DHAKA TRANSPORT COORDINATION BOARD
MINISTRY OF COMMUNICATIONS (MOC)
GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

DHAKA URBAN TRANSPORT NETWORK

DEVELOPMENT PROJECT

ENVIRONMETAL IMPACT ASSESSEMENT STUDY

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Prepared by
Dhaka Transport Coordination Board

PREPARATORY SURVEY ON DHAKA URBAN TRANSPORT NETWORK DEVELOPMENT STUDY (DHUTS) PHASE II
ENVIRONMETAL IMPACT ASSESSEMENT STUDY

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List of Abbreviations

BDT	Bangladesh Taka
BIWTA	Bangladesh Inland Water Transport Authority
BOD	Biochemical Oxygen Demand
BR	Bangladesh Rail
BRT	Bus Rail Transit
BRTA	Bangladesh Road Transport Authority
BRTC	Bangladesh Road Transport Corporation
BUET	Bangladesh University of Engineering and Technology
CCDB	Christian Commission for Development in Bangladesh
CCL	Cash Compensation under Law
CNG	Compressed Natural Gas (CNG)-run vehicles
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CPR	Common Property Resources
CRO(RU)	Chief Resettlement Officer(Resettlement Unit)
DC	Deputy Commissioner
DCC	Dhaka City Corporation
DESCO	Dhaka Electric Supply Company Limited
DG	Director General
DHUTS	Dhaka Urban Transport Network Development Study
DLAC	District Land Allocation Committee
DMA	Dhaka Metropolitan Area
DMP	Dhaka Metropolitan Police
DMTA	Dhaka Metropolitan Transport Authority
DMTC	Dhaka Metropolitan Transport Corporation
DO	Dissolved Oxygen
DOE	Department of Environment
DPDC	Dhaka Power Distribution Company
DTCB	Dhaka Transport Coordination Board
DUTP	Dhaka Urban Transport Project
ECC	Environmental Clearance Certificate
EIA	Environment Impact Assessment
EMP	Environmental Management Plan
EPA	Environment Protection Agency
EQS	Environmental Quality Standards
FS	Feasibility Study
GIBR	Government Inspector of Bangladesh Railway
GOB	Government of Bangladesh

GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
IA	Implementation Agency
IEE	Initial Environmental Examination
INGO	Implementation Non-Government Organization
IRS	International Resettlement Specialist
JICA	Japan International Cooperation Agency
JVS	Joint Verification Survey
JVT	Joint Verification Team
LA	Land Acquisition
LAO	Land Acquisition Officer
LCC	Location Clearance Certificate
LGED	Local Government Engineering Department
LMS	Land Market survey
MARV	Maximum Allowable Replacement Value
MIS	Management and Information Specialist
MOC	Ministry of Communication
MOD	Minutes of Discussion
MOHW	Ministry of Housing and Public Work
MOL	Ministry of Land
MPW	Ministry of Public Work
MRT	Mass Rapid Transit
MRTL-6	Mass Rapid Transit Lane-6
NEMAP	National Environmental Management Action Plan
NGO	Non-Governmental Organization
NHA	National Housing Authority
NOC	No Objection Certificate
NOx	Nitrogen Oxide
NRS	National Resettlement Specialist
PAHs	Project Affected Houses
PAPs	Project Affected Persons
Pb	Lead
PD	Project Director
PIA	Project Implementation Agency
PIU	Project Implementation Unit
PM	Particulate Matter
PVAT	Property Valuation Advisory Team
R&R	Resettlement and Rehabilitation
RAC	Rural Advancement Council
RAJUK	Rajdhani Unnayan Kartripakhya

RAP	Resettlement Action Plan
RHD	Roads and Highways Department
ROW	Right of Way
RRD	Roads and Railways Division
SES	Socio-Economic Survey
SO2	Sulfur Oxide
SS	Secondary Sreenline
STDs	Sexual Transmitted Diseases
STP	Strategic Transport Plan
TK	Taka
TSS	Total Suspended Solid
U/S	Under/section
VOCs	Volatile Organic Compounds
VCR	Volume Capacity Ratio
WB	World Bank
WHO	World Health Organization

CHAPTER 1

DESCRIPTION OF THE PROJECT

1.1 BACKGROUND OF THE MRT LNE 6

Dhaka Urban Transport Network Development Study (DHUTS) the Phase 2 Study (Feasibility Study of Mass Rapid Transit (MRT) Line 6 is a continuation work of Preparatory Survey of DHUTS. In the last two decades, the Government of Bangladesh and its international development partners, especially the World Bank, have done much. A number of studies have been conducted and many plans have been developed. Unfortunately, Dhaka Urban Transport project (DUTP) funded by the World Bank, was the only physical works project for the city, which was completed by the end of 2005.

Though the urban transport development works are continuous process but after that project there is no continuity and yet no big transport infrastructure works project has been taken in hand. Under the situation, Government of Bangladesh (hereinafter referred to as 'GOB') established Strategic Transport Plan (STP) for Dhaka in cooperation with World Bank in 2005. The STP stated the main strategic issues including mass rapid transit, organizational framework and project implementation.

In this regards, GOB, JICA and relevant agencies discussed and agreed Preparatory Survey on Dhaka Urban Transport Network Development Study (hereinafter referred to as the Phase 1 Study) in December 4, 2008. The Phase 1 Study has been completed in March 2010 and recommended short-term, medium-term and long-tern period projects for implementation. Among these, the study recommended the followings short-term period project by the year 2015. The projects were:

- Public Transport Projects
  - MRT Line 6 project
  - BRT Line 3 project (WB)
- Road Projects
  - Eastern fringe road project
  - Southern section of middle ring road
  - Flyover projects
- Traffic management
  - Comprehensive traffic management project
- Organizational development for DMTA and DMTC

In addition, Dhaka Urban Transport Network Development Study Phase 1 prioritized MRT Line 6 (total length of 21.5km) as the first project. Afterwards, GOB, JICA and other relevant agencies signed Minutes of Discussion (MOD) in 2010 on Preparatory Survey for Dhaka Urban Transport Network Development Study (DHUTS) the Phase 2 (Feasibility Study of Mass Rapid Transit (MRT) Line 6 (hereinafter referred to as the Phase 2 Study) with a broader objectives. The feasibility study includes:

- Feasible project plan; and
- Project implementation plan inconsideration with technical, economic and budgeting, and environmental and social aspects.

1.2 THE MRT LINE 6 LOCATION

It mentioned in the above section that the GOB and JICA has undertaken a project under DTCB (it is noticed that DTCB is renaming as Dhaka Transport Planning and Coordination Authority) namely 'Feasibility Study of Mass Rapid Transit Line 6 under the Phase 2 Study. The project aims to improve pubic transport system introducing first ever rail based MRT in Dhaka. The length of MRT Line 6 is 21.5km and includes 18 stations.

The line starts from Uttara North where Rajdhani Unnayan Kartripakhya (RAJUK) planned Uttara Phase 3 for development of residential and commercial plots/area and ends at Saidabad passing through Pallabi – Mirpur 10 – Begum Rokeya Sharani – Bijoy Sharani – Farm Gate – Sonargaon – Kamruzzaman Sharani and Hatkhola Road. The alignment of MRT Line 6 and its land use and environmental characteristics is shown in **Figure 1-1**.

The present study will address the affected households, population and properties including those on the government land, throughout the entire 21.5 km. proposed elevated MRT. It may be mentioned that 18 rail stations will have to be constructed newly which will require land acquisition at the selected places of Uttara, Pollabi, IMT, Mirpur, Kazipara, Agargaon, Chandrima Uddan, Farm Gate, Sonargaon, Shahbag, BUET, Shohidulla Hall, Kaptan Bazar, Banga Bhaban and Saidabat. And almost all the land acquisition will be for constructing these new stations.

To compensate for the socio-economic losses, mostly related to homestead and commercial enterprises along with employees/vendors, etc, the study will also propose a comprehensive compensation package so that the affected persons at least can retain their pre-project socio-economic standard or life.

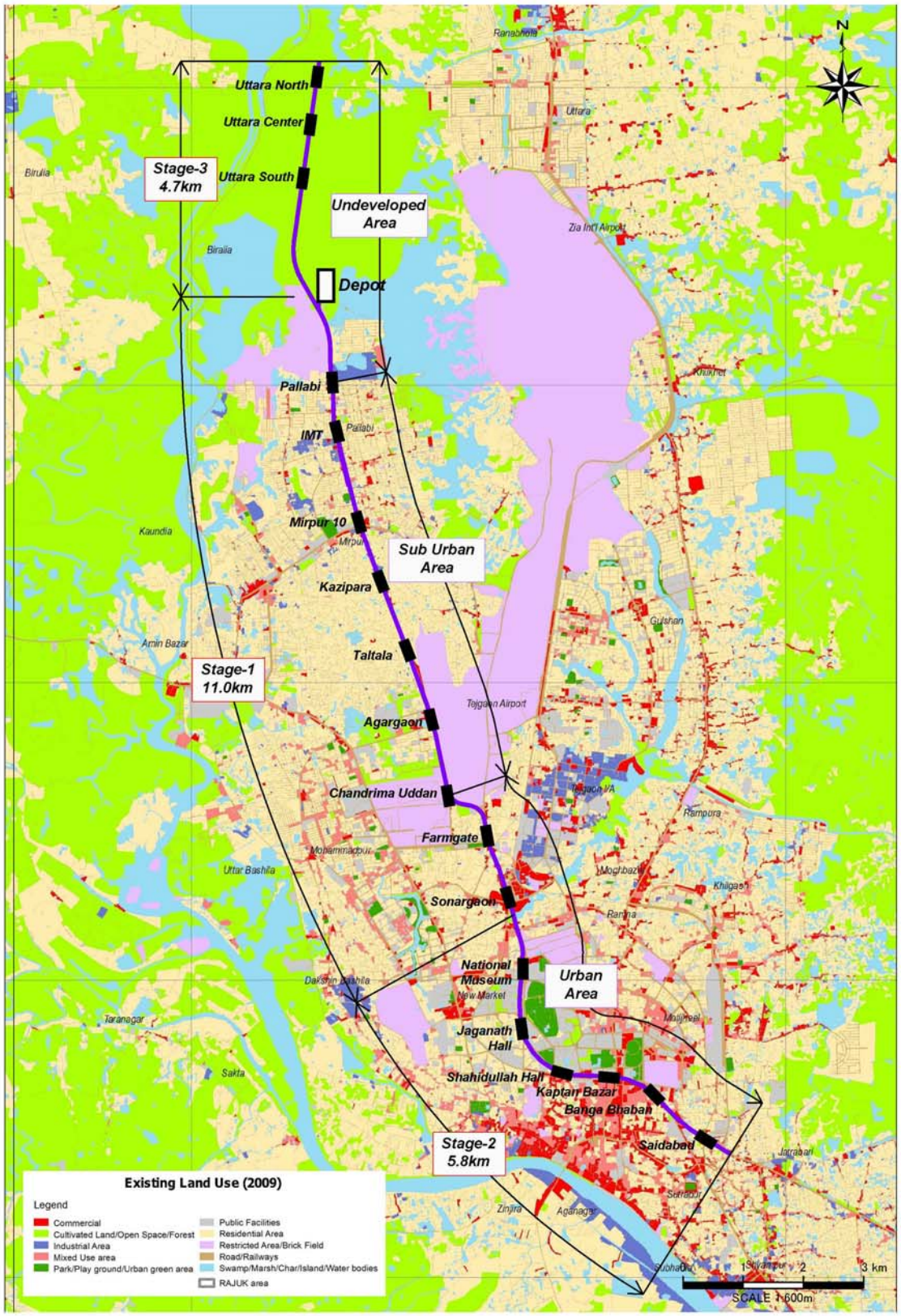


Figure 1-1 Land Use Map along Proposed MRT Line 6

1.3 PROJECT INITIATION

The present Feasibility Study of MRT Line 6 project is a follow-up action of the Strategic Transport Plan prepared by a Team of Expatriate and Local consultants in 2009. The Feasibility Study after its approval will be followed by the detail design stage, which is expected to be completed by 2012. The construction activities of MRT Line 6 is expected to be commissioned in 2013 and completed within 2017. However, the year of commissioning the construction may vary because influence of various external factors.

1.4 IMPORTANCE OF THE PROJECT

The Importance of construction of MRT Line 6 project has been clarified on the basis of following points:

- It will promote socio-economic development through the provision of high capacity transport system with socio-economic development project. When the high capacity transport system is provided, industrial production will be increased due to decrease in transport and travel time costs by alleviating road traffic congestion. At the same time, sales of commercial goods will also increase. It would also attract the foreign investors to invest in various industries, which will contribute not only to employment, but also to the socio-economic growth of the country.
- According to recent estimates, the population of DMA is expected to be 15.7 million in 2025 of which the DCC will share 10.7 million. Taking into consideration of this huge increase in population, the mass transport system can never be ignored. MRT Line 6 is a highly positive step to cater the huge transport demand on the corridor as well as improvement of public transportation system. Without introduction of high capacity transport system as MRT, traffic situation in Dhaka will tremendously stagnated in future.
- As estimated by the experts, the present (2009) average travel speed of motorized vehicles is around 15 km/hr which is expected to be decreased to 4-5 by 2025. As for the average traffic congestion rate in DMA, it will increase to 1.09 in 2025 from 0.51 in 2009. In this situation, importance of high capacity transport system as the mass transit system, traffic situation in Dhaka will be tremendously stagnated. So it is necessary to construct high capacity mass rapid transit system to alleviate traffic congestion in Dhaka, and construction MRT Line 6 is a high positive response to the future efficient transportation needs.

1.5 OBJECTIVE OF THE PROJECT

The project MRT Line 6 is one of the proposed six projects by STP and objective of all the six projects are same. The Rationale of the MRT Line 6 project is:

- To promote socio-economic development;
- To meet future traffic demand;

- To alleviate traffic congestion;
- Integration of urban development with urban transport system.

In the light of above four socio-economic rationales, the objectives of the project may be defined as:

- Development of an effective and efficient transport system in Dhaka;
- Provide easy public transport access to the people; and
- Development of safe and environment friendly transport system.

1.6 DEVELOPMENT PLAN IN UTTARA PHASE 3 PROJECT BY RAJUK

RAJUK has proposed several large scale housing developments in the Dhaka Metropolitan Area (DMA) (**Table 1-1**). One of them is Uttara Phase 3 housing project which is an extension of the existing Uttara model town project. It has the total planned area of 800 ha.and about 500,000 habitants will accommodate in this new town. Among those housing projects, only Uttara Phase 3 Project is located within DMA area and the others are outside DMA area. **Figure 1-1** shows Uttara Phase 3 housing project together with MRT Line 6 project.

Table 1-1 Housing Developments proposed by RAJUK

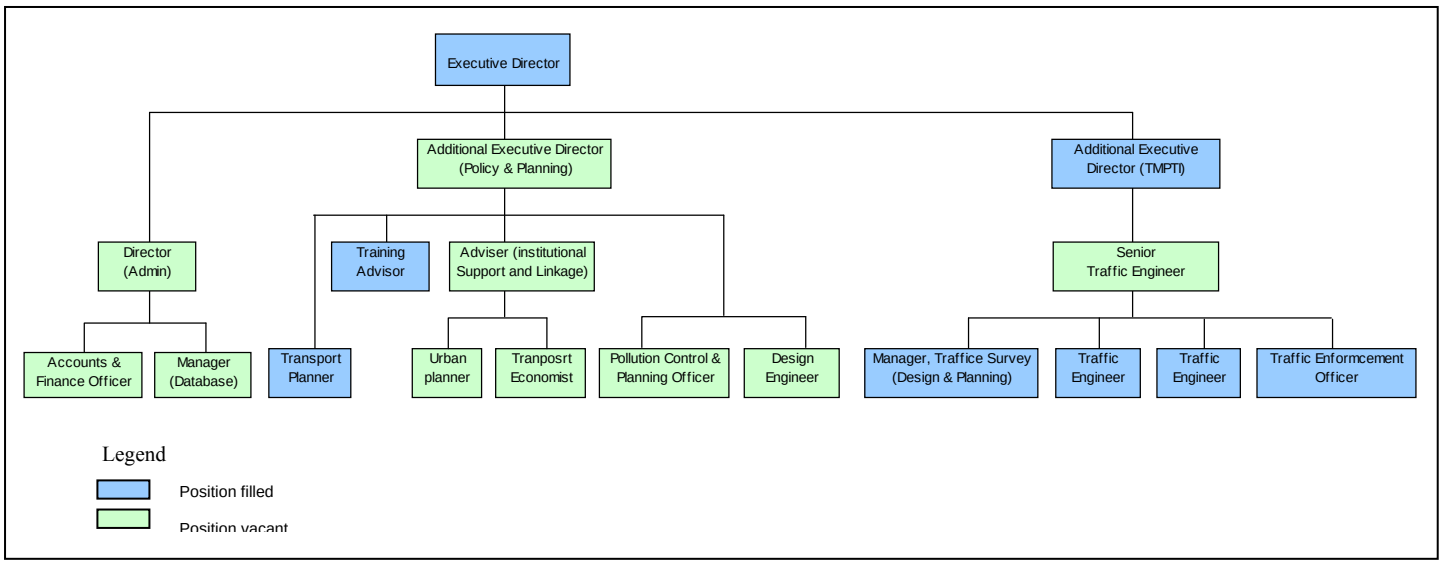
Name	Planned Area (ha)	Estimated Population		
		Assumption of Population Density (250person/acre or 625 person/ha)	2020 (Percentage of Development - 30%)	2025 (Percentage of Development - 50%)
Uttara-3	800	500,000	150,000	250,000
Purbachal	2,460	1,540,000	462,000	770,000
Jheelmil-1	160	100,000	30,000	50,000
Jheelmil-2	560	350,000	105,000	175,000
Ruhitpur, Savar, Gazipur, Dhamsona	800	500,000	150,000	250,000
TOTAL	4,780	2,990,000	897,000	1,495,000

Source: Based on the information prepared by RAJUK

1.7 THE EXECUTING AGENCY OF THE PROJECT

The executing agency of the MRT Line 6 will be Dhaka Transport Coordination Board (DTCB) under Ministry of Communication (MOC). The present organization of DTCB is illustrated in **Figure 1-2**. DTCB is now under process of reorganization as Dhaka Metropolitan Transport Authority (DMTA) (See **Figure 1-3**).

This board is a very large committee comprising of 21 members who are the chief executive of various related departments. In this board there will be one unit whole time responsible for the execution of MRT Line 6 project. This unit may be headed by a Director to be designated as PD, MRTL-6 project.



Source: DTCB

Figure 1-2 Organization Structure of DTCB (As of March 2010)

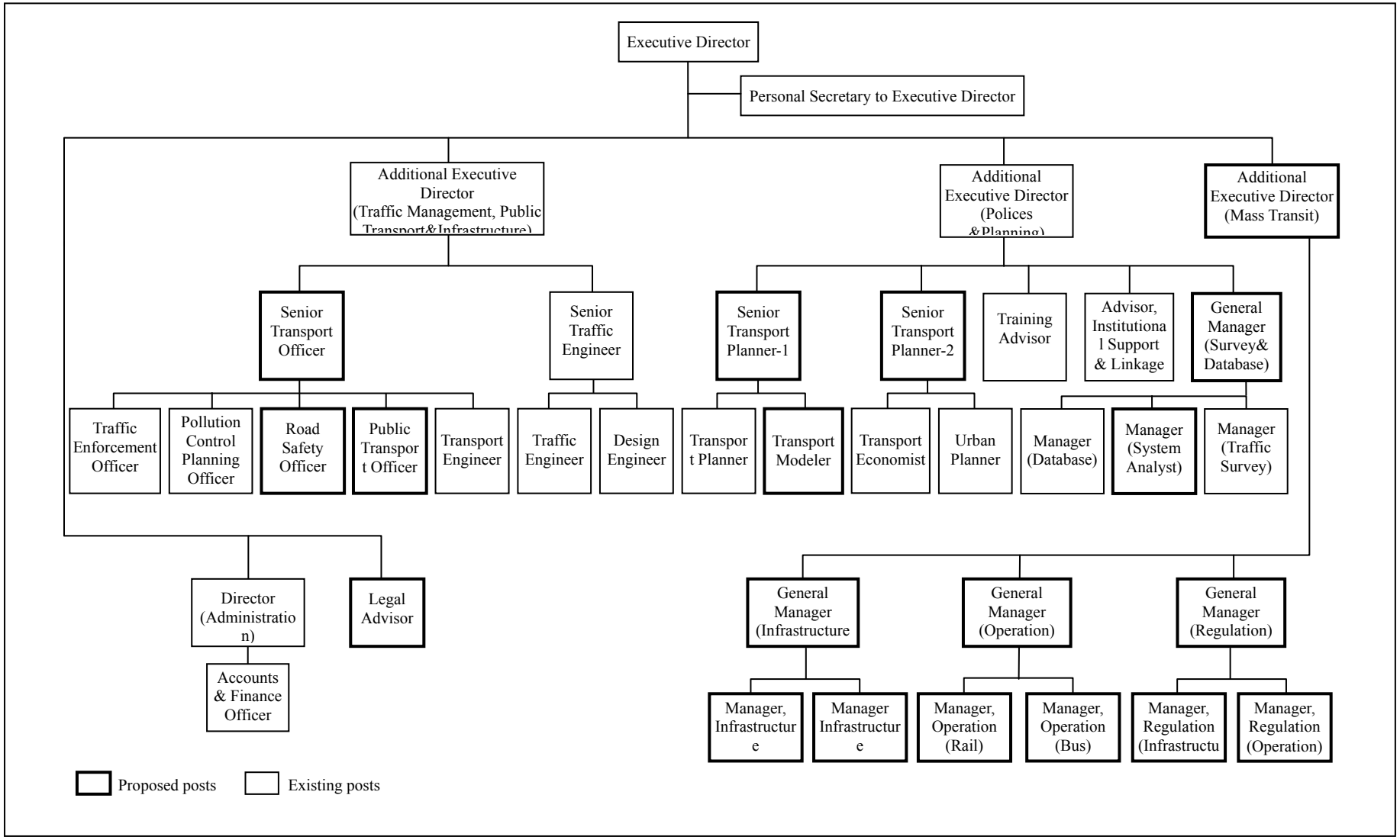


Figure 1-3 Proposed Organization Chart of Future DTCB (DMTA)

CHAPTER 2

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 POLICY AND LEGAL FRAMEWORK

According to the Schedule-1 of Environmental Conservation Rules, 1997 in Bangladesh, a project which falls on the following provisions is considered as "Red Category".

1. Item No. 60: Engineering works capital above BDT. One million, and
2. Item No. 68: Construction, reconstruction and expansion of bridge which length above 200m

Since substantial part of MRT Line 6 is elevated viaduct (L=16.8km) that is considered as bridge, the project is classified as "Red Category".

The project includes construction of elevated MRT line using median of existing road along the built-up areas of the city and proposed at-grade MRT line along the RAJUK planned Uttara Phase 3. Since the planned MRT structure is elevated along the median of the existing road, so no land would be required for construction of MRT line, but land is mainly required for depot and route alignment on sharp curves, station buildings, entry/exit structures, traffic integration, power sub-stations and temporary construction works sites.

However, every effort has been made to keep land requirement minimum and acquisition of private land and property is minimal 0.28 ha. On the other hand, Dhaka City Corporation (DCC) has been planting ornamental shrubs for beautification at the median of the widen roads. Therefore, some ornamental shrubs would need to be cut to provide ROW for the MRT line.

On the above assumptions, the impact assessment study has made main principles of RAP and EMP frameworks in the following sections. The main principles are to

1. Minimize negative impacts in consultation with Project Affected Persons (PAPs);
2. Closely consult the PAPs on RAP policy, needs assessment, poverty and rehabilitation issues;
3. Carryout resettlement activities to improve or at least restore the pre-project living standards of the PAPs;
4. Provide compensation adequately and quickly for affected property at market price prior to displacement and mainstream the poor and vulnerable PAPs with the poverty reduction and social development program for rehabilitation and livelihood regeneration; and
5. Creating green ground cover by planting of ornamental shrubs below the elevated track.

However, a detailed EIA would be carried out in detail design stage and construction stage. This following section introduces the nation's relevant environmental policy, regulations and guidelines.

1. National Environmental Policy, 1992: the Bangladesh National Environmental Policy,

approved in May 1992, sets out the basic framework for environmental action together with a set of broad sectoral action guidelines. Key elements of the policy are:

- Maintaining ecological balance and ensuring sustainable development of the country through protecting and conservation of the environment
- Protecting the country from natural disasters
- Identifying and regulating all activities that pollute and destroy the environment
- Ensuring environment-friendly development in all sectors
- Ensuring sustainable and environmentally sound management of the natural resources
- Maintaining active association, as far as possible, with all international initiatives related to environment

2. The Environmental Policy of 1992, which amongst other policies, seeks to ensure that transport system, including roads, railways and inland waterways, do not pollute the environment or degrade resources. The policy states that Environmental Impact Assessment (EIA) should be conducted before projects are undertaken.
3. National Environmental Management Action Plan (NEMAP), 1995: the National Environmental Management Action Plan (NEMAP) is a wide-ranging and multi-faced plan, which builds on and extends the statements, set out in the National Environmental Policy. NEMAP was developed to address issues and management requirements during the period 1995 to 2005, and set out of the framework within which the recommendations of the National Conservation Strategy are to be implemented. NEMAP was development based on the following broad objectives:
   - Identification of key environmental issues affecting Bangladesh
   - Identification of actions necessary to halt or reduce the rate of environmental degradation
   - Improvement of the natural environment
   - Conservation of habitats and bio-diversity
   - Promotion of sustainable development
   - Improvement of the quality of the people
4. The Environmental Conservation Act, 1995 (subsequent amendments in 2000 and 2002): the provisions of the Act authorize the Director General (DG) of Department of Environment (DOE) to undertake any activity he deems fit and necessary to conserve and enhance the quality of environment and to control, prevent and mitigate pollution. The main highlights of the act are:
   - Declaration of Ecologically Critical areas
   - Obtaining Environmental Clearance Certificates
   - Regulation with respect to vehicles emitting harmful smoke for the environment
   - Regulation of development activities from environmental prospective
   - Promulgation of standards for quality of air, water, noise, an soils for different areas and for different purposes
   - Promulgation of acceptable limits for discharging and emitting waste
   - Formulation of environmental guidelines relating to control and mitigation of

environmental pollution, conservation and improvement of environment

5. Environment Conservation Rules, 1997 (subsequent amendments in 2002 and 2003): the Environment Conservation Rules, 1997 are the first set of rules promulgated under the Environment Conservation Act, 1995. This Rule provide for the followings:
   - The national Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhaust
   - Categorization of industries, development projects and other activities on the basis of actual (for existing industries/development projects/activities) and anticipated (for proposed industries/development projects/activities) pollution load
   - Procedure for obtaining environmental clearance
   - Requirement for understanding IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities
   - Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life
6. The following table sets out an outline of the other national legal instruments that will have relevance to the proposed MRT Line 6 with respect to the social and environmental considerations. The EIA is prepared in compliance with these national policies.

Table 2-1 National Legal Instruments

Act/Rule/law/ordinance	Responsible Agency/ Ministry/Authority	Key Features/Potential Applicability
Environment Court Act, 2000 and subsequent amendments in 2002	Ministry of Environment and Forest	• GOB has given highest priority to environment pollution and passed 'Environment Court Act, 2000 for completing environment related legal proceedings effectively
National Land Transport policy, 2004	Ministry of Communications	• Reduction of pollution from all kinds of vehicles • Environmental protection management • Mass transit plans will be developed and studies on sub-ways and elevated systems of transport, in conjunction with institutional strengthening in the transport sector and assistance from development partners, will be undertaken
The National Water Policy, 1999	Ministry of water Resources	• Protection, restoration and enhancement of water resources • Protection of water quality, including strengthening regulations concerning agro-chemicals and industrial effluent • Sanitation and potable water • Fish and fisheries; and • Participation of local communities in all water sector development
The Vehicle Act, 1927 The Motor Vehicle Ordinance, 1983 The Bengal Motor Vehicle Rules,	Bangladesh Road Transport Authority	• Exhaust emission • Vehicular air and noise pollution • Road/traffic safety

Act/Rule/law/ordinance	Responsible Agency/ Ministry/Authority	Key Features/Potential Applicability
1940		• Vehicle licensing and registration • Fitness of Motor Vehicles • Parking bylaws
Water Supply and Sanitation Act, 1996	Ministry of Local Government, Rural Development and Cooperatives	• Management and Control of water supply and sanitation in urban areas
The Acquisition and Requisition of Immovable Property Ordinance 1982 and subsequent amendments in 1994, 1995 and 2004	Ministry of Land	• Current GOB Act and Guidelines, relating to acquisition and requisition of land
National Land use Policy, 2001	Ministry of Land	• The plan deals with land uses for several purposes including agriculture (crop production, fisheries and livestock), housing, forestry, industrialization, railways and roads, tea and rubber. The plan basically identifies land use constraints in all these sectors.
Draft Wetland policy, 1998	Ministry of Environment and Forest	• Establishment of principles for sustainable use of wetland resource • Maintenance of existing level of biological diversity • Maintenance of the functions and values of wetlands • Protection and recognition of the value of wetland functions in resource management and economic development

7. The Japan International Cooperation Agency Requirements: JICA Guideline provides four categories of projects as per its environmental classification system. JICA has classified Projects in the following four categories;
   - Category A: A proposed project is classified as Category A if it is likely to have significant adverse impact on the environment. Borrowers and related parties must submit Environmental Impact assessment (EIA) reports. For projects that will result in large-scale involuntary resettlement, basic resettlement plans must be submitted. EIA and other reports need to be submitted through the borrower before the JICA environmental reviews.
   - Category B: A proposed project is classified as Category B if its potential adverse environmental impact is less adverse than Category A projects.
   - Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impact.
   - Category F1: A proposed project is classified as Category F1 if it satisfies all of the following:
     - JICA's funding of the project is provided to a financial intermediary etc.;
     - The selected and assessment of the actual sub-projects is substantially undertaken by such an institution only after JICA's approval of the funding and therefore the

sub-projects cannot be specified prior to JICA's approval of funding (or assessment of the project); and

- Those sub-projects are expected to have potential impact on the environment.

The MRT Line 6, as per the above categorization, falls under Category A for the purpose of environmental investigations and involuntary resettlement. Final EIA report approved by DOE needs to be laid open for public inspection at the JICA headquarter 120 days before a loan agreement for Category A projects.

2.1.1 EIA System and Procedure set by DOE

According to the Schedule-1 of Environmental Conservation Rules, 1997 in Bangladesh, the proposed MRT Line 6 Project is classified as Red Category in accordance with the following Item No. 60 "Engineering works capital above BDT. 10 lacs" and Item No. 68 "Construction, reconstruction and expansion of bridge which length above 200m".

And the project proponent DTCB is required to prepare EIA report, Environmental Management Plan (EMP), No Objection Certificate (NOC) from Ward Commissioners and submit to DOE to obtain the Location Clearance Certificate (LCC) at first.

After obtaining the LCC, the application for Environmental Clearance Certificate from Department of Environment (DOE) of Ministry of Environment & Forests will start.

The necessary documents and required time to obtain ECC from DOE is mentioned in the following **Figure 2-1.**

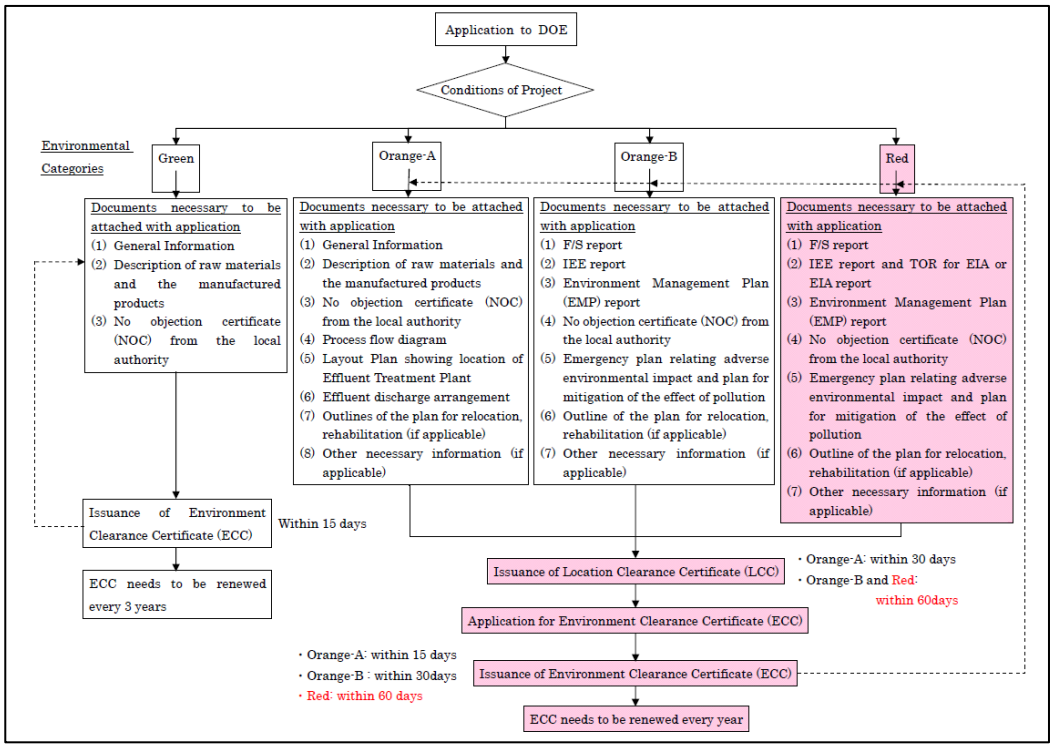


Figure 2-1 Procedure for Obtaining ECC

2.1.2 Framework on Land Acquisition

The current legislations governing land acquisition for Bangladesh is the Acquisition and Requisition of Immovable Property Ordinance 1982 and subsequent amendments during 1993 - 1994. The Ordinance requires that compensation be paid for :

Land and assets permanently acquired (including standing crops, trees, houses); and

Any other damages caused by such acquisition

The Deputy Commissioner (DC), determines the market price of assets based on the approved procedure and in addition to that pays an additional 50 percent on the assessed value as the market price established by Land Acquisition Officer (LAO) which remains much below the replacement value. The 1994 amendment made provisions for payment of crop compensation to tenant cultivators.

The Ordinance, however, does not cover project-affected persons without titles or ownership record, such as informal settler/squatters, occupiers, and informal tenants and lease-holders (without document) and does not ensure replacement value of the property acquired. The act has no provision of resettlement assistance and transitional allowances for restoration of livelihoods of the non-titled affected persons. The Acquisition and Requisition of Immovable Property Ordinance (1982) will be applied for this project including its subsequent amendments.

The Deputy Commissioner (DC) processes land acquisition under the Ordinance and pays compensation to the legal owners of the acquired land. The Ministry of Lands (MOL) is authorized to deal with land acquisition through the DCs. Khas (government owned land) lands should be acquired first when a project acquires both khas and private land. If a project acquires only khas, the land will be transferred through an inter-ministerial meeting following the preparation of acquisition proposal submitted to DC/MOL.

The land owner has to establish ownership by producing a record-of-rights in order to be eligible for compensation under the law. The record of rights prepared under Section 143 or 144 of the State Acquisition and Tenancy Act 1950 (revised 1994) are not always updated and as a result legal land owners have faced difficulties trying to “prove” ownership. The PAPs must also produce rent receipt or receipt of land development tax, but this does not assist in some situations as a person is exempted from payment of rent if the area of land is less than 25 bighas (3.37 ha).

The Government of Bangladesh has prepared a national policy on involuntary resettlement, which is consistent with the general policy of the Government that the rights of those displaced by development projects shall be fully respected, and persons being displaced shall be treated with dignity and assisted in such a way that safeguards their welfare and livelihoods irrespective

of title, gender, and ethnicity. The policy on involuntary resettlement recognizes that:

1. All those displaced involuntarily by either projects or non-project impacts like erosion and eviction must be resettled and rehabilitated in a productive and sustainable manner.
2. People who are resettled must be able, through their own efforts and/or with support as may be required, to restore or improve upon their level of living.
3. Cash compensation shall be paid in development projects at replacement value to those displaced for land and other assets acquired based on established prior ownership and/or user rights. In addition to cash compensation and resettlement, a benefit sharing will be considered where feasible.
4. Cultural and customary rights of people affected by projects are to be protected, particularly those belonging to *adibasis (*indigenous people*)* and ethnic minorities.
5. Gender equality and equity in all stages and processes of resettlement and rehabilitation will be fully respected.
6. Affected persons will be informed and consulted in a transparent manner, including formal disclosure of project impacts and mitigation measures.
7. Vulnerable groups, including landless, *adibasis*, poor women headed households, physically challenged people, elderly and those falling below the nationally defined poverty line (by the government) displaced by project or non-project impacts, are entitled to additional benefits and assistance in a manner that addresses their specific needs related to socio-economic vulnerability.
8. Similarly, affected persons and/or businesses on government leased land will be eligible for compensation for loss of access to land and sites.

The draft Policy was submitted to the Government in November 2007. It has been approved by the Ministry of Land in January 2008 and was placed before the Cabinet later in February 2008. After cabinet approval, the Government will undertake further work towards legislative changes to safeguard resettlement rights by law.

The chronological items to be followed in the proceeding of the L.A Cases under the land Acquisition Ordinance 1982 is described below:

Proposal submitted by the requiring body (hereinafter referred to as Dhaka Transport Coordination Board, DTCB) to the District Land Allocation Committee (DLAC) along with requisite papers:

(a) Administrative approval from the concerned Ministry;
(b) Land Acquisition Plan (alignment marking the proposed land in Mouza Map with red color);
(c) Layout plan and site plan (engineering plan);
(d) Minimum Requirement Certificate of Land;
(e) Specific Proforma (filled up by R/B)
(f) Plot Index (measuring the land);
(g) Clearance from RAJUK;
(h) Clearance of Certificate available of fund; and
(i) Deed of agreement in a prescribed 'G' form.

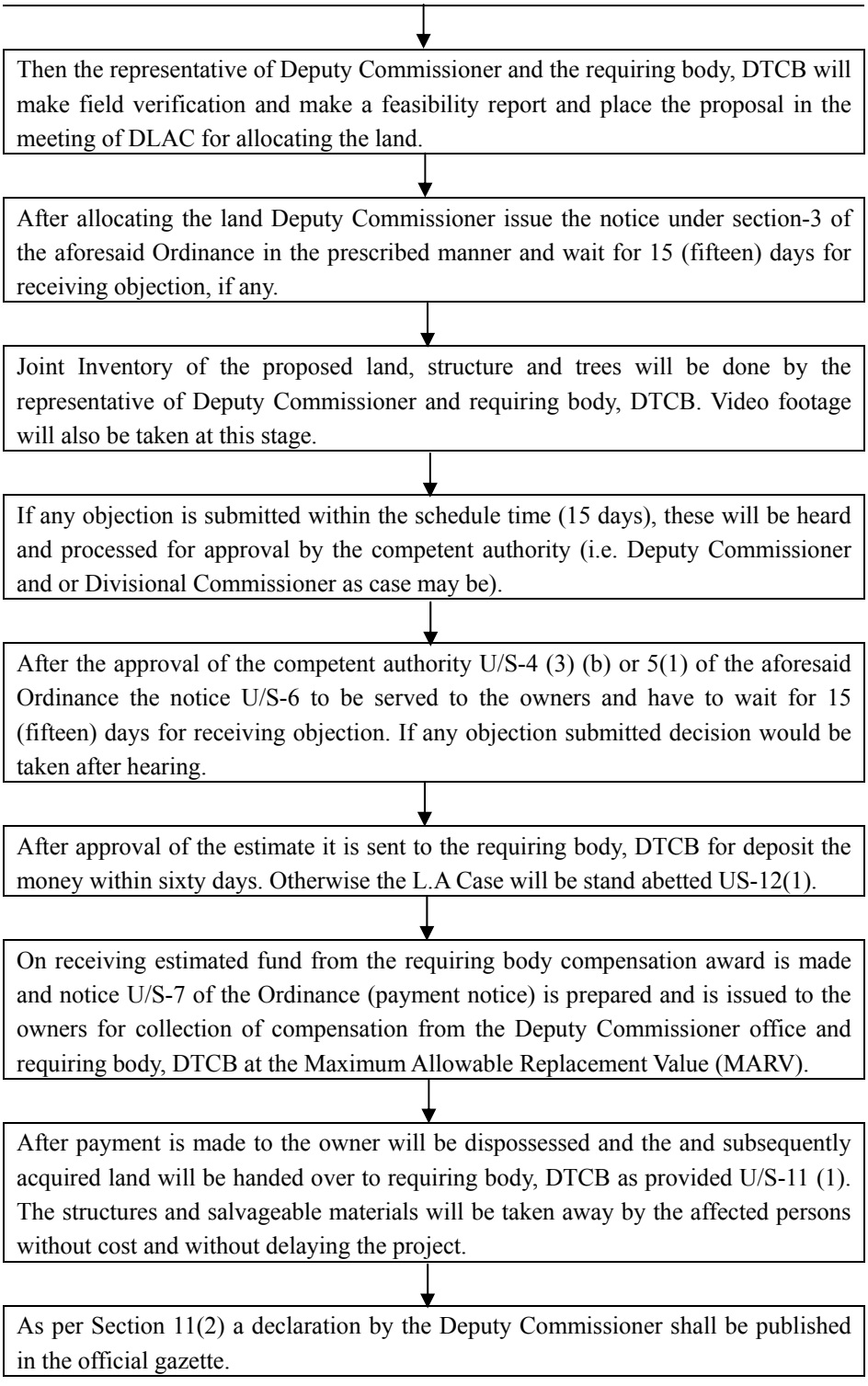


Figure 2-2 Flowchart of Chronological Items Under the Land Acquisition Ordinance 1982

2.1.3 Framework on Resettlement

The types of losses due to undertaking of the MRT Line 6 Project include:

1. Loss of land (homestead, commercial, agricultural and pond);
2. Residential/ commercial/ community structures;

3. Loss of trees and crops;
4. Loss of work days/incomes due to dislocation and relocation of households and businesses;
5. Loss of rental premises; and
6. Loss of access to land and premises for residence and trading.

The following categories of PAPs are likely to be impacted during implementation of the project:

1. PAPs whose land is affected : PAPs whose land is being used for agricultural, residential or commercial purposes and is affected either in part or in total and the effects are either temporary or permanent;
2. PAPs whose structures are affected : PAPs whose structures (including ancillary and secondary structures) are being used for residential, commercial or worship purposes which are affected in part or in total and the effects are either temporary or permanent;
3. PAPs with other assets affected : PAPs who have other assets, such as crops or trees, affected either temporarily or permanently;
4. PAPs losing access to vested and non-resident property : PAPs who are enjoying access to vested and non-resident property, both owned and purchased, will be losing their rights to cultivate and use those lands, when acquired.
5. PAPs losing income or livelihoods : PAPs whose business, source of income or livelihood (including employees of affected businesses) is affected in part or in total, and affected either temporarily or permanently;
6. PAPs losing access to common property resources : PAPs whose access to or use of common property resources is affected on a temporary or permanent basis; and
7. Vulnerable PAPs : PAPs included in any of the above categories who are defined as vulnerable.

The RAP has the following specific principles based on the government provisions and major donors' policies including JICA:

1. The land acquisition and resettlement impacts on persons affected by the subprojects would be avoided or minimized as much as possible through alternate design options;
2. Where the negative impacts are unavoidable, the persons affected by the project and vulnerable groups will be identified and assisted in improving or regaining their standard of living.
3. Information related to the preparation and implementation of resettlement plan will be disclosed to all stakeholders and people's participation will be ensured in planning and implementation. The resettlement plan will be disclosed to the PAPs in local language;
4. Land acquisition for the project would be done as per the Acquisition and Requisition of Immovable Property Ordinance 1982 and subsequent amendments during 1993-1994. Additional support would be extended for meeting the replacement value of the property.

The affected persons who does not own land or other properties, but have economic interests or lose their livelihoods will be assisted as per the broad principles described in this document.

5. Before taking possession of the acquired lands and properties, compensation and Resettlement and Rehabilitation (R&R) assistance will be paid in accordance with the provisions described in this document;
6. An entitlement matrix for different categories of people affected by the project has been prepared. People moving in the project area after the cut-off date will not be entitled to any assistance. In case of land acquisition the date of notification under section 3 for acquisition will be treated as cut-off date. For non-titleholders such as informal settlers / squatters and encroachers the date of census survey or a similar designated date declared by the executing agency will be considered as cut-off date.
7. Appropriate grievance redress mechanism will be established to ensure speedy resolution of disputes.
8. All activities related to resettlement planning, implementation, and monitoring would ensure the involvement of women and other vulnerable groups.
9. Consultations with the PAPs will continue during the implementation of resettlement and rehabilitation works.

In accordance with the resettlement principles suggested for the Project, all affected households and persons will be entitled to a combination of compensation packages and resettlement assistance depending on the nature of ownership rights on lost assets, scope of the impacts including socio-economic vulnerability of the affected persons and measures to support livelihood restoration if livelihood impacts are envisaged. The affected persons will be entitled to:

1. Compensation for the loss of land, crops/ trees at their replacement value;
2. Compensation for structures (residential/ commercial) and other immovable assets at their replacement value;
3. Assistance for loss of business/ wage income;
4. Assistance for shifting; and
5. Rebuilding and/ or restoration of community resources/facilities.

This will ensure that persons affected by land acquisition; whether titled or non-titled will be eligible for appropriate compensation/resettlement benefit. Persons having no legal title but using the land under acquisition if vacated for the Subproject purpose would be provided with compensation and resettlement benefit for structures and shifting/reconstruction allowance.

Households having customary rights to land and physical property like the owners and users of vested and non-resident property, lessees of homestead, commercial and agricultural land, sharecroppers, renters of land and structure, etc. are also covered under the resettlement action

plan. The RAP also includes opportunities for occupational skill development training for income generation activities for the PAPs, especially for poor households.

The people involuntarily displaced from homes, assets, or income sources as well as non-titled people affected by the project will receive priority access to these income restoration measures. The resettlement activities of the Project will be carried out in consultation with the PAPs and all efforts will be made to minimize disruption during project implementation. PAPs preferences will be taken into account in the selection of alternative relocation sites.

2.2 ADMINISTRATIVE FRAMEWORK ON ENVIRONMENTAL ISSUES

Environment covers two broad areas like:

- Natural Environment; and
- Social Environment.

There will be no day-to-day activities for the Administration and Management of Natural Environmental Impacts. Instead, the Natural Environmental Expert of MRT Line 6 with the help of expert of DOE will manage this aspect.

For the Administration and Management of Social Environmental Impacts, The appointed Implementing Agency will open field offices, carry out information campaign and involve affected persons including women in the implementation process from the very beginning. The Implementing Agency will collect, collate, computerize and process data for identification of eligible persons correctly for resettlement benefits and assess their entitlements as per RAP policy. However, the RU will implement the payments after necessary scrutiny. The CRO (RU) in charge of the land acquisition and resettlement management will report to the Project Director. He/she will work in close coordination with the respective field-based offices and Implementing Agency on the day-to-day activities of the resettlement implementation.

The CRO through the field offices, LA Office and the Implementing Agency will execute and monitor the progress of the LA and RAP implementation work. He/she will ensure coordination between the relevant departments, Implementing Agency, the GRC, RAC, PVAT and the Project affected people (PAPs). Apart from the GRC, Joint Verification Team (JVT) for quantification of affected properties and Property Valuation Advisory Team (PVAT) will be formed by the Ministry of Housing and Public Work (MOHW) for valuation of affected property and resolution of disputes. The composition and formation of committees and mechanisms for quantification and valuation of properties and grievance resolution will be constituted through government gazette. People's participation will be ensured through including their representatives in these committees.

Institutional Responsibilities for RAP Preparation and Implementation Activities is;

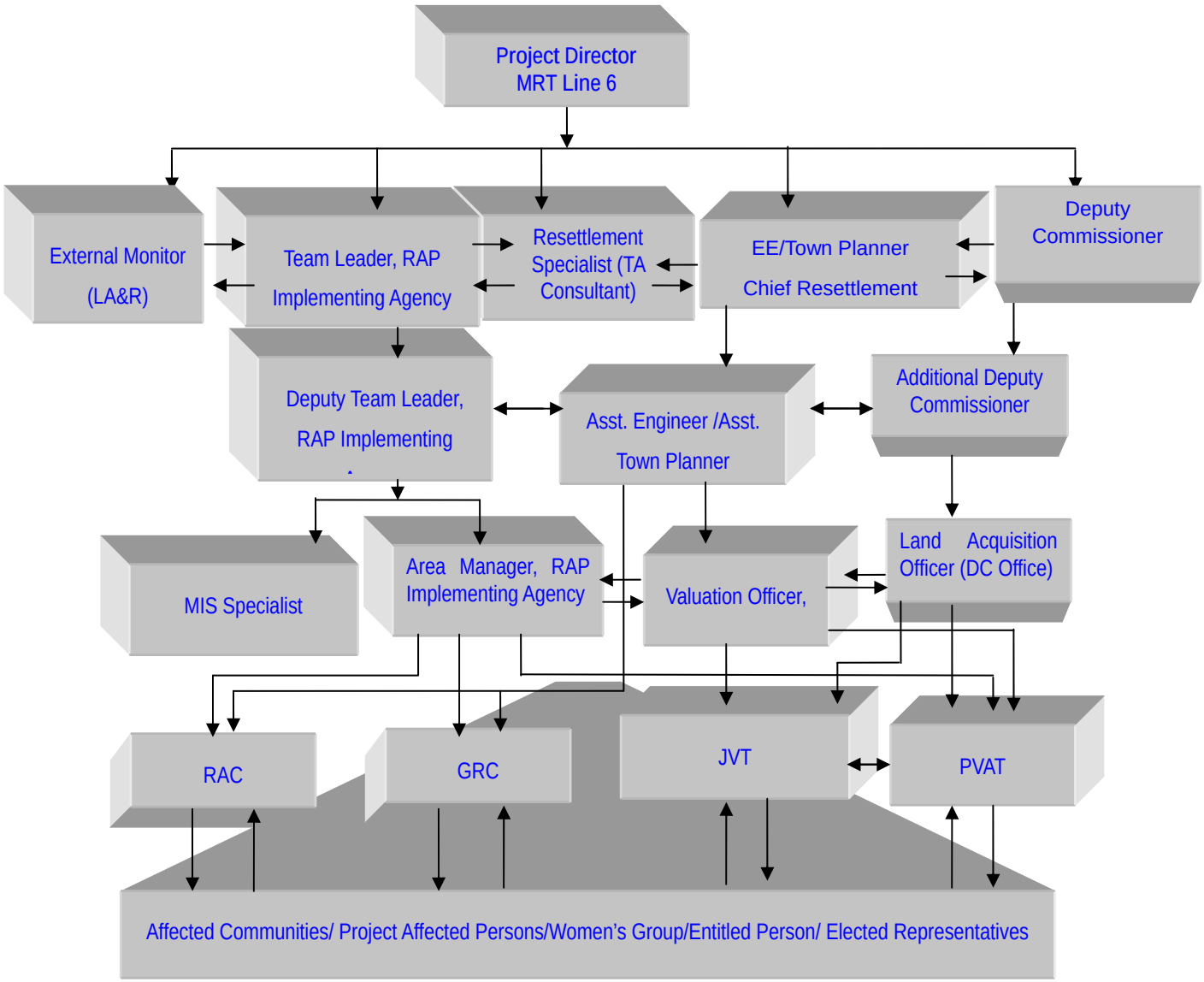


Figure 2-3 Institutional Relevancy on administration and Management

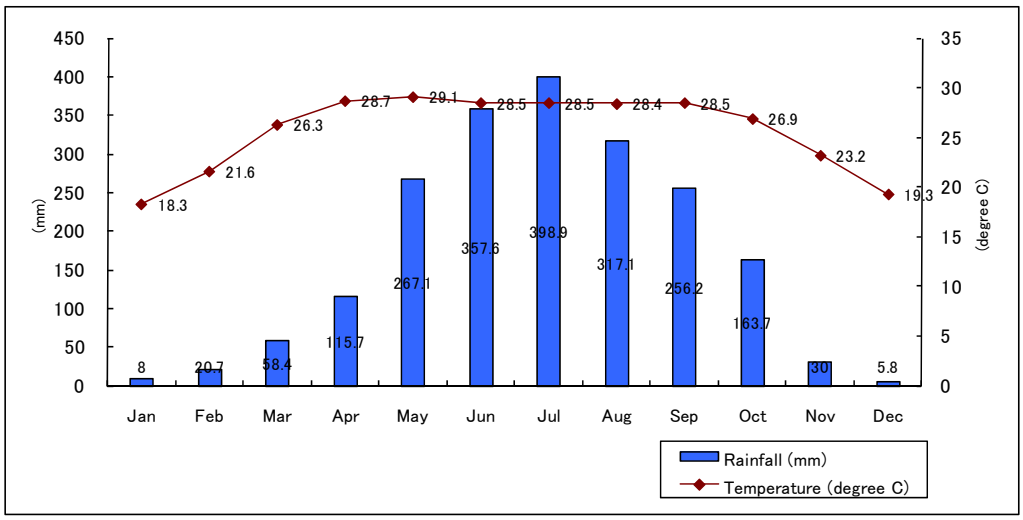
CHAPTER 3

EXISTING ENVIRONMENT OF THE PROJECT AREA

3.1 NATURAL CHARACTERISTIC

3.1.1 Climate and Temperature

Under the Koppen climate classification, Dhaka has a tropical monsoon climate with an annual average temperature of 25 degrees Celsius and rainfall of about 2,000 mm. The climate is divided into hot and rainy period from May to October, cool and dry period from November to February, and hot and dry period from March to April. About 80% of the annual rainfall occurs between May and September.



Source: http://www.worldclimate.com/

Figure 3-1 Monthly Average Rainfall and Temperature of Dhaka

3.1.2 Topography and Geology

Dhaka is located in the southern tip of Madhupur tract (Pleistocene terrace). Two characteristic geological units of Madhupur Clay of the Pleistocene times and alluvial deposits cover the Dhaka city and surroundings. The Madhupur Clay is the oldest sediment exposed in and around the city area having characteristic topography and drainage. The major geomorphic units of the city are the high land or the Dhaka terrace, the low lands or floodplains, and depressions and abandoned channels.

Low lying swamps and marshes located in and around the city are other major topographic features. The elevation of DCC area varies from 2 to 13 meters above the mean sea level. The most of the developed areas including the proposed project site are at an elevation of 6 to 8 meters above the mean sea level.

The subsurface sedimentary sequence, up to the explored depth of 300 meters, shows three distinct entities. One entity is the Madhupur Clay characterized by reddish plastic clay with silt and very fine sand particles. This Madhupur Clay unconformably overlies the Dupi Tila formation of the Plio-Pleistocene times, composed of medium to coarse yellowish brown sand and occasional gravel.

The Madhupur Clay and Dupi Tila formation generally are from surface to 10 meters and from 10 to 50 meters below grand respectively. The bearing stratum with soil bearing capacity N=50 is located in 18 to 20 meters below grand. The incised channels and depressions in the city are floored by alluvial floodplain deposits and are further subdivided into lowland alluvium and highland alluvium.

The city area does not show any surface folding. However, a large number of faults and lineaments have N-S, E-W. NE-SW and NW-SE trends recognized from air photo interpretation and the nature of the stream courses. All four sides of the city are bounded by major faults.

The city is surrounded by four major river systems. The south of Dhaka city is surrounded by the Buriganga River. The western part of Dhaka is bounded by the Truag River which is connected by a small Tongi Khal on the north. The eastern part of Dhaka is bounded by the Balu River which is also hydrologically connected with Tongi Khal.

The Dupi Tila sand aquifer is the main source of water in Dhaka city. Madhupur Clay overlies the aquifer with a thickness of 8 to 45 meters (averages 10 meters). The aquifer varies in thickness from 100 to 200 meters (averages 140 meters). Groundwater occurs at a depth of 25 to 30 meters in the central part of the city. In the surrounding areas, the groundwater table lies at a depth of 15 to 20 meters. Rivers in and around the city act as the main sources of recharge of the aquifer along the riverbeds. Other sources of recharge are vertical percolation of rain and flood water, and leakage from water supply and sewer system of the city.

3.1.3 Air Quality

The main air pollutants in Dhaka are Nitrogen Oxides (NOx), Sulfur Dioxide (SO2), Particulate Matter (PM, usually expressed as PM with diameter of 10 microns or smaller: PM10, or 2.5 microns or smaller: PM2.5), Carbon Monoxide (CO), Ozone, Volatile Organic Compounds (VOCs), and Lead. The motor vehicles and traditional brick kilns contribute predominantly to the air pollution.

The motor vehicles are major source of PM pollution that contributes to the risk of developing cardiovascular and respiratory diseases, as well as lung cancer. Most of the PM pollution (> 80%) comes from the diesel-run vehicles. Hundreds of brick kilns operate during the dry season from November to April in the low agricultural land surrounding Dhaka city and generate smoke dust including SO2, NOx and hydrocarbons that contribute to worsening the ambient air

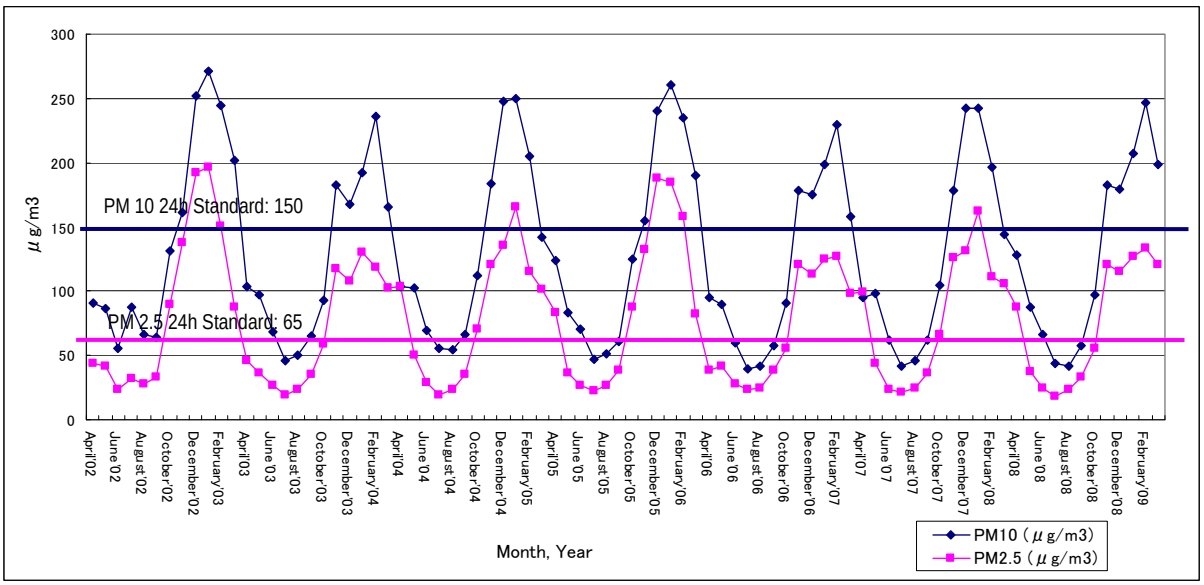
and damage of public health.

Dhaka has grown rapidly in motorization in recent years. The total number of registered vehicles in Bangladesh has increased from 0.07 million in 1970 to 0.53 million in 2009. Dhaka has more than 3,000 old minibuses which run on diesel fuel. 80% of these buses are unfit to roll over on the city roads because of their high emissions. Even though aging trucks are not allowed to run into Dhaka city during day time, the trucks contribute significantly to worsening Dhaka's air particularly during the dry winter months.

Despite the phasing out of two-stroke three wheeler baby taxis in 2003, the air quality benefit could not be sustained because of a great number of smoky diesel vehicles. Dhaka has witnessed a tremendous growth of Compressed Natural Gas (CNG)-run vehicles in the recent years. A sizeable number of gasoline-run vehicles have been converted to CNG vehicles. The refitted engines which run on the dual fuel are posing a real threat to the already polluted city's air, and the safety and security of commuters.

Emission inventory of mobile sources in Dhaka show that contributions of different vehicles dominate specific types of pollutants. Petrol-fueled light-duty vehicles and auto-rickshaws contribute to most of CO, while diesel-fueled buses and trucks contribute to most of NOx. Two and three-wheeled auto-rickshaws contribute to about half of hydrocarbon emission. PM emission comes mostly from diesel buses and trucks (45%), and auto-rickshaws (40%). According to a study conducted by the Bangladesh Atomic Energy Commission, approximately 55% of the PM10 are attributed to suspended soil and motor vehicle (31%), and PM2.5 is mostly attributed to motor vehicles (29%) and natural gas/ diesel burning (46%).

The average levels of PM10, NOx and SO2 has been increasing since 1990's. However, the annual average levels of NOx and SO2 are 40~60 μg/m3 and 15~20 μg/m3 respectively, and remained below Bangladesh national ambient air quality standards (NOx: 100 μg/m3, SO2: 80 μg/m3) in from 2002 to 2007. The most serious pollutant from the health point of view in Dhaka is Particulate Matter (PM). The PM10 and PM2.5 levels continue to exceed Bangladesh national ambient air quality standards (PM10: 24 hours 150 μg/m3 and annual 50 μg/m3, PM2.5: 24 hours 65 μg/m3 and annual 15 μg/m3) especially during the dry winter months which last about100 days per year.



Source: Department of Environment

Figure 3-2 Monthly Average Level of PM10 and PM2.5 in Dhaka City

Under JICA Study Team, air quality analyses were surveyed at three locations along the proposed MRT Line site in October, 2010 (see **Figure 3.3**). The NOx levels in central and southern Dhaka area exceeded the standard value. The other surveyed levels were less than the standard values.

Table 3-1 Result of Air Quality Analysis in the Project Site

No.	Location & Date	Ambient Air Pollutants Concentration (micro gram/m3)				
		PM10	PM2.5	SO2	NOx	Pb
1	Pallabi along Begum Rokeya Sarani (Oct. 19, 2010)	124.17	54.21	5.68	76.90	0.1823
2	South side of Farmgate along Airport Road (Oct. 20, 2010)	107.22	59.52	17.15	126.08	0.1916
3	South side of Banga Bhaban along Folder Street (Oct. 26, 2010)	141.60	61.39	8.44	142.45	0.2420
Duration (hour)		24	24	24	24	24
Bangladesh Ambient Air Quality Standard		150 (24-hour)	65 (24-hour)	365 (24-hour)	100 (Annual)	0.5 (Annual)

Source: JICA Study Team

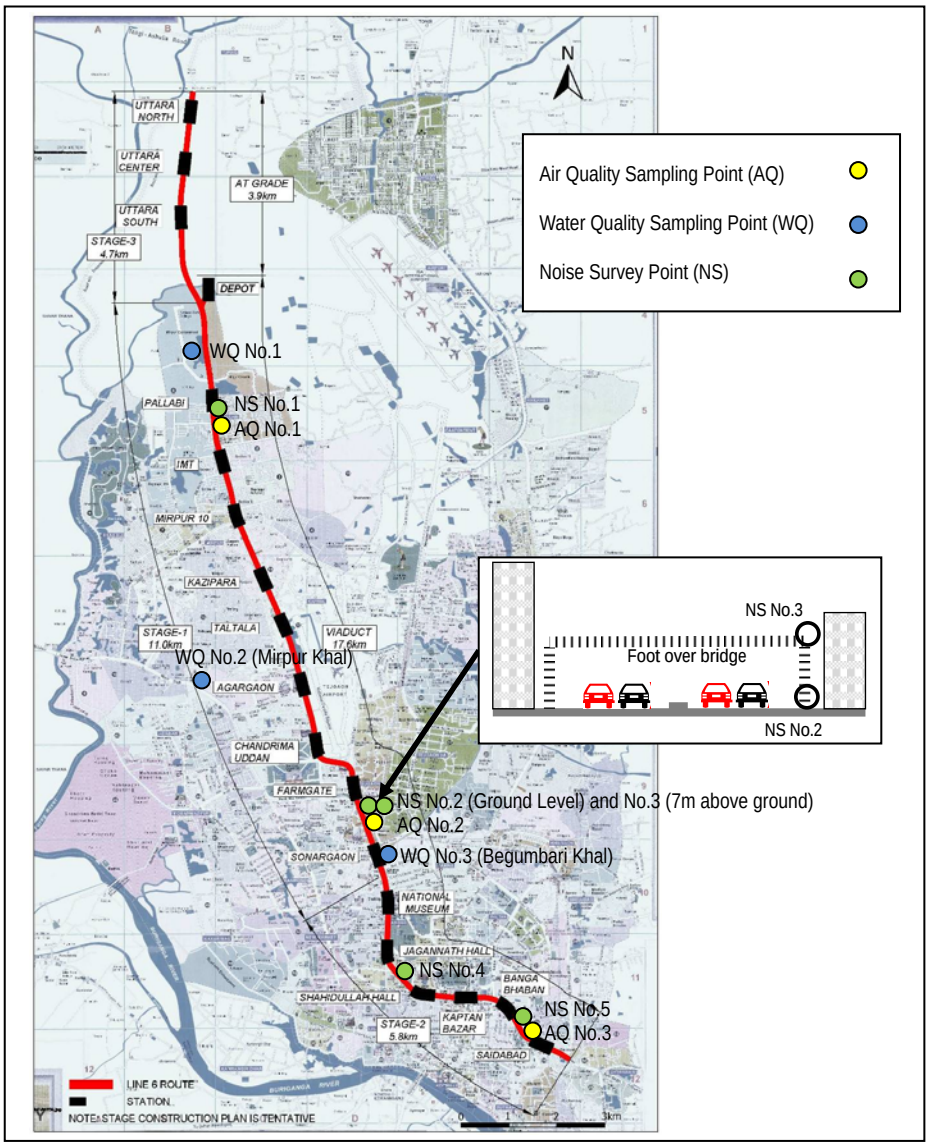


Figure 3-3 Location of Sampling and Survey Points

3.1.4 Water Quality

Dhaka is surrounded by rivers and inter-connected canals which have formed a life-line for city residents. In the last twenty years, migration from rural to urban area, earth filling of the rivers, unregulated industrial expansion, overloaded infrastructure, confusion about institutional responsibility for quality of the water bodies and ineffective enforcement of environmental regulations have caused serious water pollution on the surface water.

There is only one sewage treatment plant at Pagla which is currently operating below the capacity because of the sewerage system failures, and few factories operating effluent treatment systems in DMA. Almost all waste from the residents, industry and millions of farm animals, pesticides and fertilizers are dumped into Dhaka's surface water. These wastes infiltrate to the ground and pollute the groundwater.

Dhaka surface water is very poor condition, especially in the dry season. For some six months of a year, the flow rate of the rivers is negligible or often only a tidal pulse, but the volume of effluent flowing into the canal and river system remains about the same as during the wet season. Consequently, dilution of the contaminants is drastically reduced in the dry season.

From a viewpoint of Biochemical Oxygen Demand (BOD) and Ammonia levels, the most polluted water bodies are the Buriganga and Sitalakhya Rivers, Tongi Khal and the canal system in Dhaka East, where very low devolved oxygen levels that are 1.5~4 mg/l reflect contamination caused by organic waste, domestic sewage and chemical residues from factories. These water bodies are biologically dead during the dry season.

The high levels of BOD (Standard 6 mg/l) that are 10~30 mg/l in the Buriganga and Sitalakhya Rivers reflect mainly the high density of discharging untreated industrial wastewater into the rivers. Some tidal backflow of relatively clean water from the Meghna and Dhaleswari Rivers results in dilution of contaminants in the southern reaches of both the Buriganga and Sitalakhya Rivers, but the extent of this positive effect is limited.

The very high ammonia levels, particularly in the canal system in Dhaka East, the Balu River and the southern reaches of the Buriganga River, reflect the discharge of sewage into these waterways. Ammonia in Dhaka East area increases from about 0.3 mg/l in October to greater than 20 mg/l in March-April, which is twenty times higher than the national environmental quality standard (1.2 mg/l) for ammonia in surface water.

Under JICA Study, water quality analyses of three water bodies along the proposed MRT Line 6 were surveyed on 2nd October, 2010 and 12th December, (see **Figure 3.3**). The surveyed pH values at different three points met the environmental standard. The channel and drain in the urban area were severely polluted by organic matters. The surveyed total coliform values that indicate contamination by domestic wastewater far exceeded the standard value at all locations.

Table 3-2 Result of Water Quality Analysis along the Project Site

No.	Location	Date	pH	Dissolved Oxygen (DO) ppm	Chemical Oxygen Demand (COD) ppm	Total Suspended Solid (TSS) g/l	Total Coliform number/100
1	Pond in Northern Pallabi	2 Oct.	7.5	5.8	45.6	288	500,000
2	Mirpur Khal	2 Oct.	7.3	0.6	164.0	636.4	500,000
3	Begunbari Drain	2 Oct.	7.6	1.4	141.6	502.1	1,100,000
1	Pond in Northern Pallabi	12 Dec.	7.6	7.2	64	149	1,000
2	Mirpur Khal	12 Dec.	7.7	Under DL*	480	392	910,000
3	Begunbari Drain	12 Dec.	7.7	Under DL*	448	367	960,000
Bangladesh Standard for Inland Surface Water Quality (Water usable by various process)			6.5-8.5	5 or more	Not yet set	Not yet set	5,000 or less

Source: JICA Study Team DL*: Detection Limit

3.1.5 Fauna and Flora

Because Dhaka city has urbanized well, there are few natural forest areas in DMA. Significant natural forest areas exist only in the limited northern part of RAJUK area. However, the vegetation of Dhaka city has a variety of indigenous and exotic species especially in parks and gardens. Approximately 310 hectares in DMA accommodate parks and gardens. It is estimated that there are nearly 41-46 parks/gardens such as Osmani Uddyan, Bahadur Shah Park, National Botanical Garden, Zia Uddyan (Garden), Baldha Garden, Suhrawardi Uddyan, Ramna Park. Baldha garden and National Botanical Garden have a wide variety of plants and trees.

Besides local species, many exotic species were planted along the roadside, old secretariat area and in residential bungalows for the beautification of the city during 1905-06 when Dhaka was the capital of East Bengal and Assam. About 50 species were then planted, of which Aswath (*Ficus religiosa*), Debdaru (*Polyalthia longifolia*), Narikel (*Cocos nucifera*), Ashok (*Saraca indica*), Mahogany (*Swietenia sp.*), Shegun (*Tectona grandis*), Sissu (*Dalbergia sissoo*) were very common.

Many areas (Mirpur, Dhanmondi, Mohammadpur etc.) of DMA had been covered by natural vegetation during the earlier days. With increased population, industrial and commercial establishments, and construction of roads and highways, most of the vegetation have been cleared over the years. The Modhupur green area had been a habitat for many animals particularly elephants, tigers, leopards, boars, deer and buffaloes till the beginning of the nineteenth century. Monkeys had also been found in abundance till the mid-nineteenth century. Foxes, jackals, squirrels and otters have almost disappeared. Bats and rats are still seen sometimes within the city area. A large number of bird species were common in Dhaka, particularly pigeons, doves, kingfishers, parrots, jungle fowl, common pea-fowl, kite, fishing

eagle, vulture etc. But many of these are now extinct and the rest are rapidly disappearing. One good point is that a large number of migratory birds are found in Dhaka (especially in the lake of the National Zoo) in winter. Various species including ducks, seagull, falcons, harriers, plovers, curlews and sandpipers are seen there during winter.

Many types of poisonous snakes and non-poisonous snakes were very common till 1960s. A few species including Cobra may still be found. The number of amphibians and fishes has gone down in the last few years.

In Ramna Park and its surrounding areas beside Minto Road, kingfishers were seen even during 1997-1998 which have almost disappeared. Some monkeys and mongoose were seen in old Dhaka even in the early 60s but their numbers have decreased considerably. They are almost out of sight now a day. The biodiversity of fish species has been reduced severely due to pollution of surface water. The land ecosystem is also threatened with rapid and unplanned urbanization.

The proposed project site from Uttara North to Pallabi is not built-up area and will be developed as new town in the near future. Most of the area is grassland in dry period or pools in rainy period. Because water flow from the outer rivers is blocked by artificial banks in the area, the hydrological condition has not been a natural pattern. Rare and precious species of fauna and flora in accordance with Red Data Book in Bangladesh was surveyed in and around the project site in October, 2010. The rare and precious species were not identified in this survey.

There are well-grown roadside trees along the existing roads proposed construction of MRT Line 6 especially in the southern section, which create the good scenery and shaded areas for rest. Most center strips of the roads have been planted a lot of trees. The main tree species and number with height over five meters in the center strips were surveyed along the proposed MRT line 6 site in October, 2010. Debdaru or Indian Mast Tree (Polyalthia longifolia) and Eucaliptus or Lemon Scented Gum (Eucalyptus citriodora) are main roadside trees in the project site. Moreover, Benjamin's Fig is popular as shrubbery spices on the center strips.

Table 3-3 Result of Roadside Tree Survey in the Project Site

Local Name	Scientific Name	No. of Species			
		Uttara North to Pallabi	Pallabi to Kazipara	Kazipara to Sonargaon	Sonargaon to Saidabad
Mahogani	*Swietenia mahogani*	63	19		4
Debdaru	*Polyalthia longifolia*		1	110	6
Krisnachura	*Delonix regia*		2	9	
Koroi	*Albizia lebbeck*		2	3	7
Bat	*Ficus benghalensis*		2	4	5
Bokul	*Mimusops elengi*			6	2
Hartaki	*Terminalia chebula*			3	
Shishu	*Dalbergia sissoo*			1	1

Eucaliptus	*Eucalyptus citriodora*	1	247	192	
Boroi	*Zizyphus mauritiana*			3	
Neem	*Azadirachta indica*			1	4
Kadom	*Anthocephalus cadamba*			1	
Akashmoni	*Acacia auriculiformis*			1	2
Konok Chapa	-			5	
Jam	*Syzygium cuminii*			9	
Peara	*Psidium guava*			1	
Khejur	*Phoenix Sylvestris*			1	
Kathal	*Artocarpus heterophyllus*			2	
Palm	*Borasus flabellifer*				1
Aam	*Mangifera indica*				
Kath Badam	*Terminalia catappa*				1

Source: JICA Study Team

3.1.6 Noise and Vibration

Level of noise in Dhaka city is now a major concern for the general people because it has exceeded the tolerance level. According to WHO survey at 45 locations of Dhaka city, most of the traffic points and many of the industrial, residential, commercial, silent and mixed areas are suffering noises exceeding the standard limits of Bangladesh.

WHO found noise levels of 70 dB in Dhaka Medical College, 75 dB in Shakhari Patti, 90 dB in English Road, 88 dB in Rajuk avenue and 85 dB in Tejgaon, though the standard limit for those area are 50, 55, 60, 70 and 75 dB respectively. These are mainly due to vehicular horns and movement, loudspeakers from processions and meetings, high volume of audio players from roadside small business enterprises and others.

The noise scenarios, in fact, show an extreme threat to human health, especially for elderly people and children. Moreover, the traffic personnel, rickshaw pullers, open vehicle drivers, road side workers, small scale business enterprise workers etc are exposed for long-term noise pollution which might cause severe mental and physical health problems. Nearly 0.5 million of motor vehicles and over 0.4 millions of non-motorized vehicles are plying the roads and streets of the city.

These vehicles on limited road surface cause extreme traffic congesting, especially near the bus terminals and bus stops. Many of the major roads, lanes and by-lanes remain damaged all year around, which causes collision of vehicles and high levels of noise.

Under JICA Study Team, noise surveys were conducted at five locations along the proposed MRT Line 6 on 26th - 29th October, 2010 (see **Table 3-4**). The most of the project site run through mix and commercial area. The surveyed noise levels far exceeded the standard values at all locations and times.

Table 3-4 Result of Noise Survey in the Project Site

No.	Location		Noise Level (Equivalent sound level in dB)	
			Day (6.00 ~ 21.00)	Night (21.00 ~ 6.00)
1	Pallabi Near to Police Station, Mirpur:		83	78
2	South Side of Farmgate on ground level, Farmgate:		90	85
3	South Side of Farmgate on foot over bridge (7m above ground), Farmgate: :		89	85
4	South Side of Bangla Academy along Sir Sayed Road:		76	68
5	South Side of Banga Bhaban along Folder Street:		91	89
Bangladesh Standards for Noise (Day time : 06.00 to 21.00) (Nigh time : 21.00 to 06.00)		Silent Zone	45	35
		Residential Area	50	40
		Mixed Area	60	50
		Commercial Area	70	60
		Industrial Area	75	70

Source: JICA Study Team

3.1.7 Natural Reserve

There are no nature reserves such as national park or wildlife sanctuary in RAJUK area. Two botanical gardens as natural classified area exist in DMA and are managed by forest department.

National Botanical Garden, which is located in Mirpur, covers around 84 hectares of land with approximate 50,000 species of trees, herbs, and shrubs including a large collection of aquatic plants. Baldha garden with about 136 meters in length and 76 meters in width is located near by the proposed Saidabad station and holds around 15,000 plants representing 672 species. Many of the species at Baldha garden were collected from over 50 different countries.

3.2 SOCIAL AND CULTURAL CHARACTERISTIC

3.2.1 Current Land-use

Land-use

In order to understand general characteristics of land use pattern in Dhaka Metropolitan area, the Study Area is divided into six geographic zones as follows:

1) DCC and Inner City Zone

   Most of the areas in this zone are already urbanized and urban services are provided by DCC and also other organizations. Approximate 65% of the land is already built up and the remaining is a part of open space, park, unclassified/restricted area and water body.

2) DMA Fringe Zone

   This zone is outside of DCC but within the boundary of the Turag and Balu rivers. Approximate 35% of the land is urbanized and other areas are mostly occupied by low lying land with agriculture ponds or open spaces. Recently, some areas have been undertaken the

land reclamation to develop housing by private developers.

3) RAJUK Northern Zone

Most of the areas in this zone are high land. The high land along the Dhaka-Mymenshing corridor enhances the development of industry. Approximate 45% of the areas in this zone has already developed the remaining is a used as cultivated agricultural/open space/forest.

4) RAJUK Southern Zone

This zone is mainly low lying and flood propone area. Some 37% of the land has been built up, 44% of the area belongs to the open space/forest/cultivable land. Approximate 16% belongs to char/island/swamp/marshy land.

5) RAJUK Eastern Zone

It is agriculture predominant area. Approximate 32% of the land is built up area and 61% of total land belongs to the cultivated land/open space/forest. Government initiated housing project here and some private developer follow the Government.

6) RAJUK Western Zone

Only 35% of the land is built up and another 53% of the land is agriculture and/or flood prone area and road network is very poor.

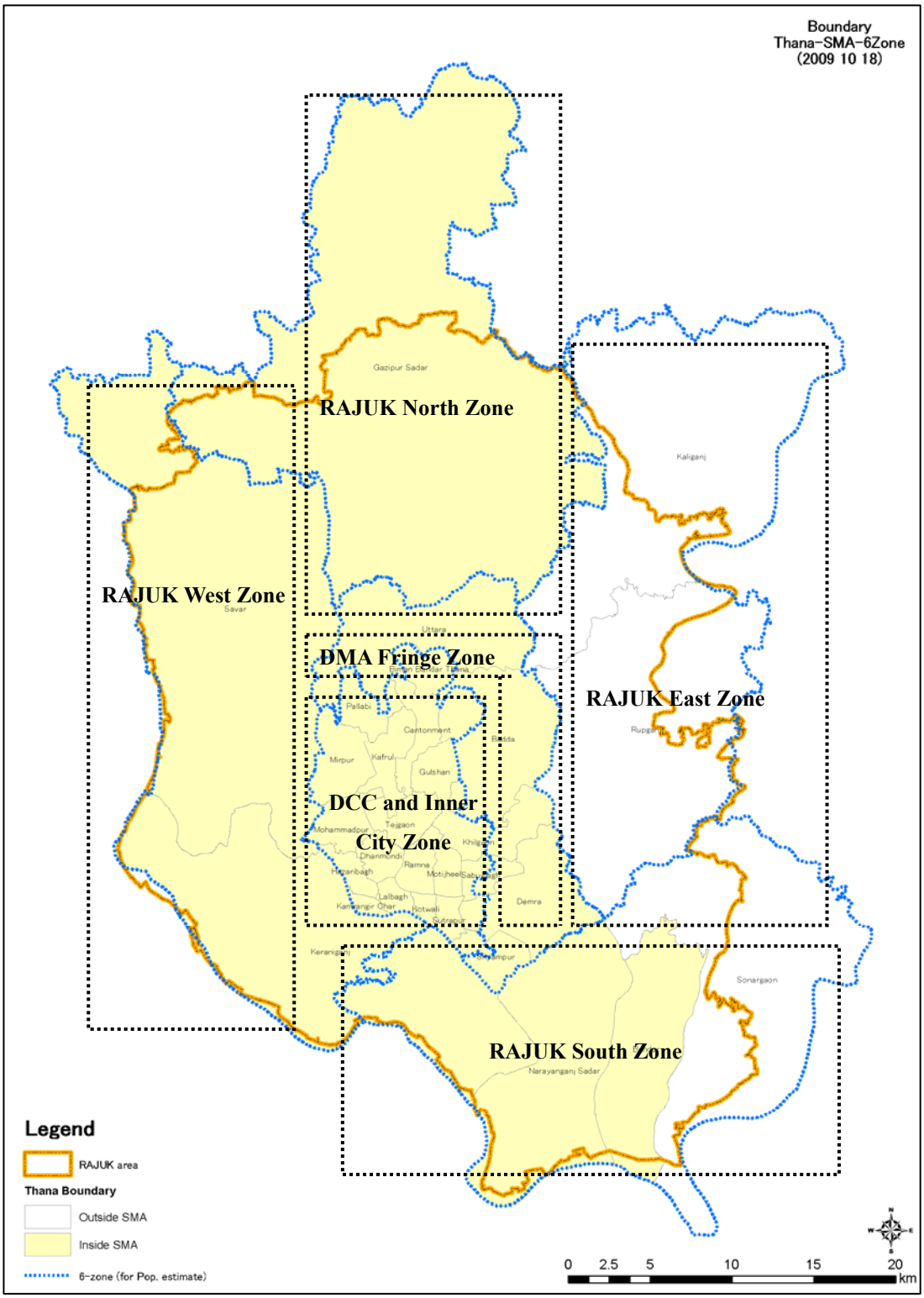


Figure 3-4 Land Use by Zone

3.2.2 Cultural Heritage

Locations of archaeological, historical and cultural importance are indicated in **Figure 3-5**. None of those will be affected due to the Project.

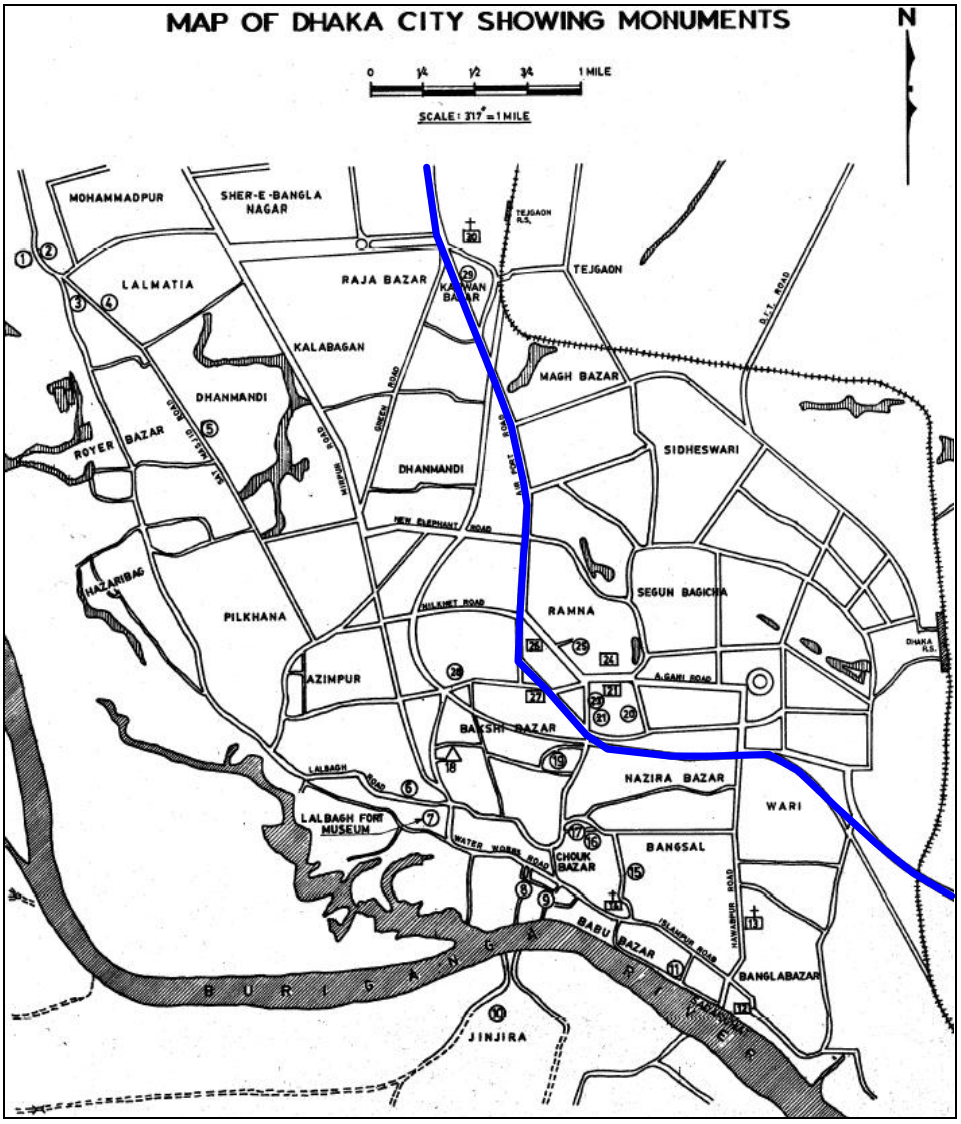


Figure 3-5 Location of Archeological and Historical Importance

List of Monuments

1. Sat Gambus Mosque
2. Unknown Tomb near Sat Gumbas Mosque
3. Alakuris Mosque
4. Dara Begum's Tomb
5. Old Eidgah
6. Khan Muhammad Mridha's Mosque
7. Lalbag Fort
8. Bara Katra
9. Chhoto Katra
10. Kadamtali Circle
11. Ahsan Manzil
12. Northbrooke Hall
13. St. Mary's Cathedral
14. The American Church
15. Sitara Mosque
16. Baoli
17. Kartalab Khan's
18. Dhakeswari Temple
19. Husaini Dalan
20. Fazlul Haq Hall
21. Curzon Hall
22. Dhaka City Corporation
23. Musa Khan Mosque
24. Greek Memorial
25. Tomb and Mosques of Hazi Khwaja Shahbazb
26. Salimullah Hall
27. Dara Begum's Tomb
28. BUET
29. Khwaja Ambar's Mosque
30. St. Augustin Church

3.2.3 Social Environmental Impacts Survey

Considering a result of scoping, the census and a socio-economic survey was carried out in September – November 2010 to provide required details of tentative PAPs to further assess the magnitude likely impacts and to identify measures for mitigation of adverse Impacts. The survey includes;

1. Full census of anticipated households and physical units (shops and tenants);
2. Full socio-economic survey of anticipated PAPs;
3. Surveys for valuation of land and other assets;
4. Photos of affected assets; and
5. Local stakeholder meetings by Thana along the MRT Line 6.

The survey identifies the households, commercial and business enterprises, common property and other facilities those locating within the Corridor of Impact of the project as per attached

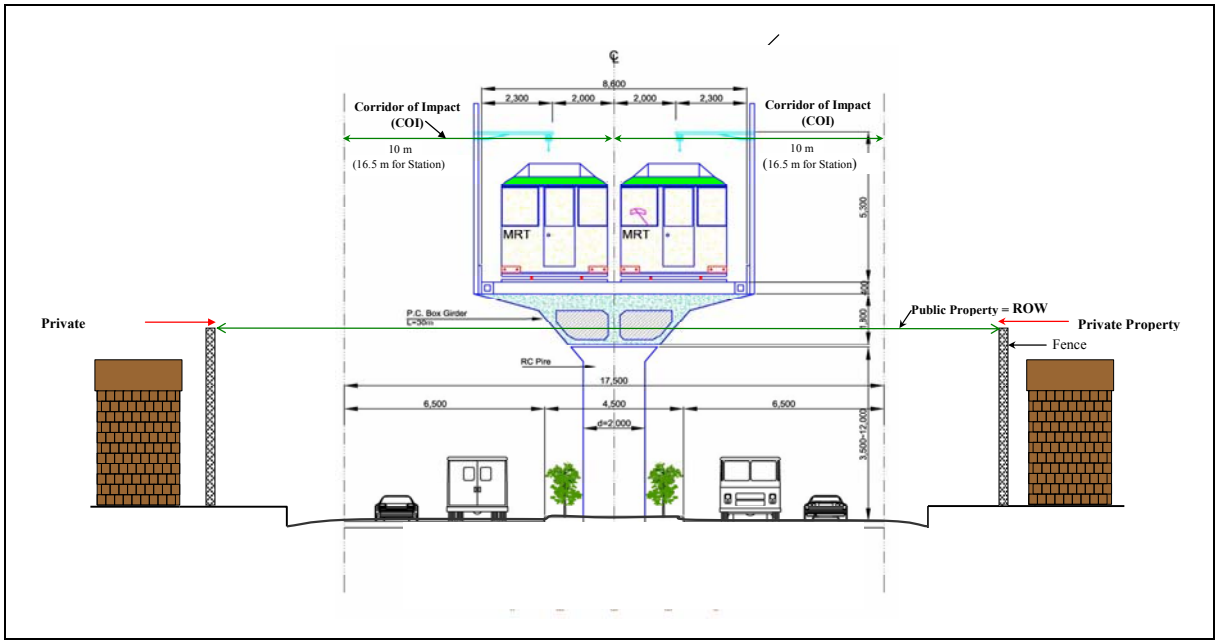


Figure 3-6 Corridor of Impact on MRT Line 6

3.2.3.1 Project Affected Households (PAHs) and Population by Sex and Age Group

Table 3-5 has shown the total number of PAHs including the temporary shopkeepers on government land as 250. And all of them are within the total area of 0.28 hectare of land

in 9 different locations where the MRT alignment/stations are expected to be constructed; **Table 3-5** deals with the sex and age distribution of all the 250 PAHs.

Table 3-5 Total Number of Project Affected Households by Sex and Age Group

Variables		Number of PAHs by Stations (locations)									Total
		Pallabi	IMT	Mirpur-10	Kazipara	Farmgate	Shahidullah Hall	Kaptan Bazar	Banga vaban	Saidabad	
Sex	Male	33	28	2	0	5	57	33	67	20	245
	Female	0	0	0	0	0	4	0	1	0	5
Age groups	Upto-29	5	9	1	0	0	4	12	11	3	45
	30-44	16	13	0	0	2	32	14	43	9	129
	45-59	8	4	0	0	0	20	7	11	7	57
	60 & Above	4	2	1	0	3	5	0	3	1	19
	Total	33	28	2	0	5	61	33	68	20	250

Source: Census & Socioeconomic Survey, October-November 2010

As regard the sex of PAHs, only 5 (2%) of 250 were female and all of them will be given some extra financial benefits beyond compensations. For location wise concentration of affented families, the highest number was in Bangabhaban area (27.2%) followed by Shahidullah Hall area (24.4%). The 3rd and 4th highest were enumerated at Pallabi (14%) and Kaptan Bazar (13.2%) respectably. As regard the of 250 PAHs, 66.4 percent may be termed as young (below 45 years) and at other end 7.6 percent may be termed as old (above 59 years).

Each of all the 250 represent a family and total of family members was enumerated at 1,392 implying an average family size of 5.57.

Table 3-6 deals with the sex and age distribution of these 1,392 persons.

Table 3-6 Total Number of Affected Population by Sex and Age Group

Variables		Stations (locations) wise Population									Total
		Pallabi	IMT	Mirpur -10	Kazi para	Farmgate	Shahi dullah Hall	Kaptan Bazar	Banga vaban	Saidabad	
Sex	Male	79	77	7	0	15	182	103	231	60	754
	Female	73	67	7	0	11	155	81	193	51	638
Age groups	Upto-14	44	49	4	0	7	81	58	110	25	378
	15-29	46	46	5	0	3	89	53	126	28	396
	30-44	33	26	1	0	9	87	35	104	28	323
	45-59	16	16	2	0	1	46	25	37	19	162
	60 and Above	13	7	2	0	6	34	13	47	11	133
Total		152	144	14	0	26	337	184	424	111	1392

Source: Census & Socioeconomic Survey, October-November 2010

Of the total population 1,392, the distribution between male and female were 54.17 and 45.83 percent respectively. The age groups of up to 14 years and above 59 years shared 27.16 and 9.55 percent of the total population. The highest concentration of population was in the age group of 15-29 years, 28.45 percent.

3.2.3.2 Number of PAHs and PAPs by Religion

As regard Ethnicity, the issue is not applicable for the 250 PAHs of different locations within the Dhaka City. As regard the Gender of the family heads, only 2.50 percent (5 PAHs out of 250) were female headed. Again of the total family members 1,392 of 250 families, nearly 46 percent were female. **Table 3-7** deals with the religion of these 250 families.

Table 3-7 Number of PAHs and PAPs by Religion

Variables	Number of PAHs and PAPs by Station (Location)									Total
	Pallabi	IMT	Mirpur-10	Kazipara	Farmgate	Shahidullah Hall	Kaptan Bazar	Banga vaban	Saidabad	
Moslem PAHs	10	28	2	0	5	59	33	64	20	221
Moslem Population	37	144	14	0	26	326	184	405	111	1247
Hindu PAHs	23					2		4		29
Hindu Population	115					11		19		145

Source: Census & Socioeconomic Survey, October-November 2010

Of the total 250 families, only 29 (11.9%) were of Hindu religion and the rest 221(88.4%) were Moslem. The average family sizes of these two groups were 5.00 and 5.54 respectively.

3.2.3.3 Marital Status, Literacy Levels and Occupations of PAHs

Of the total family heads 250, only 15 (6%) were unmarried implying that the 235 (94%) were married. Table 3.8 deals with the marital and literacy status of the 250 PAHs.

Table 3-8 Marital Status and Literacy Levels of the PAHs

Variables		Number of PAHs by Station (Location)									Total
		Pallabi	IMT	Mirpur-10	Kazipara	Farmgate	Shahidullah Hall	Kaptan Bazar	Banga vaban	Saidabad	
Marital Status	Married	33	27	2	0	5	59	29	64	16	235
	Unmarried	0	1	0	0	0	2	4	4	4	15
Literacy Levees	Illiterate	3	0	0	0	0	5	1	1	0	10
	I-v	9	18	1	0	0	8	19	18	7	80
	vi-x	18	8	1	0	0	13	7	13	8	68
	SSC & HSC	3	2	0	0	1	18	5	31	5	65
	Graduate	0	0	0	0	3	9	1	5	0	18
	Above graduate	0	0	0	0	1	8	0	0	0	9
	Total	33	28	2	0	5	61	33	68	20	250

Source: Census & Socioeconomic Survey, October-November 2010

Of the total 250 family heads, only 10 (4%) were illiterate and 9(3.6%) were above graduate. If SSC and above are considered as the effective literates, their number was 92 i,e 36.5 percent of the total. The 3rd issue of the **Item 3.2.3.3** is principal occupation of the 250 family heads and **Table 3-9** below deals with this.

Table 3-9 Current Activity Status (Occupations) of the PAHs

Activities	Number of PAHs by Station (Location)									Total
	Pallabi	IMT	Mirpur -10	Kazipara	Farmgate	Shahidullah Hall	Kaptan Bazar	Banga vaban	Saidabad	
Business	18	28	2	0	4	52	33	67	19	223
Service	7	0	0	0	1	2	0	0	1	11
Household work	1	0	0	0	0	2	0	0	0	3
Labor	3	0	0	0	0	1	0	0	0	4
Rickshaw/Vanpullar/Mistry	3	0	0	0	0	2	0	0	0	5
Retired/ old age/Jobless	2	0	0	0	0	1	0	1	0	4
Others	34	28	2	0	5	60	33	68	20	250
Total	35	28	2	8	5	61	33	68	21	261

Source: Census & Socioeconomic survey, October-November-2010

Of the 250 total family heads, 223 (89.2%) claimed their principal occupation as business followed by service, 4 percent. Three of the 5 female PAHs mentioned their occupation as Household works and another 4 family heads termed themselves as old.

No seasonal worker was found in the surveyed area.

3.2.3.4 Income and Poverty Dimensions of PAHs

Total annual income, as said by the 250 family heads was Tk. 126.63 million implying the average income per household equal to Tk. 4,85,175. **Table 3-10** deals with the distribution of the 250 families in relation to income of the household.

Table 3-10 Income Distribution of the PAHs (Annual Income in Taka)

Income groups (Tk.)	Stations (locations) wise Number of Householders									Total
	Pallabi	IMT	Mirpur-10	Kazipara	Farmgate	Shahidullah Hall	Kaptan Bazar	Banga vaban	Saidabad	
Up to 60,000	8	4	0	0	0	3	5	2	0	22
60,001 to 1,00,000	8	7	0	0	0	1	5	5	2	28
100,001-2,00,000	11	14	1	0	1	7	19	14	5	72
2,00,001-3,00,000	3	3	1	0	0	6	4	5	4	26
3,00,001-5,00,000	0	0	0	0	1	15	0	8	7	31
5,00,001-7,00,000	2	0	0	0	0	5	0	16	1	24
Above-7,00,000	1	0	0	0	3	24	0	18	1	47
Total	33	28	2	0	5	61	33	68	20	250

Source: Census & Socioeconomic Survey, October-November-2010

From the household income distribution, 22(8.8%) may be termed as poor. If the upper limit of income poor is extended to Tk. 1,00,000 from Tk. 60,000, number of poor families will be 50(20%) of the total affected families.

3.2.4 Social Impacts Survey

In order to clarify social impacts of implementation of MRT Line 6 project, the social impact survey was carried out in this study. This summary is consists of the followings;

a) Bus owner interview survey
b) Bus driver interview survey
c) Rickshaw owner interview survey
d) CNG (Auto Rickshaw) driver interview survey

e) User's opinion interview survey

The results of each survey are presented below:

3.2.4.1 BUS OWNER INTERVIEW SURVEY

(1) Objectives of the Survey

Bus transport in Dhaka is only trunk transportation system of the public transport system. When MRT Line 6 will be completed, the bus transport system along UTTARA Phase-3 – Saidabad corridor will be competition with MRT Line 6.

In the Phase 1 Study, social and traffic survey of bus transport survey were conducted. Based on such surveys carried out in the Phase 1 Study, some selected Bus Owner Interview Survey is implemented that bus companies having competitive route with MRT Line 6 are targeted to carry out the survey.

(2) Bus Owner to be Interviewed

Bus routes are identified through spatial analysis, those which are competitive to MRT Line 6 alignment. Total competitive bus routes are 76 in numbers and these bus routes are owned by different companies. Out of 76 companies, who are more or less affected by MRT Line 6, JICA Study Team selected 34 bus owner companies to be interviewed.

(3) Results of the Survey

1) Bus Owning Year

Targeted bus owners were all private company operators. The companies operate the business ranges from 2 to 36 years and their distribution is shown in **Table 3.2.4-1**.

Table 3.2.4-1 Bus Owning Year

Business Year	Number
Below 10	22
11-20	1
Over 21	11
Total	34

2) Impact by MRT Line 6 Projects

Regarding the impact of the project (MRT Line 6) to the bus business, most of the respondent feels that the project will affect them in more or less extent. Out of 34 respondents, 31 or 91% respondents feel that the project will have impact to their business.

The impact varies depending on their thinking and apprehension. Most of the respondents answered that the profit of bus Company will be lesser, competition with MRT increase, and bus users will be decrease.

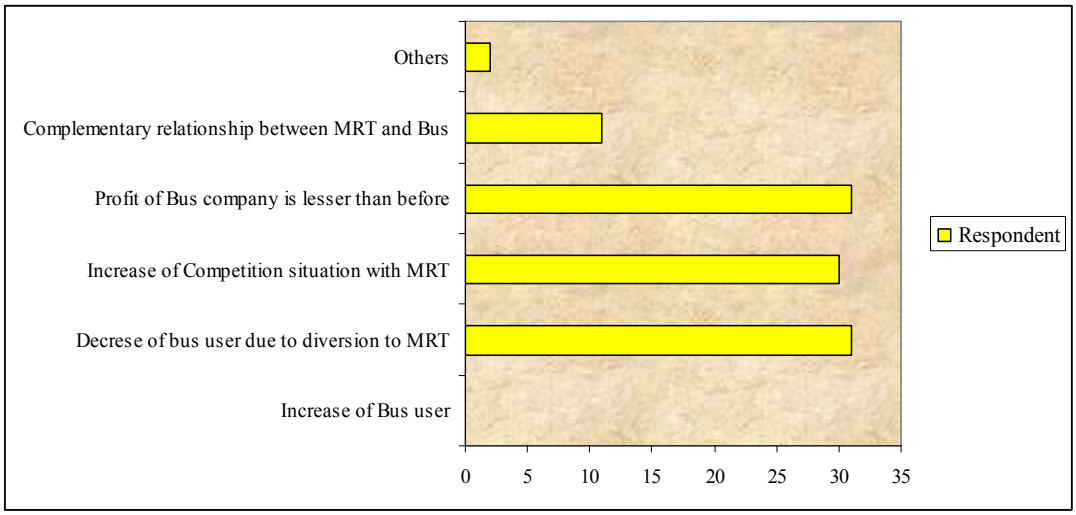


Figure 3.2.4-1 Response of Bus owner about Kinds of Project Impact

3) Project Acceptance

Although the bus owner anticipated that the MRT Line 6 has a substantial impact on their bus business but still they accept the project without any hesitation. All the bus owners positively accept the project as shown in **Figure 3.2.4-2**.

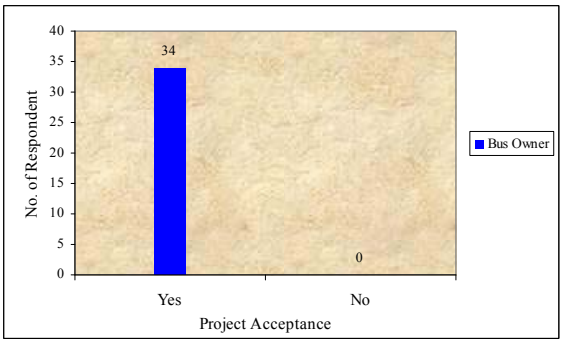


Figure 3.2.4-2 Response of Project Acceptance from Bus Owner

4) Countermeasures by Bus Owners

When the respondent of the survey i.e. the bus owner anticipated very much and much affect by MRT Line 6 then it has been tried to find out the countermeasures to minimize the effect. The bus owners thought a set of mix of countermeasures as shown in **Figure 3.2.4-3.**

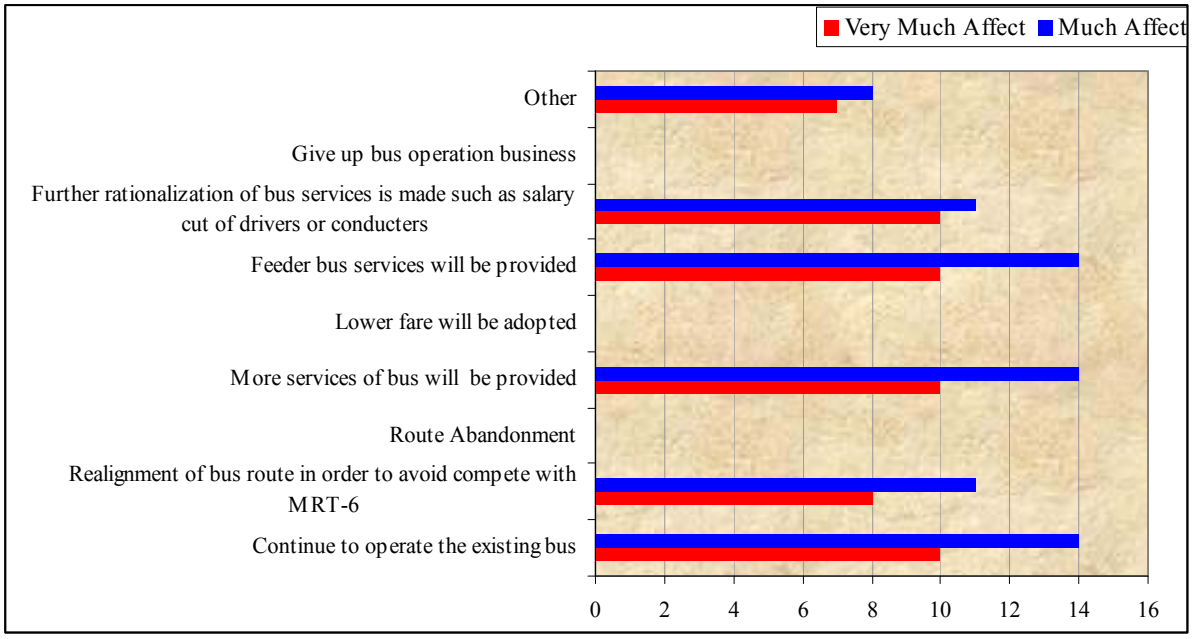


Figure 3.2.4-3 Countermeasures suggested by the Bus owners

3.2.4.2 BUS DRIVER INTERVIEW SURVEY

(1) Objectives of the Survey

Bus transport in Dhaka City is the only means of public transportation mode for middle and low income people from one place to another. Accessibility and Mobility is the two important views of the city dwellers that have to be met through ample public transport opportunity. But unfortunately the meager public transport system in Dhaka stumbled over due to nagging traffic congestion which consequently undermines the accessibility and mobility of city dwellers.

When MRT Line 6 will be completed, Bus transport system along this route will be rivaled with MRT. To apprehend this situation, the bus driver interview survey carried out as part of the social impact survey by JICA Study Team.

(2) Characteristics of Bus Drivers

All the bus drivers interviewed are male, employed by the bus company owner (in Bangladesh usually the drivers in public bus services are male) and their age range is 20-48 years

Table 3.2.4-2 Age Range of Bus Drivers

Age Range	Drivers Interviewed
20-30	24
31-40	23
41-50	13
Total =	**60**

All bus drivers are employed by the owner and no one are driving the bus by taking lease and the underlying argument is that in case of lease the driver has to bear all responsibilities, expenses and risk (business risk). According to them the better option is for undergo employee, where the driver are paid by the owner on the basis of daily trip (round trip, 100.00 to 120.00 BDT/trip) and their average working days are 20 days in a month.

(3) Results of the Survey

1) Impacts by MRT Line 6

Regarding the project impact by the introduction of MRT Line 6, 55 respondents or 92 % Bus-Drivers apprehend that the project will have impact on their employment.

2) Project Acceptance

Regarding of the project acceptance, the response from the bus drivers was very positive although the project might negatively affect their employment. But for the sake of the city dwellers interest and social responsibility, the entire respondent accepts the project.

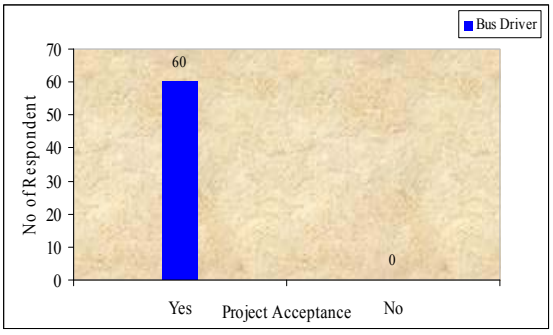


Figure 3.2.4-4 Response of Project Acceptance from Bus Driver

3) Countermeasures by Bus Drivers

To the bus driver apprehended very much and will be deeply affected by the project on their employment, the interview asked their possible countermeasures. The result is shown in **Figure 3.2.4-5.**

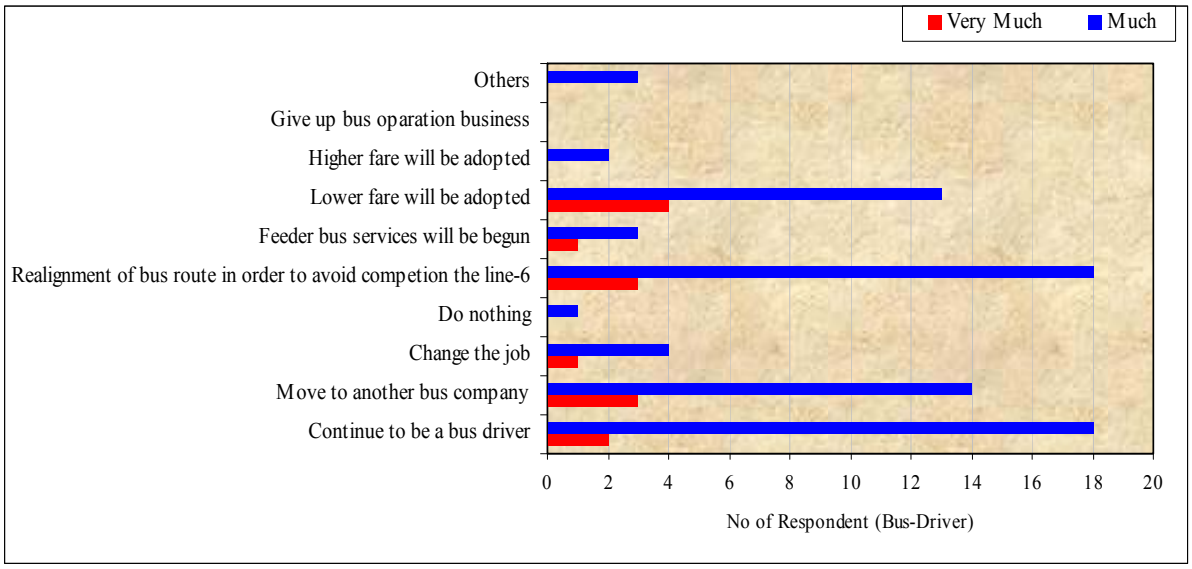


Figure 3.2.4-5 Possible countermeasures suggested by the Bus owners

3.2.4.3 RICKSHAW OWNER INTERVIEW SURVEY

(1) Objective of the Survey

Rickshaw in Dhaka is served for a short distance travel and an access mean of bus transportation. On the other hand, bus transport in Dhaka is the only trunk transportation system of the public transport system. When MRT Line 6 will be completed, rickshaw is supposed to operate as an access transport mean of MRT Line 6.

In the Phase 1 Study, social and traffic survey of rickshaw owner, rickshaw puller, rickshaw user and bus transport survey were conducted. Based on such surveys made in the Phase 1, the following Rickshaw owner survey was implemented as following scope of work.

(2) Rickshaw Owner to be interviewed

Fifty (50) rickshaw owners out of 100 rickshaw owners were randomly selected from the address collected during the pre-interview survey. These samples had been collected from

the vicinity of following four stations along the MRT Line 6:

- Pallabi
- Kazipara
- Agargaon
- Saidabad

(3) Results of the Survey

1) Owing of Rickshaw Business

Most of the rickshaw owners run the business for long time. The business operation year is shown in **Table 3.2.4-3.**

Table 3.2.4-3 Operation Year of Rickshaw

Business Year	Number
Below10	7
11-15	10
16-20	16
Over 21	17
Total	50

2) Impacts by MRT Line 6 Projects

Out of 50 respondents, 38 respondents or 76% rickshaw owner think that the project will affect their business.

3) Project Acceptance

More interestingly, all of the rickshaw owners accept the project although the project has a negative impact on their business. Being inspired by the corporate social responsibility all of the respondent accept the project.

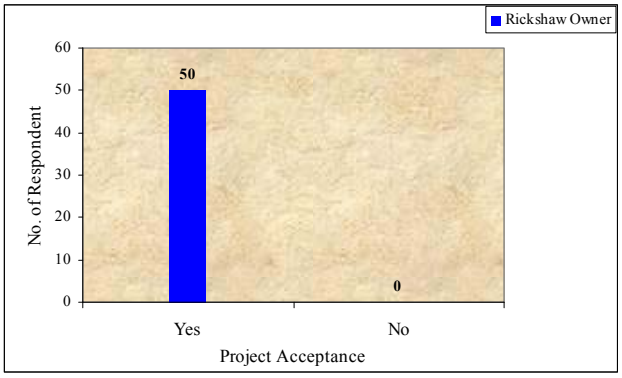


Figure 3.2.4-6 Response of Project Acceptance by Rickshaw Owner

4) Countermeasures by the Rickshaw Owners

The possible countermeasures what they are thinking were asked to those who anticipate very much and much affect by the project. Some of the possible countermeasures are shown in **Figure 3.2.4-7**.

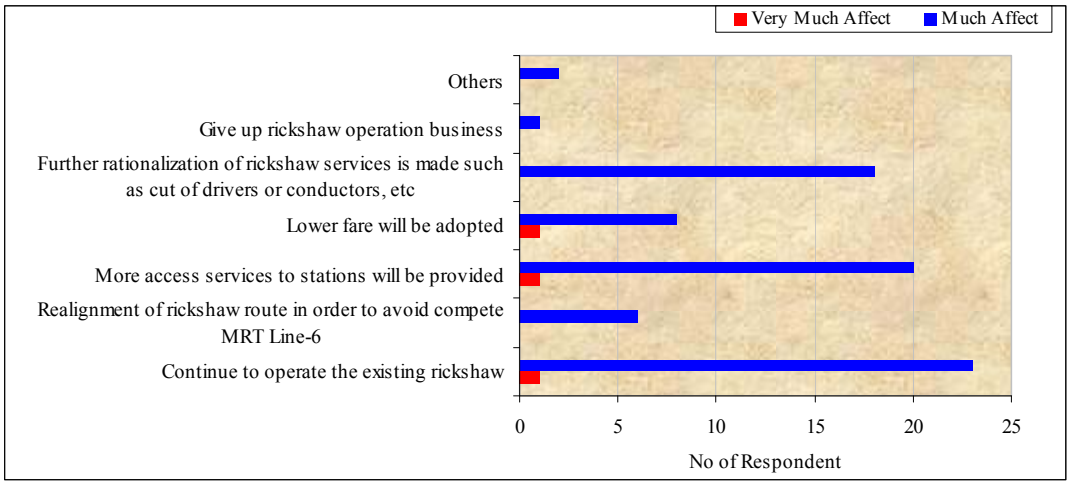


Figure 3.2.4-7 Possible Countermeasures suggested by the Rickshaw Owner

3.2.4.4 CNG DRIVER INTERVIEW SURVEY

(1) Objectives of the Survey

CNG run auto-rickshaw transport in Dhaka City is one of the means of public transportation as private transport. This mode is used by relatively higher middle and middle income people. This mode of transport can meet a small percentage of the total trip demand and used for door to door transport service.

Basically the fare is calucurated by meter reading of the vehicle. But drivers operate based on the negotiated fares and seldom use the meter. Sometimes the driver demand more fare than the meter reading and the passengers who are crying need are bound to pay the more. To apprehend this situation, the bus driver interview survey carried out as a part of the social impact survey by JICA Study Team.

(2) Characteristics of the CNG Drivers

Most of the CNG drivers are in the age of 31 to 40 year old. Their age distribution is shown in Table **3.2.4-4** The drivers are driving CNG by lease out, or owned by them. Among them 87% drivers running CNG by taking lease (most often daily lease), in that case CNG drivers paying a certain amount to the owner for a half day or full day hours. Regarding to monthly profit of the CNG drivers, 57% of drivers are in the range of BDT 10,000 to BDT 20,000 / month, where only 42 % are in the range of BDT 5,000 - 10,000 / month.

Table 3.2.4-4 Age Distribution of CNG Drivers

Age Range	Drivers Interviewed
-20	1
21-30	8
31-40	33
41-50	15
Over 50	3
Total	60

(3) Results of the Survey

1) Impacts by MRT Line 6

45% of the driver perceives that the MRT project will affect their driving. The reasons why they are expecting the impacts by the project were illustrated in Figure 1.4-5. They mostly expected decrease of their salary, but on the other hand, they expect MRT operation reduces the congestion that provide them a room to drive more safely and comfortably.

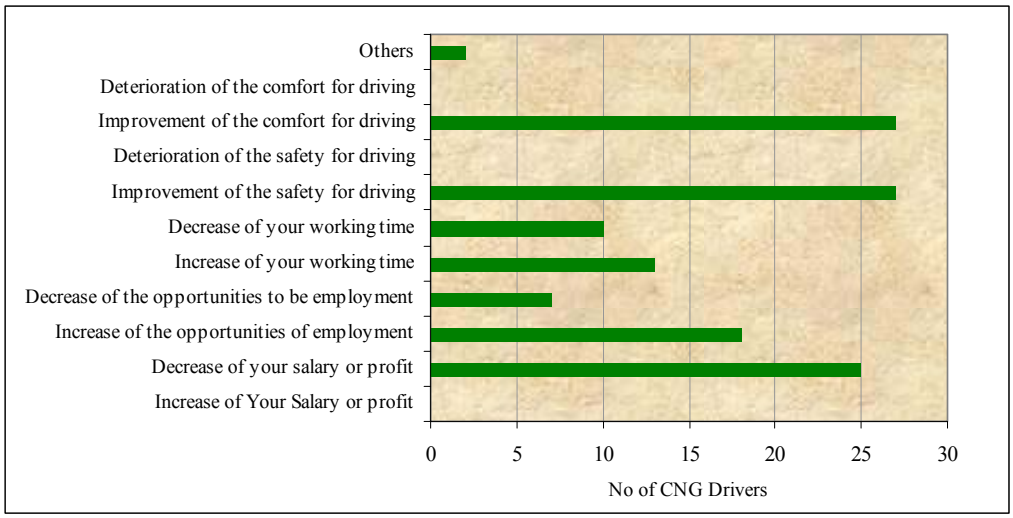


Figure 3.2.4-8 Reasons of project impact as the driver attributed

2) Project Acceptance

More interestingly, as shown in Figure 3.2.4-9, all of CNG drivers will accept the project implementation although the project might have a negative impact on their employment. Being inspired by the corporate social responsibility, all of the respondent accept the project.

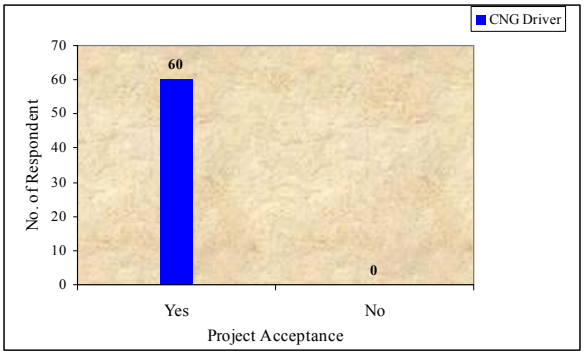


Figure 3.2.4-9 Response of Project Acceptance by CNG Driver

3) Countermeasures by the CNG Drivers

CNG drivers pose countermeasures for the project in terms of possibility of losing their job opportunity. The possible countermeasures are shown in the Figure 1.4-7.

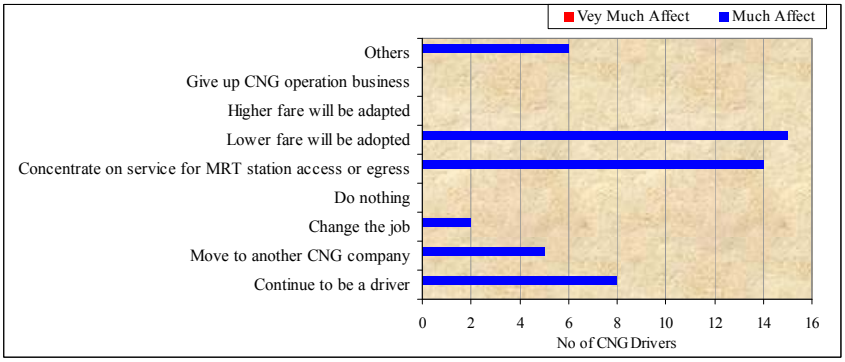


Figure 1.4-7 Possible Countermeasures suggested by the CNG Drivers

3.2.5.5 USER'S OPINION INTERVIEW SURVEY

(1) Objective of the study

The objective of the Survey is to grasp the transport environment of the peoples (residents, workers and student, etc) along MRT Line 6 corridor, peoples' consciousness to construction of MRT Line 6 and willingness to use and pay to this line.

(2) Location of survey

This Survey is carried out at around Pallabi, Mirpur 10, Farmgate, and BUET stations and obtained 200 samples at each survey location. Total number of samples collected is 798 samples.

(3) Results of the Survey

1) Traffic mode

Figure 3.2.4-11 shows the existing mode choice situation. Existing transport modes of person trips from home to office/school/shopping center are utilized that 87 % of person trips are buses, 6 % are cars, 4% are CNG and 3 % are rickshaw.

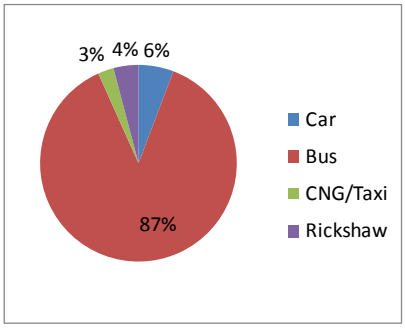


Figure 3.2.4-11 Existing Mode Choice Situation

2) Switch to MRT Line 6

Figure 3.2.4-12 shows willingness to switch to MRT. When MRT Line 6 will be operated, 95% of respondents are willing to shift to this line and the remaining is not willingness to shift to this line.

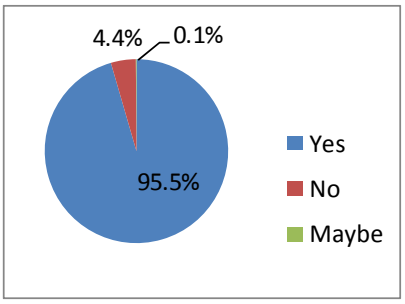


Figure 3.2.4-12 Willingness of switch to MRT

4) Willingness To Pay (WTP)

Willingness To Pay (WTP) for new transit mode of respondents is shown in Figure **3.2.4-13**. This willingness to pay is calculated by travel time categories.

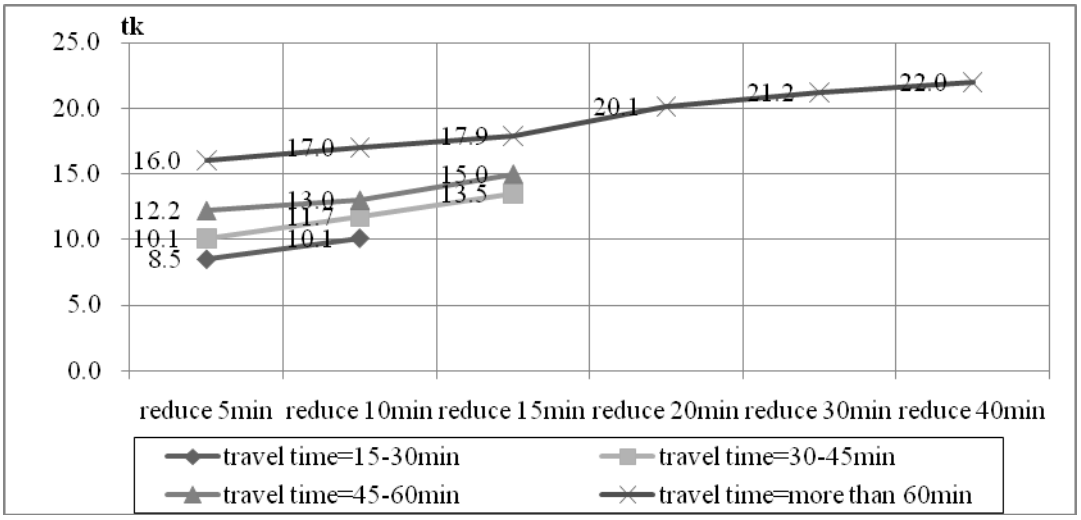


Figure 3.2.4-13 Average of Willingness to Pay Value

(4) Major findings

Major findings of the user's opinion survey are as follows;

- To minimize travel time of existing transport mode, most of respondents are willing to shift to MRT Line 6.
- As respondents of bus users who are obliged to travel longer time, they accept to pay higher transport fare.
- Since minimum reduction of travel time is 5 minutes in this interview survey, an average WTP for reduction of 5 minutes is BDT 11.7. Therefore, minimum fare level may be less than BDT 11 based on WTP survey.

Since the WTP for MRT system is BDT 3.3/km, fare level of MRT System shall be desirable less than BDT 3.3/km.

3.2.5 Fare Level of MRT

There are many fare levy systems in the public transport sector in the world. These systems can be largely classified into the followings:

1. Distance-based fare system

This fare system is to levy on the basis of the operational distances of the public

transport systems

2. Fixed fare system

This fare system is to levy fixed fare to the whole MRT or BRT Lines

3. Zonal fare system

This fare system is to levy on the basis of designated zones of MRT or BRT Lines

In major cities of the developing countries, various fare systems have been adopted. As for the MRT fare system, distance-based fare system is widely adopted in Delhi Metro, Bangkok Skytrain and subway line, and Metro Manila LRT and MRT Lines. In this study, it is assumed to adopt for distance-based fare system for MRT or BRT Lines. This is because this system is the most impartial fare levy system and similarity to the fare levy systems of the existing public transport system.

There are two categories in distance-based fare levy structure, one is charged by distance, the other is charged by ride. Former one is termed "fare by distance" and later one is termed "terminal charge". The fare was estimated by the following formula:

$$F_{ij} = UF * D_{ij} + TC$$

Where:
F_{ij} = Fare between station i and j
UF = Unit fare rate per km
D_{ij} = Distance between station i and j
TC = Terminal Charge

The unit fare rate per km and terminal charge of MRT Line 6 are set up based on the following method.

a) Benefit calculation

The distance fare per unit is estimated based on time saving benefit by MRT Line 6. The benefit per km is estimated by the following formula:

$$B = (T_B - T_M) * V_t / L$$

Where:
B: Benefit per km
T_B: Travel time of whole MRT Line 6 section by bus
T_M: Travel time of whole MRT Line 6 section by MRT
V_t: Average revised time value of all income groups in year t
L: Whole length of MRT Line 6

b) The distance fare per unit is set up 50% share of the benefit considering the aspect of social and economic benefit and alleviation of road congestion.

c) In addition, terminal charge is set up as BDT 10 considering the first ride fare of Rickshaw, CNG and Taxi (non A/C), BDT 10, BDT 14 and BDT 30, respectively.

d) The fare of BRT is assumed to be one-half of MRT fare considering the existing bus fare.

Tables 3.2.4-5 and **3.2.4-6** show benefit calculation of MRT Line 6 when introduced and **Table 3.2.4-7** shows the unit fare rate (UF).

Table 3.2.4-5 Calculation of Shortening Time

Item	Unit	MRT	Bus	Note
Length	km	20.8	20.8	Whole MRT Line 6 (Same setting as the road length)
Average speed	km/hr	32.0	14.4	MRT: Schedule speed Bus: Speed from speed survey result of the Phase 1 Study
Trip time	hr	0.65	1.44	
Saving time	hr	0.79	-	

Source; JICA Study Team

Table 3.2.4-6 Calculation of Time Saving Benefit per Km

Item	Unit	2009	2020	2025
Saving time	hr	0.79	0.79	0.79
Time value	BDT/hr	130.0	210.3	264.9
Time saving benefit	BDT	102.7	166.1	209.3
Benefit per length	BDT/km	4.9	8.0	10.1

Source; JICA Study Team

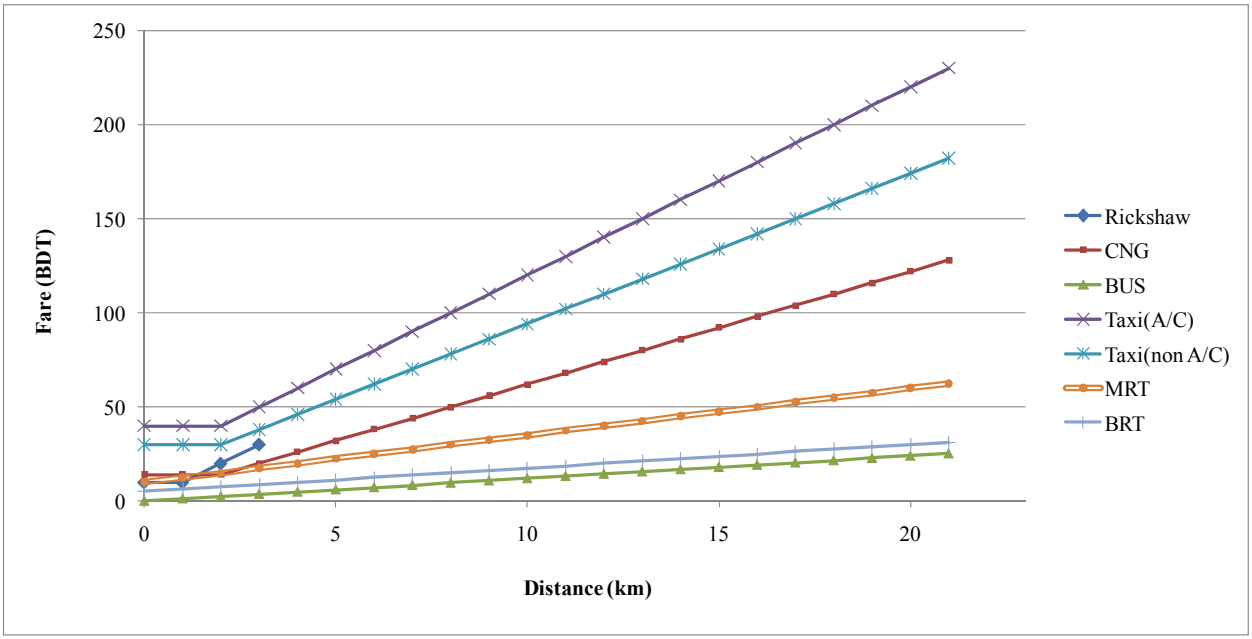
Table 3.2.4-7 Unit Fare Rates of MRT and BRT

Unit: DBT/km

Mode	2009	2020	2025	Terminal Charge
MRT	2.5	4.0	5.0	10.0
BRT	1.3	2.0	2.5	5.0

Source; JICA Study Team

Using the unit fare rates and terminal charges of MRT and BRT systems and distance between stations, the tentative fare table between MRT stations can be calculated in **Table** 3.2.4-8**3.2.4-8.**



Source; JICA Study Team
Note; present worth of 2009 is used for the figure

Figure 3.2.4-14 Comparison of Fare by Public Transport Modes

Table 3.2.4-8 Fare Table of MRT Line 6 (Tentative)

Stage		Station Name	Upper right: Distance (km)/Lower left: Fare (BDT)																	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
3	1	Uttara North		*0.8*	*1.7*	*5.4*	*6.3*	*7.5*	*8.6*	*10.1*	*11.1*	*12.3*	*13.5*	*15.0*	*15.8*	*16.9*	*17.9*	*18.7*	*19.7*	*20.8*
	2	Uttara Center	10		*0.9*	*4.6*	*5.5*	*6.7*	*7.8*	*9.3*	*10.3*	*11.5*	*12.7*	*14.2*	*15.0*	*16.1*	*17.1*	*17.9*	*18.9*	*20.0*
	3	Uttara South	15	10		*3.7*	*4.6*	*5.8*	*7.0*	*8.4*	*9.4*	*10.6*	*11.8*	*13.3*	*14.2*	*15.2*	*16.2*	*17.1*	*18.0*	*19.1*
1	4	Pallabi	25	20	20		*0.9*	*2.0*	*3.2*	*4.7*	*5.7*	*6.9*	*8.1*	*9.6*	*10.4*	*11.5*	*12.5*	*13.3*	*14.3*	*15.4*
	5	IMT	25	25	20	10		*1.2*	*2.4*	*3.8*	*4.8*	*6.0*	*7.2*	*8.7*	*9.6*	*10.6*	*11.6*	*12.5*	*13.4*	*14.5*
	6	Mirpur10	30	25	25	15	15		*1.2*	*2.6*	*3.6*	*4.9*	*6.1*	*7.6*	*8.4*	*9.5*	*10.5*	*11.3*	*12.2*	*13.4*
	7	Kazipara	30	30	25	20	15	15		*1.4*	*2.5*	*3.7*	*4.9*	*6.4*	*7.2*	*8.3*	*9.3*	*10.1*	*11.1*	*12.2*
	8	Taltala	35	35	30	20	20	15	15		*1.0*	*2.2*	*3.5*	*4.9*	*5.8*	*6.8*	*7.9*	*8.7*	*9.6*	*10.8*
	9	Agargaon	40	35	35	25	20	20	15	15		*1.2*	*2.4*	*3.9*	*4.7*	*5.8*	*6.8*	*7.6*	*8.6*	*9.7*
	10	Chandrima Uddan	40	40	35	25	25	20	20	15	15		*1.2*	*2.7*	*3.5*	*4.6*	*5.6*	*6.4*	*7.4*	*8.5*
	11	Farmgate	45	40	40	30	30	25	20	20	15	15		*1.5*	*2.3*	*3.4*	*4.4*	*5.2*	*6.2*	*7.3*
	12	Sonargaon	50	45	45	35	30	30	25	20	20	15	15		*0.8*	*1.9*	*2.9*	*3.7*	*4.7*	*5.8*
2	13	National Museum	50	50	45	35	35	30	30	25	20	20	15	15		*1.1*	*2.1*	*2.9*	*3.9*	*5.0*
	14	Jagannath Hall	50	50	50	40	35	35	30	25	25	20	20	15	15		*1.0*	*1.8*	*2.8*	*3.9*
	15	Shahidullah Hall	55	55	50	40	40	35	35	30	25	25	20	20	15	15		*0.8*	*1.8*	*2.9*
	16	Kaptan Bazar	55	55	55	45	40	40	35	30	30	25	25	20	15	15	10		*1.0*	*2.1*
	17	Banga Bhaban	60	55	55	45	45	40	40	35	30	30	25	20	20	15	15	10		*1.1*
	18	Saidabad	60	60	60	50	45	45	40	35	35	30	30	25	20	20	15	15	15	

Source; JICA Study Team
Note: present worth of 2009 is used for the table

CHAPTER 4

ENVIRONMENTAL IMPACTS EVALUATION

4.1 IMPACT INDENTIFICATION AND SCOPING MATRIX

Thus, the study on the alignment of MRT Line 6 is described in Chapter 3, then taking into account of natural environment and social condition along the Line, the scoping matrix of environmental impacts are expressed in the context of pollution, natural and social environment and other points of view, which shown in **Table 4-1**, and the reason for assessment is listed in Clause 4.2 as well as Clause 4.3

Table 4-1 Scoping Matrix

		Items of impact	Total Assessment			Factors of adverse impact													Factors of positive impact			
						Planning stage		Construction stage									Operation stage			Operation stage			
			Planning stage	Construction stage	Operation stage	Land acquisition and loss of architectures	Deterioration of living environment due to resettlement	Change of wetland	Logging	Change of landscape	Operation of vehicles and heavy equipments for construction	Constructing activity on elevated structure, stations and installation facilities to the station	Traffic jam	Inflow of construction workers and set up of construction bases	Increase of traffic density	Entity of the elevated railways and increase of the related architectures	Increase of settler	Modal shift	Increase of traffic capacity	Reduction of travel time	Promotion of well-ordered urban development
Anti-pollution measures	1	Air pollution		-B	+B/-B						-B	-B	-B		-B		-B	+B	+B	+B	
	2	Water pollution		-B							-B	-B									
	3	Soil pollution		-D							-D	-D		-D							
	4	Waste		-B	-B						-B	-B		-B			-B				
	5	Noise and vibrations		-B	-B						-B	-B	-B			-B					
	6	Ground subsidence		-B/D								-B/D									
	7	Offensive odors		-B							-B			-B							
	8	Global warming		-B	+B/-B						-B	-B	-B		-B		-B	+B	+B	+B	
Natural environment	1	Topography and geology		-D	-D					-D		-D		-D		-D					
	2	Bottom sediment		-D	-D					-D		-D		-D		-D					
	3	Biota and ecosystem		-B/-D				-D	-B												
	4	Hydrology		C	-D							C				-D					
	5	Protected areas		-D								-D									
Social environment	1	Involuntary resettlement	-A			-A															
	2	Local economies, such as employment, livelihood, etc.	-A		+A		-A														+A
	3	Land use and utilization of local resources			+A														+A		+A
	4	Social institutions such as social infrustructure and local decision-making institutions, Existing social infrustructures and services		-B	+A							-B							+A		+A
	5	Poor, indigenous or ethnic minority people	-A				-A														
	6	Misdistribution of benefits and damages	-A				-A														
	7	Local conflicts of interest			-B											-B					
	8	Gender	-B			-B	-B														
	9	Children's rights	-B				-B														
	10	Cultural heritage		-D								-D									
	11	Infectious diseases such as HIV/AIDS		-B	-B									-B			-B				
	12	Landscape		-B	-B				-B							-B					
	13	Working conditions		-B							-B	-B	-B	-B							
	14	Social Concensus	-A	-A/-B	+A/-A	-A	-A		-B		-B	-A	-A	-A		-A			+A	+A	+A
Other	1	Accidents		-B	+B/-B						-B	-B	-B	-B	-B			+B			
	2	Sun Shading			-B											-B					

Notes; assessment A: Significant impact is assumed,
B: Impact is assumed but less than A,
C: Impact is not clear because the design is not finished and further survey is needed to confirm,
D: Impact is little and further survey is not needed.
+: Positive impact is assumed
- : Negative impact is assumed
The scoping items are referred from JICA and JBIC guidelines

4.2 POSSIBLE IMAPCTS IN PLANNNING STAGE

A: Significant Impact is assumed

Social Environment	
Items of Impact	**Reason of Assessment**
Involuntary resettlement	Some chopper houses and lodgments/facility belong to cantonment will be affected Uttara in North to Pallabi The existing road width can provide sufficient corridor of impact which is required to construct viaduct and station. Two buildings located on the corner of Airport road will be affected, and land acquisition on the east comer of Novo Theater will be required in Chandrima Uddan to Farmgate The existing road width is narrow, facilities located in Dhaka University will be affected near east of Jagannath Hall Station. Facilities of Tuberculosis Research and Training Institute and some shops will be resettled due to the alignment and expected Shahidullah Hall Station Shops located between Banga Bhanban Station and Saidabad Station need relocation due to the alignment, and land acquisition is required as well
Local economies, such as employment, livelihood, etc.	When resettlement is required in Bangladesh, the legal framework to mitigate the following issues is under developing such as: ・Guarantee the compensation to illegal settlers ・Calculation method on compensation ・Timely payment of compensation ・Measures to recover livelihood Adverse impact due to the resettlement is assumed. On the other hand it is expected that the new employment will be enhanced in Uttara area significantly
Poor, indigenous or ethnic minority people	It is worried that policy when the poor becomes Project Affected Person (PAP) is not institutionalized. Neither indigenous nor ethnic group is found in the section
Misdistribution of benefits and damages	The legal way of compensation to PAP is not enough to relocate, and the way of compensation to illegal occupant is fluffy, too
Social Consensus	In Bangladesh, the mutual agreement between project proponent and PAP is under developing; therefore it is worried that the proponent can not ensure the wide range of meaningful stakeholder participation and transparency of decision-making.

B: Impact is not so significant

Social Environment	
Items of Impact	**Reason of Assessment**
Gender	It is assumed that the opportunity to participate the local stakeholder meetings might be not given to the women group
Children's right	It is assumed that the access to the school or hospital might be affected due to the resettlement

4.3 POSSIBLE IMAPCTS IN CONSTRUCTION STAGE

B: Impact is not so significant

Natural Environment	
Items of Impact	**Reason of Assessment**
Air pollution	Convey of construction materials, heavy equipment operation and earthworks will generate harmful dust. It is assumed that exhausted gas caused by heavy equipment and vehicles may increase pollution temporarily, but not significant.
Water pollution	Earthworks including excavation for foundation will generate turbid water. The turbid water is unavoidable to some degree, but not effluent of detrimental materials. It is assumed that water may be polluted temporarily by construction activity but not significant.
Waste	It is assumed that the removal of existing houses or building will cause waste. The construction works will generate construction wastes such as surplus soil, fragments of construction materials and garbage from construction workers. The estimated volume of surplus soil is approximately 60,000m3 at the Stage 1, 29,000m3 at the Stage 2 and 5,000m3 at the Stage 3.
Noise and vibration	Heavy equipment operation and earthworks will generate noise and vibration. The impact is more serious in residential or educational area. The general noise level caused by piling works is estimated a range between 95 and 101 dB at the construction point or 72 and 78 dB at 15 meter point from the construction point, which exceed the environmental standard value (70 dB in commercial area). There is no standard on vibration in Bangladesh. However, some surrounding buildings along the proposed MRT Line 6 in the southern section are old and have been extended disorderly. The construction works may affect these buildings even with little vibration.
Offensive odors	It is assumed that the increase of traffic and worker will cause the offensive odor gas temporarily
Ground subsidence	According to geological surveys conducted in DHUTS, soft foundation areas or weak strata with less than N-Value 3 except for surface layers have not identified in the project site. However, partial soft foundation areas may exist in the project site, especially Uttara North – Pallabi section that is located in low land area. However bored piles will penetrate into firm stratum and fixed, therefore, no ground subsidence is expected in other sections.
Global warming	It is assumed that exhausted gas caused by heavy equipment and vehicles may increase green house gas temporarily
Biota and ecosystem	It is worried that removal of street trees will affect the local biota and ecosystem. The dust, exhaust gas and decrease in sunlight caused by the elevated structure may have an influence on the rare tree spices in Baldha Garden located near by the proposed Saidabad station. It is assumed that the Project will give a very small effect on Biota and ecosystem in wild land.
Social Environment	
Items of Impact	**Reason of Assessment**
Infectious diseases such as HIV/AIDS	It is assumed that the risk by infection diseases might increase due to the construction employees
Landscape	It is worried that the under construction facilities fail to harmonize the local landscape

Working conditions	It is assumed that the safety and health condition to project employee may worsen due to the lack of safety facility and safety training
Others	
Items of Impact	**Reason of Assessment**
Accidents	It is assumed that the accident due to the heavy equipment and vehicle will increase. And falling accident from overhead location will happen. Also, it is assumed that the traffic accident involving the inhabitants might occur when existing road is used for logistic purpose

C: Impact is not clear because the design is not finished and further survey is needed to confirm

Item of Impacts	Reason of Assessment
Hydrology	The drainage system is poor condition in urban area. The improper construction works may deteriorate the drainage capacity.

D: Impact is little and further survey is not needed

Natural Environment	
Items of Impact	**Reason of Assessment**
Soil pollution	Fuel leakage while feeding or washing tools used for concreting may cause soil pollution, however the magnitude of impact is little.
Topography and geology	Negative impacts such as inconvenient access for inhabitants or damage by rainfall are assumed
Bottom sediment	Project area is away from water body, therefore, negative impact is not assumed
Protected areas	No protected area is observed around the Project area
Social Environment	
Items of Impact	**Reason of Assessment**
Cultural heritage	There is no cultural heritage along the Project

4.4 POSSIBLE IMPACTS IN OPEARATION STAGE

A: Significant impact is assumed

Social Environment	
Items of Impact	**Reason of Assessment**
Local economies, such as employment, livelihood, etc.	It is expected that the new employment will be enhanced in Uttara area significantly
Land use and utilization of local resources Social institutions such as local infrastructure and local-decision making institutions	Providing the new transportation system enhance the development of Uttara area New transportation system will make the access to zoological and botanic garden in Mirpur easily and expected to provide breathing space to citizen
Existing social infrastructures and services	Access to educational institutions, hospital and commercial facilities will become convenience
Social Consensus	It is expected that daily traffic congestion will be mitigated significantly when the Project carried out smoothly under the mutual consensus between proponent and local stakeholders

B: Impact is not so significant

Anti-pollution Measures	
Items of Impact	**Reason of Assessment**
Air pollution	It is assumed that the increase of traffic and residents will cause the exhausted gas. However, the proposed MRT Line 6 will be electrical operation and not use diesel fuel. Moreover the operation will improve congestion of roads along the MRT line and efficiency of the vehicle mobility. Consequently, increase in air pollution in Dhaka city may be mitigated as a positive impact.
Waste	Operation of the stations and car depot will generate solid waste such as rubbish from the users and staff. The rolling stock cars will be retired and discarded about 40 years later. The railway will be replaced at regular intervals and discarded too.
Noise and vibration	The MRT operation will generate noise and vibration. However, the proposed MRT is an electric mechanical system that is a low noise and low vibration type. The general noise level caused by the MRT operation is estimated around 65 dB at the nearest point of private area to the track. The present noise levels in Pallabi – Saidabad section that is located along existing main roads may range from 75 dB to 90 dB in the daytime. The MRT operation will not increase the present noise levels in this section. Because Uttara North – Pallabi section is not built-up area in 2010, the present noise level is much lower than Pallabi – Saidabad section's level. The noise level of this section will be increased by the MRT operation. However, after this section has been developed, the noise caused by the MRT operation may not be serious issue.
Global warming	It is assumed that the increase of traffic and residents will cause the exhausted gas. However, it is expected that the modal shift and increase of travel speed will mitigate the greenhouse gas
Social Environment	
Items of Impact	**Reason of Assessment**
Local conflicts of interest	It is worried that new conflicts will arise when access to the station is not provided properly, or relocated place is inconvenient to PAPs
Infectious diseases such as HIV/AIDS	It is worried that the risk by infection diseases might increase by new settlers
Landscape	It is worried that the constructed facilities fail to harmonize the local landscape
Others	
Items of Impact	**Reason of Assessment**
Accidents	Traffic accident will decrease because of the modal shift which will enhance the change from auto mobile to MRT.
Sun Shading	The elevated structures will shadow sunlight. This impact is unavoidable. However, because regulations on sunshine right have not been prepared yet in Bangladesh and general citizens living in Dhaka do not consider that right to enjoy sunshine is important, the impact will be not serious.

D: Impact is little and further survey is not needed

Natural Environment	
Items of Impact	**Reason of Assessment**
Topography and geology	Neither embankment nor cutting activity is expected; therefore topography will not be affected. Bored pile will be provided as foundation, however, spaced pile will not disturb existing geology

Bottom sediment	Provided facility will is away from water body and discharge condition will be same as existing one
Hydrology	Project will not change existing discharge condition

4.5 MITIGATION MEASURES

Mitigation Measures on Environmental Impacts are summarized;

Anti-pollution Measures			
No.	**Items of Impacts**	**Magnitude of adverse Impact**	**Mitigation Measures**
1	Air pollution	**B**	・Contractors will be required to conduct daily routine equipment and machinery check-ups to ensure that these are in the optimum working conditions. ・ Regular preventive maintenance service of construction equipment and machineries will strictly comply with. ・ The proper work schedules should be considered not to concentrate the construction equipment at a certain point for long time. ・ To reduce the dust, periodical water spray should be taken. ・If the residents and pedestrians complain about the dust and gas, the consultant of the supervision and contractors should reconsider the construction technique. ・ When the air pollution levels exceeds significantly the environmental standards, the regulation on fuel quality, importing old cars and emission gas control should be prepared on necessity.
2	Water pollution	**B**	・ Concrete poring and road surfacing will be closely supervised to prevent spillage. ・All formworks will be secured prior to pouring to ensure failure will not occur. ・Temporary sanitation facilities such as portable toilets and garbage bins will be provided by the contractors to ensure that the domestic wastes to be generated by the construction personals are properly handled and not thrown into the drainage to prevent further pollution. ・Contractors will be required to conduct daily routine equipment and machinery check-ups to ensure that these are in the optimum working conditions. ・ Regular preventive maintenance service of construction equipment and machineries will strictly comply with. ・ Contractors will be prohibited from washing the construction tools along the waters to prevent further pollution. ・ In construction works near water bodies such as Uttara – Pallabi and Taltala section, the consultant of supervision and contractor should monitor and control the turbid water as necessary.
3	Waste	**B**	・ Contractor will be required to facilitate proper re-use and disposal plan, and manage the construction waste ・ Because the surplus soil containing bentonite may cause negative impact on drainage condition in agricultural land, the proper disposal site should be selected at the next stage. ・ The consultant of supervision should monitor the waste disposal. ・ The rolling stock car should be made from materials such as aluminum that is easier to recycle. ・ DTCB will provide proper number of garbage bins in every station for MRT users. ・ The waste in the operation stage should be properly collected and disposed or recycled in compliance with rules in Dhaka city.
4	Noise and vibrations	**B**	・ The proper work schedules should be considered not to concentrate the construction equipment at a certain point for long time. ・ Noise suppressors such as mufflers will be installed whenever deemed necessary to maintain the noise the noise generated by the various heavy equipment and other construction machinery within permissible limits.

Anti-pollution Measures			
No.	**Items of Impacts**	**Magnitude of adverse Impact**	**Mitigation Measures**
			・Temporary noise barriers such as corrugated metal sheets will be installed around the construction sites to maintain noise level within permissible level if necessary. ・High noise generating construction activities will be scheduled during daytime only (06:00 – 21:00) to avoid noise disturbance to adjacent residential and commercial areas, and other noise-sensitive areas. ・Contractors will be required to use low-vibration equipped machinery whenever it is necessary (residential area<50dB. mixed area<60dB, commercial area<70dB, noise-sensitive area<45dB). ・To identify impact on the surrounding buildings, the vibration level and condition of the buildings should be monitored. ・The explanation and consultation to the affected persons prior to the construction should be conducted to obtain the understanding about the potential impacts including information of the positive impacts such as promotion of the local socio-economic activity. If the local people complain about noise and vibration, the consultant of the supervision and the contractors should reconsider the construction technique. ・The proper countermeasures to reduce noise and vibration such as slow speed in curve sections, installation of sound barrier and adoption of expansion and contraction joint should be included in the plan and design. ・In residential area, the noise along the MRT Line 6 should be periodically monitored. If the noise level reaches a significant level such as exceeding the environmental standards, the mitigation measures on noise control should be conducted.
5	Ground Subsidence	**B**	・In the detailed design stage, the detailed geological surveys should be conducted. The proper structure design and construction technique should be considered on the basis of the survey results. ・The consultant of supervision and contractor should monitor the ground subsidence. If the ground subsidence occurs, the consultant and contractors should reconsider the construction technique.
6	Offensive odors	**B**	・Contractors will be required to conduct daily routine equipment and machinery check-ups to ensure that these are in the optimum working conditions ・Regular preventive maintenance service of construction equipment and machineries will strictly comply with
7	Global warming	**B**	・Contractors will be required to conduct daily routine equipment and machinery check-ups to ensure that these are in the optimum working conditions ・Regular preventive maintenance service of construction equipment and machineries will strictly comply with ・When the air pollution levels exceeds significantly the environmental standards, the regulation on fuel quality, importing old cars and emission gas control should be prepared on necessity
Natural Environmental			
No.	**Items of Impacts**	**Magnitude of adverse Impact**	**Mitigation Measures**
1	Biota and ecosystem	**B**	・Compensatory planting of shrubbery spices to the limited area under the elevated structures should be considered as necessary. ・Replanting of rare and sensitive tree spices in Baldha Garden should be conducted.
2	Hydrology	**C**	・In the design stage, the detailed hydrological and drainage capacity survey should be conducted. The proper structure design and execution scheme should be considered on the basis of the survey results.

Social Environmental			
No.	**Items of Impacts**	**Magnitude of adverse Impact**	**Mitigation Measures**
1	Involuntary Resettlement	**A**	・Conduct census survey and local stakeholder meeting ・Prepare RAP involving the following measures - PAPs must be acknowledged as an eligible for compensation - Identify the eligibility of non-titled people at the census survey intended to PAPs and ensure the compensation and support - Refer the previous/on-going projects by other donors, determine the requirement for social vulnerability and compensate to them - Resettlement site must be prepared when PAPs need it ・Establish external monitoring committee consisted by the third party
2	Local economies such as employment, livelihood, etc	**A**	・Prepare RAP involving the following measure - Measure to restore PAPs' livelihood must be secured ・Enhance the orderly development in Uttara area to increase new employment
3	Existing social infrastructures and services	**B**	・Social service utilities such as power, water, drainage and communication line will be diverted before starting the construction activity
4	Poor, indigenous or ethnic minority people	**A**	・Prepare RAP involving the following measure - Define the displaced persons and criteria for determining the their eligibility for compensation ・Establish external monitoring committee by the third party
5	Misdistribution of benefits and damages	**A**	・Prepare RAP involving the following measure - Assessed compensation will base on the market price - Top up compensation method will be applied - Payment will be carried out before resettlement ・Establish external monitoring committee by the third party
6	Local conflicts of interest	**B**	・Station access facilities such as stairs, escalators, elevators will be provided for both bounds
7	Gender	**B**	・Feminine gender will be invited and join local stakeholder as well as male gender ・Interview to feminine gender while in census survey will be considered
8	Children's Right	**B**	・Secure the accessibility to go to school/hospital when select resettlement places
9	Infectious diseases such as HIV/AIDS	**B**	・Contactor will be required to conduct a periodical health education to his personnel ・Local public health center will conduct health education to new settlers
10	Landscape	**B**	・Design on facilities which will harmonize with the surrounding landscape
11	Working Conditions	**B**	・Construction personnel will be provided with the necessary safety gears such as protective hard hat and safety belt ・First aid stations supervised by the safety health officer of the contractor will be located within the construction site office ・Emergency vehicles will be on stand-by within the construction site
12	Social Consensus	**A**	・Hold sufficient local stakeholder meetings in every stage and establish mutual understanding
Others			
No.	**Items of Impacts**	**Magnitude of adverse Impact**	**Mitigation Measures**
1	Accidents	**B**	・A sound traffic management and detour plans duly approved by the concerned governmental agency will strictly implemented to minimize traffic congestions ・Traffic enforcers and flagmen will be designated along these area to assist in directing traffic flow ・Parking time of construction equipment such as dump track and

			agitator car along the major thoroughfare will be limited, especially during peak hours to minimize traffic congestions
2	Sun Shading	**B**	・The height of the structures shall be designed as low as possible in terms of economic efficiency within the clearance, which will mitigate the impacts. ・The explanation and consultation to the affected persons prior to the construction should be conducted to obtain the understanding about the potential impacts including information of the positive impacts such as promotion of the local socio-economic activity.

4.6 APPLICABLE RESETTLEMENT ACTION PLAN

4.6.1 Gap between JICA Guidelines and Present legislative

The Japan International Cooperation Agency (JICA) Policy on Involuntary Resettlement duly have recognized & addressed the R&R impacts of all the affected persons irrespective of their titles and covered issues require for the preparation of RAP in every instance where involuntary resettlement occurs. The major policy requirements of JICA are to:

1. Avoid or minimize impacts where possible;
2. Consultation with PAPs in the process of project planning and implementation;
3. Payments of compensation for the acquired assets at the replacement value;
4. Ensure that no one is worse off as a result of resettlement and would maintain their at least original standard of living;
5. Resettlement assistance to PAPs, including non-titled persons; and
6. Special attention to vulnerable people and groups.

It may be mention the JICA's overall policy on Involuntary Resettlement is almost similar to those of other donors' policy in this respect

4.6.2 Measures to Fill the Gap

As there are so many gaps between the GOB and JICA policies on Involuntary Resettlement of PAPs, **Table 4-2** has furnished the gaps and proposes measures for filling up the gaps.

Table 4-2 Gap between JICA Guideline and Related Ordinance in Bangladesh

	Item	JICA guideline	Related ordinance in Bangladesh	Proposed measure
1	**Acknowledgement as an eligible for compensation**	All of the project affected persons (PAPs), whether legally residing or not, must be acknowledged as an eligible for compensation	There are no provisions for compensation to the non-titled residents. Also, there are no provisions about providing either the expenses necessary for the relocation or the compensation for the decrease of income due to relocation	All of the PAPs must be acknowledged as an eligible for compensation
2	**Support for non-titled people**	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents etc. in a timely manner	No compensation will be made to non-titled people	Identify the eligible from the non-titled people at the time of census survey intended for PAPs, and implement compensation and support to them
3	**Construction of support system for vulnerable social groups**	Appropriate considerations must be given to vulnerable social group which may have little access to decision making process within society	There are no provisions for either acknowledgement of or compensation to vulnerable social groups	Referring to the project carried out by other donor, determine the requirement for the social vulnerability and compensation to them
4	**Land acquisition against PAPs**	Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities and production levels or at least to restore these to pre-project levels	Neither protection of alternative sites nor development of social infrastructure due to the land acquisition will particularly be made	Confirm the necessity of alternative sites in census survey and in case of need, secure the site
5	**Offering measure to the recovery of livelihood to PAPs**	Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities and production levels or at least to restore these to pre-project levels	There are no provisions for the manner and order of support until resettlement, unemployment compensation/business compensation for the recovery of livelihood, low-interest loan system nor job training/placement	Referring to project carried out by other donor, determine the measure to restore PAPs' livelihood
6	**formulation of Resettlement Action Plan and promotion of citizen's participation in the project implementation stage**	Promote the participation of affected people and their community and their opinion must be incorporated into the decision making process	There are no provisions for the formulation of RAP and public hearing. Deputy Commissioner (DC) contacts to land owner through Land Acquisition Officer (LAO), and if land owner has no objection, confirmation operation for compensation amount etc. will be proceeded among LAO, business, local government and land owner	Hold local stakeholder meetings with citizen's participation and reflect the opinion arose from the meetings to RAP

	Item	JICA guideline	Related ordinance in Bangladesh	Proposed measure
7	**Compensation for house loss at full replacement cost**	Apply criteria and the good practices which JICA, International Organization and other developed countries provide not considering depreciation	In case land owner has no objection, confirmation operation for resettlement scale and compensation amount will be proceeded among LAO, business, local government and land owner	Prompt to make compensation with full replacement cost, not considering depreciation or diversion of debris
8	**Grievance committee**	Grievance committee must be established so that PAPs will not suffer a loss due to resettlement	In case PAPs have objection to compensation amount, PAPs should protest and entrust the matter to the Arbitrator. If PAPs have appeal against Arbitrators decision, then PAPs should file a lawsuit to the court and wait for the sentence	Establish a third-party panel which has simpleness, convenience and reliability
9	**Implementation of monitoring**	A monitoring plan must be implemented so that people can monitor whether environmental and social considerations are undertaken during the project	There are no provisions for the monitoring related to the process of project, the verification of the result or the coping strategy	Establish a third-party monitoring panel which is valid both legally and administratively

It may be mentioned that the GOB has already prepared a National Resettlement Policy for the PAPs on Involuntary Resettlement which in the process of Cabinet (a body of the Honorable Ministers Chaired by the Honorable Prime Minister) approval. When it is approved, almost all the gaps will be filled-up.

4.6.3 Outline of prepared RAP

All PAPs will be entitled to compensation and resettlement assistance based on severity (significance) of impacts.[1] Nevertheless, eligibility to receive compensation and other assistance will be limited to the cut-off date. The cut-off date for compensation under law (Ordinance II of 1982 and its 1994 amendments) is considered for those identified on the project right of way land proposed for acquisition at the time of service of notice under Section 3 or joint verification by DC office whichever is earlier. The cut-off date of eligibility for resettlement assistance under this RAP is the commencement date of the census following the detailed design. The absence of legal title will not bar to PAPs from compensation and assistance, as specified in the entitlement matrix (**Table 4-3**).

Structures located on non-titled land or GOB land, if displaced, will be entitled for compensation under the Project. Vulnerable PAPs or PAHs will qualify for additional assistance to facilitate them relocation and restoration of their livelihoods.

[1] The severity of impacts is based on the difference between temporary and permanent effects and minor and significant impacts as defined in ADB's Policy and the Glossary of Terms.

Non-vulnerable households with structures affected will be entitled to compensation for structures and assistance for shifting and reconstruction of the same. Any structure not directly used by a non-vulnerable household i.e. rented out for income will also not qualify for additional resettlement assistance.

4.6.4 Compensation and Entitlement Policy

An Entitlement Matrix has been prepared on the basis of census and socioeconomic survey conducted during October-November 2010. It identifies the categories of impact based on the census and SES and shows the entitlements for each type of loss. The matrix describes the units of entitlements for compensating the lost assets, and various resettlement benefits. Cash Compensation under law (CCL) for lost assets (land, tree, structure & other physical establishments) will be accorded to the owners through the DCs as per market value assessed through legal procedure. The resettlement benefit for indirect losses and difference between replacement value and the CCL will be paid by MRT Line 6 through RAP Implementing Agency (an appointed NGO). The compensation and entitlement matrix is presented in **Table 4-3**.

Table 4-3 Compensation and Entitlement Covering All types of Losses

Item No.	Type of loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation issues/Guidelines	Organization Responsible
1	Loss of agricultural land, pond, ditches and orchards etc.	Legal owner(s) of land	i. Replacement value of land (Cash Compensation under Law (CCL) and additional grant to cover the market value of land as MARV) at market price to be determined by PVAT. ii. Refund of stamp duty & registration cost incurred for replacement land purchase at the replacement value. It is 15% of MARV to be given to every land loser of this category.	a. Assessment of quantity and quality of land by JVS b. Assessment of Cash Compensation under Law (CCL) c. Assessment of Market Value by Land Market Survey (LMS) d. Updating of title of the affected persons e. Payment of Cash Compensation under Law (CCL) f. PAPs will be fully informed of the entitlements and procedures regarding payments g. Additional cash grant to be paid to cover the current market price of land compensation based on average annual value collected from Sub-register office. h. Stamp duty and registration fees will be due to an EP in case of land is purchased within one year from the date of receiving full compensation for land	a. DC/JVT b. PVAT c. DC d. PVAT e. DC/LAO/RO f. DC/PIA g. DC/PIA h. MRTL-6/PIA
2	Loss of access to cultivable land by owner cultivator/ tenant/ sharecropper	Tenants/sharecropper/ Legal owner/grower/ socially recognized owner/ lessee/ unauthorized occupant of land	• Compensation for standing crops to owner cultivator/ sharecroppers or lessees as determined by PVAT. ii. Cash grant equivalent to 1 year income from land for titled/ non-titled lease holders or users as determined by PVAT. iii. Owner/grower to take away the standing crop	a. All the individuals identified by the JVS as tenants of sharecroppers of land b. Grant to be paid after taking possession of land and the legal/socially recognized owner is paid CCL for land and on certification of receipt by legal/socially recognized owner	a. DC/ JVT/PVAT b. DC c. MRTL6/NGO d. MRTL-6/NGO e. MRTL6/GRC/ NGO

Item No.	Type of loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation issues/Guidelines	Organization Responsible
				c. Additional cash grant to cover current market value of crop compensation as prescribed by PVAT in case of private owner himself cultivating crop d. Crop compensation and the crop will be shared between owner and sharecropper as per terms of sharecropping in case of privately owned land/socially recognized owner e. In case of dispute over verbal agreement on sharecropping, certification from the elected representative will be considered as legal document	
3	Loss of homestead/ residential/ commercial/ CPR plots by owners/Authorities	Legal owner(s) of the land	i. Replacement value of land (CCL plus 50% premium as per law and additional grant to cover the market value of land as MARV) at market price to be determined by PVAT. ii. Refund of stamp duty & registration cost incurred for replacement land purchase at the replacement value. It is 15% of MARV to be given to every concerned PAPs. iii. 25 percent above, the MARV for developing the land at the place of new establishment. iv. In total (15% + 25%) 40% above MARV to be given for the	a. Assessment of quantity and quality of land by JVS b. Assessment of Cash Compensation under Law (CCL) c. Assessment of Market Value by Land Market Survey (LMS) d. Updating of title of the affected persons e. Payment of CCL plus 50% premium f. PAPs will be fully informed of the entitlements and procedures regarding payments g. Additional cash grant to be paid to authorized member of the management committee cover the current market price of land/crop compensation based on average annual value as approved by	a. DC JVT/PVAT b. DC c. PVAT d. DC/ LAO/ RO e. DC/PIO f. DC/PIA g. MRTL-6/NGO h. MRTL-6/PIO

Item No.	Type of loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation issues/Guidelines	Organization Responsible
			purposes ii & iii to every concerned PAPs.	Ministry h. Stamp duty and registration fees will be due to an EP in case of land is purchased within one year from the date of receiving full compensation money against land	
4	Loss of Trees/ Perennials/ fish stocks	ii. Person with Legal Ownership of the land iii. Socially recognized owner/ Unauthorized occupant of the trees/ fishes	i. Cash compensation at market rates for replacement of trees/ perennials/ fish stocks value ii. For fruit bearing trees- compensation for fruits @ 30% of timber value X 1 year and for perennials- compensation for fruits @ 30% of timber value X 3 years iii. Compensation for fish stocks as determined by PVAT. iv. 5 saplings will be distributed among each affected household v. Owners will be allowed to fell and take away their trees, perennial crops/ fishes etc. free of cost without delaying the project works.	a. Assessment of loss and market value of affected trees b. Payment of CCL for trees c. Adequate compensation will be paid and the owner will be allowed to fill and take the tree free of cost d. Cost of seedlings and value of yearly production of fruits will be determined by PVAT	a. DC/ JVT/PVAT b. DC c. MRTL-6/PIO d. MRTL-6/PIO
5	Loss of residential /commercial structure by owner(s)	Legal Title holder Owner(s) of structures	i. Replacement value of structure at market price determined by PVAT. ii. Transfer grant @ Tk.12.50 % of the replacement value of structure assessed by PVAT. iii. Reconstruction grant @ Tk.12.50 % of the replacement value of structure assessed by PVAT. iv. Owners to take away all salvage materials free of cost.	a. Verification of Joint Verification Survey (JVS) and other records b. PAPs will be fully informed about their entitlements and assisted to obtaining it. c. The affected households will be relocated in resettlement site, if at all provided by MRTL-6 d. Payment of Structure Transfer and Reconstruction Grant	a. DC/JVT b. MRTL-6/PIO c. MRTL-6/PIO d. MRTL-6/PIO

Item No.	Type of loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation issues/Guidelines	Organization Responsible
6	Loss of residential /commercial structure by squatters and unauthorized occupants	Informal settlers/ squatters/non-tilted PAPs occupying public land without title/ or squatting on Govt land	i. Replacement value of structure at market price determined by PVAT. ii. Transfer grant @ Tk.12.50% of the replacement value of structure assessed by PVAT. iii. Reconstruction grant @ Tk.12.50% of the replacement value of structure assessed by PVAT. iv. Owners to take away all salvage materials free of cost without delaying the project work v. Relocation of the affected households in Resettlement sites if at all provided by MRTL-6	a. Verification of JVS and PVAT data. b. Option of relocation of the affected households in resettlement site to be provided by MRTL-6 @ gross 5 decimal plot per Households in the name of husband and wife where applicable (if resettlement site is developed). c. They will be treated as Vulnerable PAPs, and will be given a grant of an amount of Tk. 30,000 to each PAH	a. MRTL-6/PIO b. MRTL-6/PIO c. MRTL-6/PIO
7	Loss of access to Residential houses/ commercial structures (Owners/rented or leased)	Tenants of rented/ leased properties	i. One time cash grant for facilitating alternative housing/CBEs Tk. 30,000.00 per household or entity ii. Shifting allowance per household based on family members @ Tk. 500/- per member with minimum Tk. 2000 and maximum Tk 4000.00 per household	a. Verification of JVS and records b. Shifting allowance will be paid on relocation from project site	a. MRTL-6/PIO b. MRTL-6/PIO
8	Loss of business by CBEs due to dislocation	Owner/operator of the business as recorded by JVS	i. Business restoration grant to be determined by JVT/PVAT subject to minimum of Tk. 1,00,000.00 and maximum of Tk. 3,00,000.00 per unit for medium BEs and Tk. 50,000.00 to Tk. 80,000.00 per unit for small BEs. Other parameters will be determined by JVT/PVAT to define medium and small BEs	a. All persons recorded by the JVS b. Cash grant to be paid while taking possession of land	a. MRTL-6/PIO b. MRTL-6/PIO

Item No.	Type of loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation issues/Guidelines	Organization Responsible
9	Loss of Income and work days due to displacement	Employees/Daily wage earners identified by the Joint Verification Team (JVT)	i. Cash grant to the affected employees/wage earners equivalent to 90 days wage @ Tk. 300.00 for unskilled and Tk. 500 for skilled laborers ii. Preferential employment in the project construction work, if available	a. All persons recorded by the JVS b. Cash grant to be paid while taking possession c. Involvement of the incumbents in project civil works d. Involvement in job/fish culture/ livestock and poultry/ horticulture/ welding/mechanics/plant cultivation/ social forestry on road side land	a. DC/MRTL6/PO b. MRTL-6/PIO c. MRTL-6/PIO d. MRTL-6/PIO
10	Poor and vulnerable households	Poor and vulnerable households including informal settler, squatters /women headed household without elderly son/ non-titled PAPs identified by JVT	i. Additional cash grant of Tk. 25,000 for affected women headed households and other vulnerable households ii. Training and cash grant of Tk. 20,000 per PAP nominated by PAH for income generation activity	a. Identification of Vulnerable households as per guide line b. Income restoration schemes as outlined separately for vulnerable households c. Arrange training on income generating activities	a. PIO b. PIO c. MRTL-6/PIO
11	Displacement of community structure (CPR)	Community structure representative as identified by the JVT	i. Replacement value of structure at market price determined by PVAT. ii. Transfer grant @ Tk.12.50% of the replacement value of structure assessed by PVAT. iii. Reconstruction grant @ Tk.12.50% of the replacement value of structure assessed by PVAT. iv. In total (15% + 25%) 40% above MARV to be given for the purposes ii & iii to every concerned PAPs. v. Extra cash grant @ of 25% of MARV per CPR for facilitating establishment of a better one. vi. Owners to take away all salvage materials free of cost vii. New CPR will be established by the	a. Assessment of CCL b. Replacement value of structure assessed by PVAT c. Payment of additional cash grant for reconstruction or improvement to match the replacement value of CPR and transfer/ shifting grant d. Demolition of CPR to be avoided as far as possible e. New CPR will be established with a better quality	a. DC/JVT b. DC/MRTL6/PIO c. MRTL-6/PIO d. MRTL-6/PIO e. MRTL-6/PIO

Item No.	Type of loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation issues/Guidelines	Organization Responsible
			project in new location provided by MRT LINE 6. If the community desires, they can take the value of land as per Item-3 of this Matrix.		
12	Access to community/ civic facilities at resettlement sites	Households Identified by Joint verification team	Community infrastructure facilities, access roads, plantation, tube-wells, sanitary latrines and drainage.	a. Conduct a need based survey among the affected households to be relocated b. Keep provision in the agreement with Civil Contractor for providing civic facilities in resettlement sites	a. PIA b. MRTL-6/PIA
13	Temporary impact during construction	Community / Individual	i. The contractor shall bear the cost of any impact on structure or land due to movement of machinery and in connection with collection and transportation of burrow materials. ii. All temporary use of lands outside proposed COI to be through written approval of the landowner and contractor. iii. Land will be returned to owner rehabilitated to original preferably better standard.	a. Community people should be consulted before starting of construction regarding air pollution, noise pollution and other environmental impact b. The laborers in the camp would be trained about safety measures during construction, aware of health safety, STDs, safe sex etc. The contractor shall ensure first aid box and other safety measures like condoms at construction site.	a. Contractor b. Contractor
14	Adverse impact mitigation on the host community due to relocation of PAPs	The host community/host people where displaced people to be relocated	iv. Provision for tube well for drinking water, sanitary latrine, school building v. Borrow pit, rain / surface water pond for all purpose water use	a. Conduct a need based survey in the host community regarding availability of such community facility b. Project should keep provision to construct common resource properties in the host villages	a. PIA b. MRTL-6/PIA
15	Unforeseen impact	Concerned impacted	i. Determined as per policy on unique ii. findings at detailed design stage	a. It should be mitigated in the light of others related issues	a. MRTL-6/PIO

CHAPTER 5

ANALYSIS OF ALTERNATIVES

5.1 ALTERNATIVE STRUCUTRE

Generally, railway structures are classified into three (3) major types, which are: At Grade Structure Type, Elevated Structure Type and Underground Structure Type. The type of railway structure is based mainly on characteristics of urban area along a proposed scheme, considering construction cost, construction period of scheme, advantages to people (scheme users), environmental consideration, and operation and maintenance.

Therefore, JICA Study Team carefully investigates the urban characteristics of the proposed MRT Line 6 and divides the line into three (3) major sections. Based on the urban characteristics, JICA Study Team has to propose the most appropriate type of structures that would be required in certain section with the least cost solution. The urban characteristics of the proposed alignment (see **Figure 5-1**) are as follows:

(1) Underdeveloped Area (Uttara North Station- Pallabi Station Section);
(2) Suburban Area (Pallabi Station - Chandrima Uddan Station Section); and
(3) Urban Area (Chadrima Uddan Station - Saidabard Station Section)

(1) Underdeveloped Area (Uttara North Station - Pallabi Station Section)

This section is yet to be developed, therefore, At Grade Structure type is considered as the most economical option for construction of a MRT rail system. However, because of waste land in the area, embankment with soil improvement and/or man-made foundation (concrete deck with pile foundation) could be recommended to mitigate soft soil condition of the area.

(2) Suburban Area (Pallabi Station -Chandrima Uddan Station Section)

The adjacent vicinities of proposed MRT Line 6 from Pallabi Station to Chandrima Uddan Station section is a suburban area and has enough road capacity to construct elevated MRT rail system. Although it is assumed that the involuntary resettlement will occur due to the alignment and construing MRT stations, the anticipated number of affected house/building might less than that of underground structure type. In addition, adverse impact of ground subsidence is less than underground structure type because the bored pile will support super structure when the pile is fixed into the firm stratum. Therefore, Elevated Structure Type is recommended for this section, which is also economical and less time required for construction. In addition, after construction of elevated MRT system, the road space underneath will remain with the same number of lanes as before for vehicular traffic flow.

(3) Urban Area (Chandrima Uddan Station - Saidabard Station Section)

The section along Sir Sayed Road is narrow about 15.5m width but only 700m long, during construction period it has alternative routes to be identified for traffic diversion. Moreover, in the case of elevated structure, the construction period will be about six (6) months for this short section. With the mentioned constraint which can be overcome with proper planning, the Elevated Structure Type would be more recommended for this section. It also requires short duration construction period and less impact on existing at-grade road traffic. It is expected that after construction of the elevated MRT system, the same number of traffic lanes could still be secured for the at-grade road traffic.

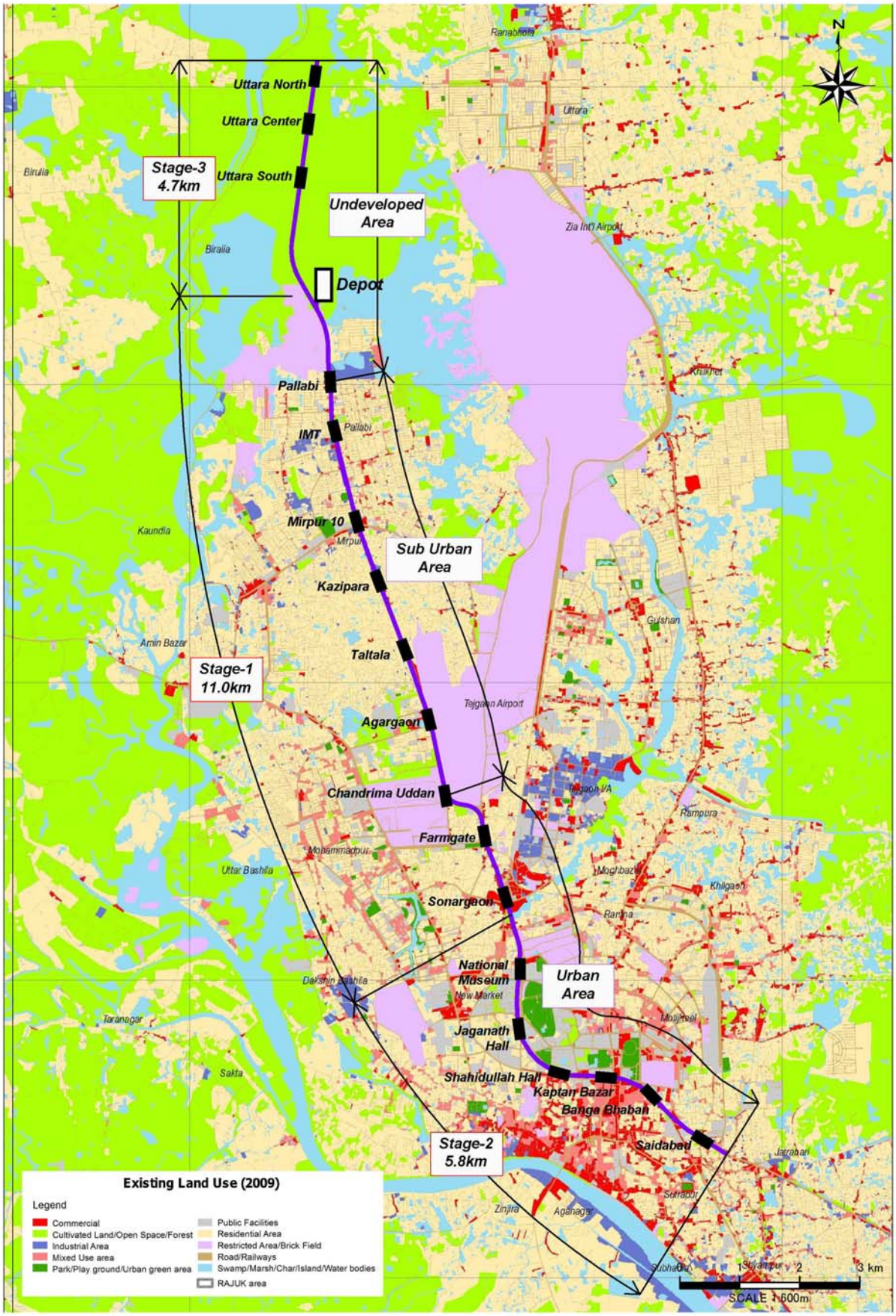


Figure 5-1 Three (3) Urban Characteristics Location

5.2 ALTERNTIVE ROUTE

In order to determine the most feasible alternative routes of the proposed MRT Line 6, the line is divided into six (6) sections as listed below.

1. Uttara North to Pallabi;
2. Pallabi to Chandrima Uddan;
3. Chandrima Uddan to Farmgate;
4. Farmgate to Sonargaon;
5. Sonargaon to Shahidullah Hall; and
6. Shahidullah Hall to Saidabad

The Uttara North to Pallabi section is still underdeveloped and no road network is provided. Therefore, the shortest and suitable MRT alignment from Uttara North to Pallabi might be preserved easily for future construction. The Pallabi to Chandrima Uddan along the Begum Rokeya Sharani Road has enough width to construct MRT rail system. The alignment between Chandrima Uddan to Farmgate is prepared with two (2) alternative routes.

The alignment between Farmgate to Sonargaon section might be able to go along Airport Road because enough road width is preserved. For the section between Sonargaon to Shahidullah Hall, it is found from the investigation that there might be three (3) alternative routes for alignment study. And finally, the investigation suggests that Shahidullah Hall to Saidabad section is to be maintained.

The following discussions describe the route alternatives shown in **Figure 5-2** for Chandrima Uddan to Farmgate and for Sonargaon to Shahidullah Hall.

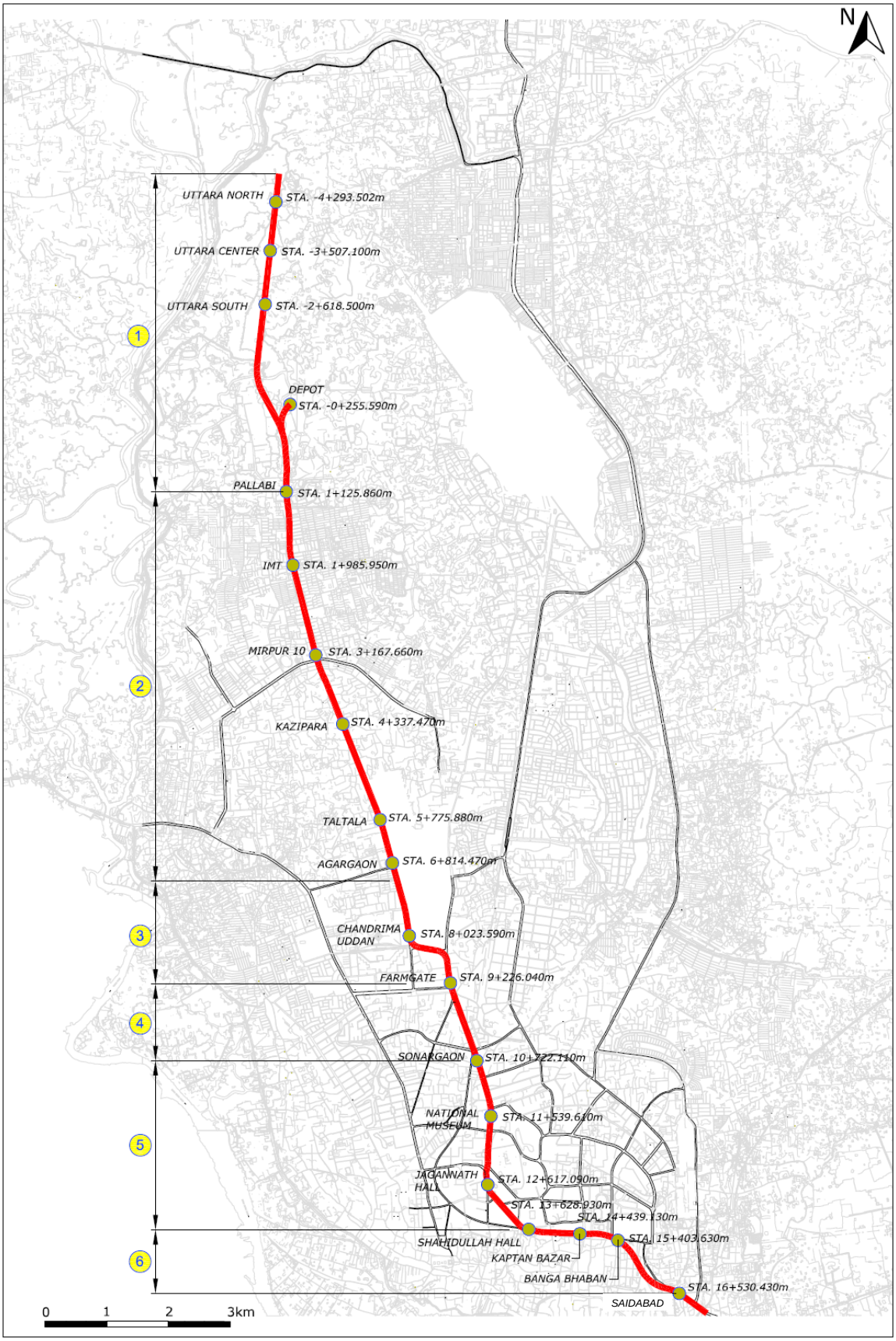


Figure 5-2 Divided Routes of MRT Line 6

(1) Alternative Route from Chandrima Uddan to Farmgate Section

There are two (2) alternative routes shown in **Figure 5-3** for the section between Chandrima to Farmgate, which are Route-A1 (Begum Rokeya Sharani~Bijoi Sharani~Airport Road) and Route-A2 (Begum Rokeya Sharani~Khamarbari Road~Airport Road). The length of Route-A1 is 1,433m and land acquisition is needed for elevated scheme. The length of Route-A2 is 1,546m and needs land acquisition also; in addition, existing building is to be affected for elevated structure scheme.

The detail of elevated and underground scenarios of Route-A1 and Route-A2 are described in the following tables **Table 5-1** and **Table 5-3**, and respectively for comparison.

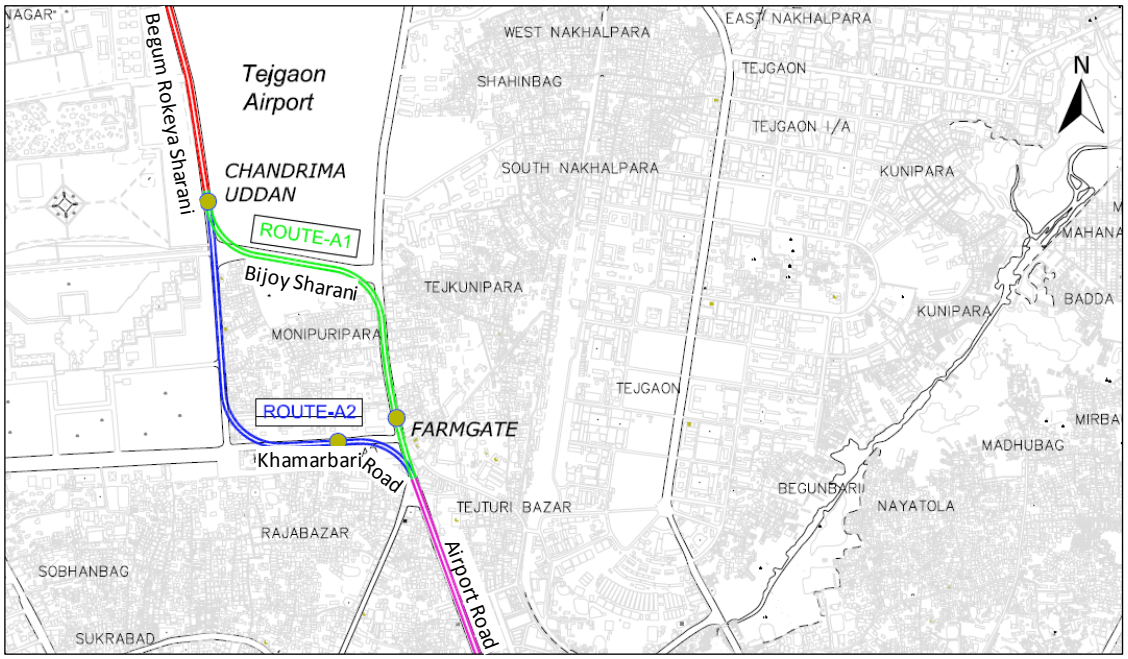


Figure 5-3 Alternative Route- A1 and Route- A2

Table 5-1 Comparison of Route-A1 and Route-A2

Item	Route- A1	Route- A2
Land Acquisition	Part of NOVO Theater is required. (approx. 0.4 ha)	Part of Khamarbari Agricultural Complex is required. (approx. 0.4 ha)
Affected Houses and Buildings	Two buildings located at NOVO Theater area might be affected; however there is a possibility to avoid when detail of alignment is reviewed in detail design stage.	Khamarbari Agricultural Complex. (2 buildings).
Evaluation	○ **(Recommended):** This Route can reduce the number of affected structures in Detailed Design stage	x **(Not Recommended)**: Affect to the Agriculture Complex is not fatalistically inevitable

(2) Alternative Route from Sonargaon to Shahidulla Hall Section

This section have three (3) options, which are Route-B1 (Airport Road~Sonargaon Road~Kataban Road ~ Zahir Raihan Sharani ~ S.Kamruzzaman Sharani), Route- B2 (Airport Road ~ Kazi Nazul Islam Avenue ~ Zahir Raihan Sharani ~ S.Kamruzzaman Sharani), and Route- B3 (Airport Road ~ Kazi Nazul Islam Avenue ~ Sir Sayed Road ~ S. Kamruzzaman Sharani).

The first option Route-B1 is 4,223m long and partial alignment from Sonargaon Road to Kataban Road has 16.0-16.5m width only (refer to **Figure 5-4**). This will require more resettlement and land acquisition to build stations too.

The second option Route- B2 (refer to **Figure 5-5**), which has a length of 3,618m and needs land acquisition is required; however the number is less than option 1.

The third option Route- B3 is 3,393m long (refer to **Figure 5-6)**, and land acquisition is also needed for elevated MRT rail system, however the required number of resettlement is the least of among three options.

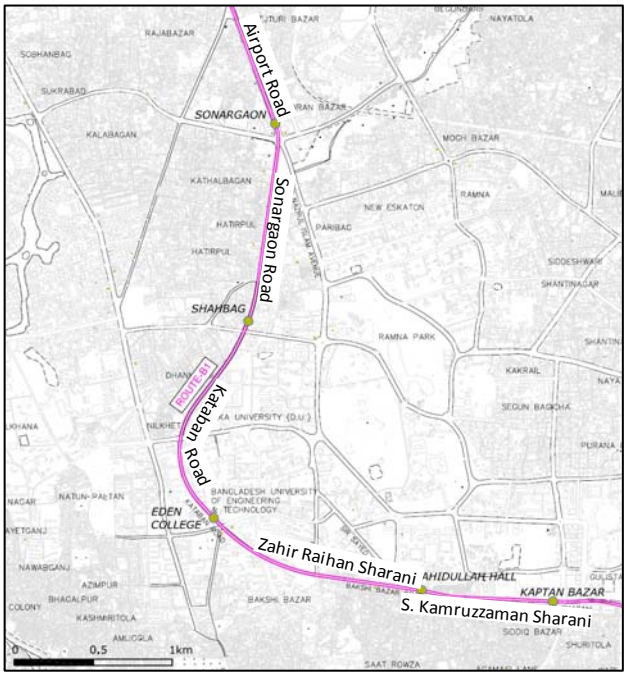


Figure 5-4 Alternative Route- B1

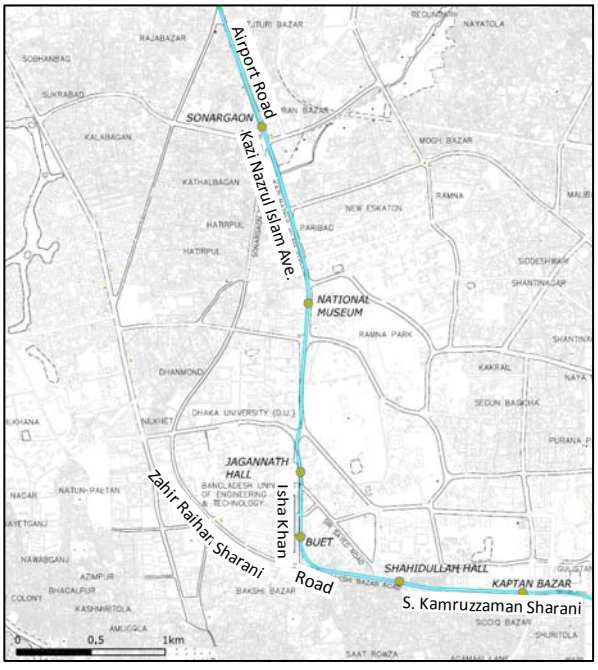


Figure 5-5 Alternative Route- B2

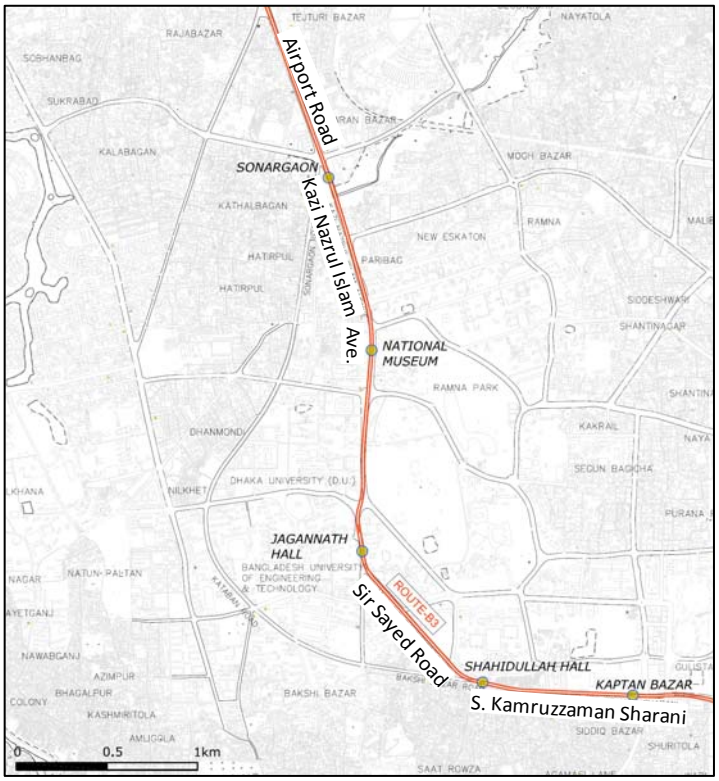


Figure 5-6 Alternative Route- B3

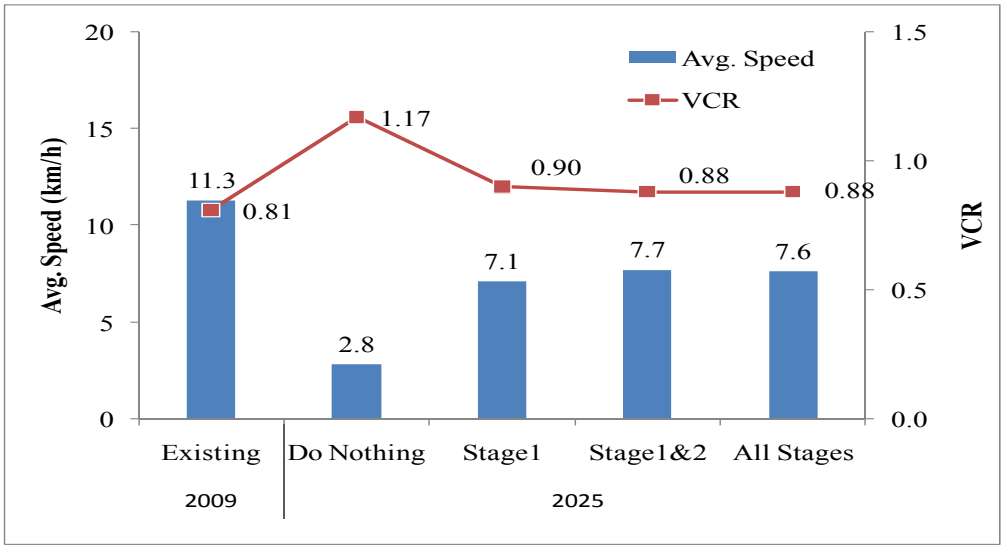
Table 5-2 Comparison of Route-B1, B2 and B3

Item	Route- B1	Route- B2	Route- B3
Land Acquisition	Part of Sonargaon Road and Kataban Road for stations (approx.0.4 ha)	Part of Dhaka Medical University for the alignment (approx. 0.4 ha)	Part of Tuberculosis Research and Training Institute for station (approx.0.4 ha)
Affected Houses, Buildings and People	Four commercial buildings and approximately 70 small shops might be affected at proposed Shahidullah Hall Station Four single story quarter houses (approximately 20 – 30 families inhabit) might be affected There are many street (homeless) people	Three buildings situated within Dhaka Medical College compound might be affected, and one of them is new building with 12 stories	Four buildings with two stories which belong to Tuberculosis Research and Training Institute might be affected
Evaluation	x **(Not Recommended)**: This Route will affect the houses, buildings and inhabitants significanly	x **(Not Recommended)**: This Route will affect the building those belong to Medical College significantly	○ **(Recommended):** This Route will also affect the Tuberculosis Research and Training Institute; however the magnitude of impact is less than other two when Government prepare alternative facility to relocate

5.3 NO ACTION ALTERNATIVE

Traffic assignment to road network under 'Do Nothing' case is made in this section. Figure 5-7 shows the traffic assignment results of years 2009 and 2025. Traffic congestion rate (VCR 1.0 means the travel time requires six times of free-flow travel time which shows extremely serious traffic congestion.

1. The current average speed is 11.3km/h（VCR ; 0.81）and daily traffic congestion occurs regularly.
2. Travel speed when no measure is taken will decrease to 2.8km/h in 2025, while it is expected that the travel speed will improve to 7.6km when the Project is carried out.
3. Thus is assumed that extinct traffic will affect urban activities, administrative functions, commercial activities and industrial activities if no measures will be taken.



Source; JICA Study Team

Figure 5-7 Share of Road Length by VCR Rank

CHAPTER 6

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

6.1 INTRODUCTION

The Environmental Management Plan (EMP) is prepared for all the identified environmental impacts as specified in Chapter 4 during pre-construction, construction and operation stages. The EMP outlines mitigation and monitoring requirements that will ensure compliance with the GOB environmental laws and regulations and comply with the JICA Guidelines for Environmental and Social Considerations. This section documents the EMP for the project and contains the overall institutional framework, project level institutional framework, environmental mitigation plan, environmental monitoring and management plan, compliance and grievances and EMP reporting.

6.2 OVERALL INSTITUTIONAL FRAMEWORK

The JICA Study Team of DHUTS Phase I have been proposed two organizations for MRT implementation and operation. One was the DMTA (Dhaka Mass Transit Authority, DMTA but Cabinet Committee suggested as Dhaka Transport Planning and Coordination Authority, DTPCA) by restructuring of DTCB, and the other was DMTC (Dhaka Mass Transit Company) for MRT operation. In addition, the JICA Study Team proposed 3 (three) options for execution of MRT project. Of them, Option C was more practical in context of local administrative environment (Page 20-11, DHUTS, March 2010). The main aspect of this option was DMTA (DTPCA) would be responsible for entire works including construction of infrastructure and E&M and procurement of rolling stock. The advantages of this option was a Special Project Organization (SPO) could be established under DTPCA during the phases of project preparation and implementation, and then the human resources and assets could be shifted to DMTC. The other stakeholders for MRT implementation were Executive Committee on National Council (ECNEC), Economic Relation Division (ERD), Ministry of Communications (MOC) and Government Inspector of Bangladesh Railway (GIBR). Therefore, the suggested overall institutional framework of MRT implementation is as follows:

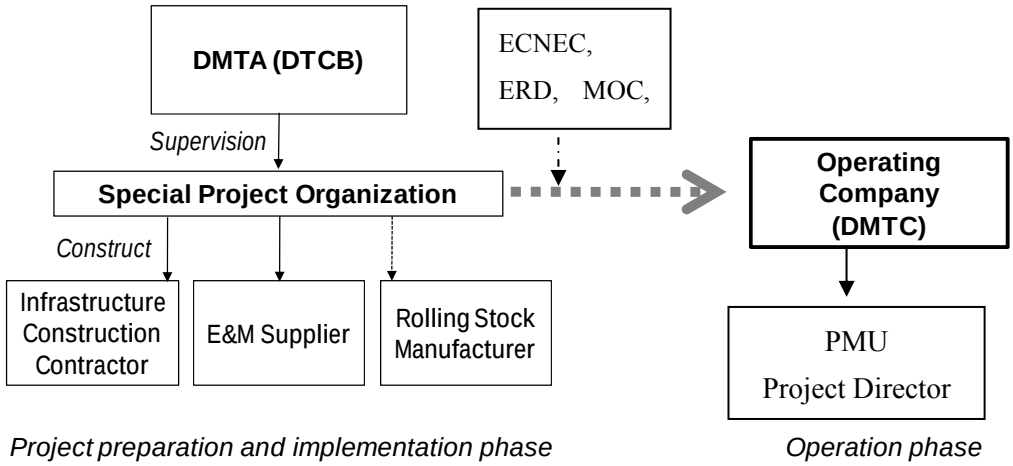


Figure 6-1 Suggested Overall Institutional Framework

6.3 PROJECT LEVEL INSTITUTE FRAMEWORK

An Environmental Unit would be created for MRT Line 6 at the time of detail design and construction phase. A tentative organogram of the Unit as follows

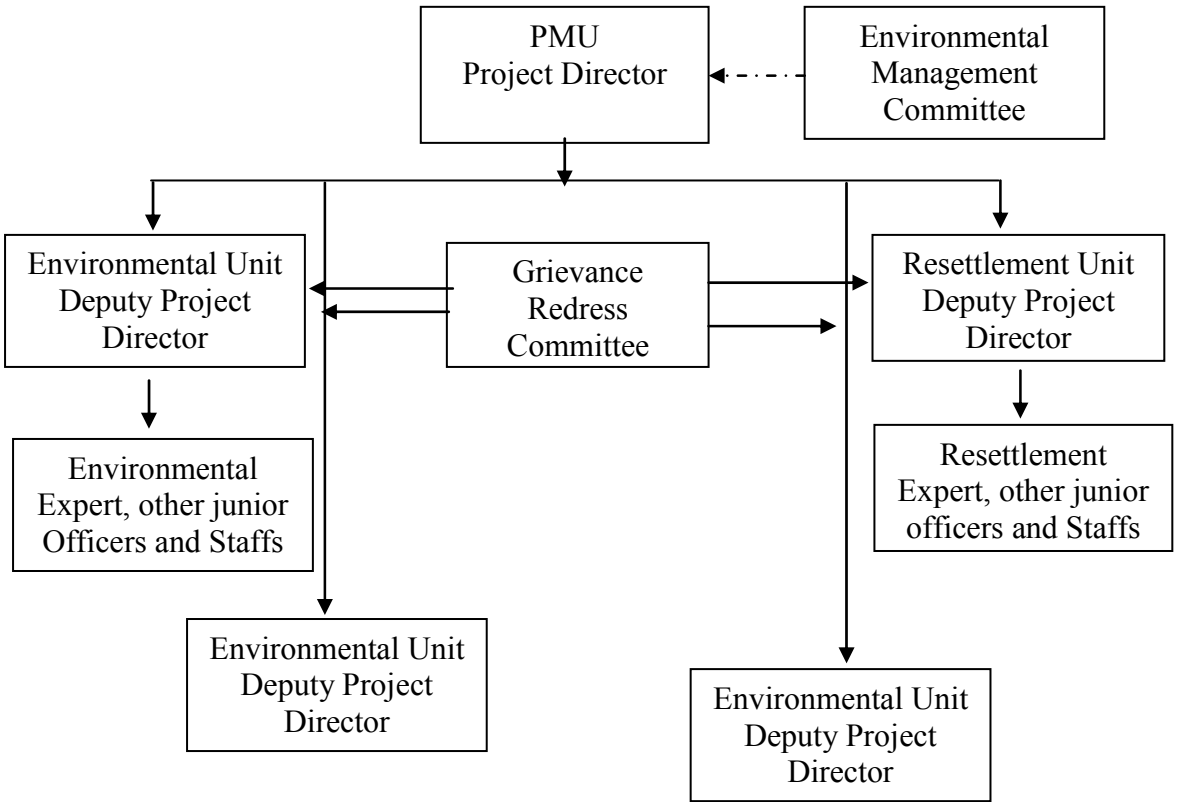


Figure 6-2 Project Level Institutional Framework

6.4 ENVIRONMENTAL MANAGEMENT PLAN

Environmental management is essential to ensure that impacts identified are prevented and mitigated by the Environmental Management Plan (EMP). The EMP includes measures to address the potential impacts listed above that will be implemented during the construction stage of the project. More specifically, contracts for the respective rehabilitation works will include in the Technical Specifications, environmental guidelines for contractor.

The implementation of the EMP shall be monitored to ensure overall potential environmental and safety impacts are readily avoidable and can be easily mitigated by adopting good engineering practices. Environmental monitoring and supervision shall be integrated into the project management and reporting system.

DTCB, PIU, and other relevant authorities will be involved in auditing project performance and will receive copies of monitoring reports. These agencies/institutions may also request an increase in frequency of monitoring and that appropriate actions are taken for environmental mitigation as they deem necessary. **Table 6-1** summarizes the proposed mitigation measures and budget and responsible agencies of management.

Table 6-1 Environmental Mitigation Plan

Project Activities	Environmental Impact	Proposed Mitigation Measures	Budget USD	Institutional Responsibilities	
				Implementation	Supervision
PRE-CONSTRUCTION STAGE					
A. Environmental Mitigation Plan for Elevated Track/Viaduct					
1. Project information	Disclosure of project information	• Prior to start of site works, local residents and establishments, local authorities who are likely to be affected by the project shall be informed on the construction schedule and activities, potential environmental impacts and mitigation measures through public meetings at each affected area.	to be filled later	DTCB, Design Consultant, Project Supervision Consultant	DTCB, DOE
2. Land acquisition	Acquisition of about 0.28 ha of private land 0.22 ha of governmental land for the project.	• Provide compensation in accordance with 'resettlement action plan' (RAPs) • Engage NGOs for implementation of RAP • Establish Monitoring Unit involving 3 parties (DC, DTCB and PAPs)	to be filled later	DC, DTCB, RAJUK, DCC, Cant. Board, NHA, NGO	NGO, External Monitor
3. Resettlement	1,392 PAPs will be affected through loss of structures (housing, business and other structures)	• Provide compensation in accordance with 'resettlement action plan' (RAPs) • Engage NGOs for implementation of RAP • Establish Monitoring Unit involving 3 parties (DC, DTCB and PAPs)	to be filled later	DC, DTCB, RAJUK, DCC, Cant. Board, NHA, NGO	NGO, External Monitor
4. Cutting trees along the MRT Line 6	Cutting of ornamental shrubs along the median of the existing road	• Creating green ground cover by planting of ornamental shrubs below the elevated track/viaduct.	to be filled later	DCC, DTCB, PIU, NGO	DCC, PIU, NGO
5. Specific management plan shall be prepared by the Contractor and shall be submitted	Hazard at work places and ambient	• Dust Control Plan • Noise Control Plan • Spoils Disposal Plan • Spill Management Plan • Traffic Management Plan • Occupational Health and Safety Plan • Emergency Response Plan	to be filled later	DTCB, PIU, Supervision Consultant, Contractors	PIU, Supervision Consultant,

Project Activities	Environmental Impact	Proposed Mitigation Measures	Budget USD	Institutional Responsibilities	
				Implementation	Supervision
Supervision Consultant prior to stat works					
6. Start of site works	Environmental complaints due to project implementation	• Grievance Redress Mechanism (GRM)	to be filled later	DTCB, Design Consultant, Project Supervision Consultant	DTCB, DOE
B. Environmental Mitigation Plan for Depot					
1. Project information	Disclosure of project information	• Prior to start of site works, local residents and establishments, local authorities who are likely to be affected by the project shall be informed on the construction schedule and activities, potential environmental impacts and mitigation measures through public meetings at each affected area.	to be filled later	DTCB, Design Consultant, Project Supervision Consultant	DTCB, DOE
2. Land acquisition	Acquisition of about 20 ha land of governmental land for the project.	• Provide compensation in accordance with 'resettlement action plan' (RAPs) • Engage NGOs for implementation of RAP • Establish Monitoring Unit involving 3 parties (DC, DTCB and PAPs)	to be filled later	DC, DTCB, RAJUK, DCC, Cant. Board, NHA, NGO	NGO, External Monitor
3. Resettlement	In case when PAPs will be affected through loss of structures (housing, business and other structures)	• Provide compensation in accordance with 'resettlement action plan' (RAPs) • Engage NGOs for implementation of RAP • Establish Monitoring Unit involving 3 parties (DC, DTCB and PAPs)	to be filled later	DC, DTCB, RAJUK, DCC, Cant. Board, NHA, NGO	NGO, External Monitor
4. Specific management plan shall be prepared by the Contractor	Hazard at work places and ambient	• Dust Control Plan • Noise Control Plan • Spoils Disposal Plan • Spill Management Plan	to be filled later	DTCB, PIU, Supervision Consultant, Contractors	PIU, Supervision Consultant,

Project Activities	Environmental Impact	Proposed Mitigation Measures	Budget USD	Institutional Responsibilities	
				Implementation	Supervision
and shall be submitted Supervision Consultant prior to stat works		• Traffic Management Plan • Occupational Health and Safety Plan • Emergency Response Plan			
5. Start of site works	Environmental complaints due to project implementation	• Grievance Redress Mechanism (GRM)	to be filled later	DTCB, Design Consultant, Project Supervision Consultant	DTCB, DOE
CONSTRUCTION STAGE					
A. Environmental Mitigation Plan for Elevated Track/Viaduct/Depot					
1. Pier excavation works	Spoils generation from pier excavation works	• Strictly implement approved Spoils Disposal plan • Spoil disposal only at the approved areas • Trucks transporting spoils shall be tightly covered with suitable materials to minimize dust emission and spills • Wheel washing shall be undertaken to remove mud so as to ensure that access road are kept clean • Road surfaces shall be regularly cleaned of spilled spoils	to be filled later	Contractor	DTCB/PIU, Supervision Consultant
2. Air quality at the time of construction	Air quality impacts due to gaseous and dust emissions	• Strictly implement approved Dust Control Plan • Wherever possible, use electrically-powered equipment • Construction equipment and vehicles shall be well-maintained and shall meet national DOE emission standards • Store excavated materials outside road reserve, but where there is no area, spoils shall be loaded and transported immediately • Clean road surfaces of debris/spoils from construction equipment and vehicles	to be filled later	Contractor	DTCB/PIU, Supervision Consultant

Project Activities	Environmental Impact	Proposed Mitigation Measures	Budget USD	Institutional Responsibilities	
				Implementation	Supervision
		• Undertake daily cleaning of paved routes around the pier construction sites • Impose speed limits on construction vehicles to minimize road dust in areas where sensitive receptors are located • Provide prior notification to the community on schedule of construction activities			
3 Noise and vibration at the time of construction	Noise and vibration impacts due to operation of construction equipment and other activities	• Strictly implement approved Noise Control Plan • Erection of temporary walls around the elevated station sites and other construction sites • Borehole pile/churned drill pile method • All construction equipments and vehicles shall be well maintained • No noisy construction –related activities will be carried out during the night • As much as possible, use quiet equipment and working method • Provide prior notification to the community on schedule of construction activities	to be filled later	Contractor	DTCB/PIU, Supervision Consultant
4.Placement of materials	Drainage obstruction	• Placement of construction materials, excavated spoils, equipment shall not block flow of rain water into drainage structures • Regular inspect and maintain all drainage channels	to be filled later	Contractor	DTCB/PIU, Supervision Consultant
5. Solid waste	Generation of solid wastes	• Separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporary on site • Undertake regular collection and disposal of wastes to sites approved by authority	to be filled later	Contractor	DTCB/PIU, Supervision Consultant
6. Closure of median lanes for traffic	Traffic congestion and access problems	• Strictly implement approved Traffic Management Plan • Provide signs advising road users that construction is in progress and that the road narrows to one lane using	to be filled later	Contractor	DTCB/PIU, Supervision Consultant

Project Activities	Environmental Impact	Proposed Mitigation Measures	Budget USD	Institutional Responsibilities	
				Implementation	Supervision
		cones • Employ flag persons to control traffic • As much as possible, lifting and placing of the pre-cast pier and viaduct sections will be done at night to minimize traffic congestions • Use traffic cones to direct traffic to move to the open lane			
7. Working Environment	Hazards to health and safety of workers and the public due to operation of viaduct facilities	• Implementation of Occupational health and safety plan • Implantation of emergency response plan • Appoint of Environment, Health and Safety Manager • Conduct orientation of construction workers on safety • Provide fire fighting equipment at the working site • Provide fencing of all areas of excavation and construction sites	to be filled later	Contractor	DTCB/PIU, Supervision Consultant
OPERATION STAGE					
A. Environmental Mitigation Plan for Elevated Track/Viaduct					
1. Train operation	Noise emission and vibration from rolling stock and operation of elevated station	• Installation of noise shield on the viaduct • Optimal maintenance of rolling stocks • At the station platform, paging and bell signaling volume shall be adjusted to the lowest level where it will not detract from their function • Insulator/anti-vibration devices will be installed under the rails thereby reducing noise and vibration • The rails are fastened with resilient fasteners and continuously welded further reduces vibration and noise	to be filled later	DMTC	DTCB, DOE
2. Cleaning of stations	Waste generation	• Waste collection bins shall be provided • Garbage shall be collected regularly • station shall be provided toilet and other facilities	to be filled later	DMTC	DTCB, DOE

Project Activities	Environmental Impact	Proposed Mitigation Measures	Budget USD	Institutional Responsibilities	
				Implementation	Supervision
3. Working condition	Hazards to health and safety of workers and the public due to operation of viaduct facilities	• Implementation of Occupational Health and Safety Plan • Implementation of Emergency Response Plan	to be filled later	DMTC	DTCB, DOE
B. Environmental Mitigation Plan for Depot					
1. Depot activities	Air quality impacts due to waste generation	• The wastewater treatment facility shall be properly maintain • Solid wastes shall be regularly removed from the depot to disposal sites	to be filled later	DMTC	DTCB, DOE
2. Maintenance of rolling stocks	Noise emission and vibration from rolling stock and maintenance activities	• Grinding and other maintenance activities that will generate high noise level will be undertaken inside the maintenance sheds • The rails are fastened with resilient fasteners and continuously welded further reduces vibration and noise	to be filled later	DMTC	
3.Wastewater	Wastewater generation	• Wastewater shall be treated at the depot's industrial treatment plant • Drainage emanating from the depot workshops will be equipped with oil interceptors • Office building shall be provided with toilets and septic tanks to handle domestic sewage	to be filled later	DMTC	DTCB, DOE
4.Water supply	Water supply liability	• Train wash water and rain water shall be collected in underground storage tanks for recycling • Considering installation of back-up well in addition to the existing well	to be filled later	DMTC	DTCB, DOE
5.Solid waste	Solid waste generation	• Offices, workshops and other areas within the depot shall be provided with waste collection bins or receptacles • Solid waste shall be separated into hazardous and non-hazardous	to be filled later	DMTC	DTCB, DOE

Table 6-2 Environmental Monitoring and Management System

Parameters	Locations	Means of Monitoring	Frequency	Responsible Agency	
				Implemented by	Supervised by
DURING CONSTRUCTION					
A. Environmental Mitigation Plan for Elevated Track/Viaduct/Depot					
Air quality PM_{10}, $PM_{2.5}$, SO_x, NO_x, and Lead	5 locations	• Sample collection and laboratory analysis	2 times in dry seasons and 2 times in rainy season	Contractor	DTCB, DMTC, DOE
Water quality DO, COD, pH, SS both for surface and ground water and total coliform index.	3 locations	• Sample collection and laboratory analysis	2 times in dry seasons and 2 times in rainy season	Contractor	DTCB, DMTC, DOE
DURING OPERATION					
B. Environmental Mitigation Plan for Elevated Track/Viaduct/Depot					
Air quality PM_{10}, $PM_{2.5}$, SO_x, NO_x, and Lead	5 locations	• Sample collection and laboratory analysis	2 times in dry seasons and 2 times in rainy season	DMTC	DTCB, DOE
Water quality DO, COD, pH, SS both for surface and ground water and total coliform index.	3 locations	• Sample collection and laboratory analysis	2 times in dry seasons and 2 times in rainy season	DMTC	DTCB, DOE

6.5 COMPLAINS AND GRIEVANCES

GRCs will be formed at each Ward level for any grievances involving resettlement benefits, relocation, and other assistance. A gazette notification on the formation and scope of the GRCs will be required from the DTCB/MOC. The GRC for each Ward will be comprised of the followings:

Table 6-3 Members of GRC in Each Ward

Title	Person in charge
Representative of MRT Line6	Convener
Ward Councilor	Member
One representative of male PAPs	Member
One representative of female	PAPs
Legal Advisor as observer to extend legal support to the committee to be deployed by PIA	Manager
RAP Implementation Agency	Member Secretary

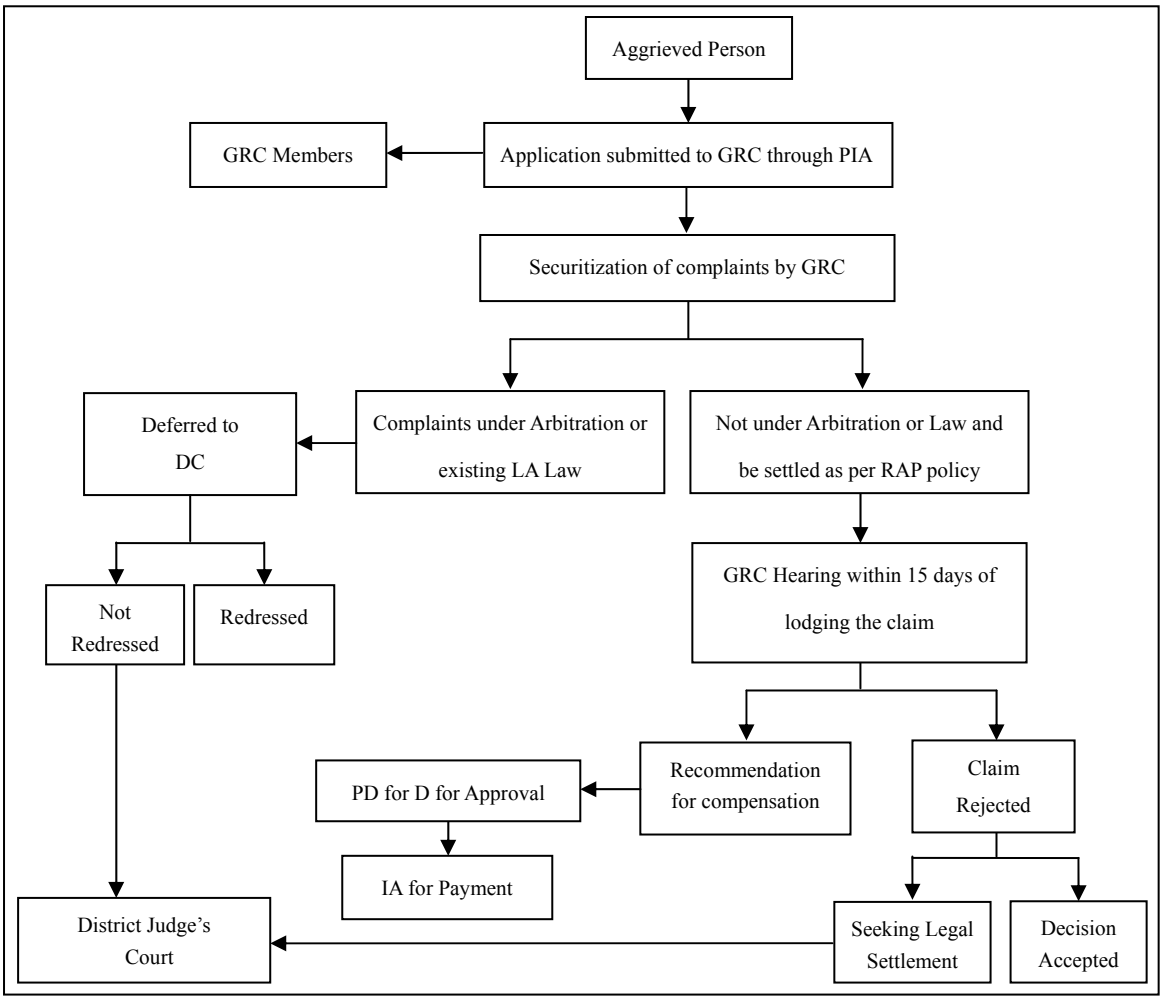


Figure 6-3 Grievance Redress Mechanism

No grievance should take more than one month for resolving from the GRC side, and before the GRC meetings, the aggrieve person(s) must be informed to remain present in the concerned GRC meeting.

6.6 REPORTING

Almost all the types of Social Environmental Impacts will be taken care under the RAP. So, all the reports related to any aspect of RAP will be considered as the report on Social Environment Impacts.

During the implementation stage, the Project Director will prepare quarterly reports on the progress of resettlement activities and forward copies of the report to the GOB and donors. A format for resettlement implementation monitoring will be devised for quarterly monitoring and data collection by the field officials. The Resettlement Specialist of the Construction Supervision Consultants Team for every six months during the implementation stage, will conduct review and report to PD, MRT Line 6 on the progress of all aspects of land acquisition and resettlement activities. The external monitor will submit mid-term and final report to the Project Director. The observation / recommendation made by the external monitor will be incorporated for smooth implementation of RAP and if necessary for betterment of PAHs.

A post-resettlement impact evaluation will be carried out by the donor to assess whether adverse impacts of the projects have been mitigated adequately and PAPs have been able to restore and/or improve their pre-project standard of living as a result of resettlement and development. The types of report to be prepared for the project are:

- Initial Inception report of RAP implementation to be submitted to MRT Line 6 by INGO
- Monthly progress report by the INGO to be submitted to MRT Line 6, every month
- Monthly progress report by the National Resettlement Specialist (NRS) of Construction Supervision Consultants Team in their monthly progress report to MRT Line 6 and JICA
- Quarterly report by NRS to MRT Line 6 and JICA
- Report with comments by the International Resettlement Specialist (IRS) of Construction Supervision Consultants Team within 6 month of commencement of RAP implementation to MRT Line 6 and JICA
- Midterm evaluation report by IRS to MRT Line 6 and JICA
- Project completion report prepared by INGO to MRT Line 6 and JICA
- Project completion report prepared by IRS to MRT Line 6 and JICA

On Natural Environmental Impacts, there will be no progress reports like those of RAP implementation; instead, the Natural Environmental Expert of MRT Line 6 and one expert from the Department of Environment jointly may prepare two reports:

- One report during the middle of implementation of MRT Line 6; and
- The other after the end of the implementation of RAP.

For submitting any report to JICA and other donor agencies by the INGO, the INGO must take approval/permission from MRT Line 6.

CHAPTER 7

PUBLIC CONSULTATIONS AND DISCLOSURE

7.1 CONSULTATION WITH CONSERNED AGENCIES

To meet the requirement of the study, the 1st stakeholder meeting was held in 24th June 2010, the 2nd stakeholder meeting was held in 5th August 2010 3rd one was held on 16th September with the relevant organizations. The participants from the organizations are shown in the following **Table 7-1.**

Table 7-1 Participants of the Meeting

Stakeholder Meeting	Date of Meeting	List of Participants
1st Meeting	24th June	DTCB, RAJUK, DCC, RHD, RRD of MOC, BUET, JICA Bangladesh, JICA Headquarter, BIWTA, DMP, BRTA, BRTC
2nd Meeting	5th August	DTCB, Deputy Commissioner (DC) of Dhaka, CCDB, Titas Gas, Fire Service and Civil Defense, BRTA, BUET, Planning Commission, DCC, LGED, DPDC, DESCO, BR, BRTC, GIBR, DMP
3rd Meeting	16th September	DTCB, RAJUK, MOC, BUET, JICA

The followings are the highlights of 1st meeting:

1. The meeting agreed in principle with the presented the Phase 2 Study Inception Report, especially stages of construction plan.
2. JICA Study Team would proceed with the study and submit the Final Report at the earliest.
3. The Meeting requested all stakeholders to extend cooperation to JICA Study Team.
4. JICA Study Team would consider the early completion of all studies for MRT Line 6.

DTCB carried out 2nd stakeholders meeting and agreed the following environmental mitigation points:

1. Alternative Route-A1 (Bijoy Sharani) was selected for MRT Line 6;
2. It was agreed that Tuberculosis Research and Training Institute may required the Government help for its partial resettlement; and
3. The Government would acquire and compensate a part of Mirpur Cantonment Area in accordance with the existing government rules.

DTCB carried out 3rd stakeholders meeting and agreed the following environmental mitigation points:

1. Alternative Depot in Uttara A-1 was selected because of the least settlement and environmentally friendly;

7.2 LOCAL STAKEHOLDER MEETING

In Bangladesh, there is no clear guideline or consultation for involvement of concern organization mentioned in the process of issuance of ECC. However, in MRT Line 6 Project, DTCB encourages to consult with local stakeholders about their understanding of development needs, the likely adverse impacts on the environment and society, and the analysis of alternative at any early stage of project among others. However, the working environment is not comfortable due to frequent demonstrations and road blockade by opposition political party(s), factory workers and students.

Under such circumstances, it is difficult to ensure the significant participation of local stakeholders in order to have consideration for environmental and social factors and to reach a consensus by publicizing by ordinary way. Therefore, selected stakeholder process is applied to induce broad public participation to a reasonable extent as described below.

Table 7-2 Selected Local Stakeholders

Category of Stakeholders	Gender
Ordinary people living adjacent to the tentative MRT station	Male and Female
Local elites	Male and Female
Local (school/college/university) teachers	Male and Female
Affected persons	Male and Female
Imams of the mosque	Male
Owners of the bus	Male and Female
Rickshaw pullers/Auto-rickshaw puller	Male
Shop keepers (small/medium/large)	Male and Female
Retired Persons	Male and Female
NGO representatives	Male and Female

Considering the Thanas in Dhaka, it is expected that local stakeholder meetings are scheduled to hold at five places as shown in **Table 7-3**, and summary of 1st round meeting is shown in following **Table 7-4**.

Table 7-3 Schedule of Local Stakeholder Meeting

Stakeholder Meeting	Month to hold the Meeting	Contents
1st Round Meeting	September - November, 2010	◊ Explain the outline of Project ◊ Inform MRT Line 6 alignment ◊ Inform the likely adverse impacts on environment and society ◊ Inform the possibility of resettlement due to the MRT alignment and new stations ◊ Inform the implementation of census survey and natural environmental survey such as water/air/noise etc.
2nd Round Meeting	December, 2010 – January, 2011	◊ Inform countermeasures against likely adverse impacts on environment and society ◊ Inform the frame of Resettlement Action Plan (RAP)
3rd Round Meeting	January-February, 2011	◊ Inform the result of EIA report ◊ Inform the prepared Resettlement Action Plan (RAP) ◊ Inform the future schedule on the Project

Table 7-4 Summary of 1st and 2nd Round Meeting

No.	Date	Time	Place	Number of Participants
1	9th September 2010	4 :00 pm	Model High School, Mirpur	115
2	11th October 2010	4:00 pm	Science College, Tejigaon	183
3	27th October 2010	12:00 noon	Sutrapur Community Center, Pallabi	249
4	30th October 2010	3:00 pm	Pallabi Community Center, Pallabi	146
5	11th November 2010	11:00 am	Siddique Bazar Community Center, Siddique Bazar	131

No.	Date	Time	Place	Number of Participants
1	21st December 2010	11:00 am	Ward Commissioner Office, Pallabi	52
2	23rd December 2010	04:00 pm	Ward Commissioner office, Mirpur 11	91
3	28th December 2010	04:00 am	Ward Commissioner office, Mirpur 10,	45
4	30th December 2010	11:00 am	Ward Commissioner office, Kazipara, Mirpur	55
5	1st January 2011	04:00 pm	Office of the Member of Parliament, Farmgate	57
6	3rd January 2011	11:00 am	Ward Commissioner office, Lalbagh Dhaka, Mirpur	60
7	6th January 2011	11:00 am	Ward Commissioner office, Sutrapur	57
8	8th January 2011	11:00 am	Dhaka University Campus	54
9	10th January 2011	11:00 am	Ward Commissioner office, Saidabad	46

10	13th January 2011	11:00 am	Office of the Rajdhani Super Market, Tikatoli	63

Appraising the expected benefits of MRT Line 6 in reducing traffic congestions, the suggestions/opinions given by the local people are:

1. For the MRT Line 6 project, the route of elevated railway should be designed on such a way so that it affects the minimum property and save wider community
2. In Dhaka it is very difficult to get a piece of land for homestead and business. So amount of compensation for land should be at least 50 percent higher than the present market value
3. For structure amount of should be also 50 percent higher than the present Public Works Department's construction cost
4. The affected business units should get an extra amount as business loss, and the amount will be equivalent to 6 months profit
5. Employees of the affected business units should also get an amount equivalent to their 6 months salary as employment loss
6. Losers of homestead should be given plot size 50 percent bigger than the lost one in any housing state to be developed in future by RAJUK
7. For loser of homestead with school going children, the Government should beat the responsibility for admission to schools in the area where the families moved
8. For the loser of business units, the Government should allocate shops when any new market is constructed by the Dhaka City Corporation
9. For the loser of business units, the total compensation package must include the amount of "Salami" (an amount given at one time to get possession) also

During other occasion, the survey team discussed with some rickshaw pullers, auto rickshaw and bus drivers about the MRT Line 6 project. They were found happy because they felt that with the decrease of traffic congestions, their job of pulling/driving will become easier and comfortable which will result into less accident also. People standing nearby listening the inquiry said that any effort/project for decreasing the present traffic congestion will be welcomed by the common people.

CHAPTER 8

CONCLUSIONS

1. All environmental documents are prepared based on JICA Environmental and Social Consideration Guidelines. The EIA reveals that there will be both adverse and positive impacts due to the construction of the 21.5 km long MRT Line 6.
2. The significant adverse environmental impacts of the Projects are involuntary resettlement and local economies such as employment and livelihood, Poor, Misdistribution of benefits and damages whereby.
3. Significant positive impacts of the Project are enhancement of Land and utilization of local resources, Social infrastructure and services.
4. Air pollution, Water pollution, Waste, Noise and vibration, Global warming and Biota ecosystem might be affected but not significantly. And affect to Soil pollution, Ground subsidence, Bottom sediment might be very little.
5. RAP and EMP has prepared to mitigate adverse impacts those assumed in planning, construction and operation stage of the Project to acceptable level. And this will be improved in accordance with the result of the detailed design

Appendix

Noise Level Monitoring Data

1. Ambient Noise Level Monitoring (Pallabi Near to Police Station, Mirpur, Dhaka)

Time	Noise Level (in dB)	Time	Noise Level (in dB)	Time	Noise Level (in dB)
6:00 AM	68.8	12:10PM	74.6	6:20PM	79.3
6:10 AM	67.3	12:20PM	79.2	6:30PM	78.5
6:20 AM	64.5	12:30PM	89.5	6:40PM	83.4
6:30 AM	62.5	12:40PM	85.7	6:50PM	84.5
6:40 AM	64.2	12:50PM	89.2	7:00PM	78.8
6:50 AM	68.9	1:00PM	86.9	7:10PM	81.9
7:00 AM	63.4	1:10PM	75.2	7:20PM	74.5
7:10 AM	65.2	1:20PM	76	7:30PM	79.1
7:20 AM	64.5	1:30PM	76.4	7:40PM	84.6
7:30 AM	69.6	1:40PM	72.3	7:50PM	82.9
7:40 AM	74.9	1:50PM	83	8:00PM	81.9
7:50 AM	79.7	2:00PM	92.1	8:10PM	82.2
8:00 AM	68.9	2:10PM	89.9	8:20PM	79.8
8:10 AM	74.2	2:20PM	87	8:30PM	84.5
8:20 AM	72.1	2:30PM	83.2	8:40PM	82.2
8:30 AM	78.7	2:40PM	76.2	8:50PM	81.9
8:40 AM	69.2	2:50PM	73.8	9:00PM	78.9
8:50 AM	75.7	3:00PM	81.3	9:10PM	80.2
9:00 AM	76.8	3:10PM	75.6	9:20PM	80.9
9:10 AM	84.7	3:20PM	79.2	9:30PM	79.8
9:20 AM	82.9	3:30PM	85.1	9:40PM	81.2
9:30 AM	87.6	3:40PM	78.4	9:50PM	78.5
9:40 AM	81.9	3:50PM	73.7	10:00PM	77.9
9:50 AM	88	4:00PM	81.2	10:10PM	79.2
10:00 AM	77.7	4:10PM	85.1	10:20PM	78.5
10:10 AM	84.3	4:20PM	78.4	10:30PM	79.2
10:20 AM	77.4	4:30PM	72.6	10:40PM	82.5
10:30 AM	80.2	4:40PM	79.6	10:50PM	76.9
10:40 AM	81.9	4:50PM	81.2	11:00PM	74.8
10:50 AM	78.3	5:00PM	79.3	11:10PM	76.5
11:00 AM	89.1	5:10PM	76.5	11:20PM	79
11:10 AM	75.2	5:20PM	84.4	11:30PM	74.2
11:20 AM	76.6	5:30PM	90.3	11:40PM	79.1
11:30 AM	81.3	5:40PM	83.6	11:50PM	72
11:40 AM	79.8	5:50PM	76.9	12:00PM	73.1
11:50 AM	78.1	6:00PM	73.8	12:10PM	73.5
12:00 PM	91	6:10PM	83.9	12:20PM	74.6
				12:30PM	70.2
				12:40PM	71.1
				12:50PM	68.2
				1:00PM	67.9

2. Ambient Noise Level Monitoring (South Side of Farmgate (On foot over bridge), Farmgate, Dhaka)

Time	Noise Level (dB)	Time	Noise Level (dB)	Time	Noise Level (dB)
6:00 AM	65.2	12:10PM	92.3	6:20PM	87.3
6:10 AM	64.9	12:20PM	89.9	6:30PM	88.5
6:20 AM	67.8	12:30PM	91	6:40PM	90.1
6:30 AM	73.4	12:40PM	91.2	6:50PM	89.5
6:40 AM	77.8	12:50PM	90.2	7:00PM	90.3
6:50 AM	80.1	1:00PM	93.1	7:10PM	91.5
7:00 AM	79.8	1:10PM	89.1	7:20PM	90.8
7:10 AM	82.1	1:20PM	88.2	7:30PM	89.2
7:20 AM	85.6	1:30PM	88.9	7:40PM	87.9
7:30 AM	84.9	1:40PM	88.4	7:50PM	88.4
7:40 AM	87.2	1:50PM	90.2	8:00PM	90.5
7:50 AM	88.5	2:00PM	89.3	8:10PM	89.4
8:00 AM	87.2	2:10PM	90.7	8:20PM	91.2
8:10 AM	89.2	2:20PM	90.8	8:30PM	87.3
8:20 AM	88.3	2:30PM	89	8:40PM	88.1
8:30 AM	87.5	2:40PM	91.7	8:50PM	89.2
8:40 AM	85.9	2:50PM	87.8	9:00PM	88.2
8:50 AM	86.9	3:00PM	91.2	9:10PM	90.1
9:00 AM	88.5	3:10PM	90.6	9:20PM	87.5
9:10 AM	90.2	3:20PM	90	9:30PM	86.9
9:20 AM	89.9	3:30PM	88.5	9:40PM	89.2
9:30 AM	88.9	3:40PM	84.3	9:50PM	88.5
9:40 AM	90.2	3:50PM	87.6	10:00PM	89.2
9:50 AM	91.5	4:00PM	83.9	10:10PM	86.2
10:00 AM	89.5	4:10PM	88.2	10:20PM	87.3
10:10 AM	90.3	4:20PM	89.9	10:30PM	85.1
10:20 AM	92.9	4:30PM	90.1	10:40PM	83.9
10:30 AM	90.4	4:40PM	89.5	10:50PM	82.1
10:40 AM	86.7	4:50PM	87.9	11:00PM	83.1
10:50 AM	90.2	5:00PM	89.2	11:10PM	80.1
11:00 AM	92.1	5:10PM	90.5	11:20PM	80.2
11:10 AM	88.9	5:20PM	88.6	11:30PM	79.2
11:20 AM	89.1	5:30PM	90.2	11:40PM	81.3
11:30 AM	87.9	5:40PM	89.5	11:50PM	80.1
11:40 AM	86.2	5:50PM	88.7	12:00PM	79.2
11:50 AM	89.1	6:00PM	84.9	12:10PM	78.9
12:00 PM	88.2	6:10PM	89.2	12:20PM	78.8
				12:30PM	78.4
				12:40PM	78.1
				12:50PM	77.8
				1:00PM	77.6

3. Ambient Noise Level Monitoring (South Side of Farmgate (on ground level), Farmgate, Dhaka)

Time	Noise Level	Time	Noise Level	Time	Noise Level
6:00 AM	69.9	12:10PM	91.8	6:20PM	87.5
6:10 AM	69.2	12:20PM	89.5	6:30PM	86.2
6:20 AM	72.8	12:30PM	91.3	6:40PM	90.2
6:30 AM	78.9	12:40PM	92	6:50PM	88.4
6:40 AM	76.2	12:50PM	89.9	7:00PM	90.1
6:50 AM	85	1:00PM	96.3	7:10PM	89.5
7:00 AM	81.3	1:10PM	91.2	7:20PM	90.3
7:10 AM	83.4	1:20PM	92.8	7:30PM	88.9
7:20 AM	84.9	1:30PM	95	7:40PM	89.2
7:30 AM	87.8	1:40PM	92.3	7:50PM	91.3
7:40 AM	88.2	1:50PM	93	8:00PM	92.3
7:50 AM	88.5	2:00PM	90.5	8:10PM	90.2
8:00 AM	89.2	2:10PM	91.7	8:20PM	89.9
8:10 AM	89.7	2:20PM	90	8:30PM	91.5
8:20 AM	88.9	2:30PM	89.8	8:40PM	89.5
8:30 AM	90.1	2:40PM	93.3	8:50PM	90.1
8:40 AM	91.2	2:50PM	91.7	9:00PM	88.6
8:50 AM	87.5	3:00PM	90.8	9:10PM	88.9
9:00 AM	89.7	3:10PM	89.7	9:20PM	89.7
9:10 AM	90	3:20PM	88.9	9:30PM	90.3
9:20 AM	90.3	3:30PM	92.3	9:40PM	88.7
9:30 AM	91.2	3:40PM	90.2	9:50PM	87.6
9:40 AM	89.9	3:50PM	91.3	10:00PM	89.5
9:50 AM	90.1	4:00PM	89.9	10:10PM	85.2
10:00 AM	91.2	4:10PM	90.1	10:20PM	85.1
10:10 AM	88.9	4:20PM	89.3	10:30PM	84.1
10:20 AM	93.1	4:30PM	88.9	10:40PM	83.2
10:30 AM	91.5	4:40PM	90.2	10:50PM	83.4
10:40 AM	88.2	4:50PM	89.4	11:00PM	82.5
10:50 AM	89.5	5:00PM	90.1	11:10PM	83
11:00 AM	91.7	5:10PM	88.7	11:20PM	80.1
11:10 AM	89.6	5:20PM	89.3	11:30PM	81.1
11:20 AM	90.1	5:30PM	92.2	11:40PM	79.8
11:30 AM	88.2	5:40PM	88.9	11:50PM	80
11:40 AM	87.1	5:50PM	90.2	12:00PM	78.9
11:50 AM	89.2	6:00PM	89.5	12:10PM	78.5
12:00 PM	87.9	6:10PM	88.3	12:20PM	78.5
				12:30PM	78.2
				12:40PM	77.9
				12:50PM	77.8
				1:00PM	77.5

4. Ambient Noise Level Monitoring (South Side of Bangla Academy along Sir Sayed Road, Dhaka)

Time	Noise Level (dB)	Time	Noise Level (dB)	Time	Noise Level (dB)
6:00 AM	57.8	12:10PM	78.5	6:20PM	77.2
6:10 AM	56	12:20PM	78.9	6:30PM	77
6:20 AM	55.1	12:30PM	77.2	6:40PM	76.9
6:30 AM	57.2	12:40PM	72.1	6:50PM	78.1
6:40 AM	62.3	12:50PM	74.5	7:00PM	72.3
6:50 AM	68	1:00PM	79.2	7:10PM	71.4
7:00 AM	67.9	1:10PM	74.5	7:20PM	73.5
7:10 AM	67.2	1:20PM	76.2	7:30PM	71
7:20 AM	70.1	1:30PM	79.2	7:40PM	71.1
7:30 AM	67.1	1:40PM	80.1	7:50PM	68.9
7:40 AM	69.1	1:50PM	77.2	8:00PM	69.2
7:50 AM	71.3	2:00PM	76.4	8:10PM	70.1
8:00 AM	67.5	2:10PM	79.1	8:20PM	68.3
8:10 AM	68.2	2:20PM	78.2	8:30PM	66.9
8:20 AM	66.5	2:30PM	74.5	8:40PM	71
8:30 AM	70.2	2:40PM	72.6	8:50PM	69.2
8:40 AM	71.1	2:50PM	77.1	9:00PM	75
8:50 AM	71.9	3:00PM	76.2	9:10PM	68
9:00 AM	72.9	3:10PM	74.1	9:20PM	77.3
9:10 AM	68.2	3:20PM	75.2	9:30PM	70.1
9:20 AM	70.1	3:30PM	73.1	9:40PM	68.2
9:30 AM	69.3	3:40PM	70.1	9:50PM	64.5
9:40 AM	77.2	3:50PM	70.3	10:00PM	67.2
9:50 AM	78.9	4:00PM	69.8	10:10PM	69.1
10:00 AM	80	4:10PM	72.1	10:20PM	64.1
10:10 AM	71.2	4:20PM	70	10:30PM	62.2
10:20 AM	81.2	4:30PM	84.5	10:40PM	60.1
10:30 AM	86.2	4:40PM	79.2	10:50PM	74.2
10:40 AM	75.4	4:50PM	72.1	11:00PM	63.2
10:50 AM	76.9	5:00PM	76.2	11:10PM	60.1
11:00 AM	73.2	5:10PM	75.2	11:20PM	62.1
11:10 AM	71	5:20PM	70	11:30PM	59.2
11:20 AM	76.9	5:30PM	74.1	11:40PM	60.1
11:30 AM	72.8	5:40PM	76.2	11:50PM	58.1
11:40 AM	75.6	5:50PM	81.1	12:00PM	56.2
11:50 AM	79.2	6:00PM	79.2	12:10PM	58.9
12:00 PM	79.4	6:10PM	78.1	12:20PM	59.9
				12:30PM	59.6
				12:40PM	58.8
				12:50PM	58.7
				1:00PM	58.4

5. Ambient Noise Level Monitoring (South Side of Banga Bhaban along Folder Street, Dhaka)

Time	Noise Level	Time	Noise Level	Time	Noise Level
6:00 AM	79.2	12:10PM	91.3	6:20PM	89.9
6:10 AM	73.5	12:20PM	92.1	6:30PM	89.2
6:20 AM	77.1	12:30PM	91.3	6:40PM	90.9
6:30 AM	76.2	12:40PM	91	6:50PM	93.1
6:40 AM	79.9	12:50PM	91.2	7:00PM	87.1
6:50 AM	78.5	1:00PM	89.3	7:10PM	90.1
7:00 AM	80.1	1:10PM	88.5	7:20PM	91.3
7:10 AM	82.2	1:20PM	90.9	7:30PM	93.2
7:20 AM	81.3	1:30PM	90.8	7:40PM	94.1
7:30 AM	84.5	1:40PM	91.5	7:50PM	98.1
7:40 AM	87.6	1:50PM	91.1	8:00PM	90.1
7:50 AM	88	2:00PM	89.9	8:10PM	92.3
8:00 AM	87.9	2:10PM	90.1	8:20PM	91.2
8:10 AM	91.2	2:20PM	91	8:30PM	89.5
8:20 AM	89.8	2:30PM	92.1	8:40PM	89.6
8:30 AM	92	2:40PM	89.1	8:50PM	90.1
8:40 AM	87.9	2:50PM	87.3	9:00PM	90.2
8:50 AM	89.3	3:00PM	89.1	9:10PM	87.5
9:00 AM	93.1	3:10PM	90.5	9:20PM	89.2
9:10 AM	91	3:20PM	91.3	9:30PM	88.5
9:20 AM	92.5	3:30PM	92.1	9:40PM	86.3
9:30 AM	89.2	3:40PM	90.1	9:50PM	89.5
9:40 AM	90.9	3:50PM	92.1	10:00PM	90.2
9:50 AM	88.7	4:00PM	89.3	10:10PM	91.3
10:00 AM	94.3	4:10PM	89.9	10:20PM	92.5
10:10 AM	93.1	4:20PM	90.1	10:30PM	95.2
10:20 AM	92.1	4:30PM	87.2	10:40PM	90.1
10:30 AM	89.5	4:40PM	90.2	10:50PM	89.3
10:40 AM	87.2	4:50PM	87.5	11:00PM	88.5
10:50 AM	93.2	5:00PM	93.1	11:10PM	92.1
11:00 AM	87.5	5:10PM	92.1	11:20PM	90.1
11:10 AM	89.6	5:20PM	91.1	11:30PM	87.5
11:20 AM	90.1	5:30PM	94.1	11:40PM	86.3
11:30 AM	91.3	5:40PM	91.3	11:50PM	90.5
11:40 AM	93.4	5:50PM	92.1	12:00PM	87.1
11:50 AM	86.2	6:00PM	89.3	12:10PM	86.3
12:00 PM	94.5	6:10PM	89.7	12:20PM	86.2
				12:30PM	85.8
				12:40PM	85.5
				12:50PM	85.2
				1:00PM	85