at free of cost. However, removal of trees from 100m buffer zone will not be allowed. 4) ½ acre homestead and 1 ½ acre of agricultural lands with irrigation facilities for those who volunteer to re-settle in Systems F or D 5) Additional benefits provided by the MASL (See Sections 3.13). 6) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
1.3)	Residential	Families	1) Compensation for lands based on leased holder

2.1)	Agricultural lands with buildings	Private lands (privately owned and inherited)	1) Compensation for lands, trees and cultivations based on market values. 2) Compensation based on replacement cost of the existing buildings & other constructions. 3) Permission to have 1 acre residential lands or 2 acres of highlands which would be acquired for the Project free of cost. However, additional benefits provided by the MASL (See Sections 3.13). 4) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
2.2)	Agricultural lands	Government permit holders under Land Development Ordinance or State Land Ordinance	1) Compensation for Land based on leased holder rights and cultivations based on market values. 2) ½ acre homestead and 1 ½ acre of agricultural lands with irrigation facilities in Systems F or D for those who have 1 acre or more paddy lands or 2 acres or more highlands which would be acquired for the Project. 3) Additional benefits provided by the MASL (See Sections 3.13). 4) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
1.4	Residential lands and buildings	Main Families and Sub-families in leased out private lands	1) Compensation based on leased holder rights. 2) ½ acre homestead and 1 ½ acre of agricultural lands with irrigation facilities for those who volunteer to re-settle in Systems F or D 3) Additional benefits provided by the MASL (See Sections 3.13). 4) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
2.3)	Agricultural lands	Government land grants	1) Compensation for trees and cultivations based on market values. 2) ½ acre homestead and 1 ½ acre of agricultural lands with irrigation facilities in Systems F or D for those who have 1 acre or more paddy lands or 2 acres or more highlands which would be acquired for the Project. 3) Additional benefits provided by the MASL (See Sections 3.13). 4) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
1.5	Loss of rented out housing	Main Families and Sub-families residing on rental basis	1) Compensation payment based on compensation received by the landlord as per the House Rent Ordinance. 2) Based on preference a ½ acre of homestead either from System F or D for those families and sub-families residing before the cutoff date. 3) Additional benefits provided by the MASL (See Sections 3.13). 4) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
2.4)	Agricultural lands	Leases in private lands	1) Compensation for land based on leased holder rights and compensation for trees and cultivations based on market values. 2) ½ acre homestead and 1 ½ acre of agricultural lands with irrigation facilities in Systems F or D for those who have 1 acre or more paddy lands or 2 acres or more highlands which would be acquired for the Project. 3) Additional benefits provided by the MASL (See Sections 3.13). 4) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
1.6)	Residential lands and buildings	Encroached Main families and Sub-families	1) Payment of developed value of the land (Crops and Trees) as compensation. 2) Replacement cost of buildings and other constructions as a compensation. 3) Additional benefits provided by the MASL (See Sections 3.13). 4) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
2.5)	Agricultural lands	Cultivators under leased holder rights	1) Compensation for land based on leased holder rights and compensation for trees and cultivations based on market values. 2) ½ acre homestead and 1 ½ acre of agricultural lands with irrigation facilities in Systems F or D 5) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12)
2) Non-residential agricultural lands			

3.1	Lands and buildings used for commercial activities	Private and inherited ownerships	1) Compensation for lands and improvements based on market value. 2) Replacement cost of buildings and constructions. 3) Additional benefits provided by the MASL (See Sections 3.13). 4) A commercial plot and a residential plot from urban centers of System F or D based on existing MASL's policies 5) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
2.6)	Agricultural lands	*Ande* Cultivators (Share cropper)	1) Compensation for *Ande* holder rights 2) ½ acre homestead and 1½ acre paddy lands with irrigation facilities from Systems F or D for those who have 1/2 acre or more Ande holder rights paddy lands which would be acquired for the Project. 3) Compensation for lands, trees and crops based on market values. 4) Additional benefits provided by the MASL (See Sections 3.13). 5) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12). 6) Permission to remove building materials from demolished buildings. 7) Other benefits given by the MASL (See Sections 3.13).
3.2)	Lands and buildings used for commercial activities.	Government grant holders	1) Compensation for lands, trees and crops based on market values. 2) Replacement cost of buildings. 3) Compensation for loss of business. 4) A commercial plot and a residential plot from urban centers of System F or D based on existing MASL's policies 5) Permission to remove building materials from demolished buildings. 6) Other compensations and benefits as per the Land Ministry Circular No. 4/2008 (See Section 3.12). 7) Other benefits given by the MASL (See Sections 3.13).
2.7)	Agricultural lands	Illegal cultivators in state lands	1) Compensation for cultivations based on developed value*. 2) Those land owners who had minimum of 1 acre of paddy lands or 2 acres of highlands developed prior to the cutoff date which are to be acquired for the project, will be entitled for ½ acre homestead and 1 ½ acre of agricultural lands with irrigation facilities in Systems F or D 3) Other benefits given by the MASL (See Sections 3.13). 4) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
3.3)	Lands and building used for commercial activities	Government permit holders	1) Compensation for lands as per the leased agreement based on market values. 2) Replacement cost of buildings. 3) Compensation for loss of business. 4) A commercial plot and a residential plot from urban centers of System F or D based on existing MASL's policies 5) Permission to remove building materials from demolished buildings. 6) Other compensations and benefits as per the Land Ministry Circular No. 4/2008 (See Section 3.12). 7) Other benefits given by the MASL (See Sections 3.13).
2.8)	Agricultural lands	Illegal cultivators in private lands	1) Compensation for cultivations based on developed value*. 2) Those illegal cultivators who had minimum of 1 acre of paddy lands or 2 acres of highlands developed prior to the cutoff date which are to be released to the project, will be entitled for ½ acre homestead and 1 ½ acre of agricultural lands with irrigation facilities in Systems F or D. 3) Additional benefits provided by the MASL (See sections 3.13). 4) Other allowances applicable under the Land Ministry Circular No. 4/2008 (See Section 3.12).
3.4)	Lands and building used for commercial activities	Leases on private lands	1) Compensation for lands as per the leased agreement based on market values. 2) Replacement cost of buildings as per the leased agreement. 3) Compensation for loss of business. 4) A commercial plot and a residential plot from
3) Buildings and lands used for businesses and industries			

			urban centers of System F or D based on existing MASL's policies 5) Permission to remove building materials from demolished buildings. 6) Other compensations and benefits as per the Land Ministry Circular No. 4/2008 (See Section 3.12). 7) Other benefits given by the MASL (See Sections 3.13).
3.5)	Lands and buildings used for commercial activities	Businesses carried out on rent	1) Compensation benefits under the House Rent Ordinance. 2) Compensation for loss of business. 3) A commercial plot and a residential plot from urban centers of System F or D based on existing MASL's policies 4) Permission to remove building materials from demolished buildings. 5) Other compensations and benefits as per the Land Ministry Circular No. 4/2008 (See Section 3.12). 6) Other benefits given by the MASL (See Sections 3.13).
3.6)	Commercial buildings	Businesses carried out illegally on State lands	1) Replacement cost of buildings. 2) Compensation for loss of business. 3) A commercial plot and a residential plot from urban centers of System F or D based on existing MASL's policies 4) Permission to remove building materials from demolished buildings. 5) Other compensations and benefits as per the Land Ministry Circular No. 4/2008 (See Section 3.12). 6) Other benefits given by the MASL (See Sections 3.13).
3.7	Business premises	Businesses carried out illegally in private lands	1) Compensation for loss of business. 2) A commercial plot and a residential plot from urban centers of System F or D based on existing MASL's 3) Other compensations and benefits as per the Land Ministry Circular No. 4/2008 (See Section 3.12). 4) Other benefits given by the MASL (See Sections 3.13).
4)Businesses			
4.1	Loss of registered businesses	Registered business owners	1) Compensation for lands based on market values. 2) Replacement cost of buildings. 3) Compensation for loss of business. 4) A commercial plot and a residential plot from urban centers of System F or D based on existing

			MASL's policies 5) Permission to remove building materials from demolished buildings. 6) Other compensations and benefits as per the Land Ministry Circular No. 4/2008 (See Section 3.12). 7) Other benefits given by the MASL (See Sections 3.13).
4.2)	Loss of commercial buildings	Un-registered business owners	1) Compensation for lands based on market values. 2) Replacement cost of buildings. 3) Compensation for loss of business. 4) A commercial plot and a residential plot from urban centers of System F or D based on existing MASL's policies 5) Permission to remove building materials from demolished buildings. 6) Other compensations and benefits as per the Land Ministry Circular No. 4/2008 (See Section 3.12). 7) Other benefits given by the MASL (See Sections 3.13).
5)Other private properties and constructions			
1)	Other properties and buildings (partially built, completed and secondary buildings**	Owners of such properties	1) Compensation for lands based on market value. 2) Replacement cost of buildings. 3) Compensation for loss of businesses.
2)	Private cemeteries and related constructions	All owners	1) Compensation for such cemeteries and constructions.
6)Loss of temporary employments			
1)	Loss of temporary employments	All impacted individuals	1) Compensation based on reasonable wages for those who lose temporary employment due to loss of businesses. 2) A monthly allowance of Rs. 3,000/= up to a maximum 6 months until an employment is found
7)Loss of properties due to urgent acquisitions			
1)	Loss of employments	All impacted individuals	1) A monthly allowance of Rs. 3,000/= up to a maximum 6 months until an employment is found 2) Compensation as per Labor Laws.

8)Compensation for improvement and restoration of living standards.			
1)	Loss of properties due to urgent evacuations	All impacted individuals irrespective of the ownership	1) Compensation for cultivations and constructions based on market value and re-establishment costs.
2)	Re-settlement and transport facilities	All families and business owners to be re-settled	1) An additional compensation of Rs. 20,000/= for change of residence. 2) Transport allowance for two lorry loads for main families and one lorry load for sub-families for transportation of goods.
3)	For re-settlement in new settlements	All impacted families and business holders	1) All allowances as per the Land Ministry Circular No. 4/2008 (See Section 3.12).
9)Provision of special assistance			
1)	For socio-economic changes	All impacted families	1) Vocational training for skill enhancement to have access to new employment opportunities. 2) Credit facilities of Rs. 10,000/= to engage in new employments. 3) Food rations provided by the MASL.
10)Special assistance for vulnerable families			
1)	Affected vulnerable groups	handicapped, poor, elderly and disabled families	1) Special monthly allowance of Rs. 3,000/= for a maximum period of 18 months. 2) An allowance of Rs. 25,000/= for economic enhancement.
2)	Affected vulnerable groups	Women Households, Below Poverty line	1) An allowance of Rs. 25,000/= for economic enhancement
11)Social infrastructure facilities			
1)	For loss of public infrastructure facilities	All impacted individuals and government and non-government organizations	1) Establishment of all social infrastructure facilities for new settlers based on national policies. 2) Establishment of social infrastructure facilities for isolated areas as and when necessary.

*Developed value – the Developed value means, the value of agricultural land covering the cost of all operations such as land clearing, land preparation & cultivation etc.

** Secondary Building – A building used for any other purposes, other than residential or commercial purposes such as Tobacco Barn, Cattle-Shed, etc.

***Replacement Cost - It means, the cost of new building at prevailing prices of material and labour (this means that there will not be any depreciation of cost deducted from the present cost **).** According to the World Bank Operational Policy 4.12, the replacement cost for agricultural land is considered "*the pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes*."
Although the market value for the acquired land is proposed in the entitlement matrix, the compensation for land which is equivalent to replacement cost including transaction cost will be provided by MASL as a total. More specifically, the transaction cost will be provided by the MASL under the Circular No.4 of 2008 of Ministry of Land and Land Development and the Regulations No. 1596/12 on 14/07/2009 if necessary since it is expected that most transaction will be between the government and the resettelrs.
**** Market Value - It means the value of the property according to the market condition depending on time & location. Generally, market value is based on the demand and supply at the particular time and location.

Note:

(1) Even though an affected household would qualify to receive compensation packages under several Entitlement Categories, it should be noted that such a party should be entitled only for a combination of one house plot plus one irrigable plot or one house plot with either a commercial or industrial plot in respect of land alienation.

(2) The compensation for the land acquired by MASL will be provided in monetary terms, in addition, MASL will provide a land parcel of 0.6 ha irrigable and 0.2 ha homestead in the resettlement sites (Systems F and D) as a gift. But it may not equivalent to the extent of lost land of a particular evacuee due to the scarcity of the land. Therefore, for those who want to purchase an alternative land outside of System F and D with the MASL's monetary compensation, MASL will consider such cases on an individual basis mutually agreeable to both parties inclusive of transaction costs.

3.12 Benefits and Compensations Eligible under the Land Ministry Circular No. 04/2008 and regulation Gazetted No 1585/7 and dated on 2009.01.20

- Compensation payments for land, trees and cultivations based on marketvalues.
- Expenses incidental to participation of inquiries under Section 9 of the Land Acquisition Act.
- Expenses incurred for selection of new lands.
- Replacement cost of buildings and constructions.

- Transport expenses for travelling to re-settlement areas.
- Publicity expenses for businesses.
- Expenses for installing equipments and furniture.
- Compensation for loss of business.
- Expenses related to re-establishment of businesses.
- Double expenses (reimbusment of duplicated expenditure such as local government taxes in the original location and new location)
- Other reasonable expenses incurred due to acquisition of lands.

3.13 Special Additional Allowances and Benefits Given by the MASL

- An additional allowance of Rs. 50,000/= for those families resettled in Medirigiriya.
- Temporary accommodation with cooking facilities for a few weeks and meals for two days for resettlers in Medirigiriya. In accordnace to the past experince of Victora, Randenigala and Kothmale projects, if there is the new resttelemnt site which is far way from their present living places, then MASL will provide commom accomodation place for this resettlesrs up to the date they are resetlled in their own house plot by construction of a temporay building. The MASL expects resttelers will construct and settle down in a permananet house within 2-3 months. On the other hand, MASL will provide food & other services to those people up to their adapting the new enviroment. This cultture was adapted by MASL due to the experinces of the past resettlement projects. When considring the Kalu Ganga resettlemnt area, there is no need to provide those facilies for the resettlers of Kaluganga. Because it is near to the affected area of Moragahakanda Development Project, the resetters can construct their hosues in new resttlemnt site while living in their present place.
- Material allowance worth Rs. 20,000/= and Rs. 5,000/= for construction of a house and a lavatory respectively, and Rs. 10,000/= cash allowance for each family to be resettled.
- Transport allowance of two lorry loads and one lorry load for each main family and sub-family respectively.
- Technical advice for construction of houses.
- Food rations for new settlers for a period of 12 – 18 months.
- Special facilities for elderly, handicapped and female heads of households.
- A monthly allowance of Rs. 3,000/= up to a maximum of 18 months for handicapped and elderly heads of households.
- A monthly allowance of Rs. 3,000/= up to a maximum of 6 months for loss of employments.
- A package of agricultural tools for new settlers.

CHAPTER FOUR

4. Institutional Responsibilities on RIP and Lessons Learnt from Resettlement Experience

The source of information of this Chapter is mainly from documents on Mahaweli Resettlements of Pre – NIRP and documents of Post – NIRP of MASL, RDA and CEB. The massive resettlement programmes implemented by MDB and MASL during 1970 – 1990 period covered Systems 'H' ,'C' & 'B' and Victoria, Kotmale, Randenigala and Rantembe reservoir projects under the Accelerated Mahaweli Development Programme (AMDP). During the time of implementation of AMDP, there was no experience gained on resettlement, in Sri Lanka. Almost 35,000 families were affected under AMDP and most of these families were resettled in Mahaweli Systems 'H'. 'C' & 'B' and balance APS were resettled in close proximity to reservoir projects.

MASL has implemented comprehensive resettlement programmes in these areas where all infrastructure facilities were also provided. However, APS were faced with many hardships during the transition period in the form of disruption of relationship with their neighbors and relatives, livelihood disruption and were to be moved to completely different areas. In systems 'B' & "C", people were resettled at very initial stages of development before the establishment of infrastructure facilities. At that time, MASL decided to launch the construction programme on a participatory approach basis where resettlers and settlers participated in the development processes. With this arrangement, the livelihood disruption it was mitigated to a certain extent. During this process they too earned an income from the project activities and became very much familiar with their own irrigation network. As those who were resettled in new hamlets were allowed to extract timber from their original lands, they were not allowed to remove timber from the new hamlet areas with a view to protect the environment.

4.1 Legal Framework

The term "Environment" defined in the National Environment Act No. 56 of 1988 includes the physical factor of the surroundings of human beings including land, soil, water, atmosphere, management and enhancement of the environment and for the regular maintenance and control of its quality. The Central Environment Authority (CEA) has been empowered under the Act to recommend to the Minister on corrective measures, a National Environment Programme relating to the protection and management of the environment and to ensure the implementation of such programme. The Minister by order, published in the Gazette has specified the projects and undertaking in respect of which approval should be obtained from the Project Approving Agency (PAA). The Project Proponent (PP) is required to prepare an Initial Environmental Examination (IEE) or an Environmental Impact Assessment (EIA), according to CEA guidelines, which requires a preparation of a Resettlement Implementation Plan.

The Minister, by Gazette Notification 772/22 published on 24th June 1993 determined the projects and undertakings for which the approval is needed in terms of Part IV C of the Act, where the schedule includes Item 12, which refers to involuntary resettlement exceeding 100 families, other than resettlement resulting from emergency situations.

The Guidelines for implementing the EIA reports are included in Appendix 2 of the CEA's publication of 1998. It was identified under the guidelines that resettlement planning should have been completed by the time resettlement process takes place by the project. However, under NIRP in year 2001, specific guidelines on this subject have been introduced by the authorities. Accordingly, all concerned agencies should follow the NIRP in preparation of the Resettlement Implementation Plans. Starting from the British period people have been moved voluntarily, mainly to the dry zone of the country due to the scarcity of land in the wet zone where they lived, even before the implementation of the Mahaweli Development Programme. These were state sponsored settlement programmes aimed at developing and exploiting land resources in those areas while relieving pressure on land in the wet zone.

4.2 National / Provincial Experience & Responsibilities

Table - 4.1 Process of Resettlement Implementation & Responsibilities

Function	**Responsibility**
Overall Policy Implementation	Ministry of Land and Land Development
Preparation of RIP	Project Proponent (can be contracted to consultants, Universities, NGOs)
Review of RIP	Project Approving Agency (PAA) and CEA
Approval of RIP	PAA and CEA
Implementation	Project Executing Agency (PEA), Provincial, Divisional and Local Administrative bodies.
Monitoring	PEA, with a review by CEA and ML & LD
Evaluation	Independent Organization on behalf of ML&LD, CEA and PEA.

4.2.1. National / Provincial Project experience-Resettlements under Accelerated Mahaweli Program.

Table 4.2 Resettlement of System 'H'

Project details	**Project experience**
Name of the Project :	'H' area
Implementing Agency	MDB & MASL
Funding Agency	World Bank, USA, China, Netherlands
Extent of land acquired	65,000 acres
Number of families affected	15,000
Social Impact Assessment (SIA)	Completed
EIA	Not applicable
Resettlement Implementation Plan (RIP)	Not applicable
Stakeholder participation	Not applicable
International Funding Agency's (IFA) Policy	Not applicable
Cost Estimates	Completed
Compensation policies	Adhered
Income restoration strategies	Implemented

Source – MASL

Table - 4.3 Resettlement of Victoria Project

Project details	**Project experience**
Name of the Project :	Victoria
Implementing Agency	MASL
Funding Agency	United Kingdom
Extent of land acquired	7200 acres
Number of families affected	6,781
SIA	Completed
EIA	Not applicable
Resettlement Implementation Plan (RIP)	Not applicable
Stakeholder participation	Completed
IFA Policy	Adopted
Cost Estimates	Completed
Compensation policies	Adhered
Income restoration strategies	Adopted

Source – MASL

Table - 4.4 Resettlement of Kotmale Project

Project details	**Project experience**
Name of the Project	Kotmale
Implementing Agency	MASL
Funding Agency	SIDA
Extent of land acquired	4000 acres
Number of families affected	6,899
SIA	Completed
EIA	Not applicable
Resettlement Implementation Plan (RIP)	Not applicable
Stakeholder participation	Completed
IFA Policy	Adopted
Cost Estimates	Completed
Compensation policies	Adhered
Income restoration strategies	Implemented

Source – MASL

Table - 4.5 Resettlement of Southern Transport Development Project

Project details	**Project experience**
Name of the Project **:**	Southern Transport Development Project
Implementing Agency	Road Development Authority Ministry of Highways and Road Development
Funding Agency	JBIC and ADB
Extent of land acquired	951.17 ha. Belonging to 8745 lots (according to the RIP, October 2002) Length of the road section : 128 km. (From Matara to Godagama)
Number of families affected	5683 (according to the RIP, October 2002)
SIA	Yes
EIA	Yes
Resettlement Implementation Plan (RIP)	Prepared in October 2002
Stakeholder participation	Stakeholder consultations have been conducted during the preparation of social impact assessment report.
IFA Policy	ADB Policy on involuntary resettlement
Cost Estimates	29.75 million $ (according to the RIP, October 2002).
Compensation policies	NIRP, ADB policy on involuntary resettlement
Income restoration strategies	Developed, based on the requirement of the project affected persons as stated in the RIP

Source: R.D.A.

Table - 4.6 Resettlement for the Outer Circular Highway Project

Project details	**Project experience**
Name of the Project**:**	Outer Circular Highway Project
Implementing Agency	Road Development Authority Ministry of Highways and Road Development
Funding Agency	JBIC
Extent of land acquired	About 60 ha. (including paddy lands and residential lands) Length of the road section : 12 km.
Number of families affected	About 120 (according to the RIP)
SIA	Yes
EIA	Yes
Resettlement Implementation Plan (RIP)	Completed
Stakeholder participation	Stakeholder consultations have been conducted during the preparation of social impact assessment report.
IFA Policy	JBIC Policy on involuntary resettlement
Cost Estimates	About 1600 million SLR.
Compensation policies	NIRP, JBIC policy on involuntary resettlement and RDA Ex-gratia package
Income restoration strategies	Developed, based on the requirement of the project affected persons, as stated in the RIP

Source: R.D.A.

Table - 4.7 Resettlement of the National Highways Sector Project

Evaluation Criteria	**Project experience**
Name of the Project **:**	National Highways Sector Project, Nuwara Eliya – Badulla Section of A005 Road.
Implementing Agency	Road Development Authority Ministry of Highways and Road Development
Funding Agency	ADB
Extent of land acquired	About 14,440 perches (according to the RIP, June 2008) Length of the road section : 50 km. (From Nuwara Eliya to Badulla)
Number of families affected	About 1400 (according to the RIP, June 2008)
SIA	Yes
EIA	Yes
Resettlement Implementation	Prepared in June 2008.

Plan (RIP)	
Stakeholder participation	Stakeholder consultations have been conducted during the preparation of social impact assessment report.
IFA Policy	ADB Policy on involuntary resettlement
Cost Estimates	9.7 million $ (according to the RIP, June 2008).
Compensation policies	NIRP, ADB policy on involuntary resettlement. RDA Ex-gratia package
Income restoration strategies	Developed ,based on the requirement of the project affected persons as stated in the RIP

Source: R.D.A.

Table - 4.8 Resettlement of the Upper Kotmale Project

Project details	**Project experience**
Name of the Project **:**	Upper Kotmale
Implementing Agency	Ceylon Electricity Board Ministry of Power & Energy
Funding Agency	Govt. of Japan
Extent of land acquired	120 Acres
Number of families affected	498
SIA	Completed
EIA	Completed
Resettlement Implementation Plan (RIP)	Completed
Stakeholder participation	P.R.A.
IFA Policy	ADB & NIRP Policy adopted
Cost Estimates	US $ 380 million
Compensation policies	NIRP, ADB policies
Income restoration strategies	Developed according to the requirement

Source – CEB

Table - 4.9 Resettlement of the Uda Walawe Left Bank Extension Project

Project details	**Project experience**
Name of the Project **:**	Uda Walawe Left Bank Extension Project
Implementing Agency	MASL
Funding Agency	JBIC, Japan
Extent of land acquired	4706 ha.
Number of families affected	9000
SIA	Completed
EIA	Completed
Resettlement Implementation Plan (RIP)	Not available
Stakeholder participation	Yes
IFA Policy	NIRP and ADB
Cost Estimates	Rs. 9,588.00 Mn.
Compensation policies	NIRP, ADB and Land acquisition policies
Income restoration strategies	a. Employment opportunities during the construction period. b. Alienation of irrigable lands for agriculture c. Homestead and housing assistance

Source – MASL

4.3. Resettlement Projects under Mahaweli Authority of Sri Lanka (MASL)

4.3.1 'H' Area

Under the Accelerated Mahaweli Development Programme, significant Resettlement Programmes have been undertaken by the MASL. Early Mahaweli Resettlement Programme was commenced at Kalawewa basin – 'H' area in mid 1970s. This resettlement programme was initiated with the Polgolla & Bowatenna diversion complexes where water has been diverted to Kalawewa Tank from Mahaweli River. People living in the villages of Kalawewa Basin were solely dependent on agriculture through paddy and Chena cultivations. Under the Mahaweli Development Programme, some of these villages transformed into irrigable areas where people had to be relocated elsewhere. At the same time, old villages were also transformed into new hamlets and were given equal plot of land to each family at the same village. This caused somewhat dissatisfaction amongst the people in the area. However, the authorities managed to rectify this situation by allocating the original paddy lands to the same person as far as possible, and the highland being given to the main family or sub-family under the new resettlement programme. 1.0 ha. of irrigable land and 0.2 ha. of homestead were the extents of units of land per family. Town, village and hamlet centers were established in each system according to Regional Plan developed by MDB/MASL. APS have been resettled in the hamlets and the common

facilities were provided at hamlet, village and town centers. Allocation of land has been made through Land Kachcheri process.

The following are the salient features of the above Resettlement program:

i) Main households were given a 0.2 ha. Homestead and 1.0 ha. Irrigable land.
ii) Sub families were given same units of homestead and farmstead.
iii) If the family size was big and there were unmarried male and female over 18 years, 0.2 ha. of homestead was provided to each of them.
iv) Commercial lots were also given to the selected entrepreneurs in the area and to APS irrespective of ownership of commercial establishments.
v) Those who owned bigger extents of land which were acquired for the project, were given additional one or two allotments.
vi) Industrial lands were provided to the resettled families, if they were willing to establish a small scale industry.
vii) Compensation was paid on the depreciated value for the structures and at market values of the land and trees.
viii) Acquired houses in the resettlement area were reallocated to the same owners free of charge.
ix) Original Chena cultivated lands too were accommodated in the resettlement program.
x) APS were able to cultivate two seasons with assured irrigation water where only one season was cultivated before the Mahaweli Programme.
xi) Well established infrastructure facilities were provided.

4.3.2 Victoria Reservoir Project

i) Victoria reservoir is located in the Central Province of Sri Lanka, which is close to the Kandy city. The tank-bed area is 2915 ha. which is below 1440 m.asl is located in the fertile Dumbara valley. Altogether 6781 families were affected and majority were resettled in System 'C' and the balance in the suburbs of Kandy city. The APS comprised of semi-urban, villagers and farmers. The land allocations were made on the ownership, Tennureship and Ande rights irrespective of them being resident in the tank-bed area or not. Those who were displaced were also considered for land allocation irrespective of their ownership. The affected families were provided lands under the following categories:

- Main families
- Married sub-families
- Ande cultivators
- Non-resident land owners
- Non-resident land owners who are having one or more houses in the area
- Paddy land owners whose land were given to the Ande cultivators
- Paddy land owners who were cultivating their own paddy lands
- Leased holders who were occupying the houses
- Tenants occupying the houses
- Encroachers of Government and Private land

- Owners of commercial establishments who were running the businesses at their own buildings
- Owners of commercial establishments who were running the businesses at rented / leased out buildings

ii) MASL has conducted a Participatory Rural Appraisal (PRA) for these affected people. At the appraisal stage, people protested and demanded land close to their present villages. Based on the choice of APS, the following criteria were adopted:

- Identified the resettlement sites close to the Victoria reservoir for residential and Agricultural purposes.
- Those who were willing to accept agricultural lands were provided with 0.4 – 0.8 ha. of developed agricultural lands (coconut and mixed crops).
- Those who were willing to accept residential lands were provided with 0.05 – 0.1 ha. lot of land close to the townships.
- Number of commercial establishments was affected and they were provided with commercial allotments with buildings in newly developed townships close to Project area at their choice.
- Those who were willing to obtain paddy lands and homesteads were provided with such lands/ homesteads in Systems 'C' & 'H'.

4.3.3 Kotmale Reservoir Project

There were 6899 families affected under the Project. Kotmale Project is located in Nuwara Eliya district, in the Tea Plantations introduced by the Britishers in 19th century. Affected persons were traditional villagers and they inherited from Kandyan families where they have maintained Kandyan home garden systems in their lands. They were forced to move out from the reservoir bed area and were resettled in System 'H' where the climatic condition is different to Kotmale area. Some of the APS were resettled in Tea estates at their choice. However they faced little difficulties in adjusting to new cultivation (Tea plantation) at the initial stages but gradually adopted to the changes.

4.3.4 Lessons learned under Accelerated Mahaweli Development Programme

i) Process of land acquisition caused a delay in the payment of compensation.

ii) Considerable time has taken to re-establish the affected persons in the new environment.

iii) The traditional villagers who were forced to move out to new settlements seriously felt their disruption of family ties with their relations & neighbors. They too faced difficulties in adjusting to new culture.

iv) Compensation was paid on depreciated value for structures and market value for land and trees.

v) Employed private Surveyors in the resettlement process to avoid delays.
vi) The affected parties who owned large extent of lands were compensated with one or two extra plots of lands after a proper evaluation, as the availability of lands were not as serious as at present.
vii) Those who were affected received reasonable extent of land in Mahaweli Systems, suburbs of Kandy city and in Nuwara Eliya district.
viii) Well established infrastructure facilities were provided for the resettlers.
ix) Lost common facilities were re-established in the area.
x) Host families integrated with the new settlements.
xi) Income restoration programmes were introduced.
xii) APS were consulted
xiii) Salvage materials of structures and trees were released to APS without cost.
xiv) Transport facilities provided according to the necessity.
xv) APS were consulted on their new settlement sites.

4.3.5. The following observations are made based on above lessons learned

i) Well established administrative set up prevailed in MDB and MASL for the implementation of land acquisition & resettlement programmes during the time of AMDP. At present, there is no such formal unit in existence due to the thinning out of these activities.
ii) Compensation for structures was calculated at depreciated value. This means APS have to spend additional funds with what they have received to build new structures.
iii) The compensation received for the land acquired was not the real market value at that particular instance, as there were delays in acquisition process.

iv) The consultations on income restoration and rehabilitation measures with the APS were done only to a limited extent.
v) MASL took care of the APS of Mahaweli Development Programme on the restoration of their livelihood to the Pre-Project status or even better.

4.3.6 Recommendations for implementation of resettlement program under the Moragahakanda project.

i) For the implementation of resettlement program of Moragahakanda project it is recommended to establish an outfit similar to that was in existence al the time of the Accelerated Mahaweli Development Programme.
ii) The above outfit shall be strengthened with relevant staff.
iii) APS shall be made aware of the benefits of the project and re-orient them to face the challenges & lifestyles of the new settlement areas with the view to improve their livelihood.

CHAPTER FIVE

5. Relocation Options - Relocation of Housing, Agricultural Land, Commercial Establishments, Public Institutions, Community Facilities and Religious Institutions

5.1 Present status of proposed resettlement areas

The proposed resettlement areas for Moragahakanda APS will be in System 'F' and System ' D' in Matale and Polonnaruwa districts respectively. It is also proposed to establish an Area Center at Ambana Junction to compensate for some of the facilities which will be inundated around the Kongahawela bazaar. This center will serve the unaffected people in the Kongahawela area, in addition to the people in the neighborhood and as well as to the future migrant population to the center.
The System 'F' which will be developed under the Kaluganga Reservoir Project lies in the Laggala – Pallegama Divisional Secretary's division. Both Systems 'F' and 'D' (extension area) which will be developed for irrigated agriculture is presently under scrub jungle and comprise of marginal soils.
MASL will facilitate the integration of resettled families with the host communities in the above areas during the resettlement process.

5.1.1 System 'F'

Kalu Ganga resettlement area is located within a range of 20-35 km. away from the Moragahakanda reservoir bed (affected area). At present, a new access road is being developed between these two areas so that the distance will be reduced to 10-20 km. range. Under the Kalu Ganga Development Project, both Right Bank (RB) and Left Bank (LB) will be developed for agriculture and water will be provided during two seasons. The gross area of System "F" is 139 Sq. km. and of which 78 Sq. km. have been identified as potential land area for development. Presently an extent of 16 Sq. km. is partially developed and therefore an extent of 62 Sq.km. is available for development. The balance area consists of part of Wasgamuwa National Park & Medaulpotha Forest Reserve.

At present, a population of 6573 persons live in this area which consists of 51% Male and 49% Female, who are mostly depending on rain-fed agriculture and chena cultivation.

5.1.2 Social Facilities to be developed in System 'F'

The Left Bank (LB) of System 'F' will be developed for allocation to the APS of Moragahakanda where one Area Centre and two Village Centres will be established. 1630 numbers of 0.6 ha. Irrigable allotments and 1935 number of homesteads of 0.2 ha. are available. The above two village centres and the Area centre will be developed with all necessary infrastructure facilities as given below:

A. Social Infrastructure

i) Village Centre

- Unit Manager's office, Quarters with Unit service centre
- Sub Post office with Quarters
- Junior secondary school (type 02) with quarters
- Gramodhaya Health centre with Quarters
- Corporative and retail shops
- Small bazaar
- area for small scale industrial activities
- Public play ground with recreation facilities
- Domestic Water supply (public well for villagers and water supply scheme for the central facilitated area
- Electricity supply scheme
- Motorble village road for every house
- Main roads for linking other villages and urban area
- Public Cemetery
- Religious places
- Pasture and firewood area.

ii) Area Center

- Block manager's office complex, quarters with training facilities
- Unit service centre With office, Quarters
- Sub Post office with Quarters
- Senior secondary school (type 1-C) complex with quarters
- Central Dispensary with maternity ward and quarters
- Corporative retail shop with rural bank
- Shops, bazaar with weekly pola ground
- Agro based industrial area
- Large play ground with recreation facilities
- Domestic Water supply (public well for villagers and water supply scheme for central facilitated area)
- Electricity supply scheme
- Motorble village road for every house
- Main roads for linking other regional centers and villages.
- Urban housing area.
- Public Cemetery
- Religious place
- Pasture and firewood area.

iii) Town Center *

- Administrative Complex with Unit Service Centre with Quarters for U.M
- Divisional Secretariat Office Complex with quarters
- Pradasiya Saba Office Complex with library building
- Agrarian Services Center Complex with quarters

- Regional Forest Office Complex with quarters
- Survey Department Divisional Office Complex with quarters
- Ceylon Electricity Board Office Complex with quarters
- Senior Secondary School (with Primary Section) (Type 1B) with quarters
- District Hospital with Operation Theater for Minor surgery with quarters.
- Gramodaya Health Center with quarters
- Medical Office for Health Complex with quarters
- Ayurvedic Central Dispensary Complex with quarters
- Veterinary Sergeants office Complex with quarters
- Post Office with quarters
- Peoples Bank Complex with quarters
- Samurdhi Bank Complex with quarters
- Kandurata Development Bank Complex with quarters
- Sri Lanka Telecom Office Complex with quarters
- Co-operative Retail shop with Rural Bank
- Market with Pola Ground
- Transport Complexes with C.T.B. Sub Depot
- Police Station with quarters
- Magistrate Court
- Large play ground with recreational facilities
- Domestic Water supply (public wells for villagers and water supply scheme for central facilitated area)
- Electricity supply scheme
- Public Cemetery
- Religious place

** This facility will be common to both Moragahakanda & Kaluganga resettlers.*

5.1.3 Irrigation Infrastructure to be Prepared in System 'F'

- Provision of separate outlets for every irrigated agricultural plot.
- Provision of irrigated water during both seasons after the construction of Kaluganga reservoir
- Construction of cascade system to capture the rain water in the region for the agricultural purposes, until the Kalu Ganga Reservoir will be in operation. The small village tanks will supplement irrigation demand mostly during dry season.
- Construction of at least one minor tank per village for agricultural and domestic purposes.

5.1.4 Socio-economic Statistics of the Host Community of System 'F'

80% of the APS are proposed to be resettled in Left Bank area of Kalu Ganga. The area consists of 139 sq.km of land and 1894 no of resident families. This situation indicates there is a low population density in this area i.e. about 14 families/sq.km. when, compared with the population densities in other Mahaweli regions, which is close to 35 families per sq.km. In this background there is a considerable potential to resettle new families in this area.

(1) Population

Table 5.1 - Present Households in system 'F'

Location	surrounding Area		Resettlement Area		Total
	LB	RB	LB	RB	
LB	1300		357	-	1657
RB	-	180	-	-	180
Elephant Corridor	57	-	-	-	57
Total	1357	180	357	-	1894

Table 5.2 - Total Population by Gender & Location

Location	Female		Male		Total	
	No.	%	No.	%	No.	%
Left Bank of Kaluganga	2814	87.47	2934	87.43	5748	87.45
Right Bank of Kaluganga	306	9.51	316	9.42	622	9.46
Elephant Corridor	97	3.02	106	3.16	203	3.09
Total	3217	100.00	3356	100.00	6573	100.00

Figure 5.1 Total Population by Gender & Location

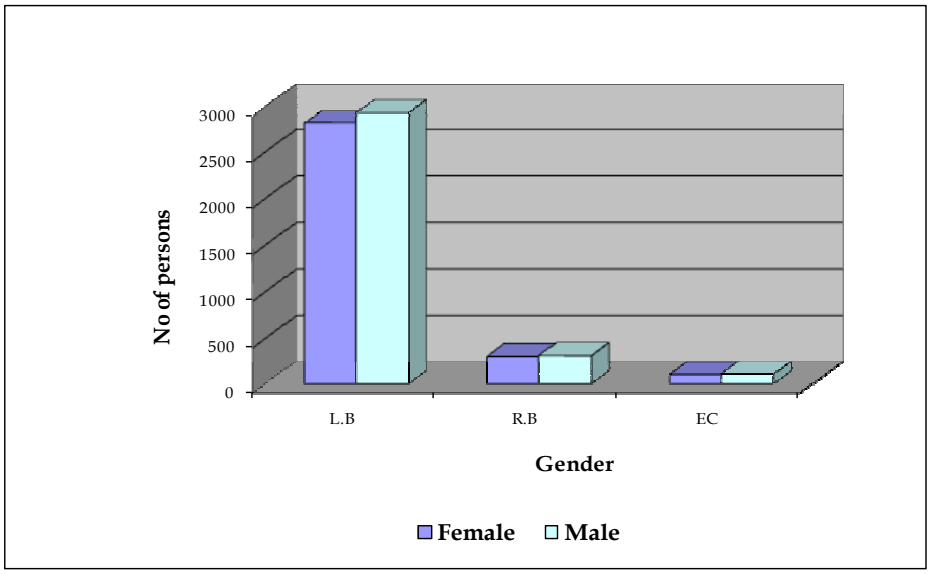
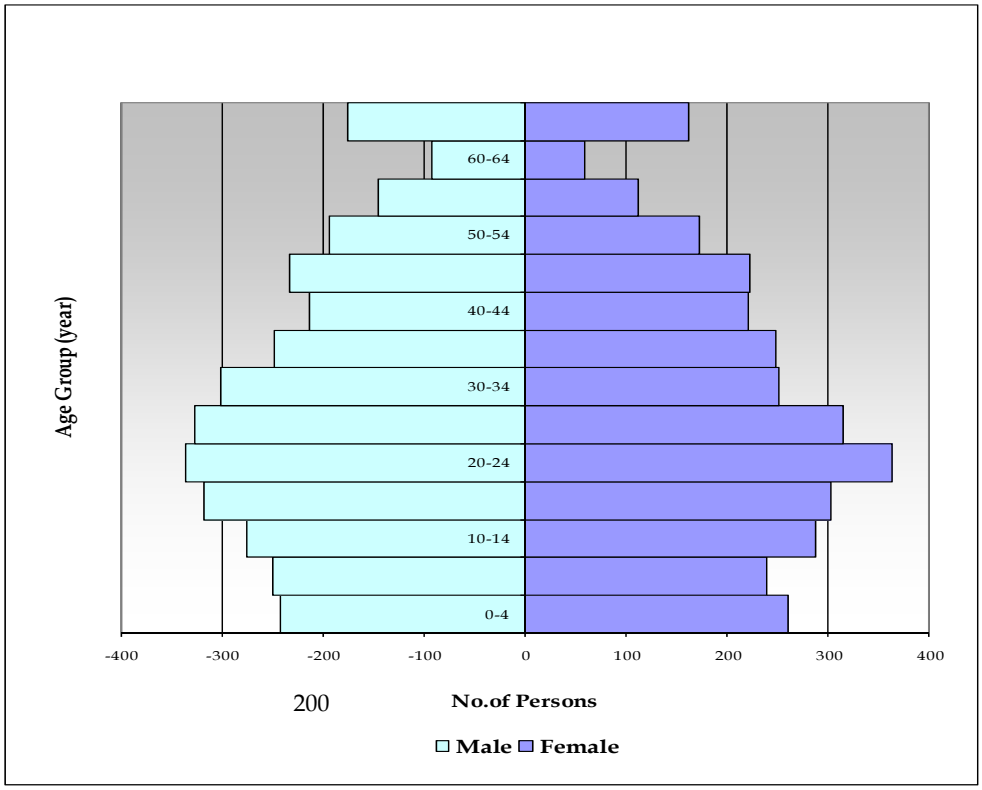


Table 5.3 - Population by Age group & Gender

Age group (Year)	No. of persons		Total	
	Female	Male	No.	%
0-4	260	243	503	7.65
5-9	239	250	489	7.44
10-14	288	275	563	8.57
15-19	303	318	621	9.45
20-24	364	337	701	10.66
25-29	315	327	642	9.77
30-34	251	302	553	8.41
35-39	248	249	497	7.56
40-44	221	214	435	6.62
45-49	223	233	456	6.94
50-54	172	194	366	5.57
55-59	112	145	257	3.91
60-64	59	93	152	2.31
above 65	162	176	338	5.14
Total	3217	3356	6573	100.00

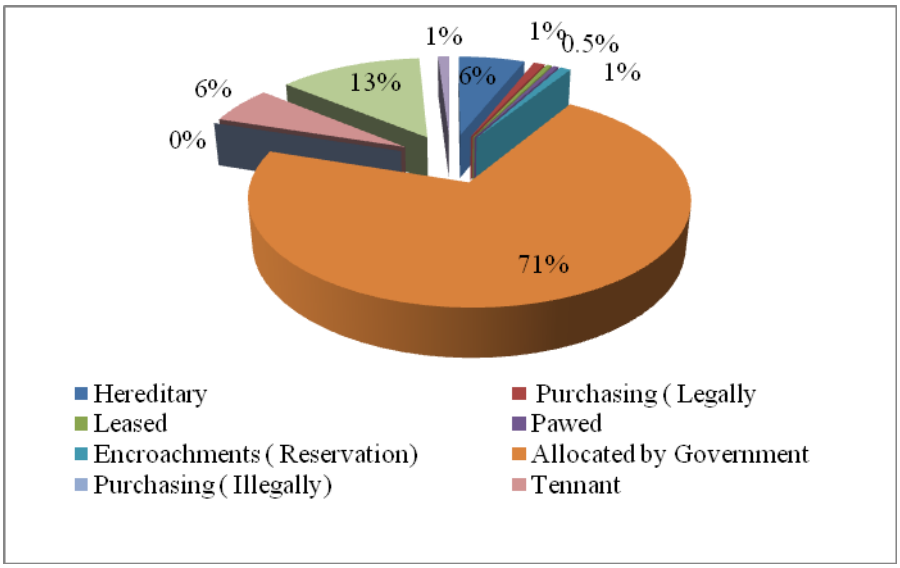
Figure 5.2.- Population Pyramid



(2) Tenure Ship

The distribution of tenure ship of developed lands is 6% private ownerships, 71% on LDO permits and balance 23% occupied without any legal rights. This situation reflects that there were no inherited settlements and there is a great potential for development.

***Figure 5.3* - Tenure Ship**



(3) Present Land Use Pattern

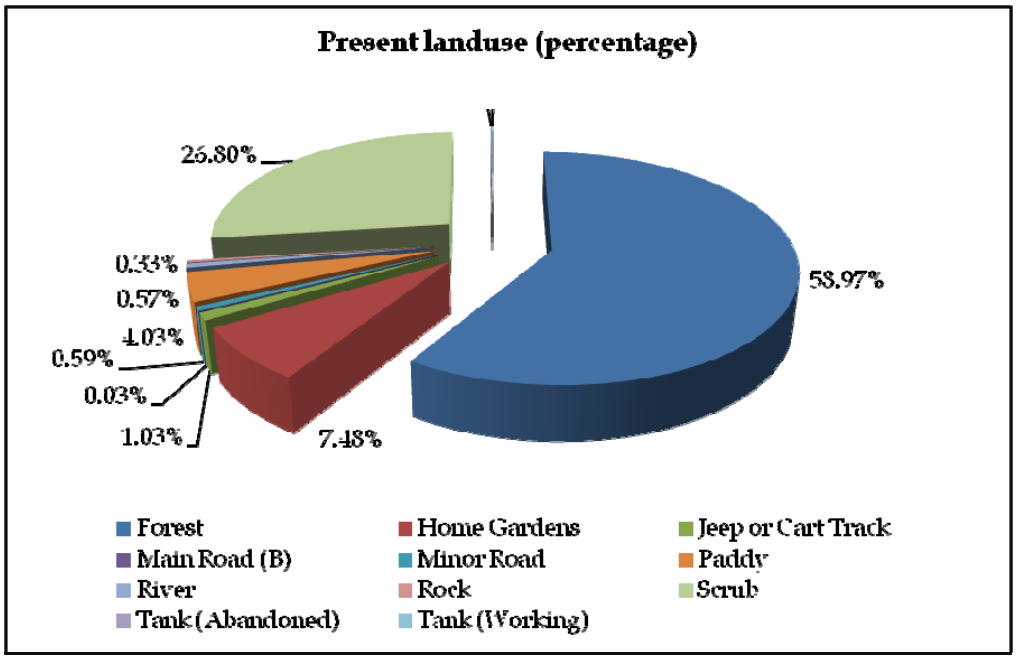
According to the data available, 13900 ha of total land of the proposed resettlement area, only 1486 ha of land are occupied and the present land use pattern is as follows.

Table 5.4 - Existing Land use Pattern

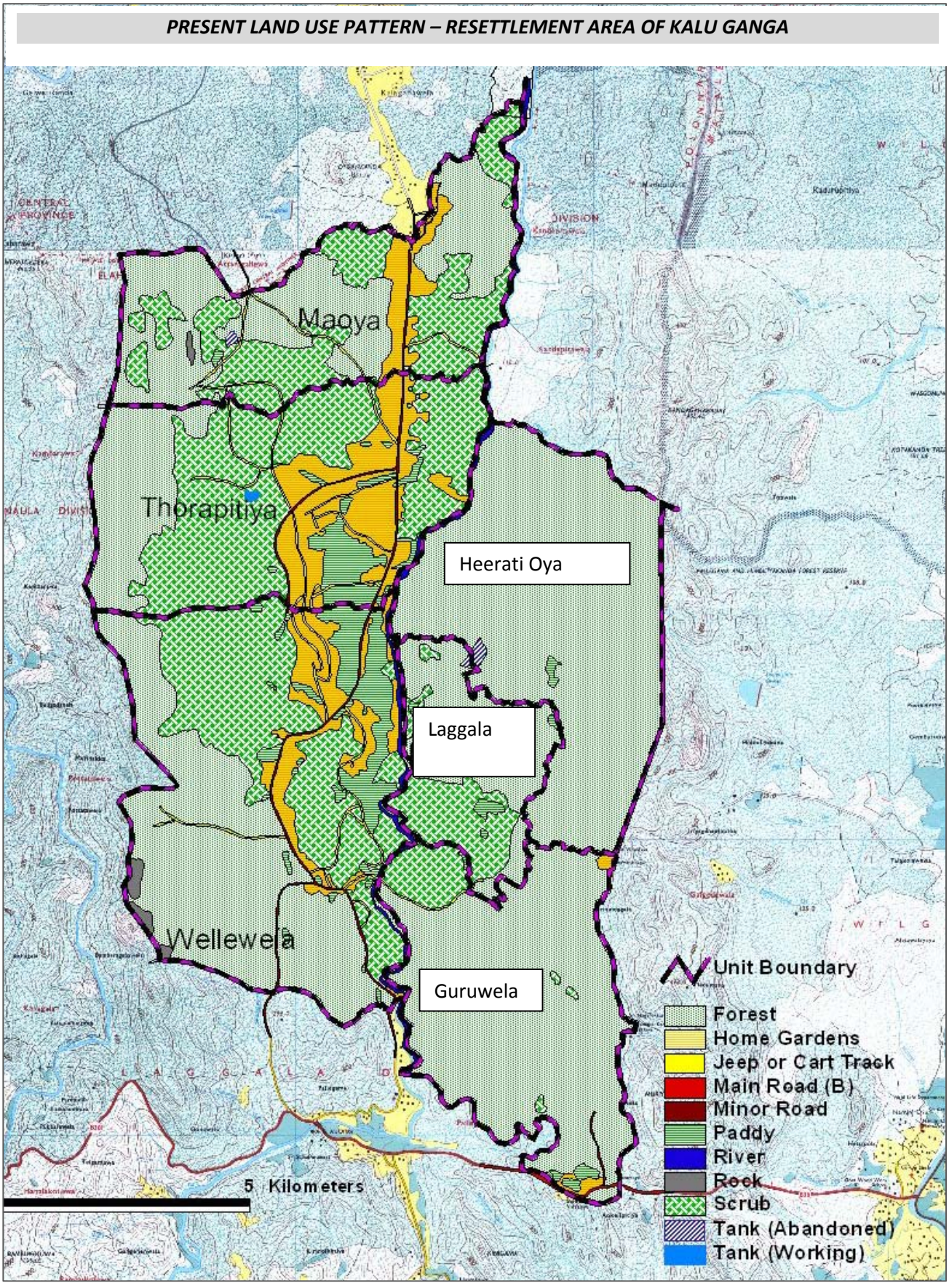
Land use Description	Land Extent (ha)					
	LB		RB		Total	
	No.	%	No.	%	No.	%
Forest	4041.9	29.08	5229.23	37.62	9271.13	66.70
Home Gardens	823.08	5.92	21.04	0.15	844.12	6.07
Jeep or Cart Track	109.54	0.79	6.64	0.05	116.18	0.84
Main Road (B)	0	0.00	3.89	0.03	3.89	0.03
Minor Road	62.6	0.45	3.84	0.03	66.44	0.48
Paddy	409.48	2.95	45.15	0.32	454.63	3.27
River	43.39	0.31	21.39	0.15	64.78	0.47
Rock	37	0.27	0	0.00	37	0.27
Scrub	2651.01	19.07	372.48	2.68	3023.49	21.75
Tank (Abandoned)	3.79	0.03	11.28	0.08	15.07	0.11
Tank (Working)	3.27	0.02	0	0.00	3.27	0.02

Total Extent	8185.06	58.89	5714.94	41.11	13900	100.00

Figure 5.4- Existing Land use Pattern



Map No. 01 Existing land use pattern of resettlement area of system "F"



5.1.5 Socio-economic Statistics of the Host Community in Kaudulla LB extension area (surrounding host community of the proposed Moragahakanda Resettlement Area

Kaudulla LB extension area in System 'D' which was the originally proposed resettlement area for Moragahakanda APS is located in Medirigiriya Divisional Secretary's division of Polonnaruwa district. This area is to be irrigated off Kaudulla tank. The distance from Moragahakanda to System 'D' is around 60 km. The project area covers 07 GN divisions and its population is 3601 of which, 52% Male and 48% Female. Their major occupation is agriculture, and mostly the youths are employed in the Civil Security Force. 71% of the developed lands are occupied by the permit holders whereas private ownership of the land is below 10%. The social, cultural and economic backgrounds of the host community and the Moragahakanda APS are very much similar, even though the environmental conditions in both places slightly differ, the host area being in the dry zone & the Moragahakanda project area being in the intermediate zone. However it is anticipated that integration of both communities would not be much difficult as there are several similarities common to both communities. Considering the fact that the host community too were living in this area for a considerable period of time they too will be provided with the facilities enjoyed by the APS of Moragahakanda at the new settlements.

Out of the APS of Moragahakanda, 302 HH have opted to resettle in System 'D'. The villages of Nabada wewa, Daham wewa & Bandara wewa each having Village Centers covering the infrastructure facilities given in 5.1.2.(A).I will be provided. In addition the pipe borne water supply facility will be extended to cover the entire resettlement area. An Area Centre at Bisopura with facilities in 5.1.2.(A).II will be established to service the entire resettlement area. The existing Medirigiriya Town would provide other additional facilities such as higher education, postal, health and security and banking facilities.

As for the surface water supply to the resettlement area of System D1, currently the construction of surface water treatment plant of Medirigiriya Water Supply Scheme is on-going. The estimated budget is Rs. 181,104,000 in accordance with the brief report prepared by National Water Supply and Drainage Board, Anuradhapura. The construction of this facility is expected to be completed in year 2013. The target service area is the present developed areas in the Kaudulla Scheme, mainly Medirigirya town & its suburbs. In addition it covers the Kaudulla LB extension area such as Bisopura Area center with the settlement area & Nabadawewa, Dahamwewa, Bandarawewa villages.

Out of the total land area of 917 ha and 2072 ha. for homesteads and farmsteads , 3350 nos of homestead allotments and 2680 nos of farmstead allotments respectively will be available for resettlement. The 03 numbers of village centres and one area centre will be established in this area. Though APS opted to resettle in System 'D' expecting a larger extent of agricultural land, it was not possible due to the scarcity of land even in system "D" and hence the larger extent of land will not be allocated there. Instead an ex-gratia cash payment of Rs.50,000/= per each household who will be made for those who opted to resettle in System 'D'.

(1) Demographic Data

Table 5.5 - Total Population by Gender & GN Division

GN Division	Female		Male		Total	
	No	%	No	%	No	%
Ekamuthugama	65	3.76	67	3.58	132	3.67
Jayathugama	343	19.84	345	18.43	688	19.11
Kauduluwewa	159	9.20	188	10.04	347	9.64
Meegaswewa	56	3.24	64	3.42	120	3.33
Wadigawewa	451	26.08	490	26.18	941	26.13
Wedikkachchiya	648	37.48	708	37.82	1356	37.66
Etambaoya	7	0.40	10	0.53	17	0.47
Total	1729	100.00	1872	100.00	3601	100.00
%	48.01		51.99		100	

Figure 5.5- Total Population by Gender & GN Division

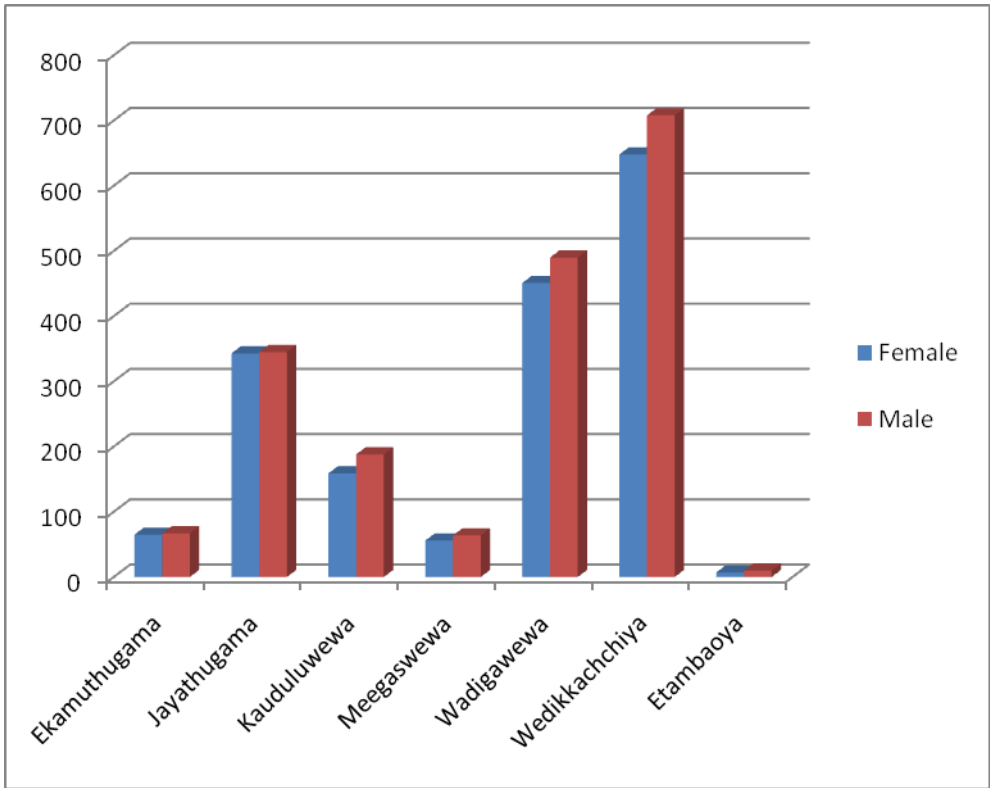
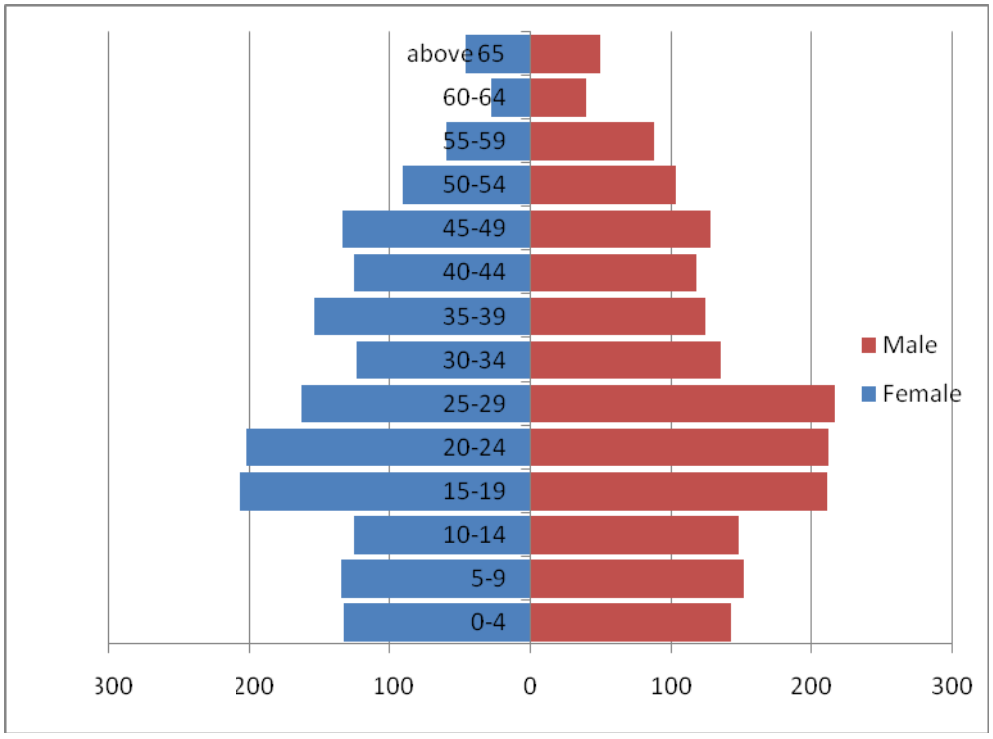


Table 5.6 - Population by Age group & Gender

Age group (Year)	No. of persons		Total No. of Persons	%
	Female	Male		
0-4	133	143	276	7.66
5-9	135	152	287	7.97
10-14	126	148	274	7.61
15-19	207	211	418	11.61
20-24	202	212	414	11.50
25-29	163	217	380	10.55
30-34	124	136	260	7.22
35-39	154	125	279	7.75
40-44	126	118	244	6.78
45-49	134	128	262	7.28
50-54	91	104	195	5.42
55-59	60	88	148	4.11
60-64	28	40	68	1.89
above 65	46	50	96	2.67
Total	1729	1872	3601	100.00

Figure 5.6- Population by Age group & Gender

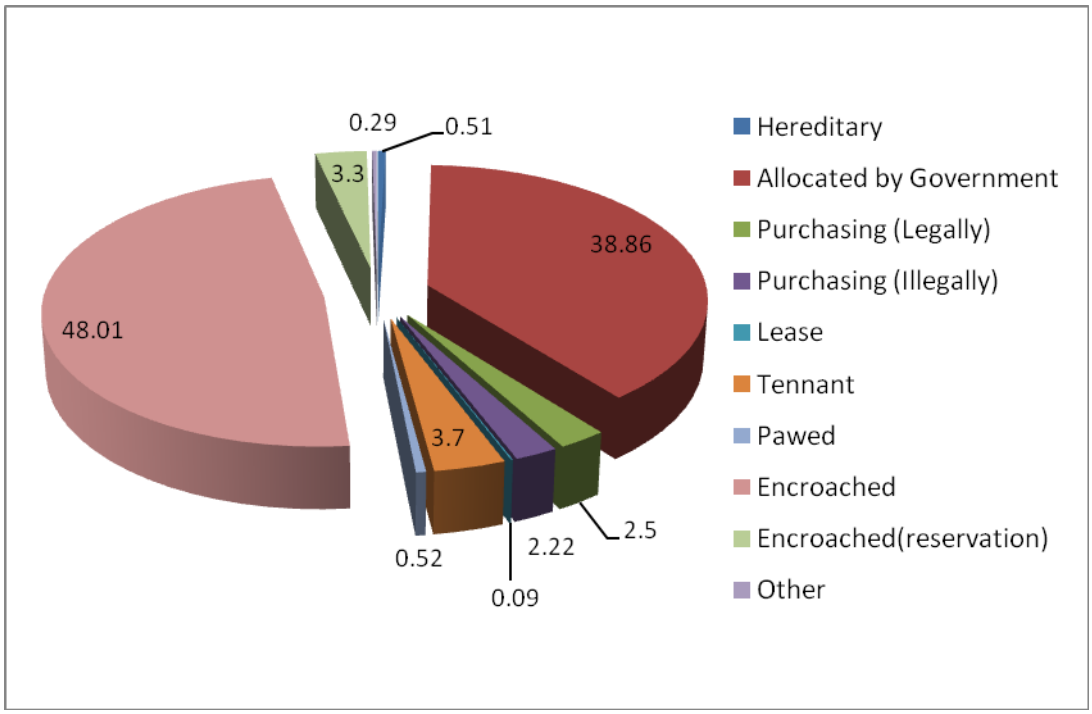


(2) Tenure Ship

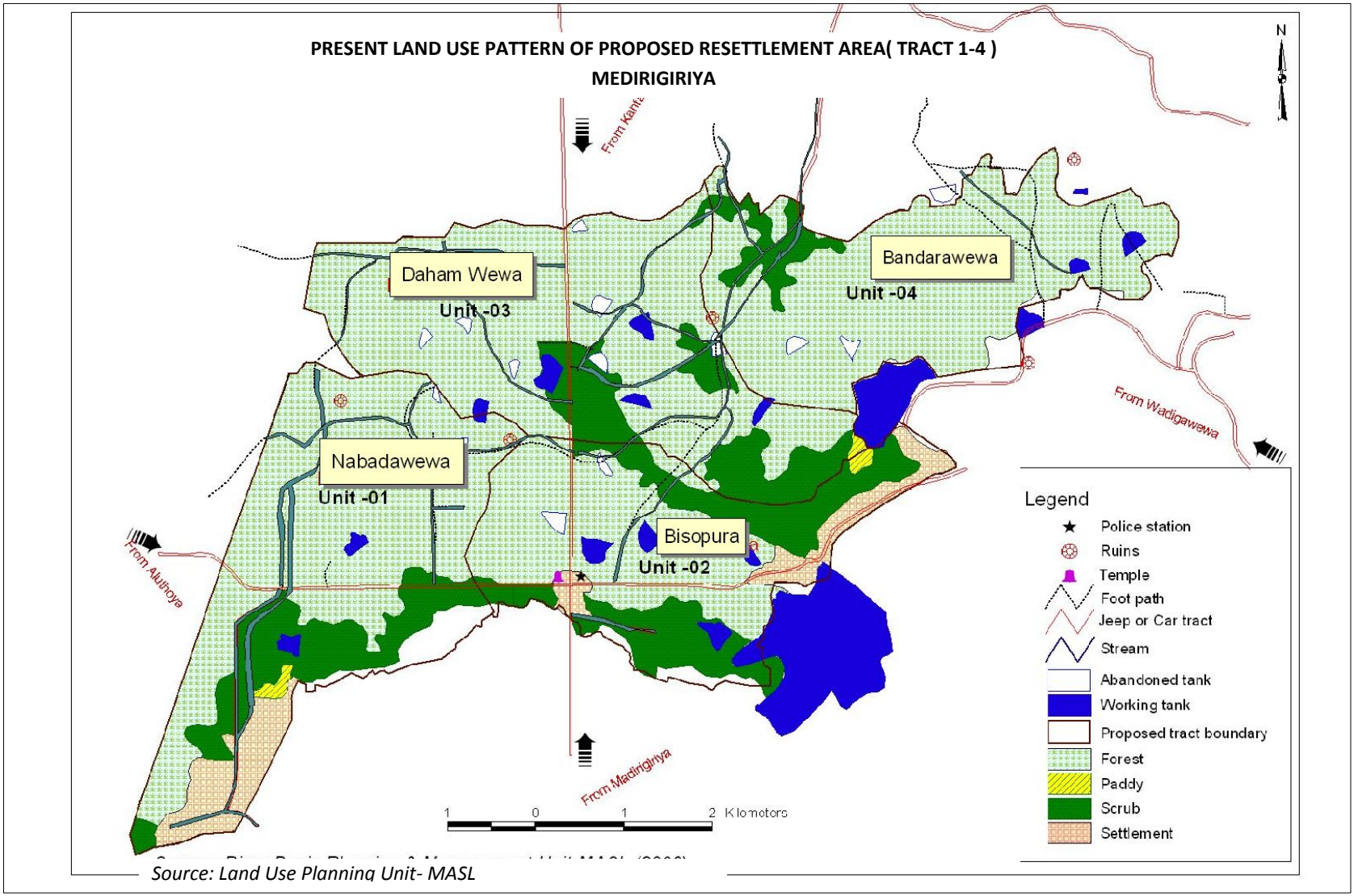
Table 5.7 - Developed Land Extent by Ownership of Land

Ownership	Irrigable		Highland		Total		
	No. of lots	Extent (Acres)	No. of lots	Extent (Acres)	No. of lots	Extent (Acres)	%
Hereditary	5	8	3	2.76	8	10.76	0.51
Allocated by Government	203	369.83	480	451.14	683	820.97	38.86
Purchasing (Legally)	11	20	29	32.75	40	52.75	2.50
Purchasing (Illegally)	12	21.55	28	25.25	40	46.8	2.22
Lease	1	2	0	0	1	2	0.09
Tennant	58	78.25	0	0	58	78.25	3.70
Pawed	6	5.5	5	5.51	11	11.01	0.52
Encroached	276	530.25	467	483.93	743	1014.18	48.01
Encroached (reservation	24	32	37	37.75	61	69.75	3.30
Other	1	1.5	5	4.63	6	6.13	0.29
Total	597	1068.88	1054	1043.72	1651	2112.6	100.00
%		50.60		49.40		100.00	

Figure 5.7- Developed Land Extent by Ownership of Land



3) Map no 02: Existing Land Use Pattern



Source: Land Use Planning Unit- MASL

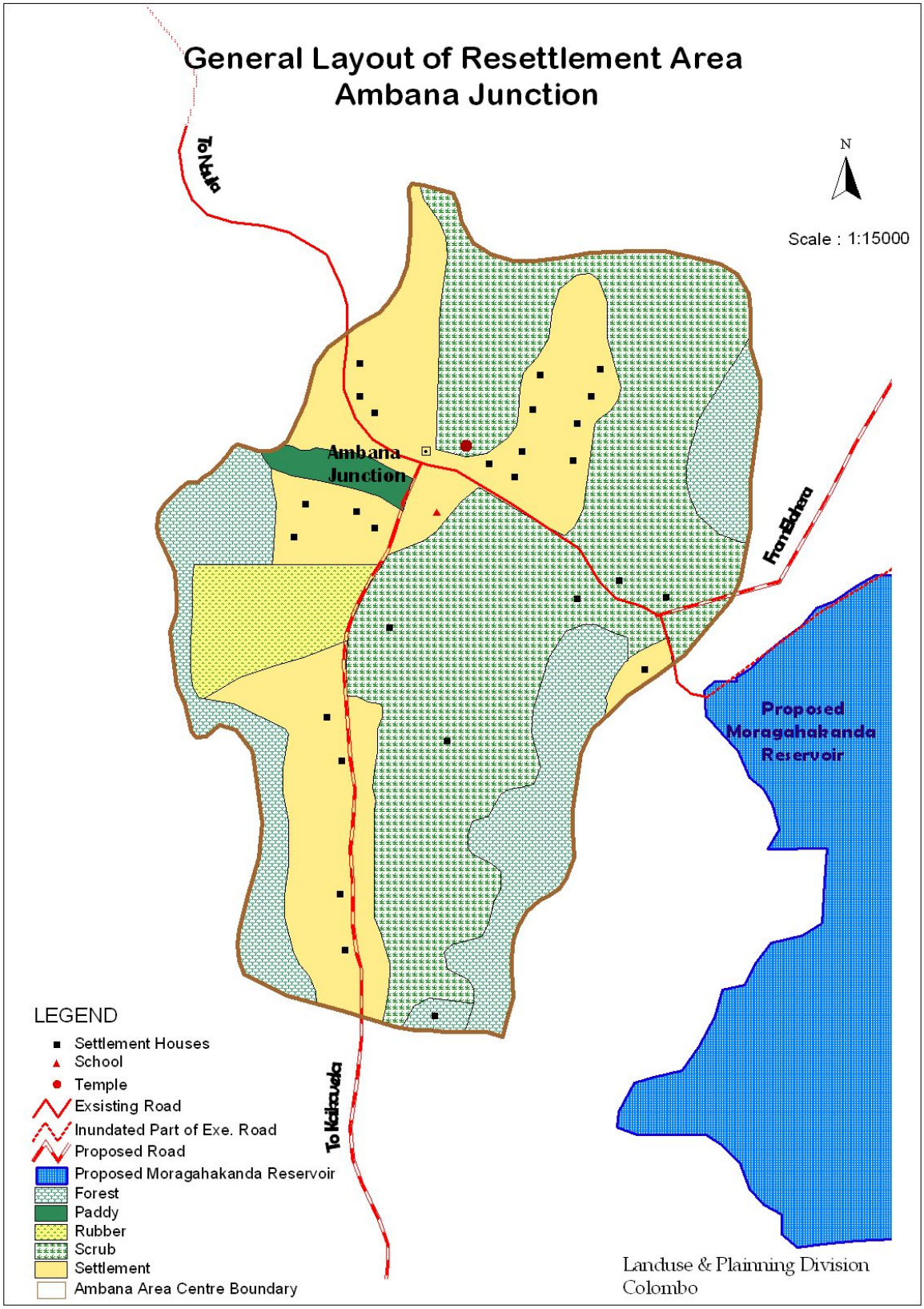
5.1.6 RESETTLEMENT AREA AT AMBANA JUNCTION

It has been proposed to establish an Area Centre at Ambana Junction which is close to the Project for relocation of few Public Institutions which will be affected. Ambana is located at 2 km. towards Naula from Kongahawela Bazzar which is going under water. Naula – Elahera road deviation begins in between Kongahawela and Ambana. This proposed Area Centre would be beneficial for the unaffected people living in the periphery of the reservoir. There exists a small bazaar at Ambana Junction at present where there is a potential for upgrading as a Service Center. An extent of 120 ha. of land has been identified for the establishment of this Service Center as an Area Centre.

The commercial allotments will be provided to the APS who opted to re-establish their ventures at this centre as well as for other entrepreneurs who request commercial allotments for new ventures. Provision also will be made for an Urban Housing Area for Government and Semi Government employees at this location. It is expected that the Moragahakanda Reservoir would produce 3000 metric tons of inland fishery annually hence provision of land will have to be made for a fishing village as well as a market place for the fishing industry. It has been ascertained that this location would have a much potential to develop as a sub collecting center to cater to Dambulla Main Collecting Center because of the fact that present collecting activities are concentrated at Kongahawela bazaar which goes under water. As such the Ambana Area Center would be very much beneficial to the people living in the neighborhood.

On the above basis Ambana Area Center will accommodate an Inland fishery village for 300 families, residential sites for government & semi government officials numbering 175 & 25 for businessmen. The size of residential plot is 20 perches. In addition there will be 10 nos of 0.8 ha highland agriculture lots and 25 nos of 06 perches commercial allotments available for future distribution.

Map No : 03 Present Land Use Pattern of Ambana Junction



5.2 Requirements and choice for relocation of housing and other structures

According to the Socio Economic Survey conducted by MASL in year 2008, 1581 Households will have to be relocated from the reservoir bed area, road deviation, elephant corridor, system "D" branch channel and partly affected families together with 71 Commercial Establishments, 21 Combined Residences and Commercial Establishments which are under private ownership whereas a total no of 20 structures belonging to government & public institutions comprising 03 Schools, 03 Pre-schools, 02 Banks, 01 Agrarian Service Centre, 01 Regional Hospital, 03 Sub-Post Offices, 05 Temples, 01 Public Library and 01 Community Hall .

Table 5.8 - Details of Residential and commercial structures to be relocated.

Type Households	Tank bed Area	Road deviation	System "D" proposed Branch Channel	Partly affected families	Elephant Corridor	**Grand Total**
Homesteads	1364	09	09	142	57	**1581**
Commercial Establishments	67	--	--	--	04	**71**
Combined residential & Commercial Establishments	**21**	**--**	**--**	**--**	**--**	**21**
Total H.H Affected	**1452**	**09**	**09**	**142**	**61**	**1673**

Note: inclusive all affected families of Tank Bed area, Elephant Corridor, Road Deviation, Partly affected & branch channel trace of Kaudulla LB extension area in Homesteads, Commercial establishments and Combined residential & Commercial Establishments

5.2.1 Reasons based for Selection of alternate resettlement areas by affected HH

The reasons based for Selection of alternate resettlement areas by affected Households and the nos opted to each resettlement area were as follows:

i) System 'F' _- 1267 nos of families

- Close proximity to the present villages
- Maintenance of kinship ties with their relatives
- Possibility to look after the remaining lands in the vicinity of the reservoir
- Safety of the area*

ii) System 'D'- 302 nos of families

- In anticipation of larger extent of land or an ex-gratia payment
- Possibility to obtain lands for their future generations

iii) Ambana -3 nos of families

- Close proximity to the present villages
- Maintenance of kinship ties with their relatives
- Possibility to look after the remaining lands in the vicinity of the reservoir
- Safety of the area*

* Considering security conditions prevailed prior to May 2009.

5.2.2 Availability of Land

The number of farmstead and homestead available in System 'F' are 3452 and 4152 respectively. After resettling of 1267 HH,an additional 2185 allotments will be available for Kaluganga reservoir bed evacuees, host community and settlement of landless people in the adjoining areas *(Refer Map No 5)*. Similarly there are 3350 nos of homesteads and 2680 nos of farmsteads in System 'D' where 302 HH who opted to System 'D' could be easily accommodated *(Refer Map No 6)*. Even at Ambana Area Center, there is a plenty of homesteads and 3 nos of HH opted to Ambana Junction could be accommodated.

Table 5.9 - Availability of land and proposed infrastructure facilities in the resettlement areas.

	System 'F'(Kaluganga) No. of Lots	**System 'D' No. of Lots**	**Ambana Junction No. of Lots**
1. Homestead	4556	3350	500**
2. Agricultural Land	3452	2680	10
3. Commercial Establishments	262	156	15
4. Temples	04	01	--
5. Common facilities	One Town center (for both Moragahakanda & Kaluganga resettlers) One Block center, two VCs for Moragahakanda affected people & One Block center, one VC for Kaluganga resettlers	One Area Center & 3 Village Centers.	One Area Center facilitated with health & other services.

***This homestead are reserved for fisheries village, officers' housing area and affected families*

Table 5.10 - Distribution of Affected Households in New Settlement Areas.

Settlement Area	**Homesteads**	**Commercial Establishments**
1. System 'F'	1267	81
2. System 'D'	311*	09
3. Ambana	03	02
TOTAL	**1581**	**92**

**- Number includes 09 affected HH from the Branch Channel trace in Kaudulla Extension Area.*

Table 5.11 - Availability of Resettlement sites

Sys. & Zone	Management Block	Unit / Category of Service Center.	Homesteads		Farmsteads		Commercial Sites
			No of Lots	Extent (ha)	No of Lots	Extent (ha)	No. of lots
Sys. 'F' LB	Wellawela	Wellewela BC	495	99	412	247.2	17
		Torapitiya VC	797	159.4	664	398.4	23
		Ma Oya VC	581	116.2	554	332.4	13
		Sub Total	1873	374.6	1630	978	53
Sys.'F' RB	New Laggala	New Laggala TC	1032	206.4	516	309.6	157
		Guruwela BC	709	141.8	591	354.6	24
		Heenati Oya VC	942	188.4	785	471	28
		Sub Total	2683	536.6	1892	1135.2	209
		TOTAL	4556	911.2	3522	2113.2	262
Sys.'D'	New Area	Bisopura AC	1240	248	704	422	156
	Centre	Nebada Wewa VC	1005	201	586	351	
		Daham Wewa VC	536	107	736	441	68
		Bandara wewa VC	570	114	654	394	
		TOTAL	3351	670	2680	1608	224
Ambana	Area Centre		500	120	9	7	25

5.3 Resettlement of affected host community in Kaudulla LB Extension Area

The resettlement of Moragahakanda APS will be confined to 4 GN divisions only in the 1st stage, where there is an existing population of 2333 in 597 nos of main families and 31 sub-families whose main occupation is agriculture. They are occupying a total extent of 1200 acres of state land. Under the new Re-settlement and Settlement Development Programme in Kaudulla LB Extension Area, one Area Centre and 3 Village Centres have been planned, where the total extent will be 1017 ha. of irrigable and 1550 ha. of highland , which will accommodate 311 affected HH from Moragahakanda Project as well as the host families. In addition 224 nos of commercial lots are available.

Dahamwewa village centre would be the most suitable area for resettlement of 311 affected HH of Moragahakanda Project as there is no single host family in this unit. As per the structure plan, 420.6 ha. of irrigable lands are available which will be 701 farmsteads allotments. A total extent of 245 ha. of highland is available in this unit where total there is provision for 578 homesteads allotments equivalent to an land area of 157 ha. There is no Private or Paraveni or leased land and all are state lands in this area. As there are no pervious occupants, no acquisition of land will be involved in this unit. Accordingly, there are 267 Homesteads (53 ha.) and 390 Farmsteads (234 ha.) available for settlement of landless families after resettling Moragahakanda APS and those who displaced from branch channel trace numbering 311 families.

Table–5.12 – Land availability for Re-settlement at Dahamwewa Village – Kaudulla LB Extension Area

Land Requirement (No .of Affected HH)	Availability				Surplus			
	Homesteads		Farmsteads		Homesteads		Farmsteads	
	No. of Lots	Extent ha.	No. of Lots	Extent ha.	No. of Lots	Extent ha.	No. of Lots	ha.
311	578	245	701	420.6	267	53	390	234

5.3.1 Area Centres and Village Centres of Kaudulla LB Extension Area

The Bisopura Area Centre will service the Kaudulla LB Extension Area comprising four Villages Bisopura, Dahamwewa, Nabadawewa & Bandarawewa.
The infrastructure facilities that will be provided at the Area & Village centers are given in sub section 5.1.5.

5.4. Resettlement Program for affected HH of Moragahakanda in System 'F'

System 'F' comprises of two areas namely Right and Left Banks of Kalu Ganga reservoir. The Right Bank is earmarked for the resettlement of the affected HH of Kalu Ganga reservoir who has requested these lands claiming that those areas were their ancestral places. Therefore, Moragahakanda affected HH were offered Left Bank of System "F" which they accepted readily. This area will be developed as 3 villages comprising one Block Centre at Wellewela and two Village Centres at, Thorapitiya & Ma Oya respectively. The total extent of LB area is 1506 ha. with 978 ha. of irrigable land and 528 ha. of highland.

According to the Socio-economic survey in 2007, total number of families already settled in System 'F' (Right and Left Banks) is 1669. The distribution is given below:

i)	Right Bank	-	180	families
ii)	Left Bank	-		
	* Haththota Amuna	-	914	"
	* Kandapitawela	-	160	"
	* Elephant Corridor	-	57	"
	* Host families	-	358	"
	Total	**-**	**1669**	**"**
		=====		

914 families settled in Haththota Amuna Irrigation scheme will not be disturbed by the Project. Also 160 families settled in Kandapitawela will not be disturbed. However, they will be provided with enhanced supply of irrigation water for cultivation during both seasons.
57 families of Elephant Corridor have been included into the Moragahakanda RIP and also 358 host families have to be accounted in the RIP. The number of affected HH to be resettled in this area will be 1267. The available land area for resettlement of 1267 families is shown in Table 5.14

Table – 5.14 – Allocation & Availability of Lands in Left Bank of System 'F'

Category of land allottees	Land Requirement (No of families)	Availability	
		Homestead	Irrigable
Moragahakanda APS	1267	1267	1267
Affected Host Families	358	358	358
Surplus allotments for future allocation	-	**310**	**5**
Total	**1625**	**1935**	**1630**

358 nos of families in the host area will be affected by the resettlement of affected families in Moragahakanda tank bed. Therefore, the land that occupied & cultivated by these families have to be taken into consideration in the land acquisition process. According to the socio economic survey of 2007, the extents of land in these areas are 75 ha. of highland and 65 ha. of paddy land. The types of ownership of these lands are mostly Government leased and few are under the private ownership. It is proposed that the land and structures (Houses and other buildings) located in the highlands will not be acquired as they could be re-allocated among the same families. As a result compensation payment will not arise in these cases. There also may be cases where parts of certain highland areas fallen in to the other uses according to the new development plan. For such lands acquisition process will be followed. In general, all paddy land will subject to the acquisition process as these lands will automatically be converted irrigable lands. . As far as possible it is planned to maintain the original Tennureship during the re- allocation process too. This will minimize the adverse impacts on the host families. Those who will not be subjected to the resettlement process are not entitled to the housing, latrine and shifting allowances. However the training & agricultural extension facilities will be common to all families.

5.5 Provision of Public Utilities in Resettlement Area.

The public utilizes such as water, electricity and telecommunication will be provided in the resettlement areas which were enjoyed in the original villages.

5.6 Relocation of Public Institutions and Religious Institutes

5.6.1 Severely affected schools

Elagamuwa Maha Vidyalaya primary school and Kambarawa Junior School will be fully affected by the Project. The affected total student population will be resettled with their families in the resettlement areas, and those facilities will be newly provided.

5.6.2 Regional Hospital at Kongahawela

This Hospital will be affected which serves the affected families and families living outside the Project. Therefore, this hospital will be relocated at Ambana Area Centre with upgraded facilities.

5.6.3 Agrarian Service Centre at Kongahawela

The present Agrarian Service Center will be affected and it will be re-established at Ambana Area Centre with same facilities. The isolated families can make use of this Agrarian Service Centre.

5.6.4 Pre-School at Kongahawela

The present Pre-school at Kongahawela will be affected and it will be re-established at Ambana Area Centre with existing facilities.

5.6.5 Public Utilities within 100 m. Buffer Zone

There exists 01 no Sub-Post Office, 01 no Public Library and 01 no Samurdhi Bank located within 100 m Buffer Zone outside the HFL. Around 75% of the people who obtained services from these institutions, will be affected and resettled in new settlement areas. Hence, services of these Institutions are to be continued for balance population with new access roads.

5.6.6 Relocation of Religious Places

05 nos Temples will be relocated to the resettlement areas together with the affected associated villagers. The temples are managed by the Nayaka Thero in associated with the "Dayaka Sabha" (subscribing committee) of the temple represented by the villagers. Therefore when offering lands for the temples in resettlement areas the ownership will be transferred to the Dayaka Sabha. The financial assistance will be provided for the re-establishment of one resident building for the priests for each temple by the project. The compensation for the acquired properties of the temple will be paid at the replacement value for structures and market value for the land and trees to the Public Trustee. The Public Trustee will release funds to the Temples as and when necessary. The project will monitor the construction activities of the temples with the in liaison with the Public Trustee. An extent of 0.8 ha. of highland(minimum) will be provided in 0.8 ha. Village Centres for the re-establishment of Temple and 01 farmstead will be allocated for a Temple where a paddy land of 0.8 ha. or below or no paddy land has been acquired and 02 farmsteads will be allocated for a Temple if the acquired paddy land is more than 0.8 ha.

5.7 Culture & Religion

1571 nos of HH belong to the Sinhala community whose religion is Buddhism. They are practicing Buddhist culture inherited from their ancestors. The village temples are located at each village where these APS used to practice their religious activities. The way of life of villagers is that they look after the temples and priests by way of giving necessary assistance such as Alms and construction of religious buildings.
The priests give them leadership in addition to the religious rituals. These practices and the way of life should be continued at the re-settlement areas where the basic infrastructure will be provided by the project. Traditionally, people are linked with the religion for all their activities of day to day life. This system prevails and respected by the state. Generally, in Sri Lanka, Buddhist priests take a lead role on behalf of the community when they are faced with difficulties. In the case of this project, the Buddhist priests have not opposed, but they were very supportive. The 'Sthupas' lie in the tank-bed area will not be demolished when evacuating the people as those are enshrined with sacred relics.

One Muslim family will be affected by the Project whose religion is Islam. This family will also be provided facilities for their religious activities in the re-settlement area.

CHAPTER SIX

6. Economic Rehabilitation and Income Restoration Programmes

6.1 Necessity of the Programme

When the people are displaced from their established settings, they are generally improvised, because it has been established that cash compensation alone for the loss of property is not sufficient to restore all the income losses incurred due to involuntary displacement. To prevent these hardships, sufferings and destitution during the post-resettlement stage, all the APS in general and the poorest of the poor in particular have to be given special attention to build up their new life with better facilities at the new settlements. As such, it is necessary to start some development programs at the initial stage, especially for the landless and marginal farmers, wage earners, income losers, the disadvantaged women and elderly households (vulnerable groups). A viable and sustainable income generation programmes will be designed prior to the dislocation and will be implemented as soon as they are resettled in resettlement area. A set of development activities aimed for economic re-establishment of those vulnerable groups will be implemented until they become self-sustained. During this period they will be assisted to develop access to the means of production and new resources as relevant. In a nutshell, all affected APS will be gradually focused to receive all benefits of the development initiatives of the Moragahakanda and Kalu Ganga Development Projects.

6.2 Programme Strategy

The Programme strategy is based on the occupational background and age group of APS mainly, farmer & business community, vulnerable groups & youth. Different kind of Income Generating programmes will be designed for each of them to suit their knowhow, skills and educational level.

6.2.1 Constraints faced by APS/Implementing Agency

i) The income restoration programmes will be the main focus of economic rehabilitation of the resettled people in view of following constraints.

- Limited land resources
- Lack of organizational capacity of APS
- Lack of institutional support
- Lack of working capital
- Lack of marketing support
- Lack of opportunity for skill development

Reluctant to use new technology for agriculture practices
Lack of entrepreneurial attitude

This will be remedied by introducing a number of appropriate programs in the resettlement areas.

ii) Possible losses

Due to the acquisition process, the following income generation avenues too will be lost by the APS affecting the future livelihood.

- Perennial crops and short-term crops
- Paddy land
- Wage earnings
- Business and Industry
- Home gardens
- Animal Husbandry
- Cottage industries
- Gem, mineral and sand Mining

6.2.2 Proposals to overcome constraints & Losses

To overcome above constraints & losses, the activities under RIP will be framed in a multi-dimensional and flexible manner with the aim of achieving broader Socio-economic benefits for the target groups. The main features of this programme will be:

- Implementation of an agricultural productivity development plan
- Fulfillment of the training needs of the APS
- Development of managerial and entrepreneurial skills
- Promotion of leadership capacity
- Arrangement of lending facilities, grants and micro-finance
- Formation of farmer, women, youth etc. groups
- Provision of easy access to new technology.

6.3 Income Restoration Plan

Strategies will be planned to assist the APS to restore their income earning capacity and production levels to reach at least, the national level.

6.3.1. The following income restoration plan will be implemented to ensure that the income levels are improved or at least restored for the following categories of APS:-

- Farmers who are not resident in the project affected area, but losing their agriculture lands below 0.8 ha. Who will not be entitling to lands in the settlement area.
- Relocated small-scale Businesses and Industries
- APS below poverty line
- Women headed, elderly and disabled households

- Labourers losing skilled jobs
- Un-employed / under employed youth

6.3.2 For the implementation of above programmes, separate plans such as, Training, Agriculture Production and Productivity etc., are to be implemented. Suitable Organizational Structure is proposed in Chapter Eight.

6.3.3 Savings

The saving habits & productive investment means will be encouraged amongst APS to save in banks the surplus savings generated from individual economic schemes. The prime objective of savings is to establish their financial stability for their sustainability. The project officials will coordinate these activities with the Banks and APS. Bank Accounts will be opened for all APS to facilitate the payment of compensation.

6.4 Income Restoration Programs for Severely Affected Households.

The affected HH who will lose all their houses, home gardens, agricultural land, business premises and their income sources will be treated as severely affected HH and will be entitled to assistance to restore their livelihood to pre-project income levels or higher. The severely affected HH will receive the highest priority during the land alienation process. One person from this category of households will be entitled to skills training to improve their livelihood base.

In the case of MASL resettlement programs, the land parcels allocated to the recipients are generally, gifts as they will be paid compensation for all acquired properties (land & other developments)
The methodology adopted for distribution of lands to severely affected HH are as follows. :-

6.4.1 Allocation of Homestead and Agricultural Land

In general, the Homestead and farmstead lands will be allocated under the rules and regulations of Land Development Ordinance following the Land Kachcheri process (mechanism adopted for distribution of state lands). However for the severely affected people, the distribution of lands will not follow the Land Kachcheri process because this is linked to a compulsory evacuation programme as a result of the project. Hence this land allocation will be on a preferential basis.

6.4.2 Allocation of Commercial & Industrial Sites

Generally, the allocation of commercial and industrial sites will be allocated under the State Land Ordinance following the auctioneering process. But in this case for the reason of compulsory evacuation, commercial sites in the resettlement area will be allocated on the preferential basis.

6.4.3. Provision of assistance

It is planned to implement an Agriculture Development Plan for farmsteads & homesteads and other income generating programs with a view to enhance the economic status of the resettlers. The Agriculture Development Plan is annexed herewith and the other income generating programs are as follows:

i) Town Centres / Area Centres / Village Centres will be provided with all infrastructure facilities including the allied services.

ii) In addition to above facilities transportation, weekly fair, commercial centers, sports and other entertainment facilities will be introduced at the initial stage.

iii) Two nos of Demonstration farms with modern technology will be established in resettlement areas of Kaluganga and Kaudulla extension area.

iv) Agricultural implements will be provided to the farmer community.

v) Participatory Home Garden Development programme will be introduced by developing technical skills through training and by providing materials such as seeds of grain & pulses.(Vegetable seeds, coconut seedlings, banana saplings and other variety of fruit and timber plants.)

vi) Cottage Industries will be introduced specially for the women households. Micro financial facilities in the range of Rs.5000/= to 10,000/= will be arranged through the Revolving Fund.

vii) Hi-tech Rice Processing Industry will be established. Loans will be arranged through the Banks. (SME Schemes.)

viii) Commercial skills of farmers will be enhanced by providing training on marketing aspects, including cultivation practices and quality Processing Technologies

ix) Revolving Fund to be established for Micro-finance and short-term loan for Small Scale businesses and Cottage Industries.

x) Establishment of potential income generating activities mentioned below will be facilitated.

- Paddy Trading
- Rice Processing and Trading

- Vegetable and Cereal Trading
- Small Cottage Industry Trading
- Trading of Milk and Eggs
- Bee-keeping
- Inland Fishery
- Agro Forestry
- Gem Mining and Trading
- Eco Tourism

xi) The resettlers will be provided with skill training programmes such as carpentry, masonry, and plumbing, electrical works etc for them to be engaged on Income Restoration Programs. One member from each family will be provided this training.

6.4.4 Small Scale Business Development

To mitigate the adverse effects of loss of production of land and commercial ventures, small scale business grants and loans will be made available to the APS by the project and banks respectively. The amount of grant per household and additional assistance including Training for Business development will be determined by the project in consultation with the concerned APS. The APS will need to re-establish their lost businesses and restore their livelihood individually at proposed new service Centres. The project will facilitate access to Banks, Insurance companies etc. The accessibility to the Market for produces made by resettlers will be arranged by the project. For this purpose, the road network will be linked up with the main commercial centers such as Dambulla & Naula.

6.4.5 Method of Restoration of affected Businesses

To mitigate the adverse effects on dislocation of informal sector businesses functioned before the cutoff date (2008.01.20), small business grants of Rs.10,000/= will be provided, to facilitate them to re-establish their new businesses.

6.4.6 Job Restoration

About 123 numbers of daily wage workers will lose their jobs on Private, State and Commercial Establishments. They will be provided employment in the Project on a priority basis. Failure to provide such an employment, will entitle them to a cash grant of Rs.3000/= per month for 06 months (Rs.18, 000/=) period.

6.4.7 Skill Development Programme for Unemployed Youths

The Skill Development Programme will be introduced for the youths of affected families and host families. This programme will be focused on Job Market in the area particularly agro-based industries and various other needs in general national wise. Special emphasis will be given to Dambulla metropolitan region which distributes agricultural produces country wide. At least one person per family will be provided this Training needs and 50% will be women. Potential Training areas are given below:

- Carpentry
- Masonry
- Plumbing
- Electrical works
- Heavy machine Operation
- Sewing Training for young women
- Computer Literacy
- Marketing and Financial Management
- TV and Radio repairing
- A/C and Refrigeration
- Food Processing
- High-tech Agriculture
- Motor Mechanism
- Driving

The youths will be selected for such training, depending on their educational qualifications. The training period will be 02 weeks to 06 months depending on the nature and quality of the Training and trainees will be entitled to Rs.3000/= training allowance per month.

6.4.8 Income restoration programmes to vulnerable families

There are 161 nos of vulnerable households categorized as 12 elderly HH, 06 women HH, 02 disabled HH and 141 HH below the poverty line who need to be provided special assistance to rebuild their livelihood in the new resettlement areas. These HH will be assisted to develop their paddy lands and construct their houses. The houses shall be built by the compensation received. Technical assistance will be provided during planning and construction stages of houses. Special income generation programs will be introduced to HH below the poverty line and women HH. Funds will be provided through the revolving fund to these programs. 12 elderly HH and 02 disabled HH will be given Rs.3000/= per month up to a maximum of 18 months for their subsistence. The balances 147 vulnerable HH are not physically disabled or elders. They are women headed HH & HH below the poverty line. So they are able to lift their own economic status and income levels when, they are provided with the same extent of lands similar to others. They too can survive until

they receive an income from their allotted lands with the food assistance given by the project up to a maximum of 18 months.

But the physically disabled and elderly HH (14 nos) are unable to cultivate the land they received. Hence, they need some special assistance to upgrade their livelihood for a certain period. This amount shall not be below the national subsistence level of Rs. 2912 per month and it is decided to pay an allowance of Rs. 3000 per month up to a maximum of 18 months.

All vulnerable HH will be entitled to an Income Restoration Grant of maximum Rs.25, 000/= per HH depending on the nature of the Income generating programme.

6.4.9 Special assistance to encroachers, rented HH and HH occupying houses in leased lands.

16 HH in encroached lands, 03 in rented houses and 01 in leased land will be affected by the Project. These 20 HH will not be entitled for compensation as they do not have titles for the land occupied. Hence, special assistance scheme will be drawn for these APS.

6.4.10 Ex-gratia Payment for HH opted to Kaudulla LB Extension Area in System 'D'

302 HH have opted to resettle in Kaudulla LB Extension Area in System 'D' anticipating that they will be provided with more extent of land than in System 'F'. However, due to a policy decision taken by the authorities because of the scarcity of lands, same extent of land will be provided both in System 'D' & 'F'. But to encourage these 302 HH opted to System 'D, they will be provided with Rs.50, 000/= as an ex-gratia payment.

6.4.11. Employment in the Project

The priority will be given to the APS for the employment opportunities in the project. MASL will encourage the contractors to recruit APS for their employment requirements.

6.5. Institutional arrangement for Training

6.5.1 Training needs and financial assistance

Because of the high literacy rate of 98% amongst the APS, the fulfillment of their training needs will be much easier. However the lack of training institutions in these areas is a major constraint at present. The project will fulfill this requirement by engaging MASL directly and arranging other concerned government & private institutions on this task.

The training cost of Rs.2500/= to Rs.25, 000/= per person will be allocated by the Project as required.

6.5.2 Training facilities available in the MASL

There are 02 Training Centres available with the MASL close to the resettlement areas at Girandurukotte – System 'C' and Thelhiriyawa – System 'H' which could be made use for training of APS in Kaluganga & Kaudulla LB extension area respectively. The training center at Girandurukotte more equipped than the one at Thelhiriyawa. The former has residential facilities and it could accommodate 70 trainees at a time. The establishment of a new Training Centre or strengthening of the present Training Centre at Girandurukotte with necessary staff, equipment and resources is shown in Annex. xiii. However as the cost of furnishing a new training center is fairly high and the maintenance cost of same would be an added burden to the MASL it was not pursued seriously and instead it is planned to upgrade the facilities at Girandurukotte Training Centre if found necessary after a proper gap analysis during the implementation of RIP. It is also planned to equip the Block Offices in the settlement areas to conduct the short term training programs and seminars.

6.5.3 Scope of Training Needs

i) During the PRA Programs, following issues which warrant training of the affected and host communities have been identified as given below:

- Low income of APS.
- Lack of skills for self-employment
- Lack of knowledge for capital formation
- Lack of employment opportunities for youths.
- Lack of knowledge on water management techniques.
- Lack of knowledge on hi-tech agricultural practices.
- Lack of entrepreneurship attitudes & skills.
- Lack of leadership qualities.
- Poor living standards.
- Low agriculture productivity.
- Poor organizing capacity of APS.

ii) It is proposed to address those issues by the Project through developing comprehensive and intensive training strategies. The following Training programs are to be implemented to overcome these issues:-

- Capacity building training programmes
- Entrepreneurship development training programmes
- Training for formation of organizations
- Training programmes on fund raising and management of funds

- Vocational and skill training programmes
- Social, cultural and entertainment programmes

6.5.4 Budgetary Provision

A separate Training Budget will be included in the Project Budget and funds will be released for the smooth implementation of the Training Programme. Detail Training Programme and the Budget are annexed Chapter Ten.

Table 6.1 - Vocational, Skills and other Training Programmes – 2 Weeks Period

Ser. No.	Name of Programme	No. of Persons to be trained	Training Allowance per Person/ per 2 weeks Rs.	Sub Total of Training Allowance Rs.	Course Fee per person per 2 weeks Rs.	Sub Total of Training Course Fee Rs.	Total Rs.
01	Horticulture	150	1500/=	225,000/=	2500/=	375,000/=	600,000/=
02	Animal Husbandry	175	1500/=	262,500/=	2500/=	437,500/=	700,000/=
03	Bee-keeping	200	1500/=	300,000/=	2500/=	500,000/=	800,000/=
04	Others	49	1500/=	73,500/=	2500/=	122,500/=	196,000/=
	Total	**574**	**1500/=**	**861,000/=**	**2500/=**	**1,435,000/=**	**2,296,000/**

Vocational, Skills and Other Training Programmes – 2 Months Period

Ser. No.	Name of Programme	No. of Persons to be trained	Training Allowance Per person for 2 Months	Sub Total of Training Allowance Rs.	Course Fee per person per 2 Months Rs.	Sub Total of Training Course Fee Rs.	Total Rs.
01	Tiling	50	6000/=	300,000/=	10,000/=	500,000/=	800,000/=
02	Plumbing	50	6000/=	300,000/=	10,000/=	500,000/=	800,000/=
03	Heavy Vehicle Driving	150	6000/=	900,000/=	10,000/=	1,500,000/=	2,400,000/=
04	High Tech Agriculture	400	6000/=	2,400,000/=	10,000/=	4,000,000/=	6,400,000/=
05	Other						

	Total	**650**	**6000/=**	**3,900,000/=**	**10,000/=**	**6,500,000/=**	**10,400,000/=**

Vocational, Skills and Other Training Programmes – 3 Months Period

Ser. No.	Name of Programme	No. of Persons to be trained	Training Allowance Per person for 3 months period Rs.	Sub Total of Training Allowance Rs.	Course Fee per person per 3 Months Rs.	Sub Total of Training Course Fee Rs.	Total Rs.
01	Gem Cutting	10	9000/=	90,000/=	15,000/=	150,000/=	240,000/=
02	Electrical	08	9000/=	72,000/=	15,000/=	120,000/=	192,000/=
03	Book-keeping	05	9000/=	45,000/=	15,000/=	75,000/=	120,000/=
04	Book Binding	05	9000/=	45,000/=	15,000/=	75,000/=	120,000/=
05	Carpentry	15	9000/=	135,000/=	15,000/=	225,000/=	360,000/=
06	Other	07	9000/=	63,000/=	15,000/=	105,000/=	168,000/=
	Total	**90**	**9000/=**	**450,000/=**	**15,000/=**	**750,000/=**	**1,200,000/=**

Vocational, Skills and Other Training Programmes – 6 Months Period

Ser. No.	Name of Programme	No. of Persons to be trained	Training Allowance Per person for 3 months period Rs.	Sub Total of Training Allowance Rs.	Course Fee per person per 6 Months Rs.	Sub Total of Training Course Fee Rs.	Total Rs.
01	Accounts & Auditing	10	18,000/=	180,000/=	25,000/=	250,000/=	430,000/=
02	Computer Application & Word Processing	15	18,000/=	270,000/=	25,000/=	375,000/=	645,000/=
03	Motor Mechanism	15	18,000/=	270,000/=	25,000/=	375,000/=	645,000/=

	Total	**40**	**18,000/=**	**720.000/=**	**25,000/=**	**1,000,000/=**	**1,720,000/=**

Table 6.2 – Human Resource Development Training Programmes

Period	**No. of Persons to be trained**	**Training Allow. Per person Rs. ***	**Sub Total Rs.**	**Training Course Fee per person Rs. ***	**Sub Total Rs.**	**Grand Total Rs.**
2 Weeks	208	1500/=	312,000/=	2500/=	520,000/=	832,000/=
2 Months	50	6000/=	300,000/=	10,000/=	500,000/=	800,000/=
Total	**258**	**6000/=**	**612,000/=**	**--**	**1,020,000/=**	**1,632,000/=**

** Training Allowance per person / per month is Rs. 3000.00*
** Training Course Fee per person / per month is Rs. 5000.00*

Note: This HRD training program includes training of Project and other staff also

Table 6.3 - Business Development & Marketing Training Programmes

Period	**No. of Persons to be trained**	**Training Allow. Per person Rs. ***	**Sub Total Rs.**	**Training Course Fee per person Rs.***	**Sub Total Rs.**	**Grand Total Rs.**
2 Weeks	50	1500/=	75,000/=	2500/=	125,000/=	200,000/=
2 Months	42	6000/=	252,000/=	10,000/=	420,000/=	672,000/=
Total	**92**	**--**	**327,000/=**	**--**	**545,000/=**	**872,000/=**

** Training Allowance per person / per month is Rs. 3000.00*
** Training Course Fee per person / per month is Rs. 5000.00*

Table : 6.4 - Summary of Training Budget

Item	Description of Training	No of trainees	Total cost
1	Vocational, skill and other training (2 weeks period)	574	2,296,000
2	Vocational, skill and other training (2 months period)	650	10,400,000
3	Vocational, skill and other training (3 months period)	90	1200000
4	Vocational, skill and other training (6 months period)	40	1720000
5	Human Resource development training (2 weeks)	208	832000
6	Human Resource development training (2 months)	50	800000
7	Business development and marketing training. (2 weeks)	50	200000
8	Business development and marketing training.(2 months)	42	672000
	Total	**1704**	**18,120,000**

6.6 Revolving Fund

This fund will be established to meet the scarcity of capital for the trained APS, specially the youths who wish to commence small scale businesses and industries and informally affected businessmen of the Project area. A sum of Rs.25 million will be allocated to revolving fund that would be for the credit facilities. The maximum credit entitlement per AP will be Rs.10,000/= irrespective of his/her pre-project status. The fund will be established at the Project level. Beneficiaries will have to contribute an equal amount. The fund will be managed by a Committee co-headed by the respective RPMs. The rules and Regulations of the fund will be determined by MASL.

6.6.1. Method of Disbursement of Proceeds from the Revolving Fund

i) On completion of Training, the trainee will submit a Business Plan with a cost estimate. The amount of credit will be released in two installments to the Bank Account.

ii) At the end of every 03 months, the entrepreneur will need to furnish progress reports to the management committee of the revolving fund until the settlement of loan.

iii) If the entrepreneur performs as per the Business Plan and satisfies the requirements, then the 2nd installment can be released to enhance the business activities. In the alternative, the project officials will guide the entrepreneur on the corrective steps to be taken. In the

event of the entrepreneur not performing satisfactorily action will be taken to act according to the conditions of the loan agreement.

6.6.2 Sustainability of Revolving Fund and Income Restoration Programme

For the long-term sustainability of the Revolving Fund as well as the income restoration programs and thereby to increase the income earning capacity of the APS, the following new ventures will be introduced / encouraged :-

vii) Off-farm activities, like fish farming, gem mining
viii) Establishment of small scale agro based industries.
ix) Market oriented crop diversification.
x) Hi-tech agriculture.
xi) Involvement in other income generating activities during off seasons
xii) Establishment of service provider entities.

RPM's Office will ensure that the release of funds from the revolving fund are made on easy terms & conditions without getting involved in too much bureaucratic procedure. In addition they will be trained on saving habits.

Table : 6.5 - Summary of Economic Rehabilitation & Income Restoration Budget

Ser.No.	Items of Allocation	No. of Units	Unit Cost Rs.	Total Cost Rs.
1	Training	--	--	18,120,000/=
2	Transport Allowance	1581	10,000/=	15,810,000/=
3	Assistance to Establish Small Scale Businesses	92	10,000/=	920,000/=
4	Special assistance to vulnerable HH i) Living Allowance ii)Income Restoration Grant	 14 X 18 161	 3000/= 25000	 756,000/= 4,025,000/=
5	Meetings & Discussions(Workshops) Awareness Programmes, PRA etc.	200	25,000/=	5,000,000/= 10,000,000/=
6	Shifting Allowance	1581	10,000/=	15,810,000/=
7	Ex-gratia payment to HH opted to System 'D'	302	50,000/=	15,100,000/=
8	Assistance for loss of employment	123	18,000/=	2,214,000/=
9	Housing and Latrine Assistance	1581 1581	20,000/= 5000/=	31,620,000 7,905,000
10	Credit Facility – Revolving Fund	--	--	25,000,000/=
	T O T A L			**152,280,000/=**

CHAPTER SEVEN

7. Consultation and Grievance Redress Mechanism

7.1. Necessity of Consultation and Participation

The project officials commenced consultations with all stakeholders including APS since year 2007. Information about the project has been disseminated among the APS as well as the affected organizations including Public and Private Sector. Several awareness meetings were held in the project area to appraise the families affected. These meetings were conducted at the village level with the mass attendance of APS. The discussions at these meetings were mainly focused on the project impact & their future, institutional frame work, acquisition of properties, resettlement process and other relevant details. These meetings were conducted in a cordial manner without resorting much controversy.

Information dissemination, consultation and awareness on compensation rates, entitlements, resettlement areas and economic rehabilitation & income restoration aspects are being done in 11 G.N. Divisions in the reservoir bed area and the host areas and will be continued during the project period. The preparation of RIP was carried out in consultation with the national , provincial & local political authorities and officials, priests, village leaders, and the affected persons.

7.1.1. Objectives of the consultation:

- To provide APS with full information on proposed entitlements including compensation rates for all losses, proposed resettlement sites in systems 'F' and 'D', income restoration and rehabilitation measures.
- To obtain comments from APS to improve the RIP where necessary.
- To make an awareness on the overall benefits of the Mahaweli Development Program.

7.1.2.1. Stages of Consultation and Participation

Consultation & participation will be carried out mainly in three stages:

I. Pre project (Planning & Design stage)

II. Project Implementation Stage.

III. Post Project Stage (after resettlement)

7.1.2.2. Pre Project Stage

At this stage, the stakeholders' views & attitudes are obtained on the following activities with respect to the resettlement planning.

- Awareness / Introduction of the project
- Land Acquisition process
- Calculation of compensation & process of payment of compensation.
- Site selection and Re-settlement planning
- Awareness on the resettlement program.
- Provision of common utilities & amenities.
- Planning of economic development.

The public consultation and awareness programs are carried out in every GN divisions of the affected area in the reservoir bed and for the resettlers, in the proposed resettlement area on GN Division basis. It is proposed to conduct public consultation and awareness meetings in the following number of GN Divisions.

- Moragahakanda Reservoir Bed Area : 11 GNDs
- Deviated road trace : 2 GNDs
- High tension transmission line : 3 GNDs
- Elephant corridor : 1 GNDs
- Kaluganga Resettlement area : 14 GNDs
- Kaudulla LB extension area : 4 GNDs

7.1.2.3. Project Implementation Stage

During the project implementation stage, the settlers in the affected area of the reservoir, isolated areas and host areas will be consulted as and when necessary. All settlers & resettlers will be familiarized with the new allotments, agricultural plans and socio economic development activities.

7.1.2.4. Post Project Stage

On completion of settlement & resettlement activities, the settlers will be directed to implement the agriculture development plan and other socio economic development activities gainfully to sustain their livelihood. In addition, they will be made aware on the income restoration programs, organizing of Farmer societies and other socio economic organizations to further their economic conditions.

The following public consultation and awareness programs have been planned to perform the above mentioned activities. *(Refer Table No7.1)*

Table No7.1 Proposed Public Participation and Awareness Programs for Moragahakanda Affected Area

Item	**Description of the Program**	**Programs**	
		No of programs	**Total**
1	**Pre settlement stage**		
1.1	*Project coordination meetings*	16	
	Sub Total		**16**
1.2	*public consultation and awareness meetings for land acquisition and compensation*		
1.2.1	Reservoir bed	63	
1.2.2	Elephant corridor	6	
1.2.3	Isolated Villages	6	
1.2.4	Electricity Transmission line	6	
1.2.5	Kaluganga proposed resettlement area	84	
1.2.6	Kaudulla LB extension area	24	
1.2.7	Road deviation	3	
	Sub Total		**192**
1.3	*Public consultation and awareness programs for familiarization of new settlement sites &, resettlement planning.*		
1.3.1	Reservoir bed	33	
1.3.2	Elephant corridor	2	
1.3.3	Isolated Villages	3	
1.3.4	Electricity Transmission line	-	
1.3.5	Kaluganga proposed resettlement area (host community)	14	
1.3.6	Kaudulla LB extension area (host community)	4	
1.3.7	Road deviation	3	
	Sub Total		**59**
1.4	*Income Restoration & community development programs*		
1.4.1	Reservoir bed	33	
1.4.2	Elephant corridor	3	
1.4.3	Isolated Villages	6	
1.4.4	Electricity Transmission line	9	
1.4.5	Kaluganga proposed resettlement area (host community)	42	
1.4.6	Kaudulla LB extension area (host community)	8	
1.4.7	Road deviation	6	

	Sub Total		**107**
1.5	*Capacity building & awareness program in Pre* settlement stage		
1.5.1	Moragahakanda Reservoir bed	33	
1.5.2	Elephant corridor	3	
1.5.3	Electricity Transmission line	3	
1.5.4	Kaluganga proposed resettlement area	42	
1.5.5	Kaudulla LB extension area	12	
1.5.6	Road deviation	3	
	Sub Total		**96**
2.0	***Public consultation and awareness meetings in the resettlement implementation stage***		
2.1	Moragahakanda Reservoir bed	22	
2.2	Elephant corridor	2	
2.3	Electricity Transmission line	-	
2.4	Kaluganga proposed resettlement area	14	
2.5	Kaudulla LB extension area	8	
2.6	Road deviation	3	
	Sub Total		**49**
3.0	***Public consultation and awareness meetings in the post settlement stage***		
3.1	*Awareness program for income restoration*		
	Kaluganga resettlement area	9	
	Kaudulla resettlement area	12	
3.2	*Awareness program for establishment of farmer, investors organizations*		
3.2.1	Kaluganga resettlement area	9	
3.2.2	Kaudulla resettlement area	12	
3.3	*Awareness programs for reorganization of employments*		
3.3.1	Kaluganga resettlement area	12	
3.3.2	Kaudulla resettlement area	16	
	Sub Total		**70**
	TOTAL		**589**

a) Awareness programs: Several awareness programs have been conducted since year 2007 by the project. This process will be continued until such time the acquisition and resettlement programs are completed. The meetings are usually chaired by the Project Director or Deputy Director and attended by members of the concerned Pradeshiya Sabhas and Provincial Council of Central Province, Government officials, Grama Niladaries, Village and Community leaders, priests of the temples and APS. Several awareness meetings especially for women and community leaders have also been conducted.

The officials of line agencies have frequently met with the Project officials for discussion of the implementation of the programme. For details refer Table No 7.1, 7.2. & 7.3 During these awareness programs & project implementation meetings, the participants have raised queries on land acquisition & compensation payment, method of calculating the compensation and dates of payments. For these queries, the participants were informed that payment of compensation are to be made before the resettlement, calculation of amount of compensation is to be made by the Valuation Department and resettlement will be done one year prior to impounding of the Moragahakanda reservoir. They were satisfied with these responses.

Table - 7.2 - Awareness Programs and Socio-Economic Surveys.

Ser. No.	Programme Description	Number of programmes	Number of Participants / Progress
1	Awareness Programmes on the Project for APS	12	1820
2	Awareness Programmes for women	06	680
3	Awareness Programmes for CBO Members.	08	350
4	Awareness Programmes for Community Leaders	04	80
5	PRA Programme	12	1492
6	Socio-economic Surveys	04	4131
	Total	**46**	**8553**

Table - 7.3 - Training programmes.

Ser. No.	Programme Description	Target Group	Number of Programmes	No. of Participants
1	Basic Awareness of Project Components	Officers of Mahaweli/ DS Divisions and Local Authorities	02	60
2	Social Mobilization	Samurdhi Officers	01	28
3	Formation of CBO's	Women Members	06	350
4	Field Study Programme	Mahaweli Officers	01	50
5	Regional Planning work shop	Regional Officers from Line Agencies	02	78
6	Enterprise Development	Small Businessmen/ Entrepreneurs	01	80
7	Mushroom Cultivation Training	Women leaders	01	20
8	Awareness of Poultry and Maize	Farming Women	02	180
9	Field Study-Women Bank Society in System "C"	Women group leaders	01	35
10	Socio Economic Survey	House Holders	02	1996
11	Vocational Training on Ceiling and Tilling	Masons, Carpenters	01	32
	Total		**20**	**2909**

Table – 7.4 Committee Meetings and Special Programmes.

Ser. No.	Programme Description	Number	Progress / Participants
1	Project Coordinating Committee	06	630
2	Meeting on deviated road trace.	02	80
3	CBO Formation Meeting	06	800
4	Land Acquisition Meeting	02	180
	Total	**16**	**1690**

APS were given the opportunity on resettlement options at the questionnaire surveys of year 2006 and 2008.Visits to resettlement sites will be arranged. Formal and Informal interviews with the selected APS and community leaders were held at several occasions.

b) Information dissemination about acquisition.

The Section 2 Notices were published in the area for each GN Division in the reservoir bed area to follow the Acquisition process. APS are aware that their lands will be acquired and they are entitled for compensation. Land marking of the perimeter boundary in tank bed area with 100m buffer zone has been completed thereby APS aware exactly which household/land will be affected.

c) Information dissemination and consultation during the Socio-economic surveys

During the Socio-economic surveys, the Survey Team interviewed 1572 HH as well as community leaders and all Grama Niladaries in the Project area. During this survey, the Survey Team had a very good rapport with the APS and the Team was able to gather their concerns and preferences. These data/ information were used in the preparation of RIP. The APS have given their fullest cooperation during the survey and they have made up their minds to resettle in new settlement area.

d) Distribution of the Entitlement Assurance Letters and Receipt of the Consent Letters

The entitlement assurance letters were distributed to the potential resettlers' households by the MASL on 30 June 2009. The entitlement assurance letter includes the overall compensation policy based on the Circular No 04/2008 of the Secretary , Ministry of Land & Land Development and other additional benefits offered by the MASL.
The consent letters from 1,509 households out of 1515 HH in the tank-bed area and consent of 57 households in the proposed elephant corridor were obtained for the project implementation
As for the households to be affected by the branch canal in System D1, MASL will obtain the consent letters after the exact alignment of the branch canal is finalized in the field in order to avoid unnecessary confusion amongst the affected households.

Table 7.5 Summary of Consent Obtained by MASL

Location	Number Consented	Remarks
Reservoir Bed Area.	1,509 out of 1,515 affected households	The consent of the balance 6 affected households will be obtained in due course.
Proposed Elephant Corridor	57 out of 57 affected households	100% agreed on project implementation
System D1 (Irrigation Area)	To be determined.	The number will be determined after the exact alignment of the

Location	Number Consented	Remarks
		branch canal is finalized in the field.

Source: the MASL

e) Consultation and Participation during RIP implementation

Consultation and Participation of the APS will be continued during the RIP implementation to ensure that APS and all stakeholders are kept updated with the latest activities of the project. This will assist them to have expressed their concerns, if any, at ease. It is expected that the APS will continue to cooperate during the RIP implementation too. The grievance redress mechanism & Income restoration program will also continue on the participatory approach basis.

f) Summary of Past Public Consultation Meetings with Stakeholders and Local Stakeholders

The public consultation activities out of the several public awareness programs conducted so far are summarized below:

Table – 7.6 List of Public Consultation Meetings

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
1	26 June 2006	D.S. Office Naula	(1) 60 Participants (2) Officers (3) Female: 10 Male: 50	Socio-economic survey awareness meeting	Sinhala	1. Necessity of the socio-economic survey 2. Explained the questionnaire	They promised to give their support For Socio-economic survey of the project	MASL agreed to complete socio-economic survey within 10 days	MASL EDs Directors Project Director and Staff	Minutes available
2	17 Aug. 2007	D.S. Office Naula	(1) Participant list are not available (2) Representative of government & non government officers, GN officers, Representatives of farmer org.	Coordinating committee Meeting	Sinhala	1. Settlement planning of the Project 2. Progress and future plans 3. Environment conservation & watershed Management	1. Submitted a petition to the Minister about safeguard the right of inundated people 2. Request to aware on compensation mechanism 3. Request to improve existing infrastructure facilities	1) Maximum compensation will be pay based on valuation report prepared by C.V & agreed to aware public about it 2) DG agreed to prepare Action plan	DG, RPM , Directors, AD, DD,	Minutes available
3	27 Sept. 2007	Elahera School	(1) 30 participants (2) Business men (3) Female 03 Male 27	Discussion on Elahera Town development	Sinhala	Discussion on Elahera Town expansion under the project and regional development	Requested to develop Elahera as a Sub Town	MASL participant agreed to submit report of their requirement to MASL DG	Director(LUP) DD(Resettlement) Agriculture Officer	Relevant Letters

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
4	8 Oct. 2007	Helabagahawatta	(1) 38 participants (2) Catchments area community (3) Female 06 Male 32	Situational analysis	Sinhala	1) Awareness on catchment areas 2) Importance of environment & soil conservation programs 3) Participatory mapping 4) Formation of environment committees 5) Preparation of environment improvement plan	1) Requested to commence on Catchments Conservation Programme 2) They satisfied with the Programme.	1) Participatory Plan completed 2) Necessary programme will start.	DD(Resettlement) , Officer of Environmental Section. Development Assistant. HRDO Land Officer	Relevant Reports
5	12 Nov. 2007	Maragamuwa Temple	(1) 50 participants (2) village people (3) Female 08 Male 42	Consultation & Awareness meeting	Sinhala	Discussion on impacts of deviation of road (Naula – Elahera)	They requested to construct proposed Road without any damage of their houses	MASL Agreed to construct proposed road with minimum disturbance	Project Director CRE DD(Resettlement) RE Acquiring Officer	Minutes of the meeting
6	22, 27, 28 Nov. 2007	Elagamuwa, Kambarawa, Kadawatha, Thalago	(1) 354 participants (2) Community members (3) Female 46 Male 208	Awareness programme	Sinhala	✓ Objective of the project and project components ✓ Project benefits ✓ Resettlement sites	They said they were fully aware of the Project activities	Project will aware of people continuously	Procument Engineer DD(Resettlement) HRDO Land Officer Agriculture Officer	Flip charts Attendance Sheet

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
		da, Galpougolla								
7	30 Nov. 2007 9:00-16:30	Development Centre Girandurukotte	(1) 28 participants (2) Samurdhi officer, Grama Niladari, Agri. Extn. Officers (3) Female 13 Male 15	Awareness programme	Sinhala	1. Objective of the project and project components 2. Project benefits 3. Resettlement implementations	They were satisfied with the activities under three components	Requested to their support for future programmes.	DD(Resettlement) HRDO, BM(Medagama), Agriculture Officer, Acquiring Officer, AD(Training), Prcoument Engineer	Attendance Sheet, Copy of the Programme.
8	6 Dec. 2007	Development Centre, Girandurukotte	(1) 125 participants (2) District Secretaries, AGA's, wildlife officers, forest officers, Other relevant officers of Mahaweli (3) Female 03 Male 122	Workshop on EIA report finalization	Sinhala/ English	1. Project activities 2. EIA report presentation 3. Suggestions 4. Finalization of the EIA report	All participants agreed with suggestions of EIA	MASL agreed to aware people about EIA report	Head of each sections in Moragahakanda project office	EIA Reports

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
9	11 Dec. 2007	Kongahawela village	(1) 42 participants (2) CBO leaders and Community (3) Female 12 Male 30	Awareness programme	Sinhala	1. Project objectives 2. Project components 3. Project benefits 4. Resettlement implementation	They requested to field visit to the resettlement areas	MASL agreed to arrange field visit for leaders.	DD (Resettlement) HRDO Acquiring Officer.	Attendance sheet and Programme copy
10	14-15 Jan. 2008 8:00-17:30	Kadawatha village	(1) 98 participants; (2) Farmers, women of displaced families; (3) Female 12 Male 83	Participatory Rapid Appraisal (PRA) Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	1. Need to strengthen CBO 2. Request job opportunity under Moragahakanda Project. 3. Naula Elahera road need to renovate. 4. Request field experience to resettlement areas 5. Requested to consideration on social needs when preparation on plans	MASL agreed to fulfil their requests	DD(Resettlement) Selected PRA expertise HRDO Sociologist Land Officer	PRA Report and Attendance sheet

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
11	14-15 Jan. 2008 8:00-17:30	Talagoda village	(1) 195 participants (2) Farmers, youth, women of displaced families (3) Female 52 Male 143	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	1) Need to aware other organizations 2) Requesting solutions for the as follows issues, inadequate income,. Lack of skill training., mitigation of wildlife human conflicts, unavailability of proper road network	MASL agreed to consider their requests and to take mitigation action overcome those issues	DD(Resettlement) Selected PRA Expertise HRDO Land Officer Selected DS'office Staff , Grama Niladari, Samurdhi Officer	PRA Report and Attendance sheet
12	15 Jan. 2008 8:00-16:30	Galporugolla	(1) 134 participants; (2) Community members; (3) Female 12 Male 122	PRA Programme for Situational Analysis	Sinhala	1. Project objectives 2. Project components 3. Project benefits 4. Resettlement sites	Similar Request as Thalagoda GND	MASL Agreed to take mitigation actions to overcome those issues	DD(Resettlements) PRA Expertise HRDO Land Officer	PRA Report and Attendance sheet available
13	16 Jan. 2008	Kambarawa village	(1) 192 participants; (2) Community members; (3) Female 43	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory	Similar Request as Thalagoda GND	MASL Agreed to take mitigation actions to overcome those issues	DD(Resettlements) PRA Expertise HRDO Land Officer	PRA Report and Attendance sheet

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
			Male 149			mapping 4. Ranking 5. Venn diagram 6. Wealth ranking			Sociologist	
14	17 Jan. 2008 7:30-18:00	Galporugolla Village	(1) 141 participants (2) Farmers, youth, women of displaced families (3) Female 14 Male 127	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	Similar Request as Thalagoda GND	MASL Agreed to take mitigation actions to overcome those issues	DD(Resettlements) PRA Expertise HRDO Land Officer Sociologist	PRA Report and Attendance sheet
15	18-19 Jan. 2008 8:00-17:00	Elegamuwa village	(1) 172 participants (2) Farmers, youth, women of displaced families (3) Female 31 Male 141	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	Similar Request as Thalagoda GND	MASL Agreed to take mitigation actions to overcome those issues	DD(Resettlements) PRA Expertise HRDO Land Officer Sociologist	PRA Report and Attendance sheet
16	19 Jan. 2008 8:00-17:00	Kongahawela village	(1) 134 participants (2) Farmers, youth, women of displaced families (3) Female 24 Male 110	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	Request to improve existing infrastructure facilities by partly affected people.	MASL agreed to improve existing infrastructure facilities	DD(Resettlements) PRA Expertise HRDO Land Officer Sociologist	PRA Report and Attendance sheet

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
17	15 Feb 2008 9:00-12:00	Galporugolla village	(1) 134 participants (2) Farming community (3) Female 12 Male 122	Awareness programme	Sinhala	1. Objective of the project and project components 2. Project benefits 3. Aware of resettlement areas and organize women as a small group	Few people gave their consent to resettle D1 Area	1. MASL agreed. 2. Requested organize women as small groups	DD (Resettlement) HRDO Sociologist	Programme copy and attendance sheet
18	20 Feb 2008	Hattota Amuna Laggala – Pallegama	(1) 28 participants (2) Farmer leaders (3) Female 01 Male 27	Awareness programme	Sinhala	Awareness campaign of the project activities	They were thanked to make aware then.	MASL promised to meet them in future programmes	Staff of Resettlement section in Project office	Attendance sheet
19	3 Apr. 2008 9:30-16:00	D.S. Office Naula	(1) 59 participants (2) Health , Education, Police, Wildlife Department etc. (3) Female 03 Male 56	Regional Planning Workshop	Sinhala/ English	1. Project activities 2. Regional planning 3. Discussion of MASL past experiences on regional planning 4. Justifications	1. Promised to send building plans. 2. Some organization requested additional land for quarters	MASL agreed to send their requirement for consideration.	District Secretaries, Director(LUP) Procument Engineer and Project Staff AGA - Matale	Minutes of the meeting

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
20	1-3 May 2008	Millagah amulatenna village	(1) 130 participants (2) Community members (3) Female 36 Male 94	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	Their request was to resettle all affected or Non affected HH	Resettlement Programme to be organised priority basis.	DD(Resettlement) HRDO Land Officer Sociologist	PRA Report and Attendance sheet
21	5 May 2008 10:00-15:30	D.S. Office Laggala Pallegama	(1) 110 participants (2) officers, farmers & political members (3) Female 04 Male 106	Coordinating committee meeting	Sinhala	1. Progress review 2. Problem discussions 3. Recommendations	1. Request to resettle within region 2. Not agreed with MASL Land Policy.	1. MASL agreed to consider their requirement 2. Policy can't be changed.	Directors of MASL Project Staff	Attendance sheet
22.1	29-30 May 2008	Konghawela village	(1) 134 participants (2) Community members (3) Female 24 Male 110	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	Infrastructure need to be developed for balance community	MASL agreed to fulfil their requirements	DD(Resettlement) HRDO Land Officer Sociologist	PRA Report and Attendance sheet.

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
22.2	29 May 2008	Medapihilla village	(1) 100 participants (2) Community members (3) Female 20 Male 80	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	Requesting solutions for the as follows issues, inadequate income,. Lack of skill training., unavailability of proper road network	MASL agreed to fulfil their requirements	DD(Resettlement) HRDO Land Officer Sociologist	PRA Report and Attendance sheet
23	29-31 May 2008	Rajawela village	(1) 187 participants (2) Community members (3) Female 47 Male 140	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	Similar Request as Medapihilla GND	MASL agreed to fulfil their requirements	DD(Resettlement) HRDO Land Officer Sociologist	PRA Report and Attendance sheet
24	30 May 2008	Galabada village	(1) 37 participants (2) Community members (3) Female 08 Male 29	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	1. What are the benefits for Isolated village 2. they reluctant to move new resettlement area	1. Existing infrastructure facilities improve & new facilities will be established 2. Reluctant people can be settle where they like and MASL will be	DD(Resettlement) HRDO Land Officer Sociologist	PRA Report and Attendance sheet

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
								pay Maximum Compensation for .loss of property & land		
25	1-2 June 2008 7:00-17:30	Moragolla village	(1) 75 participants (2) Community members (3) Female 19 Male 56	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	Similar Request as Medapihilla GND	MASL agreed to fulfil their requirement	DD(Resettlement) HRDO Land Officer Sociologist	PRA Report and Attendance sheet
26	3 June 2008 7:00-17:30	Galabodа village	(1) 55 participants (2) Community members (3) Female 36 Male 42	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking 5. Venn diagram 6. Wealth ranking	Similar Request as Medapihilla GND	MASL agreed to fulfil their requirement		PRA Report and Attendance sheet
27	30 June 2008 7:00-17:30	Millagahamullathenna village	(1) 129 participants (2) Community members (3) Female 36 Male 94	PRA Programme for Situational Analysis	Sinhala	1. Introduction of PRA methods 2. Group discussion 3. Participatory mapping 4. Ranking	Similar Request as Medapihilla GND	MASL agreed to fulfil their requirement		PRA Report and Attendance sheet

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
						5. Venn diagram 6. Wealth ranking				
28	07Aug. 2008	District Secretariat Office - Matale	(1) 14 Participants (2) District Secretary-Matale, Relevant representative of Government org. MASL officers (3) Male 14	Discussion	Sinhala	Establishment of public services under Moragahakanda – Kaluganga project (planning & design of buildings)	1. Promised to send building plans 2. Requested to design should be complementary with the area	MASL agreed to consideration on their requirement when preparation of development plan	Director (LUP) Project Director. Architect	
28	14 Aug. 2008	Kambarawa & Elagamuwa villages	Not available	Awareness programme	Sinhala	1. Discussions on the loss of properties and compensation 2. Compensation package 3. Compensation detail House Trees Land 4. Other benefits	1. Land for sub-families, 2. Land for tenant farmers 3. Request all villagers be resettled in the same area 4. Expect land from Kaluganga	1. MASL agreed their comments expel land requirement. 2. MASL will be given land according to the land policy	Consultant(Resettlement) DD(Resettlement) HRDO and Other head of Project	Minutes available
29	8 Dec.	D.S.	1).Not available	Not	Sinhala	Not available	Not available	Not available	Not available	Minutes not

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3) No of female participants/male participants	Type of Public Consultation	Language	Topics	Participants' Major Comments	MASL's Responses	Attendants from the MASL	Availability of the Minutes of Meetings/Records
	2009	Office, Naula	2.) District secretary Divisional Secretary wildlife officers, Forest officers, Mahaweli officers, Bank officers, Education officers, Politicians, Other relevant officers	available						available
30	7-9 May 2010	Project site	(1) 40 participants (2) Government officials, 5 local leaders and 30 potential resettles (3) Female 08 Male 32	Interviews	Sinhala	Interviews on the public consultation and the proposed compensation and livelihood assistance	More awareness for land acquisition & compensation Resettlement site selection	Agreed to field survey	D(LUP) PD (Moragahakanda) DD(Development)	Summary of filled Questionnaire forms

7.2 Public Opinion on Resettlement and related issues in the project area.

The main concerns of the APS which were surfaced during the Socio-economic survey were the loss of their sources of income from their land, agriculture and businesses which would be affected by the process of land acquisition. The survey revealed, that the people were forced to respond positively after viewing the nature of the project which was a national requirement. They were particular about the extent of land and the location that was to be received by them. However, it was observed that people made up their minds to vacate the present premises after the message was convinced to them. At the public meetings the participants highlighted that they are living in traditional villages at present and with the displacement by the project, they would prefer to be resettled closer to those villages. Further, they informed that they will have to sacrifice the trees and crops cultivated by them and the impossibility of having such trees in the new settlement areas during their life-time.

The farmer families indicated that their means of income is mainly from the vegetable cultivation and the farm products are sold at the closest town of Dambulla where the marketing facilities are available with a wholesale market.

During these awareness programs & project implementation meetings, mainly the participants of the meeting raised the matters with regard to land acquisition & payment of compensation, method of calculating the compensation and dates of payments. For these questions, the participants requested that payment of compensation should be completed before the resettlement. Calculation of compensation will be done by the Valuation Department and resettlement will be carried out one year prior to the inundation of Moragahakanda reservoir. The verbal agreement for these actions has been taken from the participants during the meetings.

7.2.1 Special Public Consultation Meetings held on17 .07.2010 on the Entitlements & Benefits of the Project.

A special Public Consultation Meeting was held on 17th July 2010 in the inundated areas of Moragahakanda Reservoir in 11 GN Divisions. This was subsequent to the distribution of brochures on the Entitlements and Benefits of the project two weeks ahead amongst the all APS. At this meeting the APS's got all their doubts cleared on the contents in the brochure. They all were satisfied with the Entitlements and Benefits that they would enjoy during the resettlement process and expressed their appreciation towards MASL.

Refer Annexure No' xi' for the summary comments made at the meeting.

7.3 Grievance Redress Mechanism

7.3.1 Grievance Redress Committee

All disputes related to land acquisition, compensation payment and resettlement shall be dealt by the Grievance Redress Committees (GRCs). APS must be able to make their complains without fear and without going through bureaucratic hurdles. APS may make their complaints either in writing or verbally to the GN or directly to settlement officers attached to the project office. If the complaint is made verbally the Grama Niladari / Settlement Officer will record it in writing and forward the complaint to the Project Director who will convene the GRC. The GRC consists of Additional Secretary of the Ministry in charge of the subject of Mahaweli Development Programme, Divisional Secretary, Project Director of Moragahakanda Project, Members of Land Acquisition and Resettlement Committee, leaders of Community Consultative Groups or representatives of APS. It is also proposed to include women and representatives of ethnic minority groups in the Committee. The GRC shall meet and attend to all land acquisition, compensation payment and resettlement related matters including ownership disputes, delays in payment of compensation, delays in handover of lands, issues on payment of assistance etc. The meeting will be held where the places of convenient to APS. GRC procedures will be publicized through leaflets, notices and community meetings. Then APS are made aware of their rights and procedures for grievance redress. Every effort shall be made to resolve all grievances at these meetings within the shorter period.

Any grievances that can not be resolved at this level shall be forwarded to Project Committee for final decision. To develop decision making power, the GRC members shall be provided training and assisted by the Resettlement Officers.

Every attempt will be made to settle the issues at the village or Grama Niladari level through consultation and involvement of Project Resettlement Officers as required. Complaints that cannot be addressed at this level should be presented to GRC. Under LAA, an Appeal Board has been constituted to make appeals against the compensation offered to APS. This process will minimize the grievances. However, a person who does not agree with the decision of the Appeal Board can go before the court claiming higher valuation. Appeal Board is at National level authority which consists of 16 members appointed by the President of the Country with Chairman and Deputy Chairman.

7.3.2 The Legal Framework and Dispute Resolution:

The legal issues have been discussed and elaborated in Chapter 03. The other issues that could arise are as follows:-

i) The limitation of LAA.

ii) Land Titling and Registration process

iii) Rules and Regulations for determination of losses and payments of compensation.

iv) For resolution of any kind of dispute relating to land acquisition and implementation of RIP, there will be the Grievance Redress Mechanism. The GRC will be an ex-gratia legal semi-structured body empowered to give decisions on disputes during the implementation of RIP. The fundamental objective of formation of GRC is to resolve disputes at the grass-root level to avoid lengthy and costly judicial processes. The GRC will not deal with matters pending in the Court of Law.

v) The GRC will have no jurisdiction over the "rate of compensation".

7.3.3. Local support Organizations.

To minimize adverse impacts in relocation of APS and to facilitate the resettlement process, community based organizations will be established in the resettlement planning and implementation. These organizations will explore the ways in which they could assist the APS & the Project Management.

7.4.Impact of Resettlement Programme on Host Areas.

Systems 'F' & 'D' where the people are already settled, namely, the host community will have to be integrated socially, culturally and economically with the APS of Moragahakanda Project. The infrastructure facilities and the support services at the resettlement areas would be shared with the host communities. The host population will also be given lands in systems 'F' & 'D' following the formal procedure. The project will facilitate the building -up of social integration between the APS and the host population. In addition, both communities would enjoy all other assistance provided by the project.

7.5 Information Disclosure

The summarized version of the resettlement activities of the project, the Resettlement Brochure, in 3 official languages English, Sinhala and Tamil will be distributed to the APS and other stakeholders of the area. In addition, the copies of the RIP with the Inventory Of Losses (IOL) in all three languages will be kept at Project Directors' office, Resident Project Managers' offices at Medirigiriya & Bakamuna, Block Office at Wellewala, Divisional Secretary's

office at Naula and each GNs' offices in affected area for the reference of all concerned.

CHAPTER EIGHT

8. Institutional arrangement for implementation of R.I.P.

8.1. Organizational Framework

8.1.1 Status of Organization and Establishment of Acquisition and Resettlement Division

i) Past Organizational framework for Acquisition & Resettlement under Mahaweli Development Programme carried out by MDB/MASL

There was a well established system prevailed in the country for land acquisitions under the provincial administration. In line with the prevailed system, MDB/MASL established an Acquisition and Resettlement Divisions for each project under the Mahaweli Development Programme. Originally this division was created far back as early seventies by the Mahaweli Development Board as the Settlement Planning Division (SPD) for planning, decision making and implementation of all acquisition, resettlement, settlement and related works at the Head Office in Colombo with the Regional Office at Kalawewa. All above activities related to System "H" were implemented satisfactorily through the regional office originally and later it was centralized to Head Office. This set up was prevailed for a considerable time period but later, the settlement offices were absorbed to RPMs' offices. In Head Office, no settlement division existed, as there were hardly any settlements activities carried out by MASL at this time.

ii) Resettlement Activities

With the launch of Moragahakanda Development Project, the resettlement activities of the project were assigned to the Director – Land Use Planning who is based in Head Office in Colombo. But this division did not comprise adequate expertise on acquisition and settlement planning. In order to overcome this situation, a suitable outfit is proposed in *figure 8.5*.

8.1.2 Overall Responsibility

i) MASL is held responsible for the overall implementation of the RIP. Under its direction, the outfit presently established at Project Director's Office, namely the Acquisition & Resettlement Division is responsible for the RIP implementation at the Project level . This will be further strengthened with additional resources. It will liaise with other institutions given below in the acquisition and resettlement process.

1. MASL Head Office
2. RPM offices at Bakamuna & Medirigiriya
3. Divisional Secretariats at Naula & Medirigiriya
4. Survey Department
5. Valuation Department
6. Ministry of Lands & Land Development
7. Government Printer
8. GNs in affected area.
9. Other Government Institutions connected to the resettlement process.

8.1.3 Responsibilities of MASL for implementation of RIP

MASL as the Executing agency is responsible for implementation of the RIP. It's main responsibilities will include:

- Overall planning, implementation and monitoring of Acquisition, Resettlement, Agriculture, Environment and Human Resources Development.
- Planning and development of resettlement areas of Systems 'F' and 'D'.
- Planning and development of Ambana Area Centre.
- Synchronizing resettlement activities with Moragahakanda reservoir construction work.
- Forming and facilitating of activities of Land Acquisition and Resettlement Committee (LARC).
- Monitoring of progress of the RIP implementation and modification of the "Entitlement Matrix" as and when necessary.
- Ensure smooth flow of fund for land acquisition and resettlement.

8.1.4. Coordination Framework.

At the grass-root level, Community Consultative Group (CCG) will be established and its meetings will be held regularly chaired by the Project Director Moragahakanda.

The Project Coordinating Committee (PCC) meetings chaired by District Secretary and attended by Divisional Secretary, other Heads of Institutions in the area, Project Director with relevant officers of MASL (Head Office and Project Office) and Community leaders of CCGs will be held as required.

The Project Implementation Unit (PIU) meetings chaired by the DG, attended by key officials of MASL in Head Office, Project Director,

representatives of relevant organizations connected to the project will be held once a month.

The Steering Committee meetings chaired by the Secretary of the Ministry, attended by the representatives of relevant Ministries & other organizations connected to the project, key officials of MASL in Head Office and the Project Director which is held in once in two months.

8.2.The functions and responsibilities of Acquisition and Resettlement Division at the Project Level

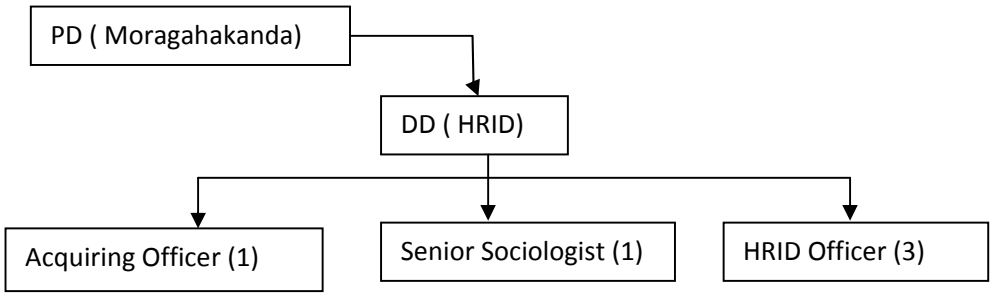
8.2.1 Implementation Mechanism

Under the provision of Land Acquisition Act of 1950, Divisional Secretary (DS) is responsible for initiating of acquisition and payment of compensation. In order to expedite this process, experienced Acquiring Officers will be recruited to the project and assigned to the DSs.

8.2.2Proposed Organizational structure for RIP implementation at Project level

I. At present, an Acquisition & Resettlement division is functioning under the Project Director (Moragahakanda). The organization structure is as follows:

Figure 8.1 Present Organization Structure of Acquisition & Resettlement Division



II. Because of the inadequate strength of the present Acquiring & Resettlement Division, it will be further strengthened with additional staff & resources.

8.2.3 Cardre Provision of Acquisition and Resettlement Division

i) The Cardre Provision of the Acquisition and Resettlement Division (ARS) as mentioned below:

- 01 Deputy Director in charge of A & R (permanent)
- 01 Senior Land Officer – Acquisition (permanent)
- 01 Senior Re-settlement Officer (permanent)
- 01 Training Co-ordinator (permanent)
- 05 Acquiring Officers (project staff/on contract basis)
- 01 Community Development Officer (permanent)
- 01 Public Consultative Officer(permanent)
- 01 Human Resource & Institutional Development Officer (permanent)
- 01 Training Officer (permanent)
- 02 Settlement Officers (permanent)
- 04 Assistant Settlement Officers
- 01 Administrative Assistant (permanent)
- 07 Support Staff(permanent)

8.2.4 Coordination Mechanism

i) The Committees directly related to the Land Acquisition & Resettlement process are as follows:

I. Land Acquisition and Resettlement Committee (LARC)
II. Grievance Redress Committee (GRC)
III. Community Consultative Group (CCG) (Common to Land Acquisition & Resettlement activities as well as the other issues connected to the project)

I. <u>Land Acquisition and Resettlement Committee (LARC)</u>

To facilitate the Acquisition & Resettlement Process, Land Acquisition and Resettlement Committee (LARC) will be established which will be chaired by the Project Director and co-chaired by the relevant Divisional Secretary. The main function of this committee is to resolve or give solutions on disputes arising during the acquisition & payment of compensation. It consists of the following members:

- Project Director (MASL)
- Divisional Secretary (Central government)
- Acquiring Officers (MASL)
- Settlement Officers (MASL)
- Valuation Officers (Valuation Department)

- Survey Superintendent (Survey Department)
- Chief Resident Engineer (MASL)
- Representatives of Community Consultative Groups
- G.N. as an observer

II. <u>Grievance Redress Committee (GRC</u>)

The Grievance Redress Committee (GRC) is established at the project level and the members are as follows.

- Project Director
- Divisional Secretary
- Concerned officer/s of the MASL.
- Relevant GNs.
- Chief priest in the area.
- Social elites of the area

Majority number to represent the state.

<u>III. Community Consultative Group (CCG)</u>

A CCG is established at the Project level to address any grievances of the APS during the acquisition and resettlement process.
The composition of this committee is as follows:

- Project Director
- Divisional Secretary
- Concerned officer/s of the MASL
- Respective Grama Niladaries
- Chief priests in the relevant GN divisions.
- Social elites of the area

ii) Main coordination & implementation arm:

- Project level.

This structure is described in subsection 8.2.2 & 8.2.3. and shown in *figure 8.3*.

- Head office level

The overall responsibility of the implementation of the project lies with the DG- MASL whereas the implementation of acquisition & resettlement component is the responsibility of Executive Director- Development. Under the latter's guidance a coordination body comprising Director (LUP), Director (Lands), Director (Agriculture), Director (Environment) and Director (HRID) will be established to direct the acquisition & resettlement program. In addition, the Director-PMU will closely monitor this program and furnish any feed backs to the coordinating body.

The proposed structure for resettlement implementation at head office level is given in *figures 8.4 & 8.5*

8.2.5 The tasks of Acquisition & Resettlement Division at pre- settlement stage

- Execution of Resettlement Implementation Plan
- Coordination with respective Institutions.
- Conducting Awareness programmes.
- Arranging necessary inputs to APS
- Provision of Vocational and Skill Training facilities
- Facilitation of APS for relocation
- Provision of assistance to APS
- Liaison with Chief Resident Engineer (CRE) and other officials on construction and development of new settlements areas.
- Provision of progress reports to MASL.

8.2.6 Acquisition Unit under the Acquisition & Resettlement Division

The Acquisition Unit is established as a sub unit of Acquisition & resettlement division under the supervision of PD (Moragahakanda). The unit is headed by a Senior Acquiring Officer/ Senior Land Officer. The main task of this unit is to follow the acquisition procedure. The Duties of the Senior Acquiring Officer of the unit are as follows.

A. Duties of the Senior Acquiring Officer

- Administrative functions of the Acquisition unit to ensure efficient & smooth operations.
- Supervision of land acquisition matters.
- Supervision of preparation of compensation claims.
- Maintain smooth coordination with the construction & other units.
- Execution of land acquisition & resettlement activities within the projected time framework.
- Liaison with the relevant authorities & institutions for an effective and accelerated works of acquisition & resettlement.
- Preparation of annual implementation plan of the unit, estimation of budgetary requirements and submission it to the PD.
- Liaison with the training unit regarding the Land acquisition & resettlement and providing training needs & resource persons.
- Submission of weekly/ monthly/ annual progress reports

8.2.7 Resettlement Unit under the Land Acquisition & Resettlement Division

The Resettlement Unit is established as a sub unit of Land Acquisition & resettlement division under the supervision of PD (Moragahakanda). Function of this unit is to attend to the pre-settlement activities of the resettlement program such as:

- Execution of selection process.
- Determining the total extent of land to be allocated.
- Categorization of type of lands to be allocated (like residential, commercial, residential with commercial lands, residential with irrigable lands and residential with industrial lands)
- Provision of transport facilities to the resettlers to their new settlements and granting other allowances.
- Granting permission to clear the scrap materials of the vacating houses and removal of timber in their lands.
    - Introduction to special income generation programs with the Training Unit.

The Duties of the Senior Settlement Officer of the unit are as follows.

A. Duties of the Senior Settlement Officer

- Administrative functions of the Resettlement unit to ensure efficient & smooth operations.
- Supervision of Resettlement matters.
- Supervision of selection of APS for resettlement
- Determining the category and extent of land to be allocated and supervision of the activities.
- Supervision of transport arrangements from affected area to the new resettlement area.
- To be in-charge of granting permission to clear the scrap materials of the vacating houses & removal of timber in their lands and to provision of special grants.
- To be in-charge of establishment and supervision of special income promotion programs.
- To be in-charge of implementation and supervision of conflict resolution mechanism.
- Selection of community leaders & supervision of their functions for an effective resettlement process.
- Submission of weekly/ monthly/ annual progress reports
- Preparation of annual implementation plan of the unit, estimation of budgetary requirements and submission it to the PD.

8.2.8 Training Unit Under the Land Acquisition & Resettlement Division.

The Training Unit will be established as a sub unit in the Acquisition & Resettlement Division. Main functions of this unit are as follows:

- Awareness amongst the APS
- Special training to APS on income generation activities.
- Socio Economic Surveys of APS to formulate plans for future assistance packages.
- Organize & conduct CCG, PCC, LARC and GRC meetings to identify the problems, issues & conflicts and directing it to the concerned parties.

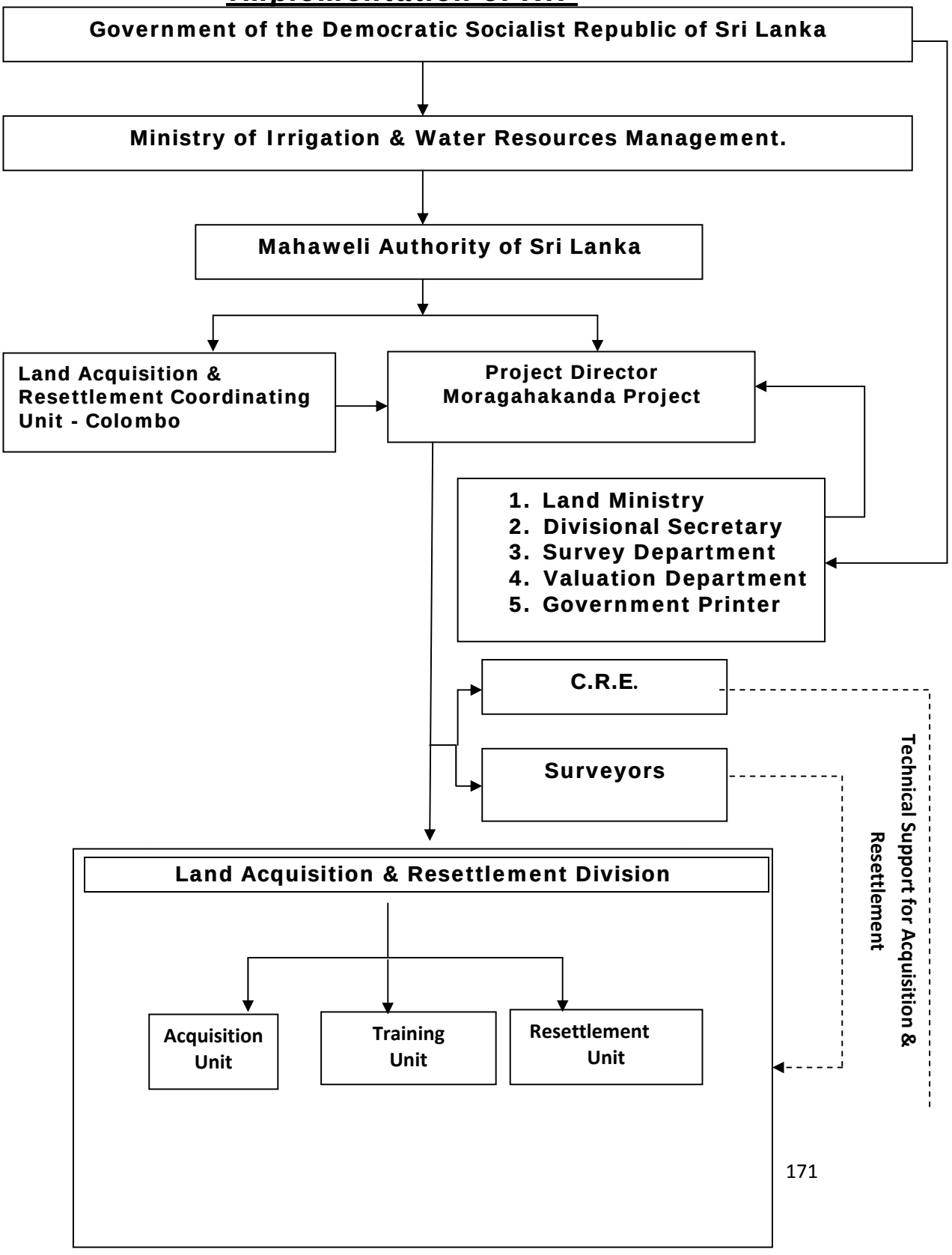
This Unit is headed by a Training coordinator. The Duties of the Training coordinator are as follows.

A. Duties of the Training coordinator.

- Administrative functions of the Training Unit to ensure efficient & smooth operations.
- conduct and supervise the training programs for the APS.
- Planning, conducting & supervision of Socio Economic Surveys & PRA programs.
- Selection of resource persons and maintenance of an inventory
- Organizing & conducting CCG, PCC, LARC and GRC meetings
- Planning, conducting & supervision of training, awareness & PRA programs and establishment of community organizations etc…
- Submission of weekly/ monthly/ annual progress reports
- Preparation of annual implementation plan of the unit, estimation of budgetary requirements and submission it to the PD.

Figure 8.2

Organization Flow Chart For Implementation of RIP



8.3 Monitoring and Evaluation (M & E)

8.3.1. Aims and Objectives of Monitoring

The aims and objectives of the internal and external monitoring activities will be to monitor the delivery, use and effect of entitlements that will be provided by the Project under the RIP. Monitoring will take place, against the activities, Entitlements, Time Frame and Budget set out in the RIP.

8.3.2. Main Functions & Organizational Setup of M & E

8.3.2.1. Functions

The requirement for Monitoring and Evaluation are specified in Section 6 of NIRP of Sri Lanka. The land acquisition and resettlement will be monitored both internally by MASL and externally by an independent body with the objective of receiving feed back to the project management on implementation and identifying problems, failures and successes. The detail indicators and benchmarks will be listed and monitored by means of two monitoring mechanisms. Findings of the external monitoring will be directly submitted to the project management so that they will be able to identify the lapses and shortcomings. Implementation structure of monitoring plan will consist of internal and external monitoring.

i) Resettlement monitoring means the collection, analysis & evaluation, reporting and use of information about the progress of resettlement, based on the resettlement programme. Monitoring focuses on progress achieved in relation to the physical and financial targets and the delivery of entitlements to people affected. Monitoring is usually conducted internally by the executing agency.

ii) Resettlement reviews take place regularly and at key points in the project cycle, for example, at mid-term and end of the term. During the reviews, project decision makers gather together with key stakeholders to asses the resettlement programme. Reviews draw upon monitoring and evaluation, reports and other data. On this basis, the reviewers reach consensus and decide upon any remedial measures needed to improve the resettlement performance or to respond the changing circumstances.

iii) Resettlement evaluation is taking place during and after implementation. It assesses whether the resettlement objectives were appropriate and whether they were met, specifically, whether livelihood and living standards have been restored or enhanced. Evaluation assesses resettlement efficiency, effectiveness, impact and sustainability.

ii) On behalf of the executing Agency (MASL), the Planning & Monitoring Unit(PMU) of MASL will undertake the monitoring of land acquisition & resettlement program together with LARC activities regularly (monthly), internally . The main activities to be covered by the internal monitors are as follows:

- Land acquisition & payment of compensation
- Selection of allottees & resettlement.
- Implementation of proposed land use.
- Land marking of the allotments.
- Establishment of common utilities.
- Training & awareness programs
- Agriculture production plan.
- Income promotion programs.
- Establishment of community organizations.

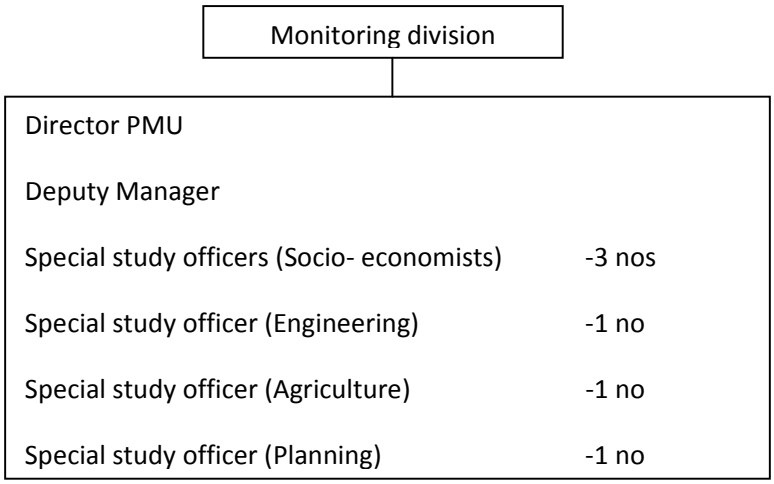
A committee headed by DS will undertake external monitoring periodically (Quarterly). The main activities to be covered by the external monitors are as follows:

- Land acquisition & payment of compensation
- Selection of allottees & resettlement.

8.3.2.2. Organizational Setup

I) Internal monitoring

Internal monitoring will be carried out by the Planning & Monitoring Unit of MASL which is headed by the director. The organizational structure of PMU is as follows:



Staff of the PMU, who are directly involved in the Moragahakanda Project will frequently visit the project to monitor the progress and set backs of the project. They will be engaged in the internal monitoring of project activities. In addition there will be a progress monitoring officer attached to the PD's office to attend to day to day monitoring activities.

II) External monitoring

An external monitoring committee will be established under the chairmanship of the Divisional Secretary comprising Project director (Moragahakanda) and other heads of stakeholder government institutions at local level* and few others as members**. The secretary of the committee will be the unit head of the A&R Division.

* Heads of the site offices of Wild life, Forest, Sri Lanka Police, Education Department, Health Department, Postal Department, Agriculture department, Youth Center etc…

** Chief priest of the area and three social elites of the area.

The committee will comprise maximum of 15 members and they are expected to do field visits once in every three months and feed back their observations on the functions assigned to them, to the project management in head office.

8.3.3. Indicators

The PMU will formulate the indicators for internal & external monitoring purposes separately based on all data & activities in the Acquisition & Resettlement plan and they will undertake the internal monitoring process and the external monitoring indicators to be sent to the PD for external monitoring purposes.

8.3.4 Methodology of Monitoring

The field level monitoring of land acquisition and resettlement activities will be based on

- Review of Secondary Data
- Collecting of Primary Data through inspections
- Collecting of public comments.

The review of secondary data will be made from the documents available in the PD office while collecting of primary data will have to be made by inspection of place to place. The collecting of public comments will be made using Participatory Monitoring & Evaluation Techniques , interviews and surveys.

8.3.5 Submission of Progress Report

The daily performance of the Acquisition & Resettlement activities will be maintained by this division and submitted to the PMU monthly. The PMU too will make monthly inspections in the field and cross check the information submitted by the A&R Division and compile the monthly

progress reports together with their evaluation. This will be submitted to the PIU & Steering Committee for their perusal. In turn, the PIU & Steering Committee will take appropriate actions in case where there are any lapses or shortcomings in the scheduled activities.

The external monitoring committee too will make periodical inspections in the field and submit their observations & comments on the project activities to the project management.

8.3.6. Organizational Structure for Post Settlement Activities.

The post settlement development activities of the resettlers will be the responsibility of the respective RPMs of Systems 'F' and 'D'. Any short fall of staff in the RPMM's divisions will be met from the A & R Division as their duties will be over by the time RPMMs take over the post settlement development activities. The post settlement development activities will be subjected to close monitoring by the external monitors until the expiry of the food subsidy period.

8.3.7. Responsibilities of Project Director and Resident Project Managers

The responsibilities of Project Director (Moragahakanda) and Resident Project Managers (RPMM) of Moragahakanda & Medirigiriya with regard to the Acquisition & Resettlement program are defined below in order to facilitate the identification of each of their obligations towards the monitoring aspect:

i) Responsibilities of Project Director, Moragahakanda:-

- Selection of eligible land allottees from affected households for allocation of land in System 'F' and 'D'.
- Arrangement of transport facilities for HH and selected allottees (This includes payment of transport fees also).
- Payment of compensation as specified under Item 5.4.1.
- Provision of pre-settlement Training facilities.
- Handing over of Allottees / evacuees to respective RPMM (System 'F' or 'D')

ii) Responsibilities of RPMM of Moragahakanda (System 'F') and Medirigiriya (System 'D').

- Receive the allottees / evacuees from PD / Moragahakanda.
- Handing over of lands to allottees / evacuees of Moragahakanda.
- Provision of necessary facilities as specified under 5.4.1 – xii, xiii-b,d, xiv, xv, xvi, xvii, and allocation of land to religious institutions and Public Institutions.
- Attending to economic rehabilitation and income restoration programme as specified under 6.3, 6.4 (except 6.4.6, 6.4.10 and 6.4.11).

PD and 2 RPMM are to make arrangements to divide areas of responsibilities under Item Nos. 6.5 and 6.6.

8.4 Awareness Programme for the Project Staff

The Project Office will arrange training programmes for officials of Acquisition & Resettlement Division in respect of capacity building depending on the need.

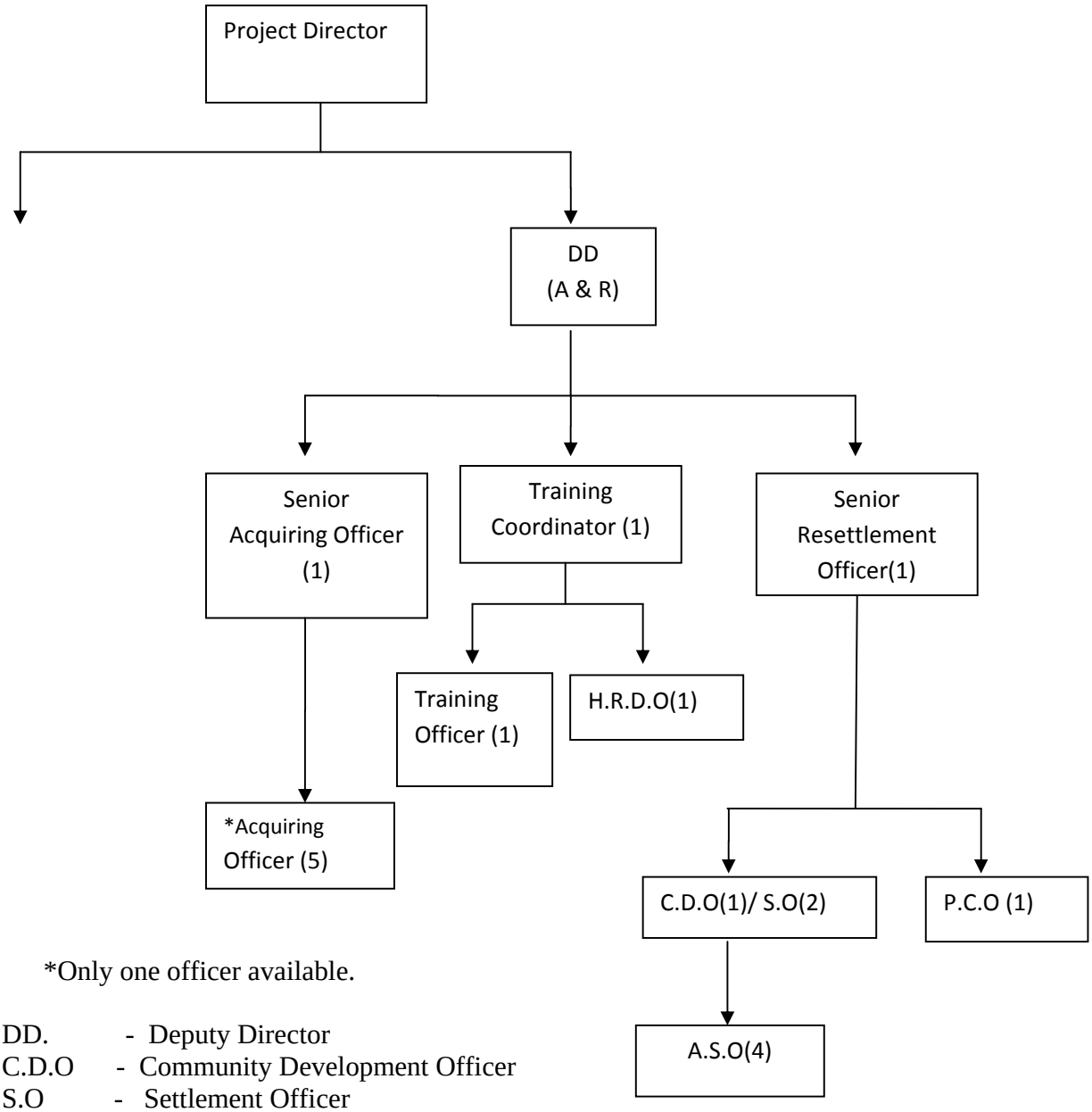
The CCG, PCC and LARC members will also be given an awareness programme on the project scope and the RIP. In addition, they should be made aware of the specific roles and responsibilities.

8.5 Computerized Management Information System(MIS)

A MIS network will be established at the Head Office of MASL and Project Director's Office at the field, in order to posses an efficient information management network to carry out the project activities.

Figure 8.3

MORAGHAKANDA PROJECT ORGANIZATIONAL STRUCTURE FOR RESETTLEMENT IMPLEMENTATION STAGE



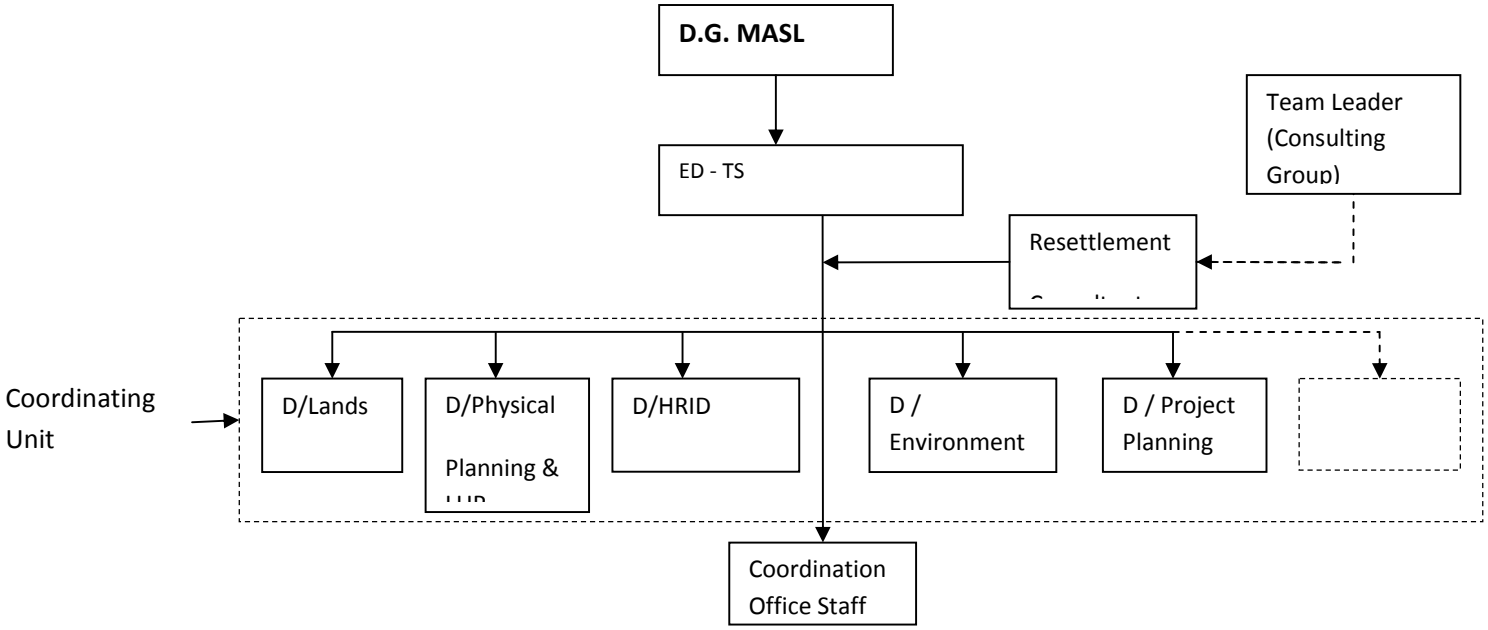
*Only one officer available.

DD. - Deputy Director
C.D.O - Community Development Officer
S.O - Settlement Officer
P.C.O - Public consultation officer
H.R.D.O - Human Resource Development Officer
P.M.O. - Progress Monitoring Officer

Note: Salaries of the above staff will be borne by the project

F*igure 8.4*

Proposed Organizational Structure for Resettlement Coordinating Unit Head Office.



Note: other concerned directors will be requested to participate at the coordinating meeting as and when they are required.

Functions of the Executive Director - Development and other Directors are given below.

Main Functions of the ED/ Dev. and Directors of the Divisions :

A. Executive Director / Development.

1. To be in charge of the coordination unit under Section 8.2.4 (iv).
2. Liaise with other respective divisions connected to the project.
3. Overall direction on activities of RIP

B. Director (HRID)

Coordination of:

1. Preparation of annual work programs
2. Training Programme
3. Resettlement activities of the affected people
4. Income Restoration Programme
5. Monitoring and Evaluation

C. Director (Lands)

Coordination of:

1. Land and Property acquisition
2. Payment of Compensation
3. Land alienation
4. Preparation of annual work programs
5. Monitoring & Evaluation

D. Director (Physical Planning & LUP)

Coordination of:

1. Preparation of annual work programs
1. Resettlement planning
2. Infrastructure planning
3. preparation of resettlement guidelines
4. Monitoring & Evaluation

E. Director – Environment

Coordination of:

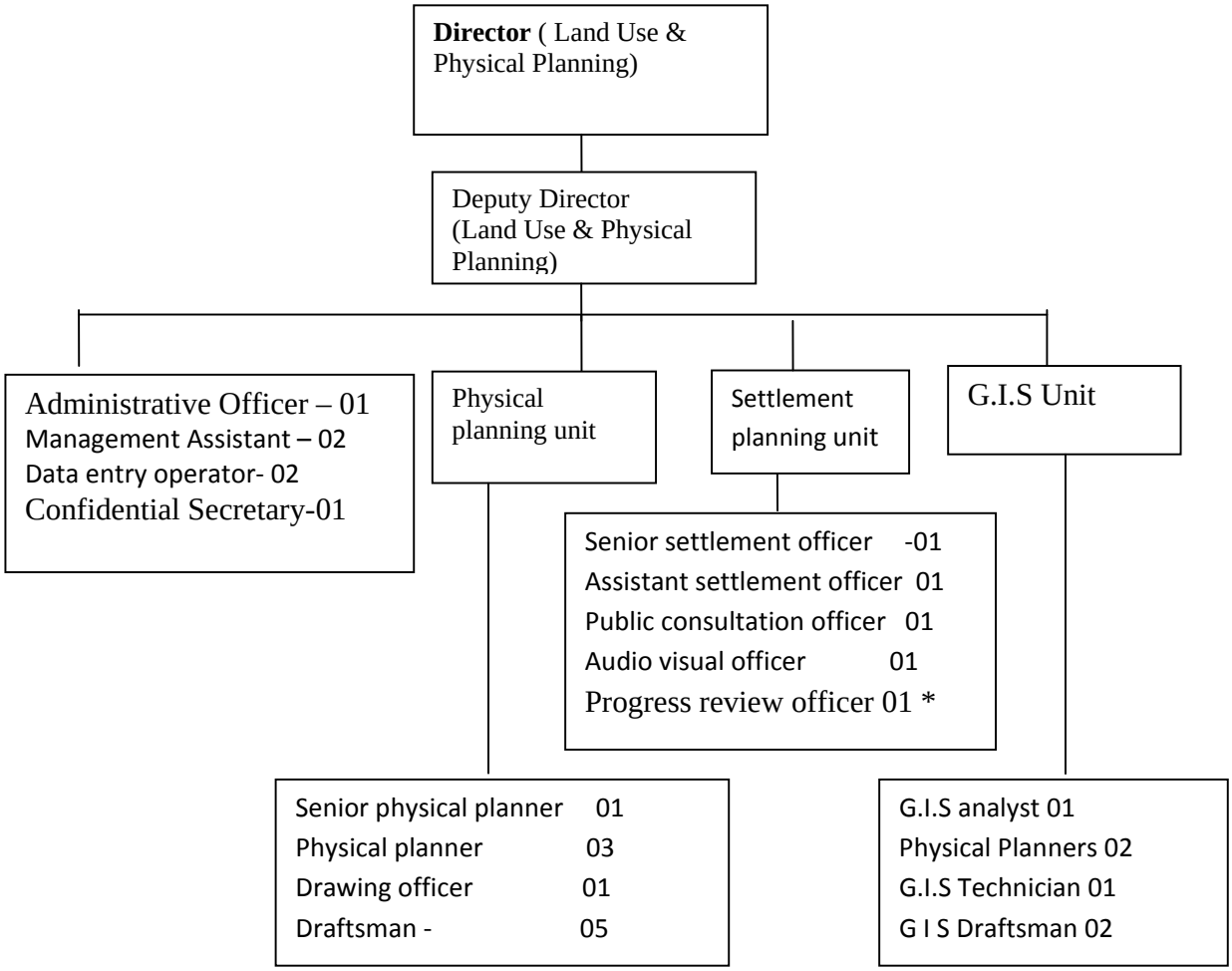
1. Preparation of annual work programs
2. Implementation of Recommendations of E.I.A. reports
3. Reforestation Programmes
4. Protection of 100 meter Buffer zone area.
5. Monitoring & Evaluation.

F. Director Agriculture

Coordination of:

1. Preparation of annual work programs
2. Implementation of agriculture development and extension programs
3. Liaison with other line agencies
4. Monitoring & Evaluation.

Figure 8.5 Organization structure of Land use and Physical Planning Division at MASL



* Vacancies to be filled.

CHAPTER NINE

9. Implementation Schedule

The Implementation Schedule (Chart 9.1) depicted in this Chapter has correlated the Acquisition and Resettlement activities together with the construction activities of the Moragahakanda development project at the macro level.

9.1 Major steps in Land Acquisition and Resettlement Implementation.

Following are the four main activities under Land Acquisition and Resettlement Implementation Plan:-

i) Possession of land & Payment of Compensation
ii) Resettlement / Relocation
iii) Income restoration
iv) Monitoring & Evaluation

9.2 Acquisition Works

The acquisition works of 11 G.N. Divisions have been already commenced. This activity will be continued in parallel with the construction activities at least one year ahead of construction. The payment of compensation too will be carried out during this period. The chart 9.2 depicts the acquisition works implementation.

9.3 Resettlement Activities

In relation to the civil works schedule, the resettlement activities will be carried out. The compensation payment will be made ahead of moving to the new settlement areas in order to facilitate the construction of houses at the new locations and re-establishment of livelihood. The new land parcels too will be handed over to them as and when such lands are ready for development. .

9.4 Resettlement Implementation

In general, the APS in Moragahakanda Reservoir Bed will be resettled in two stages of Phase 01.
The Stage 01 being the APS residents in the borrow areas and quarry sites and its immediate environs mostly within the Thalagoda GN Division. They will be resettled in the new settlement areas prior to the construction of main dam & saddle dams no 01 and it will be most likely in year 2012 *(Refer Table 9.3).* This number of APS will cover even the residents occupying the land below 150m.asl contour line which would be the likely inundated area by the coffer dam for the construction of main dam. Stage 02 being the APS resident outside the above

areas but occupying the land below the HFL plus 100m buffer zone of the reservoir. They will be resettled in the new settlement areas one year prior to the impounding of the reservoir which will be most likely before end of year 2015.

The phase 02 of the resettlement program will accommodate the sub families who were living with the main families before the resettlement date but after the cut off date most likely during 2015-2017.

The phase 03 of the resettlement program will cover the families in the isolated villages and those families whose properties are partially affected and most likely during 2017- 2018.

Table 9.1 Resettlement program of residents occupying borrow area & quarry sites (Thalagoda village) for dam construction

	Activity	**Target for completion**
1.	Possession of land & payment of compensation	4th quarter of 2011
2.	Handing over of homesteads.	1st quarter of 2012
3.	Completion of construction of Thorapitiya tank	4th quarter of 2011
5.	Handing over of farmsteads.	1st quarter of 2012
6.	Provision of Infrastructure.	4th quarter of 2011

6	**Land Alienation**	
i.	Issues of L.D.O. / C.L.O. Permit	
ii.	Issues of Land Grant	
7	**Conduct Awareness and Training Programmes**	
8	**Establishment of Income Restoration Programmes**	
9	**Establishment of grievance redress Mechanism and Operation**	
10	**Establishment of RPM setup.**	
11	**Monitoring and Evaluation of Resettlement**	
12	**Implementation of Agriculture Plan**	
i.	Implementation of Agriculture Plan	
ii.	Implementation of Land Acquisition Procedure	
iii.	Payment of compensation	
iv.	Possession of Land Ownership	
4	**Resettlement**	
i.	Selection of H.H. for resettlement and Transport	
ii.	Preparation of Resettlement Area Plan and Land Marking	
iii.	Handing over of Irrigable Allotments	
iv.	Handing over of Homestead allotments	
v.	Handing over of Commercial or Industrial allotments	
5	**Provision of Infrastructure Facilities**	
i.	Construction of Main & Market roads	
i.	Construction of Village Roads	
ii.	Construction of Social Infrastructure Building	
iii.	Establishment of Social Infrastructure	
iv.	Construction of irrigation infrastructure	

Chart 9.1 IMPLEMENTATION OF RESETTLEMENT ACTIVITIES IN RELATION TO CONSTRUCTION ACTIVITIES OF MORAGAHAKANDA

S/No.	Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
		1	2	3	4																
1	Reservoir Head works																				
2	Preparation of R.I.P.																				
3	Land Acquisition and Compensation																				
i.	Implementation of Agriculture Plan																				
ii.	Implementation of Land Acquisition Procedure																				
iii.	Payment of compensation																				
iv.	Possession of Land Ownership																				
4	Resettlement																				
i.	Selection of H.H. for resettlement and Transport																				
ii.	Preparation of Resettlement Area Plan and Land Marking																				
iii.	Handing over of Irrigable Allotments																				
iv.	Handing over of Homestead allotments																				
v.	Handing over of Commercial or Industrial allotments																				
5	Provision of Infrastructure Facilities																				
i.	Construction of Main & Market roads																				
i.	Construction of Village Roads																				
ii.	Construction of Social Infrastructure Building																				
iii.	Establishment of Social Infrastructure																				
iv.	Construction of irrigation infrastructure																				

IMPLEMENTATION OF LAND ACQUISITION PROGRAMME
MORAGAHAKANDA DEVELOPMENT PROJECT

S/No.	Description of the activities.	Time Frame																			
		1st Year				2nd Year				3rd Year				4th Year				5th Year			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Submission of Application for land acquisition																				
2	Publication of Section 2 Notice																				
3	Preparation of Advance Tracing																				
4	Implementation of Section 4 Procedures																				
5	Implementation of Section 5 Procedures																				
6	Implementation of Section 6 Procedures																				
7	Implementation of Section 7 Procedures																				
8	Implementation of Section 9 - Inquiry																				
9	Implementation of Section 10.1A - Decision																				
10	Valuation of Properties																				
11	Section 17 - Payment of Compensation																				
12	Publication of 38A or 38 Order																				
13	Taking over of possession																				

CHAPTER TEN

10 The Investment Budget

10.1 Cost of Compensation, Income Restoration Programme and Institutional Development

The total Investment Budget (Table 10.5) for Land Acquisition and Resettlement covers following components:

viii) Cost of Compensation – covers cost of all losses falling within the tank bed including 100m buffer zone, road deviation, elephant corridor, branch channel trace of system 'D' & electricity transmission line.
ix) Cost of Electricity supply restoration for isolated villages.
x) Cost of Resettlement Area Development
xi) Cost of Resettlement and relocation.
xii) Cost of Training and Income restoration
xiii) Cost of Agriculture Extension.
xiv) Cost of Monitoring and Evaluation
xv) Cost of Institutional Development

As a total, the total budget of resettlement and compensation is expected Rs. M 3283.102 (refer Table 10.1.3.3). The break down will be provided in the following sections.

10.1.1. Cost of Compensation

Determination of Compensation

The compensation payments for lost assets will be determined in terms of Circular No. 4/2008 of Secretary to the Ministry of Land and Land Development. The policy on compensation rates is the replacement value for structures and market value for land and trees. The task of acquisition is carried out by the Acquiring Officers of MASL under the direction of the Divisional Secretaries and the valuation of property is done by the officials of the Valuation Department.

10.1.1.1. Cost of Lost Assets

Table 10.1.1.1 Cost of Compensation - Moragahakanda Project (Tank bed, Road deviation, Elephant Corridor)

Item No.	Description of losses	Total cost Rs.
1.	**Developed Land**	
1.1	Paddy land	279,615,000
1.2	Highland and Homestead	536,800,500
1.3	Chena	16,974,000
1.4	Commercial Land	8,490,000
	Sub Total	**841,879,500**
2.	**Trees and Crops**	
2.1	Long Term crops	226,080,000
2.2	Medium Term crops	8,164,000
2.3	Short Term crops	2,032,500
	Sub Total	**236,276,500**
3.	**Structures**	
3.1	Permanent Building	1,159,637,500
3.2	Semi Permanent Building	396,807,000
3.3	Temporary building	6,628,500
3.4	Toilets and toilets pits	333,600
	Sub Total	1,563,406,600
	GRAND TOTAL	**2,641,562,600**

Table 10.1.1.2 Cost of Compensation - Thorapitiya Unit - LB of System F

Item No.	Description of losses	Total cost Rs.
1.	Payment of compensation for acquired paddy lands	48,750,000.00
	Total	**48,750,000.00**

Table 10.1.1.3 Cost of Compensation - Electricity Transmission Line

Item No.	Description of losses	Total cost Rs.
1.	Payment of compensation for acquired trees and crops	
1.1	Long Term	1,925,000
1.2	Medium Term	159,000
1.3	Short Term	94,000
	Total	**2,178,000**

Table 10.1.1.4 Cost of Compensation -Branch Channel Trace in Kaudulla LB Extension Area

Item No.	Description of losses	Total cost Rs.
1.	Developed Land	
1.1	Highland and home garden	2,691,000
	Sub Total	2,691,000
2.	Trees and crops	
2.1	Long Term	420,000
	Sub Total	420,000
3.	Structures	
3.1	Permanent Building	10,927,000
3.2	Temporary building	405,000
	Sub Total	11,332,000
	Grand Total	14,443,000

Table 10.1.1.5. Summary Cost of Compensation

Item	**Description**	**Total Cost**
1.	Moragahakanda Project (Tank bed, Road Deviation & Elephant Corridor)	2,641,562,600.00
2.	Thorapitiya Unit - LB of System F	48,750,000.00
3.	Electricity Transmission Line	2,178,000.00
4.	Branch Channel Trace in Kaudulla LB Extension Area	14,443,000.00
	Total	2,706,933,600.00

10.1.2. Cost of restoration of Electricity supply to Isolated Villages

There are few isolated villages where the existing electricity supply lines are getting disrupted for which new connections are to be given.

Item No.	**Description**	**Total cost Rs.**
1.	Electricity Line	37,359,200

10.1.3. Cost of Resettlement Area Development

Table 10.1.3.1. Cost Estimate for Resettlement Area Development in System 'D',

Item	Description	Total Cost Rs.(M)
1	Cost of Irrigation Infrastructure	1821
2	Cost of social infrastructure	1151
	Total	2971

Table 10.1.3.2. Cost estimate for Resettlement Area Development in System 'F',

Item	Description	Total Cost Rs .(M)
1	Cost of Irrigation Infrastructure	1063
2	Cost of social infrastructure	1002
	Total	**2065**

Table 10.1.3.3. Cost estimate for Ambana Junction

Item	Description	Total Cost Rs.(M)
1	Cost of social Infrastructure	300
	Total	**300**

Table 10.1.3.3. Summary- Cost of Irrigation and Social Infrastructure (System F, D and Ambana Junction)

No.	Description of work	Total cost Rs .(M)
(1)	**System F**	2971
(2)	**System D**	**2065**
(3)	**Ambana Junction**	**300**
	Total	**5336**

10.1.4. Cost of Resettlement and relocation.

In addition to the legitimate compensation payments for the lost assets, MASL has introduced following assistance package to the settlers with a view to facilitate the rapid enhancement of their livelihood at the new location, in conformity with the NIRP.

Table 10.1.4. Cost of Resettlement and relocation

Item	Description	No of Affected families	Cost per family (Rs)	Total Cost
1.	Transport Allowance	1581	10,000	15,810,000
2.	Shifting Allowance	1581	10,000	15,810,000 15,100,000
3.	Ex-gratia Payment to families opted to system'D"	302	50,000	31,620,000
4.	Material allowance - Housing	1581 1581	20,000 5,000	7,905,000 1,000,000
5	- Lavatory	05	200,000	
	- Re-establishment of temple			
	Total			**87,245,000**

10.1.5. Cost of Training and Income restoration

Table 10.1.5. Cost of Training and Income restoration

Iteme	Description	No. of Units	Unit Cost Rs.	Total Cost Rs.
1	Training	--	--	18,120,000
2	Assistance to Establish Small Businesses	92 nos	10,000	920,000
3	Special assistance to vulnerable HH ii) Living Allowance	14 HH X 18months	3000 (Per month)	756,000
	ii)Income Restoration Grant	161HH	25000	4,025,000

4	Meetings & Discussions(Workshops) Awareness Programmes, PRA etc.	200	25,000	5,000,000 10,000,000
5	Assistance for loss of employment	123	18,000	2,214,000
	Credit Facility – Revolving Fund	--	--	25,000,000
	T O T A L			66,035,000/=

10.1.6. Cost of Agriculture Extension

Table 10.1.6. Cost of Agriculture Extension

Item No.	Description	Amount (Rs.)
1.	Implementation of Agriculture Extension Plan	**57,514,000.00**

10.1.7. Cost of monitoring and evaluation

This is basically meant for any expenditure to be incurred on external monitoring & evaluation. It is estimated as 1% of the Acquisition & Resettlement Cost .

Table 10.1.7. Cost of monitoring and evaluation

Item No.	Description	Amount (Rs.)
1.	Monitoring and Evaluation (1%)	29,550,868

10.1.8. Cost of Establishment of administrative setup and their functions.

Table 10.1.8. Cost of Establishment of administrative setup and their functions.

Item No.	Description	Amount (Rs.)
1.	Institutional Development and other Cost(10%)	298,463,767

- ***Table 10.2 Summary- Cost of compensation & resettlement (Investment Budget)***

Item	Description of Activities	Amount in Rs(M)
1	Acquisition & Payment of compensation	2706.934
2	Resettlement and Relocation	87.245
3	Agriculture Extension	57.514
4	Restoration of Electricity supply to Isolated Villages	37.359
5	Training and Income restoration	66.035
	sub total	2955.087
6	Monitoring and Evaluation (1%)	29.551
	sub total	2984.638
7	Establishment of administrative setup (10%)	298.464
	Grand Total	3283.102

Note: The above Total Cost excludes the cost of infrastructure facilities in resettlement areas of System "F"& "D". However it is covered in the Total Cost of the Project.

10.3. Investment Budget

Table 10.3 Implementation Targets

Acquisition of land & properties in Tank Bed, Elephant Corridor & Road Deviation

Item	Description of activity	Total Physical Target (Ha.)	Total Financial Target (Rs.M)	1 Year (Ha.)	2 Year (Ha.)	3 Year (Ha.)	4 Year (Ha.)	5 Year (Ha.)
1	Submission of applications	4148		4148	-	-	-	-
2	Publication of Section 2	4148		4148				
3	Preparation of Advance Tracing	4148		4148				
4	Publication of Section 4 Notice and holding inquires	4148		2074	2074			
5	Decision to acquire land under Section 5	4148		155	1919	2074		
6	Preparation of Preliminary Plan under Section 6	4148		155	1919	2074		
7	Publication of Section 7 Notice	4148		155	1919	2074		
8	Holding Section 9 Inquiries	4148		155	467	2074	1452	
9	Issue of 10.1.A decision	4148		155	467	2074	1452	
10	Issue of Section 17 Awards and payment of compensation	4148		155	467	1659	1245	622
11	Publication of 38 or 38A Notice and taking over of possession			155	467	1659	1245	622
	Financial Utilization (Rs.M)		2706.934	101.51	304.53	1082.774	812.08	406.04

10.4 Financial Plan

The total Investment Budget on Acquisition & Compensation, Restoration of Electricity supply to Isolated Villages, Resettlement & Relocation, Training & Income restoration, Agriculture Extension, Monitoring & Evaluation and Institutional Cost amounts to Rs. 3278.602 Million (excluding irrigation & social infrastructure development cost)

Table 10.4 - Financial Plan

Items	Description of activities	Budget for 5 years (Rs.M)					Total
		1	2	3	4	5	
1	Payment of Compensation	101.51	304.53	1082.774	812.08	406.04	**2706.934**
2	Resettlement and Income Restoration	8.724	17.45	17.449	21.811	21.811	**87.245**
3	Restoration of Electricity Supply to isolated villages	18.680	18.679	-	-	-	**37.359**
4	Training and Income Restoration	-	6.604	6.604	19.810	33.017	**66.035**
5	Agriculture Extension	-	11.503	11.503	11.503	23.005	**57.514**
6	Monitoring and Evaluation	4.433	7.386	4.433	8.866	4.433	**29.551**
7	Administrative and Other Related Costs	73.474	45.455	45.455	73.474	60.606	**298.464**
	Total	**206.821**	**411.607**	**1168.218**	**947.544**	**548.912**	**3283.102**

Table 10.5 - Summary of Financial Plan

Item No.	Time period	Budget (Rs.M)	%
1	1st Year	**206.821**	**6**
2	2nd Year	**411.607**	**13**
3	3rd Year	**1168.218**	**35**
4	4th Year	**947.544**	**29**
5	5th Year	**548.912**	**17**
	Total	**3283.102**	**100**

10.5 Source of Funding

The total cost of acquisition and resettlement budget will be borne by GOSL.

CHAPTER ELEVEN

11. Conclusion and Recommendations

11.1 Conclusion

The data collected during two Socio-economic surveys in 2006 & 2008, interviews with community leaders, priests etc… in the area, few Grama Niladaris ,Divisional Secretaries of Naula, Laggala-Pallegama, Elahera & Medirigiriya, divisional and village level Government officials and the data from the documents of Survey Department, Census & Statistics Department, Divisional Secretariat were used in preparing the RIP.

The project will result few negative impacts on the social life of the people in the inundated and in the surrounding areas. They will lose their land and properties with the religious places and the livelihood. Some common facilities around Kongahawela Bazaar will also be affected.

11.2. Recommendations

The under-mentioned recommendations are made to mitigate above negative impacts based on the findings of the studies and other data:-

- Displaced people will be relocated in System 'F' as far as possible due to its close proximity to the present villages. The balance will be relocated in Kaudulla LB Extension Area at their choice.
- Reforestation programme will be carried out in the 100 Meter Buffer zone as some scrub jungles will be affected by the Moragahakanda reservoir.
- Reservation and forest area will be protected by fencing and be handed over to Forest Department to enforce better management in these areas.
- There are several encroachers from the surrounding areas who are engaged in Chena cultivation in System 'F' area. Eventually they would lose their livelihood once this area is developed for irrigated agriculture. Hence, the project will facilitate creation of several investment opportunities for them.
- Payments of Way Leave clearance will be effected for those who lose cultivations during project construction activities.

ANNEXURE

Annexure No I:

Questionnaire on Socio Economic Survey on Land & families Affected

by Moragahakanda- 2006

SOCIO ECONOMIC RESEARCH ON LAND AND FAMILIES SUBMERGED BY MORAGAHAKANDA AND KALUGANGA TANK – 2006

Symbol No:
Main families (1) / Sub families (2) [ ]

1. PRIMARY DATA

1. a
1. District : .....
2. Divisional Secretarial Division : .....
3. Grama Niladari Division (Name / No): .....
4. Village / Town / Road : .....
5. Address : .....

6. Order No: of election list [ ]
7. No. of household [ ]
8. Identity Card No. [ ]

1. b
1. Residence Name : .....
2. Name of the Owner : .....
3. Permanent address of the Owner : .....
4. Gender, Race, Religious (Fill the following table)

Particular	Gender 1/	Race 2/	Religion 3/
House hold			
Husband / Wife			

1/		2/		3/	
1.	Female	1.	Sinhalese	1.	Buddhist
2.	Male	2.	Sri Lankan Tamil	2.	Christian
		3.	Indian Tamil	3.	Hindu
		4.	Moor	4.	Islamic
		5.	Malay		
		6.	Burger		

5. Do you receive Samurdhi? Yes (1) No (2) [ ]

6. Monthly validity of received money / goods. Rs. /cts. [ ]

Name of the Researcher : - .....
Designation : - .....
Date of Research : - .....
Signature : - .....

2. GENERAL INFORAMATION OF FAMILY MEMBERS

1/	2/	3/	4/	5/		6/	7/	8/	*9/	10/	11/	*12/
Serial No.	Relationship to House Holder	Female (1) Male (2)	Age (Years)	Level of Education	Schooling / Non Schooling	Activity	Nature of Main Occupation	Main Designation	Annual Income receive from main occupation (Rs.)	Nature of Secondary occupation	Secondary designation	Annual income receive from secondary occupation (Rs :)
1.												
2.												
3.												
4.												
5.												
6.												
7.												
8.												
9.												
10												

2/ Relationship to House Holder

1. House Holder
2. Wife/Husband
3. Son/Daughter
4. Brother/Sister
5. Brothers'/Sisters' Son/Daughter
6. Son in Low/Daughter in Low
7. Mother/Father
8. Mother in Low/Father in Low
9. Other (mention)

3/ Gender

1. Female
2. Male

5/ Level of Education

1. 1-5 year
2. 8-6 year
3. 9-11 year
4. O/L
5. A/L
6. Under graduate
7. Graduate
8. Diploma holder
9. Other qualification holder
10. Non schooling but literate
11. Non schooling but illiterate

6/ Activity

1. Trained occupation – full time
2. Trained occupation – part time
3. Untrained – occupation – full time
4. Untrained – occupation –part time
5. Unemployment (job expected)
6. Under employment
7. Unemployment (no job expectation)
8. Student
9. Pensioned/Old/Disabled/Child
10. House Wife
11. Other (mention)

7/ -10/ Nature of occupation

1. Farming
2. Salaried employment - government sector, permanent
3. Salaried employment - government sector, temporary
4. Salaried employment - private sector, permanent
5. Salaried employment - private sector, temporary
6. Business
7. Agricultural labour
8. Non agricultural labour
9. Foreign employment
10. Land drivers
11. Three-wheeler driver
12. Heavy vehicle driver
13. Gem mining
14. Other self employment (mention)
15. .....
16. .....
17. Other

8/ Designation/Post

1. Administration
2. Executive Officer
3. Other Officer/Teachers
4. Clerk
5. Typewriters
6. Office Assistants
7. Daily Worker
8. Trade Assistant
9. Driver
10. Machine Operators/Technician/Carpenter/Mason
11. Business/Broker
12. Labourer
13. Helper
14. Other .....
15. .....

Income from farming, business, pension and self employment should not be mentioned here.

3. DETAILS OF RESIDENCE

3.1 Information of residential house and other buildings.

Building	1/ Ownership	2/ Usage	3/ No: of stories	4/ Square	5/ No of rooms	6/ Roof	7/ Floor	8/ Wall	9/ Electricity facilities	10/ Telephone facilities	11/ Toilets(residence)
Residence											
Other buildings 1											
2											
3											

1/ Ownership

1. single ownership
2. joint ownership
3. tax
4. Rent
5. Encroach
6. other (mention)

2/ Usage

1. Resident
2. business activities
3. storage activities
4. rent for resident
5. rent for business
6. other (mention)

6/ Roof

1. tile
2. asbestos
3. other sheets
4. cadjan
5. hay/illuk

7/ Floor

1. cement
2. flow tile/terrazzo
3. mud
4. plank
5. other (mention)

8/ Wall

1. Bricks
2. Cement blocks
3. Plank
4. Cadjan
5. sheets
6. mud
7. other (mention)

9/ Electricity

1. available
2. unavailable

10/ Telephone facilities

1. wire
2. wireless
3. mobile phones
4. unavailable

11/ Toilets

1. available
2. unavailable
3. water seal
4. other (mention)

3.2 Water usage

3.2.1 Drink
3.2.2 Bathe
3.2.3 Washing
3.2.4 Agriculture
3.2.5 For animals

3.2.6 Industrial activities
3.2.7 Other (mention)

1. Your own well (open)
2. Neighbor well (open)
3. Own tube well
4. Neighbor tube well
5 Common open well
6 Common tube well
7 Irrigational cannel
8 Main irrigational tank
9 Small irrigational tank
10. River
11. Natural canal
12. Tube water
13. Tube water (others)
14. Irrigational canal
15. Bowser
16. Collected rain water
17. Sewerage
18. Other (mention)

3 Power usages

1. Main electricity
2. Mechanical engine
3. Solar battery
4. Bio gas
5. No electricity if not electricity
   Petrol max
   Chimney lamp
   Bottle lamp

3 Cooking

1 Main power
2 Gas
3 Kerosene cooker
4 Solar heat
5 Bio gas
6 Fire wood
7 Other

4 OWNERSHIP OF THE LANDS AND

4.1Size of the owned land, type and usage.

Type		Size				Present usage	Present usage	Location of the land	Annual payment
		Ac :	Ru :	Per :	1/	2/	2/	3/	Rs:
Irrigated land (paddy)									
1	Traditional								
2	Distributed by the state								
3	Bought (lawfully)								
4	Bought (unlawfully)								
5	Leased								
6	Tenant cultivate (anda cultivate)								
7	Pawned								
8	Squatted								
9	Squatted reservation								
10	Other								
Total									
land									
1	Traditional								
2	Distributed by the state								
3	Bought (lawfully)								
4	Bought (unlawfully)								
5	Leased								
6	pawned								
7	Squatted								
8	Squatted reservation								
9	other								
Total									
Business									
1	Traditional								
2	Distributed by the state								
3	Bought (lawfully)								
4	Bought (unlawfully)								
5	Leased								

6	rented								
7	pawned								
8	Squatted								
9	Squatted reservation								
10	other								
Total									
Other									
1	Traditional								
2	Distributed by the state								
3	Bought (lawfully)								
4	Bought (unlawfully)								
5	Leased								
6	Pawned								
7	Squatted								
8	Squatted reservation								
9	**Other**								
Total									

1/
1. Sole ownership (Praveni)
2. Private deed
3. Swarna bumi
4 Jaya bumi
5. Lease permits
6. Written document by a certified Notary public
7. Written document
8. Verbal permission
9. LD permits under the land fertilizing act.
10. Other

2/
1. Paddy cultivation
2. Other short term crops
3. Perenial Crop
4. Animal husbandry
5. Business activities
6. Fresh water fishing industry
7. Residence
8. Chena
9. Other (mention)

3/ Location of land

1. Inside the residential Grama Niladari division ☐
2. Inside the DS division ☐

4.2 Persons who did the development activities in the land.

1. Owner ☐ 2. User ☐

4.3 Margin of the land

1. Wall ☐
2. Barbed fence ☐
3. Pole fence ☐
4. Other ☐

4.4 Further information about squatted lands.

Type 1/	Size (Acr :)	Nature of the land 2/	Reason 3/	Time (year)	Present usage 4/

1/	2/	3/	4/
1. Land	1. Land for common facilities	1.No other land	1. For a house
2. Muddy land	2. Canal system	2.Make large the	2. For a Cultivation
3. Business	3. Tank bed area Cultivation	present land	3. For a house and
4. Other	4. Forest reservation	3. For a child	4. For businesses
	5. Highway reservation	4. Other	5.Other
	6. Other		

5. DETAILS OF INCOME

5.1 Agricultural activities

(a) 2004/ 2005 data for Maha season

Crop	Quantity			Production				Price of a unit (Rs :)	Gross profit (Rs :)	Production Cost (Rs :)
	Ac:	Ru:	Per:	Unit	Whole production	Paid as goods	Sold			
Paddy cultivation										
Other field crops										
1.										
2.										
3.										
4.										
5.										
6.										

X

7. DETAIL OF DEBTS

7.1 Have you obtained a loan last year? 1. Yes 2. No

7.2 If not give reason

2/1. Loan not needed
2. Loan not settled
3. No desire for loans
4.Other

7.3 Agricultural loans

Institute 1/	Season/ Year (nearest)	Loan amount (R)	Interest rate (% annual)	Paid amount up to now (R)	Amount have to pay (R)

7.4 Non-agricultural loans

Institute	Year (nearest)	Reason 2/	Loan amount (R)	Interest rate (% annual)	Paid amount up to now (R)	Amount have to pay (R)

1/

1. State Mortgage Bank
2. Other State Banks
3. Private Banks

2/

1.Build a house
2.Start a business
3. To improve a current Business
4. Improve other Institute
5. Private loan
6.Other private reason
7.For funeral/feast
8. To buy a land
9. Other

8. ASSETS (MAIN COMPONENTS IN THE HOUSE)

		Amount				Amount	
1	Radio/ cassette			16	Three wheeler		
2	Television			17	Water pump		
3	Computer			18			
4	Sewing machine			19	Harvesting machine		
5	Refrigerator			20	Sewing machine		
6	Gas cooker/ Electric Cooker			21	Weeding machine		
7	Electric iron			22	Oil tank (knapsack)		
8	Bicycle			23	Oil spray machine (machinery)		
9	Motor bike			24	Electrical fan		
10	Car			25	Almirah		
11	van			26	Cabinet		
12	Lorry/Truck			27	living room furniture		
13	Bus			28	Beds		
14	Two wheel tractor			29	Chairs		
15	Four wheel tractor			30	Tables		
				31	Other		

9. MEMBERSHIP OF THE SOCIETIES – PERSON WHO ANSWER AND OTHER MEMBERS

Member of Family	Organization	Designation
1/	2/	3/

1/
1. House hold
2. Wife
3. Son
4. Daughter
5. Mother/Mother in Low
6. Father/Father in Low
7. Other

2/
1. Farm Organization 5.
2. Farm society
3. Funeral aid society
4. Women society
5. Community Development Society
6. Sport society
7. Samurdhi Society
8. Sanasa
9. Sarvodaya
10. Community based Organization
11. Other

3/
1. President
2. Secretary
3. Member
4. Treasurer
5. Other

10. SERVICES AND OTHER FACILITIES AVAILABLE NOW

	Type of Service Centers	Level/Nature *	Distance from Home k.m.
1	Shops		
2	Fair		
3	Hospital		
4	School		
5	Post Office		
6	Bank		
7	Court		
8	Office Divisional Secretariat		
9	Divisional council		
10	Community hall		
11	Play Ground		
12	Office of Sri Lanka Electricity Board		
13	Water Supply and Drainage Board		
14	Office of Telecom		
15	Co-operative		
16	Other (mention)		

*1. If it is schools mention whether it is a Primary/Junior/Senior.
2. If it is a hospital mention whether it is a rural or district.

11. INFORMATION NEED FOR RESETTLEMENT

1. Do you agree to leave due to Moragahakanda / Kaluganga Project?

Yes ☐ No ☐

If not give reasons:

1. Losing employment. ☐
2. Lost of the connection between relations ☐
3. Lost of connection between neighbors and friends. ☐
4. Effect on income ☐
5. Effect on agricultural productions ☐
6. Effect on nonagricultural productions. ☐
7. Effect on social and cultural activities ☐
8. Effect on children education. ☐
9. Other …….. ☐

2. What are the suggestions you meet for resettlement?

1. Receiving sufficient amount as Compensation. ☐
2. A land need with basic facilities. ☐
3. Must provide the land to relatives in the same unite where the person is settled. ☐
4. Neighbors should get lands in that same unit. ☐
5. Aids for the progress of your own job. ☐
6. Other ☐

3. Alternatives select in resettlement

1. Paying compensation for land and the development. ☐
2. Paying compensation for the development and providing land in the closer region. ☐
3. Paying compensation for the development and providing land in Medirigiriya new development region. ☐

12. CURRENT PRICE OF THE LANDS IN THE REGION

Type	Unit	General price (R)
Land for residence		
For Agricultural activities – land		
For Agricultural activities - muddy		
Commercial Land		

Annexure II:

Questionnaire on Socio Economic Survey on Affected Families in Moragahakanda Reservoir Area - 2008

Code No:
Chief Household-1/ Sub House hold – 2

Socio - Economic survey of Affected families in Moragahakanda reservoir area - 2008

Impact	Due to inundation	Loss of access road	Loss of Employment place	Due to New road construction	Due to Burrow pit	Due to new towns / Villages
Completely						
Partly						
Isolated						

01. a Primary information

1. 1 District
1.2 Divisional Secretary Division
1.3 Grama Niladhari Division name & Number
1.4 Village name / Town / Road
1.5 Occupant name
1.6 Address
1.7 Number of polling name list
1.8 Household No
1.9 Identity card No

01 b

1.1 Year of settled

Nature of ownership of the house
1. Owner
2. Rent
3. Leased
4. Encroached
5. Other (Pls. Specify)

1.2 If occupant is not owner indicate the owner's name
1.3 Permanent address of the owner

1

Code No:

1.4 Gender / Ethnicity / Religion

Description	Gender -1/	Ethnicity -2/	Religion -3/	Civil status -4/
Household				
Husband / Wife				

1/	2/	3/	4/
1. Female	1. Sinhala	1. Buddhist	1. Married
2. Male	2. Sri Lankan Tamil	2. Christian	2. Unmarried
	3. Indian Tamil	3. Hindu	3. Widow
	4. Muslims	4. Islam	4. Legally not married
	5.Malay		5. Separated
	6.Burger		6.Divoced

1.5 Whether Samurdhi recipient Yes (1) No(2)
1.6 Value of monthly received cash /Goods Rs:

2. General information and income of the family members

1	2	3	4	5		6	7	8		9	10	11		12	13
Serial No	Relation ship to HH	Female (1) Male (2)	Age	Education Level	No. of child. Schooling & not	Type of occupation	Nature of main occupation	Rank & Designation (Main)	Annual Income from Main occupation	Impact for main occup. Due to reservoir	Nature of secondary occupation	Rank & Designation (Secondary)	Annual Income from 2nd occupation	Impact for 2nd occup. Due to reservoir	Impact for property due to reservoir

2/ **Relation ship to household**
1. Household
2.Wife / Husband
3. Son / Daughter
5. Son / Daughter of Brother/ sister
6. Mother / father in law
7. Other (Specify)

3/ Gender
1. Female
2. Male

4. Brother/ sister

5/. Education Level

1. Year 1 – 5
2. Year 6 – 8
3. Year 9 – 11
4. GCE – O/L
5. GCE – A/L
6. Under graduate
7. Graduate
8. Diploma
9. Other certificate
10. Non Schooled / Able to Read & Write
11. Non Schooled / unable to Read & Write

6/. Type of Occupation

1. Skilled occupation -full time
2. Skilled occupation -part time
3. Unskilled occupation -full time
4. Unskilled occupation -part time
5. Unemployed (Pending job)
6. Under Employed
7. Student
8. Retired
9. Old
10. Physically disabled
11. Mentally disabled
12. Child
13. House wife

7/ – 11/ Nature of Main & Secondary occupation

1. Farmer
2. Permanent –Government
3. Temporary – Government
4. Permanent –Private
5. Temporary – Private
6. Business
7. Agri. labour
8. Non Agri. Labour
9. Foreign Employee
10. Driver- Land vehicle
11. Three wheel Driver
12. Driver heavy vehicle
13. Gem mining
14. Self employment
15. Animal husbandry
16. Other

8/ Rank / Designation

1. Administration
2. Executive
3. Teacher
4. Clerk/ Parallel grade
5. Typist
6. Office Aid
7. Labour
8. Sales assit.
9. Driver
10. Machine operator
11. Technician
12. Carpenter
13. Mason
14. Middleman (Business)
15. Labour
16. Helper
17. Security
18. Farmer
19. Housemaid
20. Gament Employee
21. Volentier
22. Other

9/ - 13/ Impact for Main / Secondary occupation due to reservoir

1. Loss
2. Not loss
3. Loss of working place

03. If loss information of building & land

Building	1/	2/	3/	4/	5/	6/	7/	8/	9/	10/	11/
	Owner ship	Usage	No. of Stories	Sq ft.	No. of rooms	Roof	Floor	Walls	Electricity	Telephone	Toilet

Building
1. Residence
2. Rice mill
3.Butique
4. Shop
5. Stores
6. Grocery
7. Buildings(Not completed)

1/ Ownership
1. Single owner
2. Join owner
3. Leased
4. Rent
5. Encroached
6.Other (Specify)

2/ Usage
1 Residence
2.Business
3.Stores
4.Rented for residence
5. Rented for business
6 Other (Specify)

6/ Roof
1 Tile
2.Asbestos
3.Other sheet
4. Cadjan
5. Straw / Iluk
6. Tile/Other Sheet
7.Cadjan / Other Sheet

7/ Floor
1 Cement
2.Floor tile / terrazzo
3. Clay
4. Flanks
5. Other (Specify)

8/ Walls
1 Bricks
2. Cement
3. Cement blocks
4. Flanks
5. Corrugated iron
6 Clay
7 Other (Specify)

9/ Electricity
1. Available
2.Not Available

10/ Telephone
1. Available
2. Available (With code)
3. Available – Cellular
4 Not available

11/ Toilet
1. Not available
2. Pit
3 Water sealed
4 Other (Specify)

3.1 Land Information

					Total extent			Inundated to reservoir			Permanent crops (3)			Seasonal crops(4)	
Land	Ownership (1)	Deed /Document(2)	Within GND (-/)	Outside GND (-/)	A	R	P	A	R	P	Type (3.1)	No. of trees	Age of trees (3.2)	Type (4.1)	No. of trees
Highland															
1															
2															
3															
Paddy land															
1															
2															
3															

1/ Ownership	**2/ Deed/ Document**	
1.Single owner	1. Outright (Praveni)	7. Annual permit
2 Join	2 Outright	8.Leased
3.Ande	3 Swarnabhoomi	9 Rent
	4. Jayabhoomi	10 Encroached
	5. LDO	11Written permit
	6. CLO	12. Other

3.1Type	**3.2 Age of trees**	**4.1 Type**
1. Coconut	1. Year 1- 5	1. Banana
2. Teak	2 Year 6 – 10	2. Orange
3. Satin wood	3 Year 11 – 15	3 Pomegranate
4.Jack	4.Year 16 – 20	4. Guava
5.Halmilla	5. Year More than 21	5. Pineapple
6.Mango		6. Lime
7.Beli		7. Other..
8.Other		

04 **Information of Private vehicles**

1. Bicycle	2.Moter bicycle	3.Moter car
4. Van	5 Lorry	6. Two wheel tractor
7. Four wheel tractor	8. Three wheeler	9 Other

Information to be filled only for the Vulnerable families (5 – 5.1- 5.2)

5 Persons with Physically or Mentally weaknesses

1 Own work could do him / her self
2 Need helper for day to day work
3 Mentally / Physically disable by birth

Impact of physically disabled persons due to reservoir project

1.Loss of neighbors / Relatives who are helping presently
2 Inconvenience for go to hospital in emergency
3 Inconvenience for go to the medical clinic
4.Impact for the income

Suggestions for resettlement of disable / Widows / lonely persons

1.Only reasonable cash compensation
2 A land with basic facilities
3 Land should be given for relatives in same unit
4. Land should be given for neighbors in same unit

5

5. Construction of a house
6. Other

06. Information of the Families who will be affected indirectly due to Reservoir project

6.1 Economically isolated

	Nature of the employment	1 A family will be lost the employment place due to reservoir	2 A family will be lost the job due to loss of the business	3 A family will be lost the job due to reservoir
1	Paddy cultivation			
2	Chena cultivation			
3	Vegetable garden			
4	Other agri. activities			
5	Sand mining			
6	Selling of Fire wood			
7	Jobs in Paddy/ Saw mills			
8	Gem mining			
9	Animal husbandry			
10	Agri. labour			
11	Non agri. labour			
12	Business			
13	Other (Specify)			

6.2 Isolation due to loss of services

	Type of Service	Loss due to reservoir	Distance for nearest place
1	Shops		
2	Fair		
3	Hospital		
4	School		
5	Post office		
6	Bank		
7	Court		
8	Divisional Secretary office		
9	Pradesheeya sabha		
10	Community hall		
11	Electricity board		
12	Play ground		
13	Water board		

14	Telecom office		
15	Co-operative		
16	Cemetry		
17	Library		
18	Other		

6.3 Human impact been isolates

1. Loss of relationship between relatives
2. Loss of relationship between neighbors and friends
3. Loss of religious places
4. Other

07. Loss of infra-structures due to Isolation

1. Electricity 2. Roads 3 Telephone 4 Water 5. Other

7.1 Loss of Religious / Cultural centers due to isolation

Center	Partly loss	Totally loss
Buddhist Temple		
Kovil		
Christian church		
Mosque		
Archeological places		
Cultural places		
Others		

08Any Suggestions been isolated

1.Acquisition of land and obtaining a new land for settling
2. Request for Infra-structure development and economic assistance to stay in the village
3. Acquisition of land , obtaining a cash compensation
4. Other

09. Concern of land owners those affected their houses, farms and structures due to Reservoir

9.1 Your Suggestions with regard to resettlements

1 To obtain adequate money as compensation
2.Cash compensation and land with amenities
3.Cash compensation and own selection of land for settlement
4.Request of a land together with other relatives and neighbors
5 Request a land for living alone
6. Other

* Give two options according to priority

7

9.2 Options for resettlement

1. Kalu ganga area –System F
2. Medirigiriya -System D
3. Bowatenna / Mahakanadarawa

9.3. Concern of land owners and disabled families those affected their houses, farms and structures due to Reservoir

1. Only Cash compensation for the land
2. Only land with amenities
3. Cash compensation and assistance for house construction
4. Construction of a new house
5 Land and assistance for house construction
6 Other

10 Any other matters

1
2
3

Name of the Investigator
Designation
Date of surveyed
Signature

Annexure III:

Questionnaire on Survey of Commercial Establishments in Moragahakanda Reservoir Area – 2008

Survey of Commercial sites in Moragahakanda reservoir area - 2008

01. Name of the business owner
02. Name of the business land owner

	Nature of ownership	A	R	P
1	Outright (Praweni)			
2	Outright deed			
3	Swarnabhoomi			
4	Jayabhoomi			
5	Land Dev. Ordinance			
6	Crown Land Ordinance			
7	Annual permit			
8	Leased			
9	Rent			
10	Encroachment			
11	Written permit			
12	Other			

03. Grama Niladhari Division :-
04. Household No:-
05. Nature of business

No	Business	Mark
1	Residence	
2	Rice mill	
3	Boutique	
4	Shop	
5	Stores	
6	Grocery	
7	Incomplete building	
8	Other	

06. Establishment of business
Join with residence :
Separate with residence:
Other

1

07 Building information

Building	1/	2/	3/	4/	5/	6/	7/	8/	9/	10/	11/
	Owner ship	Usage	No. of Stories	Sq ft.	No. of rooms	Roof	Floor	Walls	Electricity	Telephone	Toilet
1											
2											
3											

Building	**1/ Ownership**	**2/ Usage**
1. Residence	1. Single owner	1 Residence
2. Rice mill	2. Join owner	2.Business
3.Butique	3. Leased	3.Stores
4. Shop	4. Rent	4.Rented for residence
5. Stores	5. Encroached	5. Rented for business
6. Grocery	6.Other (Specify)	6 Other (Specify)
7. Buildings(Not completed)		

6/ Roof	**7/ Floor**	**8/ Walls**
1 Tile	1 Cement	1 Bricks
2.Asbestos	2.Floor tile / terrazzo	2. Cement
3.Other sheet	3. Clay	3. Cement blocks
4. Cadjan	4. Flanks	4. Flanks
5. Straw / Iluk	5. Other (Specify)	5. Corrugated iron
6. Tile/Other Sheet		6 Clay
7.Cadjan / Other Sheet		7 Other (Specify)

2

9/ Electricity	**10/ Telephone**	**11/ Toilet**
1. Available	1. Available	1. Not available
2.Not Available	2. Available (With code)	2. Pit
	3. Available – Cellular	3 Water sealed
	4 Not available	4 Other (Specify)

08 No. of employees :

09 Business registration : Yes No

10 If yes, Put the registration No:

11. Commenced date of the business:

13. Name of the business :

B1 Fill 1A or 1B as match with business

Type of lands to be inundated due to reservoir project	Land extent			Land value Rs:	Value of structures Rs:
	A	R	P		
1A Lands with houses & business					
1B Lands with commercial structures					
2. Farms: Animals					
Agriculture					
3. Other (Specify)					

Suggestions	Options for business reestablishment = Put Nos by priority		
	Kaluganga- System F	Medirigiriya – System D	Ambana Only highland
1 Choose a land for farm by himself			
2 Choose land for business			
3 Land giving himself, neighbor & business man			
4 Other			

B3 Suggestions in compensation for Business &Farms

1.Only cash compensation
2.Only alternative land
3 Land and cash
4 Land and assistance for establishment of Farms & business
5.Cash compensation & land for farm and business
6. Other

Name of the investigator:
Designation
Date of surveyed
Signature

Annexure IV:

Circular No 4/2008 by Ministry of Lands & Land development

ඉඩම් හා ඉඩම් සංවර්ධන අමාත්‍යාංශය
காணி, காணி அபிவிருத்தி அமைச்சு
Ministry of Land and Land Development

"ගොවිජන මන්දිරය", 80/5, රජමල්වත්ත පටුමග, බත්තරමුල්ල. "கொவிஜன மந்திரய", 80/5, ராஜமல்வத்தை வீதி, பத்தரமுல்லை.
"Govijana Mandiraya", 80/5, Rajamalwatte Avenue, Battaramulla, Sri Lanka.

MAHAWELI AUTHORITY OF SRI LANKA
02 SEP 2008
3517

මගේ අංකය எனது இல. My No. එල්ඩී/5/සී/8/1

ඔබේ අංකය உமது இல. Your No.

දිනය திகதி Date 2008.08. 29

අමාත්‍යාංශ වත්‍රලේඛ අංක 4/2008

Director / Lands
01 SEP 2008

RECEIVED
01 SEP 2008
Director General
M A S L

සියලුම ප්‍රාදේශීය ලේකම්වරුන්/
ඉඩම් අත්කර ගැනීමේ නිලධාරීන් වෙත,

ඉඩම් අත්කර ගැනීමේ පණත යටතේ වන්දි ගෙවීමේ ප්‍රායෝගික ප්‍රතිපත්තියක් ක්‍රියාත්මක කිරීම

අමාත්‍ය මණ්ඩලය විසින් අනුමත කරන ලද ඉහත ප්‍රතිපත්තිය යටතේ වන්දි තක්සේරු කිරීම සම්බන්ධයෙන් අදාල උපදෙස් දැනටමත් මා විසින් ප්‍රධාන තක්සේරුකරු වෙත ලබාදී ඇත. ඒ අනුව අමාත්‍යාංශය විසින් අනුමත කර ඇති පරිදි වන්දි තක්සේරු කිරීමේදී පාදක කරගත යුතු කරුණු පහත දක්වා ඇත.

අනු අංකය	වන්දි ශීර්ෂ	සංශෝධිත ව්‍යවස්ථාපිත තක්සේරුව යෝජිත
01	වෙළඳපල වටිනාකම	පහත 1.1 සිට 1.4 දක්වා වන විධිවිධානයන්ට යටත්ව අත්කර ගනු ලැබූ ඉඩමේ වෙළඳ වටිනාකම/ප්‍රතිෂ්ඨාපන වියදම 1.1 ඉඩමකින් කොටසක් අත්කර ගනු ලැබූ විට ඉනි ඒකකයක් වශයෙන් එහි වෙළඳ වටිනාකම එම දේපළ සඳහා වෙළඳ පොලේ වටිනාකමට අඩු වන අවස්ථාවන්හි එම අත්පත් කරගනු ලැබූ කොටසේ වෙළඳ වටිනාකම මුල් ඉඩමේ වෙළඳ වටිනාකමට අනුපාතිකව විය යුතුය. 1.2. අත්කර ගනු ලැබූ ඉඩම් අභිප්‍රේත අත්කර ගැනීම පිළිබඳ දැන්වීම ප්‍රසිද්ධ කළ දිනයේදී පදිංචිය හා/හෝ ව්‍යාපාරික කටයුතු සඳහා යොදාගත් හෝ පදිංචිය හා/හෝ ව්‍යාපාරික කටයුතු සඳහා ඉදිරියේදී යොදා ගැනීමේ හැකියාව ඇති ගොඩනැගිල්ලක් වන අවස්ථාවන්හිදී සහ එය නැවත තැනීමට සහ /හෝ නැවත තැනීමට අපේක්ෂිත අවස්ථාවන්හිදී එසේ නැවත තැනීමට යන වියදම් සහ වෙළඳ වටිනාකම ගණනය කිරීම සඳහා පදනම් කරගත් ගොඩනැගිල්ලේ වෙළඳ මිළ අතර වෙනස අමතර වන්දියක් ලෙස ගෙවිය යුතුය. 1.3 කුඹුරු ඉඩමක් වනවිට එය පිරවීම සඳහා ගොවිජන සේවා කොමසාරිස් ජනරාල්ගේ අනුමැතිය ලබාගෙන ඇති අවස්ථාවන්හිදී සංවර්ධනයට යෝග්‍ය ඉඩමක් සේ සළකා එහි වෙළඳ වටිනාකම විය යුතුය.

		1.4 ව්‍යවස්ථාපිත කුලිකරුවකු පදිංචි ස්ථානයක් වූ විට 2002 අංක 26 දරණ ගෙවල් කුලී සංශෝධන පනතේ විධිවිධාන වලට යටත්ව වන්දි මුදල අයිතිකරු හා ව්‍යවස්ථාපිත කුලී කරු අතර අනුපාතිකව බෙදී යායුතුය.
02	අහිතකර බලපෑම් සහ වෙන්කිරීම්	අහිතකර බලපෑම් සහ වෙන්කිරීම් සඳහා ගෙවිය යුතු සම්පූර්ණ වන්දි මුදල
03	අත්කර ගැනීම නිසා ඉඩමේ අයිතිකරුට/වන්දි හිමිකරුට සිදුවූ බාධා කිරීම නිසා දැරීමට සිදුවූ අනෙකුත් වියදම් සඳහා වන්දි මුදල්	වන්දි පිළිබඳ නිර්වචනය සාධනය කිරීම සඳහා ඉහත 1 හා 2 ශීර්ෂ යටතේ ගෙවනු ලබන අත්කර ගනු ලැබූ ඉඩමේ වෙළඳ වටිනාකම පදනම් කර ගණනය කල වන්දි මුදලට අමතරව අයිතිකරුට/වන්දි හිමියාට අනන්‍ය වන සේ ගෙවිය යුතු අමතර වන්දි මුදල් පහත සඳහන් උප ශීර්ෂයන් පදනම් කරගෙන සහ වන්දි ඉල්ලීම් සැළකිල්ලට ගෙන ගණනය කළයුතුය. ❖ 09 වන වගන්තිය යටතේ වූ හිමිකම් පරීක්ෂණයට පෙනී සිටීම සඳහා වියදම ❖ විකල්ප පදිංචි ස්ථාන සොයා ගැනීමේ වියදම ❖ පදිංචිය වෙනස් කිරීමේදී දැරූ ප්‍රවාහන වියදම ❖ ව්‍යාපාරික ස්ථානයක් වහවිට ප්‍රවාරණ වියදම ❖ ගෘහභාණ්ඩ සහ යවිකිරීම් සඳහා නැවත යවිකිරීම සඳහා කළයුතු වියදම ❖ වැය වූ ගමන් වියදම් අදාළ පරිදි ❖ ව්‍යාපාර හානිය (පනත යටතේ දැනට දක්වා ඇති සීමාවන්ට යටත්ව) ❖ ව්‍යාපාරික හෝ කර්මාන්ත ශාලා නැවත ප්‍රතිස්ථාපනයේදී වැඩිවන පොදු කාර්යය පිරිවැය ❖ ද්විගුණනය වියහැකි වියදම් උදා :- කුලී, වරිපනම් යනාදිය ❖ දේපල අත්පත් කර ගැනීම නිසා අයිතිකරුට දැරීමට සිදුවන අනෙකුත් සියලුම වියදම් සහායනය වන පරිදි ගෙවීම්

		❖ වෙනත් බාධා කිරීම් සඳහා වන වන්දි හෝ මෙම පනතේ වෙනත් උප වගන්තියක් යටතේ නොගෙවනු ලැබූ ඉඩමේ වටිනාකම හා සෘජුව සම්බන්ධ නොවූ වෙනත් හානියක් සඳහා වන්දි මුදලක් ❖ නිවසක අයිතිකරුවෙක් හෝ ආයෝජන දේපලක් විස්ථාපනය (අවතැන්) වන අවස්ථාවකදී වෙළඳ වටිනාකමින් 10 % ක අමතර ගෙවීමක්

02. එබැවින් වන්දි ගණනය කිරීමේදී පාදක කර ගැනීමට හැකිවන පරිදි 9 වගන්තියේ පරීක්ෂණ වලදී එම වන්දි ශීර්ෂයන් ඔබ විසින් හඳුනාගෙන ඒ පිළිබඳ නිර්දේශද 10 (1) (අ) වගන්තිය යටතේ තීරණය සමඟ ප්‍රධාන තක්සේරුකරු වෙත ඉදිරිපත් කරන ලෙස කාරුණිකව දන්වමි. සෙසේ වෙතත් ගෙවනු ලබන මුලු වන්දි මුදල 7 වගන්තිය යටතේ දැන්වීමට අදාළව වන්දිලාභියා විසින් ඉදිරිපත් කල මුල් ලිඛිත හෝ වාචික වන්දි ඉල්ලීම නොඉක්මවිය යුතු බවද තවදුරටත් දන්වමි.

03. පනත යටතේ පොළී ගෙවීමට අදාල වන වන්දි මුදල පිළිබඳ ප්‍රධාන තක්සේරුකරු විසින් ඔබ වෙත වාර්තා කරනු ඇත.

04. මෙම වක්‍රලේඛයේ විධිවිධාන 2008 සැප්තැම්බර් 01 දිනට පසු නිකුත් කරනු ලබන 2 වගන්තියේ දැන්වීම්වලට අදාළ සියළුම අත්පත් යෝජනා සම්බන්ධයෙන් සහ දැනටමත් අත්පත් කර ගැනීමේ කටයුතු ක්‍රියාත්මකව පවත්නා ඉඩම් සම්බන්ධයෙන් වන විට දැනට 7 වන වගන්තිය යටතේ දැන්වීම් නිකුත් කර නැති සියළුම අත්පත් යෝජනා සඳහා පමණක් බලපැවැත්වේ.

05. 2008 සැප්තැම්බර් 01 දිනට පෙර 2 වගන්තියේ දැන්වීම් ප්‍රසිද්ධියට පත්කර ඇති ලාස් කමිටු ක්‍රමය ක්‍රියාත්මක වන ව්‍යාපෘති සඳහා මෙහි සඳහන් විධිවිධාන අදාල නොවේ.

ජයලත් ර.වි. දියානායක
ලේකම්
ඉඩම් හා ඉඩම් සංවර්ධන අමාත්‍යාංශය

පිටපත -

1. ප්‍රධාන තක්සේරුකරු - දැ.ගැ.ස.

Annexure V:

NIRP (National Involuntary Resettlement Policy)

Sri Lanka
National Involuntary Resettlement Policy (NIRP)

Review and Approval Process

- Discussed and approved by Working Groups on November 2nd 2000
- Discussed and approved by Steering Committee on December 4th 2000
- Distributed to Stakeholders December 2000
- Stakeholders written comments incorporated at National Workshop
- Discussed and finalized NIRP at Second National Workshop January 26th-28th 2001
- Distributed NIRP to National Workshop Participants and Steering Committee on February 1st 2001
- Reviewed and approved by Steering Committee on March 5, 2001
- Approved by Cabinet of Ministers on May 24, 2001

1. Rationale

Public and private sector development projects increasingly involve acquisition of land. People whose homes and lands are acquired then have to move elsewhere and resettle in locations that may be unfamiliar. In general, resettlement has not been very successful and there are several recent examples in Sri Lanka where people have shown resistance to projects that cause displacement. Among the significant consequences of poor resettlement have been impoverishment of affected people due to landlessness, homelessness, joblessness, relatively higher mortality and morbidity, food insecurity, lack of access to common property and public services, and disruption of the existing social organization. International, regional and national experience with resettlement has generated considerable knowledge on the planning and implementation of involuntary resettlement and this experience if used effectively can ensure that adverse impacts on affected people are fully addressed in terms of established policy objectives.

In Sri Lanka the Land Acquisition Act of 1950 as amended from time to time only provides for compensation for land, structures and crops. It does not require project executing agencies (PEA) to address key resettlement issues such as (a) exploring alternative project options that avoid or minimize impacts on people; (b) compensating those who do not have title to land; (c) consulting affected people and hosts on resettlement options; (d) providing for successful social and economic integration of the affected people and their hosts, and (e) full social and economic rehabilitation of the affected people.

The National Environmental Act (NEA), No. 47 of 1980, amended by Act, No. 56 of 1988 has some provisions relevant to involuntary settlement. The Minister has by gazette notification No. 859/14 of 23.2.1995 determined the projects and undertakings for which Central Environmental Authority (CEA) approval is needed in terms of Part IV C of the NEA. The schedule includes item 12, which refers to *involuntary resettlement exceeding 100 families*, other than resettlement resulting from emergency situations. However these provisions do not adequately address key resettlement issues mentioned in paragraph 2 above.

To ensure that people affected by development projects are treated in a fair and equitable manner, and that they are not impoverished in the process, it is necessary that Sri Lanka adopts a NIRP. Such a policy would establish the framework for project planning and implementation. Subsequently, it will be necessary to prepare guidelines on resettlement planning and implementation to be used by PEAs.

People have moved voluntarily, mainly to the dry zone, starting from colonial days. These were state sponsored settlement programmes aimed at developing and exploiting land resources in that region, while relieving pressure on land in the wet zone. There are many commonalties in the objectives and implementation of voluntary and involuntary settlement and re-settlement programmes.

Nonetheless, the policy proposed here refers only to development-induced involuntary resettlement, where the option to stay behind does not exist. It does, however, also apply to cases where people do not have to be physically relocated.

2. Objectives of the Policy

- To avoid, minimize and mitigate negative impacts of involuntary resettlement by facilitating the reestablishment of the affected people on a productive and self-sustaining basis. The policy should also facilitate the development of the project-affected people and the project.
- To ensure that people adversely affected by development projects are fully and promptly compensated and successfully resettled. The livelihoods of the displaced persons should be reestablished and the standard of living improved.
- To ensure that no impoverishment of people shall result as a consequence of compulsory land acquisition for development purposes by the State.
- To assist adversely affected people in dealing with the psychological, cultural, social and other stresses caused by compulsory land acquisition.
- To make all affected people aware of processes available for the redress of grievances that are easily accessible and immediately responsive.
- To have in place a consultative, transparent and accountable involuntary resettlement process with a time frame agreed to by the PEA and the affected people.

3. Scope

- The policy will apply to all development-induced land acquisition or recovery of possession by the State.
- A comprehensive Resettlement Action Plan will be required where 20 or more families are affected.
- If less than 20 families are affected the policy still applies but a plan can be prepared to a lesser level of detail.
- The policy will apply to all projects regardless of source of funding.
- The policy will apply to all projects in the planning phase on the date this policy comes into effect, and all future projects.

4. Policy Principles

- Involuntary resettlement should be avoided or reduced as much as possible by reviewing alternatives to the project as well as alternatives within the project.
- Where involuntary resettlement is unavoidable, affected people should be assisted to re-establish themselves and improve their quality of life.
- Gender equality and equity should be ensured and adhered to throughout the policy.
- Affected persons should be fully involved in the selection of relocation sites, livelihood compensation and development options at the earliest opportunity.
- Replacement land should be an option for compensation in the case of loss of land; in the absence of replacement land cash compensation should be an option for all affected persons
- Compensation for loss of land, structures, other assets and income should be based on full replacement cost and should be paid promptly. This should include transaction costs.

- Resettlement should be planned and implemented with full participation of the provincial and local authorities.
- To assist those affected to be economically and socially integrated into the host communities, participatory measures should be designed and implemented.
- Common property resources and community and public services should be provided to affected people.
- Resettlement should be planned as a development activity for the affected people.
- Affected persons who do not have documented title to land should receive fair and just treatment.
- Vulnerable groups should be identified and given appropriate assistance to substantially improve their living standards.
- Project Executing Agencies should bear the full costs of compensation and resettlement.

5. Institutional Responsibilities

- The Ministry of Land Development (MLD) will be responsible for the implementation of the NIRP.
- The Project Executing Agencies (PEAs) will be responsible for complying with all the requirements for planning and implementing resettlement according to the NIRP.
- The PEAs (like the Road Development Authority) that have significant resettlement in their projects will establish Resettlement Units with adequately trained staff.
- The CEA will be responsible for the review of impacts and mitigating measures of projects involving involuntary resettlement.
- The CEA's capacity will be strengthened so that it could provide the necessary guidance to public and private sector agencies undertaking projects that have involuntary resettlement impacts.
- The MLD will prepare regulations and guidelines on involuntary resettlement planning, implementation and monitoring.
- The MLD and the CEA will conduct training courses in resettlement planning, implementation, monitoring.
- The CEA will review and approve the Resettlement Action Plans prepared by PEAs, and make plans publicly available.
- The MLD will draft amendments to the Land Acquisition Act in order to bring the law in line with NIRP
- Following consultations with stakeholders, MLD will submit a final draft of the amended Land Acquisition Act for government approval
- MLD will prepare the necessary implementation guidelines based on the amended LAA
- A Steering Committee will be formed comprising the MLD, CEA, PEAs and other relevant agencies to exchange experience on resettlement, and coordinate and oversee the implementation of the policy

6. Monitoring and Evaluation

- A system of internal monitoring should be established by PEAs to monitor implementation of Resettlement Action Plans, including budget, schedule, and delivery of entitlements, consultation, grievances and benefits.
- PEAs should make adequate resources available for monitoring and evaluation.
- A further system of external monitoring and evaluation by an independent party should be established to assess the overall outcome of resettlement activities.
- Monitoring and evaluation reports should be reviewed by the PEA, CEA and MLD and action taken to make improvements where indicated.
- Affected persons and other stakeholders should be consulted in monitoring and evaluation.
- Lessons thus learned from resettlement experiences should be used to improve resettlement policy and practice.

Summary of Institutional Responsibilities for Involuntary Resettlement

Function	Responsibility
Overall Policy Implementation	MLD
Preparation (Planning)	Project Proponent (can be contracted to consultants, Universities, NGOs)
Review of Resettlement Action Plans (RAP)	Project Approving Agency (PAA) and CEA
Approval of RAPs	PAA and CEA
Implementation	(PEA), Divisional Administration, Provincial Administration and Local Government
Monitoring	PEA, with review by CEA and MLD
Evaluation	Independent organization on behalf of MLD, PEA and CEA

7. Definitions of Terms Used

- **Affected Person** – person affected by changes to use of land, water or other resources caused by development projects
- **Compensation** – cash or payment in kind made to affected persons to replace assets, resources or income.
- **Emergency Situation** – natural disasters, civil and political conflict situations.
- **Expropriation** – government taking possession of property or changing property rights in order to execute or facilitate development projects.
- **Entitlements** – a variety of measures including compensation, income restoration and interim support, transfer assistance, relocation and other benefits that are due to affected people, depending on the nature of their losses, to improve their economic and social base.
- **Gender Equity** – recognition of both genders in the provision of entitlements, treatment and other measures under the Resettlement Action Plan.
- **Host Population** – households and communities residing in or near the area to which affected people are to be relocated.
- **Income Restoration** – reestablishing income sources and livelihoods of people affected.
- **Involuntary Resettlement** – unavoidable displacement of people arising from development projects that creates the need for rebuilding their livelihoods, incomes and asset bases in another location.
- **Rehabilitation** – reestablishing and improving incomes, livelihoods, living, and social systems.
- **Relocation** – moving affected persons and their moveable assets and rebuilding housing, structures, improvements to land, and public infrastructure in another location.
- **Replacement Cost** – the level of valuation for expropriated property sufficient to actually replace lost assets, or to acquire substitutes of equal value or comparable productivity or use; transaction costs are to be included
- **Resettlement Action Plan** – a time-bound action plan with budget setting out resettlement strategy, objectives, options, entitlements, actions, approvals, responsibilities, monitoring and evaluation.
- **Resettlement Budget** – a detailed breakdown of all the costs of a resettlement action plan phased over the implementation period

- **Resettlement Effect** –loss of physical and non physical assets including homes, communities, productive land, income earning assets and sources, subsistence, resources, cultural sites, social structures, networks and ties, cultural identity and mutual help mechanisms.

- **Settlement** – voluntary movement of people to a new site where they reestablish their livelihoods as in the case of the Mahaweli Scheme

- **Social Preparation** – process of consultation with affected people undertaken before key resettlement decisions are made; measures to build their capacity to deal with resettlement, taking into account existing social and cultural institutions.

- **Vulnerable Groups** – distinct groups of people who might suffer disproportionately from resettlement effects such as the old, the young, the handicapped, the poor, isolated groups and single parent households

Annexure VI:

Cropping Model and Income Generating Programs for Resettlement in system "F" & "D"

Schedule…….

Cropping Models and Income Generating Programmes

for Resettlers in Systems 'F' and 'D'

It is decided to allocate 0.6 ha. of irrigable land and 0.2 ha. highland to develop as a homestead for a settler/resettler in Systems 'F' & 'D'. This decision has been taken due to the shortage of available irrigable lands in the settlement area. However proposed land area is larger than the recommended extent of land in Matale district. According to Land Commissioner's Office details, it is a policy decision to give 01 acre of agricultural land and 20 perches upland in irrigation projects of Matale District. But other Mahaweli settlers enjoy 1 ha. of irrigable land parcel. Therefore, an argument is raised whether this 0.6 ha. is sufficient for survival.

To overcome this problem several cropping patterns with advanced technology is introduced. Economics of different models are as follows. (Table – 01 & 02)

Crop Model	Annual Expenditure (Eg. Family labour)Rs	Annual income (Rs)	Net Return Per year (Rs)	Net Return per month (Rs.
Paddy				
1 Model 1	63,500/-	135,300/-	71,800/-	5980/-
2.Model 2	70,000/-	202,950/-	132,950/-	11080/-
3.Model 3	108,200/-	294,450/-	186250/-	15520/-
4.Model 4	115,200/-	350,825/-	235,625/-	19635/-
Other Field Crops	107625/-	241500/-	133,875/-	11156/-
1.Model 1	127690/-	300,000/-	172,310/-	14360/-
2.Model 2	148375/-	322,500/-	174,125/-	14510/-
3.Model 3	146625/-	328,750/-	182125/-	15180/-
4.Model 4	155375/-	383,250/-	227875/-	18990/-
5.Model 5				

Only agricultural activities in irrigable allotment are considered in the above analysis. But the expected income is higher than that due to additional income comes from homestead.

Poverty Line: The household income and expenditure survey which is a year long national sample survey conducted by the Department of Census and Statistics once in about five years time is the main data source for the calculation of poverty line in Sri Lanka. Actual total food and non-food expenditure (average monthly per capita) during year 2006/07 and official poverty line during 2008 are as follows.

i

Average monthly per capita

Sri Lanka (Average)	=Rs 5436.00
Rural sector	=Rs 5200.00
Polonnaruwa District	= Rs 5586.00
Matale District	=Rs 4960.00

Official poverty line (Nov. 2008)

Sri Lanka (Average)	=Rs 2919.00
Polonnaruwa District	= Rs 2883.00
Matale District	=Rs 2890.00

(Source: Dept. of Census and Statistics, Sri Lanka)

According to the following sources if average family size is 04, the official poverty line for a family in Matale district would be Rs.11, 560.00 (Source: Economic and Social Statistics of Moragahakanda, 2007 and Socio-Economic Statistics of Resettlement Area of System "F"- 2007).

Net income level of Paddy Model 1 is much lower than official poverty line but other crop models exceed the official poverty line.

Mahaweli Settler Income: Planning and Monitoring unit (PMU) of MASL annually publish income levels of Mahaweli settlers under the system basis. Estimated Real Annual Settler Income and Estimated Average Real Annual Per Capita Income of Mahaweli Settlers published in Statistical Hand Book of MASL (Year 2007) is as follows.

Estimated Real Annual Settler Income (System G) =Rs 142,296.00

(Monthly = Rs 11858.00)

Estimated Real Annual Settler Income (MASL Average) =Rs 137,283.00

(Monthly = Rs 11440.00)

Estimated Average Real Annual Per Capita Income (Sys G) =Rs 17903.00 (Monthly= Rs 1492.00)

Estimated Average Real Annual Per Capita Income (MASL Av.) =Rs 25442.00 (Monthly= Rs 2120.00)

When compare Estimated Real Annual Settler Income (System G) with proposed crop models of Moragahakanda. Only Paddy Modal 1 gives less income and all the others give higher incomes.

Paddy Plot Model I

Annual expenditure (excluding family labour), Annual income from both Maha and Yala season, net return and net return per month are calculated. Subsidized fertilizer rates and charges for present land preparation are included. Yield per area has taken as 100 Bu/Ac and value of a 01 kg of paddy is taken as Rs 22/- per kilogram which is recently imposed by the government as certified price for paddy. Annual net return from this general cultivation model is 71,800/- Rs. Per year and per month distribution of this net return is Rs. 5980/-. It is hardly insufficient for the sustainable economic surveillance. All the analyses are done excluding family labour.

Paddy Plot Model 2

Advance technique of paddy cultivation is introduced in this model. "Parachute method" is special transplanting technique which is needed specific skilled labour. 315 nos. of seedling trays are required for the preparation of paddy seedlings per 01 acre. Seedling trays can be used at least 04 seasons and therefore depreciated value of cost of trays are only included for the analysis.

Expenditure is not so high in this techniques and chemical weed control is not essential. Average yield is taken as 150Bu/Ac for this analysis but the users of this technique are getting more yield. Annual net income from the model is Rs. 132,950/- and net return per month is Rs. 11,080/- Farmers can get more return from this model than model 1.

Paddy Plot Model 3

Dairy farming is incorporated in this modal. Therefore 0.1ha of irrigable land is allocated for high quality pasture cultivation. Three cows are recommended to rear in a shed at homestead under cut and feed system. Rest 0.5 ha area is under the normal paddy cultivation. Annual net income from this model is Rs. 186,250/- and net return per month is Rs. 15,520/- Farmers can get more return from this model than model 1 and 2.

Table 1: Annual Income from proposed 0.6ha irrigable paddy plot

	Crop Model	Annual Expenditure Excluding family labour) (Rs)	Annual Income (Rs)	Net return (Rs)	Net return per month (Rs)
1	**PP Model 1** Normal paddy cultivation in whole 0.6ha plot during both Maha & Yala	63,500/- (21,166/-)	135,300/- (45,100/-)	71,800/- (23,933/-)	5,980/-
2	**PP Model 2** Paddy cultivation under "Parachute" transplanting method in whole 0.6ha plot during both Maha & Yala	70,000/- (23,333/-)	202,950 (67,650/-)	132,950/- (44,316/-)	11,080/-
3	**PP Model 3** General Paddy cultivation in 0.5ha and cultivation of 0.1ha high quality improved pasture for incorporating dairy farming (03 cows) in homestead.	53,000/- + 55,200/- (108200/-)	112,750/- + 181,700/- (294,450/-)	59,750/- + 126,500/ (186,250/-)	15520/-
4	**PP Model 4** Paddy cultivation under "Parachute" transplanting method in 0.5ha and 0.1ha improved high quality pasture cultivation for incorporation dairy farming (03 cows) in homesteads.	60,000/- + 55,200/- (115,200/-)	169,125/- + 181,700/- (350,825/-)	109,125/- + 126500/- (235,625/-)	19635/-

1. Annual income from proposed 0.6ha irrigable paddy plot.

   Four models are analyzed under this category (table 01).

Analyze suitable different crop mixtures and crop livestock combination to get maximum return from 0.6 ha of irrigable allotment & 0.2ha of homestead for the sustainable economic survival of settler farmer

Due to limited land availability it is decided to allocate 0.6ha of irrigable allotment and 0.2ha of homestead for each settler in proposed settlement areas of Kalu Ganga left & right banks that are dislocating from reservoir construction sites of Moragahakanda and Kalu Ganga. Above said 0.6ha of irrigable allotments are also two types such as irrigable paddy land and irrigable uplands. Therefore some farmers will be received irrigable paddy land and the other will be received upland suitable for OFC cultivation under irrigation condition.

Each and every farmer of the existing Mahaweli systems has received 01ha of paddy land and 0.2ha of homestead. Therefore there is a doubt in here whether the proposed land extent of 0.6ha is sufficient for the economic survival of proposed settler.

Therefore different crop mixtures and crop livestock combinations for both paddy and OFC allotments are analyzed below to give suitable recommendations.

Paddy Plot Model 4

Dairy farming is also incorporated in this modal. Here also 0.1ha of irrigable land is allocated for high quality pasture cultivation. Three cows are recommended to rear in a shed at homestead under cut and feed system. Rest 0.5 ha area is proposed to cultivate under parachute method. Annual net income from this model is Rs. 235,625/- and net return per month is Rs. 19,635/-. Farmers can get more return from this model than model 1, 2 and 3.

Table 2: Annual income from proposed 0.6ha irrigable OFC plot

Crop Modal (*Cultivate both season)	Extent (Ac)	Annual Expenditure (Rs)	Annual Income (Rs)	Net Income (Rs)	Net Return per month (Rs)
1. OFC Model 1					
Banana + Pineapple	½ Ac	40,875/-	100,000/-		
Papaw + Maize	½Ac	40,000/-	100,000/-		
Greengram *	1/4Ac	14,250/-	22,500/-		
Cowpea*	1/4Ac	12,500/-	19,000/-		
Total	**1½Ac**	**107,625/-**	**241,500/-**	**133,875/-**	**11,156/-**
2. OFC Model 2					
Banana + Pineapple					
Papaw	½ Ac	40,875/-	100,000/-		
Vegetable (Local)*	¼ Ac	19,315/-	75,000/-		
Maize (Hybrid)*	¼ Ac	37,500/-	75,000/-		
Total	½ Ac	30,000/-	50,000/-		
	1½ Ac	**127,690/-**	**300,000/-**	**172,310/-**	**14,360/-**

OFC models

Several models are discussed below and these models are recommended to highland irrigable allotments.

1. OFC Model 1

Half an acre area of Banana cultivation and intercrop it with pineapple after shade development is recommended. Half an acre of "Red Lady" papaw is proposed with border raw of maize. Seasonal crops such as green gram and cowpea are proposed to cultivate in both seasons in crop rotational basis. Annual net income from this model is Rs. 133,875/- and net return per month is Rs. 11,156/-.

2. OFC Model 2

In this model also half an acre area of Banana cultivation intercrop with pineapple after shade development and Quarter acre of "Red Lady" papaw are proposed as cash crops. Seasonal crops such as vegetables and maize are proposed to cultivate in both seasons in crop rotational basis. Annual net income from this model is Rs. 172,310/- and net return per month is Rs. 14,360/-. Farmers can get more return from this model than model 1.

3. OFC Model 3

In this model also half an acre area of Banana cultivation intercrop with pineapple after shade development is recommended. Half an acre of "Red Lady" papaw is proposed with border rows of maize. Seasonal crops such as vegetables and chili are proposed to cultivate in both seasons in crop rotational basis. Annual net income from this model is Rs. 174,125/- and net return per month is Rs. 14,510/-. Farmers can earn more return from this model than model 1 and 2.

4. OFC Model 4

In this model also half an acre area of Banana cultivation intercrop with pineapple after shade development is recommended. Half an acre of "Red Lady" papaw is proposed with border raws of maize. Vegetables are proposed to cultivate in both seasons in crop rotational basis. Quarter acre Big onion during Yala season and chili in same area during Maha are recommended. Annual net income from this model is Rs. 182,125/- and net return per month is Rs. 15,180/-. Farmers can get more return from this model than model 1, 2 and 3.

3. OFC Model 3					
Banana + Pineapple	½ Ac	40,875/-	100,000/-		
Papaw+Maize	½Ac	40,000/-	100.000/-		
Chillie *	1/4Ac	30,000/-	47,500/-		
Vegetables (Local)*	1/4Ac	37,500/-	75,000/-		
Total	**1½Ac**	**148,375/-**	**322,500/-**	**174,125/-**	**14,510/-**
4. OFC Model 4					
Banana + Pineapple	½ Ac	40,875/-	100,000/-		
Papaw+Maize	½Ac	40,000/-	100.000/-		
B Onion (Yala)	1/4Ac	13,250/-	30,000/-		
Vegetables (Local)*	1/4Ac	37,500/-	75,000/-		
Chillie (Maha)	1/4AC	15,000/-	23,750/-		
Total	**1½Ac**	**146,625/-**	**328,750/-**	**182,125/-**	**15,180/-**
5. OFC Model 5					
Banana + Pineapple	½ Ac	40,875/-	100,000/-		
Papaw+Maize	¼ Ac	20,000/-	50.000/-		
Sweet potato (Yala)	¾ Ac	49500/-	162000/-		
Chillie (Maha)	¾ Ac	45,000/-	71,250/-		
Total	**1½Ac**	**155,375/-**	**383,250/-**	**227875/-**	**18990/-**

5. OFC Model 5

In this model also half an acre area of Banana cultivation intercrop with pineapple after shade development is recommended. Quarter acre of "Red Lady" papaw is proposed with border raws of maize. Three forth acre area of Sweet potato during Yala season and chili in same area during Maha are recommended. Annual net income from this model is Rs. 227,875/- and net return per month is Rs. 18,990/-. Farmers can get more return from this model than model 1, 2, 3 and 4.

Table 3. Poultry farming in Homestead (Rearing 1000 Broiler chicken per batch and six batches per year)

No. of Birds	Expenditure (Rs)	Income (Rs)	Net Income (Rs)	Net Income per month (Rs)
Rearing 1000 birds one time / one batch (42 to 45 days period)	188,300/-	212,350/-	24,050/-	16,033/=
Rearing six batches per year (each batch consisted with 1000 birds)	1,129,800/-	1,274,100/-	144,300/- (Per year)	**12,025/-**

12. Dairy Development

Total land area of both Right and Left Banks of the Kalu Ganga Project is 8800 ha. and proposed irrigable area is approximately 3500 ha. Remaining highland area is approximately 5300 ha. Around 1500 ha. of area out of the total highland area will be utilized for settlement purposes. Meanwhile, 3800 ha. of highland remain as conservation land or reservations and those can be utilized for cattle rearing.

It is proposed to reserve 120 ha. of pasture land in Project area by allowing 20 ha. in each hamlet of 06 administrative units. Project is highly concerned on Dairy Development in Project area by introducing cross-bred cattle, upgrading of local breeds, introducing improved pasture and fodder for cultivation. Giving training for farmers on capacity development and management support to achieve high production levels is also taken into consideration. By reducing the number of local breeds gradually and practicing high management techniques with 3-4 cows, the milk production will not drop and farmer will not lose their income.

Annexure VII:

Training Strategy for Resettlement of Moragahakanda Project

Schedule

Training Strategy for Resettlers of Moragahakanda Reservoir Project

1. Background

The 1572 Households to be resettled due to Moragahakanda Reservoir building and related construction work. These people are **"leaving"** their traditional homesteads and villages, which have been developed and evolved for generations. It tooks long years of generations for them to establish this socio-economic and cultural habitat called **peasant village** unique to them. Especially, the older generation tends to think, probably the Head of the household, who lacks the confidence of establishing themselves again; during their lifetime; in the new environment and circumstances. Thus a notion of **Displacement** is inevitable as every member of the family is **"disturbed"** in different ways and degrees. On the other hand, they are not the same **"beneficiaries"** who **obtained** settler status. This Sociological aspect to their traditions, values, knowledge, skills, resources and aspirations are to be carefully dealt with in every aspect of the resettlement process. Another important aspect to be considered is that this is not the first instance of this type of resettlement and the subjected people are well of other such schemes.

Therefore, making a social consciousness among them that their social, economical and cultural sacrifices are valued by the total society and making them envisaged in **active participation** and **confident** in this development endeavor, **for a better life,** is a great challenge particularly for the **trainers** in System 'F'.

However, some degree of disturbance is experienced by many settler who is displaced from his original habitat. A busy settler who is trying to establish with family in the new environment needs a whole range of guidance, assistance and services at the inception and continued training with subsequent development processes of complex mature. At the same time, it is strongly suggested that the principal theme should be to build-up their **confidence and capabilities** to handle their affairs by the **community themselves collectively and cohesively** and not to depend on MASL. This will require both short term and long term training strategies for a considerable period of time.

Thus the training contribution could easily be described in view of above observations; that is, APS of Moragahakanda Reservoir Project who will be resettled in Systems 'F' & 'D' support a specially designed training approach for them, who are experiencing a Resettlement process, than are evident elsewhere in most of other Mahaweli Settlement Projects, consistent always with the objectives and programmes of Mahaweli Authority.

2. Target Area and the Target Groups

The target area would be Moragahakanda Project area and Systems 'F' and 'D' of Mahaweli Development Programme. The main target group will be the people affected by Moragahakanda reservoir, its related infrastructure construction and other related development activities pertaining to Systems 'F' & 'D'. This group would fall within a wide range of broad categories of trainees; from farmers to non-farmers including women and children, youth, craft, tradesmen and service providers.

3. Training

All Mahaweli settlements are administered under a unitary management structure with a Resident Project Manager (RPM) responsible for all services and inputs to the settlement called a System area. He is assisted by Deputies (DRPM) representing different disciplines such as Land Administration, Agriculture, Water Management, Community Development, Administration etc. A System area is consisted of several Block areas. A Block area is settled with about 2000 families and headed by a Block Manager (BM) assisted by specialist officers in various disciplines. A Block area is consisted with several Unit areas with 150-200 families assigned to a Unit area. This Unit area is the smallest administrative area under a Unit Manager (UM) who is responsible for a package of services to the settlers and is assisted by a Field Assistant (FA). Almost all major systems are equipped with a multi-disciplinary training centre with very satisfactory training facilities.

Although, System 'F' is neighboured by System 'B' and System 'C', they are in different stages of development, thus training focus is quite different with compared to System 'F' requirements. It is certain that training resources available with other Systems would be assets for training efforts in System 'F' provided that a unique training strategy is implemented. With above background, it is strongly suggested that a unique and integrated training strategy is formulated and implemented through a **Multi-disciplinary Training Centre in System 'F'**. However, in the alternative, Training Centre in System 'C' should be utilized with improved facilities.

Training Management and Core-staff requirement

In the context of Moragahakanda development **induction** sessions with settlers will definitely facilitate the process. A healthy dialog should be maintained between affected people and the management. This is an important prerequisite in planning process, sometimes neglected previously.

Therefore, immediate appointment of a **Coordinator at MASL** level is recommended. He would be a person with Community Development training. Reviewing, liaison with other divisions and national / international organizations, coordination of resources and planning an integrated training strategy for Moragahakanda Project, Systems 'F' and 'D' would be his major responsibilities. Starting a continued dialog with affected people through induction sessions is immediately expected from him. He should be assisted by a **Field Coordinator** at Project level.

The Field Coordinator's main responsibilities would include assisting MASL Coordinator in designing of a training policy that fulfills the needs of the System and liaison with other bodies, coordination of training activities, including presently available programmes conducted by other organizations in the area, assisting Acquisition and Resettlement (A&R) Division of the Project and RPM in his overall management by providing budgetary proposals and required inputs and preparation of a Training and Implementation programme for the System including a Multi-disciplinary Residential Training Centre which can accommodate about 120 day Course trainees, initially for short courses, and about 60 residential trainees, with a Demonstration Farm.

Demonstration Farm is included in order to develop agriculture related training facility to an effective level. This will be available for training purposes to develop practical skills in agriculture field including commercial crop production, farming systems, water application and other recommended practices.

The Field Coordinator is assisted by a **Training Centre Manager** whose tasks will be supported by **Training Officers** of required disciplines, initially representing Community Development, Agriculture, Irrigation & Water Management, Women Development who are responsible for class room and on-site training ; a **Librarian** to establish a library to provide library resources to Trainers, Trainers in response to their needs and accumulation of training resource materials; an **Audio Visual Operator** and an **Audio Visual Assistant.**

A **Farm Manager** is to be appointed under the guidance of Training Officer (Agriculture). Farm Manager is assisted by two Farm assistants. The Farm Manager is responsible for the running of Demonstration Farm and it is suggested that the residential aspects of the Training Center should be one of his functions. He is provided with required **Dormitory and Kitchen Staff.** And it is strongly recommended that the physical infrastructure of the Training Center including Trainee residential facilities should be erected **amongst** the Demonstration Farm.

Expansion of centre facilities is inevitable with emerging training needs of complex nature due to subsequent developments and providing space for other national organizations like Vocational Training Authority in introducing national standards.

Training Delivery

Training will be done at two major levels; beneficiary Training and Officer Training

Beneficiary Training

Beneficiary training will be conducted primarily at field level. Selected beneficiaries and beneficiary leaders will be trained at the training center according to the need. Farmer leasers/Opinion Leasers will be trained to assist their fellow members in building up their capabilities to analyze their own realities, to propose alternatives and to initiate participation in action leading to viable solutions. Full participation of Women as well as Men and Youth is emphasized. Training planned in response to identified needs and interests will be coordinated by the Training Center Manager and disseminated by appropriate Training Officer/ Extension Officer/Subject Specialists/ Agencies/Departments.

Officer training

Officer training will be provided by Training Officers and by other resource personnel, internal/external. Training planning is done on the basis of coordinated need assessments arrived at discussions with officers/divisional heads/trainees. Trainees would include from field level to Management level including secretarial staff.

The training will include induction training and in-service training. This will help them to grasp the "vision" of the development endeavour as well as to supplement their training and to be aware of comparative developments in their own fields and other fields relevant in the execution their function.

External Training

In addition to the above training, all training categories should have opportunities to participate in study tours / training courses in other Systems and regions of the country as well as in other countries according to need and funding possibilities. These participants are expected to share their experiences with their fellow member and will be monitored.

3.3 Training Activities

3.3.1 Induction Training

This should be the first training activity of training strategy for APS of Moragahakanda Project. Induction training is meant for both settlers as well as for Management personnel. In the context of Moragahakanda Project, immediate steps should be taken to start induction sessions with settlers.

The first session of these can be held probably with the present social leaders representing small groups. It is suggested that small homogeneous groups be formed like neighbourhood groups where interaction is free and easy. Small groups of "vicinity" leaders should be thoroughly explained of the real objective of the sessions, session time table and be encouraged to come up with their problems, grievances and ideas. They should be briefed of the totality of Mahaweli Development Programme, Moragahakanda Reservoir Project, its importance in achieving the expected goals of Mahaweli Development Programme, thus the value and importance of their contributions made by Victoria and Kotmale evacuees, remedies adopted towards them, hardships anticipated during the initial stages, assistance planned for them from the very beginning including transportation of their belongings, other assistance, facilities and services. Especially they should be encouraged to come up with their problems and grievances and expected relief in attaining their aspirations. These sessions should be very intimate and interactive. It should be noted that not to have accomplished everything in one or two sessions. A stage by stage process is recommended while allowing them to discuss new situation with their family members and the neighbourhood. Subsequently, opportunities should be made available for larger groups of families with the participation of the above leaders for the same kind of sessions.

They should be listened and given legitimate recognition to their traditions, resources, values, attitudes and relationships in these sessions. This could be the basic step in identifying their immediate training needs as well as other requirements. These sessions should be considered as social investments.

3.3.2 Resource Development Training

As the settlers are predominantly agricultural peasantries, inevitably most of the training should be geared towards the agricultural resource development. In addition to paddy cultivation, attention should be directed to commercialize the farming systems and to encourage modern practices in market oriented practices including packaging, value addition etc.

Women population amounts to 48% of the total population indicting the volume of contribution they make to economy. It is certain that this could be multiplied with adequate training and assures their entitled share in the economy.

Initially, the following areas are recommended:

(i) Agriculture, Farming Systems with special attention towards commercial crop cultivation and related improved practices, Value addition. Intensive Home gardening with export potentials along with Home Economics.

(ii) Water application and Management

(iii) Institutional building and Community affairs

(iv) Women's participation and Development

(v) Conservation

(vi) Sports, Recreation and Cultural Heritage

3.3.3 Vocational and Skill Development

This is the most effective means of absorbing the emerging labour force. The labour force is not consisted only with the school leaving population. Therefore, vocational and skill development training facilities should be made available for other segments too. With the complex development of the project area, development of labour market for different trades is eminent such as masons, carpenters, barbers, drivers, mechanics, welders, vehicle servicemen, tradesmen as well as opportunities for entrepreneurship. With improved inter-relations with other religions, above opportunities will increase. In addition to this, new training avenues should be made for emerging labour force that will bring back investment to the area. Therefore, training opportunities should be made available for craftsmanship as well as for other job opportunities.

Initially, criteria in selection of trades and skills will be conditioned by local priorities as well as aspirations of the labour force. Initially, the following are suggested :

(i) Agro Industry, Farm skills and Entrepreneurship

(ii) Light Engineering skills including Welding and Blacksmithy

(iii) Building construction skills and electrical wiring, tiling including modern practices, production of building materials etc.

(iv) Modern Wood technology

(v) Cottage industry including Gem cutting and traditional skill development with local / foreign market orientation

(vi) Motor mechanism and driving

(vii) Computer skills

3.3.4 Special Programmes

It is essential to provide avenues for spirit / team building in the form of relaxation. Therefore, Recreational / Cultural programmes are suggested in attitude building. Special Seminars for disturbed schooling population of higher grades is suggested according to the need.

4. Training Infrastructure Requirement

The Training Centre should be built within the demonstration farm. The entire complex should include physical structures including facilities for Academic with Library and Audio Visual units, Administrative, Residential (Trainer/Trainee), Welfare services and a farm area for farming systems and practices. It should be noted that facilities should be made available at least for the other National Organizations like Department of Agriculture, Vocational Training Authority in coordinating and introducing national standards for an effective training strategy.

5. a) Centre Requirement

Item	No.
Main Lecture Hall (75 seats)	01
Two Semi-Lecture Halls	02
Small Training Laboratory (40 seats)	01
Administration Building	01
Grade IV Quarters	01
Grade III Quarters	03
Bachelor Quarters	01
Hostel Building (23 Rooms with 02 A/C Rooms with Kitchen & Dining hall)	01

b) Cadre Requirement

Category	No.	
5.1 Professional		
MASL Training Coordinator	01	
Field Training Coordinator / Centre Manager	01	
Training Officers	02	
Sub Total		**2,000,000**
5.2 Supporting Staff		
Administrative Assistant	01	
Programming Officer / Librarian	01	
Computer Operator	01	
A/V Assistant	01	
Cook	01	
Assistant Cook	01	
Room boy / Waiter	02	
Labourer	02	
Drivers	02	
Electrician	01	
Sub Total		**2,690,000**

6. Budgetary Requirements

6.1 Capital Budget Requirement

Civil Works	Quantity	Estimated Cost
Main Lecture Hall	01	
Semi Lecture Halls	02	
Small Training Laboratory	01	
Administrative Area		
Welfare Facilities		
Grade IV Quarters	01	
Grade III Quarters	03	
Bachelor Quarters	01	
Hostel Building (21 normal rooms, 02 A/C Rooms, Kitchen and Dinning Hall)		
Sub Total		**300,000,000**

6.2 Training Equipment

Multi-media Projector (01 No. for Head Office)	02	
Overhead Projector	02	
Digital Video Camera (with accessories)	02	
Digital Still Camera (with Photocopy Machine)	01	
Binding Machine	01	
Slide Projector	01	
Laptop Computer -P IV (01 No. for Head Office)	03	
21" Colour TV	04	
DVD Player	02	
Projector Screen	03	
Daylight Screen	01	
Paper Cutter	01	
Digital Duplicate Machine	01	
Public Address System	01	
Magiboard – Magnetic Screen	03	
Magiboard – Non magnetic board 4 x 6	03	
Sub Total		**2,725,000**

6.3 Training Furniture – Training Room

Lecture Hall chairs	115	
Adjustable table 5 x 2	18	
Lecture table 3 x 4	05	
Lecture chair	10	
Water Filter	01	
Sub Total		**900,000**

6.3 Office Furniture & Equipment

Executive Table	02	
Executive Chair	02	
Office Table	07	
Chair	07	
Computer Table / Chair	01	
Computer (PC)	03	
File Cabinet	07	
Sofa set	02	
Intercom Telephone System with 10 lines	01	
Wall Clock	05	
Sub Total		**632,000**

6.4 Vehicles

Pick-up vehicles (01 No. for Training Coordinator / MASL, and Training Centre)	02	
26 Seater – Mini Bus	01	
Sub Total		**19,000,000**

6.5 Library Furniture, Equipment & material

Book Racks 6 x 4	10	
Book Racks 3 x 4	05	
Chairs	15	
Table 10 x 4	01	
Table 3 x 4	02	
Sub Total		**800,000**

6.6 Dining Hall Furniture

Dining Table	10	
Dining Table Chair	60	
Table Cloth	20	
Serviettes	100	
Sub Total		**1,000,000**

6.7 Hostel Block

Single Bed (6 x 3)	46	
Mattress (6 x 3)	46	
Pillow	60	
Bed Sheets with Pillow cases	100	
Bath Towels	100	
Face Towels	100	
Serviettes	100	
Door Mats	20	
Mosquito Nets (single)	50	
Dressing Tables	25	
Washing Machines	03	
Chairs – Wooden	25	
Waste Baskets (small)	75	
Folding Mattress	50	
Sub Total		**2,500,000**

6.8 Kitchen

Table Spoons - (Stainless Steel)	100	
Soup Spoons - (S/Steel)	100	
Tea Spoons - (S/Steel)	100	
Forks - (S/Steel)	100	
Rice Spoons - (S/Steel)	100	
Jars (Glass)	10	
Cutlery set - (S/Steel)	05	
Saucepan sets - (23x 0 and 12x16 – 10 pieces)	01	
Dinner Plates	200	
Rice Bowls	75	
Curry Dishes - (Large)	100	
Curry Dishes - (Small)	50	
Fruit Salad cups – (Glass)	100	
Chopping Boards - Wooden	02	
Chopping Boards – Plastic	03	
Kitchen Knives - (S/Steel) - Sets	03	
Plastic Trays	30	
Waste Paper Baskets	10	
Rubber Hose - (100 Feet)	03	
Grinding Stone	01	
Mortar with Pestle	01	
Gas Cylinders - (40 Kg.)	05	
Gas Cookers - (Local)	02	
LG Refrigerator - (GR 282 Mf)	02	
Deep Freezer - (Electrolux)	01	
Cup & Saucers	250	
Water Filters	05	
Water Boilers	04	
Strainers (Metal – Large)	03	
Decanters - (Glass)	30	
Plastic Jugs - (3 Liters)	02	
Plastic Jugs - (1 Liter)	02	
Coconut Scraper - (Electric)	01	
Glass Tumblers	300	
Jugs (Glass) - (1.8 Liters)	25	
High Pressure Gas Regulator	01	
Normal Pressure Gas Regulator	01	
Floor Polishers - (Electric)	02	
Bread Toaster - (Electric)	02	
Sub Total		**20,000,000**
Grand Total		**352,247,000**

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Annexure VIII:

Gazette Notification No 1585/7 dated on 2009.01.20

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The Gazette of the Democratic Socialist Republic of Sri Lanka

EXTRAORDINARY

අංක 1585/7 - 2009 ජනවාරි 20 වැනි අඟහරුවාදා - 2009.01.20

No.1585/7 - TUESDAY, JANUARY 20, 2009

(Published by Authority)

PART I : SECTION (I) — GENERAL

Government Notifications

LAND ACQUISITION ACT, No. 09 OF 1950

REGULATIONS made by the Minister of Land and Land Development under Section 63(2)(f) of the Land Acquisition Act, No. 09 of 1950.

JEEVAN KUMARANATUNGA,
Minister of Land and Land Development.

Colombo,
03rd December, 2008.

Regulations

These regulations may be cited as the Land Acquisition Regulations, 2008.

The basis of assessing the market value of any land or the compensation for any injurious affection caused by the acquisition of any land under this Act.

(1) Market Value should be assessed as given under.

1.1 In the case of land where part of a land is acquired and when its value as a separate entity deems to realize a value proportionately lower than the Market Value of the main land the compensation should be proportionate to the value of the main land.

1.2 Where at the date of intension to acquire was published, the building is used for occupation and or business purposes or is intended to be used for occupation and or business purposes, the difference between the cost of re-construction and the value of building, based for determination of Market Value under Section 1.1, should be paid as an additional compensation.

1.3 Value based on development potential could be considered for paddy lands acquired where permission to fill such lands have been granted by the Agrarian Services Commissioner General.

1.4 When an acquired building is occupied by a tenant /statutory tenant protected under the provisions of the Rent Act, No. 7 of 1972 (as amended thereafter) the compensation should be ascertained in proportion having regard to the provisions of Rent (Amendment) Act, No. 26 of 2006.

(2) Injurious affection and Severance—

Damage caused by any severance and injurious affection should be allowed fully.

(3) Payment of Disturbances and Other Expenses—

To fulfill the requirement of the definition of compensation, in addition to the compensation under Section 1 and 2 above, which are based on the "market value", compensation for Disturbance based on the "value to owner" basis should be paid under following Sub-headings, after taking into consideration the written claims made.

3.1 Expenses incurred for appearing for Section 9 inquiry ;

3.2 Expenses for finding alternative accommodation ;

3.3 Cost incurred in charge of residence ;

3.4 Cost of advertising ;

3.5 Refixing cost of fixtures and fittings ;

3.6 Expenses incurred for transport ;

3.7 Loss of earnings from business (within the limits given in prevailing Act) ;

3.8 Increased overhead expenses ;

3.9 Double payments ;

3.10 All other expenses to the owner due to the acquisition ;

3.11 Any other additional expenses for disturbance or compensation not connected under any other Sub-Section of this act which is directly not connected to market value of the land ;

3.12 When an owner of a house or of an investment property displaced, additional 10% payment based on market value.

02-32

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Annexure IX:

Letter- Appointing the Reviewing Committee

Annexure No : ix

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தொழில்நுட்ப சேவைகள் பிரிவு
இலங்கை மகாவலி அதிகாரசபை
TECHNICAL SERVICES DIVISION
Mahaweli Authority of Sri Lanka

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කොළඹ 10

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No. 500,
T.B. Jayah Mawatha,
Colombo 10

MA/TS/ADM/118
9 July 2010

09 JUL 2010

Eng. M.M. Gunatilake	Consultant (TS)
Eng. M.H. Abeygunawardena	Director (Moragahakanda Designs)
Mr. K. Somapala	Director (LUP)
Mr. C.C. Hidellarachchi	Actg. DD (HRID)
Mr. M.M.S.R. Perera	Director (Env. & NR)
Mr. E.A.M.C. Egodage	Physical Planner

Appointment of a Committee to Review
the draft Resettlement Implementation Plan(RIP)

Reference paragraph 2.5 of the Minutes of the Moragahakanda / Kaluganga PIU Meeting held on 24 November 2009, the above Committee is appointed to review the draft Resettlement Implementation Plan (RIP).

Mr. K. Somapala, Director (LUP) will be the Chairman of the Committee.

Please review the RIP and submit the report to DG/MASL by 15th July 2010 to be taken up at the next PIU Meeting for final approval.

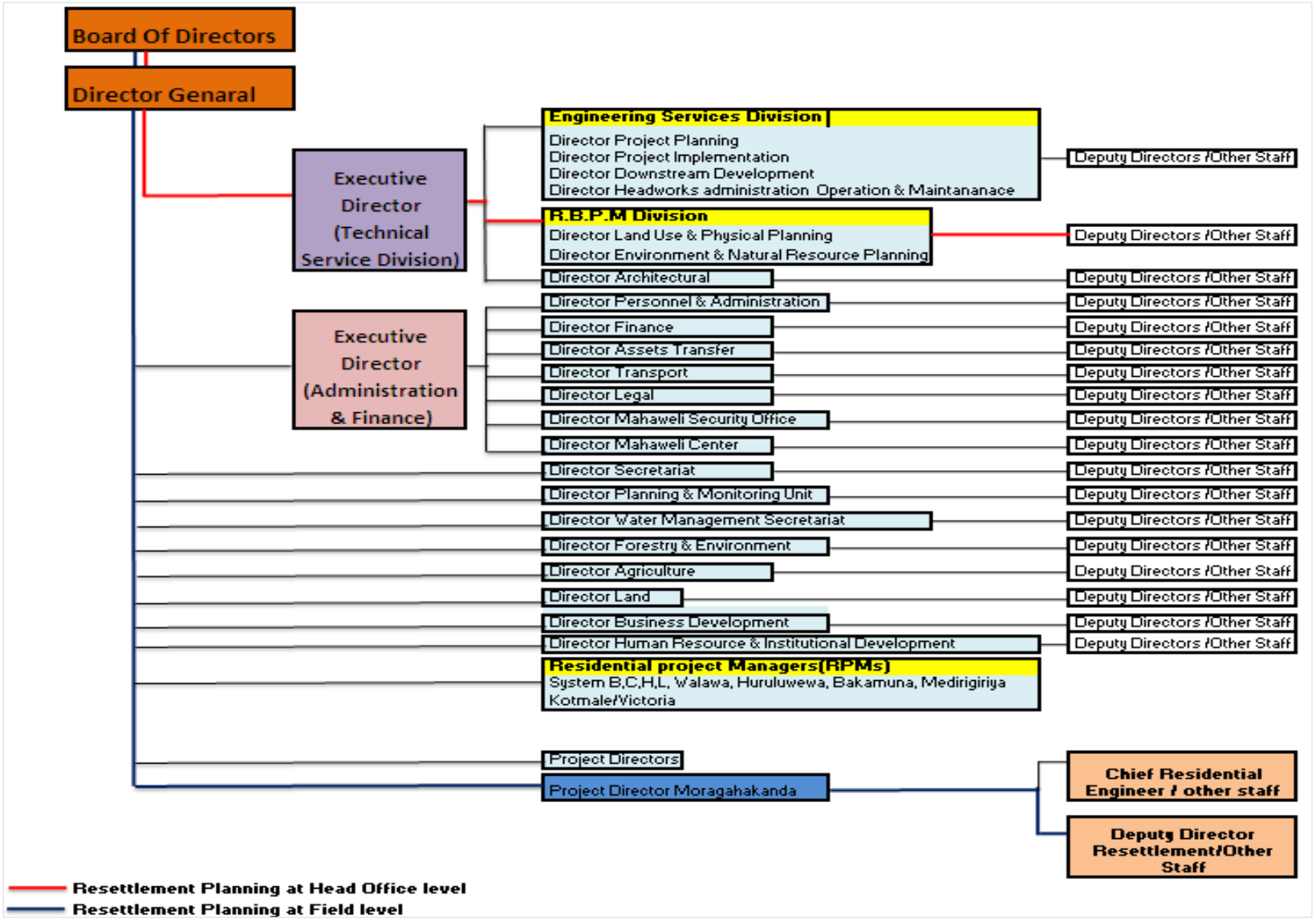
Eng. N.C.M. Navaratne
Executive Director (Technical Services)
For Director General
Mahaweli Authority of Sri Lanka

විධායක අධ්‍යක්ෂ (තා/සෙ) நிறைவேற்றுப் பணிப்பாளர்(தொ/சே) Executive Director (T/S) 011-2696436
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Annexure x :

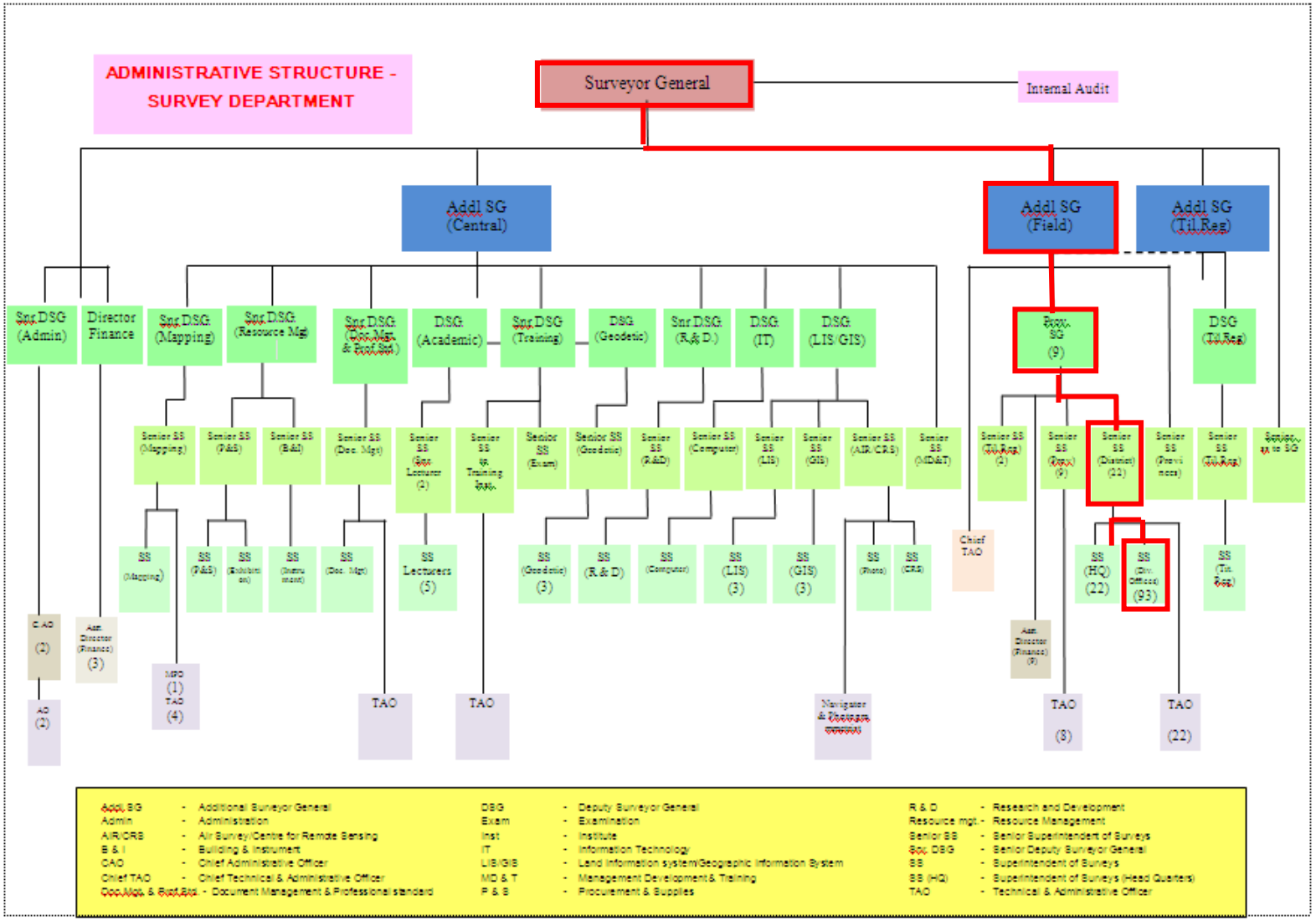
Organization structures

Present Organization Structure of MASL-2009 ***Annexure No : x-i***



Source: Official web site of Mahaweli Authority of Sri Lanka

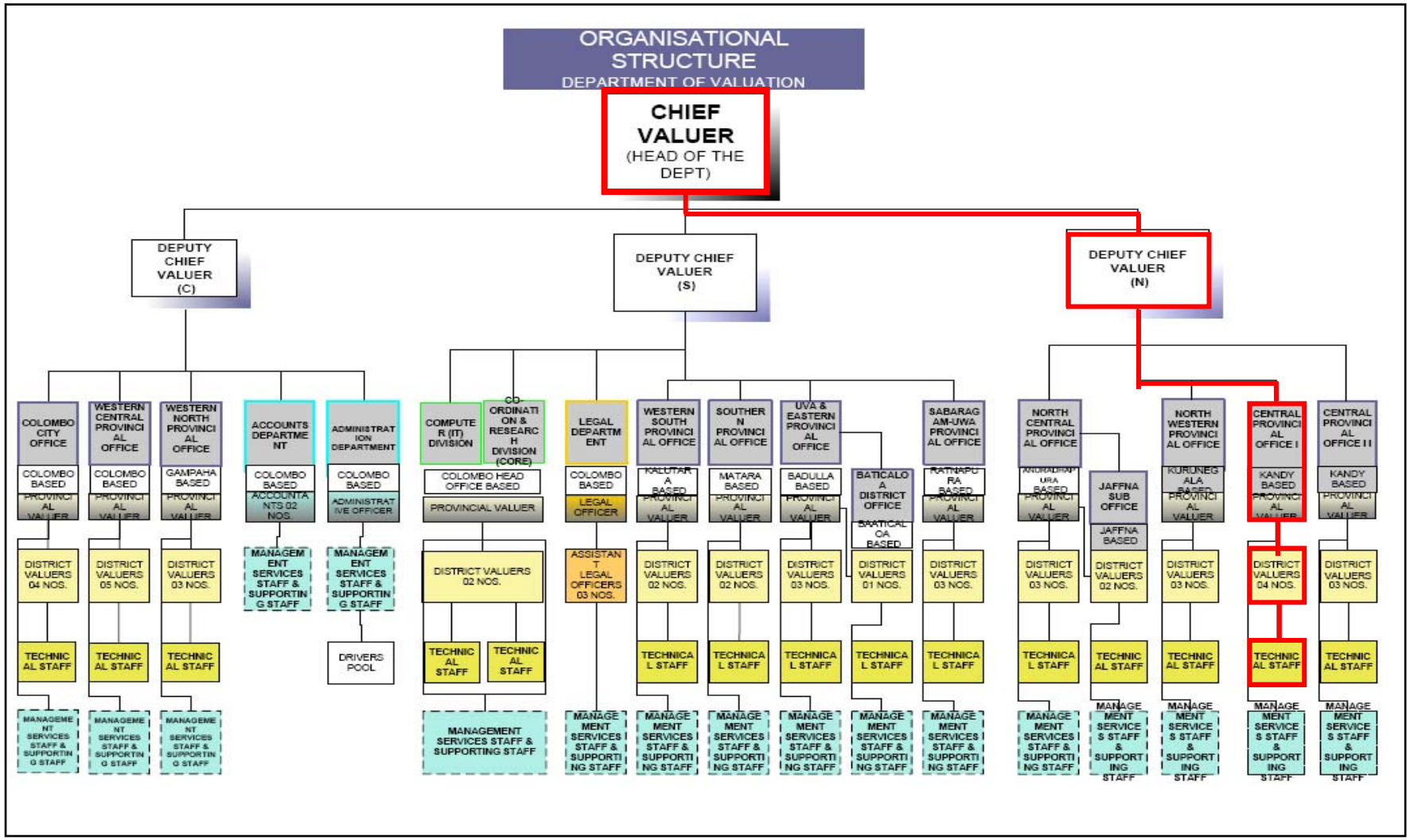
Present Organization Structure of Survey Department ***Annexure No : x-ii***



Survey Works undertake in Moragahakanda Project

Source: Official web site of Survey Department

Present Organization Structure of Valuation Department ***Annexure No : x-iii***



Survey Works undertake in Moragahakanda Project

Source: Official web site of Valuation Department

Annexure XI

Findings of public consultation meetings held on 17. 07.2010

SUMMARY OF PUBLIC COMMENTS & RESPONSES OF MASL

at the

Public Consultation Meetings held on 17.07.2010 on the Moragahakanda Development Project

The Public Consultation Meetings were held in the inundated areas of Moragahakanda Reservoir in 11 GN Divisions.

1. Basic Information

1.1 The name of GN Division and the numbers assigned to them are as follows.

1) Rajawela (E 409 A)
2) Ealagamuwa (E 407)
3) Medapihilla (E 407 C)
4) Koongahawela (E 409)
5) Kadawatha (E 407 B)
6) Millagahamullathenna (409 B)
7) Moragolla (E 409 C)
8) Maragamuwa (E 406)
9) Thalagoda (E 407 A)
10) Kambarawa (E 401)
11) Galporugolla (E 401 A)

1.2 Total no of affected families in the reservoir bed area is **1515**

2. Participation

2.1 No of participants (inclusive of MASL & other government officials and other interested individuals from the community) : **1648**

2.2 No of Participants by Affected families: **1463**

2.3 Percentage of participation of affected families: **97%**

2.4 MASL officials: **45**

2.5 Other Government officials: **24**

2.6 Other interested individuals: **116**

2.7 Percentage of Female participation: **21%**

2.8 Percentage of Male Participation: **79%**

3. Summary of Major Comments & Responses

1. Project Construction & Implementation Schedule

- There were 15 nos of comments from all GN divisions.
- 60 % of comments (quarries) were "why can't accelerate the project construction activities?"
- 12% of comments were on the details of construction of the project.
- 6% of comments requested to rehabilitate the existing irrigation network in the affected area where they cultivate at present.
- 21% of comments were on the availability of foreign & local funds for the project activities

All participants were satisfied with the responses made by the MASL officials.

(Refer item No 1 of Annex No 01 & 02)

2.1 Environment impacts

- There were 15 nos of comments from all GN divisions.
- 19% of comments inquired on "the construction of electric fence"
- 18% of comments were on "how to obtain firewood after the resettlement in new locations"
- 7% of comments informed that proposed methodologies for environmental conservations were acceptable.
- 7% of comments informed that they very well understood the environmental mitigation measures through the brochure.
- The balance 49% of comments made inquiries on the reforestation areas, protection from wildlife threats in the new settlement areas, water spread area of the reservoir, conservation measures in the upper watershed, protection of water springs, wells & water ways and establishment of grassland for the cows.

The participants were very much satisfied with MASL's responses based on the brochure and the leaflet on environmental mitigation measures.

(Refer item No 2.1 of Annex No 01 & 02)

2.2 Social impacts

- There were 17 nos of comments from all GN divisions.
- 17% of comments informed that they have fully understood the social impacts covered in the brochure.
- 11% of queried on the resettlement areas & establishment of social organizations.

- The balance 72% covered the issues related to disabled families, isolated families, obtaining of building materials, provision of employment opportunities, building up of relationships with the host community and obtaining lands for soldiers.

They agreed with the explanations made by MASL officials based on the Chapter 03 of RIP, Land Acquisition, Resettlement Policy & Strategies

(Refer item No 2.2 of Annex No 01 & 02)

3.1 Scale of Resettlement

- There were 11 nos of comments from all GN divisions.
- 73% of comments informed that they have fully understood the scale of resettlement covered in the brochure
- 27% of comments were on the policy of allocating land for the subfamilies that were not counted during the Socio-Economic Survey and allocation of extra extents of land for the affected families who lost larger extents of lands.

They agreed with the explanations made by MASL officials based on the Chapters 02 & 03 of RIP

(Refer item No 3.1 of Annex No 01 & 02)

3.2 Selection of affected families for the resettlement

- There were 12 nos of comments from all GN divisions.
- 26% of comments informed that they have fully understood the selection criteria covered in the brochure
- 26% of comments have inquired on the possibilities of accommodating all sub families under the Phase 01 of the resettlement process.
- 48% of comments inquired about the selection process of the resettlers

They agreed with the explanations made by MASL officials based on the Chapter 03 of RIP.

(Refer item No 3.2 of Annex No 01 & 02)

4.1. A . Land Acquisition Process

- There were 14 nos of comments from all GN divisions.
- 30% of comments stated that they have fully understood the Land Acquisition Process covered in the brochure.
- The balance 70% of comments sought additional explanations on the Land Acquisition Process

They agreed with the explanations made by MASL officials based on the Chapter 03 of RIP.

(Refer item No 4.1A of Annex No 01 & 02)

4.1. B Valuation of compensation & payment of compensation

- There were 17 nos of comments from all GN divisions.
- 23% of comments were on the process of payment of compensation of the lost properties
- 11% of comments were on the payment of compensation to the *Ande* ownership.
- 64% of comments were on the process of payment of compensation & valuation of compensation for each owner on the type of tenure ship

They agreed with the explanations made by MASL officials based on the Chapter 03 of RIP

(Refer item No 4.1B of Annex No 01 & 02)

4.2 Other Allowances & Livelihood Assistance

- There were 11 nos of comments from all GN divisions.
- 28% of comments expressed that they have obtained sufficient awareness through the brochure.
- 18% of comments were on the policies related to the land alienation for the disabled persons & elderly women.
- The balances 54% of comments were on the quota of rations and special assistances & allowances given exclusively for the settlers opted to Medirigiriya area.

They agreed with the explanations made by MASL officials based on the Chapter 03 of RIP.

(Refer item No 4.2of Annex No 01 & 02)

5.1 Proposed Resettlement Areas

- There were 12 nos of comments from all GN divisions.
- 60% of comments indicated that they have obtained sufficient knowledge through the brochure
- 40% of comments were on the temporary accommodations provided only for Medirigiriya area whereas why same facilities not provided in the Kaluganga LB area, status of development of Kalu Ganga Right Bank area.

They agreed with the explanations made by MASL officials based on the Chapter 05 of RIP & in Section 5.3 of the Resettlement Brochure.

(Refer item No 5.1of Annex No 01 & 02)

5.2 Provision of Social Infrastructure Facilities

- There were 13 nos of comments from all GN divisions.
- 36% of comments indicated that they have obtained sufficient knowledge through the brochure.
- 64% of comments have inquired on the availability of Market facilities, Mobile health clinics, Schools, provision of commercial lands & establishment of women small groups.
- They have also indicated that they are very grateful to the MASL for the provision substantial infrastructure facilities than what they are enjoying at present.

They agreed with the explanations made by MASL officials based on the Chapter 05 of RIP

(Refer item No 5.2of Annex No 01 & 02)

5.3 provision of irrigation infrastructure facilities

- There were 12 nos of comments from all GN divisions.
- 49% of comments indicated that they have obtained sufficient knowledge through the brochure
- 51% of comments inquired on the availability of water for agricultural activities during two seasons of the year, whether water releases in the canals will be made during the off season, possibility of having irrigation supplies off Kaluganga reservoir early and whether sufficient storage available in the Kaluganga reservoir.

They agreed with the explanations made by MASL officials based on the Chapter 05 of RIP & in Section 4.3 of the Resettlement Brochure

(Refer item No 5.3of Annex No 01 & 02)

6.1 Stages of Resettlement

- There were 12 nos of comments from all GN divisions.
- 42% of comments indicated that they have obtained sufficient knowledge through the brochure.
- 26% of the comments inquire on the possibility to accelerating the proposed resettlement program.
- 32% of comments inquire on the time period allotted for the resettlement process.

They agreed with the explanations made by MASL officials based on the Section 4.3 of the Resettlement Brochure

(Refer item No 6.1of Annex No 01 & 02)

6.2 <u>Settlers Transport</u>

- There were 11 nos of comments from all GN divisions.
- 55% of comments indicated that they have obtained sufficient knowledge through the brochure
- 27% of comments request to increase the transportation facilities in accordance to the needs.
- 18% of comments were on the provision of transport, whether it is in kind or cash? & are there any extra provisions to transport the building materials which are in possession by them?

They agreed with the explanations made by MASL officials based on the Chapter 03 of RIP

(Refer item No 6.2of Annex No 01 & 02)

6.3 <u>Settlers Assistance</u>

- There were 12 nos of comments from all GN divisions.
- 67% of comments indicated that they have obtained sufficient knowledge through the brochure.
- 17% of the comments inquiries on the possibility of building new houses for women headed & elderly HH
- The balance 16% of the comments, covers two questions i.e. whether it is possible to increase the time period of allowed for special assistance (18 months) for the elderly HH and the possibility of increasing the allowance for the construction of temporary accommodations

They agreed with the explanations made by MASL officials based on the Chapter 03 of RIP

(Refer item No 6.3 of Annex No 01 & 02)

7. <u>Grievance Redress Mechanism.</u>

- There were 11 nos of comments from all GN divisions.
- 91% of comments indicated that they have obtained sufficient knowledge through the brochure.
- The rest 9% of the comments were on the question of "Are the women headed & elderly HH are entitled for the special assistance for the construction of houses for them?"

All agreed with the explanations made by MASL officials based on the Chapter 03 of RIP & Resettlement Brochure

(Refer item No 7 of Annex No 01 & 02)

8. Further Information Disclosure

- There were 12 nos of comments from all GN divisions.
- 84% of comments have expressed that they have got sufficient information through the brochure.
- 17% of comments have made inquiries on the possibility of assisting in the construction of houses in place of the "shifting allowance". In addition, they wanted to know whether the elderly HH could be assisted by constructing houses for them?

All agreed with the explanations made by MASL officials based on the Chapter 03 of RIP

(Refer item No 8 of Annex No 01 & 02)

9. Monitoring Plan & Mechanism

- There were 11 nos of comments from all GN divisions.
- All expressed that they were able to gather sufficient information from the brochure.

MASL stated that it is covered in the Chapter 08 of RIP also.

(Refer item No 9 of Annex No 01 & 02)

10. Contact Information of the Project Proponent

- There were 11 nos of comments from all GN divisions.
- All stated that they were able to gather sufficient information & appreciated the information given in the brochure on the contact persons

(Refer item No 10 of Annex No 01 & 02)

11. Other Proposals

- 10 out of the 11 GN Divisions haven't had any other proposals.
- Only 01 GND have mentioned that it would be advisable to conduct more awareness programs.

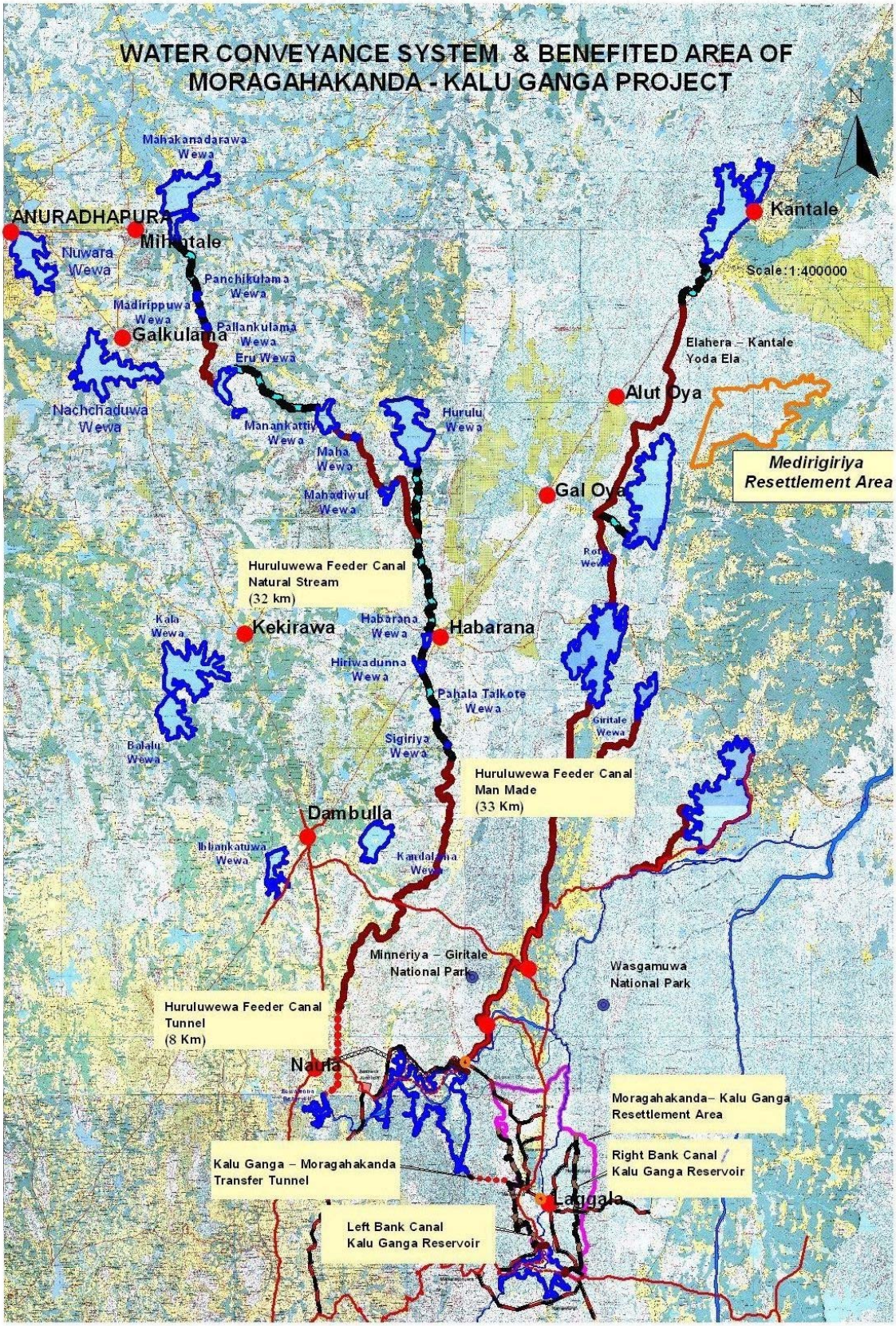
MASL pointed out that such awareness programmes will be conducted in future also as stated in Chapter 06 of RIP and all agreed with this explanation.

(Refer item No. 11 of Annex No 01 & 02)

****** Note. These all information & data was included in the final Resettlement Implementation Plan . Therefore, the RIP didn't want to revise again with consideration of the comments of the Public consultation meeting.***

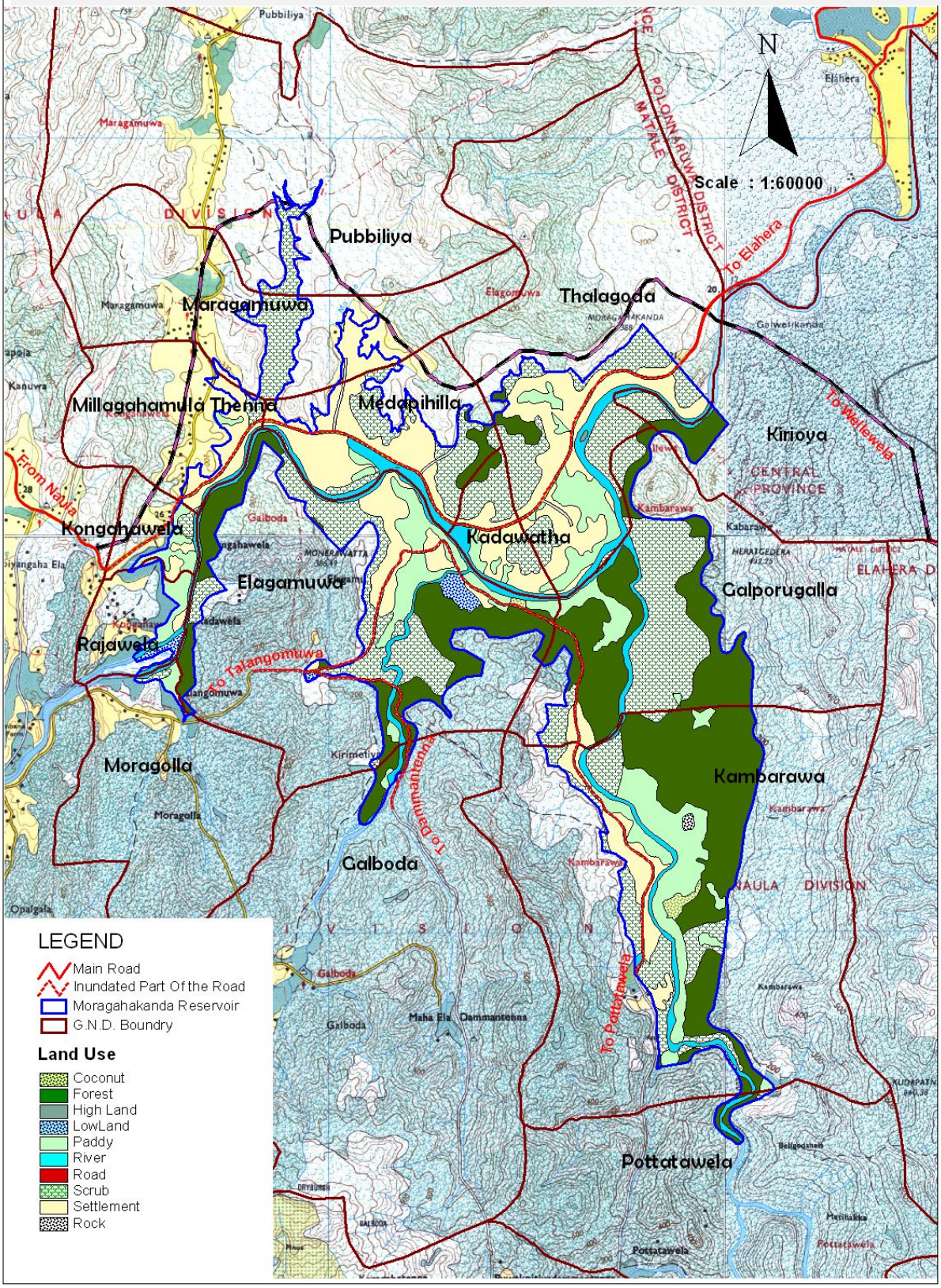
MAPS

Map of Project Benifited Area



Map No 01

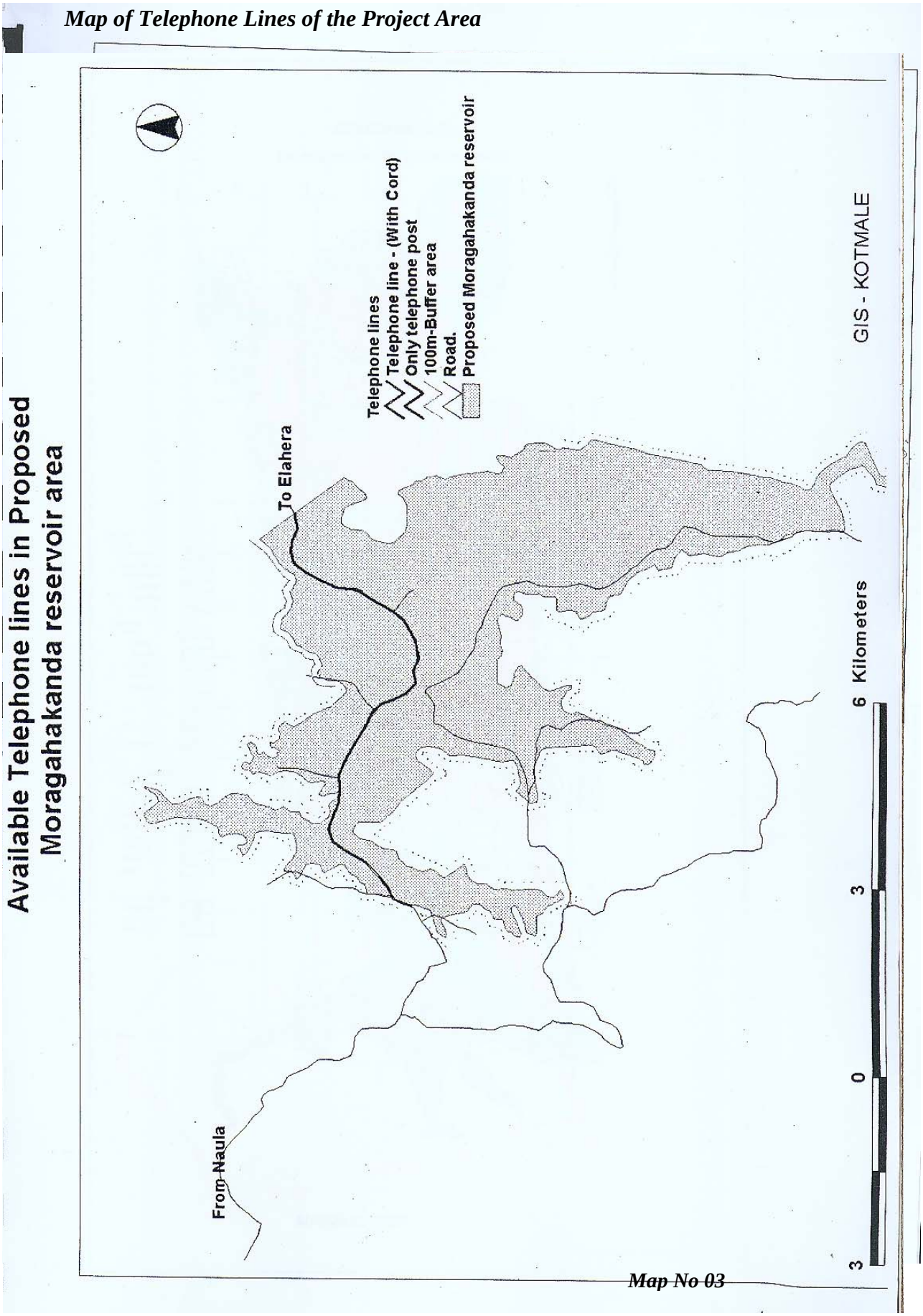
Map of GN Divisions of the Project Area



Map No 02

Map of Electricity Line of the Project Area

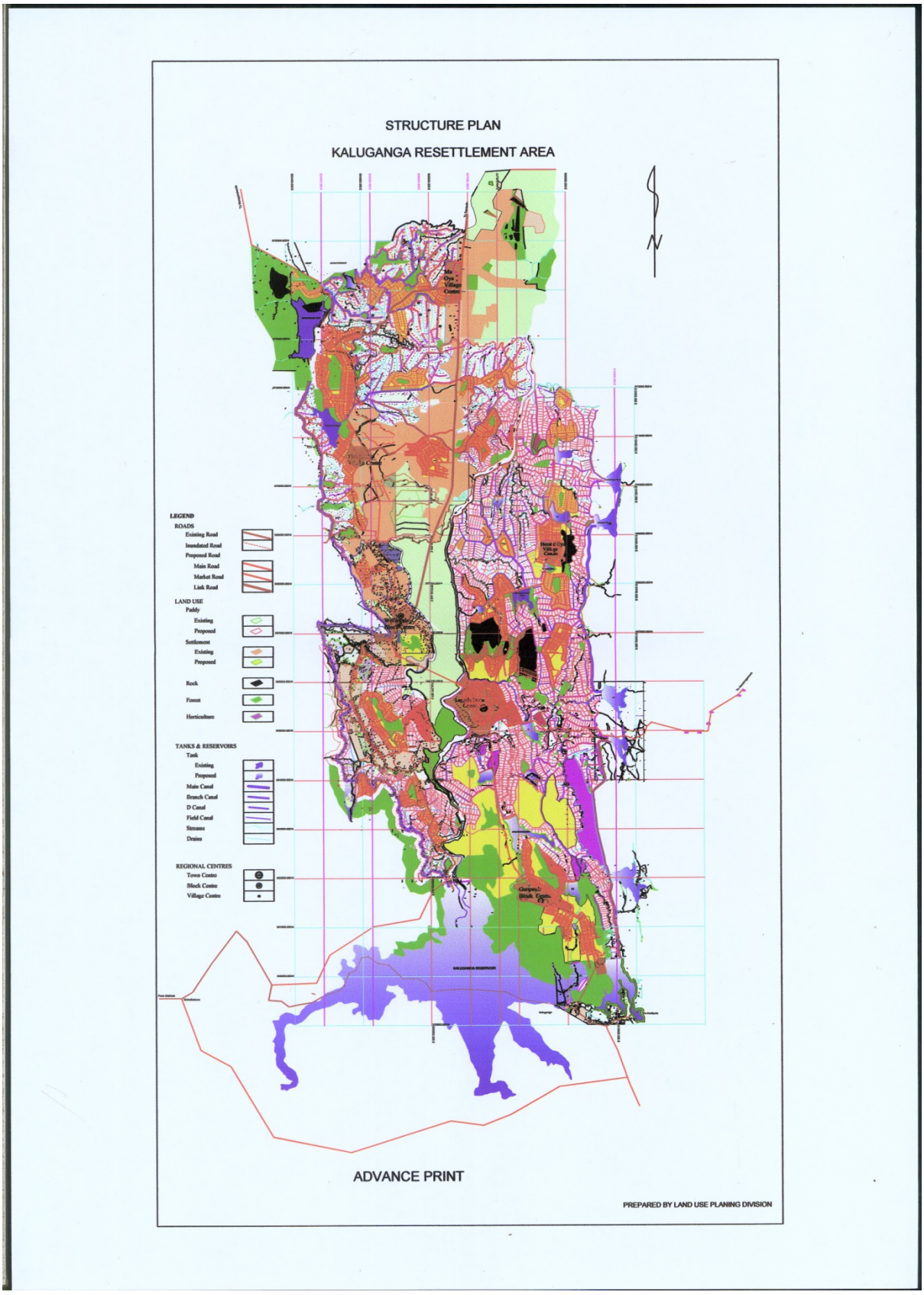
Map of Telephone Lines of the Project Area



Map No 03

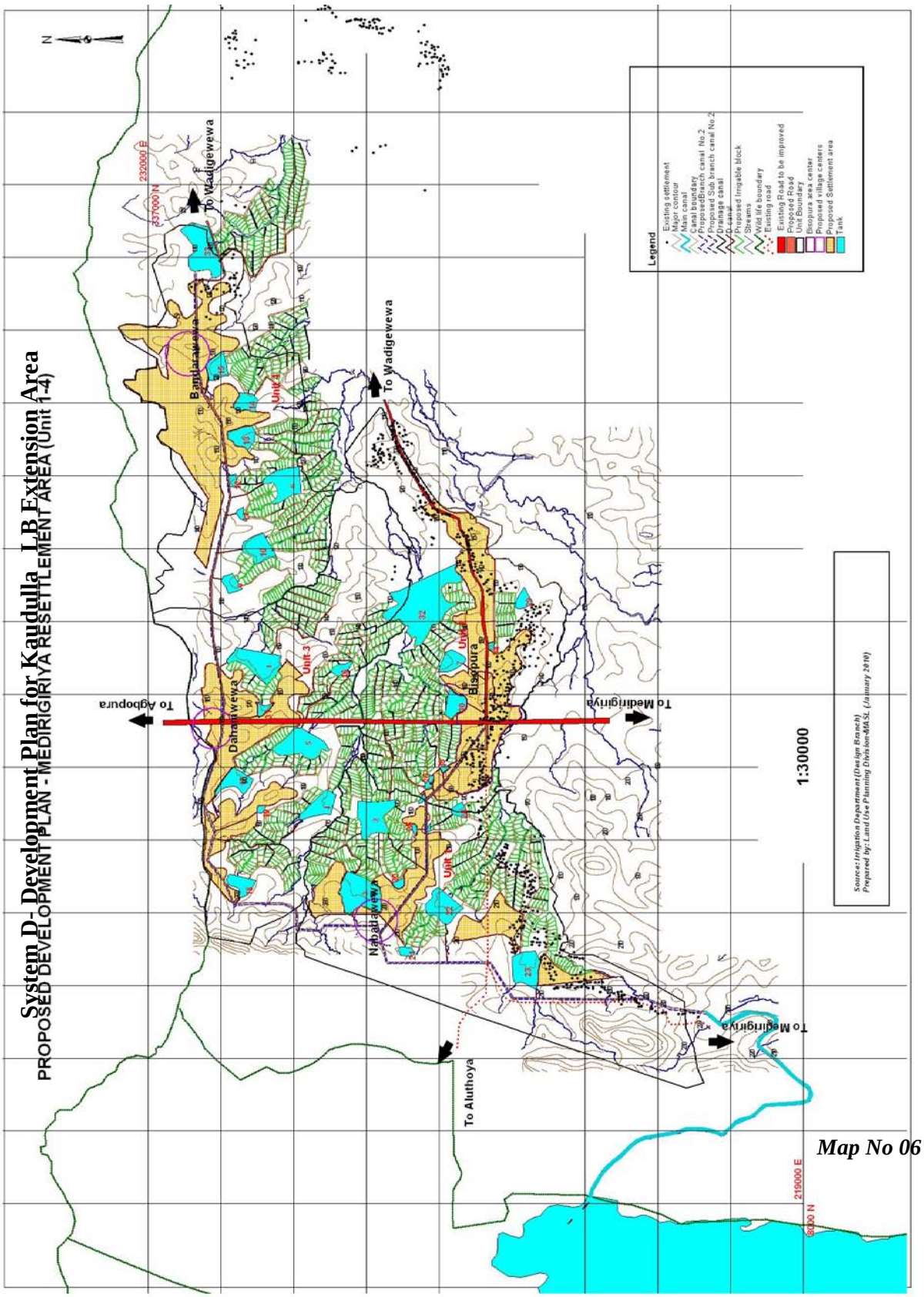
Map No 04

Proposed Structure Plan – System F - Kaluganga



Map No 05

Proposed Structure Plan – System D - Medirigiriya



Map No 06

Japan International Cooperation Agency

Social and Environmental Management Plan (ESMP)

Final Report

26th May 2010

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List of Abbreviation

AIDS	Acquired immunodeficiency syndrome
CEA	Central Environmental Authority
CEB	Ceylon Electricity Board
CPC	Ceylon Petroleum Cooperation
DS	Divisional Secretariat
DWLC	Department of Wildlife Conservation
EIA	Environmental Impact Assessment
EMC	Environmental Monitoring Committee
EMU	Environmental Management Unit
EMoP	Environment Monitoring Plan
EMP	Environmental Management Plan
GN	Grama Niladhari
GSMB	Geological Survey & Mines Bureau
HIV	Human Immunodeficiency Virus
IUCN	International Union for Conservation of Nature
IPM	Integrated Pest Management
JICA	Japan International Co-operation Agency
MADP	Moragahakanda Agricultural Development Project
MAFFCD	Ministry of Agriculture, Forestry, Food and Co-operative Development
MASL	Mahaweli Authority of Sri Lanka
MOH	Medical Officer of Health
MoU	Memorandum of Understanding
MSDS	Material Safety Data Sheets
NARA	National Aquatic Resources Agency
NBRO	National Building Research Organization
NIRP	National Involuntary Resettlement Policy
OHS	Occupational, Health and Safety
PAA	Project Approving Agency
PD	Project Director
PCB s	Polychlorinated biphenyls
PHI	Public Health Inspector
PPE	Personnel Protective Equipment
ESMP	Social and Environmental Management Plan
STDs	Sexually transmitted diseases
WHO	World Health Organization

1 Introduction

1.1 Environmental and Social Management Plan (ESMP): An Overview

The objective of the Environmental and Social Management Plan (ESMP) is to outline the mitigation, monitoring, and institutional measures to be undertaken during project implementation and operational framework to avoid or control adverse social and environmental impacts, and the program of actions needed to implement these measures. The ESMP is an integral element of social and environmental assessment. The core elements of the ESMP are the mitigation measures and the means of ensuring their implementation. It identifies feasible and cost-effective measures to reduce potentially significant adverse environmental and social impacts to acceptable levels. This ESMP has been prepared taking into consideration of the EIA study done by TEAMS in 1998 and related supplementary studies such as the Biodiversity Assessment carried out by the IUCN, the Comprehensive Watershed Management Plan and Mitigatory Plan prepared by University of Sri Jayewardenepura, and the Total Environmental Mitigation Plan for the MADP, etc. Additionally, this ESMP considers the present status of the project (see below).

An EIA at the start of the project had identified potential environmental impacts and made recommendations on mitigation practices. Several studies were conducted following the EIA and had recommended environmental mitigatory actions to address potential impacts. List of these documents are given in the Reference List. Therefore, this ESMP is prepared as an extension to the EMP in the earlier EIA taking into account the specific mitigation measures and actions necessary and identified by subsequent studies for the project to comply with applicable national policies, i.e, National Involuntary Resettlement Policy(NIRP), laws and regulations in Sri Lanka, especially the provisions of the National Environmental Act No. 47 of 1980 (*As amended*), The Land Acquisition Act, No. 9 of 1950, and also the Mahaweli Authority Act No. 23of 1979 (*As amended*). Furthermore, this ESMP is prepared in accordance with the Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Considerations (2002) within the JICA Survey.

Since site mobilization and construction works for Saddle Dam No. 2 and the diversion of the Naula – Elahera road (approximately 13 km) have already commenced by the Mahaweli Authority of Sri Lanka (MASL), this ESMP also describes the measures to be taken considering the present status and also considering the impact of completed activities. This ESMP serves as a guideline and may require updating to suit emerging scenarios during the course of the project.

1.2 Current Status of the Project

Figure 1 presents a map of the project area showing the major works sites and proposed infrastructure locations. As indicated earlier, at the time of preparation of this ESMP, construction works of the project has already commenced. Work in progress as of March 8th, 2010, includes construction of the saddle dam number 2, an access road of 13.5 km (width approximately 8 m) as an alternative to the Naula-Elahara or Pallegama-Naula Road (where 9 km stretch would be inundated once the main dam is built) and some borrowing sites. Furthermore, two of the borrow areas have been already rehabilitated and a nursery has been established for raising native vegetation for replanting.



Scale:1:105,000

Figure 1 Map of the project area showing major infrastructure

In view of the above developments this ESMP doesn't provide recommendations for the pre-construction phase related impacts (except for involuntary resettlement related issues), since construction works have already commenced. Environmental safeguards for the blasting operations and appropriate health and safety recommendations for overall project activities are however included since it is expected that more blasting and other high risk operations will continue to the late construction phase.

2 Social & Environmental Management Plan

2.1 Layout of the Plan

The MADP had been subject to the EIA process and an Environmental Management Plan had been prepared as part of the EIA approval. The ESMP prepared earlier will therefore form the basis of the present ESMP prepared under the current report.

Accordingly the consultants used the EMP in the earlier EIA and the subsequent reports in formulating this ESMP where more details are given based on the site specific observations were used to make more effective and practical mitigation recommendations.

The potential environmental impacts due to this project can be grouped according to the four main phases of the project. Namely these are the planning/pre-construction phase impacts, Construction phase impacts, operational/implementation phase impacts and decommissioning phase impacts. In addition to the above phases, re-settlement and health and safety issues have been addressed separately since these are not confined to any particular period of the project. By nature some of the impacts that will be experienced are unavoidable and thus need to be reduced by taking safeguard measures to reduce its impact. Some of these safeguard measures can be considered as corrective impact mitigation measures since they need to be carried out to reduce the impact of an activity when it happens while those measures that can prevent an event/issue from happening totally or partially can be considered as preventive impact mitigation measures. In this ESMP both corrective and preventive measures are proposed. For example, impact of dry weather or reduced flow cannot be prevented under the project but impacts of these events can be reduced as it happens by several measures while an event like contamination of the river flow can be totally prevented by many preventive measures.

2.1.1 Pre-construction Phase:

Since the preconstruction phase is already over, the main impact that remains to be addressed is the resettlement and downstream water users issues. These impacts are being addressed in detailed in the separate resettlement plan prepared based on the social assessment carried out as a part of this assignment.

2.1.2 Construction Phase:

The project is currently in the construction phase and many environmental impacts are taking place. It is noted that most of these are being addressed on the grounds by the project but several improvements that can be introduced to the EMP and

EMoP were noted. Main impacts discussed under the construction phase include following

1. Impact on biodiversity and natural resources in the areas where construction activities are taking place;
2. Possible contamination of the river flow with spoil and construction wastes;
3. Air quality deterioration in where construction related activities are taking place;
4. Increased noise and vibration pollution due to construction machinery and transport and blasting;
5. Soil erosion due to construction activities in the dams, roads, powerhouse and other site related areas;
6. Displacement and resettlement related issues and related socio-economic impacts (including water-born diseases and sexually transmitted diseases); and
7. Impacts on Archaeological sites.

2.1.3 Operational and Implementation Phase:

The project is expected to begin its operation in five years from now onwards. The power generation and the associated irrigation activities will gradually be implemented and several environmental and social impacts can be expected due to these events. Main impacts that can be expected during these processes can be:

1. Impact related to inundation on biodiversity and natural resources;
2. Hydrological and ecological impacts due to reduced down stream flows;
3. Contamination of the water due to various remains left behind in the inundation areas;
4. Increased soil erosion and potential bank erosion in the newly inundated areas;
5. Noise and dust related problems with increased traffic to and from the area; and
6. Livelihood impacts in the resettlement sites.

2.1.4 Decommissioning Phase (Demobilization and site Restoration Phase at the end of Construction):

Since the decommissioning of the Project is unlikely to happen, this ESMP does not cover the impacts during the decommissioning.

It is clear that many impacts identified in the earlier prepared EMP and under the current report occur throughout the project period from construction phase to the operation phase outlined above. Therefore, to avoid the repetition of the possible mitigation measures and other features in the report, the ESMP is presented

according to the possible impacts and recommendations. The recommendations are made on how these impacts can be reduced if encountered and how some of the impacts can be completely eliminated by adopting preventive measures. The following table is therefore, structured according to the impacts and gives the potential sites where these impacts may occur while other details such as recommended mitigation measure(s), responsible agency and how these responsibility can be institutionalized, the time of these actions to be taken and the approximate cost associated with these actions are presented.

Finally, in Section 2.3, the implementation structure for the EMP is briefly discussed. More detailed structure and description of the relevant organizations will be discussed in the EMoP which is separately prepared by the EML Consultants (Pvt) Ltd.

2.2 Impacts and Recommended Mitigation Measures

Impacts identified in this ESMP covers the impacts due to the construction and operation of the dam, power generation facility, transmission line, and irrigation areas including the resettlement areas at Morgahakanda Agriculture Development Project (MADP) under MASL. For easy reference the impacts and recommended mitigations are described under five different tables given below. These tables describe:

Table 1: Mitigation measures for impacts on addressing on impacts of social environment during planning, construction and operation phases.

Table 2: Mitigation measures for impacts on addressing on impacts of natural environment during planning, construction and operation phases.

Table 3: Mitigation measures for impacts on addressing on impacts of environmental pollution during planning, construction and operation phases.

Table 1: EMP for Impacts of Social Environment

Environ & Social Issues	Timeframe			Management Action	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
Involuntary Resettlement	A-/B-			▪ Prepare and implement a comprehensive resettlement action plan and a land acquisition plan, ▪ Ensure prompt and adequate compensation to the affected persons (resettlers), ▪ Provide necessary awareness and education on issues of compensation money in collaboration with relevant government organizations, ▪ Involve the affected persons on all stages of the resettlement plan.	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Throughout the construction and transitional periods, more discussed in the RIP	MASL	*Approx. Rs. 3.8 billion for resettlement; and approx. 1.8 billion for social dev. In the resettlement sites.
				▪ Community infrastructure dev. in watershed area (rehabilitation of 16 small tanks, rehabilitation of 110 small anicuts, 25 agri roads (70km), drinking water & social welfare, & sanitary facilities)	Resettlement sites	Once during the construction period	MASL	**Approx. Rs. 32.80 million
Local Economy such as Employment and livelihood, etc.		B-/B+	A+	▪ It is recommended that compensations for the loss of employment and affected crops and the livelihood assistance for the transitional period will be paid as planned in the RIP	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Once before the affected families are relocated.	MASL	Included in the RIP.
				▪ Impress upon the contractor(s) to utilize local labour to the extent possible, ▪ Wherever possible construction materials will need to be sourced from the locality,		Regularly throughout the construction period	Contractor	Included in the construction cost.
				▪ Farm production & income generation activities for setters in watershed area (establishment of 20 units of nurseries, dev. of home garden in 1,000ha, agro	Resettlement sites/Watershed area	Throughout the construction period	MASL	** Approx. Rs. 60.6 million

Environ & Social Issues	Timeframe			Management Action	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
				processing & marketing, & income generating activities)				
Social institutions such as split of communities	B-	B-		▪ To preserve existing social ties, resettlement by the community and preference of resettlers on the resettlement site selection need to be prioritised. ▪ Public awareness programmes to the local residents.	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Throughout planning & construction period, more discussed in the RIP.	MASL	Included in the RIP.
Existing social infrastructures & services such as traffic/existing public facilities		B-	B-	▪ Provide alternative access to public facilities (watering points, schools, health centres, road, temples, community hall and markets) where necessary,	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Once before resettlement, more discussed in the RIP.	MASL	Included in the RIP.
The poor, indigenous and ethnic people	B-/C-			▪ People with special needs and/or the vulnerable groups should be given special priority during resettlement and the transitional period. ▪ Livelihood assistance for the vulnerables needs to be provided as planned in the RIP.	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Before resettlement ad the transitional period	MASL	Included in the RIP
Misdistribution of Benefit and Damage	B-		B-	▪ Ensure adequate and fair compensation for the affected residents; ▪ Compensation on damages to the local communities should be harmonized to be uniform to all (including the damage to the host communities) ▪ Ensure enough public awareness to the resettlers and the host communities.	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Before resettlement ad the transitional period	MASL	Included in the RIP
Cultural heritage	B/C-	C-		▪ Ensure the adequate compensation and/or relocation shall be decided in	Dams, power generation plant,	Throughout the planning period.	MASL	Included in the RIP

Environ & Social Issues	Timeframe			Management Action	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
				consultation with the affected owners, local government, community leaders for 5 affected temples	transmission line, deviated road, and resettlement sites.			
	B-	C-		▪ Preserve the cultural and historical heritages as instructed in the Archeological Impact Assessment of Dept. of Archeology (preserving the remain(s) in an exhibition centre) ▪ Request Dept of Archeology to dispatch an expert to the construction site to supervise the mitigatory measure. ▪ If any archeological artifact or remain is found, stop all works and inform the Dept of Archeology immediately in accordance with Antiquities Ordinance No, 9 of 1940; ▪ Ensure appropriate compensation and mitigatory measures in consultation with Dept. of Archeology if any cultural/historical heritage is found during construction. ▪ Provide education programme on the preservation of archaeological artifacts to workers.	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Throughout the construction site.	MASL	The cost of the detailed study and preservation work needs to be added once the cost estimate is received from Dept. of Archaeology. For Personnel cost (approx. Rs. 40,000./month) or no additional cost if arranged with gov't. The cost for the newly found remain will be estimated on the need.
Local Conflict of Interest	B-/C-		B-/C-	▪ Ensure adequate and fair compensation for the affected residents; ▪ Compensation on damages to the local communities should be harmonized to be	Dams, power generation plant, transmission line, deviated road, and	Before resettlement & the transitional period	MASL	Included in the RIP

Environ & Social Issues	Timeframe			Management Action	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
				uniform to all (including the damage to the host communities) ▪ Ensure enough public awareness to the resettlers and the host communities.	resettlement sites.			
Water usage or water rights & rights of common			B+/ C-	▪ Monitor and Secure water from the dam and backwater between the proposed dam and the Elahera Anicut; ▪ Monitor water between the Elahera Anicut and the confluence. ▪ Secure the minimum river flow (environmental flow) of 1.4m^3/s for the downstream of the confluence of Amban River and the water demand; and ▪ Monitor water demand and coordinate the water flow from Elahera Anicut in accordance with the Sri Lankan practice (e.g. regular discussions between stakeholders).	Elahera anicut	Daily record of the flow.	MASL and Water Board	No additional cost for the discussion; *Approx. Rs. 4 million/construction period for water flow monitoring as planned in EMP.
Sanitation		B-		▪ Appropriate waste water and waste management shall be implemented for the construction site and workers' camps	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Daily throughout the construction period	Contractor	Included in the construction cost.
Hazard, risks and infectious diseases such as HIV/AIDS		B-		▪ Isolate safety risk areas and work camps from the public; ▪ Collaborate with other players (a local government and a NGO in community training and sensitization on infectious diseases control (such as HIV/AIDS) during construction and provide free contraceptives.	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Regularly throughout the construction period	Contractor	Included in the construction cost.
			B-	▪ Provide necessary awareness	Dams and	Regularly	MASL	*(to be provided*

Environ & Social Issues	Timeframe			Management Action	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
				information to the communities on water-borne diseases (e.g. malaria and dengu fever) and free mosquito nets to nearby residents; and ▪ Provide necessary awareness information to the communities on dam safety aspect. ▪ Release mosquito larva eating fish.	irrigation areas in resettlement sites.	throughout the operation period		*in the final report)*
Occupational Safety ad Health		B-		▪ Ensure compliance with regulations occupational health and safety regulations of Sri Lanka as well as the international practices during construction; and ▪ Provide safety gear to the construction workers and ensure application at all times.	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Regularly throughout the construction period	Contractor	Included in the construction cost.
				▪ Prepare a code of good practices on worker health and safety aspects	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Before construction	MASL	No additional cost

Note: P: Planning; C: Construction; and O: Operation.

*: Cost from MASL's RIP report

**: Cost from MASL's original EMP

Table 2: EMP for Impacts of Natural Environment

Environ & Social Issues	Timeframe			Management Actions	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
Topography and geographical		B-	B+/-	▪ Implement a rehabilitation plan including landscaping and repairs of the dam site and the borrow/disposal sites.	Dams, power generation plant, transmission	Regularly throughout the construction	MASL/Contractor	Partially included in the EMP cost of tree

Environ & Social Issues	Timeframe			Management Actions	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
features					line, deviated road, resettlement sites, borrow sites and disposal sites.	period		planting (see Soil Erosion)
Soil erosion		B-		▪ Minimise clearing vegetations during construction ▪ Construction to be confined during the dry season	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Regularly throughout the construction period	Contractor	Included in the construction cost
		B-	B+	▪ Protection & conservation of river/streams embankments in the watershed area (Constructions of retaining walls, drop walls, rubble cushion, etc.; tree plantation in reservation, river/stream banks in 600ha; & flow monitoring)	Reservoir and river banks in watershed area	Regularly throughout the construction period	MASL	**Approx. Rs. 56 million
				▪ Forestry Development in watershed area (upland forest conservation; timber farms in 300ha; & medicinal farms)	Water catchment area	Regularly throughout the construction period	MASL	**Approx. Rs. 227 million
				▪ Implementation of soil conservation methods for watershed area (on-farm soil conservation in 2,500ha; & off-farm soil conservation in 100km	Watershed area	Regularly throughout the construction period	MASL	**Approx. Rs. 102.5 million
Fauna, flora and biodiversity		A-/B-	A-/A+/B-/B+	▪ Establishment of 100m reservation around the perimeter of the reservoir (tree planting in 600ha & demarcation of buffer zone in Moragahakanda,	Watershed area	Regularly throughout the construction period	MASL	**Approx. Rs 96 million

Environ & Social Issues	Timeframe			Management Actions	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
				Bowatenna & Nalanda Reservations)				
				▪ Wildlife conservation in the watershed area (baseline survey; survey & demarcation the boundary; habitat enrichment; electric fencing; eco development; etc.)	Watershed area	Regularly throughout the construction period	Funded by MASL; and implemented by Dept. of Wildlife Conservation	**Approx. Rs 147 million
				▪ Biodiversity conservation in watershed area (translocation of species in the inundation area; collecting specimens of the flora & fauna; facilitate the ethno biological knowledge in the lost area through doct; mitigation of destructive land use practices outside the proposed protected area; prohibit introduction of competitive exotic fish species into reservoir; strictly adhere to environmental guidelines pertaining to construction activities, awareness programmes & employment of dedicated env. staff); control of proliferation Invasive Alien Species & enhancement of native biodiversity; Introduce biodiversity friendly livelihood strategies, incorporate biodiversity concerns, & introduce appropriate local area development policies; and maintain sustainable flow rate to recreate annual flash flood in reverine habitat and flood plains.	Watershed area	Regularly throughout the construction period	MASL; and implemented by Dept. of Wildlife Conservation	**Approx. Rs. 25.8 million
				▪ Env. Conservation activities in resettlement area (Kalu ganga & Medirigiriya) (tree planting in 50m tank reservation, river bank and avenue;	Resettlement sites	Regularly throughout the construction and transitional	MASL	**Approx. Rs. 100 million

Environ & Social Issues	Timeframe			Management Actions	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
				establishment of timber farms; home garden dev.; water quality monitoring; drinking water facilities; sanitary facilities; & training & mgmt activities)		periods		
				▪ Training & capacity building on watershed conservation mgmt (awareness training, training on agriculture & forestry, etc.)	Watershed area	Regularly throughout the construction period	MASL	**Approx. Rs. 91 million
		B-		▪ Provide the educational programme and prohibit workers from hunting animals and plant illegally in the construction site and/or protected area.	Dams, power generation plant, transmission line, deviated road, resettlement sites, borrow sites and disposal sites.	Regularly throughout the construction period	Contractor	Included in the construction cost
Meteorology			B-	▪ Provide the mitigatory measures for the water-borne diseases increased by humidity (see Hazard, risks and infectious diseases such as HIV/AIDS)	Irrigation areas	Regularly throughout the operation period	MASL	Included in the RIP
Landscape		B-	B+	▪ Partially covered under “Soil Erosion,” “Fauna, flora and biodiversity” and “topography and geographical features”	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Regularly throughout the construction period	MASL/Contractor	See “Soil Erosion,” “Fauna, flora and biodiversity” and “topography and geographical features”
Global warming			C-	▪ Clear trees in the reservoir area before inundation to minimize the methane emissions from reservoir.	Reservoir	Before inundation	MASL	Included in the construction cost.

Note: P: Planning; C: Construction; and O: Operation.
*: Cost from MASL's RIP report
**: Cost from MASL's original EMP

Table 3: EMP for Impacts of Environmental Pollution

Environ & Social Issues	Timeframe			Management Actions	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
Air pollution		B-		▪ Limit construction during the daytime only (6:00-18:00); ▪ Earth moving be carried out under dump conditions; ▪ Construction machines be maintained in good working conditions; and ▪ Inform communities on anticipated emissions for preparedness. ▪ Maintain the speed limits (10-15 km/hr) for all heavy construction vehicle in the community area. ▪ Use of a cover for trucks/lorries for transporting materials.	Dams, power generation plant, transmission line, deviated road, resettlement sites, borrow sites and quarry sites.	Daily throughout the construction period	Contractor	Included in the construction cost
Water pollution		B-		▪ Ensure appropriate waste water discharge from construction sites and worker's camps (e.g. pH 5.5-9, oil & grease ≦.10mg/l, BOD5 ≦ 250mg/l for industrial effluents discharged on land for irrigation purposes; or pH 6-8.5, oil & grease ≦.10mg/l, BOD5 ≦ 30mg/l, TTS <50mg/l, COD ≦250mg/L for industrial effluents discharged into inland surface	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Regularly throughout the construction period	Contractor	Included in the construction cost

Environ & Social Issues	Timeframe			Management Actions	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
				waters of Sri Lankan standards) ▪ Remove logs and plants as much as possible before inundation.				
			B-	▪ Water quality monitoring on the basic ambient water quality parameters (e.g. pH, Turbidity, NH4, NO2, NO3, PO4 & Conductivity) in the reservoir to meet the applicable parameters of water quality standards.	Around the reservoir area (upstream, reservoir, downstream)	Three times per year (maha season, yala season and dry season)	MASL	Monitoring of basic parameters: Approx. Rs. 5,000/sample
				▪ Influence application of agrochemicals upon additional water availability, ▪ Water quality monitoring on the agrochemicals (oganochlorine, organophosphates, pyrethroids, & polychlorinated biphenyis) and the other basic water quality parameters (Chlorophyll a & b, color, odor, pH, turbidity, total phosphorus (TP), NH3-N, NO2, NO3, PO4 & Conductivity) in the irrigation areas to meet the applicable parameters of water quality standards.	Irrigation areas (System F and D1)	Twice a year when water in the irrigated areas is discharged.	MASL	Monitoring of agrochemicals (Approx. Rs. 4,000/ sample) and basic parameters (Approx. Rs. 5,000/ sample)
Soil contamination		B-		▪ Secure handling and storage of machinery fuels, lubricants and metals	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Daily throughout the construction period	Contractor	Included in the construction cost.
			B/C -	▪ Provide the educational training on application of agrochemicals such as Integrated Pest Management (IPM)	Irrigation areas (System F and D1)	Throughout the operation period/once a year	MASL	Included in the agricultural extension programme of the RIP (Approx. Rs.58 million)

Environ & Social Issues	Timeframe			Management Actions	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
Waste management		B-	B-/+	▪ Contractor will be required to provide an adequate waste management system to construction sites and workers'camps; ▪ Categorise wastes into inert materials and others for safe disposal. Inert materials (concrete residuals ad earth) may be used on local access roads; ▪ Other waste materials to be disposed off into the approved disposal sites.	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Regularly throughout the construction period	Contractor	Included in the construction cost.
Noise and vibration		B-	B+	▪ Compliance with noise and excessive vibrations regulations (e.g. 75 dB (A) within the boundary of the noise source for construction noise between 6:00-18:00; 45 dB (A) for nighttime between 18:00-6:00 as per the National Env. (Noise Control) Regulations No. 1 of 1996); ▪ Limit construction during the daytime (e.g. 6:00-18:00) only; ▪ Notification of the residents on unusual noise and vibration levels during construction (e.g. blasting); ▪ Maintain vehicles and equipment well to avoid unnecessary noise and vibration; ▪ Inform the residents on un-usually high noise and vibration levels (when blasting)	Dams, power generation plant, transmission line, deviated road, resettlement sites, borrow sites and quarry sites.	Daily throughout the construction period	Contractor	Monitoring of noise and vibration: Rs 500,000 for 1 sound meter and Rs. 900,000 1 vibration meter. Rs. 325,000/ lump sum for noise and vibration monitoring by an independent laboratory
Offensive odour			B-	▪ Remove logs and plants as much as possible in the reservoir before inundation.	Reservoir	Before inundation	Contractor	Included in the construction cost.
Bottom sediments			B-	▪ Provide proper maintenance for the canals.	Irrigation areas	Regularly throughout the operation periods	MASL	Included in the cost of tree planning of EMP

Environ & Social Issues	Timeframe			Management Actions	Target Area	Frequency	Responsibility	Cost Estimates
	P	C	O					
Accidents		B-		▪ Isolate the construction sites from the general public ▪ Ensure occupational safety and hearth of the construction workers in accordance with Sri Lankan laws and the international practices,	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Regularly throughout the construction and operation periods	Contractor	Included in the construction cost.
			C-	▪ Provide safe public provision in relation to the dam and the canal including crossings, watering points, fishing, etc,	Dams and canals	Regularly through the operation period	MASL	Included in the training cost proposed in EMP

Note: P: Planning; C: Construction; and O: Operation.

*: Cost from MASL's RIP report

**: Cost from MASL's original EMP

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2.3 Implementation of ESMP and ESMoP – Organizational Structure

Figure 1 presents the proposed Management Structure/Organization Chart for the Project with respect to the socio-environmental management and monitoring aspects of the project (the monitoring aspect will be discussed in the ESMoP report separately). Moragahakanda Agricultural Development Project (MADP) which is executed by the MASL is expected to be funded by JICA. The overall responsibility for implementation of the Social and Environmental Management Plan and the Environmental Monitoring Plan is with the Project Director (PD) of the Moragahakanda project.

MASL will appoint Consultants and Contractors for the construction of the MADP. The contractors will construct the project under the supervision of the consultants, who will report to MASL as the client. The Environmental Management Unit and Resettlement unit at MASL will provide guidance and supervise implementation of the ESMP, possibly with the assistance of a team of Social & Environmental Management Consultants. The field level implementation of ESMP and EMoP is rest with the Environmental Division and Land Acquisition and Resettlement Division under the direct supervision of the Project Director. The environmental management and social safeguard activities will be under the overall control and supervision of the External Environmental Monitoring Committee, functioned at Ministry level. This committee, which is made up of representatives of relevant government departments and other key stakeholders is work under the direct supervision of the CEA. The Grievance Redress Mechanism, including conflict resolution mechanism is the key institutional set up to redress grievances of involuntary resettler community with the process of resettlement, which will be more discussed in the RIP report.

There are a set of services agencies involving very important set of activities in the environment and social safeguard process such as Land Ministry Survey Department, Valuation Department, Divisional Secretary especially in the resettlement process. The Divisional Secretary is also actively involved in environmental management activities in the field level.

MASL plans to appoint Consultants and Contractors for supervision and construction of the MDP. Supervision of the construction contractors will be by the consultants, who will report to MASL on the progress and issues. MADP will be responsible for field level monitoring of the compliance of environmental and social safeguards of the project and report to the Environmental Unit (EU) of MASL. This ESMP will form an integral part of the construction and operational activities of the project. The MASL Environmental Unit and Resettlement Unit will therefore, ensure the implementation of the ESMP. If the required expertise is unavailable it is recommended that the assistance of suitably qualified external Social & Environmental Management Consultants be obtained to execute recommendations of the plan.

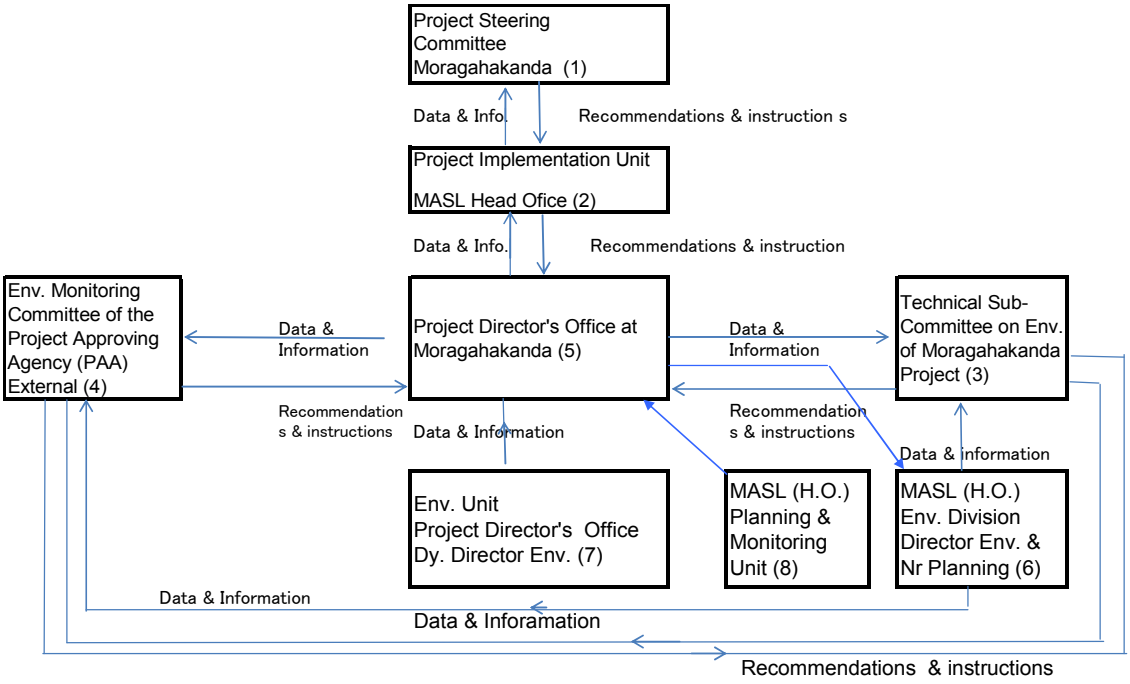


Figure 1 ESMP and ESMoP – Organizational Structure

The more detailed descriptions are available in the ESMoP.

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Social and Envoiremental Monitoring Plan (SEMoP)

Final Report

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1 Introduction

The Environmental and Social Monitoring Plan (ESMoP) is essential for successfully implementing the project specific environmental management program developed through the Social and Environmental Assessment done for the project and the Social ad Environmental Management Plan (SEMP) prepared taking in to account of the current status of construction works and future construction activities. The broad objectives are:

- To evaluate the performance of mitigation measures proposed I the EMP;
- To suggest improvements in management plan, if required;
- To enhance environmental and social quality; and
- To satisfy the legal and community obligations.

This document consists of the monitoring plans for the external and internal monitoring and the APPENDIX section contains monitoring forms that should be used for monitoring of specific segments of the environment such as air quality, water quality and also physical parameters such as noise and vibration.

It is important that the Project Director (PD), the Environmental Manager/Engineer and the Resident Engineer from MASL and all appointed Environment Compliance Officers reporting to the Environmental Manager/Engineer and/or the Resident Engineer understand the importance of Monitoring as a tool for analyzing and understanding the status of the project. Monitoring enables to assess the quality and impact of the work, against the action plans of the project.

During the construction phase all forms of internal monitoring should be accompanied by weekly or monthly reports with dated photographs, interview results, test reports produced by independent environmental consultancy, research institution or academic organizations where necessary. Note that test reports such as water quality, air and noise & vibration obtained during internal/external monitoring should be obtained from independent reputed laboratories, environmental consultants, research institutions and/or academic institutions (preferably from the list of laboratories and/or environmental consultants prepared by CEA: Central Environmental Agency).

All the reports produced by the MASL should be made readily available to the External Environmental Monitoring Committee (EEC) which is headed by the Project

Approving Agency the Ministry of Agriculture Development / Ministry of Agriculture, Forestry, Food and Co-operative Development, officials from Department of Wildlife Conservation (DWC), Forest Department (FD) and Irrigation Department and so on).

The Social and Environmental Compliance Monitoring in broad terms could be explained as below:

A systematic collection and analysis of social and environmental mitigation/compliance related information as a project progresses. It is aimed at improving the efficiency and effectiveness of a project. Monitoring is based on targets set and activities planned during the planning phases of work. It helps to keep the work on track, and can let management know when things are going wrong. If done properly, it is an invaluable tool for good social and environmental management, and it provides a useful base for evaluation. It enables to determine whether the project is meeting the set social and environmental standards and whether the resources available are sufficient and are being well used, whether the capacity is sufficient and appropriate, and whether the progress projects social and environmental mitigation component to result in the expected outputs. Most importantly, the monitoring is conducted for the impacts which are identified significant and/or uncertain in the EIA as part of the EIA procedure.

Monitoring involves: Establishing indicators (quantitative and qualitative) on efficiency, effectiveness and impact; Setting up systems to collect information relating to these indicators; Collecting and recording the information; analyzing the information; Using the information to inform day-to-day management, analyzing the status as an internal function in any project.

2 ESMoP

The detailed monitoring programme for the social environment, natural environment and environmental pollution during preparation (for resettlement), construction and operation stages are presented in Table 1, 2 and 3 respectively.

Table 1: EMP for Impacts of Social Environment

Environ & Social Issues	Timeframe			Monitored Parameter/ Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
Involuntary Resettlement	A-/B-			▪ Compensation Payment; ▪ Provision of livelihood restoration assistance. ▪ Preparation of resettlement sites; ▪ Socio-economic status; and ▪ Received requests/compl aints from PAPs. (More details discussed in the RIP)	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Regularly monitored by the officers of Acquisition Unit, Resettlemen t Unit and Monitoring Unit of MASL; and prepared the internal report monthly	Recording and reviewing the database of the PAPs' compensation and assistance; and reviewing the received requests/compl aints.	Yearly	Review and verify the MASL' s monitoring report, site visits, consultation with PAPs (Focused Group Meetings) and relevant officials; and conducting post-resettlement socio-economic	MASL	**Internal**: included in the MASL's personnel cost. **External:** Approx. Rs. 100,000 – 500,000 per year depending on the scope size (with or without the consultation meetings/socio-economic survey)

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Environ & Social Issues	Timeframe			Monitored Parameter/ Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
									survey if required		
Local Economy such as employment and livelihood, etc.		B-/B+	A+	▪ Provision of livelihood restoration assistance; ▪ Socio-economic status; and ▪ Received requests/complaints from PAPs.	Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.
Social institutions such as split of communities	B-	B-		▪ Socio-economic status; and ▪ Received requests/complaints from PAPs.	Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.
The Poor, indigenous and ethnic people	B-/C-			▪ No of affected vulnerables; and ▪ received requests/complaints	Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.	▪ Same as above.
Cultural	B-	C-		▪ Progress of the detailed survey	Dams	Regularly monitored by	Reviewing the draft detailed	Yearly	Review and verify the	Contractor /MASL	**Internal:** Personnel cost (approx. Rs.

Environ & Social Issues	Timeframe			Monitored Parameter/ Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
Heritage				and preservation Work ▪ Report on any findings from the contractor		the officers of Environment al Unit, Monitoring Unit of MASL and Dept. of Archaeology; and prepared the internal report monthly	survey report and the work schedule; Site visits; and		MASL' s monitoring report, site visits, and consultation with relevant officials.	with Dept of Archaeolo gy	40,000./month) or no additional cost if arranged with gov't. **External:** Approx. Rs. 100,000 – 500,000 per year for the entire env & social parameters but depending on the scope size (with or without the consultation meetings)
Local Conflict of Interest	B-/C-		B-/C-	▪ Compensation Payment; ▪ Provision of livelihood restoration assistance. ▪ No of Public awareness activities and ▪ Received requests/compl aints from PAPs.	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Regularly monitored by the officers of Acquisition Unit, Resettlement Unit and Monitoring Unit of MASL; and prepared the internal report	Recording the progress of compensation and assistance provision; no of public consultations; and reviewing the received requests/compl	Yearly	Review and verify the MASL' s monitoring report, site visits, and consultation with PAPs (Focused Group Meetings)	MASL	Included in the RIP

Environ & Social Issues	Timeframe			Monitored Parameter/ Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
						monthly	aints.		and relevant officials/		
Water usage or water rights & rights of common			B+/ C-	▪ Monitor and Secure water discharged from the dam and the Elahera Anicut; ▪ Monitor water flow at least 4 points identified in the target area; and ▪ Monitor water demand and coordinate the water flow from Elahera Anicut in accordance with the Sri Lankan practice (e.g. regular discussions between stakeholders).	(1) just downstream of the main dam; (2) between the main dam & the Elahera Anicut; (3) just downstresm of the Elahera Anicut; (4) between the Elahera Anicut and the confluence.	Daily record of the discharged flow from the main dam and the Elahera Anicut. Monthly record of the river flow at the target areas.	Recording the discharged water amount. Measuring the water flow with a water flow meter.	Yearly	Review and verify the MASL' s monitoring report, site visits, and consultation with relevant officials and downstream water users.	MASL and Water Board	**Internal:** Partially included in *Approx. Rs. 4 million/construction period for water flow monitoring as planned in EMP. In operation phase, no additional cost for the flow meter and personnel. **External:** Rs. 100,000 – 500,000 per year for the entire env & social parameters but depending on the scope size.

Note: P: Planning; C: Construction; and O: Operation.
*: Cost from MASL's RIP report

**: Cost from MASL's original EMP

Table 2: ESMP for Impacts of Natural Environment

Environ & Social Issues	Timeframe			Monitored Parameter/ Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
Soil erosion		B-	B+	▪ No of the constructed retaining walls, drop walls, rubble cushion, etc.; tree plantation in reservation, river/stream banks in 600ha; & flow monitoring ▪ Progress and area of Forestry Development in watershed area ▪ Progress and area of Implementation of soil conservation methods (on-farm soil	Reservoir and river banks in water shed area; Water catchment area; Water catchment area	Weekly record of the conservation work progress.	Recording the conservation work progress and site visits.	Yearly	Review and verify the MASL' s monitoring report, site visits, and consultation with relevant officials and selected local residents.	MASL with DWC and Forest Dept.	**Internal:** no additional cost for the personnel. **External:** Rs. 100,000 – 500,000 per year for the entire env & social parameters but depending on the scope size.

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Environ & Social Issues	Timeframe			Monitored Parameter/ Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
				conservation in 2,500ha; & off-farm soil conservation in 100km)							
Fauna, flora and biodiversity		A-/B-	A-/A+/B-/B+	▪ Progress and area of tree planting in 600ha & demarcation of buffer zone in Moragahakanda, Bowatenna & Nalanda Reservations	Watershed area	Weekly record of the conservation work progress.	Recording the conservation work progress and site visits.	Yearly	Review and verify the MASL' s monitoring report, site visits, and consultation with relevant officials and selected local residents.	MASL	**Internal:** no additional cost for the personnel. **External:** Rs. 100,000 – 500,000 per year for the entire env & social parameters but depending on the scope size.
				▪ Progress of the wildlife conservation work and the study (baseline study, survey & demarcation of the boundary; habitat enrichment,	Watershed area	Same as above	Same as above	Same as above	Same as above	Funded by MASL; and implemented by Dept. of Wildlife Conservation	Same as above

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Environ & Social Issues	Timeframe			Monitored Parameter/ Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
				electric fencing; eco-development)							
				▪ Progress of the biodiversity conservation work (No of translocated plants and collected specimens, etc.)	Watershed area	Same as above	Same as above	Same as above	Same as above	MASL; and implemented by Dept. of Wildlife Conservation	Same as above
				▪ The progress of the env. conservation activities in resettlement area (Kalu ganga & Medirigiriya) (Area of tree planting in 50m tank reservation, river bank and avenue; establishment of timber farms; home	Resettlement sites	Same as above	Same as above	Same as above	Same as above	MASL	Same as above

Environ & Social Issues	Timeframe			Monitored Parameter/ Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
				garden dev.; water quality monitoring; drinking water facilities; sanitary facilities; & training & mgmt activities)							

Note: P: Planning; C: Construction; and O: Operation.
*: Cost from MASL's RIP report
**: Cost from MASL's original EMP

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Table 3: EMP for Impacts of Environmental Pollution

Environ & Social Issues	Timeframe			Monitored Parameter/Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
Air pollution		B-		▪ Compliance of the working hour (6:00-18:00); ▪ No of water sprinkling per day; and ▪ No of complaints on	Dams, power generation plant, transmission line, deviated road, resettlement sites, borrow	Daily throughout the construction period	Observation	Yearly	Review and verify the MASL' s monitoring report, site visits, and consultation with relevant	Contractor /MASL	**Internal:** no additional cost for the personnel. **External:** Rs. 100,000 – 500,000 per year for the entire env & social

Environ & Social Issues	Timeframe			Monitored Parameter/Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
				dust from the local residents	sites and quarry sites.				officials and selected local residents.		parameters but depending on the scope size.
Water pollution		B-		▪ Waste water discharge from construction sites and worker's camps (e.g. pH 5.5-9, oil & grease ≦ .10mg/l, BOD5 ≦ 250mg/l for industrial effluents discharged on land for irrigation purposes; or pH 6-8.5, oil & grease ≦ .10mg/l, BOD5 ≦ 30mg/l, TTS <50mg/l, COD	Dams, power generation plant, transmission line, deviated road, and resettlement sites.	Monthly throughout the construction period	Water quality analysis in accordance with the Sri Lankan's water quality standard	Yearly	Review and verify the MASL's monitoring report, site visits, and consultation with relevant officials and selected local residents	Contractor/MASL	**Internal:** Monitoring of basic parameters: Approx. Rs. 5,000/sample **External:** Rs. 100,000 – 500,000 per year for the entire env & social parameters but depending on the scope size.

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Environ & Social Issues	Timeframe			Monitored Parameter/Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
				≦250mg/L for industrial effluents discharged into inland surface waters of Sri Lankan standards) ▪ No of complaints on dust from the local residents							
			B-	▪ Water quality monitoring on the basic ambient water quality parameters (e.g. pH, Turbidity, NH4, NO2, NO3, PO4 & Conductivity) in the reservoir to meet the applicable parameters of water quality standards.	Around the reservoir area (upstream, reservoir, downstream)	Three times per year (maha season, yala season and dry season)	Water quality analysis in accordance with the Sri Lankan's water quality standard	Yearly	Review and verify the MASL's monitoring report, site visits, and consultation with relevant officials and selected local	MASL	**Internal:** Monitoring of basic parameters: Approx. Rs. 5,000/sample **External:** Rs. 100,000 – 500,000 per year for the entire env & social parameters but depending on the scope size.

Environ & Social Issues	Timeframe			Monitored Parameter/Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
				▪ No of complaints on dust from the local residents					residents		
				▪ Water quality monitoring on the agrochemicals (oganochlorine, organophosphates, pyrethroids, & polychlorinated biphenyis) and the other basic water quality parameters (Chlorophyll a & b, color, odor, pH, turbidity, total phosphorus (TP), NH3-N, NO2, NO3, PO4 & Conductivity) in the irrigation areas to meet	Irrigation areas (System F and D1)	Twice a year when water in the irrigated areas is discharged.	Water quality analysis in accordance with the Sri Lankan and/or the international standard (e.g. WHO, IFC EHS)	Yearly	Review and verify the MASL's monitoring report, site visits, and consultation with relevant officials and selected local residents	MASL	**Internal:** Monitoring of agrochemicals (Approx. Rs. 4,000/ sample) and basic parameters (Approx. Rs. 5,000/ sample) **External:** Rs. 100,000 – 500,000 per year for the entire env & social parameters but depending on the scope size.

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Environ & Social Issues	Timeframe			Monitored Parameter/Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
				the applicable parameters of water quality standards.							
Soil contamination			B/C-	▪ Soil contamination by agrochemicals will be monitored by the above-mentioned water quality monitoring.	Irrigation areas (System F and D1)	Same as above	Same as above	Same as above	Same as above	Same as above	Same as above
Noise and vibration		B-	B+	▪ Compliance with noise and excessive vibrations regulations (e.g. 75 dB (A) within the boundary of the noise source for construction noise between 6:00-18:00; 45 dB (A) for nighttime	Dams, power generation plant, transmission line, deviated road, resettlement sites, borrow sites and quarry sites.	Daily observation and weekly spot measurement throughout the construction period	Noise measurement in accordance with the Sri Lankan regulations (i.e. British Standards) Vibration measurement in accordance	Yearly	Review and verify the MASL's monitoring report, site visits, and consultation with relevant officials and selected	Contractor/MASL	**Internal:** Monitoring of noise and vibration: Rs 500,000 for 1 sound meter and Rs. 900,000 1 vibration meter. **External:** Rs. 100,000 – 500,000 per year for the entire env & social parameters but depending on the

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Environ & Social Issues	Timeframe			Monitored Parameter/Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
				between 18:00-6:00 as per the National Env. (Noise Control) Regulations No. 1 of 1996); ▪ Compliance of the construction hours (e.g. 6:00-18:00) only; and ▪ No of complaints on dust from the local residents			with the international standard (e.g. IFC EHS, EU, UK)		local residents		scope size. If necessary, additional Rs. 325,000/ lumpsum for noise and vibration monitoring by an independent laboratory
Accident			C-	▪ Provision of safe public provisions in relation to the dam and the canal including crossings, watering points, fishing, etc,	Dams and canals	Regularly through the operation period	Observation	Yearly	Review and verify the MASL's monitoring report, site visits, and consultation with relevant officials	MASL	**Internal:** no additional cost for the personnel. **External:** Rs. 100,000 – 500,000 per year for the entire env & social parameters but depending on the

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Environ & Social Issues	Timeframe			Monitored Parameter/Indicator	Target Area	Internal Monitoring		External Monitoring		Respon sibility	Cost Estimates
	P	C	O			Frequency	Method	Frequency	Method		
									and selected local residents		scope size.

Note: P: Planning; C: Construction; and O: Operation.
*: Cost from MASL's RIP report
**: Cost from MASL's original EMP

2.1 Organizational Structure for the Implementation of ESMoP

Figure 1 presents the proposed Management Structure/Organization Chart for the ESMoP of the Project at the MASL Head Office and the Project Office with the relevant organizations. The overall structure for the ESMoP including relevant external organizations is shown in Figure 1.

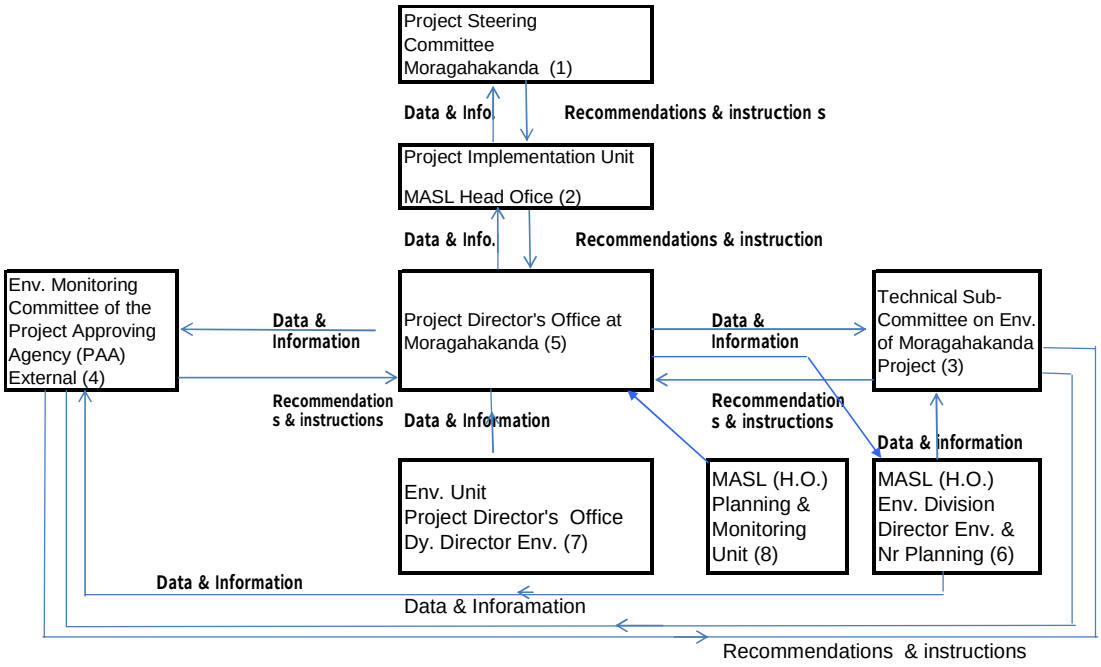


Figure 1 ESMoP – Organizational Structure

The roles and members of the organizations in the Figure 1 are as follows.

(1) Steering Committee of Moragahakanda Development Project - Ministry Secretary Level: Chaired by the Secretary of the Ministry of Irrigation & Water Management. The highest decision making level represented by the Heads of the relevant line institutions make policy decisions and issue necessary instructions & guidelines including for problems and issues forwarded in relation to monitoring aspects.

(a) Secretary - Ministry of Irrigation & Water Management -Chairman
(b) Secretary - Ministry of Agriculture & Agrarian Services
(c) Director General-MASL

(d) Director General - Irrigation Dept.
(e) Director - External Resource Dept.
(f) Director - National Planning Dept.
(g) Conservator of Forest - Dept. of Forest
(h) Director General - Central Environmental Authority
(i) Director General - Dept. of Wild Life Conservation
(j) Commissioner - Land Settlement Dept.
(k) Divisional Secretary - Laggala / Pallegama
(l) Divisional Secretary - Naula
(m) Chairman - GSMB
(n) Survey General - Dept. of Survey
(o) Executive Directors of the MASL - Executive Director - Technical Services
(p) do - Fin. & Admn.
(q) Directors of the MASL - Director - Env.
- Director – Land Use Planning (LUS)
- Director – Project Management Unit (PMU)
- Director - Settlement
- Director - Agriculture
- Director - Land

(r) Project Director - Moragahakanda
(s) Resident Project Manager – Medirigiriya

(2) Project Implementation Unit (PIU) of Moragahakanda Development Project – MASL DG Level: Chaired by the Director General, Mahaweli Authority of Sri Lanka. A decision making committee represent by the all the relevant Directors of the Mahaweli Authority of Sri Lanka. Make decisions and give necessary instructions & guidelines including for problems and issues forwarded in relation to monitoring aspects.

(a) Director General - MASL - Chairman
(b) Executive Director - Technical Services
(c) Executive Director - Finance & Admin.
(d) Directors of the MASL
- Director - LUP
- Director - PMU
- Director – WMS
- Director - Agriculture
- Director – Land
- Director – Finance
- Director – Project Planning

- Director - HIRD

(3) Technical Sub Committee (TSCE) of Moragahakanda Development Project– MASL, Head Office Level: This committee will be chaired by the DG/MASL and represented by all the relevant (Directors level) representatives of the relevant line agencies. TSCE will give instructions and recommendations regarding the implementation of the conditions given in the Environmental Approval Letter issued by the Project Approving Agency (PAA), the Ministry of Agriculture Development & Agrarian Services.

(a) Director General - MASL
(b) Executive Directors & Directors of the MASL
    - Executive Director -Technical Services
    - do - Fin. & Admn.
    - Director - LUP
    - Director - PMU
    - Director - WMS
    - Director - Agriculture
    - Director - Land
    - Director - Finance
    - Director - Project Planning
    - Director - HIRD
        - Project Director -Moragahakanda Project
        - RPM - Medirigiriya (System G)
(c) Director Project Development / Ministry of Agriculture Development & Agrarian Services
(d) Director - Irrigation Dept.
(e) Chairman - GSMB
(f) Director - NBRO
(g) Director - Ministry of Land Development & Resettlement
(h) Director - CEA
(i) Representatives of Survey Dept.
(j) Representative of DWLC
(k) Director - NRMS
(l) Representatives of Archeology
(m) Director - NRMS - Dept. of Agriculture
(n) Divisional Secretariat - Naula
(o) -do- - Laggala / Pallegama

(4) External Environmental Monitoring Committee (EIA) of Moragahakanda Development Project:

The committee is chaired by Secretary Ministry of Agriculture Development & Agrarian Services and responsible for monitoring of the successful implementation of the mitigatory measures and conditions of the EIA and the Env. Approval letter respectively. Monitoring would involve ensure compliance with National Environment standards, conditions and the effectiveness of the mitigatory measures.

(a) Secretary - Ministry of Agriculture Dev. & Agrarian Services - Chairman
(b) District Secretary - Polonnaruwa
(c) Director - EIA - Central Environmental Authority
(d) Dy. Director - Dept. of Irrigation
(e) Snr. Dy. Conservator of Forest - Dept. of Forest
(f) Director - GSMB
(g) Addl. Director(NRMS) - Dept. of Agriculture
(h) Director – Land Development & Resettlement
(i) Divisional Secretary Divisional
(j) Divisional Secretary - Divisional Secretariat - Naula
(k) Land Commissioner (Lands) - Land Commissioners Dept.

(5) Project Director – Moragahakanda Development Project– Project Level

He is responsible for the successful implementation of the project components including the environment mitigation plan and Env. Management plan and he will be assisted by the project level Env. Division headed by a Director Environmental in relation to Env. components.

(6) Environment Division of MASL (Head Office)

Environment Division at MASL Head Office (under Director – Env. & Natural Resource Planning) will coordinate and facilitate the activities regarding implementation of the Environment Mitigation Plan, Environment Management Plan, Recommendations of the various relevant study reports (EIAR) and Conditions of the Env. Approval letter issued by the Project Approving Agency (Ministry of Agriculture Development & Agrarian Services), He will also send necessary instructions & technical guidance to the Env. Management Division at Moragahakanda Project level.

1. Responsible for preparation of policies, plans & guidelines for Environment & Natural Resource components of MASL

2. Facilitation of Environmental approval procedure for granting environmental approval (EIA Process) for the projects coming under Mahaweli Gazetted areas.

3. Conducting Technical Sub Committee on Environment for Moragahakanda & Kaluganga Agricultural Development Project to implement the conditions of the Environmental approval letters.

4. Facilitation and preparation of various Environment Management Plan and study reports required by Moragahakanda & Kaluganga Agricultural projects (e.g. – Env. Mitigation plan, Env. Monitoring plan, Biodiversity Assessment study, Watershed Management plan etc.)

5. Facilitation and implementation of the recommendations of the various study reports of Moragahakanda & Kaluganga Agricultural projects.

6. Facilitation of Environmental Monitoring activities of the Moragahakanda & Kaluganga Agricultural projects.

7. Facilitation and coordination of wild life conservation programme, reforestation programme of the Moragahakanda and Kaluganga projects with DWLC.

8. Coordinating, issuing technical guidance & instructions to Deputy Director – Environment at Moragahakanda project office regarding implementation of the environment component of the Moragahakanda project.

9. Conducting meetings of the Environmental Cell of the Mahaweli Authority of Sri Lanka.

10. Coordinating National Action Plan for Haritha Lanka Programme in Mahaweli Authority of Sri Lanka.

11. Facilitation of the preparation of the environment Assessment Reports based on the World Bank Guidelines for the rehabilitation of the under mentioned dams coming under Dam Safety and Water Resource Planning Project (DSWRPP) and obtaining clearance from the Funding Agency (World Bank) for the same.

12. Liaison with other agencies such as Central Environmental Authority, Dept. of Forest, Dept. of Wild Life, Geological Survey & Mines Bureau (GSMB)

Local authorities etc. regarding Env. & Natural Resource Planning & Management activities.

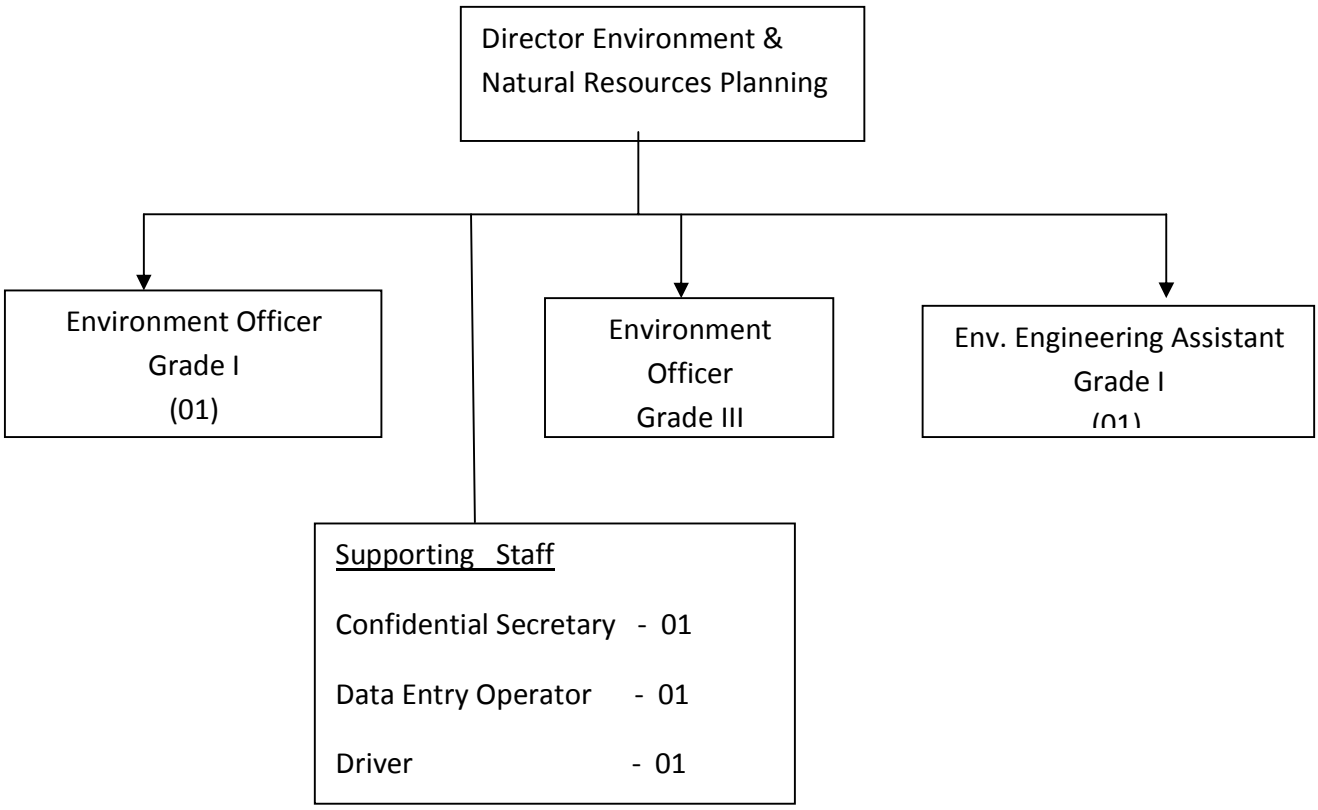


Figure 2 Environmental Unit of MASL

(7) Environment Unit at Moragahakanda Project Level – (Dy. Director Env. – Moragahakanda): Responsible for the successful implementation of the Environment Mitigation Plan and Environment Management Programme of the Moragahakanda project and will ensure coordination among line agencies at district, divisional and field levels.

The Environmental Unit headed by a Deputy Director – Environmental Conservation will be established at the MASL Moragahakanda Office under the Director – Environment & Natural Resource Planning of the MASL Head Office. Following are some of the main duties the Environmental Unit is entrusted with;

1. Successful implementation of the Environment Mitigation Plan and the Environment Management programme of the Moragahakanda Project

2. Ensure coordination among line agencies at district, divisional and field level. Take leadership in coordination and implementation activities.

3. Resolve watershed management problems and issues at various levels on various aspects

4. Liaise with the Director Environment Natural Resources Planning Unit in Head Office and get their guidance and support for project implementation.

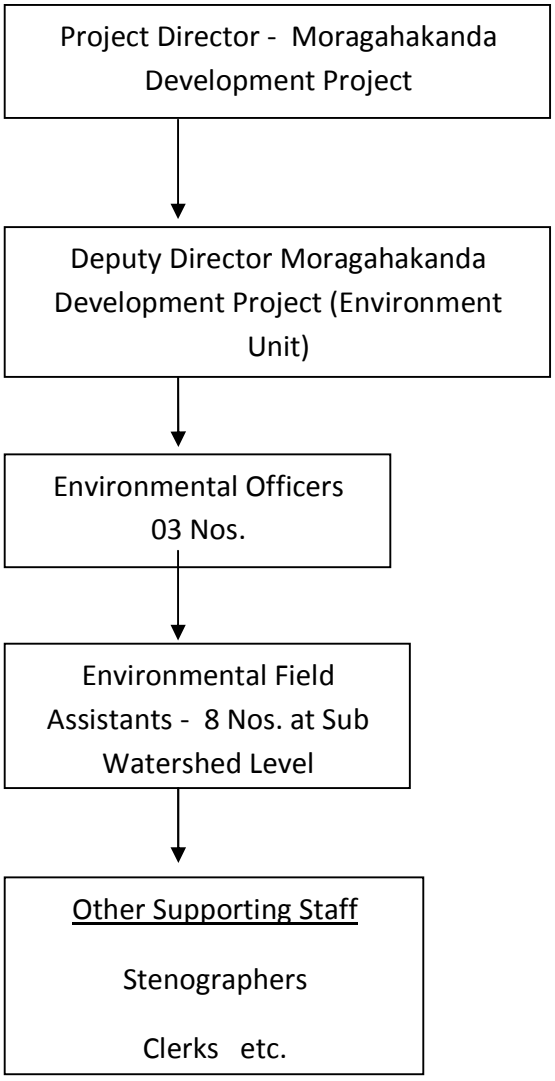


Figure 3 The proposed structure of the Environment Unit at Moragahakanda Project Level

(8) Planning and Monitoring Unit of Mahaweli Authority of Sri Lanka: Planning & Monitoring Unit is responsible to the Director General for macro planning, compilation of action plans, annual plans, operation of budget, submission of progress reports, monthly, quarterly and annually in accordance with the MASL rules and guidelines, maintenance of data depository/library and co-ordination with other government institutions such as National Planning Department, Census & statistic Department, Central Bank of Sri Lanka and funding institutions.

5. Forwarding annual work programme and action plans of the authority.
6. Monitoring on a regular basis of all MASL. Systems, Projects and Programmes and their effects upon the settlers and their economy.
7. Compilation of monthly, quarterly and annual progress reports related to physical and financial programme for authority and for other institutions and presentations.
8. Review operational planning and coordination of planning & implementation divisions/agencies and scheduling of work items.
9. Maintenance of up-to-date development statistics, technical reports pertaining to the Mahaweli project and updating the data depository/library.
10. Operation and maintenance of Mahaweli computer network and updating Mahaweli Web Site.
11. Co-ordination of surveys, conduct socio-economic studies, evaluations and problems/issues focused position papers.
12. Consultative service provision for national and international agencies on the Mahaweli in planning, monitoring and evaluation aspects, as well as setting up computerized data banks and monitoring systems.
13. Preparation of the corporate plan, macro plans, project proposals and pre-feasibility reposts.

2.2 Job Descriptions of the Key Posts

No.	Post	Brief Job Description	No. of Staff	Work Place	Type of Staff	Salary/month (approximately) Rs.
1	Director - Environment	Overall responsible for environment maters regarding MASL (Mahaweli Dev. Project/Moragahakanda Dev. Project and other projects). Formulation of Env. Policies, plans & guidelines etc., Conducting EIA Process Preparation and coordination of EMP, EMOP, overall monitoring etc.	1	Head Office Env. Division (existing)	Permanent	57230/-
2	Deputy Director	He will be responsible for assisting Director in all environmental related aspects. Dy. Director Mora. will also responsible for monitoring & implementation of environment components of Mora. Project including mitigation plan, environment management plan etc. Will ensure coordination among line agencies at district, divisional and field level.	2	Head Office (01) & Project Office (01) Moragahakanda (proposed)	Permanent	38530/- (Basic)
3	Env. Officer Gr. I	He will be responsible for assisting Director in all environmental related aspects in planning, implementation & monitoring etc.	2	Head Office (01) & Project Office (01) (existing)	Permanent	39255/-
4	Environment Officer Gr. III	Will assist in planning, implementation and monitoring of environmental aspects of Mahaweli Dev. Project/Moragahakanda Dev. Project & other projects.	4	Head Office (01) & Project Office (03) (existing)	Permanent	27475/-
5	Field Assistant	Will assist the Env. Officer in all related matters relevant to the subject.	8	Project Office (08) Moragahakanda (existing)	Permanent	15500/-
6	Eng. Assistant (Env.)	Will responsible for implementation of plans, programmes in relation to environmental engineering aspects.	1	Head Office (01) (existing)	Permanent	32425/-

Appendix

Appendix 1 **Proposed Environmental & Social Monitoring Forms**

Date : ……. Location : …….

GPS Coordinates : ……. Weather conditions : …….

Remarks : …….

(1) Monitoring of Environmental Mitigation Measures – Discharged water from construction site and workers' camps

Proposed Parameters	**Unit**	**Measured Value (Mean)**	**Measured Value (Max)**	**CEA standards (**for industrial effluents**)**	**Standards for Contract (Baseline conditions)**	**Referred International Standards**	**Remarks**
pH	-			6.0 to 8.5	6.0 to 8.5	6-9 (IFC EHS)	
Temperature	^{o}C			shall not exceed 40°C in any Section of the Stream within 15m down stream from the effluent outlet.	shall not exceed 40°C in any Section of the Stream within 15m down stream from the effluent outlet.	-	
Turbidity	NTU			-	-	-	
TSS	mg/L			50	50	50 (IFC EHS)	
Oil and grease	mg/L			10	10	10 (IFC EHS)	
BOD5	mg/L			30	30	-	

(2) Monitoring of Environmental Mitigation Measures – River water quality

Proposed Parameters	**Unit**	**Measured Value (Mean)**	**Measured Value (Max)**	**CEA standards (**for industrial effluents discharged on land for irrigation purposes**)**	**Standards for Contract (Baseline conditions)**	**Referred International Standards**	**Remarks**
pH	-			5.5-9.0	5.5-9.0	6-9 (IFC EHS)	
EC	mS/m			-	-	-	
Temperature	^{o}C			-	-	-	
Turbidity	NTU			-	-	-	
DO	mg/l			-	-	-	
COD	mg/l			-	125	125 (IFC EHS)	
BOD5	mg/l			30	30	-	
Cl	mg/l			600	600	-	
NH4	mg/l			-	-	-	
NO2	mg/l			-	-	-	
NO3	mg/l			-	-	-	
PO4	mg/l			-	-	-	
Discharged amount from	M3/s			-	-	-	

the main dam							
Discharged amount from Elahera Anicut	M3/s			-	-	-	
Water Flow downstream of the main dam	M3/s			-	-	-	
Water availability and Flow between the main dam and anicut	- M3/s			-	-	-	
Water Flow downstream of the elahera anicut	M3/s			-	-	-	
Water Flow between the elahera anicut and the confluence	M3/s			-	1.4	-	

(3) Monitoring of Environmental Mitigation Measures – Agrochemicals in water from discharged from the irrigation areas

Proposed Parameters*	Unit	Measured Value (Mean)	Measured Value (Max)	CEA standards	Standards for Contract (Baseline conditions)	**Referred International Standards**	**Remarks**
oganochlorine				Undetectable for pesticides	Undetectable for pesticides	N.A. in WHO/WB's EHS	

						Guidelines	
pyrethroids				Undetectable for pesticides	Undetectable for pesticides	N.A. in WHO/WB's EHS Guidelines	
polychlorinated biphenyis				Undetectable for pesticides	Undetectable for pesticides	N.A. in WHO/WB's EHS Guidelines	

* Parameters need to be confirmed with the existing use of the agrochemicals in the planned agriculture areas.

Conclusions:

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Name & Signature Environmental Manager / Officer in Charge (Contractor) ……

Name & Signature of Project Director (MASL) ……

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Appendix 2 Monitoring of Environmental Mitigation Measures - Noise Levels

Date : ……. Location : …….

GPS Coordinates : ……. Weather conditions : …….

Remarks : …….

(1) LAeq values obtained for the test location

Parameter	Unit	Measured Value (Mean)	Measured Value (Max)	CEA standards	Standards for Contract (Baseline conditions)	Referred International Standards	Remarks
▪ LAeq	dB (A)			▪ Compliance with noise and excessive vibrations regulations (e.g. 75 dB (A) within the boundary of the noise source for construction noise between 6:00-18:00; 45 dB (A) for nighttime between 18:00-6:00 as per the National Env. (Noise Control) Regulations No. 1 of 1996);	Same as the CEA Standards	70 for industrial area (IFC EHS)	
▪ Compliance of the construction hours (e.g. 6:00-18:00) only; and	-			-	-		
▪ No of complaints on dust from the local residents	-			-	-		

(2) LAeq values obtained for Reference Points (If any)

Parameter	Unit	Measured Value (Mean)	Measured Value (Max)	CEA standards	Standards for Contract (Baseline conditions)	Referred International Standards	Remarks
▪ LAeq ▪ Compliance of the construction hours (e.g. 6:00-18:00) only; and ▪ No of complaints on dust from the local residents	dB (A) - -			▪ Compliance with noise and excessive vibrations regulations (e.g. 75 dB (A) within the boundary of the noise source for construction noise between 6:00-18:00; 45 dB (A) for nighttime between 18:00-6:00 as per the National Env. (Noise Control) Regulations No. 1 of 1996); - -	CEA Standards/IFC EHS - -	70 for industrial area (IFC EHS) Heavy Industry (no demand for oral communication) 85 dB(A) for Equivalent level LAeq,8h 110 dB(A) for Maximum LAmax,fast (IFC EHS)	

Conclusions:

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Name & Signature Environmental Manager / Officer in Charge (Contractor) ……

Name & Signature of Project Director (MASL) ……

Appendix 3 Monitoring of Environmental Mitigation Measures (Blasting Log)

1. Blasting Date : ……
2. Blasting No : ……
3. Location : ……
4. GPS Coordinates : ……
5. Blasting Time : ……
6. Weather conditions : ……
7. Blasting Pattern : Test Blast 1 Test Blast 2 Test Blast 3
8. Diameter of boreholes : ……
9. No. of boreholes : ……
10. Length of borehole : ……
11. Burden (B) : ……
12. Spacing (S) : ……
13. Sub drilling (J) : ……
14. Utility of delay : YES NO
15. Charge per detonator :

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Hole length (m)							
ANFO (Kg)							
Dynamite (Kg)							
Stemming (m)							

16. Explosive Consumption : ANFO…… DYNAMITE……
17. Fly rocks report : YES NO
18. Maximum distance of fly rocks : ……
19. Fragmentation : GOOD MODERATE BAD
20. Misfires : YES NO

If YES, what action taken : ……

21. Rock surface : CLEAN NOT CLEAN
22. Precautionary Measures Adopted :

Notify blasting dates : YES NO

If YES, details ……

Flagmen employed : YES NO

Details (name, national ID, etc) ……

Warning signaling system : GOOD BAD

Details ……

Evacuation of workers/people : YES NO

Details ……

Safety measures taken : YES NO

Details ……

23. Wearing of PPE by workers : YES NO

Ear plugs

Ear muffs

Dust masks

Eye shields

Details……

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24. Silt traps or curtains employed and Condition ……

Conclusions:

……

……..

Name & Signature Environmental Manager / Officer in Charge (Contractor) ……

Name & Signature of Project Director (MASL) ……

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Appendix 4 Progress of the Other Parameters (Natural Environment and Social Environment)

(1) Monitoring of

Date : ……. Location : …….

GPS Coordinates : ……. Weather conditions : …….

Remarks : …….

Parameter	Monitored Items	Monitoring Results during Report Period	Remarks
Resettlement	(1) Progress of Payment (2) Provision of livelihood restoration assistance (3) Preparation of resettlement sites (4) Socio-economic status (5) Received requests/complaints from PAPs.		
Local Economy and Livelihood	(1) Provision of livelihood restoration assistance (2) Socio-economic status (3) Received requests/complaints from PAPs.		
Social Institution	(1) Socio-economic status; and (2) Received requests/complaints from PAPs.		
The Poor, indigenous and ethnic people (the Vulnerables)	(1) No of affected vulnerables; and (2) received requests/complaints		
Cultural Heritage	(1) Progress of the detailed survey and preservation Work (2) Report on any findings from the contractor		
Local Conflict	(1) Compensation Payment;		

Parameter	Monitored Items	Monitoring Results during Report Period	Remarks
	(2) Provision of livelihood restoration assistance. (3) No of Public awareness activities and (4) Received requests/complaints from PAPs.		
Soil Erosion	(1) No of the constructed retaining walls, drop walls, rubble cushion, etc.; tree plantation in reservation, river/stream banks in 600ha; & flow monitoring (2) Progress and area of Forestry Development in watershed area (3) Progress and area of Implementation of soil conservation methods (on-farm soil conservation in 2,500ha; & off-farm soil conservation in 100km)		
Fauna, Flora and Biodiversity	(1) Progress and area of tree planting in 600ha & demarcation of buffer zone in Moragahakanda, Bowatenna & Nalanda Reservations; (2) Progress of the wildlife conservation work and the study (baseline study, survey & demarcation of the boundary; habitat enrichment, electric fencing; eco-development); (3) Progress of the biodiversity conservation work (No of translocated plants and collected specimens, etc.); (4) The progress of the env. conservation activities in resettlement area (Kalu ganga & Medirigiriya) (Area of tree planting in 50m tank reservation, river bank and avenue; establishment of timber farms; home garden dev.; water quality monitoring; drinking water facilities;		

Parameter	Monitored Items	Monitoring Results during Report Period	Remarks
	sanitary facilities; & training & mgmt activities)		
Air (Dust)	(1) the working hour (6:00-18:00); (2) No of water sprinkling per day; and (3) No of complaints on dust from the local residents		
Water Demand	(1) Monitor water demand and coordinate the water flow from Elahera Anicut in accordance with the Sri Lankan practice (e.g. regular discussions between stakeholders).		
Vibration	(1) Vibration during construction at the construction sites (dB)		
Accidents	(1) No of accidents		

Conclusions:

……

……..

Name & Signature Environmental Manager / Officer in Charge (Contractor) ……

Name & Signature of Project Director (MASL) ……

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Appendix 2 Sri Lankan Environmental Standards
(1) Air Quality

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අති විශෙෂ

The Gazette of the Democratic Socialist Republic of Sri Lanka

EXTRAORDINARY

අංක 1562/22 - 2008 අගෝස්තු 15 වැනි සිකුරාදා - 2008.08.15

No. 1562/22 - FRIDAY, AUGUST 15, 2008

(Published by Authority)

PART I : SECTION (I) — GENERAL

Government Notifications

L.D.B. 4/81.

THE NATIONAL ENVIRONMENTAL ACT, No. 47 OF 1980

REGULATIONS made by Minister of Environment and Natural Resources under Section 32 of the National Environmental Act, No. 47 of 1980.

PATALI CHAMPIKA RANAWAKA,
Minister of Environment and Natural Resources.

Colombo,
13th August, 2008.

Regulations

The National Environmental (Ambient Air Quality) Regulations, 1994, published in *Gazette Extraordinary,* No. 850/4 of December, 1994 are hereby amended by the subsitution for the Schedule to that regulation of the following :-

"SCHEDULE

Pollutant	*Averaging Time**	*Maximum Permissible Level*		*+ Method of measurement*
		μgm^{-3}	*ppm*	
1. Particulate Matter - Aerodynamic diameter is less than 10 μm in size (PM_{10})	Annual	50	—	Hi-volume sampling and Gravimtric or Beta Attenuation
	24 hrs.	100	—	
2. Particulate Matter - Aerodynamic diameter is less than 2.5 μm in size ($PM_{2.5}$)	Annual	25	—	Hi-volume sampling and Gravimtric or Beta Attenuation
	24 hrs.	50	—	

1A

SCHEDULE *(Contd.,)*

Pollutant	*Averaging Time**	*Maximum Permissible Level*		*+ Method of measurement*
		μgm^{-3}	*ppm*	
3. Nitrogen Dioxide (NO_2)	24 hrs.	100	0.05	Colorimetric using saltzman Method or equivalent Gas phase chemiluminescence
	8 hrs.	150	0.08	
	1hr.	250	0.13	
4. Sulphur Dixoxide (SO_2)	24 hrs.	80	0.03	Pararosaniliene Method or equivalent Pulse Flourescent
	8 hrs.	120	0.05	
	1hrs.	200	0.08	
5. Ozone (O_3)	1 hr.	200	0.10	Chemiluminescence Method or equivalent Ultraviolet photometric
6. Carbon Monoxide (CO)	8 hrs.	10,000	9.00	Non-Dispersive Infrared Spectroscopy"
	1 hr.	30,000	26.00	
	Any time	58,000	50.00	

* Minimum number of observatons required to determine the average over the specified period —

03 hour average	-	03 consecutive hourly average
08 hour average	-	08 hourly average
24 hour average	-	18 hourly average
Yearly average	-	09 monthly average with at least 02 monthly average each quarter.

\+ By using Chemicals or Automatic Analysers.

08-1106

PRINTED AT THE DEPARTMENT OF GOVERNMENT PRINTING, SRI LANKA.

924/12

PART I : SECTION (1) GENERAL
Government Notifications

THE NATIONAL ENVIRONMENT ACT, NO. 47 OF 1980

REGULATIONS made by the Minister of Transport, Environment and Women's Affairs under section 23P, 23Q and 23R of the National Environmental Act, No. 47 1980 read with section 32 of that Act.

Srimani Athulathmudali
Minister of Transport , Environment
And Women's Affairs

Colombo
21st May, 1996,

Regulations

1. These Regulations may be cited as the National Environmental (Noise Control) Regulations No.1 1996

2. Except in the instances where the provisions of regulation 7 applies, the maximum permissible noise levels at the boundary of the land in which any source of noise is located, shall not exceed the limits set out in the First Schedule hereto. The provisions of this regulation shall operate only in respect of the areas specified in the said schedule.

3. Except in the instances where the provisions of regulation 7 applies, where the background noise levels in relation to any source of noise exceeds the limits set out in the First Schedule hereto, the limits set out in the Second Schedule hereto shall apply in respect of the areas specified therein.

4. Except in the instances where the provision of regulation 7 applies and notwithstanding anything the contrary in regulations 2 and 3 , the maximum permissible noise levels, at the boundary of any land in which any source of noise is located and emitted consequence of the carrying out of any construction activity on such land, shall not exceed the limits set out in the Third Schedule hereto:

   Provided that the noise levels caused by such activity shall not be carried on for a period which in the aggregate exceeds three months, without the written consent of the Authority given in respect of any such particular activity, or in terms of a licence granted under Section 23A of the Act, for the discharge or emission of waste or the emission of noise.

5. Notwithstanding anything to the contrary in regulations 2,3 and 4 of these regulations any local authority may prepare in consultation with the Authority a

noise zone map covering the area of authority of such local authority. Any noise zone map so prepared shall on completion be approved by the Authority. Any noise zone map so prepared and approved may be amended from to time.

6. Where the Authority approves any noise zone map in terms of regulation 5, it shall, by Notification published in the Gazette inform the public of such approval. With effect from the date of such Notification, regulations 2,3 and 4 of these regulations shall cease to apply within the area of authority of the respective local authority to which such noise zone map applies, and regulation 7 shall thereupon apply to the area covered by such noise zone map.

7. Where a noise zone map has been prepared and approved by the Authority in terms of regulation 6

   a The maximum permissible noise levels at the boundary of the land in which any source of noise is located shall not exceed the limits set out in the Fourth Schedule hereto, within the respective areas specified in the said Schedule, and which are demarcated on a noise zone map published under regulation 6.

   b where the background noise levels in relation to any source of noise exceeds the limits set out at the Fourth Schedule hereto, the limits set out in the Fifth Schedule hereto shall apply within the respective areas specified therein, and which are demarcated on a noise zone map published under regulation 6.

   c notwithstanding anything to the contrary in regulations 7 (a) and (b) maximum noise levels at the boundary of any land in which any source of noise is located and emitted in consequence of any construction activity, shall not exceed the limits set out in the Sixth Schedule hereto within the areas specified therein, and which are demarcated on a noise zone map published under regulation 6.

8. Noise level measurements procedure, shall be in accordance with the criteria set out in the Seventh Schedule hereto.

9. The equipment used for noise level measurement shall be in accordance with the specifications set out in the Eighth Schedule hereto.

10. In these Regulations:-

    "A-weighted" means a process of automatic adjustments made to the out put of the Sound sensor in a sound level meter, so that the reading of the meter takes into account the frequency characteristics of the human ear:

    "Act" means the National Environmental Act, No 47 of 1980:

    "Authority" means the Central Environmental Authority established under the Act:

    "background noise level" means the A-weighted sound pressure level of the residual noise in decibels exceeded for 90% of a given time interval:

    "commercial area" means any area which consists predominantly of commercial buildings such as shops and offices, depicted in a noise zone map:

    "day time" from 06.00 hours to 18.00 hrs, except of the purposes of the Third and the Sixth Schedule hereto, where it means 06.00 hours to 21.00 hours:

"IEC" means the International Electro technical Standardization

"Industrial area" means any area which consists predominantly of industries and manufacturing establishments, depicted in a noise zone map

"ISO" means the International Oranization for Standardization.

"LA_{eq} "T"means the equivalent continuous, A-weighted sound pressure determined over a time interval T(in dB)

"local authority" means a Pradeshiya Sabha, Urban Council or Municipal Council and includes any authority created and established by or under any written law to exercise, perform and discharge powers, duties and functions corresponding to or similar to the powers, duties and functions exercised, performed and discharged by any such institution.

"mixed residential area" means an area consisting of residences and commercial establishments, depicted in a noise zone map .

"night time" means from 18.00 to 06.00 hours except for the purposes of the Third Schedule and the Sixth Schedule hereto where it means 21.00 hours to 06.00 hours.

"Noise sensitive area" includes any area in which a courthouse, hospital, public library, school, zoo sacred area and areas set a part for recreation or environmental purposes are depicted in a noise zone map;

"Noise zone map" means a survey map or plan of the whole or any part of the area of authority of any Local Authority demarcating such area into rural residential, urban residential , commercial, industrial and noise sensitive areas and clearly identifying the metes and bounds and prepared to a scale of 1:10.000 in Pradeshiya Sabha areas and to a scale of 1:5000 in Urban or Municipals Council areas or to any other scale as may from time to time be stipulated by the Authority;

"Residual noise" means the ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to such a degree that it does not contribute to the ambient noise;

"Rural residential area" means an area located within any area consisting predominantly of residences, depicted in a noise zone map:

"Urban residential area" means an area located within any build up area consisting predominantly of residences, and which are depicted in a noise zone map.

For the purposes of Schedules I and II : -

"Low noise area" means an area located within any Pradeshiya Sabha area.

"Medium noise area" means an area located within any Municipal Council or Urban Council area:

"High noise area" means any export processing zone established by the Board of Investment or industrial estates approved under Part IV C of the National Environmental Act:

"Silent Zone means the area covered by a distance of 100 meters from the boundary of a courthouse, hospital, public library, school, zoo, sacred areas and areas set apart for recreation or environmental purposes.

SCHEDULE I
(Regulation 2)

Maximum Permissible Noise Levels at Boundaries in La_{eq}, T

Area	La_{eq} T	
	Day Time	Night Time
Low Noise	**55**	**45**
Medium Noise	**63***	**50**
High Noise	**70**	**60**
Silent Zone	**50**	**45**

*Provided that the noise level should not exceed 60 dB (A) inside existing houses, during day time.

SCHEDULE II

(Regulation 3)

The following noise levels will be allowed where the background noise level exceed or is marginal to the given levels in Schedule I

(a)	For low noise areas in which the background noise level exceed or is marginal to the given level	Measured Background Noise Level +3dB (A)
(b)	For medium noise areas in which the background noise level exceeds or is marginal to the given level	Measured Background Noise Level +3dB (A)
©	For silent zone in which the background noise level exceeds or is marginal to the given level	Measured Background Noise Level +3 dB(A)
(d)	For high noise areas in which the background noise level exceeds or is marginal to the given level	
	(i)For day time	Measured Background Noise Level +5 dB (A)
	(ii)For night time	Measured Background Noise Level +3 dB (A)

The above maximum noise levels should be maintained inside the boundary of the land, in which the source noise is located.

SCHEDULE III

(Regulation 4)

Maximum permissible Noise Levels at Boundaries of the land in which the source of noise is located in $La_{eq'}$,T, for construction activities.

$La_{eq'}$, T	
Day Time	**Night Time**
75	**50**

SCHEDULE IV

(Regulation 7 (a))

Maximum permissible Noise Levels at Boundaries in $L_{Aeq,}$ T, for industrial activities .

Areas	L_{Aeq} ',T	
	Day Time	Night time
Rural Residential Area	55	45
Urban Residential Area	60	50
Noise Sensitive Area	50	45
Mixed Residential	63	55
Commercial Areas	65	55
Industrial Area	70	60

SCHEDULE V

(Regulation 7 (b))

The following noise levels will be allowed in places where the background noise levels exceed or is marginal to the given levels in Schedule I

(a)	For rural residential areas in which the background noise level exceeds or is marginal to the given level	Measured Background Noise Level +3dB (A)
(b)	For noise sensitive areas in which the background noise level exceeds or is marginal to the given level	Measured Background Noise Level +3dB (A)
(c)	For noise sensitive areas in which the background noise level exceeds or is marginal to the given level	Measured Background Noise Level +3 dB(A)
(d)	For mixed residential or commercial areas in which the background noise level exceed or is marginal to the given level	
	(i) For day time	Measured Background Noise Level +5 dB (A)

	(ii) For night time	Measured Background Noise Level +3 dB (A)
(e)	For industrial areas in which the background noise level exceeds or is marginal to the given level	
	(i) For day time	Measured Background Noise Level +5 dB (A)
	(ii) For night time	Measured Background Noise Level +3 dB (A)

SCHEDULE VI

(Regulation 7 (c)

Area	**L_{Aeq} ',T**	
	Day Time	**Night Time**
Industrial / commercial	75	60
Urban /Rural/Mixed Residential	65	56

SCHEDULE VII

(Regulation 8)

1. Measurement Procedure:

   Environment noise level measurements should be carried out generally in accordance with the methods laid down either in 150 1996 (Parts 1,2,3) and BS 4142:1990. The specific noise level shall be determined by measurement, or by a combination of measurements and calculations as given in B 5 4142:1990.

2. Measurement Time Interval:

   a. Each measurement time shall be chosen so that all significant variations of noise emission and transmission are covered.

   b. Each measurement time shall not exceed one (1) hour during the day time, and five (5) minutes during night time, for industrial areas.

c. Each measurement time shall not exceed five (5) minutes during the day time, night time for construction activities.

3. Correction to Measured Noise Level:

The following corrections should be made to the measured level according to the characteristic features of the noise:-

Characteristic features of the noise	*Correction dB (A)*
Impulsive noise	
(Bangs, clicks, clatters, thumps etc)	+5
Total character	
Whine, hiss, screech, hum etc.	+5

4. The measurement procedure set out above will be superseded by procedure duly adopted by the Sri Lanka Standards Institute for such purpose.

SCHEDULE VIII

(Regulation 9**)**

1. Measuring Equipment

Noise levels shall be measured in terms of $L_{Aeq,}$ T by either of the following means.

i. Using integrating averaging sound level meter complying with type 2 of BS 6698 : 1986 (IEC 804) or complying with standards or by means of a measuring equipment recommended by the Authority.

ii. If noise is steady, by visually averaging an analogue out from a sound level meter set to frequency weighing "A" and time weighing "S" and complying with type 2 of BS 5969 1989 :IEC 651)or complying with standards with standards or by means of measuring equipment recommended by the Authority.

Note: Use of integrating – averaging and sound level meter complying with type 1 of BS 6998 (IEC 804) is preferred,

2. Calibration

Before and after each series of measurements sound level meter should be calibrated using acoustic calibrator or pistonophone complying with class 2 of BS 7189 : 1989 (IEC 942), or complying with standards or by means of a Measuring equipment recommended by the Authority.

(3) Water Quality

Discharged Water Standards

Parameters	Allowable Limit
1. Total Suspended Solids, mg/l、max	50
2. Particle size of total suspended solids	shall pass sieve of aperture size 850 micro m.
3. pH value at ambient temperature	6.0 to 8.5
4. BOD_5, in 5 days at 20°C, mg/l, max	30
5. Temperature of discharge	shall not exceed 40°C in any Section of the Stream within 15m down stream from the effluent outlet.
6. Oils and grease, mg/l max	10.0
7. Phenolic Compounds (as phenolic OH) mg/l, max	1.0
8. Cyandes as (CN) mg/l, max	0.2
9. Sulfides, mg/l, max	2.0
10. Flourides, mg/l, max	2.0
11. Total residual chlorine mg/l, max	1.0
12. Arsenic, mg/l, max	0.2
13. Cadmium total, mg/l, max	0.1
14. Chromium total, mg/l, max	0.1
15. Copper total, mg/l, max	3.0
16. Lead, total, mg/l, max	0.1
17. Mercury total, mg/l, max	0.0005
18. Nickel total, mg/l, max	3.0
19. Selenium total, mg/l, max	0.05
20. Zinc total, mg/l, max	5.0
21. Ammoniacal nitrogen, mg/l, max	50.0
22. Pesticides	undetectable
23. Radio active material (a) Alpha emitters micro curie/ml (b) Beta-emitters micro curie/ml	 10^{-7} 10^{-8}
24. Chemical Oxygen Demand (COD), mg/l, max	2.50

Source: Dr. (Ms.) Ajantha Peneva "National Programme on Recycling of Solid Waste"

Industrial Effluent Standards into Irrigation Area

Parameters	Allowable Limit
Total dissolved solid, mg/l, max.	2100
pH value a ambient temperature	5.5 to 9.0
BOD_5 in 5 days at 20°C, mg/l, max.	250
Oils and grease, mg/l, max.	10.0
Chloride (as Cl), mg/l, max.	600
Sulfate (as SO_4), mg/l, max.	1000
Boron (as B), mg/l, max.	2.0
Arsenic (as As), mg/l, max.	0.2
Cadmium (as Cd), mg/l, max.	2.0
Chromium (as Cr), mg/l, max.	1.0
Lead (as Pb), mg/l, max.	1.0
Mercury (as Hg), mg/l, max.	0.01
Sodium absorption ratio: (SAR)	10 to 15
Residual Sodium Carbonate, mol/l, max.	2.5
Radio active material:	
(a) Alpha emitters, micro curie/ml	10-9
(b) Beta emitters, micro/ml	10-8

Source: Dr. (Ms.) Ajantha Peneva "National Programme on Recycling of Solid Waste"

F.9 EIA Approval Letters (1 Approval Letter and 2 Extension Letters)

EIA承認文書
(2001年10月26日)

කෘෂිකර්ම, වන සම්පත්, ආහාර හා සමුපකාර සංවර්ධන අමාත්‍යාංශය
விவசாய, வனவள, உணவு, கூட்டுறவு அபிவிருத்தி அமைச்சு
Ministry of Agriculture, Forestry, Food and Co-operative Development

මගේ අංකය / எனது இல. / My No.	3/1/1/950	ඔබේ අංකය / உமது இல. / Your No.		දිනය / திகதி / Date	26th October 2001

Director General
Mahaweli Authority of Sri Lanka
500 T. B. Jaya Mawatha
Colombo 10

Morgahakanda Agricultural Development Project
Environmental Impact Assessment

This is to inform you that Technical Evaluation Committee of the Ministry of Agriculture, Forestry, Food and Cooperative Development (MAFF&CD) after study of the EIA Report of the proposed Moragahakanda Agricultural Development Project and review of the comments received from the public and your responses to such comments, has decided, with the concurrence of the CEA, in terms of the Regulation 13 of the National Environmental (Procedure for Approval of Projects) Regulations No. 1 of 1993, to grant approval to Mahaweli Authority of Sri Lanka (MASL) for the implementation of the above project subject to the following conditions:

1. GENERAL

1.1. This approval is valid for three years from the date of issue of this letter unless upon written application to M/AFF&CD within thirty days prior to the expiry date, the validity period is extended.

1.2. This environmental clearance is valid for the construction of a dam (rock-fill dams in the main dam and second saddle dam/s and concrete facing etc.) of maximum height of 61 meters across Amban Ganga upstream of the existing Elahera Anicut and a reservoir with a net storage capacity of approx. 500 MCM and associated developments, as outlined in the EIAR- Volume 1 Main Report and Maps and Photographs contained in Volume II and III submitted by the MASL, subject to the final details being re-designed to address engineering considerations of dam construction and safety.

කෘෂිකර්ම, වන සම්පත්, ආහාර හා සමුපකාර සංවර්ධන අමාත්‍යාංශය "ගොවිජන මන්දිරය", 80/5, රජමල්වත්ත පටුමග, මොරටුව.
விவசாய, வனவள, உணவு, கூட்டுறவு அபிவிருத்தி அமைச்சு, "கொவிஜன மந்திராய", 80/5, ராஜமல்வத்தை ஒழுங்கை, பத்தரமுல்லை.
Ministry of Agriculture, Forestry, Food and Co-operative Development, "Govijana Mandiraya", 80/5, Rajamalwatte Avenue, Battaramulla.

දුරකථන / தொலைபேசி / Telephones : කාර්යාලය / அலுவலகம் / Office 869553/888902, 888513/872093, 872097 ; ලේකම් / செயலாளர் / Secretary 863497(හැක්ස්), 868920, 878676 ; අතිරේක ලේකම්/ සංචාරක/Admin. 878674, පාලිතීය සෙයලාණ්/ කෘෂිකම්/Agri. 868926, Addl. Secretary/ மேலதி/திட்டங்கள்/Project 872096 ; ෆැක්ස් / தொலை / Fax 86891, 86891, 87209

1.3. MASL should where necessary, obtain fresh approval in terms of Regulation 17 (i) (a) contained in Gazette Extra - Ordinary No 772/22 of 24th June 1993, in respect of any alterations that are intended to be made to the approved designs of the project.

1.4. MASL is bound to ensure that the terms and conditions given in this letter are adhered to, during project implementation. The MASL shall have full control over a third party that may be involved in project implementation, by entering into agreements which contain the conditions stipulated in this letter with such parties. MAFF&CD as the Project Approving Agency (PAA) should have access to the contract documents pertaining to environmental aspects, entered into by MASL and any outside contractors.

1.5. MASL shall intimate to PAA, the date of commencement of project activities/construction activities within one month of this letter, inclusive of a phased implementation schedule.

1.6. A copy of this letter of clearance should be kept at the project site, for purposes of perusal.

1.7. It is the duty of the MASL to inform the PAA of any adverse environmental impacts arising during project implementation, which are not anticipated at this stage. In such an event, relevant guidelines and necessary mitigatory measures should be implemented as directed by the PAA. The MASL should ensure that such impacts are properly assessed and addressed even at a later stage of project implementation.

1.8. The MASL should co-ordinate closely with planning agencies such as the Department of Irrigation (DI), and relevant Provincial and Local Authorities, Divisional Secretariats to resolve any conflicts with existing and future development plans

2. MINERAL AND FOREST RESOURCES

2.1. A detailed feasibility study of mining of mineral resources in areas affected by the project supplemented with additional drilling for exploration of minerals will be undertaken by the MASL before the commencement of the Project and submitted to the PAA and Monitoring Committee for approval.

2.2. The exploration and extraction of minerals should be carried out subject to guidelines and procedures laid down by the Geological Survey and Mines Bureau (GS&MB) and National Gem and Jewellery Authority.

2.3. All extractable timber resources in the reservoir bed and borrow areas will be identified by the help of the Forest Department and suitably extracted.

2.4. Recommendations given in the EIAR sections 5.2.2. (i-v) and 7.4 (i-vii) should be followed.

3. IMPACTS OF CONSTRUCTION ACTIVITIES - EXTRACTION, HANDLING, TRANSPORTATION AND STORAGE OF MATERIAL

3.1. Quarrying of rock, sand and other material for construction activities should be done at sites selected in consultation with and approval of the GS&MB.

3.2. Required licences/permits for the operation of all borrow pits and quarry sites in the proposed borrow areas for impervious material, filter material and fine aggregates etc. (Section 4.8.1 (a-c)) should be obtained from the CEA / relevant Local Authority, whenever it is required.

3.3. Necessary approvals shall be obtained from CEA and/or the relevant Local Authorities for the operation of blasting sites, rock quarries, metal crushers etc. prior to commencement of operations.

3.4. Blasting operations should be carried out only during the day between 06.00-18.00 hrs. and after proper trials supervised by necessary authorities.

3.5. Exposed areas should be kept suitably protected to prevent rain erosion or emission of dusts during dry periods.

3.6. Details regarding the areas and locations where the material is to be removed of should be marked on a 1:5000 scale map and forwarded to the PAA.

3.7. Movement of heavy loads of material for project purposes shall be done with the concurrence of the relevant authorities and shall be done at non-peak traffic times and in such a way not to cause nuisance to public.

3.8. The measures indicated above from 3.1 to 3.7 as well as any other relevant conditions in this letter, should be included in the contract documents, so that the contractor or sub-contractor is held responsible for carrying them out during construction, and on completion of the work. The MASL would be held responsible for the breach of any such conditions by any contractor or sub-contractor.

4. WATER RESOURCES AND HYDROLOGICAl ASPECTS

4.1. The MASL should develop a comprehensive watershed protection and management plan covering the catchment and command areas, including those aspects identified in EIAR Section 5.9, prior to commencement of any development activity and effectively implement it during and after reservoir construction.

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4.2. Conservation measures necessary to minimize soil loss within the catchment area and prevent excessive erosion from command area due to construction and operation of channel flows should be built in to the construction plans.

4.3. The need for compensatory discharge for ecological purposes in the stretch below Elahera Anicut should be considered in the hydrologic plan and appropriate measures taken. The Monitoring Committee will determine the adequacy of such actions proposed.

5. IMPACT ON BIOLOGICAL ENVIRONMENT

5.1. A detailed mitigation plan should be developed for the mitigation of adverse impacts on fauna, flora and habitats in line with the mitigation measures identified in the sections 5.4 and 5.5, but not limited to those already identified. The development of this plan will be supported by a detailed bio-diversity study proposed to be undertaken by MASL.

5.2. Necessary steps should be taken to declare the Moragahakanda catchment and the area surroundings the reservoir as protected areas to preserve habitat taking into consideration the area lost due to dam construction.

5.3. Mitigation should contain measures to minimize adverse impacts on the elephant population by establishing elephant corridors and permanent extensions to protected areas.

5.4. Habitat enrichment and a comprehensive protected area management system should be developed covering wild life reserves, buffer zones, forest reserves and elephant corridors in consultation with the Department of Wild Life Conservation and Department of Forestry.

5.5. A detailed survey to inventorise endangered medicinal plants and flora should be completed and nurseries established for conservation purposes. Reservation and conservation forest areas will be utilized for planting of endangered medicinal and other flora.

5.6. Identification and declaration of wild life and forest reserves and protected areas should be completed before the commencement of project activities.

6. ROAD NETWORK AND CONSTRUCTION

6.1. Construction of proposed alternative main and minor roads will be done in accordance with the proposals in the EIA report (section 5.7.3) and following standards and guidelines stipulated by the relevant authorities.

6.2. MASL should ensure that all procedures and guidelines applicable to design and construction of roads are followed during road construction.

7. SOCIOLOGICAL IMPACTS

7.1. The final project design should be selected in such a way as to minimize the relocation of people while maximizing potential development opportunities as well as contributing positively to anticipated future development programmes in the region.

7.2. A comprehensive resettlement plan / programme and compensation package should be prepared inclusive of the proposed relocation site at Kaudulla under Mahaweli Zone D1. The resettlement plan and the compensation package so prepared should be submitted to the PAA for approval.

7.3. Since many established home gardens provide a part of household food and other requirements and income, the compensation package should contain, in addition to compensation of land income lost from such avenues for at least three years.

7.4. The cut off date for encroachment for compensation should not be earlier than September 1996.

7.5. The payment of compensation should not be delayed and should be paid prior to moving into the alternative land.

7.6. Recommendations given in sub section 5.10 of the EIA report should be implemented.

8. INFRASTRUCTURE AND URBAN DEVELOPMENT ASPECTS

8.1. The MASL should comply with the guidelines set out by the UDA and other relevant agencies in the design, development and construction of urban facilities within the project area.

9. ARCHAEOLOGICAL, RELIGIOUS AND CULTURALLY IMPORTANT SITES

9.1. Final project design and construction activities should be carried out in such a way that any damage or interference to sites of archaeological, religious or cultural importance is avoided and adequate measures taken to preserve places of such importance.

10. MONITORING PROGRAMME

10.1. The MASL shall forward to the PAA an environmental monitoring plan as specified in Chapter 6 of the EIA report and containing any other provisions required in accordance with terms and conditions of this approval. It should contain

the work schedule, parameters to be monitored, with intervals/frequencies and the responsible agencies for monitoring each parameter.

10.2. A Monitoring Committee comprising of representations from following agencies will be established by the PAA to monitor the above plan.

a. Land Commissioner's Department
b. Department of Forest Conservation
c. Department of Wild Life Conservation
d. Geological Survey and Mines Bureau
e. Department of Agriculture
f. Irrigation Department
g. Land Use Policy Planning Division
h. Central Environmental Authority
i. Ministry of Agriculture
j. Divisional Secretaries of Naula and Laggala-Pallegama

10.3. Any changes to the Monitoring Programme should be approved by the Monitoring Committee.

10.4. All costs incurred by the monitoring committee appointed by PAA to oversee implementation of the mitigatory measures and the monitoring plan shall be borne by the MASL.

10.5. In addition proposed special Monitoring Panel for monitoring of mining activities in the affected areas identified in Section 7.3.vi should be made functional.

10.6. MASL will make necessary budgetary provision to ensure effective functioning of all obligations outlined in the EIA report and described above.

11. ADDITIONAL PROVISIONS

11.1. The MASL shall comply with any additional conditions that may be communicated from time to time by the PAA during the execution of the project.

11.2. The MASL should pay attention to regulation NO 17 of the National Environmental (procedure for approval of projects) Regulations No. 01 of 1993 which states;

(i) The project proponent shall inform the appropriate PAA of;

(a) any alteration to a prescribed project approved under regulation 9(i); and 13(ii); and/or,

(b) the abandonment of such approved project.

(ii) The project proponent shall where necessary obtain fresh approval in respect of any such alterations that are intended to be made to such project. The Project Approving Agency shall in consultation with the Central Environmental Authority, determine the scope and format of the supplemental report required to be submitted for such alterations.

(iii) The Project Proponent shall, where a project is abandoned, restore the project site to a condition as specified by the Project Approving Agency.

Ananda S. Gunesekera
Secretary
Ministry of Agriculture, Forestry, Food and Cooperative Development

Copies to:
Secretary, Ministry of Mahaweli Development
Director, External Resources
Director, Central Environmental Authority
Director, Geological Survey and Mines Bureau
Director, Road Development Authority
Lands Commissioner
Conservator General, Department of Forest Conservation
Director, Department of Wild Life Conservation
Director General, Department of Agriculture
Director General, Irrigation Department
Director, Land Use Policy Planning Division
Chairman, Jem and Jewellery Authority
District Secretary, Matale/Anuradapura/Polonnaruwa
Divisional Secretary, Naula/Laggala-Pallegama

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கமத்தொழில் அபிவிருத்தி அமைச்சு
Ministry of Agriculture Development
"ගොවිජන මන්දිරය",80/5, රජමල්වත්ත පටුමග, බත්තරමුල්ල. "கொவிஜன மந்திரய", 80/5, ராஜமல்வத்தை வீதி, பத்தாமுல்லை.
"Govijana Mandiraya", 80/5, Rajamalwatte Avenue, Battaramulla,Sri Lanka.
කාර්යාලය அலுவலகம் Office - 2869553, 2888902, 2872097 ෆැක්ස් தொலைநகல் Fax 2868919, 2868910

R82 06 OF SRI LANKA 27 MAR 2006 500, T. B. Jayah Mawatha, Colombo-10.

EIA延長承認文書 (2006年3月16日)

මගේ අංකය / எமது இல. / My No. 3/1/1/950

ඔබේ අංකය / உமது இல. / Your No.

දිනය / திகதி / Date 16.03.06

RECEIVED 27 MAR 2006 Director MAC

ED/DS
ED/RBPM

The Director General
Mahaweli Authority of Sri Lanka
500, T.B. Jayah Mawatha,
Colombo 10.

Extension to the Environmental Clearance for the Moragahakanda Agriculture Development Project Environmental Impact Assessment

This is to inform you that the Technical Evaluation Committee (TEC) of the above project established by the Ministry of Agriculture Development (MOAD) decided to grant an extension for the environmental clearance of the above project with the concurrence of the Central Environmental Authority under section 23 EE of Part IV C of the National environmental Act No. 47 of 1980. Please note that some conditions stipulated in the approval granted on 26th Oct. 2001 shall remain as it is and a number of new conditions and amendments are included in the extension.

1. General

Condition 1.1 shall read as follows

1.1 This is an extension to the environmental approval being issued on 26.10.2001 by the Secretary of then Ministry of Agriculture, Forestry, Food and Cooperative Development for the aforesaid project. This extension is valid until 26.10.2007 unless upon written application to the MOAD within 30 days prior to expiry date the validity period is extended.

1.2
1.3
1.4
1.5
1.6
1.7
1.8

Conditions in the aforesaid Environmental Clearance shall remain as it is.

Secretary · Telephone · 011-2869920 · Fax · 011-2863497 · Addl. Secretary · Admin · 011-2878674 · Agri · 011-2868926 · Project · 011-2868930 · Deputy agriculture · 011-2868924

1.9 Mahaweli Authority of Sri Lanka shall make necessary arrangements in consultation and agreement with the Dept. of Forests, Dept. of Wildlife and the Dept. of Archaeology regarding the activities carried out within the areas which come under the jurisdiction of the above agencies prior to commencement of the project activities.

2. MINERAL AND FOREST RESOURCES

2.1, 2.2 Conditions shall remain as it is

2.3 All usable timber resources in the reservoir bed & borrow and resettlement areas will be identified by the Project Proponent (PP) in consultation with the Department of Forests and properly utilized.

2.4 Condition shall remain as it is

2.5 The PP shall obtain a report from the Geological Survey and Mines Bureau which contains an assessment of the commercial viability of exploitation of existing mineral resources in reservoir area and whether adverse impacts arise on reservoir water quality or water stagnation may result from mining activities prior to inundation as stated in the EIA Report, Appendix P, Environment, section 2.2.5 and section 3.2.2 of Environment Management Action Plan.

3. IMPACTS OF CONSTRUCTION ACTIVITIES - EXTRACTION, HANDLING, TRANSPORTATION AND STORAGE OF MATERIALS

3.1, 3.2 Conditions shall remain as it is

3.3 Necessary approvals shall be obtained from the CEA and /or the relevant Authorities and Local Authorities for the operation of blasting sites, rock quarries, metal crushers etc. and copy of the approvals should submitted to the PAA prior to commencement of the operations.

3.4
3.5
3.6
3.7
3.8
} Conditions shall remain as it is

4. WATER RESOURCES AND HYDROLOGICAL ASPECTS

4.1 The Mahaweli Authority of Sri Lanka (MASL) shall develop a comprehensive Watershed Protection and Management Plan covering the catchment and command areas, including those aspects identified in the Section 5.9 of the EIA Report and submitted to the Project Approving Agency (PAA) prior to commencement of any development activity and effectively implement it during and after reservoir construction.

4.2
4.3
} Conditions shall remain as it is

4.4 All the measures mentioned in section 3.1 of the proposed Environment Management Action Plan with respect to the upstream catchment protection shall strictly be implemented by MASL and further improvements for the same, where necessary shall be included in order to minimize habitat loss, water pollution and forest exploitation due to catchment encroachment once the dam is constructed and reservoir is built. Reservations for Aban ganga and Bowatenna shall not be limited to 100m and as much as possible it shall be maintained more than 100m.

5. IMPACT ON BIOLOGICAL ENVIRONMENT

5.1
5.2
5.3 Conditions shall remain as it is
5.4
5.5
5.6

5.7 The detailed mitigation plan and the biodiversity study proposed to be undertaken by MASL as stated in section 5.1 of the environmental approval granted on 26.10.2001 shall be complemented with the needful for clearing of forest area for resettlement.

5.8 In order to mitigate loss of flora and possible threat to fauna all the recommendations highlighted in section 3.2 of the Environment Management Action Plan (Feasibility study of Moragahakanda Development Project Appendix P, Environment) shall also be implemented by the PP, MASL.

6. ROAD NETWORK AND CONSTRUCTION

6.1 Conditions shall remain as it is
6.2

The Section 7 shall be read as follows

7. RESETTLEMENT AND SOCIOLOGICAL IMPACTS

7.1
7.2
7.3 } Conditions shall remain as it is
7.4
7.5
7.6

7.7 Conditions stipulated as 7.2, 7.3,7.4,7.5,7.6 shall equally be applicable and compliment with the displacement of 41 households in the area of proposed elephant corridor between Wasgamuwa National park and Minneriya Giritale Nature reserve which was not identified in the Environment Impact Study submitted by TEAMS, 1998.

7.8 The PP shall adhere to the National Involuntary Resettlement Policy (NIRP) adopted in May 2001. Accordingly Resettlement Action Plan should be prepared for all the families to be displaced by this project and PP shall take all efforts to select Resettlement Sites within the present settlement areas.

7.9 Resolving Human-Elephant Conflict
Construction of electric fences shall be done where human-elephant conflicts are likely to occur.

8. INFRASTRUCTURE & URBEN DEVELOPMENT ASPECTS

Condition shall remain as it is

9. ARCHEOLOGICAL, RELIGIOUS AND CULTURALLY IMPORTANT SITES

Condition shall remain as it is

Following conditions will also be included in addition to terms and conditions stipulated already in our letter dated 26.10.2001

10. RESERVOIR WATER QUALITY AND ASSOCIATED AQUATIC ECOLOGY

The proposed Environment Management Action Plan shall be renewed by the PP and submitted to PAA for approval with detailed investigation and suitable mitigatory measures on effects of reservoir construction on ground water table and its quality/salinity, riverine species, downstream riverine habitats and fish migration and spawning due to discontinuation of the upper reaches and lower reaches of the stream.

11. LONG TERM SUSTAINABILITY OF AGRICULTURAL ACTIVITIES

The PP, MASL shall develop a detailed Agriculture Development Plan as recommended in the EIA Report. This shall also be included with suitable mitigatory measures to minimize possible threats to human and aquatic life due to water pollution and soil salinisation.

12. Monitoring Programme

10.1
10.2
10.3
10.4
10.5
10.6

Conditions shall remain as it is

13. Additional Provisions

11.1 } Conditions shall remain as it is
11.2 }

R.M. Senanayake
Additional Secretary/Projects
For Secretary
Ministry of Agriculture Development

Copy : Director General – Central Environmental Authority
All TEC members

EIA延長(第2回)承認書
(2009年12月20日)
Annexure to 6.2

කෘෂිකර්ම සංවර්ධන හා ගොවිජන සේවා අමාත්‍යාංශය
கமத்தொழில் அபிவிருத்தி கமநல சேவைகள் அமைச்சு
Ministry of Agricultural Development and Agrarian Services

"ගොවිජන මන්දිරය", 80/5, රජමල්වත්ත පටුමග, බත්තරමුල්ල. "கொவிஜன மந்திரய", 80/5, இராஜமல்வத்தை ஒழுங்கை, பத்தரமுல்லை.
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කාර්යාලය அலுவலகம் Office – 2869553, 2888902, 2872097. ෆැක්ස් தொலைநகல் Fax – 286891, 2868910.

මගේ අංකය எனது இல. My No. 3/1/1/950 ඔබේ අංකය உமது இல. Your No. දිනය திகதி Date 20.12.2007

RECEIVED
GV
26 DEC 2007
Director General
M A S L

Director General
Mahaweli Authority of Sri Lanka
500, T.B. Jayah Mw,
Colombo 10.

Second Extension to the Environmental Clearance for the Moragahakanda Agricultural Development Project
Environment Impact Assessment

This has reference to your letter dated 13th September 2007 requesting for an extension to the Environmental Clearance granted on 26th October 2001 on the above proposed project.

Please find enclosed extension of the Environmental Clearance for the proposed Moragahakanda Agricultural Development Project for further period of three years from 26th October 2007 to 25th October 2010 subject to terms and conditions.

T.M. Abayawickrama
Secretary
Ministry of Agriculture Development &
Agrarian Services

Second Extension to the Environmental Clearance for the Moragahakanda Agricultural Development Project
Environment Impact Assessment

This is to inform you that being the Secretary of the Ministry of Agriculture Development & Agrarian Services (M/AD&AS) which is the Project Approving Agency for this development project, after studying the Environmental Impact Assessment Report (EIAR) of the proposed Moragahakanda Agricultural Development Project dated October 1998; the Environmental approval letter dated 26th October 2001 issued by the Ministry of Agriculture, forestry, Food and Cooperative Development; the first extension of the Environmental approval dated 16th March 2006 issued by the Ministry of Agriculture Development; your request made to this Ministry on 13th Sep. 2007 for the second extension to the Environmental approval and review of the recommendations of the Technical Evaluation Committee (TEC) appointed on 9th November 2007, I have decided to grant extension to the Environmental approval of the above project with the concurrence of the Central Environmental Authority (CEA), in terms of Regulation No. 13 of the National Environmental Regulations No.1 of 1993 subject to following conditions.

1. General

1.1 This is the **Second Extension** to the Environmental Clearance being issued on 26.10.2001 by the Secretary of then Ministry of Agriculture, Forestry, Food and Cooperative Development for the Moragahakanda Agricultural Development project. This extension is granted for further three (3) years from 26th October 2007 to 25th October 2010 unless upon written application to the M/AD&AS within 60 days prior to expiry date the validity period is extended.

1.2 This Environmental Clearance is valid for the construction of a dam (rock –fill dams in the main dam and second saddle dam/s and concrete facing etc.) of maximum height of 61 meters across Amban Ganga upstream of the existing Elahera Anicut and a reservoir with a net storage capacity of approximately 500 MCM and associated developments, as outlined in the EIAR Volume 1, the Main Report and the Maps and the Photographs contained in Volume II and III submitted by the Mahaweli Authority of Sri Lanka, subject to the final details being re-designed to address engineering considerations of dam construction and safety.

1.3 The Mahaweli Authority of Sri Lanka is bound to ensure that the terms and conditions given in this approval are adhered to during project implementation. The Mahaweli Authority of Sri Lanka shall have full control over a third party that may be involved in project implementation by entering into agreements which contain the conditions stipulated in this approval with such parties. M/AD&AS as the PAA should have access to the contract documents pertaining

to environmental aspects entered into by the Mahaweli Authority of Sri Lanka and any outside contractors.

1.4 The Mahaweli Authority of Sri Lanka shall intimate to the PAA, the date of re-commencement of project activities/construction activities within one month from issuance of this extension, inclusive of a phased implementation schedule.

1.5 A copy of this extension shall be kept at the project site, for purposes of perusal.

1.6 It is the duty of the Mahaweli Authority of Sri Lanka to inform the PAA of any adverse environmental impacts arising during project implementation, which are not anticipated at this stage. In such an event, relevant guidelines and necessary mitigatory measures should be implemented as directed by the PAA. The Mahaweli Authority of Sri Lanka shall ensure that such impacts are properly assessed and addressed even at a later stage of project implementation.

1.7 The Mahaweli Authority of Sri Lanka shall coordinate closely with planning agencies such as the Department of Irrigation (DI) and relevant Provincial and Local Authorities, Divisional Secretaries to resolve any conflicts with existing and future development plans.

1.8 The Mahaweli Authority of Sri Lanka shall make necessary arrangements in consultation and agreement with the Department of Forests, Department of Wildlife and the Department of Archaeology regarding the activities carried out within the areas which come under the jurisdiction of those agencies during the project period.

2. Mineral and Forest Resources

2.1 A detailed feasibility study of mining of mineral resources in areas affected by the project supplemented with additional drilling for exploration of minerals will be undertaken by the Mahaweli Authority of Sri Lanka ***within six months from the date of issuance of this extension*** and submitted to the PAA and Monitoring Committee for approval.

2.2 The exploration and extraction of minerals should be carried out subject to the guidelines and procedures laid down by the Geological Survey and Mines Bureau (GS&MB) and National Gem and Jewellery Authority.

2.3 All extractable timber resources in the reservoir bed and borrow area shall be identified by the Mahaweli Authority of Sri Lanka in consultation with the Department of Forests and Dept. of Wildlife Conservation, and properly utilized.

2.4 Recommendations given in the EIAR sections 5.2.2. (i-v) and 7.4 (i-vii) shall be adhered to by the Mahaweli Authority of Sri Lanka.

2.5 The Mahaweli Authority of Sri Lanka shall obtain a report from the GS&MB ***within three months from the issuance of the this extension*** which contains an assessment of the commercial viability of exploitation of existing mineral resources in reservoir area and whether adverse impacts arise on reservoir water quality or water stagnation may result from mining activities prior to inundation as stated in the EIA Report, Appendix P, Environment, section 2.2.5 and section 3.2.2. of Environment Management Action Plan.

3. Impacts of Construction Activities – Extraction, Handling, Transportation and Storage of Materials

3.1 Quarrying of rock, sand and other material for construction activities shall be done by the Mahaweli Authority of Sri Lanka at sites selected in consultation with and the approval of the GS&MB.

3.2 Required licenses/permits for the operation of all borrow pits and quarry sites in the proposed borrow areas for impervious material, filter material and fine aggregates etc. Section 4.8.1 (a-c) shall be obtained by the Mahaweli Authority of Sri Lanka from the CEA/ relevant Local Authority, whenever it is required.

3.3. Necessary approvals shall be obtained by the Mahaweli Authority of Sri Lanka from the CEA and/or the relevant authorities and local authorities for the operation of blasting sites, rock quarries, metal crushers etc. and copies of the approvals shall be submitted to the PAA prior to commencement of the operations.

3.4. The Blasting operations shall be carried out only during 06.00 - 18.00 hours after conducting proper trials supervised by necessary authorities.

3.5 Exposed areas shall be kept suitably protected to prevent all kinds of erosions or emissions of dust during dry periods.

3.6. Details regarding the areas and locations where the material is to be removed shall be marked by the Mahaweli Authority of Sri Lanka on a 1:5000 scale map and forwarded to the PAA.

3.7. Movements of heavy loads of material for project purposes shall be done by the Mahaweli Authority of Sri Lanka with the concurrence of the relevant authorities and shall be done at non-peak traffic times in such a way not to cause nuisance to public.

3.8 Transport of loading and unloading of material shall be carried out by the Mahaweli Authority of Sri Lanka in such a way as to minimize the nuisance to the people by way of dust and noise.

3.9 To prevent fine dust blowing from open-topped vehicles during transportation it is necessary to ensure that the loads are covered during transportation.

3.10 The Mahaweli Authority of Sri Lanka is responsible to provide compensation to the relevant authorities if roads, culverts and buildings in the area to be damaged due to transportation of material and machinery.

3.11 The measures indicated above from 3.1 to 3.7 as well as any other relevant conditions in this approval shall be included in the contract documents by the Mahaweli Authority of Sri Lanka, so that the contractor or sub-contractor holds responsibility for carrying them out during construction, and on completion of the work. The Mahaweli Authority of Sri Lanka shall hold responsibility for the breach of any such conditions by any contractor or sub-contractor.

3.12 The Mahaweli Authority of Sri Lanka shall take care of debris disposal in such a way not to cause nuisance to the surrounding environment.

3.13 Borrow pits and temporary transport routes shall be rehabilitated by the Mahaweli Authority of Sri Lanka with required measures.

3.14 Temporary used areas shall be restored properly by the Mahaweli Authority of Sri Lanka and post-construction unusable material shall be disposed in consultation with the relevant Local Authorities.

3.15 Rehabilitation of construction site (s) and spoil dump areas shall be completed prior to commissioning of the operational activities.

4. Water Resources and Hydrological Aspects

4.1 The Mahaweli Authority of Sri Lanka shall develop a Comprehensive Watershed Protection and Management Plan covering the catchments and command areas including those aspects identified in the Section 5.9 of the EIA Report and submitted to the Project Approving Agency ***within six months from the date of issuance of this extension.***

4.2 Conservation measures necessary to minimize soil loss within the catchments area and prevent excessive erosion from command area due to construction and operation of channel flows shall be built into the construction plans by the Mahaweli Authority of Sri Lanka.

4.3 The need for compensatory discharge for ecological purposes in the stretch below Elahera Anicut shall be considered in the hydrology plan and appropriate measures need to be taken. The Monitoring Committee shall determine the adequacy of such actions proposed.

4.4 All measures mentioned in the section 3.1 of the proposed Environment Management Action Plan with respect to the upstream catchment's protection shall strictly be implemented by the Mahaweli Authority of Sri Lanka and further improvements for the same, where necessary shall be included in order to minimize habitat loss, water pollution and forest exploitation due to catchment's encroachment once the dam is constructed and reservoir is built. Reservations for Amban Ganga and, Bowatenna reservoir shall not be limited to 100m and it shall be maintained more than 100m as much as possible.

4.5 Drainage plan shall be developed and submitted to the PAA in consultation with the relevant authorities by the Mahaweli Authority of Sri Lanka ***within twelve months from the date of issuance of this extension.***

4.6 The Mahaweli Authority of Sri Lanka shall come into an agreement with the Department of Irrigation in the form of Memorandum of Understanding with respect to the water sharing in significant places where necessary ***within three months from the date of issuance of this extension.***

4.7 A detailed geological study shall be carried out in consultation with the National Building Research Organization with respect to land stability of the project area by the Mahaweli Authority of Sri Lanka. This report shall be submitted to the M/AD&AS and CEA.

4.8 Natural drainage system of the area shall not be affected due to project activities. All the efforts shall be taken in designing and constructing the project components in such a way to avoid adverse impacts on existing drainage system of the project area by the Mahaweli Authority of Sri Lanka.

4.9 Soils removed during the preparation of ground for construction of project components shall not be dumped at any edges of water or disposed into the surrounding environment without proper protection measures to prevent soil erosion.

4.10 Turfing of canal bunds shall be carried in order to minimize the soil erosion and to maintain the soil stability.

4.11 Road banks (if any) shall be protected with suitable cover crops or with stone paving or by cutting the bank as terraces.

20/12

4.12 Adequate roadside drains and culverts shall be developed to discharge the cross drainage by the Mahaweli Authority of Sri Lanka.

5. Impact on Biological Environment

5.1 A detailed mitigation plan shall be developed by the Mahaweli Authority of Sri Lanka for the mitigation of adverse impacts on fauna, flora and habitats in line with the mitigation measures identified in the section 5.4 and 5.5, but not limited to those already identified. The development of this plan will be supported by a detailed bio-diversity study proposed to be undertaken by the Mahaweli Authority of Sri Lanka.

5.2. Necessary steps shall be taken by the Mahaweli Authority of Sri Lanka to declare the Moragahakanda catchement and the area surroundings the reservoir as protected areas to preserve habitat taking into consideration the area lost due to dam construction.

5.3 Mitigation shall contain measures to minimize adverse impacts on the elephant population by establishing elephant corridors and permanent extensions to protected areas by the Mahaweli Authority of Sri Lanka in consultation with the Department of Wildlife Conservation.

5.4 Habitat enrichment and a Comprehensive Protected Area Management system shall be developed by the Mahaweli Authority of Sri Lanka covering wildlife reserves, buffer zones, forest reserves and elephant corridors in consultation with the Department of Wildlife Conservation and Department of Forests.

5.5 A detailed survey to inventorise the endangered medicinal plants and flora shall be completed and nurseries established for conservation purposes by the Mahaweli Authority of Sri Lanka. Reservation and conservation of forest areas shall be utilized for planting of the endangered medicinal and other flora.

5.6 Identification and declaration of wildlife, forest and protected areas in line with the current laws and regulations with consultation of relevant authorities shall be carried out by the Mahaweli Authority of Sri Lanka, ***within twelve months from the date of issuance of this extension.***

5.7 The detailed Mitigation plan and the Biodiversity study proposed to be undertaken by the Mahaweli Authority of Sri Lanka as stated in section 5.1 of the environmental approval granted on 26.10.2001 shall be complemented with the needful for clearing of forest area for resettlement.

5.8 In order to mitigate the loss of flora and possible threat to fauna all the recommendations highlighted in section 3.2 of the Environment Management

Action Plan (Feasibility study of Moragahakanda Development Project Appendix P. Environment) shall also be implemented by the Mahaweli Authority of Sri Lanka.

6. Road Network and Construction

6.1. Construction of proposed alternative main and minor roads shall be done by the Mahaweli Authority of Sri Lanka in accordance with the proposals in the EIAR (section 5.7.3) by following standards and guidelines stipulated by the relevant authorities.

6.2 The Mahaweli Authority of Sri Lanka shall ensure that all procedures and guidelines applicable to design and construction of roads are followed during road construction.

7. Resettlement and Sociological Impacts

7.1 The final project design shall be selected by the Mahaweli Authority of Sri Lanka in such a way as to minimize the re-location of people while maximizing potential development opportunities as well as contributing positively to anticipated future development programmes in the region.

7.2 A comprehensive Resettlement Action Plan/Programme including detail map that shows the proposed resettlement sites, infrastructure, natural resources, compensation package, inventory of loss & asserts shall be prepared by the Mahaweli Authority of Sri Lanka in compliance with the National Involuntary Resettlement Policy in consultation with the relevant authorities. The comprehensive Resettlement action plan shall be submitted to the PAA for approval ***within six months from the issuance of this extension.***

7.3 Since many established home gardens provide a part of household food and other requirements and income, the compensation package shall contain, in addition to compensation of land income loss from such avenues for at least three years.

7.4 The Mahaweli Authority of Sri Lanka shall decide the cut off date for encroachment in consultation with the Ministry of Lands and Land Development as it is indicated in the National Involuntary Resettlement Policy.

7.5 The payment of compensation shall not be delayed for a long period of time. At least 50% of the compensation package should be paid prior to moving into the alternative land.

7.6 The Mahaweli Authority of Sri Lanka shall implement the recommendations given in the sub section 5.10 of the EIAR.

7.7 The Mahaweli Authority of Sri Lanka shall adhere to the National Involuntary Resettlement Policy (NIRP) adopted in May 2001. Accordingly, Resettlement Action Plan should be prepared for all the families to be displaced by this project and the Mahaweli Authority of Sri Lanka shall take all efforts to select Resettlement sites within the present settlement areas.

7.8 Appropriate action shall be taken by the Mahaweli Authority of Sri Lanka in consultation with the Department of Wildlife and local authorities to mitigate the issues arisen due to Human-Elephant conflict.

8. Infrastructure and Urban Development Aspects

8.1 The Mahaweli Authority of Sri Lanka shall comply with the guidelines set out by the Urban Development Authority and other relevant agencies in designing, development and construction of urban facilities.

9. Archeologically, Religiously and Culturally Important Sites

9.1 Final project design and construction activities shall be carried out by the Mahaweli Authority of Sri Lanka in such a way that any damage or inferences to the sites of archeological religious or cultural importance is avoided and adequate measures shall be taken to reserve places of such importance. However, Mahaweli Authority of Sri Lanka shall consult Department of Archeology and other relevant authorities in this regard.

10. Reservoir Water Quality and Associated Aquatic Ecology

10.1 The proposed Environment Management Action Plan shall be renewed by the Mahaweli Authority of Sri Lanka and submitted to the PAA for approval with detailed investigation and suitable mitigatory measures on effects of reservoir construction on ground water table and its quality/salinity, riverine species, downstream riverine habitats and fish migration and spawning due to discontinuation of the upper reaches and lower reaches of the stream.

and Vibration

oise levels at the boundaries of the construction site(s) shall not exceed the d limits stated in schedule III of the National Environmental Act (Noise

control Regulations No. 1 of 1996) as per Gazette Extra Ordinary No. 924/12 dated 23rd May 1996.

11.2 Appropriate mitigation measures shall be adapted in order to maintain vibration levels generated by operations of machineries, construction activities, vehicle movement and blasting activities within the interim standards stipulated by the CEA (Annex I).

12. Waste Disposal

12.1 Measures should be taken to prevent the discharge of cement, cement mix, fuel oil, lubricants, waste oil, polythene and other waste material into water bodies during construction and operation periods. Oil separation devices should be installed where necessary.

12.2 Construction site(s) shall be provided with proper sanitary facilities such as sewage and waste disposal facilities in keeping with Local Authority requirements.

13. Long Term Sustainability of Agricultural Activities

13.1 The Mahaweli Authority of Sri Lanka shall develop a detailed Agricultural Development Plan as recommended in the EIAR. This shall also be included with suitable mitigatory measures to minimize possible threats to human and aquatic life due to water pollution and soil salinization.

14. Monitoring Programme

14.1 The Mahaweli Authority of Sri Lanka shall submit monthly Progress Reports to the PAA indicating the achievements of the project activities in terms of the condition stipulated in this approval for the monitoring purposes.

14.2 The Mahaweli Authority of Sri Lanka shall forward to the PAA an environmental monitoring plan as specified in chapter 6 of the EIA report and containing any other provisions required in accordance with terms and conditions of this approval. It should contain the work schedule, parameters to be monitored, with intervals/frequencies and the responsible agencies for monitoring each parameter.

14.3 A Monitoring Committee comprising of representations from following agencies will be established by the PAA to monitor the above plan

(a) Ministry of Agriculture Development & Agrarian Services
(b) Ministry of Lands & Lands Development
(c) Central Environmental Authority
(d) National Building Research Organization
(e) Land Commissioner's Department
(f) Department of Forest Conservation
(g) Department of Wildlife Conservation
(h) Department of Archaeology
(i) Geological Survey and Mines Bureau
(j) Department of Agriculture
(k) Department of Irrigation
(l) Land Use Policy Planning Division of Ministry of Lands & Land Development
(m) Divisional Secretaries of Naula and Laggala-Pallegama
(n) Divisional Secretary of Elahera

14.4 Any changes to the Monitoring Programme shall be approved by the Monitoring Committee.

14.5 All cost to be incurred by the Monitoring Committee which is established to oversee the implementation of the mitigation and monitoring plan shall be borne from the Mahaweli Authority of Sri Lanka

14.6 In addition, proposed special Monitoring Panel for monitoring of mining activities in the affected areas which was identified in Section 7.3 vi shall be functional on time.

14.7 The Mahaweli Authority of Sri Lanka shall make necessary budgetary provisions to ensure the effective functioning of all obligations outlined in the EIAR and described above.

15. Additional Provisions

15.1 The Mahaweli Authority of Sri Lanka shall comply with any additional conditions that may be communicated to them from time to time by the PAA during the execution of the project.

15.2 The Mahaweli Authority of Sri Lanka shall pay attention to regulation No. 17 of the National Environmental (procedure for approval of projects) Regulations No. 01 of 1993 which states;

(i) The Mahaweli Authority of Sri Lanka shall inform the appropriate PAA of;

(a) Any alteration to a prescribed project approved under regulation 9(i); and 13(ii); and/or

(b) The abandonment of such approved project

(ii) The Mahaweli Authority of Sri Lanka shall where necessary obtain fresh approval in respect of any such alterations that are intended to be made to such project. The Project Approving Agency shall in consultation with the Central Environmental Authority, determine the scope and format of the supplemental report required to be submitted for such alterations.

(iii) The Mahaweli Authority of Sri Lanka shall, where a project is abandoned, restore the project site to a condition as specified by the Project Approving Agency.

T.M. Abayawickrama
Secretary
Agriculture Development & Agrarian Services

20/12/2007

Copies: Director General – Central Environmental Authority
All Technical Evaluation Committee members

Public Consultation Meeting on 16. 07.2010& 17.07.2010 - Monitoring Form

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1.	**17.07.2010**	**Elagamuwa Temple**	**1. No of Participants. : 208** **2. Presenting condition** **2.1 Affected H/H: 194** **2.2 MASL officers: 06** **2.3 Other NGO/ Govt Representatives: 08** **2.4 Other interested persons : 0** **3. No. Of Female Participants : 39** **4. No of Male participants: 169**	**Sinhala**	**1. Project Components & Implementation schedule**	1. Can supply irrigation water for the resettlement area firstly by constructing of Kalu Ganga Reservoir firstly?	Kalu Ganga reservoir will be constructing before the Moragahakanda reservoir in accordance to the present implementation planned. By that, water can be supply for the resettlement area firstly.	**RPM , Resident Eng, PP, EO, D- LUP**
						2. Is there any connectivity with Karagahawela- Pallegama Road & construction road from Moragahakanda to Kalu Ganga ?	There will provide connectivity to the Dambulla – Karagahawela road from the Thorapitiya to Maoya, Thorapitiya to Gomahandiya & Thorapitiya to Wellewela area centre. Through this Dambulla-Karagahawela road and construction road from Moragahakanda area to Kaluganga resettlement area will be connect.	
						3.		
						4.		
						5.		
						6.		
2.1	**Total Affected families 203**	**Elagamuwa GN Division (E407)**			**2. Env. & Social Impacts; and Mitigations Measures; 2.1 Environment Impacts**	1. How doing reforestation activities & what are the locations that establish?	**Reforestation activities in water source area and fuel wood forest area in resettlement area will establish by MASL and Department of forest conservation with corporation of public.**	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
2.2					**2.2 Social Impacts**	1. Is downward the living standard due to loss of present livelihood with the settle in another area?	Living standard will not decrease because MASL will provide special allowances and assistances in accordance to the Entitlement matrix.	
						2. Aren't there any connection project officers with people after the resettlement?	RPM's, BM's & UM's will work with the people closely in according to the MASL administration system other than present relationship.	
						3. Are there provide transport allowances to transport the building materials in Temples?	There is giving transportation facilities as equal in Main family**.**	
						4. Are there giving land for Soldiers?	If mention as sub family , in accordance to that benefit will receive them	
						5.		
						6.		
3.1					**3.1 Scale of Resettlement**	1. There was obtain enough knowledge as per brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. Are there giving land & benefit who settle in another area due to marriage but record in household list as sub family?	Selection list will prepare by inspecting the objections after the publish selection list. There will not giving land for the non residents.	
						2.		
						3.		
						4.		
						5.		
						6.		
4.1A					**4.1 Land Acquisition & Compensation 4.1A Land Acquisition**	1. There was obtain enough awareness by reading brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. Is there pay full compensation amount for the loss properties at once & which period?	Full compensation amount will paid at once before the resettlement.	
						2.		
						3.		
						4.		
						5.		
						6.		
4.2					**4.2 Livelihood Assistance**	1. Are there giving land for the elderly women & Disables?	Land will give for the Main families & sub families who marriage before the cut off date as mentioned in brochure	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities** **5.1 Proposed Resettlement Areas**	1. Is supply necessary water to cultivate other field crops in resettlement areas also?	Water will supply with control as per the agricultural plan.	
						2.		
						3.		
						4.		
						5.		
						6.		
5.2					**5.2 provision of Social infrastructure facilities**	1. Is establish market in the resettlement area to sell the new products?	**There will establish new town as Laggala at the Dagawilla**	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. Is supply water for agricultural purposes throughout the year?	Water will supply to cultivate the two seasons in the year ,after the completion of Kalu Ganga reservoir	
						2. Are there any methodology to provide water for common purposes when stop the supply of water by the canals?	Yes, there will construct at least one small tank per one village.	
						3.		
						4.		
						5.		
						6.		
6.1					**6. Proposed Resettlement Schedule 6.1 Resettlement Stages**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					**6.2 Settlers transport**	1. Can be give solution for the transportation problem due to two lorries not enough for the one main family?	Transportation facilities will provide in accordance to the present policies.	
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					**6.3 settlers Assistance**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. Are provide special relief for the elderly households when construction of house?	There will be provide relief decided by the village committee which is establish to solve the problem at the village level	
						2.		
						3.		
						4.		
						5.		
						6.		
8.					**8. Further Information Disclosure;**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
10.					**10. Contact Info. of the Project Proponent;**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
11.					**11. Any other proposal**	1. there are no any other proposal		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

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No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1. E 401-A	**17th of July 2010**	**Galporugolla Temple**	**Total No of Affected Families ....113.....** **1. No of Participants.....131.....** **2. Type of participants** **2.1 Affected H/H.....113.....** **2.2 MASL officers.....03.....** **2.3 Other NGO/ Govt Representatives.....-.....** **2.4 Other Interest People-.....15.....** **3. No of .female participants .....18.....** **4. No of Male participants.....113.....**	**Sinhala**	**1. Project Components & Implementation schedule**	1. Have any possibility to accelerate the project?	Explain to them, project can be accelerating after receiving foreign funds.	**A.M.K.Adikari (Senior Ecnomist)**
						2. Can be given first priority to construct Kaluganga reservoir which is supply water for the resettlement area?	Explain to them, there will be done construction activities of Kalu ganga reservoir firstly.	**R.M.M.Ranasinghe (Social Scientist)**
						3.		**A.P.T. Jayasinghe (Environment Officer)**
						4.		
						5.		
						6.		
		2.1 Galporugoola G.N.Division			**2. Env. & Social Impacts; and Mitigations Measures; 2.1 Environment Impacts**	1. Is there any proposal to locate grassland for cows in isolated villages?	Explain to them , there was prepare work program for that	
						2. Can be locate firewood areas for the isolated villages?	**Explain to them,** there was prepare work program for that	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
2.2					**2.2 Social Impacts**	1. There was giving consent by 48 families to go to the Medirigiriya. Is there any possibility to Collapse social organization of that people?	Explain to them , MASL will encourage settlers to establish the social organization.	
						2.		
						3.		
						4.		
						5.		
						6.		
3.1					**3.1 Scale of Resettlement**	1. There was obtain enough knowledge thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. There was obtain enough knowledge thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
4.1A					**4.1 Land Acquisition & Compensation** **4.1A Land Acquisition**	1. Is there any possibility to accelerate the Land acquisition?	Land will be acquired without any delay by taking action in accordance to the current allocation of Land acquisition Act.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. Can't be accelerate the valuation of compensation & payment of compensation?	valuation of compensation & payment of compensation will do as planned accompanied with allocation of Land Acquisition Act	
						2.		
						3.		
						4.		
						5.		
						6.		
4.2					**4.2 Livelihood Assistance**	1. Are there give subsidies (Ration)for each family to adequately for the all members ?	Yes, Ration will provide by considering the family members	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities** **5.1 Proposed Resettlement Areas**	1. There was obtain enough knowledge thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
5.2					**5.2 provision of Social infrastructure facilities**	1. There was obtain enough knowledge thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. Can't provide irrigation facilities as soon by completing the construction activities of Kalu ganga reservoir?	Explain to them, priority is given to supply water for resettlement area by constructing the Kalu ganga reservoir firstly, in accordance to the present plan.	
						2.		
						3.		
						4.		
						5.		
						6.		
6.1					**6. Proposed Resettlement Schedule 6.1 Resettlement Stages**	1. Can't be accelerate the resettlement?	Explained to them, Resettlement will be done to the plan as soon.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					**6.2 Settlers transport**	1. Can't increase the transportation facilities in accordance to the necessity?	Explained to them, There can be take suitable action in that situation by considering necessity	
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					**6.3 settlers Assistance**	1. There was obtain enough knowledge thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. There was obtain enough knowledge thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
8.					**8. Further Information Disclosure;**	1. 1. Can't be give at least small constructed house behalf of proposed allowances (Request to explain it)?	Explain to them, there is no policy like that.	
						2. Can't be provide constructed houses for the disable people (Request to explain it)?	Explain to them, there will be taken action by conspiring separately in accordance to the present implementation methodologies	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. There was obtain enough knowledge thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
10.					**10. Contact Info. of the Project Proponent;**	1. There was obtain enough knowledge thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
11.					**11. Any other proposal**	1. No any other proposal. There is enough implementation of these proposals		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

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No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1. E 407-B	**17th of July 2010**	**Elagamuwa School**	**Total no. Of affected people .....** **1. No of Participants.....** **2. Type of participants** **2.1 Affected H/H.....** **2.2 MASL officers.....** **2.3 Other NGO/ Govt Representatives.....** **2.4. Other interest people .....** **3. No of .female participants .....** **4. No of Male participants.....**	**Sinhala**	**1. Project Components & Implementation schedule**	1. Can't complete the construction activities as soon?	**Explain to them, Project can be accelerate after receiving foreign funds**	**B.H.W. Basnayake (Civil engineer)**
						2.		**E.P.G.C.K. Madugalla (Environment officer)**
						3.		**M.A. Nandathissa (HR&ID officer)**
						4.		
						5.		
						6.		
2.1		**Kadawatha G.N Division.**			**2. Env. & Social Impacts; and Mitigations Measures;** **2.1 Environment Impacts**	1. There is obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
2.2					**2.2 Social Impacts**	1. There is obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
3.1					**3.1 Scale of Resettlement**	1. Can't be increase the land extent given for the land owners which owned large extent of lands?	There will be receive land in accordance to the current policies. There will consider loss of large quantity of properties as separate case.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. Is there give land for sub families who are not included in socio-economic survey but marriage before the cut of date?	If present at the occasion of calling application for the inspection of qualification to be a land allottee, conducting of inspections & inspecting of objections and selected as land receiver. There will take action in accordance to that.	
						2.		
						3.		
						4.		
						5.		
						6.		
4.1A					**4.1 Land Acquisition & Compensation 4.1A Land Acquisition**	1. What are the benefits given for the settlers who settle in Kadawatha GN division but loss in paddy lands in Thalagoda GN division?	There will take suitable action by considering separately at the inspecting of qualification.	
						2. Can't give constructed shops for the commercial land allottees?	Presently , There is no policy like as	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. Are distribute compensation among the children when land owner was deceased and children were occupied in the land presently?	Yes, There will pay compensation by inspecting the ownership	
						2. Is there pay total compensation before the resettlement?	There will do land acquisition & payment of total compensation before the resettlement	
						3. Is there pay compensation for the paddy landowners of Thalagoda at the resettlement of Thalagoda people?	There will be paying compensation for each GN division within each time period.	
						4.		
						5.		
						6.		
4.2					**4.2 Livelihood Assistance**	1. Is there give priority for the Thalagoda settlers when provide employment opportunities by the project?	Yes , There will be give priority for the Thlagoda settlers when providing the employment opportunities through the project	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities** **5.1 Proposed Resettlement Areas**	1. There was obtain clear idea through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
5.2					**5.2 provision of Social infrastructure facilities**	1. Can't conduct the mobile health clinic?	There will be conduct mobile clinic to protect the health of Mahaweli settlers	
						2. Are there provide schools as soon for the children of immediately removing families?	Yes, All the social infrastructure facilities will be establish before the resettlement	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. There is obtain enough understanding through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
6.1					**6. Proposed Resettlement Schedule 6.1 Resettlement Stages**	1. There is obtain enough understanding through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					**6.2 Settlers transport**	1. Can be transport the building materials to the new resettlement areas which are collected by owner?	Can, there will be provide transportation facilities after the inspection	
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					**6.3 settlers Assistance**	1. There is obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. There is obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
8.					**8. Further Information Disclosure;**	1. There is no any special information to known		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male .female participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. It is enough ,if implement as mention in brochure	MASL will be implement it	
						2.		
						3.		
						4.		
						5.		
						6.		
10.					**10. Contact Info. of the Project Proponent;**	1.there is appreciating about appointment of officer as mentioned in brochure to receive the additional information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
11.					**11. Any other proposal**	1. No any other proposal		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

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No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1.	**17.07.2010**	**Kambarawa Temple**	**1. No of Participants. : 260** **2. Presenting condition** **2.1 Affected H/H: 253** **2.2 MASL officers: 04** **2.3 Other NGO/ Govt Representatives: 03** **2.4 Other interested persons : 0** **3. No. Of Female Participants : 48** **4. No of Male participants: 212**	**Sinhala**	**1. Project Components & Implementation schedule**	1. Can't be done Project construction activities?	Explained to them, Construction activities plan to complete on foreign donation & in accordance to it construction activities will be done.	**Acting D- Land EO** **Physical planner**
						2.		
						3.		
						4.		
						5.		
						6.		
2.1	**Total Affected families : 267**	**Kambarawa GN Division (E 401)**			**2. Env. & Social Impacts; and Mitigations Measures;** **2.1 Environment Impacts**	1. Is construct electric fence definitely?	Yes, it will be construct as planned	
						2. Are there allocate land for the firewood purposes?	Explained to them, There is allocate land for the firewood purposes when preparing the resettlement plans.	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
2.2					**2.2 Social Impacts**	1. Can be establish social organizations in resettlement areas?	Explained to them, MASL also encourage establishing social organization in Resettlement areas.	
						2. Are there any affect to relationship among relatives & Neighbours?	Relations and Neighbours will settle in one village in accordance to their request.	
						3.		
						4.		
						5.		
						6.		
3.1					**3.1 Scale of Resettlement**	1. There is obtain clear understanding through brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. Are there giving land for the sub families who marriage after the cut of date?	Explained to them, there will be take action to provide land under Phase II after the new Socio economic survey	
						2.		
						3.		
						4.		
						5.		
						6.		
4.1A					**4.1 Land Acquisition & Compensation 4.1A Land Acquisition**	1. When finish the land acquisition?	Explained to them, there will be take action to acquire the all land before the resettlement	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. What is the Gross Valuation amount?	Inform to them. The amount is difficult to mention. Because, valuation not done by the Department of Valuation still.	
						2.		
						3.		
						4.		
						5.		
						6.		
4.2					**4.2 Livelihood Assistance**	1. can't be give the special assistance for the Kaluganga area also like Medirigiriya area ?	This special assistance provide for behalf of going to settle in other District and it is difficult to provide for settlers who resettle in same district.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities** **5.1 Proposed Resettlement Areas**	1. Can't be construct place for temporary accommodation in Kalu Ganga also?	There can't be doing any construction for temporary accommodation in Kalu Ganga area. Because, resetters can construct their hosues in new resttlemnt site while living in their present place.	
						2.		
						3.		
						4.		
						5.		
						6.		
5.2					**5.2 provision of Social infrastructure facilities**	1. There can satisfy with social infrastructure facilities mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. participants informed , irrigation infrastructure facilities are enough		
						2.		
						3.		
						4.		
						5.		
						6.		
6.1					**6. Proposed Resettlement Schedule 6.1 Resettlement Stages**	1. Is happen according to the planned?	Explained to them, it will be doing according to the plan & existing grants	
						2. When will be the starting date of resettlement this area after completion of Thalagoda ?	In accordance to the plan, Main families & sub families will be settle under the Phase I .	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					**6.2 Settlers transport**	1. allowances are enough as mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					**6.3 settlers Assistance**	1. Can't be extend the 18 month duration of allowances pay for the elderly families?	The elderly families can earn income by rent out their land or cultivate three seasons. Therefore, this allowance is limit to 18 month period by considering those factors.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. It is enough		
						2.		
						3.		
						4.		
						5.		
						6.		
8.					**8. Further Information Disclosure;**	1. All information were understanding through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. There can be satisfy with monitoring plan & mechanism		
						2.		
						3.		
						4.		
						5.		
						6.		
10.					**10. Contact Info. of the Project Proponent;**	1. There can be satisfy with methodology of receiving information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
11.					**11. Any other proposal**	1.There is no any other proposal		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

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No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1.E 407-B	**17th of July 2010**	**Koongahawela School**	**Total No of Affected people.....48.....** **1. No of Participants.....71.....** **2. Type of participants** **2.1 Affected H/H.....48.....** **2.2 MASL officers.....03.....** **2.3 Other NGO/ Govt Representatives.....03.....** **2.4 other interest people .....17.....** **3. No of .female participants .....22.....** **4. No of Male participants.....49.....**	**Sinhala**	**1. Project Components & Implementation schedule**	1 is there any proposal to maintain the existing decayed irrigation system?	The relevant line agencies will proceed irrigation maintenance activities with intervention of MASL	**D.B. Wijerathne (Chief Residence Engineer)**
						2. The construction activities of Naula – Elahera Road is going on. Do the construction without aware affected people?	Already, relevant line agencies & affected peoples were aware.	**H.W. Chandrasinhghe (Engineer Assistance)**
						3		**Rathnasiri Weragala (HRID Officer)**
						4.		
						5.		
						6.		
2.1		**Koongahaewella GN Division**			**2. Env. & Social Impacts; and Mitigations Measures; 2.1 Environment Impacts**	1. Is area completely inundated which is demarcated by Reserve pole of Moragahakanda Reservoir?	No. Reserve poles were located including 100m buffer zone	
						2. Is there establish mechanism after construction of electric fence for maintenances purposes?	Yes, there will be establish Community Based organization & Maintenance funds	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
2.2					**2.2 Social Impacts**	1. Is execute certain special program for the Disable people?	Yes, certain relief program carry out for Disable people	
						2. Are provide certain reliefs for isolated owners of retail shop?	Yes. It will consider to resettling them under the 3rd phase.	
						3.		
						4.		
						5.		
						6.		
3.1					**3.1 Scale of Resettlement**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. Can't give agricultural land for acquired agricultural land owners who had less than of 1 acre?	There will be give suitable solution by inspecting person by person separately	
						2. Can be giving land for isolated people?	There will be take action to provide land for the isolated people under the 3rd stage in accordance to their request**.**	
						3.		
						4.		
						5.		
						6.		
4.1A					**4.1 Land Acquisition & Compensation 4.1A Land Acquisition**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. Is giving land and Compensation, If Ande ownerships is more than 2 acre?	Yes. They will receive agricultural land & homestead with compensation (For Ande ownership)	
						2.		
						3.		
						4.		
						5.		
						6.		
4.2					**4.2 Livelihood Assistance**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities 5.1 Proposed Resettlement Areas**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
5.2					**5.2 provision of Social infrastructure facilities**	1. How can we explicit map of resettlement area because map shows in the brochure is not clear?	There is large scale map In the Moragahakanda Project office if any need to see it, they can observe any time.	
						2. As a present we have not small women group in our village. Do establish at the future?	Yes. There will be create in future	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. There was obtain enough awareness through the brochure.		
						2.		
						3.		
						4.		
						5.		
						6.		
6.1					**6. Proposed Resettlement Schedule 6.1 Resettlement Stages**	1. Can be doing resettlement at one stage?	**Difficult, Resettlement will be done by three stages in accordance to the necessity**	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					**6.2 Settlers transport**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					**6.3 settlers Assistance**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
8.					**8. Further Information Disclosure;**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
10.					**10. Contact Info. of the Project Proponent;**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
11.					**11. Any other proposal**	1. Request to organise programmes like this to awareness & obtain the ideas		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

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No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1.	**17.07.2010**	**Maragamuwa Temple**	**1. No of Participants. : 27** **2. Presenting condition** **2.1 Affected H/H: 22** **2.2 MASL officers: 03** **2.3 Other NGO/ Govt Representatives: 02** **2.4 Other interested persons : 0** **3. No. Of Female Participants : 11** **4. No of Male participants: 16**	**Sinhala**	**1. Project Components & Implementation schedule**	1. How to allocate foreign & local funds when project construction going on?	Preliminary construction activities doing by local funds and remaining activities will depend on foreign grants.	**DRPM- Land Acquisition Officer** **EO**
						2. Can't be accelerate the project construction activities?	Constructions can do immediately, after the receiving foreign grants.	
						3.		
						4.		
						5.		
2.1	**Total Affected families: 23**	**Maragamuwa GN Division (E146)**			**2. Env. & Social Impacts; and Mitigations Measures;** **2.1 Environment Impacts**	1. Are there protect wells & water springs located below the bridges in alternative road?	There was prepare plans to protect the wells, water springs & water ways	
						2.		
						3.		
						4.		
						5.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
2.2					**2.2 Social Impacts**	1. There was obtain enough knowledge through the brochure & lecture		
						2.		
						3.		
						4.		
						5.		
3.1					**3.1 Scale of Resettlement**	1. There was obtain enough knowledge through the brochure & lecture		
						2.		
						3.		
						4.		
						5.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. Is there enough land in Kalu ganga area for the Resettlement?	There are enough land lots in accordance to the present data and information	
						2.		
						3.		
						4.		
						5.		
4.1A					**4.1 Land Acquisition & Compensation 4.1A Land Acquisition**	1. There was obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. Is there obtain report from the property owner when doing the valuation & Is it based for the valuation?	Compensation valuation will be done by Department of valuation and there will be consider property owners report also.	
						2. Is there any change on valuation of compensation with location?	There is small change in Market value & Replacement cost with location	
						3. Can explain the steps following in payment of compensation?	There is explain steps in accordance to the Acquisition Act	
						4.		
						5.		
4.2					**4.2 Livelihood Assistance**	1. There was obtain enough knowledge in accordance to the brochure		
						2.		
						3.		
						4.		
						5.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities** **5.1 Proposed Resettlement Areas**	1. There was obtain enough knowledge in accordance to the brochure		
						2.		
						3.		
						4.		
						5.		
5.2					**5.2 provision of Social infrastructure facilities**	1. Is there taken any action to replace the tube well in another location which has to remove due to construction of alternative road?	There was prepare plan to establish that Tube well in another location	
						2.		
						3.		
						4.		
						5.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. There was obtain enough awareness in accordance to the brochure		
						2.		
						3.		
						4.		
						5.		
6.1					**6. Proposed Resettlement Schedule 6.1 Resettlement Stages**	1. There was obtain enough awareness in accordance to the brochure		
						2.		
						3.		
						4.		
						5.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					**6.2 Settlers transport**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
6.3					**6.3 settlers Assistance**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
8.					**8. Further Information Disclosure;**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
10.					**10. Contact Info. of the Project Proponent;**	1. There was obtain enough knowledge through the brochure		
						2.		
						3.		
						4.		
						5.		
11.					**11. Any other proposal**	1. they were inform, actual information were obtain through this awareness programme & the brochure		
						2.		

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No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1.	**17.07.2010**	**Medaphilla Temple**	**1. No of Participants. : 130** **2. Presenting condition** **2.1 Affected H/H: 124** **2.2 MASL officers: 04** **2.3 Other NGO/ Govt Representatives: 02** **2.4 Other interested persons : 0** **3. No. Of Female Participants : 28** **4. No of Male participants: 102**	**Sinhala**	**1. Project Components & Implementation schedule**	1. Can't do acceleration the project construction?	Main constructions are planned to do on the foreign grants. Therefore, construction will complete after the receiving foreign grants.	**Assistant D- Env, HRDO,EO, FA**
						2.		
						3.		
						4.		
						5.		
						6.		
2.1	**Total Affected families : 150**	**Medaphilla GN Division (E 407 C)**			**2. Env. & Social Impacts; and Mitigations Measures; 2.1 Environment Impacts**	1. Is there any mechanism to minimize the wildlife impacts in the resettlement areas?	There is explain about wildlife conservation programmes of the project & special concentration was give about construction of electric fence.	
						2.		
						3.		
						4.		
						5.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
						6.		
2.2					**2.2 Social Impacts**	1. How is taken building materials to construct the houses in the new settlement areas?	There is explain about the Permission to utilize re-usable building materials removed from demolished buildings and trees grown on the lands at free of cost & Implementation of proper coordination by intervention of RPM	
						2.		
						3.		
						4.		
						5.		
						6.		
3.1					**3.1 Scale of Resettlement**	1. How to give reasonable solution for property losses whose information not included at the Socio economic survey? Please explain it.	There will be select land receivers before the resettlement. In that occasion they can accomplish their purpose by presenting written evidence.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. Are there any chance to given up to the external forces when doing resettlement?	There were explaining about the methodology use to select settlers impartially without any effect of external forces.	
						2.		
						3.		
						4.		
						5.		
						6.		
4.1A					**4.1 Land Acquisition & Compensation 4.1A Land Acquisition**	1. Do acquisition of land in all GN Division at once?	At once, Acquisition will do at the GN division level under the regulation of Land Acquisition Act.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. Please explain the process of payment of compensation. Are pay money at once?	Compensation will pay on allocation of Land Acquisition Act. There is take action to pay compensation at once also.	
						2.		
						3.		
						4.		
						5.		
						6.		
4.2					**4.2 Livelihood Assistance**	1. Are provide special reliefs for the disable persons appropriately?	There will provide special relief for the disable as mention in brochure	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities** **5.1 Proposed Resettlement Areas**	1. There was obtain clear idea about resettlement areas		
						2.		
						3.		
						4.		
						5.		
						6.		
5.2					**5.2 provision of Social infrastructure facilities**	1. special thanking given to the MASL about provision of large amount of social infrastructure facilities other than available in presently		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. Infrastructure facilities will get as expected. Satisfied about it.		
						2.		
						3.		
						4.		
						5.		
						6.		
6.1					**6. Proposed Resettlement Schedule** **6.1 Resettlement Stages**	1. Can't do acceleration proposed reconstruction schedule?	Construction should carryout simultaneously & explained to them, planning also done compatible with that.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					**6.2 Settlers transport**	1. There is given thanks to the MASL about the supply of transport facilities at the resettlement		
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					**6.3 settlers Assistance**	1. There was obtain clear idea about the assistance received by the resettlers		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. There is satisfy about the establishment of Grievance Redness Mechanism		
						2.		
						3.		
						4.		
						5.		
						6.		
8.					**8. Further Information Disclosure;**	1. There is no any special information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male .female participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. There is satisfy about establishment of monitoring plan & mechanism		
						2.		
						3.		
						4.		
						5.		
						6.		
10.					**10. Contact Info. of the Project Proponent;**	1. there is given thanks to MASL about the appointment of officers to obtain special information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
11.					**11. Any other proposal**	1. no any other special proposals		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

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No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1.E 409-B	**17th of July 2010**	**Koongahawela school**	**Total Affected families .....111.....** **1. No of Participants.....144.....** **2. Type of participants** **2.1 Affected H/H.....111.....** **2.2 MASL officers.....03.....** **2.3 Other NGO/ Govt Representatives.....01.....** **2.4 other interest peopl1e .....29.....** **3. No of .female participants .....34.....** **4. No of Male participants.....110.....**	**Sinhala**	**1. Project Components & Implementation schedule**	1. Can't accelerate the project construction activities?	Explain to them, project can be accelerating after receiving foreign funds	**W.K.K Perera (Deputy Manager)**
						2.		**W.M.T.D. Weerakoon (Environment Officer)**
						3.		**O.G.C. Bandara (DevelopmentAssistant)**
						4.		
						5.		
						6.		
2.1		**Milagahamulatenna GN Division**			**2. Env. & Social Impacts; and Mitigations Measures;** **2.1 Environment Impacts**	1. Can't accelerate the construction of electric fence for the isolated people?	**Plan was done for the construction of electric fence?**	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
2.2					**2.2 Social Impacts**	1. There was obtain enough awareness thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
3.1					**3.1 Scale of Resettlement**	1. There was obtain enough awareness thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. Are there give land for sub families who are not included in socio Economic survey?	They can get suitable solution by providing reasonable data to the inspection of selection of land allottees	
						2.		
						3.		
						4.		
						5.		
						6.		
4.1A					**4.1 Land Acquisition & Compensation 4.1A Land Acquisition**	1. There was obtain enough awareness thorough the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. Are there give compensation before the resettlement?	Explain to them, compensation will pay before the resettlement	
						2. Are paid all compensation at once?	Yes, all compensation money will borrow to the bank account by cheque at once	
						3.		
						4.		
						5.		
						6.		
4.2					**4.2 Livelihood Assistance**	1. There can be satisfy with presented subsidies		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities** **5.1 Proposed Resettlement Areas**	1. Which people to allocate land for resettle of right bank in Kaluganga?	Explain to them, Kalu ganga Right bank area was allocated for the people who are loss properties due to construction of Kalu ganga reservoir	
						2.		
						3.		
						4.		
						5.		
						6.		
5.2					**5.2 provision of Social infrastructure facilities**	1. Are there give commercial lands for businessmen at city centre, who losses the properties by the project?	There will be provide commercial land for the property losses businessmen in the Town centre, Area centre & Village centres.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. Have enough water in Kalu ganga reservoir for the agricultural purpose in resettlement areas?	Explain to them, according to the studies, there is enough water volume in Kalu ganga reservoir or the agricultural purpose in resettlement area. As well as additional water volume is enough to supply the Moragahakanda Reservoir**.**	
						2.		
						3.		
						4.		
						5.		
						6.		
6.1					**6. Proposed Resettlement Schedule** **6.1 Resettlement Stages**	1. Can be resettle isolated families with the property losses families?	Explain to them, there should be resettle large no. of affected families Therefore, it can't be done at once & resettlement will do step by step.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					**6.2 Settlers transport**	1. Are there provide lorry for transportation of goods or is provide money equal to it?	Explain to them, there is take proper action by considering necessity in that time**.**	
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					**6.3 settlers Assistance**	1. Can't increase allowance given for the construct temporary house?	This amount will give in accordance to the existing polices	
						2. Can't provide the constructed houses for women & elderly based head of householders?	If that request is reasonable MASL will take action according to their needs.	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. It is enough		
						2.		
						3.		
						4.		
						5.		
						6.		
8.					**8. Further Information Disclosure;**	1. there is no any other special information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. Agreed with the methodology as mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
10.					**10. Contact Info. of the Project Proponent;**	1. There can take information by the division mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
11.					**11. Any other proposal**	1. There is no any other proposal		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

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No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1.	**17.07.2010**	**Moragolla Temple**	**1. No of Participants. : 70** **2. Presenting condition** **2.1 Affected H/H: 53** **2.2 MASL officers: 03** **2.3 Other NGO/ Govt Representatives: 02** **2.4 Other interested persons : 12** **3. No. Of Female Participants : 09** **4. No of Male participants: 61**	**Sinhala**	**1. Project Components & Implementation schedule**	1. Can't be accelerate the project construction activities?	Construction activities can accelerate after receiving the foreign funds.	**Assistant D – Env.** **EO** **Physical planner**
						2.		
						3.		
						4.		
						5.		
						6.		
2.1	**Total Affected families : 53**	**Moragolla GN Division (E 409 C)**			**2. Env. & Social Impacts; and Mitigations Measures;** **2.1 Environment Impacts**	1. Are there implementing soil conservation methods in Resettlement areas also like upper watershed management areas?	Yes, it will be done according to the planned.	
						2. How to take fuel woods after the resettlement?	There is preparing resettlement area development plans by allocating land for the fuel woods purposes also.	
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
2.2					**2.2 Social Impacts**	1. Is there any threat to separate the existing village two parts when doing resettlement?	Resettlement will do properly without separating the existing villages	
						2. What are the benefits given to every one of this village?	Everything was explained as mention in brochure	
						3.		
						4.		
						5.		
						6.		
3.1					**3.1 Scale of Resettlement**	1. There is obtain good understanding through the brochure about the scale of resettlement		
						2.		
						3.		
						4.		
						5.		
						6.	Benefits received by these landowners was explained as mentioned in brochure	

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. What are the benefits give for the families loss of land without losing their residence?		
						2.		
						3.		
						4.		
						5.		
						6.		
4.1A					**4.1 Land Acquisition & Compensation 4.1A Land Acquisition**	1. What is the Methodology applying to acquire the land?	Acquisition will be doing under the Land acquisition Act.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. What is the methodology applying to calculate the compensation?	Valuation will be done by the department of valuation according to the circular No 4 /2008 as mention in brochure.	
						2. How to pay compensation for the Anda farmers?	There will do payment of compensation for the Anda farmers who were included in Anda farmer's list	
						3.		
						4.		
						5.		
						6.		
4.2					**4.2 Livelihood Assistance**	1. Can explain the special assistances provide by the MASL?	It was explained according to the brochure	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities** **5.1 Proposed Resettlement Areas**	1. There is obtained good understand through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
5.2					**5.2 provision of Social infrastructure facilities**	1. There is obtained good understand through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. There is obtained good understand about the irrigation infrastructure facilities through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
6.1					**6. Proposed Resettlement Schedule** **6.1 Resettlement Stages**	1. There is no any problem about the resettlement stages		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					**6.2 Settlers transport**	1. Can't provide additional transport facilities because it is not enough for the some property losses?	There will be take proper action in that situation by considering separately.	
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					**6.3 settlers Assistance**	1. There can be satisfy with information mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. there is obtain enough awareness through the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
8.					**8. Further Information Disclosure;**	1.There is no any additional information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. agree with the monitoring plan mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
10.					**10. Contact Info. of the Project Proponent;**	1.It is very good , mentioning of proper mechanism to know the further information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
11.					**11. Any other proposal**	1. There is no any other proposal		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

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No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
1.	**17.07.2010**	**Rajawel a Temple**	**1. No of Participants. : 170** **2. Presenting condition** **2.1 Affected H/H: 140`** **2.2 MASL officers: 05** **2.3 Other NGO/ Govt Representatives: 01** **2.4 Other interested persons : 24** **3. No. Of Female Participants : 41** **4. No of Male participants: 129**	**Sinhal a**	**1. Project Components & Implementation schedule**	1. Is can't be accelerate the construction activities of the project?	Construction activities depend on the foreign funds. Then, time also will be decided on it.	**D – Agriculture** **D – Environment** **Physical planner**
						2.		
						3.		
						4.		
						5.		
						6.		
2.1	**Total Affected Families : 140**	**Rajawel a GN Division (E 409A)**			**2. Env. & Social Impacts; and Mitigations Measures;** **2.1 Environment Impacts**	1. The introduced methodology of environment protection is good		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
2.2					**2.2 Social Impacts**	1. Can't give immediate solution for the no of 11 isolated families due to facing of social problems?	Explained to them, It will be consider separately in accordance to the necessity.	
						2.		
						3.		
						4.		
						5.		
						6.		
3.1					**3.1 Scale of Resettlement**	1.Methodology is suitable as mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
3.2					**3.2 Selection of Resettlers**	1. Methodology is suitable as mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
4.1A					**4.1 Land Acquisition & Compensation** **4.1A Land Acquisition**	1. Is can be consider paddy land owners less than 0.5 acres?	Explained to them, there can be taken action by considering separately	
						2. What is the methodology providing the land for sub families who are marriage after the cut of date?	There will be consider providing of land under Phase II	
						3. What is the methodology providing the land for cultivators by changing cultivating season?	Explained to them, methodology of land provide in accordance to the ownership.	
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
4.1B					**4.1B Valuation & Compensation**	1. Is can be explain process of payment of compensation for the pawed lands?	The process of payment of compensation was explained. By inspecting the ownership and discuss on relevant institute compensation will be paid.	
						2.		
						3.		
						4.		
						5.		
						6.		
4.2					**4.2 Livelihood Assistance**	1. Assistance are enough as mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
5.1					**5. Proposed Resettlement & Provision of Infrastructure Facilities** **5.1 Proposed Resettlement Areas**	1. Information are enough as mentioned in brochure.		
						2.		
						3.		
						4.		
						5.		
						6.		
5.2					**5.2 provision of Social infrastructure facilities**	1. Social infrastructure facilities are enough as mentioned in brochure.		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
5.3					**5.3 Provision of irrigation Infrastructure Facilities**	1. Irrigation Infrastructure Facilities is suitable as mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
6.1					**6. Proposed Resettlement Schedule** **6.1 Resettlement Stages**	1. Agreed with schedule		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
6.2					**6.2 Settlers transport**	1. Agreed with the proposal for transport		
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					**6.3 settlers Assistance**	1. Assistance are enough		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
7.					**7. Grievance Redness Mechanism;**	1. Grievance Redness Mechanism is very good		
						2.		
						3.		
						4.		
						5.		
						6.		
8.					**8. Further Information Disclosure;**	1. There are no special information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
9.					**9. Monitoring Plan & Mechanism**	1. Monitoring Mechanism is very good		
						2.		
						3.		
						4.		
						5.		
						6.		
10.					**10. Contact Info. of the Project Proponent;**	1. Gladness about mentioned on contact persons details to take information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	**MASL's Responses**	Attendant from MASL
11.					**11. Any other proposal**	1. There is no any other proposal		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

Public Consultation Meeting on 16. 07.2010& 17.07.2010 - Monitoring Form

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
1.	**17.07.2010**	**Thalagoda Temple**	**1. No of Participants. : 248** **2. Presenting condition** **2.1 Affected H/H: 221** **2.2 MASL officers: 07** **2.3 Other NGO/ Govt Representatives: 01** **2.4 Other interested persons : 19** **3. No. Of Female Participants : 62** **4. No of Male participants: 186**	**Sinhal a**		1. Is can't be accelerate the Proposed Construction activities?	Construction activities can be accelerate after the receiving the foreign funds.	RPM- Moragahakanda DD- Resettlement EO, HRDO, DA, Management Assistant
						2.		
						3.		
						4.		
						5.		
						6.		
2.1	**Total Affected families : 221**	**Thalagoda GN Division**			1. Env. & Social Impacts; and Mitigations Measures; 2.1 Environment Impacts	1. Is can be accelerate the construction of electric fence ?	Explain to them, construction of electric fence will be accelerating as planned.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
2.2					2.2 Social Impacts	1. Is can be give priority to the Thalagoda GN Division when providing the employment opportunities under the project?	Priority will be given to the immediate replace families which are property losses of Thalagoda GN division when providing the employment opportunities under the project.	
						2.		
						3.		
						4.		
						5.		
						6.		
3.1					3.1 Scale of Resettlement	1. Is can't be give additional land lots for the land losses families between 3-5 acres due to the project?	MASL will be providing land lots for the property losses families as gift. Therefore can't be providing any additional land other than it.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
3.2					3.2 Selection of Resettlers	1.All matters were understand in accordance to the brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
4.1A					4.1 Land Acquisition & Compensation 4.1A Land Acquisition	1. Is can be pay compensation for the acquired land before the provide land from resettlement areas?	Explained to them, Compensation will be pay before the showing land from the resettlement areas.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
4.1B					4.1B Valuation & Compensation	1. Are giving compensation as mentioned in brochure?	Yes. Compensation will be pays as mentioned in brochure.	
						2.		
						3.		
						4.		
						5.		
						6.		
4.2					4.2 Livelihood Assistance	1. Is can't be pay assistance by calculating the amount of losses harvest other than Quota (Ration) proposed by MASL?	Monthly providing of equal rations by considering the no of members of each and every property loss family will be reasonable & very useful in accordance to the current needs. Explained to them, there can't be achieve as above mention objective by giving assistance as their request.	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female participants/ male participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.1					5. Proposed Resettlement & Provision of Infrastructure Facilities 5.1 Proposed Resettlement Areas	1. Is can't be give land from Medirigiriya area for the property losses who area requesting land from the Kalu Ganga area earlier?	Explained to them, there can be give reasonable solution after doing the written request.	
						2. Is can't be organize field visit for the proposed resettlement areas?	Field visit will be arrange after the preparation of land selection list	
						3.		
						4.		
						5.		
						6.		
5.2					5.2 provision of Social infrastructure facilities	1. The Social infrastructure facilities area enough as mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
5.3					5.3 Provision of irrigation Infrastructure Facilities	1.The irrigation facilities area enough as mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
6.1					6. Proposed Resettlement Schedule 6.1 Resettlement Stages	1. Is can't be accelerate the resettlement?	Resettlement will be accelerate by following existing regulations	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
6.2					6.2 Settlers transport	1. Think, it will be received necessary quantity as mentioned in brochure.		
						2.		
						3.		
						4.		
						5.		
						6.		
6.3					6.3 settlers Assistance	1. Is can't be give house by constructing for the elderly head of householders?	There will be take suitable actions by identifying the necessity of them separately	
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
7.					7. Grievance Redness Mechanism;	1. It is enough as mentioned in brochure		
						2.		
						3.		
						4.		
						5.		
						6.		
8.					8. Further Information Disclosure;	1.There is no any special information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of .female male participants/ participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
9.					9. Monitoring Plan & Mechanism	1. Monitoring plan & mechanise is very good.		
						2.		
						3.		
						4.		
						5.		
						6.		
10.					10. Contact Info. of the Project Proponent;	1. Gladness about presenting on process of receiving information		
						2.		
						3.		
						4.		
						5.		
						6.		

No.	Date	Venue	(1) No. of the participants; (2) Type of participants; (3)No of male participants/ .female participants	Language	Topics	Participants' Major Comments	MASL's Responses	Attendant from MASL
11.					11. Any other proposal	1. There is no any other proposal		
						2.		
						3.		
						4.		
						5.		
						6.		
						7.		
						8.		
						9.		
						10		
						11.		
						12.		

Moragahakanda Agricultural Development Project - Summary of the Updated Environment Monitoring Plan with the Progress up to end of July 2010

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
1	**Establishment of 100 m reservation around the peremeter of the reservoir**														
	Soil erosion & Sedimentation of the reservoirs due to loss of forest cover in the watershed area by human activities.	(100 m strip from FSL of Moragahakanda, Bowatenna & Nalanda Reservoirs to be preserved as a reservation and kept under the forest cover.)	1.1) Tree Planting in 600 ha.		600 ha	80 ha	240 ha	240 ha	40 ha	-	a) Replanting progress in Ha. b) Survival rate of plant %	MASL	Monitoring committee	Once in three month	
			Moragahakanda Reservation	P	360 ha.	48 ha.	144 ha.	144 ha.	24 ha.	-					
				F	45	6	18	18	3	0					
			Bowatenna Reservation	P	150 ha.	20 ha.	60 ha.	60 ha.	10 ha.	-					
				F	18.75	2.5	7.5	7.5	1.25	0					
			Nalanda Reservation	P	90 ha.	12 ha.	36 ha.	36 ha.	6 ha.	-					
				F	11.25	1.5	4.5	4.5	0.75	0					
			1.2) Demarcation of buffer zone in three reservoirs	P	700 km	400 km	300 km	-	-	-	No. of posts fixed in the boundary				Total length of peripery of Moragahakanda is 66 km. Completed the fixing of posts along the entire boundary in 30 m intervels
				F	21	12	9	0	0	0					
Sub Total					**96.00**	**22.00**	**39.00**	**30.00**	**5.00**	**0.00**					

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
2	**Protection & Conservation of river/streams embakments in the watershed area**														
	Soil erosion & Sedimentation of reservoirs due to destruction of forest cover in river/stream banks etc. in watershed area	Tree planting & Construction retaininig wall ,Block walls & rubbles cushions to minimize soil detachment & soil erosion. Continue flow monitoring proramme conduct to determine sedimentation rate of the reservoirs.	2.1) Civil construction along the streams	**P**	10 km	2.5 km	2.5 km	2.5 km	2.5 km	-	a) Length of retaining wall completed. b) Length of block walls completed. c) Length of rubbles cushion completed.	MASL	Monitoring committee	Once in three month	
				F	4	1	1	1	1	0					
			2.2) Tree Plantating in reservation, river/stream banks, Burrow pits, dumping areas & Avenue planting - 600 ha.	P	600 ha.	150 ha.	150 ha.	150 ha.	150 ha.	-	a) No. of ha. completed.				**Stream bank /river bank planting in 2009** Stream bank reservations are replanted (15 km) Babaragahawatte -1300 plants, Halabagahawatte - 400 plants, Pubbbiliya - 2200 plants, Ganamayaya 400 plants, Haduwa - 500 plants, Maragamuwa - 500 plants, Devaradapola - 900 plants, Moragahamada -500 plants etc. **Rehabili. of barrow pits & Dumping sites** Rehabilitation of barrow pits along the new road & 15 Ac. replanted using native species with the assistance of F.D. (2007/2008) In addition 6 ha. replanted in 2009 (3 Nos. borrow pits & 02 dumping sites). MaOya burrow pit - 3 ha. Wadurumulla burrow pit - 2 ha. Balumgala burrow pit - 1 ha. Maragamuwa dumping site -1 ha. Murunga Aththa road -1 ha. **Avenue planting** 2000 plants - Wadurumulla
				F	48	12	12	12	12	0	b) Survival rate of plants %				
			2.3) Flow monitoring	**P**	Sum	25%	25%	25%	12.5%	12.5%	flow monitoring & Data analysis, sediment rate monitoring				
				F	4	1	1	1	0.5	0.5					
Sub Total					**56.00**	**14.00**	**14.00**	**14.00**	**13.50**	**0.50**					

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F) year 01	year 02	year 03	year 04	year 05	Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
3	**Forestry Development in watershed area**														
	Destruction of forest cover in the catchment area due to increase human activities (extraction of trees for fulfill timber,fuel wood & medicinal requiments etc.)	Preserve the Forest Cover in the Catchment and establishing conservation measures to minimize soil losses (providing alternative methods to fulfill the requirements)	3.1) Up land forest conservation - 2,500 ha	P	2500 ha.	350 ha.	500 ha.	650 ha.	650 ha.	350 ha.	a) No. of ha. completed.	MASL	Monitoring committee	Once in three month	0.3 ha. replanted in vacant areas
				F	200	30	40	50	50	30	b) Survival rate of plants %				
			3.2) Timber Farms - 300 ha	**P**	300 ha.	75 ha.	75 ha.	75 ha.	75 ha.		a) No. of ha. completed.				
				F	24	6	6	6	6	0	b) Survival rate of plants %				
			3.3) Medicinal farm	**P**	20 ha	-	6.6 ha	6.8ha	6.6 ha.		No. of ha. completed.				
				F	3		1	1	1						
	Sub Total				**227.00**	**36.00**	**47.00**	**57.00**	**57.00**	**30.00**					
4	**Implementation of Soil Conservation Methods for watershed area**														
	Increase Soil erosion in catchment area due to increase human activities such as construction activities,illegal timber felling,unplanned Farming etc.)	Measures to minimize soil degradation and erosion.	***4.1) On-farm soil conservation in 2,500 ha.*** *(Soil conservation activities implement inside the farm block)*	*P*	2500 ha.	500 ha.	600 ha.	600 ha.	600 ha.	200 ha.	No. of ha. covered on farm soil conservation & length (m) of completed	MASL	Monitoring committee	Once in three month	***2008***
				F	62.5	12.5	15	15	15	5	*1. **Mechanical Method** - drains, stones bunds , stone walls,terraces, single platforms.*				Countour drains - 6,503.5 m
															Countour bunds - 2,493 m
															Boulder bunds -18.5 m completed
											*2. **Biological methods** - Vegetative bunds salt, Grass strips, cover crops, forest trees.*				***2009***
															Countour drains - 7,487.5 m
											*3. **Agrinomic Method** - Mulching, planting along contours, minimum tillage, selective weeding.*				Countour bunds - 707 m
															Boulder bunds -707 m completed
															2010
															Countour drains - 9,749 m
															Countour bunds - 1,016 m
															Boulder bunds - 245 m completed
			4.2) Off-farm soil conservation in 100 km	P	100 km.	10 km.	40 km.	40 km.	10 km.	-	a) No of Km. /m. completed off farm conservation.				
			(Soil conservation activities implement outside the farm block)	F	40	4	16	16	4	0	b) Engineering Works				
											1. Length of cut slope completed				
											2. Length of fill slope completed				
											3. Length of road drain completed				
	Sub Total				**102.50**	**16.50**	**31.00**	**31.00**	**19.00**	**5.00**					

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
5	**Wildlife Conservation in the watershed area**														
	Destruction of wildlife habitats due to construction activities in the project area (Construction of dams, roads ,camp sites, buildings etc.)	5.1) Baseline survey	Elephant population survey in Mahaweli Wildlife region	**P**	sum	100%					Ensure a baseline servay conducted on elephant their distribution ,foods habitats etc.	DWC	Monitoring committee	Once in three month	
				F	3.50	3.50									
		5.2) Survey & Demarcation of the boundary of protected area	Identification & demarcation of elephant corridor between wasgamuwa & Moragahakanda	**P**	No. 01	20%	80%				Survey map produced with Demarcated boundary of the protected area	DWC			
				F	2.00		2.00								
			Relocation of families of the corridor	**P**							No. of families relocated	MASL			
				F											
			Surveying & demarcation of Angammedilla N.P	**P**	No. 01			50%	50%		No. of km surveyed & demarcated	DWC			
				F	2.50			1.25	1.25						
			Managing grasslands in Angammediila N.P	**P**	25 ha.		50%		50%		No. of ha. grass land managed	DWC			
				F	1.25		0.625		0.625						
		5.3) Habitat Enrichment	Managing grasslands in Minneriya N.P	**P**	25 ha.			50%		50%	No. of ha. grass land managed	DWC			
				F	1.25			0.625		0.625					
			Managing grasslands in Kaudulla N.P	**P**	20 ha.		50%		50%		No. of ha. grass land managed	DWC			
				F	1.00		0.50		0.50						
			Removing of invasive spp. In Elahera N.R	**P**	25 ha.		50%	50%			No. of ha. invasive spp. Removed	DWC			
				F	1.50		0.75	0.75							
			Establishment of Fire belts at open areas of Parakrama Samudraya	**P**	25 ha.		25%	25%	25%	25%	No. of Ha. Fire belt established.	DWC			
				F	1.00		0.25	0.25	0.25	0.25					
			Renovation of tanks in Angammedilla N.P(Mahayyawa wewa, , Sedini wewa,	**P**	2 No.		100%				No. of tank renovated in Anganmedilla N.P	MASL			
				F	4.00		4.00								
		5.4) Erection of Electric fences including elephant corridors	Sandawasalakanda –Pubbiliya electric fence	**P**	30 km	10%	90%				No. of km completed	DWC			
				F	15.00		15.00								
			Pubbiliya-wawalawewa electric fence	**P**	30 km		100%				No. of km completed	DWC			
				F	15.00		15.00								
			Attaragallewa elephant corridor	**P**	20 km			100%			No. of km completed	DWC			
				F	10.00			10.00							
			Aluthwewa-Gallella electric fence	**P**	15 km				100%		No. of km completed	DWC			
				F	7.50				7.50						
			Rehabilitation of Mahaweli System ‘G’ Electric fence	**P**	70 km		50%	50%			No. of km completed	DWC			
				F	14.00		7.00	7.00							

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
		5.5) Eco tourism promotion & Eco- development	Establishment of a Nature trail at Angammedilla N.P	P	2 km		100%				No. of km completed.	DWC	Monitoring committee	Once in three month	
				F	0.20		0.20								
			Establishment of 2 camp sites at Angammedilla N.P(Rajabamma & Mahaiyawa)	P	02 No.		50%		50%		No. of camp sites established	DWC			
				F	1.00		0.50		0.50						
			Establishment of a Nature trail to Diviyagala Kanda at Minneriya N.P	P	3 km			100%			No. of km completed.	DWC			
				F	1.00			1.00							
			Establishment of 4 camp sites at Minneriya N.P	P	4 No.		25%	25%	25%	25%	No. of camp sites established	DWC			
				F	2.00		0.50	0.50	0.50	0.50					
			Building of wash rooms for visitors at Angammedilla N.P	P	01 No.			100%			Percentage of the building for wash rooms established	MASL			
				F	1.50			1.50							
			Building a viewing deck/ platform for visitors at Elephant domestication centre Angammedilla N.P	P	1 No.				100%		Percentage of the building for viewing desk/platform established	MASL			
				F	2.50				2.50						
			Rehabilitation of roads for viewing wild animals	P	12 km			100%			No. of Km of road rehabilitated	MASL			
				F	6.00			6.00							
			Preparation & Displaying historical exhibits at the visitor centre of Kaudulla N.P	P	1 No.				100%		Ensure displaying of historical exhibits	DWC			
				F	0.80				0.80						
		5.6) Construction of office units	Construction of new beat office at Rajjammana	P	01 No.		100%				Percentage of the beat office constructed	MASL	Monitoring committee	Once in three month	
				F	3.50		3.50								
			Repairing of beat office at pubbiliya	P	01 No.		100%				Percentage of the beat office repaired	DWC			
				F	1.30		1.30								
			Repairing of range office at Elahera	P	01 No.			100%			Percentage of the range office repaired	DWC			
				F	2.00			2.00							
			Construction of new beat office-1 at Kaudulla N.P	P	01 No.			100%			Percentage of the beat office - 1 constructed	MASL			
				F	3.50			3.50							
			Construction of new beat office-2 at Kaudulla N.P	P	01 No.				100%		Percentage of the beat office -2 constructed	MASL			
				F	3.50				3.50						
			Repairing of staff building at Angammedilla N.P	P	01 No.			100%			Percentage of the staff building repaired	DWC			
				F	1.20			1.20							

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
		5.7) Protected area conservation	Identification of new Moragahakanda - Kaluganga wildlife reserve	P			50%	50%			Percentage of the reserve identified	DWC / MASL	Monitoring committee	Once in three month	
				F	1.50		0.75	0.75							
			Surveying & demarcation of new reserve (Moragahakanda related components)	P				50%	50%		Percentage of the reserve surveyed & Demarcated	DWC / MASL			
				F	5.00			2.50	2.50						
			Identify details regarding families to be resettled	P					100%		Percentage of the details identified regarding the families to be relocated	DWC			
				F	4.00				4.00						
			Preparation of a Management plan to new WL reserve	P	No.				100%		Percentage of the Management plan prepared	DWC			
				F	2.00				2.00						
			Renovation of tanks in Elahera N.R (Thambarala wewa, , Boogaswewa, game wewa	P	4 No.		50%	50%			No .of tanks renovated	MASL			
				F	9.00		4.50	4.50							
		5.8) Management Activities of electric fence involving communities	Formation of new CBOs' & strengthening of existing CBOs	P	No.		100%				No. of CBO formed & strengthened	DWC / MASL			
				F	0.30		0.30								
			Establishment of a fund for maintenance	P			100%				Ensure that the fund is established	MASL			
				F	0.20		0.20								
			Maintenance of electric fence	P			25%	25%	25%	25%	Ensure that the electric fence is maintenced	CBO			
				F	14.50		3.63	3.63	3.63	3.63					
		5.9) Maintenance & overheads					25%	25%	25%	25%		DWC			
					2.00		0.50	0.50	0.50	0.50					
Sub total					**148.00**	**3.50**	**61.00**	**47.45**	**30.55**	**5.50**					

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
6) Biodiversity conservation in watershed area															
6.1	Total disappearence of some habitats and species including valuable wild relatives of agro-biodiversity (Impounding area)	Translocation of species in the inundation area.	Implementation of translocation plan	**P**							Survival % of relocated species	MASL	Monitoring committee	Once in three month	
				F	1.00		0.50	0.50							
6.2		Collecting of specimens of the flora and fauna in the inundation area.	Preservation of collected flora & Fauna samples	**P**							No. of specimens preserved in the National Herbarium/ National Museum				
				F	0.50		0.25	0.25							
6.3	Loss of traditional knowledge	Facilitate preservation & maintanance of the ethno biological knowledge in the lost area through documentation	Documentation of ethno biological knowledge in the lost area	**P**							Percentage of audio visual information and ethno- biological information documented.				
				F	1.5		0.75	0.75							
6.4	Destructive land use practises outside the proposed protected area	Mitigation of destructive land use practices outside the proposed protected area (Law enforcement, public awareness, and restoration of degraded habitats)	i) Law enforcement ii) public awareness iii) Restoration of degraded habitats	**P**							i) No. of programmes ii) No. of programmes conducted & No. of participants.				
				F	3.00	0.60	0.60	0.60	0.60	0.60	iii) No. of ha. converted				
6.5	Desappearance of native fish species	Prohibit introduction of competitive exotic fish species into reservoir	Prohibit introducting of competitive exotic fish species into reservoir	**P**							Percentage of fish surveys conducted to monitor presence of exhotic fish species				
				F	0.60	0.12	0.12	0.12	0.12	0.12					
6.6	Habitat destruction and deterioration and disturbance to wildlife due to construction activities.(quarrying, dumping,jungle clearing, camp sites, temporary road network, transmission line)	i.) Strictly adhere to environmental guidelines pertaining to construction activities iii) Awareness of relevant stakeholders iii) Employ dedicated staff for related environmental matters	i.) Strictly adhere to environmental guidelines pertaining to construction activities ii) Awareness of relevant stakeholders iii) Employ dedicated staff for related environmental matters	**P**							i) Ensure implementation of env. Guidelines related to construction activities				
				F	6.00	1.20	1.20	1.20	1.20	1.20	ii) No. of programmes conducted & No. of participants. iii) No. of Env. staff employed the env. activities				

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
6.7	Proliferation of IAS & Suppression of native biodiversity	Controll proliferation of IAS & Enhancement of native biodiversity	Eradication of Invasive Alian Species (IAS) & Enhancement of native biodiversity	P							Percentage of programme completed	MASL	Monitoring committee	Once in three month	
				F	1.2	0.24	0.24	0.24	0.24	0.24					
6.8	Upstream land base human activities such as land clearing,agriculture, expansion of settlements and soil waste will have devastating on species and habitats	i) Introduce biodiversity friendly livelihood strategies including eco-agriculture, ecotourism ii) Incorporate biodiversity concerns in to human settlement policies iii) Introduce appropriate local area development policies for likely industries to minimize impact on biodiversity.	i) Implementation of eco agriculture & Ecotourism programme ii) Implementation of biodiversity conserns in selltement activities iii) Preparation of local area development policies for industries	P							i) No. of eco agriculture & ecotourism programme conducted. ii) Ensure conservation of adequate reservation in tanks,streams & rivers etc. iii) Ensure implementation of local area development policies to industries				
				F	12	2.4	2.4	2.4	2.4	2.4					
6.9	Deterioration of habitat quality of the downstream riverine habitat and species	Maintain sustainable e- flow rate & recreate annual flash flood event to maintain the reverine habitat and flood plains.	Maintain sustainable e- flow rate & recreate annual flash flood event to maintain the reverine habitat and flood plains.								Releasing of adequate water to facilitate e-flow rate &flash flood (Average of 18.86 MCM per month from November to March every year.)				
Sub Total for Biodivesity Conservation Programme (IUCN Programme)					**25.80**	**4.56**	**6.06**	**6.06**	**4.56**	**4.56**					

Note :- Biodiversity co-ordinating committee will decide & re - adjust five year programme base on the priority activities during the implementation /Augmentation of the reservoir.

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
7	***Environment conservation activities in Resettlement area (Kaluganga & Medirigiriya)***														
	Destruction of social life of resettlers in newly resettlement area due to lack of facilitites, deforestration, destruction of income generation etc.	Enhance living stardards through enhance forest cover , providing better quality drinking water ,sanitory facilities & home garden development etc. in resettlement area	7.1) Tree planting in 50 m tank reservation/River bank conservation/Avenue planting etc.	P	500 ha	50	150	100	150	50	a) No. of ha. completed.	MASL	Monitoring committee	Once in three month	
				F	40	4	12	8	12	4	b) Survival rate of plants %				
			7.2) Establishment of timber farms	P	250 ha	50	50	50	50	50	No. of ha. completed				
				F	20	4	4	4	4	4					
			7.3) Home garden development	P	550 ha	50	100	200	150	50	No. of ha. completed				
				F	16.5	1.5	3	6	4.5	1.5					
			7.4) Water Quality Monitoring	P	sum						No. of water Quality samples tested & No. of Monthly water quality reports produced.				
				F	6	1	1	2	1	1					
			7.5) Drinking water facilities	P	sum						No.of drinking water facilities provided.				
				F	8	1	2	2	2	1					
			7.6) Sanitary facilities	P	sum						No.of sanitory facilities provided				
				F	7	1	1	2	2	1					
			7.7)Training & Management activities	P							No. of training pro. Conducted				
				F	2.5	0.5	0.5	0.5	0.5	0.5					
					100.00	**13.00**	**23.50**	**24.50**	**26.00**	**13.00**					

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
8	**Community Infrastructure Development in watershed area**														
	Over illegal exploitation of resources from the protected areas due to poor income sources.	To improve living standard and social status of the community providing irrigation ,marketing,Social welfare facilities to reduce threatening /over expoitation of natural resources	8.1) Rehabilation of small tanks - 16 Nos.	**P**	16	-	7 Nos.	9 Nos.	-	-	No. of tanks rehabilitated	MASL	Monitoring committee	Once in three month	01 anicut improved in Babaragahawatte mini watershed in 2009 , Rehabilitated 01 anicut in Pubbiliya & constucted 01 small culvert in Dodan Aththawala in 2010.
				F	4.8	0	2	2.8	0	0					
			8.2) Rehabilation of small anicuts - 110 Nos.	P	110	-	20 Nos.	30 Nos.	30 Nos.	30 Nos.	No. of small anicuts rehabilitated				
				F	11	0	2	3	3	3					
			8.3) Agri Roads - 25 Nos. (70 km)	P	25	-	5 Km.	10 Km.	10 Km.	-	No. of roads/length (Km) completed				***Rehabilitation of following agri. Road as completed gravel roads*** * Helabagahawatte ,Babaragahawette , Dambagolla - 7 km in 2008 * Moragahamada - 3.7 km in 2009 * Galaboda 4.6 km in 2009 * Rajawela 2.2 km completed.in 2009 * Wekandayaya 0.6 km in 2009 * Moragolla 0.9 k.m. completed in 2009 * Opalgala - 2 km * Kadawatha Thalagoda - 1.2 km * Kabarawa - Moragolla 9 km being rehabilated
				F	5	0	1	2	2	0					
			8.4) Drinking water & social welfare	P	activities	-	30%	30%	30%	10%	No. of wells completed				***01 well compelted***
				F	7	0	2	2	2	1					
			8.5) Sanitory facilities	P	activities	-	20%	40%	40%	-	No. of toilets completed				
				F	5	0	1	2	2	0					
Sub Total					**32.80**	**0.00**	**8.00**	**11.80**	**9.00**	**4.00**					
9	**Farm production & income generation activities for settlers in watershed area**														
	Over exploitation of natural resources due to increase human activities such as farming, constructions, illegal timber felling etc	Introducing income generating activities and formulate strategies and methods to control timber felling in the upper watershed area (introducing alternative income generation activities)	9.1) Establishment of nurseries - 20 units	P	20 units	10 nos.	10 nos.	-	-	-	No. of nursery units established	MASL	Monitoring committee	Once in three months	Central plant nursery is established in Mora. Project & 35,000 plants available for catchment conservation activities. In addition 08 village plant nurseries established (Puddliya - 04 , Halabagahawatte 02 & Maragamuwa - 02)
				F	0.6	0.3	0.3	0	0	0					
			9.2) Development of home gardening - 1000 ha.	P	1000 ha	200 ha	300 ha	300 ha	200 ha	-	No. of home garden developed				Home garden development in 144.5 Ac. - famers' lands & 5.5 Ac. - School) in Moragahakanda catchment & reservoir bed.(566 farmers & 22 schools are benefited.)
				F	30	5	10	10	5	0					
			9.3) Agro processing & marketing	P	pro	30%	40%	30%	-	-	No. of pro. completed				
				F	15	5	5	5							
			9.4) Income generating activities	P	pro	-	30%	40%	30%	-	No. of pro. completed				60 farmers from 6 villages involved in demostration farming activities
				F	15	0	5	5	5	0					
Sub Total					**60.60**	**10.30**	**20.30**	**20.00**	**10.00**	**0.00**					

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F) year 01	year 02	year 03	year 04	year 05	Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
10	**Training & Capacity Building**														
	Lack of training and technical know how to implement environment programme	Enhance awareness regarding productivity of the land lot , watershed conservation management, etc.	10.1) Awareness Training	P	Item	50%	25%	25%	-	-	No. of training pro. Conducted & No. of participants paticipated.	MASL	Monitoring committee	Once in three month	* Training pro. conducted for farmers in 12 small watershed. * 8 Nos. rural watershed management committees formed. * 10 Nos. awareness meeting were conducted & 3 Nos. training pro. were conducted. * 09 Nos. Sramadana camps were organized. * 03 school awareness pro. Were conducted * 01 Health improvement programme was conduced ***Target location*** Halabagahawatte , Dambagolla , Babaragahawatte, Puddliya , Maragahamuwa, Opalgala , Henegama, Moragahamada, Kubiyangaha ela
				F	4	2	1	1							
			10.2) Community leader training	P	Item	40%	30%	30%	-	-	No. of training pro. Conducted & No. of participants paticipated.				07 Nos. school programmes conducted. 01 village level officer training & 01 Community leader training conducted.
				F	3	1	1	1							
			10.3) Mass media Develoment	P	Item	50%	30%	20%	-	-	No. of pro. conducted				Conducted Environment awarness programme using 14 Banners & prepred CD with field activities.
				F	6	3	2	1							
			10.4) Trai. on Agriculture & forestry	P	Item	30%	30%	30%	10%	-	No. of training pro. conducted & No. of participants paticipated.				05 Agriculture training pro. in CIC - Dambulla for farmers , Nationa Food Week pro. in Mora. Project etc.
				F	3	1	1	1							
			10.5) Training on marketing	P	Item	-	30%	30%	20%	20%	No. of training pro. conducted & No. of participants paticipated.				
				F	3		1	1	0.6	0.4					
			10.6) Income generating activites	P	Item	-	30%	30%	30%	10%	No. of pro. conducted				
				F	3		1	1	1						
			10.7) Follow up programme	P	Item	-	-	30%	30%	40%	No. of pro. conducted				
				F	3			1	1	1					
			10.8) Staff Training (Local)	P	Item	30%	30%	20%	10%	10%	No. of training pro. conducted & No. of participants paticipated.				2 Forestry training pro. ,01 wildlife training pro & 01 agriculture training pro. for Morahahakanda Environment staff
				F	7	2	2	1.5	1	0.5					
			10.9) Staff Training (Overseas)	P	Item	-	30%	50%	-	-	No. of training pro.conducted & No. of participants paticipated.				
				F	8		4	4							
Sub Total					**40.00**	**9.00**	**13.00**	**12.50**	**3.60**	**1.90**					

No	Possible impacts	Mitigatory Activities	Sub Activities		Total Physical & Financial target	Physical (P) & Financial target (F)					Parameters to be Monitored	Activity Responsibility	Monitoring Responsibility	Monitoring Frequency	Present Situation
						year 01	year 02	year 03	year 04	year 05					
11	**Support Facilities**														
			11.1) Community Centres/sub offices	P	8 Nos.	8Nos.	-	-	-	-	Ensure establishment of community centre/sub offices	MASL	Monitoring committee	Once in three month	
				F	12	12									
			11.2) Renovation of WMD -Naula	P	sum				-	-	Ensure renovation of WMD - Naula				
				F	1.5	1.5									
			11.3) Renting out of two building for two divisional offices	P	sum				-	-	Ensure renting out of two building for two divisional offices				
				F	1.8	1.8									
			11.4) Office Furniture & Equipment	P	sum					-	No. of Furniture & Equipment purchased				
				F	7	4	3								
			11.5) Purchasing of 4 WD double cabs	P	3 Nos	3 Nos					No.of 4 WD double cabs purchased				
				F	10.5	10.5									
			11.6) Truck (4 Tons)	P	1 Nos	1 Nos					Purchasing of a Truck (4 Tons)				
				F	3	3									
			11.7) Motor Cycles	P	15 Nos	15 Nos	-				No. of 15 motor cycles purchased				
				F	2.25	2.25									
			11.8) Computers & Accessories	P	8 Nos	8 Nos					No. of computers & Accessories purchased				
				F	1.6	1.2	0.4								
			11.9) Training equipment	P	sum						No. of training equipments purchased				
				F	4	3	1								
			11.10) Meteorological & flow measurement instrument	P	sum						No. of Metrological & flow measurement instrument purchased				
				F	5.0		3.5	0.5	0.5	0.5					
			11.11) Miscellaneous	P	Item	-	30%	50%	-	-					
				F	2.35			0.7	0.7	0.95					
	Sub Total				**51.00**	**39.25**	**7.90**	**1.20**	**1.20**	**1.45**					
Total Budget for Environment activities in Moragahakanda project					**939.70**	**168.11**	**270.76**	**255.51**	**179.41**	**65.91**					
Management cost (Cost for the Management of the total programme & Monitoring cost)					60.80	15.00	15.00	10.00	10.00	10.80					
Contingencies 7.89%					78.94	14.65	22.86	21.24	15.15	6.14					
Grand Total Rs. Mn					**1079.44**	**197.76**	**308.62**	**286.75**	**204.56**	**82.85**					
Grand Total US$. Mn					**9.47**	**1.73**	**2.71**	**2.52**	**1.79**	**0.73**					
Percentage					**100%**	**18%**	**29%**	**27%**	**19%**	**8%**					

(1 US$ = Rs. 114)

Table 5 Summary of Scoping Results on Environmental & Social Impacts of the MAD Project (Dam and Reservoir Site)

Impacts / Phase	1.Involuntary Resettlement	2.Local Economy suc as Employment & Livelihood, etc.	3.Land Use & Utilization of Local Resources	4. Social Institutions such as Split of Communities	5.Existing Social Infrastructures & Services	6.The poor, indigenous & ethinic people	7.Misdistribution of Benefit & Damage	8.Cultural Heritage	9.Local Conflict of Interest	10.Water Usage or Water Rights & Rights of Common	11.Sanitation	12.Hazards (Risk), Infectous Diseases such as HIV/AIDS	13. Occupational Safety and Health	14.Topography & Geographical Features	15.Soil Erosion	16.Groundwater	17.Hydrological Situation	18.Coastal Zone	19.Fauna, Flora & Biodiversity	20.Meteorology	21.Landscape	22.Global Warming	23.Air Pollution	24.Water Pollution	25.Soil Contamination	26.Waste	27.Noise & Vibration	28.Ground Subsidence	29.Offensive Odor	30.Bottom Sediment	31.Accidents
	Social Environment													**Natural Environment**									**Environmental Pollution**								
Planning Phase	A-			B-		B-	B-	B-	C-																						
Construction Phase		B+/-		B-	B-			C-			B-	B-	B-	B-	B-				A-		B-		B-	B-	B-	B-	B-				B-
Operation Phase		A+	A+		B-		B-		C-	B+/C-		B-		B+	B+	C+/-	B+		A+	B+	B+	C-				B+	B+		B-	C-	

A+/-: Significant positive/negative impact is expected.

B+/-: Some positive/negative impact is expected to some extent.

C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

Blank: No negative impact is expected.

N/A: Not applicable

Table 6 Summary of Scoping Results on Environmental & Social Impacts of the MAD Project (Irrigation Areas/Resettlement Sites)

Impacts / Phase	1.Involuntary Resettlement	2.Local Economy suc as Employment & Livelihood, etc.	3.Land Use & Utilization of Local Resources	4. Social Institutions such as Split of Communities	5.Existing Social Infrastructures & Services	6.The poor, indigenous & ethinic people	7.Misdistribution of Benefit & Damage	8.Cultural Heritage	9.Local Conflict of Interest	10.Water Usage or Water Rights & Rights of Common	11.Sanitation	12.Hazards (Risk), Infectous Diseases such as HIV/AIDS	13. Occupational Safety and Health	14.Topography & Geographical Features	15.Soil Erosion	16.Groundwater	17.Hydrological Situation	18.Coastal Zone	19.Fauna, Flora & Biodiversity	20.Meteorology	21.Landscape	22.Global Warming	23.Air Pollution	24.Water Pollution	25.Soil Contamination	26.Waste	27.Noise & Vibration	28.Ground Subsidence	29.Offensive Odor	30.Bottom Sediment	31.Accidents
	Social Environment													**Natural Environment**									**Environmental Pollution**								
Planning Phase	B-			B-		C-	B-	C-	B-	B-																					
Construction Phase		B+						C-			B-	B-	B-	B-	B-				B-		B-		B-			B-	B-				B-
Operation Phase		A+	A+				B-		B-	B-/C-				B+/B-	B+	B-	B+	B+	B+	B-		C-		B-	B-	B-			B-	B-	

A+/-: Significant positive/negative impact is expected.

B+/-: Some positive/negative impact is expected to some extent.

C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

Blank: No negative impact is expected.

N/A: Not applicable

Table 7 Descriptions of Scoping Results for the Moragahakanda Development Project

Upstream Impacts (Dams, Reservoir, Power Station, Transmission Line, and Deviated Road)

	No.	Likely Impacts	Ranking			Description
			Design	Construction	Operation	
Social Environment	1	Involuntary Resettlement	A-			1,572 households to be affected were identified at the proposed tank-bed area, deviation road and elephant corridor by the census conducted by the MASL's RIP Report. Additionally, there are 24 land owners to be affected by land acquisition, not resettlement due to the transmission line.
	2	Local Economy such as Employment & Livelihood, etc.		B+/-	A+	During construction, more job opportunities of casual labor for local people would be created. However, in the very short-period, existing farming in the dam site and reservoir area would be disturbed due to the land acquisition and construction works. Additionally, fishing in the reservoir would benefit residents during operation. Overall, the project will contribute to the local economy by providing water consistently, increasing the farming in the area, and more employment opportunities for local residents for the operation of the dam during operation.
	3	Land Use & Utilization of Local Resources			A+	Since the land use and water use for the project will be improved by the project, there is no identified negative impact caused by the project, even though trees and farms are cleared in the dam & reservoir area.
	4	Social Institutions such as Split of Communities	B-	B-		Split of communities is expected around the dam & reservoir site.
	5	Existing Social Infrastructures & Services such as Traffic / Existing Public Facilities		B-	B-	According to the draft RIP report, 45 public structures will be affected by the project. Besides, access to existing social infrastructure such as the existing roads, schools, post offices, banks, agrarian service centre, hospital, community halls, public library, cemeteries, pubic pola, water supply schemes, Buddhist temples, and electricity lines could be disturbed during construction. During operation, the impact is expected to be mitigated by the development of social infrastructures in the resettlement sites.
	6	The poor, indigenous and ethnic people	B-			No indigenous or ethnic people will be affected by the project according to the RIP report. As for the poor, there are 141 households (10%) which are below the district poverty line of Matale District (Rs. 2,919) and 277 households received a governmental assistance, Samurdhi amongst the potentially displaced persons. Additionally, some vulnerables such as widow-headed households to be affected are identified in the RIP. Additionally, there is one Tamil family affected by the project at the tank-bed area.
	7	Misdistribution of Benefit & Damage	B-		B-	Inequality between beneficiaries of the project and the Project Affected Persons (PAPs) would occur to some extent. However, the impact is expected to be minimum since the displace persons will be provided the agricultural land in System F or D1 and will be the beneficiaries of the project.

	No.	Likely Impacts	Ranking			Description
			Design	Construction	Operation	
	8	Cultural Heritage	B-	C-		13 structures of 5 temples are going to be affected by the project according to the RIP report. Additionally, the impact needs to be clarified with the existing AIA report.
	9	Local Conflict of Interests	C-		C-	Conflicts of interests related to the project could occur among beneficiaries and the PAPs such as between the farmers in the irrigation area and farmers but to be displaced from the dam site unless the adequate RAP and public consultation are not arranged.
	10	Water Usage or Water Rights & Rights of Common			B+/C-	Water rights will be discussed and arranged by MASL and relevant organizations in accordance with the formal practice of Sri Lanka. Water usage will be further facilitated by the project during operation.
	11	Sanitation		B-		During construction, deterioration of the sanitary condition could occur in & around the construction site during construction including workers' camps in the short-term.
	12	Hazards (Risk) Infectious Diseases such as HIV/AIDS		B-	B-	It is expected that construction laborers would be hired from inside/outside which would increase the possibility to spread infectious diseases such as HIV/AIDS in the short run.
	13	Occupational Safety and Health		B-		It will be secured in accordance with the domestic laws and regulations during construction.
Natural Environment	14	Topography & Geographical Features		B-	B+	Scarring of hillsides during road and dam construction. Change from river valley to lake after inundation.
	15	Soil Erosion		B-	B+	Exposure of soil during construction, followed by soil conservation measures as part of EMP in the watershed during operation.
	16	Groundwater			C+/-	Increased groundwater level after filling of reservoir.
	17	Hydrological Situation			B+	Moderation of downstream flow during annual cycle due to availability of stored of water in reservoir.
	18	Coastal Zone (Mangroves, Coral Reefs, Tidal Flats, etc.)				N/A
	19	Fauna, Flora and Biodiversity		A-	A+	Loss of riverine forest and moist evergreen forest due to construction and filling reservoir. Valuable habitats and elephant migration routes affected. However, establishment of elephant corridors, other conservation areas and electric fences will improve the overall conservation situation in the area during operation.
	20	Meteorology			B-	Slight increase in humidity in vicinity of reservoir.
	21	Landscape		B-	B+	Scarring of hillsides during road and dam construction. Change from river valley to lake after inundation. Possible minor negative impact on landscape by 33kv transmission line during operation.
	22	Global Warming			C-	Decreased CO_2 emissions due to reduced fossil fuel use, and possible methane emissions from reservoir during operation.
Enviro	23	Air Pollution		B-		Dust and exhaust emissions during construction.
	24	Water Pollution		B-		Run-off contaminated with soil and cement during construction.

	No.	Likely Impacts	Ranking			Description
			Design	Construction	Operation	
	25	Soil Contamination		B-		Possible contamination with oil / fuel during construction.
	26	Waste		B-	B+	Rock and earth spoil to be disposed of during construction. Wastes to be disposed of from construction camp. Reduced waste after inundation due to evacuation of population.
	27	Noise and Vibration		B-	B+	Noise and vibration due to blasting and other construction activities. Reduced noise after inundation due to evacuation of population.
	28	Ground Subsidence				N/A
	29	Offensive Odour			B-	Possible bad odours from water during first year or two of operation.
	30	Bottom Sediment			C-	Some sediment accumulation in reservoir.
	31	Accidents		B-		Some accidents inevitable during construction.

Source: The Survey Team

Table 8 Descriptions of Scoping Results for the Moragahakanda Development Project

Downstream Impacts (i.e. Irrigated Resettlement Areas in System D1 and F)

	No.	Likely Impacts	Ranking			Description
			Design	Construction	Operation	
Social Environment	1	Involuntary Resettlement	B-			In System F, there are several families whose farm land will be affected according to the draft RIP report. However, the relocation of the affected households was not planned. In System D1, 9 households were identified as the potential resettlers affected by the branch canal; however, the alignment of the branch canal is planned to be reviewed in the next study stage to minimise the resettlers according to MASL.
	2	Local Economy such as Employment & Livelihood, etc.		B+	A+	During construction, more job opportunities of casual labor for local people would be created even though the extent to smaller than that in the dam and reservoir area. Overall, the project will contribute to the local economy by providing water consistently, increasing the farming in the area, and making employment opportunities for local residents would be created for the operation of the dam.
	3	Land Use & Utilization of Local Resources			A+	Since the land use and water use for the project will be improved by the project, there is no identified negative impact caused by the project, even though trees and farms are cleared in the dam site.
	4	Social Institutions such as Split of Communities	B-			In System F, the social institution of the host communities could be affected to some extent; However, the impact in System D1 would be very limited since there is no host community in the resettlement site according to MASL.
	5	Existing Social Infrastructures & Services such as Traffic / Existing Public Facilities				In System F and D1, the disturbance in the access to the existing social infrastructure is expected to be limited since mainly the social infrastructures will be newly constructed for the displaced persons.
	6	The poor, indigenous and ethnic people	C-			No indigenous or ethnic people will be affected by the project according to the RIP report. As for the poor, there are more than 324 but less than 772 households out of 1,894 households (approx. 2.38-12.63%) in System F (both RB & LB) which are below the district poverty line of Matale District (Rs. 2,919), and 1,281 households out of 1,894 households in System F (RB and LB) received a governmental assistance, Samurdhi according to the socio-economic statistics of resettlement area of System F (2007). Moreover, the majority ethnicity is Sinhalese, and the 0.11-0.16% consists of Sri Lankan Tamil and Muslim respectively according to the socio-economic survey. As for System D1, there is no host community in the resettlement site according to the draft RIP report. However, since the draft RIP report says that socio-economic condition of the resettlement sites is similar to that of the displaced persons, minorities of Sri Lankan Tamil and Muslim, the people below the poverty line, Samurdhi recipients are expected in D1.

	No.	Likely Impacts	Ranking			Description
			Design	Construction	Operation	
	7	Misdistribution of Benefit & Damage	B-		B-	Misdistribution of benefits and damage is expected in System F and System D1 to some extent. For instance, the partial land acquisition of some households of the host community in System F is identified in the draft RIP and there are 9 households to be affected by the branch canal in System D1. Additionally, the resettlers to be displaced to System F are going to have limited irrigation water during non-Maha season until Kalu Ganga Reservoir is filled. Additionally, there is a possibility for the rest of the resettlers from the tank-bed areas moving to System F might have limited access to irrigation water if Kalu Ganga Reservoir is not filled at that time.
	8	Cultural Heritage	C-	C-		The draft RIP report does not specify the impact on cultural heritage in System F and D1, and the impact needs to be clarified with the existing AIA report. During the construction, the proper mitigation measures instructed by the Archaeological Impact Assessment (AIA) and the supervision by an expert from Archaeological Dept. suggested by JICA will be planned in the EMP.
	9	Local Conflict of Interests	B-		B-	Since there are host communities in System F, the impact would be expected to some extent. However, the impact is expected to be limited if the social integration programmes are implemented as planned in the draft RIP.
	10	Water Usage or Water Rights & Rights of Common	B-		B+/C-	Water rights will be discussed and arranged by MASL and relevant organizations in accordance with the formal practice of Sri Lanka. Water usage will be further facilitated by the project during operation. The water usage is expected to be increased in System F and D1 due to the expansion of the irrigable areas in System F and D1. Therefore, adequate water supply shall be arranged in advance of resettlement.
	11	Sanitation	-	B-	-	During construction, deterioration of the sanitary condition could occur in & around the construction site during construction activities including workers' camps in the short-term.
	12	Hazards (Risk) Infectious Diseases such as HIV/AIDS		B-		It is expected that construction laborers would be hired from inside/outside which would increase the possibility to spread infectious diseases such as HIV/AIDS in the short run.
	13	Occupational Safety and Health		B-		It will be secured in accordance with the domestic laws and regulations during construction.
Natural Environment	14	Topography & Geographical Features		B-	B-	Levelling of land and formation of canals during construction. Then change from scrub/forest to paddy fields.
	15	Soil Erosion		B-	B+/B+	Exposure of soil during construction, followed by soil conservation measures in irrigated agriculture.
	16	Groundwater			C+/-	Increase in groundwater level by irrigation. Adequate drainage to be provided.
	17	Hydrological Situation			B+	Increase in return flows to river from irrigated area.
	18	Coastal Zone (Mangroves, Coral Reefs, Tidal Flats, etc.)			B+	Opportunity to recreate biannual flood of downstream riparian wetlands, due to volume of stored water.

	No.	Likely Impacts	Ranking			Description
			Design	Construction	Operation	
	19	Fauna, Flora and Biodiversity		B-	B+	Loss of some forest during construction. Opportunity for planting of canal margins.
	20	Meteorology			B-	Slight increase in humidity in vicinity of paddy fields.
	21	Landscape		B-		Levelling of land and formation of canals during construction. Then change from scrub/forest to paddy fields.
	22	Global Warming				Possible methane emissions from paddy fields, but negligible.
Environmental Pollution	23	Air Pollution		B-		Dust and exhaust emissions during construction.
	24	Water Pollution			B-	Pollution of drainage water with fertilisers and pesticides.
	25	Soil Contamination		B-	B-	Possible soil contamination from pesticides, especially at formulation points.
	26	Waste			B-	Waste arising from new population in resettlement areas.
	27	Noise and Vibration		B-		Some noise and vibration during land clearing / levelling. Noise arising from new population in resettlement areas but very limited and negligible.
	28	Ground Subsidence				Some settling of ground levels after initial levelling.
	29	Offensive Odour			B-	Some offensive odours during application of fertilisers and pesticides but very limited and negligible.
	30	Bottom Sediment			B-	Some sedimentation of canals during operation.
	31	Accidents		B-		Some accidents inevitable during construction.

Source: The Survey Team

Appendix F: Evaluation of Environmental & Social Considerations

F.4 JBIC's Environmental Checklists No. 12 Dams & Reservoirs, No. 13 Other Electric Generation, No. 14 Power Transmission and Distribution Lines, and No. 22 Irrigation Projects

F4.1 No. 12 Dams & Reservoirs

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
1 Permits & Explanation	(1) EIA and Environmental Permits	(1) Have EIA reports been officially completed? (2) Have EIA reports been approved by authorities of the host country's government? (3) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (4) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(1) EIA report completed 1998. (2) EIA approved by Ministry of Agriculture & Agrarian Services (Project Approving Agency: PAA) with the concurrence of the Central Environmental Authority (CEA). (3) Environmental Clearance was granted on 26th October 2001, extended on 16th March 2006, and extended again on 26th October 2007 (until 25th October 2010). At each of these three stages, a number of conditions were stipulated. As far as can be ascertained, the conditions have been met, with the exception of those which cannot be applied until later in the development of the project, and those that have become redundant due to a change in the proposed project. (4) As far as can be ascertained, other required permits have been obtained from relevant authorities, with the exception of those which cannot be obtained until later in the development of the project, and those that are no longer required due to a change in the proposed project.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
	(2) Explanation to the Public	(1) Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? (2) Are proper responses made to comments from the public and regulatory authorities?	(1) Public consultations have been conducted in various ways. For EIA, the public consultation meetings with local residents affected by the project were initially organised since it was not required by the EIA regulations of Sri Lanka. However, as part of pubic consultation, (a) the EIA was also disclosed to the public from 5 July 2000 to 11 September 2000 (for 30 working days) in accordance with the EIA regulations of Sri Lanka, (b) the workshop was organised amongst 125 participants from the local government officers, wildlife officers, forest officers and MASL officers on 6 Dec. 2007 to discuss and make suggestions for the EIA, and (c) the interviews with 9 wildlife management experts such as government officers, NGOs and academicians were conducted in May 2010 in the JICA Survey. For RIP or resettlement, since 2006 (e.g. 1 initial awareness meeting in 2006; 8 awareness programmes in 2007; 21 Participatory Rapid Appraisal (PRA) programmes, awareness programmes and the other meetings in 2008; 1 meeting with relevant officers in 2009; and 1 interview survey within the JICA Survey in 2010). More public consultation activities (awareness programmes) are planned by MASL after June 2010 continuously. (2) The comments on the EIA from the public were forwarded by Min. of Agriculture and Lands to MASL on 28 Sept. 2000 and responses were provided by MASL to Min. of Agriculture and Lands on 20 June 2001.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
2 Mitigation Measures	(1) Water Quality	(1) Does water quality of dam pond/reservoir comply with the country's ambient water quality standards? Is there a possibility that proliferation of phytoplankton and zooplankton will occur? (2) Does the quality of water discharged from the dam pond/reservoir comply with the country's ambient water quality standards? (3) Are adequate measures, such as clearance of woody vegetation from the inundation zone prior to flooding planned to prevent water quality degradation in the dam pond/reservoir? (4) Is there a possibility that reduced the river flow downstream will cause water quality degradation resulting in areas that do not comply with the country's ambient water quality standards? (5) Is the discharge of water from the lower portion of the dam pond/reservoir (the water temperature of the lower portion is generally lower than the water temperature of the upper portion) planned by considering the impacts to downstream areas?	(1) The issue of water quality in the reservoir appears to have been overlooked in the EIA. There is an apparent lack of water quality data for the existing Amban Ganga, and there are no stated plans for monitoring the quality of water stored in the reservoir (although it is known that monthly monitoring is conducted for all MASL reservoirs). It is certain that there will be a proliferation of phytoplankton and zooplankton, particularly in the initial stages of operation. (This is a natural occurrence in any new reservoir as large quantities of nutrient are released from the decomposing vegetation and the soil of the reservoir bed.) Water quality monitoring will be needed to check whether eutrophication continues beyond the initial stages, and if so, to trace the sources of nutrient input. Suspended solids concentration should also be monitored to identify any soil erosion problem areas that may cause sedimentation in the reservoir. (2) Similarly, the quality of the downstream discharge from the reservoir will need to be monitored. (3) Forest will be cleared from the inundation zone, which will help to minimise eutrophication, but there will still be an inevitable degradation of water quality in the reservoir during the first one or two years. (4) The flow from the dam will continue to be intercepted by the Elahera Anicut, some 2km downstream of the dam. However, the flow to be released downstream from the Anicut will be exactly the same as at present, i.e. the minimum downstream flow in the Amban Ganga after completion of the project will be approx. 1.4m^3/s and be equivalent to 100% of the present flow rate. Therefore, it is expected the water quality is not degraded due to the reduced water flow and overall meet the water quality standard for irrigation or ambient water quality of Sri Lanka except the initial stage of operation. (5) The water stored in the reservoir will almost certainly stratify, with the lower, cooler, layers becoming anoxic (deoxygenated). However, the power station intake is about 30 m above reservoir bed level, i.e. at about half depth when the reservoir is full. It is likely that this will usually be above the interface between the lower deoxygenated *hypolimnion* layer and the upper oxygenated *epilimnium.* Poor downstream water quality is therefore unlikely most of the time. However, it should be monitored at regular intervals, at least monthly.
	(2) Wastes	(1) Are earth and sand generated by excavation properly treated and disposed of in accordance with the country's standards?	(1) Spoil will be produced by excavation of the dam foundations and the diversion channel. Some of this material could be used in construction, but most of it will have to be disposed of. Disposal sites have not yet been finally identified. Given the protected areas in the immediate vicinity of the construction site, spoil disposal sites must be selected with great care, must be engineered to remain stable and must be landscaped. Given the large dead storage of the reservoir, the disposal of waste rock within the reservoir basin could be considered. Waste soil, clay, etc., cannot be disposed of within the reservoir.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
3 Natural Environment	(1) Protected Areas	(1) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(1) The project will encroach into a small part of the Minneriya-Giritale Nature Reserve. Moreover, the reservoir will inundate parts of the areas which are presently used by elephants to move between the M-N N. R. and the Knuckles Conservation Area to the south, and between the M-N N.R. and Wasgamuwa National Park to the east. However, arrangements are being made to create elephant corridors to enhance elephant movement and to minimise elephant – human conflict (EHC). See Ecosystem below.
3 Natural Environment	(2) Ecosystem	(1) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (2) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (3) Is there a possibility that the project will adversely affect downstream aquatic organisms, animals, plants, and ecosystems? Are adequate protection measures taken to reduce the impacts on the ecosystem? (4) Is there a possibility that installation of structures, such as dams will block the movement of the migratory fish species (such as salmon, trout and eel that move between rivers and sea for spawning)? Are adequate measures taken to reduce the impacts on these species?	(1) The area in and around the reservoir is Tropical Moist Evergreen Forest, within which there is Riverine Forest along parts of the river and its affluent streams. Downstream there are seasonally flooded wetland areas. All of these ecosystems are recognised for their high biodiversity. (2) These areas include the habitats of endemic and threatened species of plants and animals, the 'flagship' species being *Elephas maximus maximus*, the Sri Lankan Elephant. Elephant movements will be sustained by creating two new protected elephant corridors: ✓ an elephant corridor (officially a Jungle Corridor) between Wasgamuwa National Park and Minneriya-Giritale National Park. (This will be an expansion of the existing Elahera / Minneriya-Giritale Nature Reserve); ✓ a protected area (a Nature Reserve then National Park) around the Moragahakanda Reservoir to allow the movement of elephants around the southern and western margins of the new reservoir. (3) Parts of these corridors will be bounded by electric fences to guide / contain the elephants and prevent Human – Elephant Conflict (HEC). (A total of 650 km of electric fencing is being budgeted for in the Moragahakanda and Kalu Ganga projects.) Note, however, that elephant movement between the two National Parks will be 'squeezed' into a river crossing area of only 2 km between Moragahakanda Dam and Elahera Anicut, which will be further constrained by the new road bridge across the Amban Ganga below the Moragahakanda Dam and the associated new road to be constructed to Wellewela. (4) For other endemic species of plants and animals, a translocation programme (during construction) and rescue programme (during inundation) have been developed by IUCN and have been incorporated into the Watershed Management Plan. (5) If the planned minimum 'environmental flow' and flood replication flows are provided, there should be no adverse effect on downstream aquatic ecosystems; in fact they could be improved. (6) Construction of the dam will prevent the upstream migration of fish. However, such migration is already prevented by the Elahera Anicut just below the Moragahakanda Dam and the Bowatenna Dam just above the Moragahakanda Reservoir. In the circumstances, mitigation measures would be not applicable.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
	(3) Topography and Geology	(1) Is there a possibility that reductions in sediment loads downstream due to settling of suspended particles in the reservoir will cause impacts, such as scouring of the downstream riverbeds and soil erosion? Is there a possibility that sedimentation of the reservoir will cause loss of storage capacity, water logging upstream, and formation of sediment deposits at the reservoir entrance? Are the possibilities of the impacts studied, and adequate prevention measures taken?	(1) Sediment inflow to the reservoir has been predicted (1998 EIA) to be relatively modest at 15 MCM in 100 years, which is equivalent to approximately one third of the dead water storage of 48 MCM. (Much of the sediment derived from the main Amban Ganga will be intercepted by the Bowatenna Reservoir upstream.) Most of the flow of the Amban Ganga is already diverted for irrigation by the Elahera Anicut, which situation will prevail after construction of the dam. The sediment load in the downstream river will therefore not change significantly after the commissioning of Moragahakanda Dam.
4 Social Environment	(1) Resettlement	(1) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (2) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? (3) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (4) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (5) Are agreements with the affected persons obtained prior to resettlement? (6) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (7) Is a plan developed to monitor the impacts of resettlement?	(1) Involuntary resettlement will be inevitable. The current estimate of people to be resettled is 1,506 families from the reservoir basin and its 100m buffer zone, 9 families in the deviated road, and a further 57 families from the proposed elephant corridor between Wasgamuwa National Park and Minneriya-Giritale Nature Reserve. Resettlement will be to MASL irrigation systems D1 (Medirirgiriya) and F (Kalu Ganga) Left Bank. In the F/S of Lahmeyer in 2000/2001, the alternative consideration of the dam heights was conducted, and the number of potential displaced persons was reduced from 2,325 households to 1,572 households by lowering the dam height. (2) Since 2006 (e.g. 1 initial awareness meeting in 2006; 8 awareness programmes in 2007; 21 Participatory Rapid Appraisal (PRA) programmes, awareness programmes and the other meetings in 2008; 1 meeting with relevant officers in 2009; and 1 interview survey in 2010 within the JICA Survey). More public consultation activities (awareness programmes) are planned by MASL after June 2010 continuously. (3) Overall the draft RIP is considered to be well prepared and contains the proper compensation and livelihood restoration programmes based on the socio-economic studies. However, the practical resettlement schedule needs to be prepared, and the compensation policy for land needs to equivalent to the full replacement cost. (4) The impact on the vulnerables (e.g. woman-headed households, the poor, the disabled, and the elderly) is mentioned in the draft RIP report, and a special allowance for the vulnerable groups is included in the entitlement matrix of the draft RIP. (5) 99% of the consent letters signed by displaced persons were obtained by MASL. (6) The Division of Landuse Planning of MASL is in charge of resettlement. Approx. 10 local staff are already hired and working at the project office. The more necessary local staff will be hired and the budget will be prepared in accordance with the RIP report later on. (7) The resettlement monitoring plan (internal and external) was prepared in Section 8.3 of the draft RIP report.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(2) Living and Livelihood	(1) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (2) Is there a possibility that the project will adversely affect the downstream land uses? In particular, is there a possibility that reductions in the supply of fertile soils to downstream areas will adversely affect agricultural production? (3) Is sufficient infrastructure (e.g., hospitals, schools, roads) available for project implementation? If existing infrastructure is insufficient, is a plan developed to construct new infrastructure or improve existing infrastructure? (4) Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (5) Is there a possibility that the existence of the dam will cause impacts on water navigation, such as limitations of vessel traffic and water area uses by local inhabitants? (6) Is the minimum flow required for maintaining downstream water uses secured? (7) Is there a possibility that reductions in water flow downstream or seawater intrusion will cause impacts on downstream water uses and land uses? (8) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, and filariasis) will be introduced?	(1) The project will affect the living conditions of inhabitants. Overall, the project will benefit the farmers in the irrigation areas; however, 1,572 households in the dam and reservoir will be negatively affected and displaced due to the project, which negative impact will be mitigated by compensation proposed in the draft RIP. (2) The project is designed to increase agricultural production in the downstream irrigated land. (3) New infrastructures listed below will be available according the draft RIP. In System F, drinking water from common wells, roads, canals, 2 village centres (unite centre, one sub-post office, a junior secondary school, a grmodaya health centre, cooperative retail shop) and 1 town centre (block manager's office, unit service centre, senior secondary school, sub-post office, central dispensary with maternity ward, and cooperative retails shop with a rural bank) will be available. In System D1, piped drinking water, 1 agrarian service centre, 2 village centres will be available. In Ambana, a regional hospital & quarters, agrarian service centre, and pre-school will be available. (4) The project would increase the chance for the local residents to be infected by the communicable diseases such as HIV infection due to the immigration of the construction workers. The educational programme for workers and local residents as well as free provision of contraceptives are proposed in the updated EMP. (5) There is no navigation on the Amban Ganga, which is already blocked by the Elahera Anicut just below the Moragahakanda Dam and the Bowatenna Dam just above the Moragahakanda Reservoir. (6) The minimum downstream flow of approx. 1.4 m^3/s is proposed in the JICA Survey and the updated EMP and EMoP. (7) No adverse effects on downstream water users are expected. If the water flow will be monitored, if any additionally requirement, it will be discussed and adjusted by relevant officers in accordance with the current practice. (8) The new reservoir can be expected to create new habitat for the breeding of mosquitoes. Mitigation measures such as the drainage of peripheral pools, changing the reservoir water level from time to time, maintenance of the minimum dry season flow in the downstream river, occasional flushing of the downstream river (if necessary), educational programmes on the water-borne diseases (e.g. malaria and dengue fever) for nearby residents, and provision of mosquito net.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
	(3) Heritage	(1) Is there a possibility that the project will damage the local archaeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(1) The project will affect 13 structures of 5 Buddhist temples which will be compensated by MASL. If any remain is found, MASL needs to consult with archaeological officer dispatched from the Dept. of Archaeology. Additionally, as instructed in the Archaeological Impact Assessment, archaeological remains will be stored and displayed in a exhibition centre.
	(4) Landscape	(1) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(1) The project will change the landscape of the Amban Ganga from a narrow river valley to a broad expanse of water. Whether this is an adverse effect is a matter of taste, but the resulting landscape of a lake surrounded by forested hills would be considered attractive by many people. Any areas of bare ground will be vegetated as part of the Watershed Management Plan. Borrow pits will be landscaped and planted with indigenous tree species. No special additional measures are envisaged.
	(5) Ethnic Minorities and Indigenous Peoples	(1) Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples? (2) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	(1) There is no law for rights of ethic minorities and indigenous people in Sri Lanka. Only 1 Muslim family is identified as resetters in the draft RIP report. (2) No mitigations are proposed since any ethnic minorities or indigenous people will be affected according to the draft RIP report.
5 Others	(1) Impacts during Construction	(1) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (2) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (3) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (4) In the case of the projects including borrow sites, if construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (5) If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	(1) Some measures are briefly mentioned in the 1998 EIA and others are mentioned in more detail in the conditions attached to the two letters from the Ministry of Agriculture to MASL extending the Environmental Clearance for the project. However, an Environmental Management Plan (EMP) has been prepared, setting out all of the environmental protection measures to be applied during construction. In addition, it will be necessary for all contractors to prepare their own 'daughter' EMPs setting out exactly how they will manage environmental issues within the implementation of their work. (Note that a separate detailed EMP will be required for operation of Moragahakanda Dam, Power Station and Reservoir.) (2) Construction activities will adversely affect the natural environment (air, noise and vibration, water quality, soil quality). See above Section 2, 3 and 4 re. measures to reduce adverse impacts. (3) Construction activities will affect the social environment such as access to the existing social infrastructures, social institutions to some extent, infectious diseases (e.g. HIV) and cultural heritages if found. The necessary mitigation measures are proposed in the updated EMP. (4) Yes, borrow pits will be rehabilitated and vegetated following the example of the replanted borrow area for saddle dam No. 2 and as planned in the EMP. (5) H & S training requirements included in the EMP.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
	(2) Accident Prevention Measures	(1) Are adequate contingency plans and mitigation measures developed to cover both the soft and hard aspects of the project, such as accident prevention programs, installation of prevention facilities and equipment, and safety education for workers? Are adequate measures for emergency response to accidental events considered? (2) Is a warning system established to alert the inhabitants to water discharge from the dam?	(1) Requirements for H & S measures included in the EMP. An Accident & Emergency Response Plan should be included in the contractors' EMPs. (2) No warning system was originally proposed. This has been added to the EMP for operation of Moragahakanda Dam, Power Station and Reservoir.
	(3) Monitoring	(1) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (2) Are the items, methods and frequencies included in the monitoring program judged to be appropriate? (3) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (4) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(1) The original Monitoring Plan initially prepared by MASL focused on negative impact the natural environment prepared; however, this was not adequate, particularly in relation to water quality monitoring in the river and subsequently in the reservoir. An Environmental Monitoring Plan (EMoP) was therefore be updated in the JICA Survey. (2) The updated EMoP specifies the methods, frequencies and locations for each monitoring item, which is considered adequate. (3) Similarly, the EMoP specifies the responsibilities and costs for each monitoring item. (4) Currently MASL has the external environmental monitoring committee consisting of the PAA, CEA and relevant governmental organisations in accordance with the EIA approval extension letter (2007.12.20) and is required to submit a monthly progress report (indicating achievements of the project activities for the approval conditions) to the PAA for monitoring purposes.
6 Note	Reference to Checklist of Other Sectors	(1) Where necessary, pertinent items described in the Forestry Projects checklist should also be checked (e.g., projects in the mountains including large areas of deforestation). (2) In the case of dams and reservoirs, such as irrigation, water supply, and industrial water purposes, where necessary, pertinent items described in the Irrigation Projects, and Water Supply checklists should also be checked. (3) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(1) Forest within the reservoir basin will be cut and removed before inundation. (2) Irrigation checklist has also been completed. (3) Power transmission checklist has also been completed.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
6 Note	Note on Using Environmental Checklist	(1) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(1) The project does not involve any transboundary issues. It may contribute to the reduction of CO_2 emissions by substitution for hydrocarbon fuels. There may be some methane emissions from the water body in the initial stages due to the decomposition of vegetation within the deoxygenated zone at the reservoir bed.

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are made, if necessary. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan' experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

F4.2 No. 13 Electric Generation

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
1 Permits and Explanation	(1) EIA and Environmental Permits	(1) Have EIA reports been officially completed? (2) Have EIA reports been approved by authorities of the host country's government? (3) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (4) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(1) EIA report completed 1998. (2) EIA approved by Ministry of Agriculture & Agrarian Services (PAA) with the concurrence of the CEA. (3) Environmental Clearance was granted on 26th October 2001, extended on 16th March 2006, and extended again on 26th October 2007 (until 25th October 2010). At each of these three stages, a number of conditions were stipulated. As far as can be ascertained, the conditions have been met, with the exception of those which cannot be applied until later in the development of the project, and those that have become redundant due to a change in the proposed project. (4) As far as can be ascertained, other required permits have been obtained from relevant authorities, with the exception of those which cannot be obtained until later in the development of the project, and those that are no longer required due to a change in the proposed project.
	(2) Explanation to the Public	(1) Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? (2) Are proper responses made to comments from the public and regulatory authorities?	(1) Public consultations have been conducted in various ways. For EIA, the public consultation meetings with local residents affected by the project were initially organised since it was not required by the EIA regulations of Sri Lanka. However, as part of pubic consultation, (a) the EIA was also disclosed to the public from 5 July 2000 to 11 September 2000 (for 30 working days) in accordance with the EIA regulations of Sri Lanka, (b) the workshop was organised amongst 125 participants from the local government officers, wildlife officers, forest officers and MASL officers on 6 Dec. 2007 to discuss and make suggestions for the EIA, and (c) the interviews with 9 wildlife management experts such as government officers, NGOs and academicians were conducted in May 2010 in the JICA Survey. For RIP or resettlement, since 2006 (e.g. 1 initial awareness meeting in 2006; 8 awareness programmes in 2007; 21 Participatory Rapid Appraisal (PRA) programmes, awareness programmes and the other meetings in 2008; 1 meeting with relevant officers in 2009; and 1 interview survey within the JICA Survey in 2010). More public consultation activities (awareness programmes) are planned by MASL after June 2010 continuously. (2) The comments on the EIA from the public were forwarded by Min. of Agriculture and Lands to MASL on 28 Sept. 2000 and responses were provided by MASL to Min. of Agriculture and Lands on 20 June 2001.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
2 Mitigation Measures	(1) Air Quality	(1) In the case that electric power is generated by combustion, such as biomass energy projects, do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted by power plant operations comply with the country's emission standards and ambient air quality standards? (2) Do air pollutants, such as hydrogen sulfide emitted from geothermal power plants comply with the country's standards? Is there a possibility that emitted hydrogen sulfide will cause impacts on the surrounding areas, including vegetation? (3) Do air pollutants emitted from other facilities comply with the country's emission standards?	(3) Not applicable (4) Not applicable (5) Not applicable
	(2) Water Quality	(1) Do effluents (including thermal effluent) from various facilities, such as power generation facilities comply with the country's effluent standards? Is there a possibility that the effluents from the project will cause areas that do not comply with the country's ambient water quality standards? (2) In the case of geothermal power plants, is there a possibility that geothermal utilization will cause water pollution by pollutants, such as As and Hg contained in geothermal fluids? If water pollution is anticipated, are adequate measures considered? (3) Do leachates from the waste disposal sites comply with the country's effluent standards and ambient water quality standards? Are adequate measures taken to prevent contamination of soil, groundwater, and seawater by leachates?	(1) Not applicable (2) Not applicable (3) Not applicable
	(3) Wastes	(1) Are wastes generated by the plant operations properly treated and disposed of in accordance with the country's standards (especially biomass energy projects)?	(1) Not applicable
	(4) Soil Contamination	(1) Has the soil in the project site been contaminated in the past, and are adequate measures taken to prevent soil contamination?	(1) There may be small areas of contamination e.g. from past careless fuelling or artisanal mining. Construction activities could cause soil contamination, but this should be controlled by the provisions of the EMP, e.g. bunding of all fuel and lubricant stores.
2 Mitigation	(5) Noise and Vibration	(1) Do noise and vibrations comply with the country's standards?	(1) Not applicable

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
Measures	(6) Subsidence	(1) In the case of extraction of a large volume of groundwater or extraction of steam by geothermal power generation, is there a possibility that the extraction of groundwater or steam will cause subsidence?	(1) Not applicable
	(7) Odor	(1) Are there any odor sources? Are adequate odor control measures taken?	(1) No, not under normal operating conditions. However, water discharged from the reservoir during the initial stages of operation could have a smell of H_2S due to the decomposition of vegetation on the reservoir bed. This is a natural occurrence which cannot be controlled.
3 Natural Environment	(1) Protected Areas	(1) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(1) The project will encroach into a small part of the Minneriya-Giritale Nature Reserve (M-N N.R). Moreover, the reservoir will inundate parts of the areas which are presently used by elephants to move between the M-N N. R. and the Knuckles Conservation Area to the south, and between the M-N N.R. and Wasgamuwa National Park to the east. However, arrangements are being made to create elephant corridors to enhance elephant movement and to minimise elephant – human conflict (EHC). See Ecosystem below.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
	(2) Ecosystem	(1) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (2) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (3) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (4) Is there a possibility that localized micro-meteorological changes due to wind power generation will affect valuable vegetation in the surrounding areas? (Is there valuable vegetation in the vicinity of the wind power generation facilities?) If impacts on vegetation are anticipated, are adequate measures considered? (5) Are the wind power generation facilities (wind turbines) sited by considering the habitats and migration routes of sensitive or potentially affected bird species?	(1) The area in and around the reservoir is Tropical Moist Evergreen Forest, within which there is Riverine Forest along parts of the river and its affluent streams. Downstream there are seasonally flooded wetland areas. All of these ecosystems are recognised for their high biodiversity. (2) These areas include the habitats of endemic and threatened species of plants and animals, the 'flagship' species being *Elephas maximus maximus*, the Sri Lankan Elephant. (3) Elephant movements will be sustained by creating three new protected elephant corridors: ✓ an elephant corridor (officially a Jungle Corridor) between Wasgamuwa National Park and Minneriya-Giritale Nature Reserve. (This will involve regazetting part of the existing Elahera Sanctuary); ✓ a protected area (a Nature Reserve then National Park) around the Moragahakanda Reservoir to allow the movement of elephants around the southern and western margins of the new reservoir. ✓ Parts of these corridors will be bounded by electric fences to guide / contain the elephants and prevent Human – Elephant Conflict (HEC). (A total of 650 km of electric fencing is being budgeted for in the Moragahakanda and Kalu Ganga projects.) Note, however, that elephant movement between the two protected areas will be 'squeezed' into a river crossing area of only 2 km between Moragahakanda Dam and Elahera Anicut, which will be further constrained by the new road bridge across the Amban Ganga below the Moragahakanda Dam and the associated new road to be constructed to Wellewela. For other endemic species of plants and animals, a translocation programme (during construction) and rescue programme (during inundation) have been developed by IUCN and have been incorporated into the Watershed Management Plan. (4) Not applicable (not wind power) (5) Not applicable (not wind power)
	(3) Hydrology	(1) Is there a possibility that hydrologic changes due to installation of structures, such as weirs will adversely affect the surface and groundwater flows (especially in "run of the river generation" projects)?	(1) The reservoir is bound to raise groundwater levels in the surrounding area. However, the fact that a 100m buffer zone around the reservoir will be evacuated means that the raised groundwater level will not adversely affect any structures or properties.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
	(4) Topography and Geology	(1) Is there a possibility that the project will cause a large-scale alteration of the topographic features and geologic structures in the surrounding areas (especially in run of the river generation projects and geothermal power generation projects)?	(1) The main dam and two saddle dams can be considered large-scale alteration of the topographic features and geologic structures.
4 Social Environment	(1) Resettlement	(1) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (2) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? (3) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (4) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (5) Are agreements with the affected persons obtained prior to resettlement? (6) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (7) Is a plan developed to monitor the impacts of resettlement?	(1) Involuntary resettlement will be inevitable. The current estimate of people to be resettled is 1,506 families from the reservoir basin and its 100m buffer zone, 9 families in the deviated road, and a further 57 families from the proposed elephant corridor between Wasgamuwa National Park and Minneriya-Giritale Nature Reserve. Resettlement will be to MASL irrigation systems D1 (Medirirgiriya) and F (Kalu Ganga) Left Bank. In the F/S of Lahmeyer in 2000/2001, the alternative consideration of the dam heights was conducted, and the number of potential displaced persons was reduced from 2,325 households to 1,572 households by lowering the dam height. (2) Since 2006 (e.g. 1 initial awareness meeting in 2006; 8 awareness programmes in 2007; 21 Participatory Rapid Appraisal (PRA) programmes, awareness programmes and the other meetings in 2008; 1 meeting with relevant officers in 2009; and 1 interview survey in 2010 within the JICA Survey). More public consultation activities (awareness programmes) are planned by MASL after June 2010 continuously. (3) Overall the draft RIP is considered to be well prepared and contains the proper compensation and livelihood restoration programmes based on the socio-economic studies. However, the practical resettlement schedule needs to be prepared, and the compensation policy for land needs to equivalent to the full replacement cost. (4) The impact on the vulnerables (e.g. woman-headed households, the poor, the disabled, and the elderly) is mentioned in the draft RIP report, and a special allowance for the vulnerable groups is included in the entitlement matrix of the draft RIP. (5) 99% of the consent letters signed by displaced persons were obtained by MASL. (6) The Division of Landuse Planning of MASL is in charge of resettlement. Approx. 10 local staff are already hired and working at the project office. The more necessary local staff will be hired and the budget will be prepared in accordance with the RIP report later on. (7) The resettlement monitoring plan (internal and external) was prepared in Section 8.3 of the draft RIP report.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
	(2) Living and Livelihood	(1) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (2) Is there a possibility that the amount of water (e.g., surface water, groundwater) used and discharge of effluents by the project will adversely affect the existing water uses and water area uses?	(1) The project will affect the living conditions of inhabitants. Overall, the project will benefit the farmers in the irrigation areas; however, 1,572 households in the dam and reservoir will be negatively affected and displaced due to the project, which negative impact will be mitigated by compensation proposed in the draft RIP. (2) No. The minimum downstream flow of approx. 1.4 m^3/s is proposed in the JICA Survey and the updated EMP and EMoP. MASL will arrange the maintenance flow upon the demand, and the maintenance flow will be decided based on the discussions with relevant officers (e.g. Water Resource Management Secretariat within MASL) in accordance with the practices of Sri Lanka.
	(3) Heritage	(1) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(1) 13 structures of 5 Buddhist temples will be affected in the dam and reservoir site, which will be compensated by MASL according to the draft RIP report. If any remain is found, MASL needs to consult with archaeological officer dispatched from the Dept. of Archaeology. Additionally, as instructed in the Archaeological Impact Assessment, archaeological remains will be stored and displayed in an exhibition centre.
	(4) Landscape	(1) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(1) The project will change the landscape of the Amban Ganga from a narrow river valley to a broad expanse of water. Whether this is an adverse effect is a matter of taste, but the resulting landscape of a lake surrounded by forested hills would be considered attractive by many people. Any areas of bare ground will be vegetated as part of the Watershed Management Plan. Borrow pits will be landscaped and planted with indigenous tree species. No special additional measures are envisaged.
	(5) Ethnic Minorities and Indigenous Peoples	(1) Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples? (2) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	(1) There is no law for rights of ethic minorities and indigenous people in Sri Lanka. Only 1 Muslim family is identified as resetters in the draft RIP report. (2) No mitigations are proposed since any ethnic minorities or indigenous people will be affected according to the draft RIP report.
5 Others	(1) Impacts during Construction	(1) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (2) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (3) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (4) If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	(1) Some measures are briefly mentioned in the 1998 EIA and others are mentioned in more detail in the conditions attached to the two letters from the Ministry of Agriculture to MASL extending the Environmental Clearance for the project. However, an Environmental Management Plan (EMP) has been prepared, setting out all of the environmental protection measures to be applied during construction. In addition, it will be necessary for all contractors to prepare their own 'daughter' EMPs setting out exactly how they will manage environmental issues within the implementation of their work. (Note that a separate detailed EMP will be required for operation of Moragahakanda Dam, Power Station, Reservoir and the transmission

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
			line.) (2) Construction activities will adversely affect the natural environment (air, noise and vibration, water quality, soil quality). See above Section 2, 3 and 4 re. measures to reduce adverse impacts. (3) Construction activities will affect the social environment such as access to the existing social infrastructures, social institutions to some extent, infectious diseases (e.g. HIV) and cultural heritages if found. The necessary mitigation measures are proposed in the updated EMP. (4) H & S training requirements included in the EMP.
5 Others	(2) Monitoring	(1) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (2) Are the items, methods and frequencies included in the monitoring program judged to be appropriate? (3) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (4) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(1) The original Monitoring Plan initially prepared by MASL focused on negative impact the natural environment prepared; however, this was not adequate, particularly in relation to water quality monitoring in the river and subsequently in the reservoir. An Environmental Monitoring Plan (EMoP) was therefore be updated in the JICA Survey. (2) The updated EMoP specifies the methods, frequencies and locations for each monitoring item, which is considered adequate. (3) Similarly, the EMoP specifies the responsibilities and costs for each monitoring item. (4) Currently MASL has the external environmental monitoring committee consisting of the PAA, CEA and relevant governmental organisations in accordance with the EIA approval extension letter (2007.12.20) and is required to submit a monthly progress report (indicating achievements of the project activities for the approval conditions) to the PAA for monitoring purposes.
6 Note	Reference to Checklist of Other Sectors	(1) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of electric transmission lines and/or electric distribution facilities).	(1) Power transmission checklist has also been completed.
	Note on Using Environmental Checklist	(1) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(1) The project does not involve any transboundary issues. It may contribute to the reduction of CO_2 emissions by substitution for hydrocarbon fuels. There may be some methane emissions from the water body in the initial stages due to the decomposition of vegetation within the deoxygenated zone at the reservoir bed.

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are made, if necessary. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan' experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

F4.3 No. 14 Power Transmission & Distribution Lines

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
1 Permits and Explanation	(1) EIA and Environmental Permits	(1) Have EIA reports been officially completed? (2) Have EIA reports been approved by authorities of the host country's government? (3) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (4) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(1) EIA report completed 1998. (2) EIA approved by Ministry of Agriculture & Agrarian Services (PAA) with the concurrence of the CEA. (3) Environmental Clearance was granted on 26th October 2001, extended on 16th March 2006, and extended again on 26th October 2007 (until 25th October 2010). At each of these three stages, a number of conditions were stipulated. As far as can be ascertained, the conditions have been met, with the exception of those which cannot be applied until later in the development of the project, and those that have become redundant due to a change in the proposed project. As far as can be ascertained, other required permits have been obtained from relevant authorities, with the exception of those which cannot be obtained until later in the development of the project, and those that are no longer required due to a change in the proposed project.
	(2) Explanation to the Public	(1) Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? (2) Are proper responses made to comments from the public and regulatory authorities?	(1) Public consultations have been conducted in various ways. For EIA, the public consultation meetings with local residents affected by the project were initially organised since it was not required by the EIA regulations of Sri Lanka. However, as part of pubic consultation, (a) the EIA was also disclosed to the public from 5 July 2000 to 11 September 2000 (for 30 working days) in accordance with the EIA regulations of Sri Lanka, (b) the workshop was organised amongst 125 participants from the local government officers, wildlife officers, forest officers and MASL officers on 6 Dec. 2007 to discuss and make suggestions for the EIA, and (c) the interviews with 9 wildlife management experts such as government officers, NGOs and academicians were conducted in May 2010 in the JICA Survey. For RIP or resettlement, since 2006 (e.g. 1 initial awareness meeting in 2006; 8 awareness programmes in 2007; 21 Participatory Rapid Appraisal (PRA) programmes, awareness programmes and the other meetings in 2008; 1 meeting with relevant officers in 2009; and 1 interview survey within the JICA Survey in 2010). More public consultation activities (awareness programmes) are planned by MASL after June 2010 continuously. (2) The comments on the EIA from the public were forwarded by Min. of Agriculture and Lands to MASL on 28 Sept. 2000 and responses were provided by MASL to Min. of Agriculture and Lands on 20 June 2001.
2 Mitigation Measures	(1) Water Quality	(1) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? If water quality degradation is anticipated, are adequate measures considered?	(3) There is the possibility of minor soil run-off due to earthmoving. Methods of control are included in the updated EMP (see below)

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
3 Natural Environment	(1) Protected Areas	(1) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(1) The transmission line from the power station to Naula will encroach into a small part of the Minneriya-Giritale Nature Reserve. Moreover, the reservoir will inundate parts of the areas which are presently used by elephants to move between the M-N N. R. and the Knuckles Conservation Area to the south, and between the M-N N.R. and Wasgamuwa National Park to the east. However, arrangements are being made to create elephant corridors to enhance elephant movement and to minimise elephant – human conflict (EHC). See Ecosystem below.
	(2) Ecosystem	(1) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (2) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (3) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (4) Are adequate measures taken to prevent disruption of migration routes and habitat fragmentation of wildlife, and livestock? Is there a possibility that improved access by the project will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystem due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered? (5) In cases where the project site is located in undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	(1) The area around the reservoir through which the transmission line will pass is Tropical Moist Evergreen Forest which is recognised for its high biodiversity. (2) These forest areas include the habitats of endemic and threatened species of plants and animals, the 'flagship' species being *Elephas maximus maximus*, the Sri Lankan Elephant. (3) Yes, see below (4) Elephant movements will be sustained by creating two new protected elephant corridors: ✓ an elephant corridor (officially a Jungle Corridor) between Wasgamuwa National Park and Minneriya-Giritale Nature Reserve. (This will be a regazetting of part of the existing Elahera Sanctuary); ✓ a protected area (a Nature Reserve then National Park) around the Moragahakanda Reservoir to allow the movement of elephants around the southern and western margins of the new reservoir. (5) Parts of these corridors will be bounded by electric fences to guide / contain the elephants and prevent Human – Elephant Conflict (HEC). (A total of 650 km of electric fencing is being budgeted for in the Moragahakanda and Kalu Ganga projects.) Note, however, that elephant movement between the two National Parks will be 'squeezed' into a river crossing area of only 2 km between Moragahakanda Dam and Elahera Anicut, which will be further constrained by the new road bridge across the Amban Ganga below the Moragahakanda Dam and the associated new road to be constructed to Wellewela. (6) For other endemic species of plants and animals, a translocation programme (during construction) and rescue programme (during inundation) have been developed by IUCN and have been incorporated into the Watershed Management Plan. (7) The transmission line will follow the road between Naula and the dam site. Approximately half of this road is a new road constructed at higher level around the reservoir perimeter. The new road could create greater access for timber poaching, but this is not related to the transmission line itself. (8) Efforts have been made to surround the project site with new protected / conservation areas. If these are well policed there will not be additional loss of natural environments. Protected areas seem to be well respected in Sri Lanka.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
3 Natural Environment	(3) Topography and Geology	(1) Is there a soft ground on the route of power transmission lines that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed? (2) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides? (3) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(1) The soft ground on the route which would cause slope failures or landslides is not identified, and the mitigatory measures will be prepared if it is identified in the next study stage. (2) Landscaping is proposed within the EMP. (3) Rehabilitation of the soil disposal sites and borrow sites were proposed in the EIA-relevant reports.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
4 Social Environment	(1) Resettlement	(1) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (2) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? (3) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (4) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (5) Are agreements with the affected persons obtained prior to resettlement? (6) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (7) Is a plan developed to monitor the impacts of resettlement?	(1) Involuntary resettlement will be inevitable. The current estimate of people to be resettled is 1,506 families from the reservoir basin and its 100m buffer zone, 9 families in the deviated road, and a further 57 families from the proposed elephant corridor between Wasgamuwa National Park and Minneriya-Giritale Nature Reserve. Resettlement will be to MASL irrigation systems D1 (Medirirgiriya) and F (Kalu Ganga) Left Bank. In the F/S of Lahmeyer in 2000/2001, the alternative consideration of the dam heights was conducted, and the number of potential displaced persons was reduced from 2,325 households to 1,572 households by lowering the dam height. (2) Since 2006 (e.g. 1 initial awareness meeting in 2006; 8 awareness programmes in 2007; 21 Participatory Rapid Appraisal (PRA) programmes, awareness programmes and the other meetings in 2008; 1 meeting with relevant officers in 2009; and 1 interview survey in 2010 within the JICA Survey). More public consultation activities (awareness programmes) are planned by MASL after June 2010 continuously. (3) Overall the draft RIP is considered to be well prepared and contains the proper compensation and livelihood restoration programmes based on the socio-economic studies. However, the practical resettlement schedule needs to be prepared, and the compensation policy for land needs to equivalent to the full replacement cost. (4) The impact on the vulnerables (e.g. woman-headed households, the poor, the disabled, and the elderly) is mentioned in the draft RIP report, and a special allowance for the vulnerable groups is included in the entitlement matrix of the draft RIP. (5) 99% of the consent letters signed by displaced persons were obtained by MASL. (6) The Division of Landuse Planning of MASL is in charge of resettlement. Approx. 10 local staff are already hired and working at the project office. The more necessary local staff will be hired and the budget will be prepared in accordance with the RIP report later on. (7) The resettlement monitoring plan (internal and external) was prepared in Section 8.3 of the draft RIP report.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
	(2) Living and Livelihood	(1) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (2) Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (3) Is there a possibility that installation of structures, such as power line towers will cause a radio interference? If significant radio interference is anticipated, are adequate measures considered?	(1) The project will affect the living conditions of inhabitants. Overall, the project will benefit the farmers in the irrigation areas; however, 1,572 households in the dam and reservoir will be negatively affected and displaced due to the project, which negative impact will be mitigated by compensation proposed in the draft RIP. (2) Construction activities will affect the social environment such as access to the existing social infrastructures, social institutions to some extent, infectious diseases (e.g. HIV). The necessary mitigation measures (educational programmes for the workers and local residents, provision of contraceptives) are proposed in the updated EMP. (3) It is not expected since the capacity is very limited.
	(3) Heritage	(1) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(4) The transmission line is not expected to intercept any such sites. If any remain is found, MASL needs to consult with archaeological officer dispatched from the Dept. of Archaeology. Additionally, as instructed in the Archaeological Impact Assessment, archaeological remains will be stored and displayed in an exhibition centre.
	(4) Landscape	(1) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(1) The transmission line will inevitably affect the landscape, but given that it is a 33 KV line the impact will be minor. (In fact there is already a 33 KV line running alongside the new access road to supply the project office and its staff quarters.)
4 Social Environment	(5) Ethnic Minorities and Indigenous Peoples	(1) Where ethnic minorities and indigenous peoples are living in the rights-of-way, are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (2) Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples?	(1) There is no law for rights of ethic minorities and indigenous people in Sri Lanka. Only 1 Muslim family is identified as resetters in the draft RIP report. (2) No mitigations are proposed since any ethnic minorities or indigenous people will be affected according to the draft RIP report

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
5 Others	(1) Impacts during Construction	(1) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (2) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (3) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (4) If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	(1) Some measures are briefly mentioned in the 1998 EIA and others are mentioned in more detail in the conditions attached to the two letters from the Ministry of Agriculture to MASL extending the Environmental Clearance for the project. However, an Environmental Management Plan (EMP) has been prepared, setting out all of the environmental protection measures to be applied during construction. In addition, it will be necessary for all contractors to prepare their own 'daughter' EMPs setting out exactly how they will manage environmental issues within the implementation of their work. (Note that a separate detailed EMP will be required for operation of Moragahakanda Dam, Power Station and Reservoir.) (2) Construction activities will adversely affect the natural environment (air, noise and vibration, water quality, soil quality). See above Section 2, 3 and 4 re. measures to reduce adverse impacts. (3) Construction activities will affect the social environment such as access to the existing social infrastructures, social institutions to some extent, infectious diseases (e.g. HIV) and cultural heritages if found. The necessary mitigation measures are proposed in the updated EMP. (4) H & S training requirements included in the EMP.
	(2) Monitoring	(1) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (2) Are the items, methods and frequencies included in the monitoring program judged to be appropriate? (3) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (4) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(1) The original Monitoring Plan initially prepared by MASL focused on negative impact the natural environment prepared; however, this was not adequate, particularly in relation to water quality monitoring in the river and subsequently in the reservoir. An Environmental Monitoring Plan (EMoP) was therefore be updated in the JICA Survey. (2) The updated EMoP specifies the methods, frequencies and locations for each monitoring item, which is considered adequate. (3) Similarly, the EMoP specifies the responsibilities and costs for each monitoring item. (4) Currently MASL has the external environmental monitoring committee consisting of the PAA, CEA and relevant governmental organisations in accordance with the EIA approval extension letter (2007.12.20) and is required to submit a monthly progress report (indicating achievements of the project activities for the approval conditions) to the PAA for monitoring purposes.
6 Note	Note on Using Environmental Checklist	(1) If necessary, the impacts to transboundary or global issues should be confirmed, (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(1) No transboundary or global issues are involved.

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are made, if necessary. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan' experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

F4.4 No. 22 Irrigation Projects

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
1 Permits and Explanation	(1) EIA and Environmental Permits	(1) Have EIA reports been officially completed? (2) Have EIA reports been approved by authorities of the host country's government? (3) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (4) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(1) EIA report completed 1998. (2) EIA approved by Ministry of Agriculture & Agrarian Services (Project Approving Agency: PAA) with the concurrence of the Central Environmental Authority (CEA). (3) Environmental Clearance was granted on 26th October 2001, extended on 16th March 2006, and extended again on 26th October 2007 (until 25th October 2010). At each of these three stages, a number of conditions were stipulated. As far as can be ascertained, the conditions have been met, with the exception of those which cannot be applied until later in the development of the project, and those that have become redundant due to a change in the proposed project. (4) As far as can be ascertained, other required permits have been obtained from relevant authorities, with the exception of those which cannot be obtained until later in the development of the project, and those that are no longer required due to a change in the proposed project.
	(2) Explanation to the Public	(1) Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? (2) Are proper responses made to comments from the public and regulatory authorities?	(1) Public consultations have been conducted in various ways. For EIA, the public consultation meetings with local residents affected by the project were initially organised since it was not required by the EIA regulations of Sri Lanka. However, as part of pubic consultation, (a) the EIA was also disclosed to the public from 5 July 2000 to 11 September 2000 (for 30 working days) in accordance with the EIA regulations of Sri Lanka, (b) the workshop was organised amongst 125 participants from the local government officers, wildlife officers, forest officers and MASL officers on 6 Dec. 2007 to discuss and make suggestions for the EIA, and (c) the interviews with 9 wildlife management experts such as government officers, NGOs and academicians were conducted in May 2010 in the JICA Survey. For RIP or resettlement, since 2006 (e.g. 1 initial awareness meeting in 2006; 8 awareness programmes in 2007; 21 Participatory Rapid Appraisal (PRA) programmes, awareness programmes and the other meetings in 2008; 1 meeting with relevant officers in 2009; and 1 interview survey within the JICA Survey in 2010). More public consultation activities (awareness programmes) are planned by MASL after June 2010 continuously. (2) The comments on the EIA from the public were forwarded by Min. of Agriculture and Lands to MASL on 28 Sept. 2000 and responses were provided by MASL to Min. of Agriculture and Lands on 20 June 2001.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
2 Mitigation Measures	(1) Water Quality	(1) Are considerations given to water pollution of the surrounding water bodies, such as rivers and groundwater by the effluents or leachates from irrigation ponds? Are adequate use/disposal standards for chemicals, such as fertilizers and agrochemicals established? Is a framework established to increase awareness of the standards among farmers? (2) Do effluents and ambient water quality of the surrounding water bodies comply with the country's effluent standards and ambient water quality standards?	(1) There will not be irrigation ponds, there will be a reservoir, a primary canal (existing), secondary and distribution canals. Water in this system will be clean water derived from rivers and therefore contaminated effluents or leachates will not occur. There are national standards for the quality of effluent water to be used for irrigation purposes, and there are national standards for the quality of effluents to be discharged to surface waters. Neither of these include standards for specific fertilisers (that would be unusual). However, the latter includes standards for compounds that could be derived from fertiliser e.g. ammoniacal nitrogen. The latter also requires that pesticides in effluent discharges should be at undetectable levels, and heavy metals concentrations should be at low (stated) levels. Once the resettlement areas are established the settlers will be provided with agricultural extension services as is normal with MASL projects; such extension work includes advice on the application of fertilisers and pesticides. (2) The Moragahakanda Environmental Monitoring Plan provides for water quality monitoring in the resettlement areas. The results will be compared with the national standards.
	(2) Soil Contamination	(1) Is there a possibility that impacts in irrigated lands, such as salinization of soils will result? (2) Are adequate measures taken to prevent soil contamination of irrigated lands by agrochemicals, heavy metals and other hazardous substances?	(3) Soil salination problems have not yet been experienced in other Sri Lankan irrigation schemes. Neither the soils nor the water of the irrigated settlement areas indicate the likelihood of salination. (4) See (1) Water Quality above.
	(3) Subsidence	(1) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(1) Not applicable.
3 Natural Environment	(1) Protected Areas	(1) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(1) The irrigated resettlement area in System D1 is within dry scrub woodland and former 'chena' cultivation areas. The System F resettlement area (Kalu Ganga LB) is largely scrubland with some dry evergreen forest (only 7 %). Neither is a protected area. The latter area is partially occupied and farmed already.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
3 Natural Environment	(2) Ecosystem	(1) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (2) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (3) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (4) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms? (5) Is there a possibility that installation of structures, such as intake weirs will block the movement of the migratory fish species (such as salmon, trout and eel that move between rivers and the sea for spawning)? Are adequate measures taken to reduce the impacts on these species?	(1) See Protected Areas section above. (2) No (3) Not applicable (4) No. Minimum downstream flow requirement (100%) is applied to Elahera Anicut in the EMP. (5) The flow from the dam will continue to be intercepted by the Elahera Anicut, some 2km downstream of the dam. However, the flow to be released downstream from the Anicut will be exactly the same as at present, i.e. the minimum downstream flow in the Amban Ganga after completion of the project will be approx. 1.4m^3/s and be equivalent to 100% of the present flow rate. Therefore, it is expected the water quality is not degraded due to the reduced water flow and overall meet the water quality standard for irrigation or ambient water quality of Sri Lanka except the initial stage of operation.
4 Social Environment	(1) Resettlement	(1) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (2) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? (3) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (4) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (5) Are agreements with the affected persons obtained prior to resettlement? (6) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured	(1) In System F, the land of some host communities (but not residential structures) will be affected by the land acquisition according to the draft RIP. In System D1, there are 9 households to be affected by the branch canal; however, the alignment of the branch canal will be reviewed to reduce the resettlers in the next study stage. (2) Since 2006 (e.g. 1 initial awareness meeting in 2006; 8 awareness programmes in 2007; 21 Participatory Rapid Appraisal (PRA) programmes, awareness programmes and the other meetings in 2008; 1 meeting with relevant officers in 2009; and 1 interview survey in 2010 within the JICA Survey). More public consultation activities (awareness programmes) are planned by MASL after June 2010 continuously. (3) Overall the draft RIP is considered to be well prepared and contains the proper compensation and livelihood restoration programmes based on the socio-economic studies. However, the practical resettlement schedule needs to be prepared, and the compensation policy for land needs to equivalent to the full replacement cost. (4) The impact on the vulnerables (e.g. woman-headed households, the poor, the disabled, and the elderly) is mentioned in the draft RIP report, and a special

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
		to implement the plan? (7) Is a plan developed to monitor the impacts of resettlement?	allowance for the vulnerable groups is included in the entitlement matrix of the draft RIP. (5) 99% of the consent letters signed by displaced persons were obtained by MASL. (6) The Division of Landuse Planning of MASL is in charge of resettlement. Approx. 10 local staff are already hired and working at the project office. The more necessary local staff will be hired and the budget will be prepared in accordance with the RIP report later on. (7) The resettlement monitoring plan (internal and external) was prepared in Section 8.3 of the draft RIP report.
4 Social Environment	(2) Living and Livelihood	(1) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (2) Are proper allotments, such as water rights allotment in the project area made? Is there a possibility that the allotments will result in inequitable distribution or usurpation of water rights and available resources? (3) Is there a possibility that the amount of water used (surface water, groundwater) by the project will adversely the downstream fisheries and water uses? (4) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced? Is adequate consideration given to public health education, if necessary?	(1) The project will affect the living conditions of inhabitants. Overall, the project will benefit the farmers in the irrigation areas; however, 1,572 households in the dam and reservoir will be negatively affected and displaced due to the project, which negative impact will be mitigated by compensation proposed in the draft RIP. (2) No adverse effects on downstream water users are expected. If the water flow will be monitored, if any additionally requirement, it will be discussed and adjusted by relevant officers (e.g. Water Resource Management Secretariat within MASL) in accordance with the current practice. (3) No. Same as above. (4) Water seepage or overflows in the irrigated areas could increase mosquito habitat in the dry season. Mitigation measures such as the drainage of peripheral pools, changing the reservoir water level from time to time, maintenance of the minimum dry season flow in the downstream river, occasional flushing of the downstream river (if necessary), educational programmes on the water-borne diseases (e.g. malaria and dengue fever) for nearby residents, and provision of mosquito net.
	(3) Heritage	(1) Is there a possibility that the project will damage the local archaeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(1) No significant sites in the irrigated resettlement areas, but former ancient irrigation structures may be encountered. If any remain is found, MASL needs to consult with archaeological officer dispatched from the Dept. of Archaeology. Additionally, as instructed in the Archaeological Impact Assessment, archaeological remains will be stored and displayed in a exhibition centre.
	(4) Landscape	(1) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(1) Establishment of the irrigated agricultural areas will change the landscape from scrub / forest to paddy fields and settlements. This is unavoidable. MASL build new administrative and other buildings in traditional style.

Category	Environmental Item	Main Check Items	Confirmation of Environmental Considerations
5 Others	(1) Impacts during Construction	(1) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (2) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (3) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (4) If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	(1) For System F, adequate mitigation measures are included in the Kalu Ganga EIA. For System D1, mitigation measures are included in the Moragahakanda EMP. (2) Construction activities will adversely affect the natural environment (air, noise and vibration, water quality, soil quality). See above Section 2, 3 and 4 re. measures to reduce adverse impacts. (3) Construction activities will affect the social environment such as access to the existing social infrastructures, social institutions to some extent, infectious diseases (e.g. HIV) and cultural heritages if found. The necessary mitigation measures are proposed in the updated EMP. (4) H & S training requirements included in the EMP.
	(2) Monitoring	(1) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (2) Are the items, methods and frequencies included in the monitoring program judged to be appropriate? (3) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (4) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(1) The original Monitoring Plan initially prepared by MASL focused on negative impact the natural environment prepared; however, this was not adequate, particularly in relation to water quality monitoring in the river and subsequently in the reservoir. An Environmental Monitoring Plan (EMoP) was therefore be updated in the JICA Survey. (2) The updated EMoP specifies the methods, frequencies and locations for each monitoring item, which is considered adequate. (3) Similarly, the EMoP specifies the responsibilities and costs for each monitoring item. (4) Currently MASL has the external environmental monitoring committee consisting of the PAA, CEA and relevant governmental organisations in accordance with the EIA approval extension letter (2007.12.20) and is required to submit a monthly progress report (indicating achievements of the project activities for the approval conditions) to the PAA for monitoring purposes.
6 Note	Reference to Checklist of Other Sectors	(1) Where necessary, pertinent items described in the Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation). (2) For the projects including construction of large-scale weirs, reservoirs, and dams, where necessary, pertinent items described in the Dams and Reservoirs checklist should also be checked.	(1) Not applicable. (2) Dams & Reservoirs checklist completed.
	Note on Using Environmental Checklist	(1) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(1) Not applicable.

1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are made, if necessary. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan' experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.