CHAPTER 14: PUBLIC TRANSPORT DEVELOPMENT PLAN

14.1 General

(1) Procedure for Public Transport Development Plan

This Chapter is to discuss the future public transport system of both Mass Transit System (MTS) and conventional road based public transport system. The procedure for formulating public transport development plan is as follows;

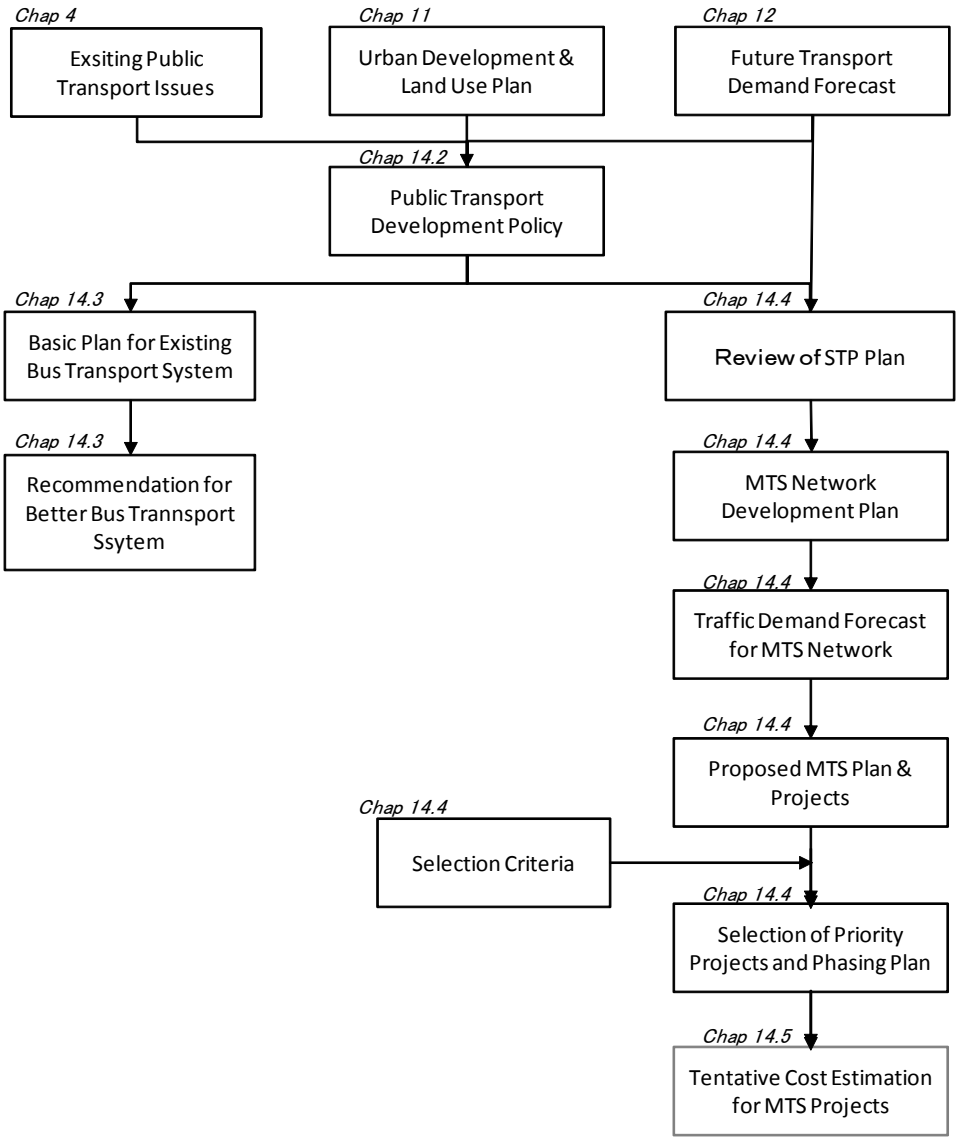


Figure 14.1-1 Study Procedure for Public Transport Development Plan

(2) Definition[1]

Prior to discuss public transport system, definition of public transport systems is defined as below;

Public transport in its broadest sense refers to collective passenger services. It can, thus, include the assortment of both the informal and formal services founded in Dhaka. Public transport in Dhaka consists of:

a) Regular bus
b) Mini-bus
c) Laguna
d) Auto-rickshaw
e) Rickshaw
f) Bangladesh Railway
g) Ferry service and inland water service

Mass Transit System (MTS) in Dhaka is a new concept. MTS is defined as a collective urban passenger service that operates at high level of customer performance, especially with regard to travel times and passenger carrying capacity.

14.2 Public Transport Plan

14.2.1 Basic Considerations

This section is to describe the overall public transport system not only mass transit system but also conventional bus transport system.

(1) Promotion of Socio-Economic Development

a) The provision of high capacity transport system is linked with the development of socio-economic. There exists a dynamic interaction between public transport development and the socio-economic development.
b) When enough capacity of the transport system can be provided, amount of industrial products may be increased due to decreasing transport costs and travel time cost by alleviating road traffic congestion. At the same time, sales of commercial goods may be also increased.
c) The foreign investments of not only garment but also other kinds of industry are required to achieve socio-economic growth and improve unemployment rate in Bangladesh in general and in Dhaka in particular.
d) In Bangladesh, the economic growth rate has been steadily increasing at average annual growth rate of over 6 % since 2000. This tendency shall be continuously maintained in future.

[1] Vehicle classification is refered to Chapter 3 Section 3.1 (3).

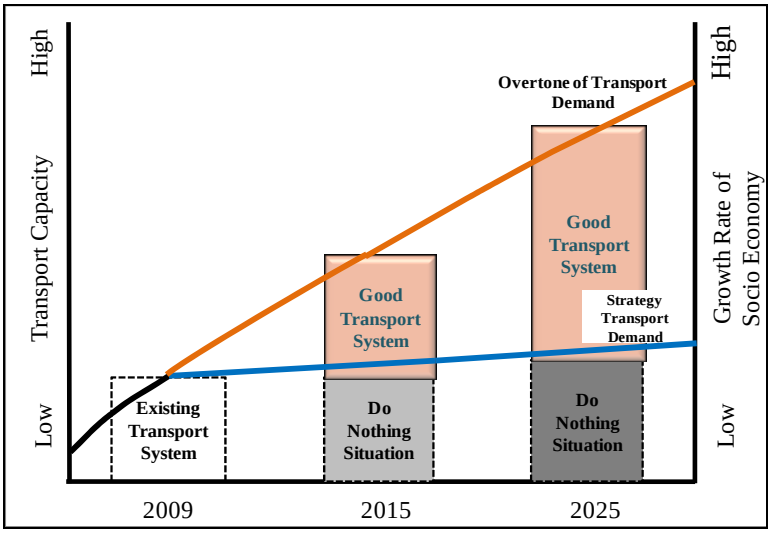


Figure 14.2-1 Relationship between Transport Capacity and Growth Rate of Socio-economy

Passenger Traffic Demand and Traffic CongestionTable 14.2-1 and Table 14.2-2 are showing existing passenger traffic demand and traffic congestion of north – south direction on the major arterial road on east-west screenline. The following findings can be made;

a) Number of passenger movement of north-south direction on the east west screenline accounts for about 3.5 million passengers per day.
b) Among location of major arterial roads, passenger volume on Kazi Nazurul Islam as main axle in Dhaka is largest among the others. The passenger volume at that location accounts for about 1.0 million per day.
c) As seen in Table 14.2-2, road traffic congestion of north south direction is very severe due to the shortage of traffic capacity and great demand of traffic.
d) All public transport modes are road –based ones as shown in Figure 14.2-2. There is no high quality and mass transit in the public transport system.

Table 14.2-1 Passenger Traffic Demand of North-South Direction on East-West Screen Line

Location	Bus	Car	Auto Rickshaw	Rickshaw	No of PAX
Sat. Masjid	319,373	66,807	13,573	56,753	456,506
Mirpur Road	684,202	110,931	36,740	7,552	839,426
Kazi Nazrul Islam Avenue	857,193	130,465	53,613	4,121	1,045,392
Shaheed Tazuddin Road	549,365	90,023	50,120	12,345	701,854
DIT Road	343,841	34,333	13,131	35,257	426,561
Total	2,753,975	432,559	167,177	116,028	3,469,739

Source: JICA Study Team

Table 14.2-2 Vehicle Traffic Volume, Capacity and Congestion Degree on East –West Screen Line

Location	Peak Hour Traffic Volume	Capacity (PCU / Hour)	Congestion Degree
Sat. Masjid Road	4,203	2,800	1.50
Mirpur Road	5,840	4,200	1.39
Kazi Nazrul Islam Avenue	7,262	5,600	1.30
Shaheed Tazuddin Road	5,465	4,200	1.30
DIT Road	4,281	2,800	1.53
Total	27,052	19,600	1.38

Source: JICA Study Team

Note: Location of road shall be referred to Figure 14.2-2.

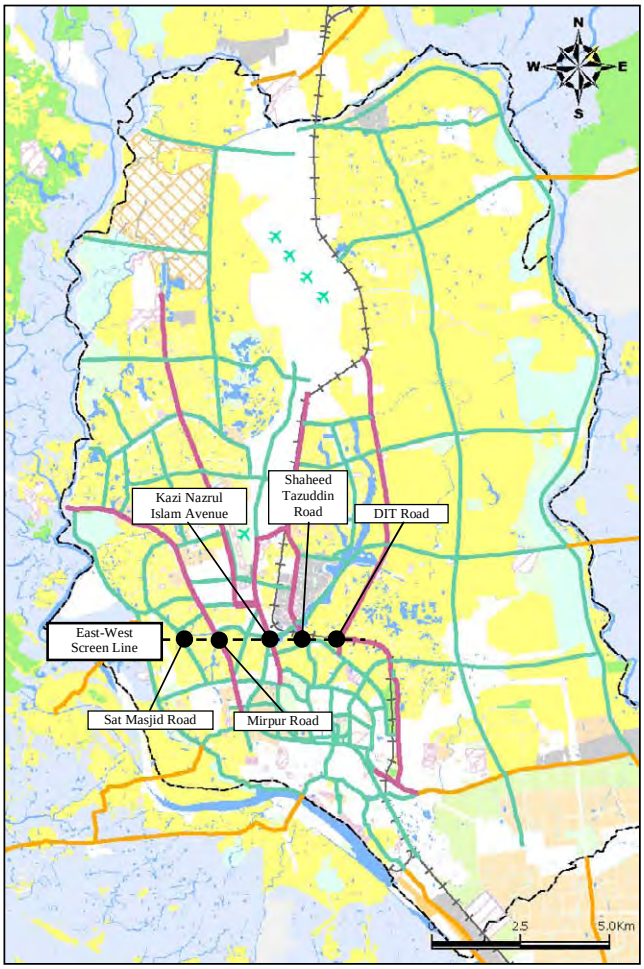
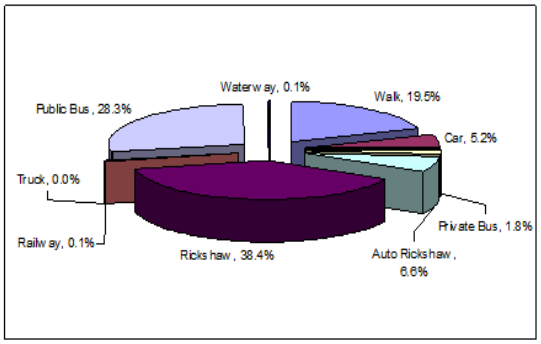
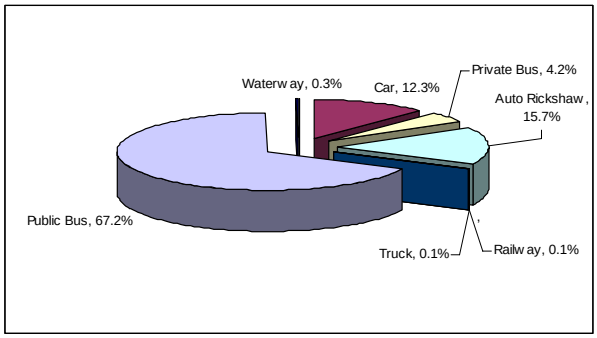


Figure 14.2-2 Location of East-West Screen Line



Existing Modal Share in the Study Area (Excluding NMT)



Existing Modal Share in the Study Area

Figure 14.2-3 Modal Share in the Study Area[2]

(2) Urban Structure

a) The provision of public transport services is intrinsically linked with the form and extent of the urban structure. There exists a dynamics interaction between transport and the land use and the urban structure.

b) Recent spatial and demographic evolution in DMA has been grown from 6.5 million to 9.2 million 2001 and 2009, respectively. Population within the DMA will reach 10 million at around the year 2011. The population is expected to increase from 9.2 million to 13.5 million and 15.7 million in 2020 and 2025, respectively.

c) In proportion with the population increase, the major urban expansion was largely toward the north leading Mirpur,

d) Gulshan/ Banani/ Badda and Tongi, where are relatively high-land to meet the development need. This is largely due to flooding problems.

e) Regarding to the future land use pattern, the Growth Pole-Satellite Community Scenario is adopted for the DMA in the Study Area.

f) In future, it is recommended to employ "Growth Pole-Satellite Community Scenario" as shown in Chapter 11. In order to achieve such urban development, it is necessary for transport network especially public transport system to link strongly between existing urban core and satellite community.

[2] Vehicle classification is referred to Chapter 3 Section 3.1 (3).

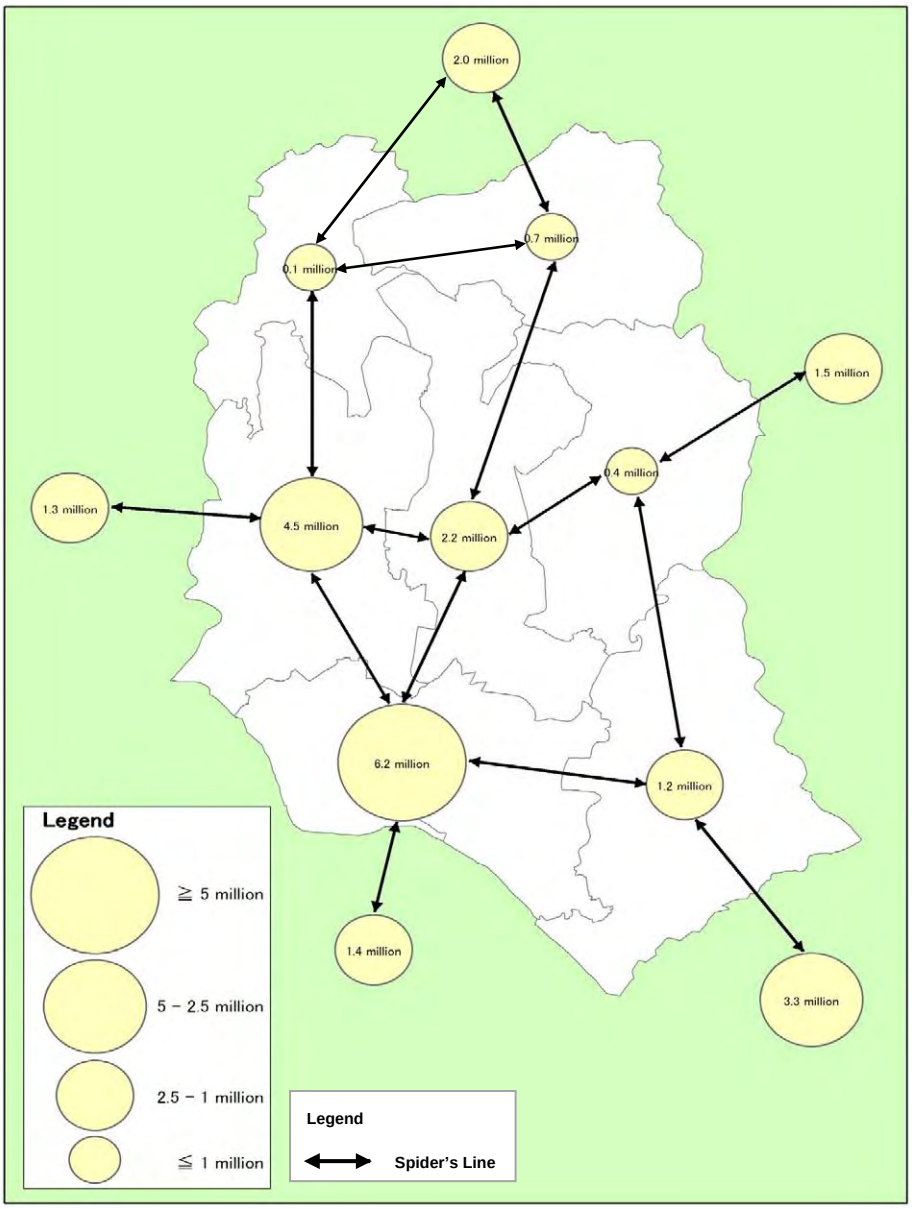


Figure 14.2-4 Population Distribution Plan

(3) New Community Axles

Distances between the new communities and Central Dhaka are far about 20 kilometers. Land use within these corridors is dynamic varying impacts upon the transport modes selected to meet forecast demand. At present, person trip demand is largely focused between new communities and the metropolitan area. However, linear development patterns, consisting of residential and industrial activities, are already clearly evident. Thus, in the longer term future, and in the absence of rigid land use controls, this pattern is likely to continue with a high probability of nodal sub-centers forming within the new community corridors. Differing types of person trip demand are likely to result.

Table 14.2-3 Large Scale Urban Developments in the Study Area

	Planned Area (ha)	Estimated Population (618person /ha)	2020 (30%)	2020 (50%)
Uttra 3	809	500,000	150,000	250,000
Purbachal	2,489	1,540,000	462,000	770,000
Jheelmil-1	162	100,000	30,000	50,000
Jheelmil-2	567	350,000	105,000	175,000
Ruhitpur, Savar, Gazipur, Dhamsona	809	500,000	150,000	250,000
Total	4,836	2,990,000	897,000	1,495,000

Source; JICA Study Team

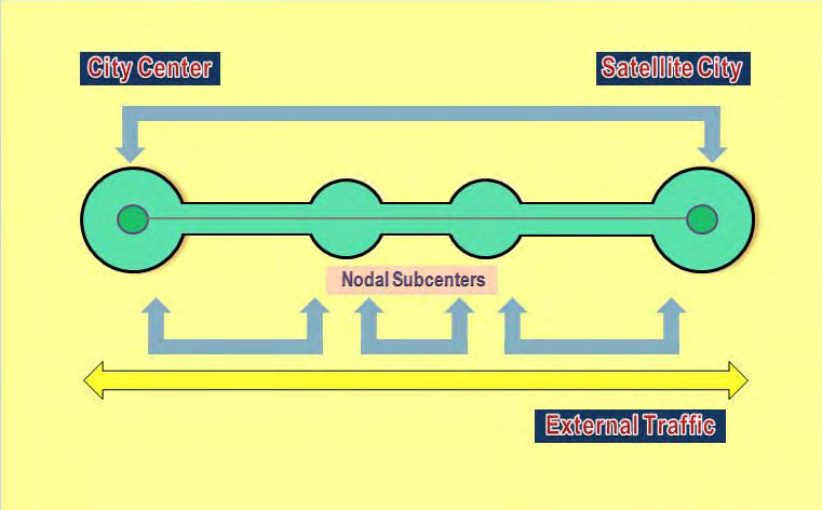


Figure 14.2-5 Future Satellite Communities Trip Patterns

(4) Passenger Preferences

Public transport services carried a total of 22 million daily trips during a typical 2009 weekday. This represents 68 percent of all motorized trips generated within the Dhaka study area. Rickshaw trip carry some 8.4 million daily passengers, or roughly one-half of public transport trips. Public buses (large bus /minibus) account for 7.5 million daily trips and the auto rickshaw over 1.6 million trips per day (Figure 14.2-6).

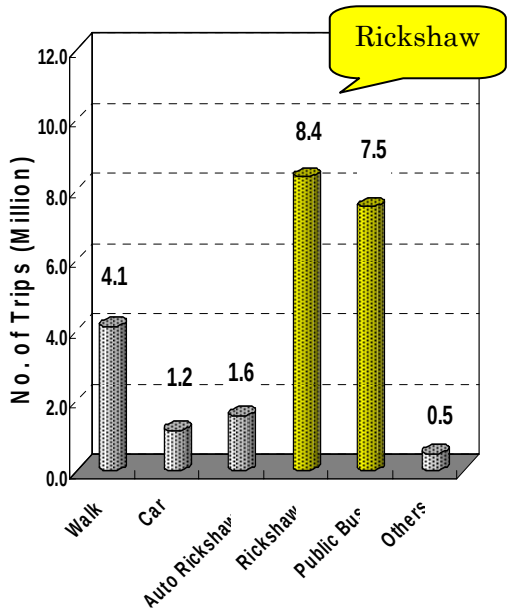


Figure 14.2-6 Trip Production in the Study Area

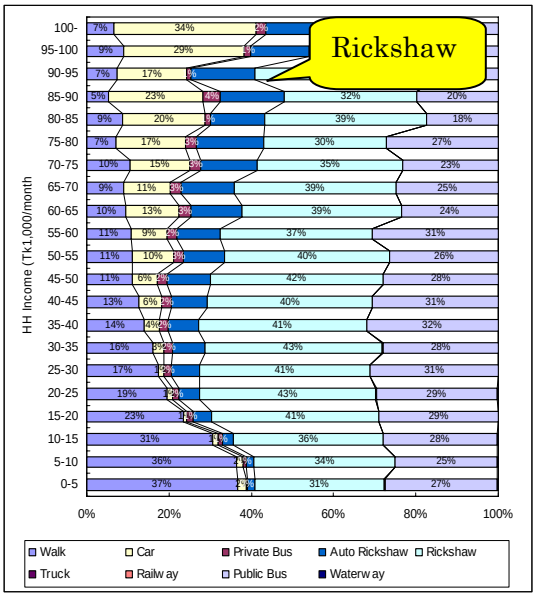


Figure 14.2-7 Mode Share by Income Group

Observing these figures, Dhaka peoples are favor to ride rickshaw from high income group to low income group.

(5) Shortage of High Capacity Public Transport

a) Public transport includes both the informal and formal services founded in Dhaka. Public transport in Dhaka consists of Regular bus, Mini-bus, Laguna, Auto-rickshaw, Rickshaw, Bangladesh Railway, Ferry service or inland water service.

b) The evolution of public transport supply and demand in DMA shows that formal sector public transport services have suffered a decline in market share. The experiences of Dhaka are not dissimilar from those of other Mega cities in Asian countries.

c) However, MTS has never introduced in Dhaka except long distance Bangladesh Railway. Among the various Mega cities in the world, it could not been seen the cities without MTS. The realization of a balanced and multi-modal environment makes a continuing challenge to introduce MTS system in Dhaka.

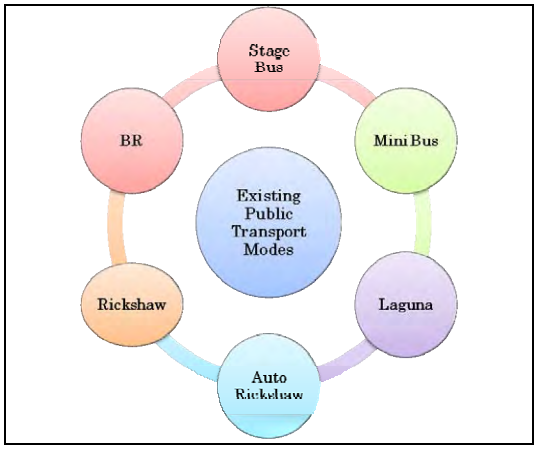


Figure 14.2-8 Existing Public Transport Modes

14.2.2 Public Transport Development Policy

(1) Introduction of Mass Transit System based on Hierarchy of Public Transport System

The keys of public transport to function are speed and capacity. BRT / busway can carry 10,000 to about 20,000 persons per hour per direction. Light rail transit can accommodate some 10,000-22,000 persons per hour per direction in segregated alignments. Mass rapid transit on the other hand, can accommodate 25,000-50,000 persons per hour per direction at much higher speeds. The capacity of arterial road/freeway per lane is only, at 2,000-3,000 persons per hour so that 3-lane road can carry out about 6,000-10,000 persons per hour (Figure 14.2-9).

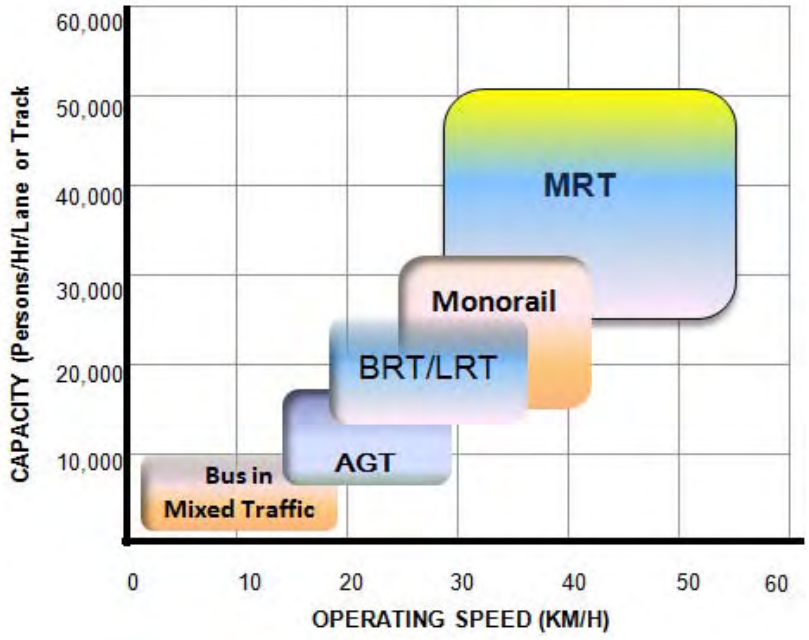


Figure 14.2-9 Hierarchy of the Mass Transport System

Source; JICA Study Team modified based on Public Transport in Urban Area[3]

[3] "Public Transport in Urban Area" edited by Dr. Kozo Amano, Gihodo-Publication

Presently, the public transport systems in Dhaka are operating only road-based low capacity transit system. Therefore, it is necessary to introduce the Mass Rapid Transit (MRT) and Bus Rapid Transit (BRT) Systems to meet future transport demand.

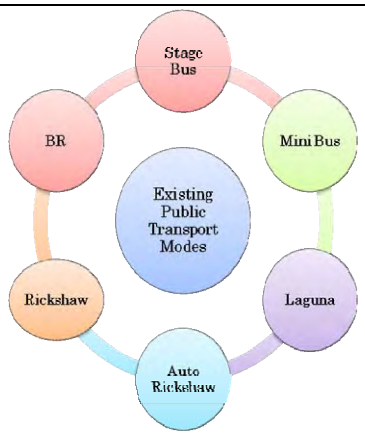


Figure 14.2-10 Current Public Transport System

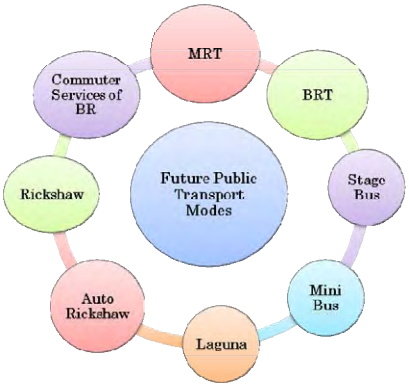


Figure 14.2-11 Proposed Public Transport System

(2) Building Integrated Public Transport System

Developing an intermodal public transport system consisting of MRT that is proposed to introduce to Dhaka and bus and para-transit systems requires the efficient integration and interconnection of the different public transport elements. The intermodal public transport can be approached based on assessment of the capacities of the different public transport modes and their interconnection with each other. This interconnection relates on the hierarchy of public transport systems as discussed in the previous section and role of intermodal terminals.

Under such an approach, one may argue that fixed route and high capacity systems shouldn't be given priority in the scheme, while more flexible public transport systems should be supplemented to create an integrated network. The integrated public transport model is illustrated in Figure 14.2-12. This figure is basic concept of integrated public transport model. Backbone of the public transport system is MRT system, while supplement to backbone of the public transport system is BRT and bus systems.

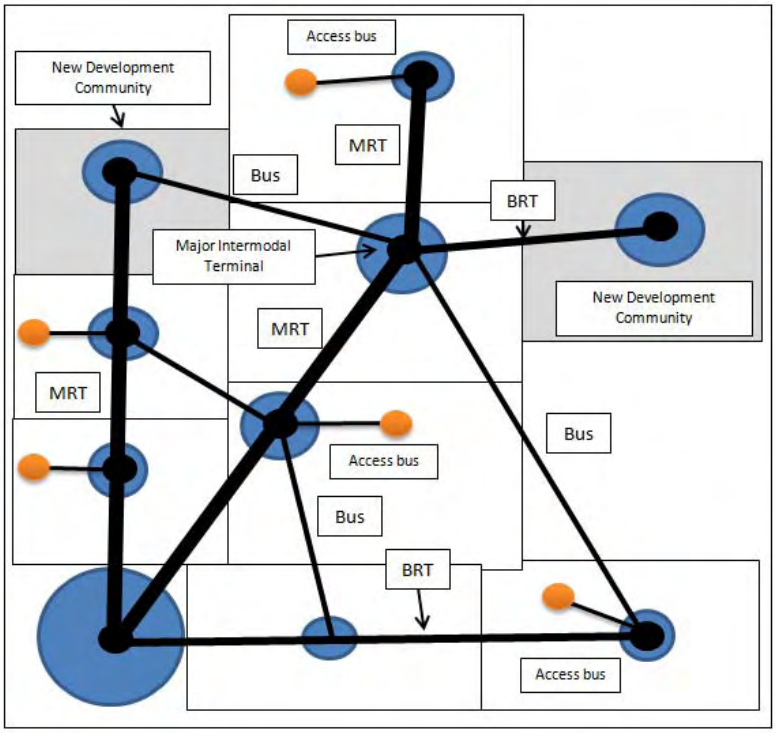


Figure 14.2-12 Basic Concept of Integrated Public Transport Model in Dhaka

Source: JICA Study Team

(3) Public Transport for Low Income Group

As mentioned in Strategy 4, accessible transport for all people shall be taken into account. According to the passenger preference mentioned, low income group people are used mainly for public bus. This is due that transport cost of public bus is comparatively cheaper than the other modes. It is necessary to improve conventional bus transport services in order to cope with the needs for the poor people.

(4) Public Transport System for Promotion of Urban Development

In mega-cities in the developed counties, the Transit-Oriented Development (TOD) refers to residential and commercial centers designed maximize access by transit and non-motorized transportation and with to encourage transit ridership. However, in the context of Dhaka, the JICA Study Team proposes to develop the mass rapid transit railway (MRT) system in order to solve traffic congestion in the Central Business District (CBD), to promote new urban development to accommodate increasing population and to promote appropriate urban development. This TOD scheme is generally very popular in cities in Asian Counties such as Singapore, Kuala Lumpur in Malaysia, Metro Manila in Philippines, Jakarta in Indonesia and Bangkok in Thailand, Deli and Kolkata in India.

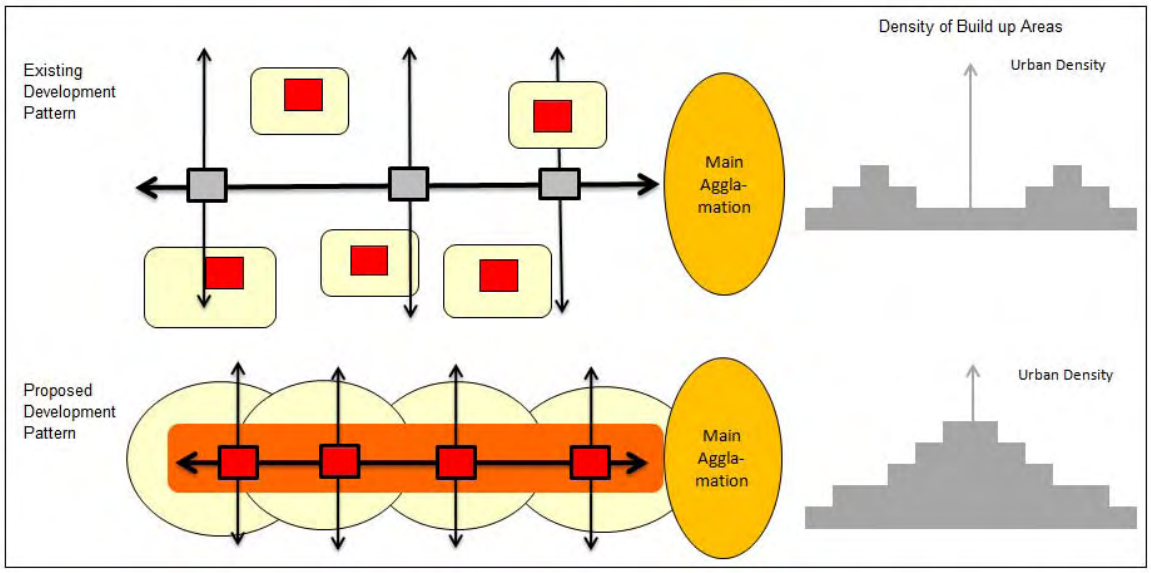


Figure 14.2-13 Transit Oriented Development Pattern

14.3 Basic Plan for Bus Transport System

This section is to describe mainly conventional bus transport system, but also described Bus Rapid Transit (BRT) system partially.

The provision of safe, convenient, reasonable and reliable public transport services is a challenge to improve the exhausted urban transport in DMA. As the share of railway services in the DMA transport system is only of a small portion due to the inter-city specific operation, public transport in the region relies mainly on buses. Unfortunately, the present bus service is quite far below a level of satisfaction. Current bus operations in DMA are characterized by poor quality of services, including the lack of scheduled operations, poor condition of buses, degrading safety and comfort levels, violation of traffic rules and so forth.

Poor quality and badly managed bus operations has made it less attractive as an urban transport mode and eventually caused an increasing usage of private vehicles as trip makers prefer to use cars for the trips. The unrestrained use of private transport will apparently result in severe traffic congestion on DMA's limited road stretch.

The improvement of urban public transport system, particularly bus operations, should become the comprehensive and strategic. The challenge is not only for BRTA as the responsible agency for bus operations, but also for other related agencies Regional Transportation Committee (RTC) and DTCB, as well as for the transportation operators and the general public.

14.3.1 Overview of Issues

As discussed in Chapter 5, the issues in bus transport system in DMA can be sub-divided into four principal categories:

- Issues with Delivery of Services – This includes poor safety, comfort and reliability.
  - Unavailability of scheduled operation
  - Overloading of passengers
  - Poor quality of bus service
  - Poor appearance of buses inside and out.
- Issues of Bus Route Structure – The route structure in DMA is rather complex with more than 152 routes comprising omni and mini bus services. Although the bus route structure seemed to have covered most arterial road on the north-south corridor, the central Dhaka (old Dhaka) and the fringe area are generally less covered.
- Financial Difficulties on Bus Operations – For the small-scale bus operators, the increasing operation and maintenance cost are a matter of life and death. On the other hand, a bus operator has no right to set bus fare for their service since it is regulated by the government. The more passengers get in a bus, the more the company's revenue is increasing. It eventually causes in strong competition to secure passengers in the limited bus space as much as possible.
- Inadequacy of Bus Transport Facilities – This problem covers insufficient number of bus stops coupled with improper location and usage of the bus stops, limited capacity of bus terminals, lack of pedestrian facilities such as pelican crossing or pedestrian bridge, poor sidewalk condition for walking, and so forth.

Factors causing the bus transport issues are often interrelated with each other. Possible root causes of the above-mentioned issues could be attributable to the following categories:

- Regulatory aspects – particularly with respect to the rules and regulations that have not functioned or implemented properly, lack of robust licensing system and unclear specification of service standard.
- Institutional system – inadequate planning and management capability, weak enforcement and monitoring of bus operation, and lack of integration between the planning process and the implementation procedure.
- Improper management and weak financial capability of bus operators – high operating costs, improper collection of fares, irregular and improper vehicle maintenance.

14.3.2 Recommendations for the better Bus Transport System

(1) Restructuring the Bus Industries

One of the important issues is reform of the bus operating system. There exist many bus companies who own more than 30 large buses in Dhaka; while mini buses are mostly operated by small-scale operators holding less than 10 mini buses. Some drivers work for a bus company on a contract basis, but others, in particular, individual drivers borrow buses at the fixed rate and operate on fixed route at their own revenue risk. Most of the buses are operated under the latter situation. Since there is no incentive in improving quality of services other than

maximizing passengers, they tend to stop a long time at certain bus stops or points to wait for passengers, resulting in less punctuality and less comfort, eventually traffic congestion surely be brought about behind those buses.

In order to solve this situation, restructuring the bus operators and companies is necessary measure so that they run their business under the same and improved condition.

One of policy interventions ensuring above mentioned restructuring bus transport industry is introduction of "Bus Route Franchising System". In Bangladesh, plenty of studies and actual attempts to introduce the system were conducted in the past. The bus route franchising system includes (a) Consolidation of existing fragmented bus industry, (b) Empowerment of the capacity of the governmental bodies concerned, (c) Modernization of overall bus transport system in DMA, (d) Establishment of user friendly bus system, (e) Alleviation of chronic road traffic congestion and so forth.

Key Components

- Establishing a management and monitoring (public) entity
- Regulating a requirement for bus operator (scale, fleet, driver's management etc.)
- Introduction of "Bus Route Franchising System"

(2) Improving a Bus Operation System

Together with the establishment of an effective bus route plan, an effective bus operation and management system should be developed in order to improve operators' management. The improved management bodies can provide more quality of services such as new air-conditioned bus fleets with CNG engine, thus contributing to the environmental improvement as well. In order to improve such management, current bus operation system should be reviewed.

Key Components

- Bus Fleet Management
- Periodical Monitoring (for bus fleets and crews)
- Crew Management
- Roster of employees
- Introduction of electronic technology such as automatic fare collection machines.

(3) Providing Proper Information regarding Bus Operation

As discussed, buses are operated completely under disorderly conditions: no information on bus route, formal fare, bus stop and its frequency. Some buses are painted its direction or destination in front or back side, but could not be identified clearly in most cases, until a bus is coming. This causes in the loss of time and opportunities. In order to improve that situation, provision of the recognizable information system should be implemented.

Key Components

- Developing the comprehensive bus route map
- Presenting bus fare system
- Running Interval

(4) Fare Policy Reform (Ticketing)

From a passenger viewpoint, having a distance-based, flat-rate fare across the network offers ease of use and a cost saving. This 'common ticket' is based on zonal fare structure where the passenger pays only for the distance travelled. In effect this means that a user pays an entry fee to the system and can use the system on any number of services to complete the journey.

Modern ticketing systems can easily accommodate complex fare configurations and adapt to various requirements. It provides significant user benefits for convenience and ease of use, and it also provides essential ridership data for revenue control and system planning. With the planned BRT system and the feeder buses can be fitted with ticket machines to allow free transfers within the system onto the BRT.

Key Components

- Reviewing current fare policy
- Formulating precise fare structure (zone base or distance base)
- Establishing the common ticketing system

(5) Public Transport for the Urban Poor

The residents who belong to the low income group with less than BDT 20,000 are definitely depending on non-motorized mode such as walking, bicycle and Cycle-Rickshaw. Except non-motorized transport, low income group tends to use mainly public bus, because transport cost of public bus is comparatively lower level than other motorized modes. Those persons may not access to the information on bus route, bus fare and frequency. By paying attention to them, the possibility to have an opportunity to work and study will be raised in the future, thus it will lead to the growth of Bangladesh economy.

Key Components

- Campaigning for promoting urban public transportation use
- Establishing a subsidy system for the vulnerable transport users

(6) Training Program for Bus Drivers

Well-trained drivers preserve well-ordered public transport market. Aggressive driving so as to violate traffic rule will cause not only traffic congestion also unsafe condition of passengers and other transport users. To tackle that issue, a training program for a bus driver and/or bus-specified driving license system will be key components. A driver should continuously improve their driving skills as a servant in public transport firm.

Key Components

- Developing a driver training program
- Establishing a bus-specified driving licensing system
- Establishing a training centre for public transport drivers

(7) Integration with Urban Development

In Dhaka, it is essential to promote urban development in order to accommodate increasing population by 2025. Furthermore, it is necessary to promote Transit-Oriented Development (TOD) in the major transport corridors in close cooperation with transport corridor and urban development. Such developments are very popular in mega-cities in Asian Countries.

(8) Building an Integrated Network

The development of a comprehensive bus route network is a critical issue to be addressed. Prevailing regulation have specified the basic categorization of public transport network. As set forth in the prevailing regulation, planning of such public transport network is supposed to be undertaken by taking into consideration the transport demand, performance of the route, operational aspects and infrastructure condition. However, in practice, there is practically no systematic planning process for the bus network. Route development is incremental and reactive; the existing route may not be forming an efficient network because they historically came from intuitive, traditional practices – not based on scientific exercises. Case of too long and winding routes, overlapping routes, or uneven supply of buses along bus routes are often found. To cope with this situation the following strategies might be considered:

- Systematic planning of route network
- Community involvement in the planning process
- Integrated and consistent actions between the planning process and the implementation
- Better monitoring and enforcement of bus operation
- Capacity building for local government's planning staff

As we proposed, Bus Rapid Transit system will be introduced until 2025; it has a large impact on public bus industry. The comprehensive route restructuring must be undertaken before or at the time. BRT system can carry about 30,000 passenger/direction/hour, that is to say, a large bus may not need its function at all on the same corridor as BRT. Therefore, the following functions are expected in the future:

- Large Bus (Omni Bus): Operate on an arterial road that can be expected higher passenger demand, not on the same route as BRT. Also, operate for long distance routes.
- Mini Bus: Operate as a feeder bus between MRT/BRT station and highly populated area that trip distance is in middle range of 3-5km.
- Tempo/Laguna: Operate as a community bus service within the area or a community.

14.4 Mass Transit System Development Plan

14.4.1 Review of STP Plan

The STP plan proposed three (3) BRT lines and three (3) MRT lines as illustrated in Figure 14.4-1.

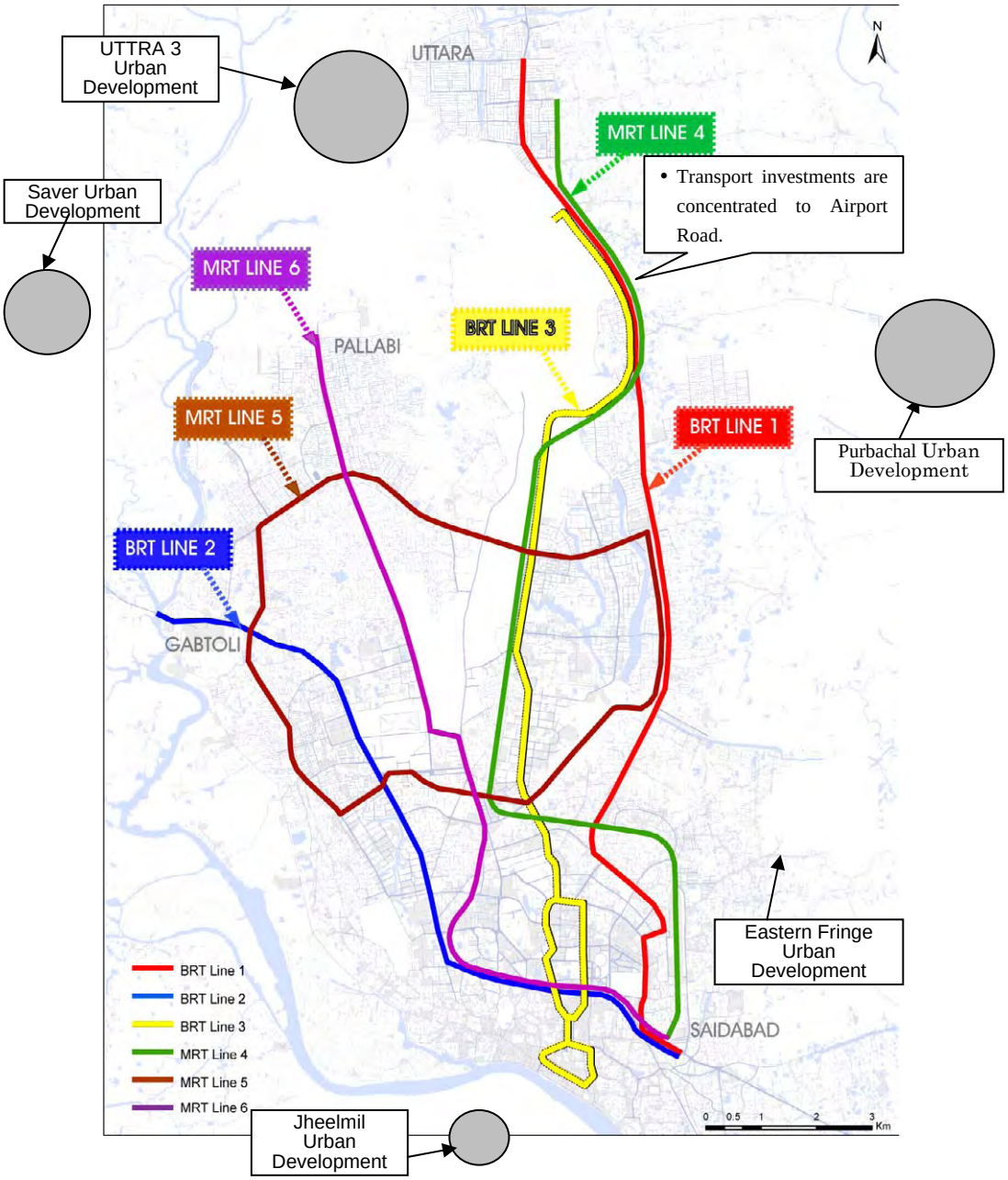


Figure 14.4-1 Public Transport Network Proposed by STP

According to the STP plan, it can be pointed out two (2) major problems and issues. The first one is that three (3) transport investment plans proposed by STP are concentrated to Airport Avenue namely BRT Line 3, MRT Line 4 and Urban Expressway. Although there is a large amount of traffic demand on Airport Road, it seems to be too much transport investment to be concentrated to the Airport Road. The other is that the public transport services are not

provided for new urban communities at all such as Purbachal, UTTRA Phase 3, Savar, Jheelmil and Eastern Fringe areas. These areas are expected to accommodate over 5 million from 2010 toward 2050. However, the STP has not considered any public transport system.

14.4.2 Future MTS Network Plan toward 2050

(1) Conceptual MTS Network Development

Figure 14.4-2 shows a conceptual MTS network development taking into consideration future urban structure plan.

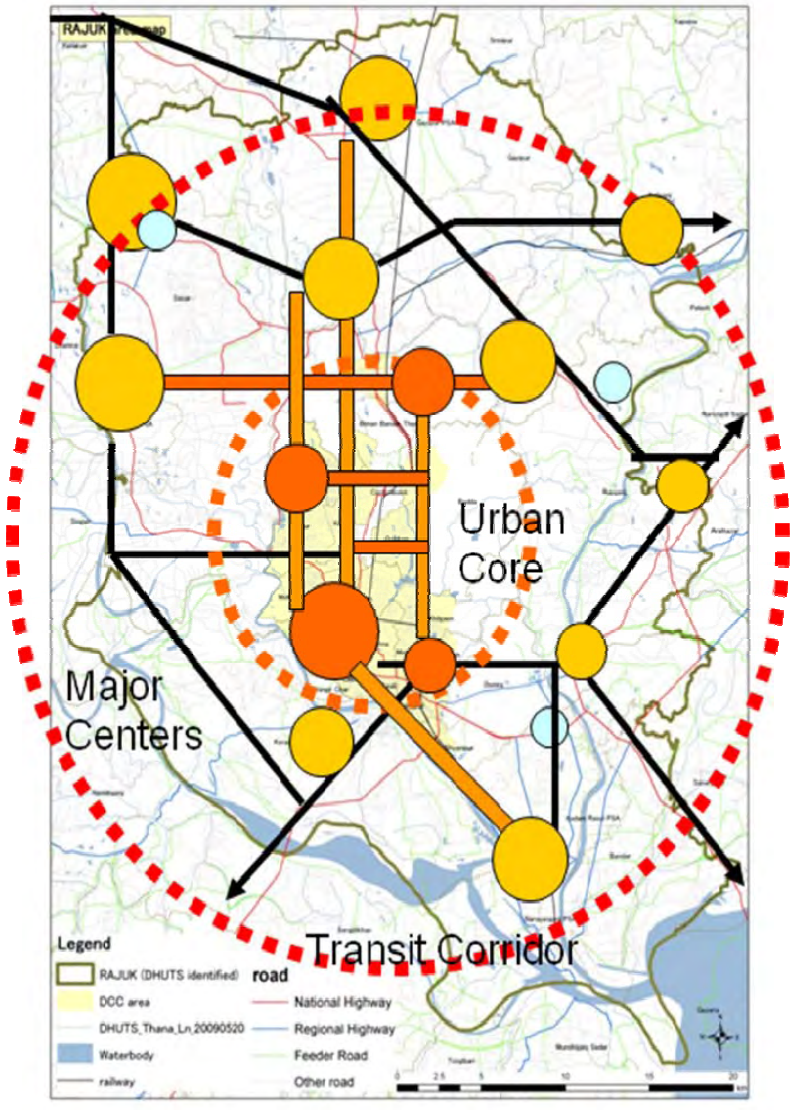


Figure 14.4-2 Conceptual MTS Network Plan with Urban Structure Plan

Source: JICA Study Team

(2) Network Description

The future urban structure making multi-core mega region in Greater Dhaka Area toward 2050 is proposed and presented in Figure 14.4-2. This structure plan proposed the three (3) development axles with mass transit corridors, namely a) Existing North-South Development Corridor, i.e., Tongi – Mirpur – City Center – Nayangaji, b) East-West Development Corridor, i.e., Purbachal – Uttra –Savar, c) Eastern Fringe Development Corridor. Based on the above-mentioned urban structure and major issues of the STP Plan, the future MTS network plan toward 2050 is proposed in Figure 14.4-2 and Table 14.4-1. The proposed MRT development plan is eight (8) lines, of which five (5) lines are proposed for MRT system and the remaining three (3) lines are BRT Line.

Table 14.4-1 Summary of MTS System Plan ("Do Maximum" Scenario)

	Section	Staring Points	Via	Terminating Point	Proposed System	Length (Km)	Notes
Line 1	Purbachar-Sidabad Line	Purbachar	DTI Road	Saidbad	BRT	23	
Line 2	Gastali - Saidabad Line	Gastali	New Market	Saidabad	BRT	14	
Line 3	UTTRA - Jheelhil Line	UTTRA	Old Dhaka	Jheelhil	BRT	31	
Line 4	UTTRA - Saidabad Line	UTTRA	Airport Road	Saidabad	MRT	22	Beyond 2025
Line 5	Circular Line	Badda	Mirpur	Badda	MRT	30	8 km are future extension
Line 6	UTTRA 3 - Saidabad Line	UTTRA 3	Farmgate	Saidabad	MRT	22	
Line 7	Purbachar-Savar Line	Purbachar	UTTRA	Savar	MRT	26	Beyond 2025
Line 8	Eastern Fringe Line	Tongi	Satakul	Narayangaji	MRT	33	Beyond 2025

Source JICA Study Team

(3) Traffic Demand Forecast

The traffic assignment to the transport network is made using JICA STRADA model. Table 14.4-2 shows summary of the traffic assignment results and Figure 14.4-2 shows the assigned passenger volume on links of MRT.

Table 14.4-2 Summary of Daily Passenger Volume by MRT Systems ("Do Maximum"Scenario)

	Section	Starting Point	Terminating Point	Proposed System	Length (km)	No. of PAX in 2025 ('000/Day)	No. of PAX-km in 2025 ('000/day)	Average PAX in 2025 ('000/KM)	Average Trip Length in 2025 (Km)
Line 1	Purbachar-Saidabad Line	Purbachar	Saidbad	BRT	23	329,000	1,538,000	67,000	4.7
Line 2	Gastali - Saidabad Line	Gastali	Saidabad	BRT	14	448,000	1,522,000	112,000	3.4
Line 3	UTTRA-Jheelhil Line	UTTRA	Jheelhil	BRT	30	824,000	2,765,000	92,000	3.4
Line 4	UTTRA - Saidabad Line	UTTRA	Narayanganj	MRT	33	807,000	6,919,273	210,000	8.6
Line 5	Circular Line	Badda	Badda	MRT	23	755,000	2,523,000	110,000	3.3
Line 6	Pallabi -Saidabad Line	UTTRA 3	Tarabo	MRT	29	1,017,000	6,555,000	226,000	6.4
Line 7	Purbachar-Savar Line	Purbachar	Savar	MRT/BRT	26	155,000	2,143,000	82,000	13.8
Line 8	East Fringe Line	Tongi	Narayanganj	MRT/BRT	34	168,000	1,167,000	34,000	6.9
Total					212	4,503,000	25,132,273	118,773	5.6

Source: JICA Study Team

Accoriding to this Table, MRT Line 6 is attrcted the largest passenger volume among the proposed MRT line following MRT Line 4. However, passgenger volume on Line 5 is almost one-half of line 6 passengers. It is therefore suggested that Line 5 shall be introduced either BRT or light rail transit (LRT).

Eatern fringe line and east-east connection line cannot be identified whether it is necessary to intoroduce MRT or BRT line. However, it is expected to inctrease passeger traffic volume when corridor development will be made. It is recommended to develop urban deveopment cum transport development.

Table 14.4-3 Passenger Traffic Demand of MRT/BRT Lines by Sections ("Do Nothing" Scenario)

Section	Line	No. of Passengers
A	BRT Line 1	3,700
	BRT Lin 2	11,200
	BRT Line 3	21,100
	MRT Liine 4	13,000
	MRT Line 5	NA
	MRT Line 6	23,000
	Eastern Fringe MRT Line	3,300
	Total	75,300
B	BRT Line 1	28,900
	BRT Line 2	NA
	BRT Line 3	6,200
	MRT Line 4	24,700
	MRT Line 5	NA
	MRT Line 6	28,900
	Eastern Fringe MRT Line	3,300
	Total	92,000
C	Future Extension MRT Line 6	14,600
	Extension of MRT Line 4	7,400
	Total	22,000
D	East West MRT Line	8,200
	BRT Line1	5,300
	Total	13,500

Source JICA Study Team

Note; Sections shall be referred in Figure 14.4-2

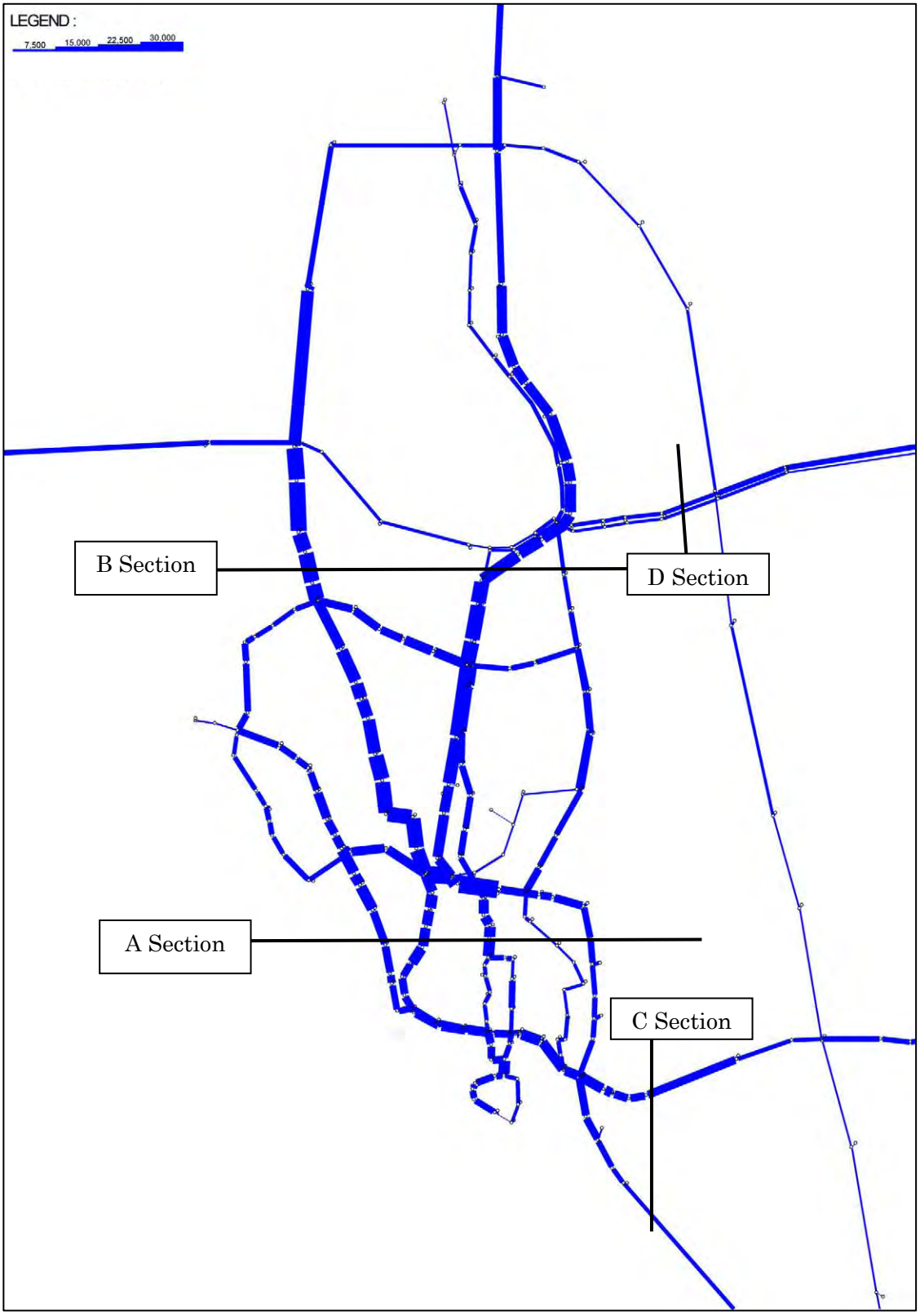


Figure 14.4-3 Passenger Flow of Mass Transport System in 2025 Under 'Do Maximum Scenario'

Source: JICA Study Team

(4) Priority of MRT System

Based on the traffic demand forecasting, the priority ranking of MRT lines are calculated based on the factors considered as: a) traffic aspect, b) system efficiency, c) economic aspect. These criteria are employed in accessment of alternative scenarios.

Table 14.4-4 Summary of Future Traffic Conditions by MRT Lines ("Do Maximum"Scenario)

	Section	No. of PAX in 2025 per Day	No. of PAX-km in 2025 per day	Average PAX in 2025 pre KM	Peak Hour PAX Volume	Peak Hour PAX Volume per Direction
Line 1	Purbachar-Saidabad Line	329,000	1,538,000	67,000	10,050	7,035
Line 2	Gastali - Saidabad Line	448,000	1,522,000	112,000	16,800	11,760
Line 3	UTTRA-Jheelhil Line	824,000	2,765,000	92,000	13,800	9,660
Line 4	UTTRA - Saidabad Line	807,000	6,919,273	210,000	31,500	22,050
Line 5	Circular Line	755,000	2,523,000	110,000	16,500	11,550
Line 6	Pallabi -Saidabad Line	1,017,000	6,555,000	226,000	33,900	23,730
Line 7	Purbachar-Savar Line	155,000	2,143,000	82,000	12,300	8,610
Line 8	East Fringe Line	168,000	1,167,000	34,000	5,100	3,570
Total		4,503,000	25,132,273	118,773	17,816	12,471

Source: JICA Study Team

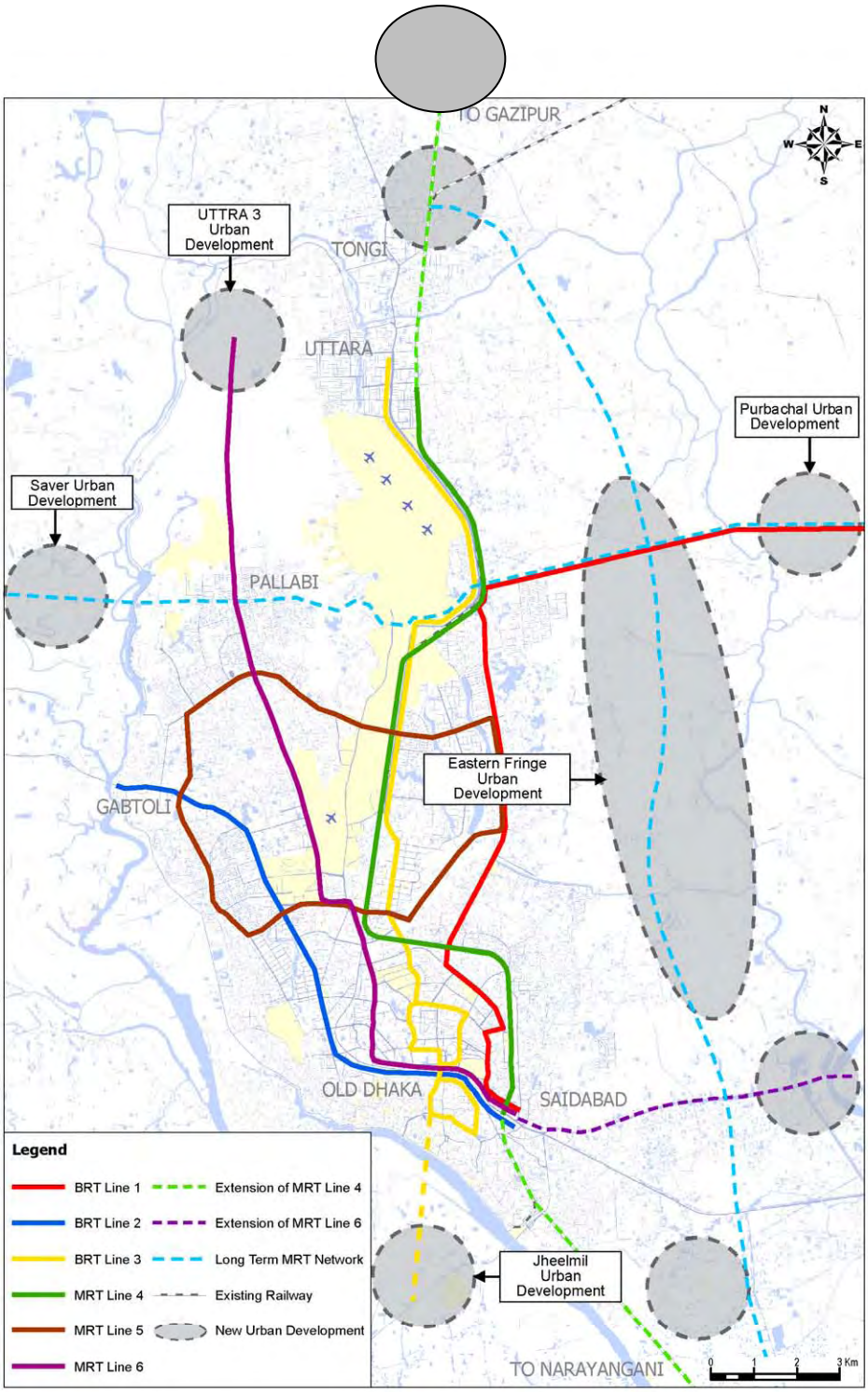


Figure 14.4-4 Ultimate MTS Development Plan by 2050

Source: JICA Study Team

Table 14.4-5 Overall Evaluation of MRT Lines

Line	Traffic Aspect	System Efficiency	Economic / Financial Aspects	Overall Evaluation
Line 1	・ Peak hour passenger volume =10,050 ・ Number of passengers = 329,000 pax [X]	・ Passenger load = 67,000 ・ Trip length = 4.7 km [X]	・ Fare revenue = 2.3 million Tk ・ Fare revenue per cost=10.4 TK [X]	From all aspects, line 1 is less priority than lines 2 and 3. [X]
Line 2	・ Peak hour passenger volume =16,800 ・ Number of passengers = 448,000 pax [○]	・ Passenger load = 112,000 ・ Trip length = 3.4 km [◎]	・ Fare revenue = 2.3 million Tk ・ Fare revenue per cost=12.1 TK [○]	From all aspects, line 2 is the second best plan among BRT plan. [○]
Line 3	・ Peak hour passenger volume =13,800 ・ Number of passengers = 824,000 pax [◎]	・ Passenger load = 92,000 ・ Trip length = 3.2 km [○]	・ Fare revenue =4.1 million ・ Fare revenue per cost=4.8 TK [◎]	From all aspects, line 3 is the best plan among BRT plan. [◎]
Line 4	・ Peak hour passenger volume =31,,500 ・ Number of passengers = 807,000 pax [○]	・ Passenger load = 210,000 ・ Trip length = 5.4 km [○]	・ Fare revenue = 17.3 million Tk ・ Fare revenue per cost= 10.9TK [X]	From all aspects, line 3 is best plan. [○]
Line 5	・ Peak hour passenger volume =16,500 ・ Number of passengers = 755,000 pax [△]	・ Passenger load = 110,000 ・ Trip length = 3.3 km [△]	・ Fare revenue = 6.3 million Tk ・ Fare revenue per cost= 3.7TK [X]	From all aspects, line 5 is less priority than lines 4 and 6. [△]
Line 6	・ Peak hour passenger volume =33,900 ・ Number of passengers = 1,016,000 pax [◎]	・ Passenger load = 226,000 ・ Trip length = 5.1 km [◎]	・ Fare revenue = 16.4million Tk ・ Fare revenue per cost= 8.0 TK [◎]	From all aspects, line 6 is surperior to the other [◎]
Line 7	・ Peak hour passenger volume =12,300 ・ Number of passengers = 155,000 pax [X]	・ Passenger load = 82,000 ・ Trip length = 8.4 km [X]	・ Fare revenue = 5.4million Tk ・ Fare revenue per cost= 2.7TK [X]	From all aspects, line 7 is the least priority among the others [X]
Line 8	・ Peak hour passenger volume =5,100 ・ Number of passengers = 168,000 pax [X]	・ Passenger load = 34,000 ・ Trip length = 6.9 km [X]	・ Fare revenue = 2.9million Tk ・ Fare revenue per cost= 1.1 TK [X]	From all aspects, line 8 is the least priority among the others [X]

Source: JICA Study Team

14.4.3 Phasing Development Plan by 2025

Based on the above mentioned examinations, it is recommended that Line 6 is the best plan for MRT system and Line 3 is the best plan for BRT system. MRT line 4 is also better plan than the other plans. However, BRT system is now considering to introduce along Airport Road corridor so that after introduction of BRT system, the Government shall consider whether the MRT line 4 project be invested additionally or not.

Table 14.4-6 Phasing Development of MRT Plan

	Section	Starting Point	Terminating Point	Proposed System	Length (km)	Short Term (2010 -'15)	Medium Term (2016 -'20)	Long Term (2021 -'25)	Beyond 2025
Line 1	Purbachar-Saidabad Line	Purbachar	Saidbad	BRT	23				
Line 2	Gastali - Saidabad Line	Gastali	Saidabad	BRT	14				
Line 3	UTTRA-Jheelhil Line	UTTRA	Jheelhil	BRT	30				
Line 4	UTTRA - Saidabad Line	UTTRA	Narayanganj	MRT	33				
Line 5	Circular Line	Badda	Badda	MRT	23				
Line 6	Pallabi -Saidabad Line	UTTRA 3	Tarabo	MRT	29				
Line 7	Purbachar-Savar Line	Purbachar	Savar	MRT/BRT	26				
Line 8	East Fringe Line	Tongi	Narayanganj	MRT/BRT	34				

Source: JICA Study Team

14.4.4 MTS Plan

(1) Selection of MTS Vehicle

Mass Transit System (MTS) in Dhaka is a new concept. MTS is defined as a collective urban passenger service that operates at high level of customer performance, especially with regard to travel times and passenger carrying capacity. MTS, which is expected to introduce in future, can be precisely categorized as follows;

a) Rail-based Mass Rapid Transit (MRT)

A heavy rail transit system operating on grade separated tracks that located at-grade, underground, or elevated.

b) Bus Rapid Transit (BRT)

Bus based technology typically operated on exclusive ROW lanes at surface level in general.

c) Light Rail Transit (LRT) or Tram

Electric rail based technology operating either as a single railway cars or short rain of cars on executive right of way at surface level.

d) Monorail

It is also new transit system that runs straddle on the exclusive beam track.

e) Automated Guideway Transit (AGT)

It is a new transit system that runs exclusive track built on elevated structure with light weight vehicles.

Characteristics and transport capacity of various MTS systems is shown in Table 14.4-8. The MTS lines proposed in this study is compared on the basis of field survey, the existing and future traffic demand, existing urban form and future urban development, etc.

a) Urban development
   i. Land use
   ii. Conformity of land use
b) Traffic demand on each line
c) Engineering aspect
   i. Engineering profile plan
   ii. Project cost
d) Environmental aspect
   i. Land acquisition
   ii. Natural environment

e) Other aspect as

i. Implementation aspect

ii. Expandability

Table 14.4-7 shows the results of the comparative analysis.

According to the comparative analysis, MRT Line 6 is superior to the other lines. This is because this line is expected to get more passengers, road space is comparatively wide, and no major difficulty to implementation of the project. It is, therefore, Chapter 19 will be examined mainly the MRT Line 6.

Table 14.4-7 Comparison Analysis of Three (3) MRT Corridors

		Line 4 (Green Line)	Line 5 (Brown Line)	Line 6 (Purpul Line)
Outline of the Project	Location of Origin	Uttra	Gulshan	Pallabi
	Location of Destination	Saidabad Bus Terminal	Gulshan	Saidabad
	Route	· This Route passes through Uttra, Airport, Kuril, Mahakhali, Tejgaon, Kamalapur, Saidabad	· This line is circle line. · This Route passes through Gulshan, Kakoli, Mirpur, Hmahadpur, Malibagh, Rampura	· This route passes through Pallabi, Mirpur Section 10. Tejgaon North, BUET, Banga Bhaban and Saidbad bus terminal.
	Length of Plan (km)	22km	22 km	16 km
	Structure	Uttara-Cantonment: At Grade 6.5 km Cantonment - Siadabad; Underground 13.5km	Elevated stucture	· Pallabi - Sher e-Bangla; Elevated 7km · Sher e-Bangla - Saidabad; Undergraound; 9km
	No. of Stations	18 Stations	19 Stations	16 Stations
	Related Improvement	Relocation of Kamarapure container terminal to Tongi area		
Urban Development	Land Use	· Uttara is new residential area, · Cantonment is military use, · Mahakari is mixed use and Tejgaon is inducstrial use	· Gulshan, Banani, Mirpur are residential areas · Tejgaonis industrial area, · Southern line water catchment area	· Pallabi / Milpur residential area, Air Force · National assembly, park, · University, commertial and institutional use
	Conformity with Urban development Direction	· Due to the existing BR line, it is not conformity to existing and future land uses		
Traffic Demand (persons/h.d)		· 62,000 pph in 2024, Tajgaon & Kamalapur	· 40,000persons in 2024 · Traffic demend for East-West axes is not	· 64,000 pph in 2024, at Mirpur section 10
Engineering Aspect	Engineering Profile Plan	· Within the CBD area, it is not impossible to construct via-duct structure due to three flyovers	· All section will be constructed as elevated structure · Gulshan and Banani road is narrow to construct via-duct structure	· All section may be possible to construct as elevated structure as alternative structure
	Rough Cost Estimate			
Environmental Aspect	Land Acquisition & Families affected by the Option	· Although ROW is owed by BR, many families are affected by the projects.	· Within the CBD area, via-duct structure is very high structure due to fly-over structures or at-grade structure	· In most of the section, it is possible to construct w/o PFP except Dhaka university - Old Dhaka Area
	Natural Environment	· Little adverse natural environment	· Little adverse natural environment	· Little adverse natural environment
Other Aspect	Implementation Aspects	· Depending on BR's decision maker's opinion	· Due to low traffic demand, implementation may be later stage	No major difficulty to implement
	Expandability	· Expandability to Gazipur and Narayangaji	No expandability	· Expandability to North and Narayangaji
Major Issues		· Concentration of investment of BRT 1 & 3 and expressway · BRT Line 3 is already committed to implemented so timing of construction would be much later stage · Gulistan - Jatrabari Flyover is cscheduled to contrsucted Railway truck shall be kept from inhabitants	· Passenger demand is lowest among the others · BRT Line 3 is already committed to implemented so timing of construction would be much later stage · Gulistan - Jatrabari Flyover is cscheduled to contrsucted · Railway truck shall be kept from inhabitants	· Alignment from Dhaka University to Jatrabali streets are narrow · Integration with Bus Terminal needs resettlement

Source; *JICA Study Team*

Table 14.4-8 Description of MTS System

	Automated Guideway Transit (AGT)	Straddle Type Mono-rail System	Light Rail Transit (LRT)	Bus Rapid Transit (BRT)	Mass Rapid Transit Railway (MRT)
Exterior of the Train					
System Feature	It is a new transit system that runs exclusive track built on elevated structure with light weight vehicles	It is also new transit system that runs straddle on the exclusive beam track.	Electric rail-based technology operating either as a single rail cars or as a short train of cars on exclusive right of way at surface level	Bus based technology typically operated on exclusive ROW lanes at surface level in general. .	A heavy rail transit system operating on grade separated tracks that are located either underground or elevated.
Service Length (km)	5-15 km	5 - 15 km	5-15 km	5-15km	10 -50 km
Transport Capacity	10,000-17,000 pphpd	15,000 - 20,000 pphpd	10,000-17,000 pphpd	10,000- 25,000 pphpd	30,000 - 60,000 pphpd
Maximum Speed (km/h)	60 km/h	80 km/h	70 km/h	70 km/h	80 km/h
Operating Speed (km/h)	20-30 km/h	25 -30 km/h	20-40 km/h	20 -30 km/h	30 -40 km/h
Length of Vehicle (m)	27 m / 3-vehicle	14 m / vehicle	30 m / 3-vehicle as one unit	18.5 m /articulated	20 m / train
Width of Vehicle (m)	2.7 m	3.0 m	2.6 m	2.6 m	2.8 m
Height of Vehicle (m)	3.3 m	3.6 m	3.7 m	3.7 m	3.5 m
Minimum Service Frequency (min)	2 min	2 min	2 min	1 min	2 min

Source; "Public Transport in Urban Area" edited by Dr. Kozo Amano, Gihodo-Publication

Table 14.4-9 Transport Capacity by Various MTS Modes

		Vehicle Capacity	Congestion Rate (%)	Transport Capacity (pphpd) Service Frequency / Direction				
				60	30	20	12	6
LRT Articulated	1 unit	150	120	10,800	5,400	3,600	2,160	1,080
	2 unit	300	120	21,600	10,800	7,200	4,320	2,160
Mono Rail	3 vehi.	300	120	–	10,800	7,200	4,320	2,160
	6 vehi.	600	120	-	21,600	14,400	8,640	4,320
BRT Articulated	1 unit	160	100	9,600	4,800	3,200	1,920	960
	2 unit	320	100	19,200	9,600	6,400	3,840	1,920
MRT	6 vehi.	840	150	-	37,800	25,200	15,120	7,560
	8 vehi.	1120	150	-	50,400	33,600	20,160	10,080

Source: JICA Study Team

Note: Service frequency is defined as number of MTS services per direction per hour.

CHAPTER 15: ROAD NETWORK DEVELOPMENT PLAN

15.1 Study Procedure

Road network development plan in 2025 was proposed through the study flow illustrated in Figure 15.1-1. There are four (4) major components in the road network development plan: (1) road network development plans in DMA and RAJUK area, (2) intersection improvement plan, (3) urban expressway development plan, and (4) road development plan in eastern fringe area.

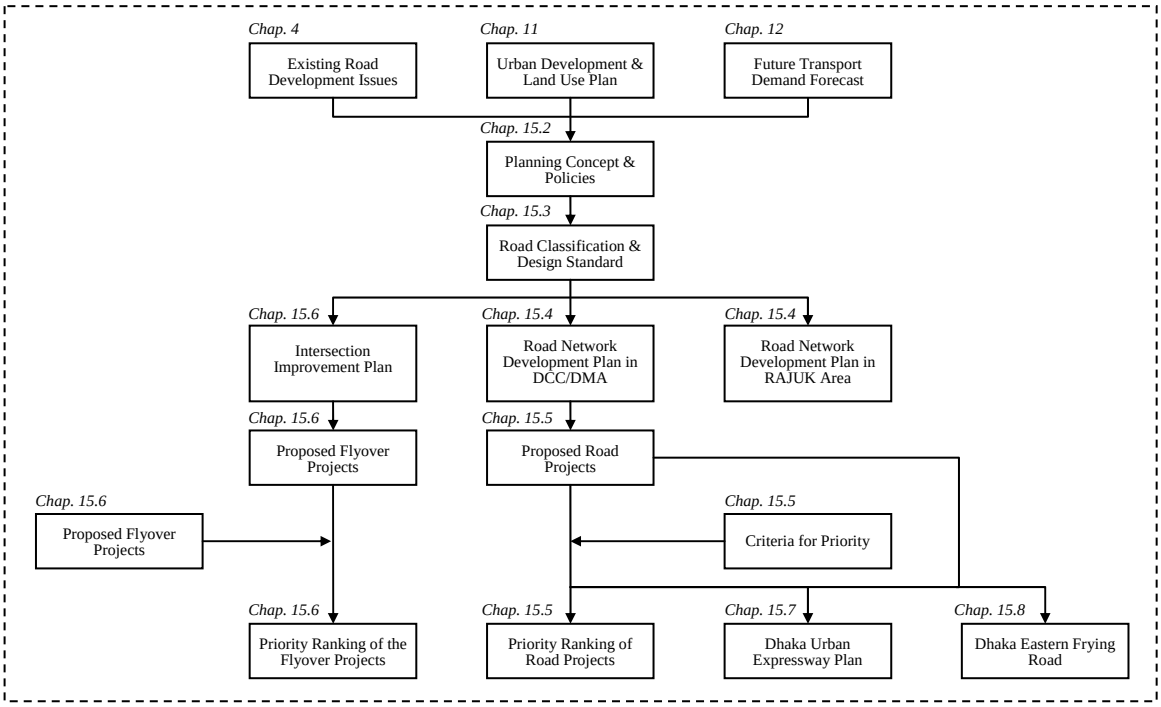


Figure 15.1-1 Study Procedure

15.2 Planning Concept for Road Network Development

Based on the existing road development issues (Chapter 5), urban development and land use plan (Chapter 11), and future traffic demand forecast (Chapter 12), conceptual road network development plan is prepared.

(1) Major Issues of the Existing Road Network in DMA and RAJUK area

The following road network development issues were identified in Chapter 5:

a) Establishment of road hierarchy

b) Improvement of missing links
c) Construction of grid road network in new development area
d) Construction and improvement of ring roads
e) Construction and improvement of radial roads
f) Improvement NMT roads
g) Construction of Dhaka North-South Expressway
h) Construction of Dhaka Eastern Fringe Road

Table 15.2-1 Road Network Issues and Road Network Development Measures

Issues	Measures
1. Chronic traffic congestion in CBD and Old Dhaka ・Mixed traffic ・Shortage of road capacity ・Shortage of intersection capacity	1. Improvement of missing link 2. Construction of grade separations 3. Traffic management measure 4. NMT road improvement
2. Lack of Road Hierarchy ・Road hierarchy in CBD and old Dhaka	1. Establishment of design criteria 2. Improvement by road hierarchy based on functional classification of roads
3. Connection with Inter-City Road Network	1. Development of grid and ring system 2. Effective connection of existing road with Dhaka – Khulna Road to be constructed Padoma Bridge
4. Urban Expressway	1. Construction of North –South Urban Expressway
5. Road Network with New Development Areas	1. Improvement of grid road network such as Dhaka Eastern Fringe Road 2. Development of ring and radial system 3. Construction of access road to new development area 4. Effective connection with existing road network
6. Road network development in Urbanized Area	1. Improvement of missing links 2. Improvement of secondary roads 3. Construction of Grade Separation 4. NMT road improvement
7. Missing Link	1. Improvement of missing link

(2) Road Network Development Policies

Based on the road network development issues, DHUTS proposed the following road network development policies:

a) The road network plays a role as' a prime Mover of Economic Growth' and as arteries linking all parts of Dhaka to be a cohesive economic body and to integrate the Dhaka economy within Bangladesh and the Region.
b) The road network development in Dhaka shall be integrated with the Land use development plan of RAJUK area.
c) The Government will continue to give high priority to the rehabilitation and reconstruction of road network connecting to all parts of the Dhaka Division and with neighboring Division.
d) The Government will continue to accord high priority to the maintenance of National Highway and Regional Highway and the reconstruction of feeder roads.
e) The Government will seek increasing private sector and road users to participate in road infrastructure development.
f) The Government will review the Law on Roads to meet the future Road Network Development.
g) The Government will place emphasis on traffic safety for road users.

15.3 Road Classification and Design Criteria

Functional road classification is important to formulate an efficient and effective road network in DMA. It is therefore proposed the road classification taking into consideration the below mentioned road design manuals and guidelines. Following the road classification, the Study Team proposes the road design polices for road structures, traffic management and environmental measure and their typical cross section as mention in Table 15.3-1 and Figure 15.3-1, respectively.

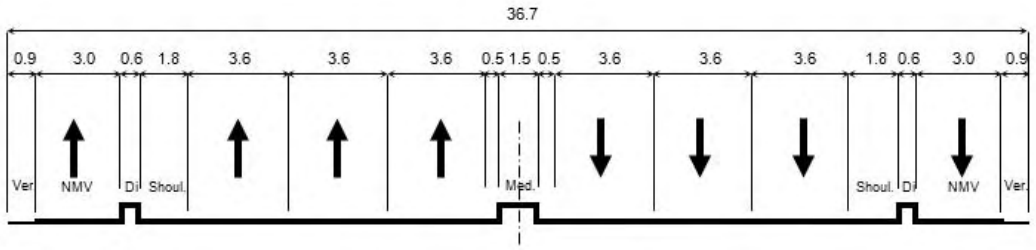
a) Road design manual, Road and Highway Department, Ministry of Communication, Bangladesh
b) Road design manual, Ministry of Local Government, Bangladesh
c) Road design manual, RAJUK, Ministry of Housing and Public Works
d) A Policy on Geometric Design of Highway and Streets, the American Association of State Highway and Transport Officials (AASHTO). Washington DC.
e) Highway Capacity Manual, Fourth Edition, Transport Research Board, National Research Council (NRC)
f) Guide for Design of Pavement Structure, AASHTO
g) Road Structure Guidelines, Japan Association of Rod

Table 15.3-1 Recommended Policies on Road Structures/Traffic Management/Environmental Measures with Functional Classifications

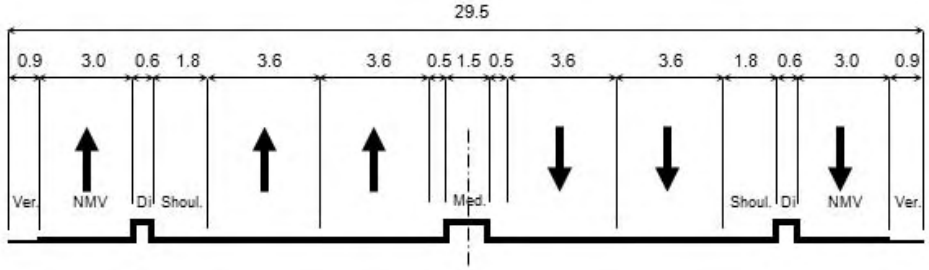
Policy Category & Item		National Highway	Regional Highway	Urban Expressway	Primary	Secondary	Collector	Local	Narrow
Road Structure	Structure	Embankment/ Viaduact	Embankment/ Viaduact	Embankment/ Viaduct	At-grade	At-grade	At-grade	At-grade	At-grade
	Crossing System	Interchange	Interchange	Intersection	Flyover/Signalized/ Non-signalized	Flyover/Signalized/ Non-Signalized	Signalized/ Non-signalized	-	-
	Number of Lanes	Multi-lane divided	Multi-lane divided	Multi-lane divided	Multi-lane divided	Multi-lane divided/ undivided	2 lane undivided	Narrow 2-lane road	Narrow 2-lane road or one lane road
	Pedestrian Facility	N/A	N/A	N/A	Dual sidewalk	Dual sidewalk	Dual sidewalk	-	-
	Bus Lanes	N/A	N/A	Possible	Possible	Possible	N/A	N/A	N/A
	Typical No. of Lane	4-6	4-6	4-6	4-8	2-4	2-4	2	1-2
Traffic Management	Speed Limit	100km/h or less	100km/h or less	100 km/h or less	60km/h or less	40km/h or less	30km/h or less	20km/h or less	10km/h or less
	Parking Regulation	N/A	N/A	N/A	Parking prohibited	Parking prohibited	Designed	Designed	N/A
	One-Way Operation	N/A	N/A	N/A	Applicable	Applicable	Designed	Designed	N/A
	Vehicle Type Restriction	N/A	N/A	N/A	Vehicle type/hour	Vehicle type/hour	Vehicle type/hour	No cargo traffic	No cargo traffic
	Signal Control	N/A	N/A	N/A	Syncronized signalisation	Signalized/Enforcer	Signalized/Enforcer	Zonal traffic control	Zonal traffic control
	Pedestrian Accomodation	Full grade separation	Full grad separation	Full grade separation	Grade separation/ Crosswalk	Crosswalk	Crosswalk	Crosswalk	Zonal traffic control
Environmental Measures	Roadside Faclities	Buffer area	Buffer area	Noise barrier/Wall	Roadside flora	Roadside flora	Roadside flora	N/A	N/A
	Traffic Regulation	Speed limit	Speed limit	Speed limit	Cargo traffic control	Cargo traffic control	Zonal control	Zonal control	Zonal control
	Land Use Restriction	Non-residential area	Non-residentila area	Non-residential area	-	-	-	-	-

Source: JICA Study Team

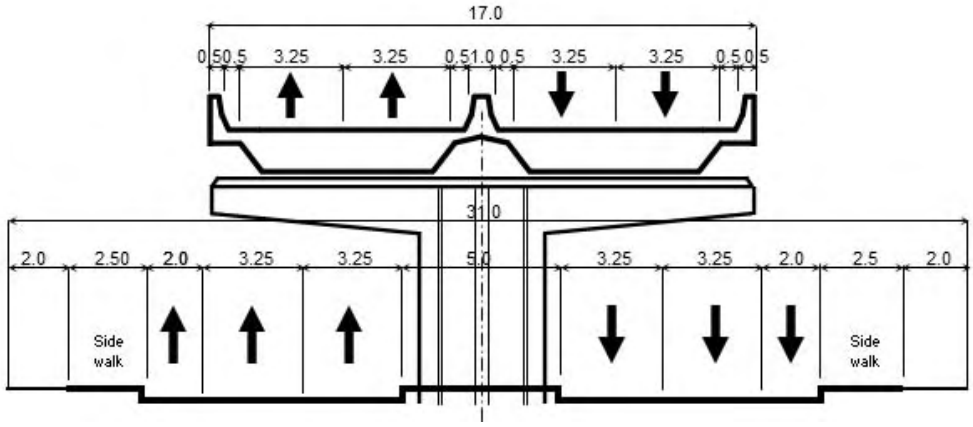
National Highway



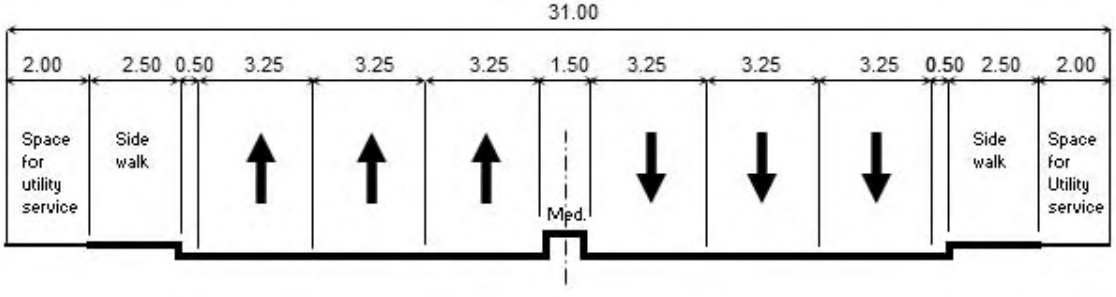
Regional Highway



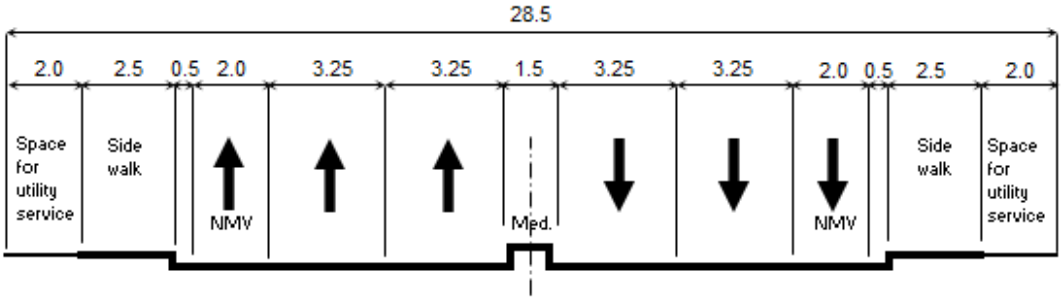
Urban Expressway



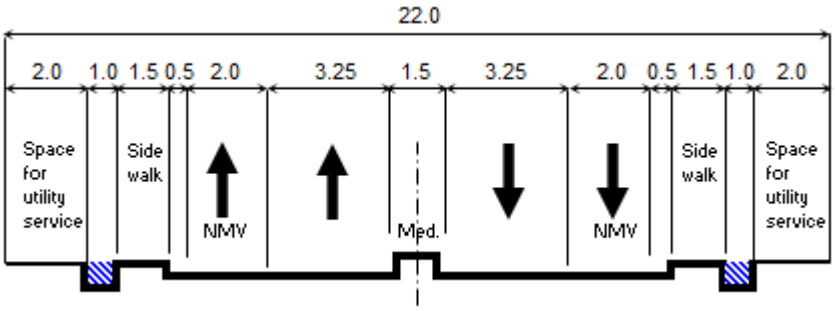
Primary Road



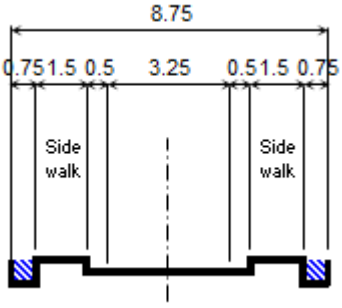
Secondary Road



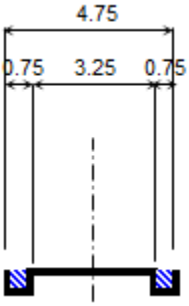
Collector Road



Local Road



Narrow Road



Note:
Ver.: Verge, Div.: Divider, Med.: Median, Shoul: Shoulder
NMV: Non Motorized Vehicle

Figure 15.3-1 Typical Cross Section of Road in the Study Area

15.4 Road Network Development Plan

15.4.1 Proposed Road Network Development in DCC and DMA

(1) Principals of the Road Network Development in DCC and DMA

The principals of the road network development plan for DCC and DMA are;

a) To improve based on hierarchical and functional road network
b) To improve the primary road network to link between CBD of Dhaka and urban cores, satellite communities and division centers.
c) To improve the missing link within the urbanized area in order to prepare efficient road network
d) To develop the grid type road network for newly development areas taking into consideration the geographic feature of the East Fringe Area,
e) To construct the Urban Expressway to make backbone road network in the center of Dhaka
f) To improve Inner Ring Road to serve traffic from Dhaka to regional centers in RAJUK area but also in Bangladesh.
g) To construct Future Road Network for DCC and DMA by Grid road, Ring road and Radial road based on Development Plan of STP.

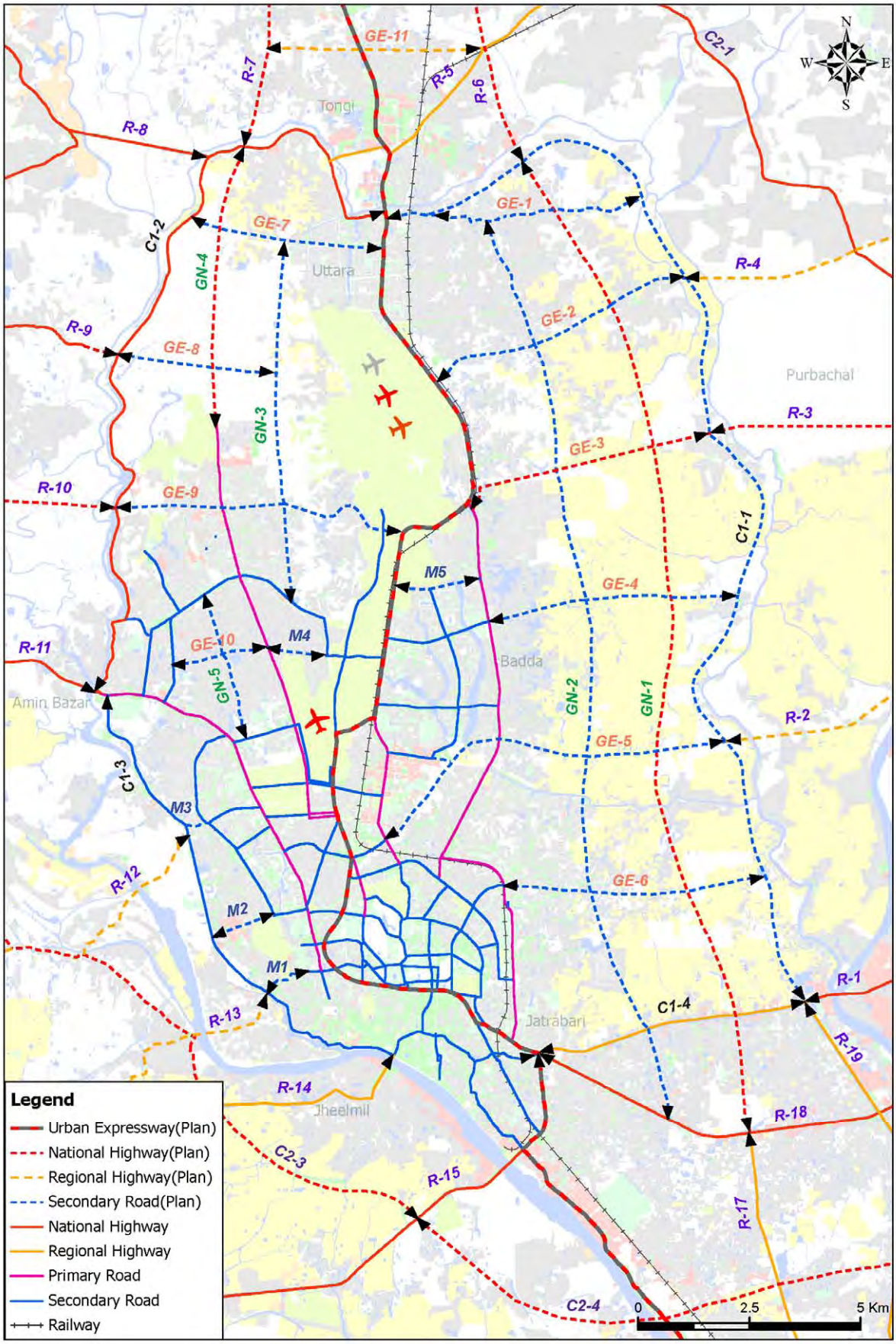


Figure 15.4-1 Proposed Road Network in DCC/DMA

15.4.2 Proposed Road Network Development Plan in RAJUK Area

The principals of the road network development for RAJUK area are as follows;

a) To develop the road network taking into consideration hierarchy and road functions,
b) To development as concept of ring and radial road network,
c) To improve inter-regional roads such as Dhaka – Chittagong Road, Dhaka –Khruna Road, etc
d) To construct Future Road Network for RAJUK Area by Ring road and Radial road based on Development Plan of STP and RAJUK.

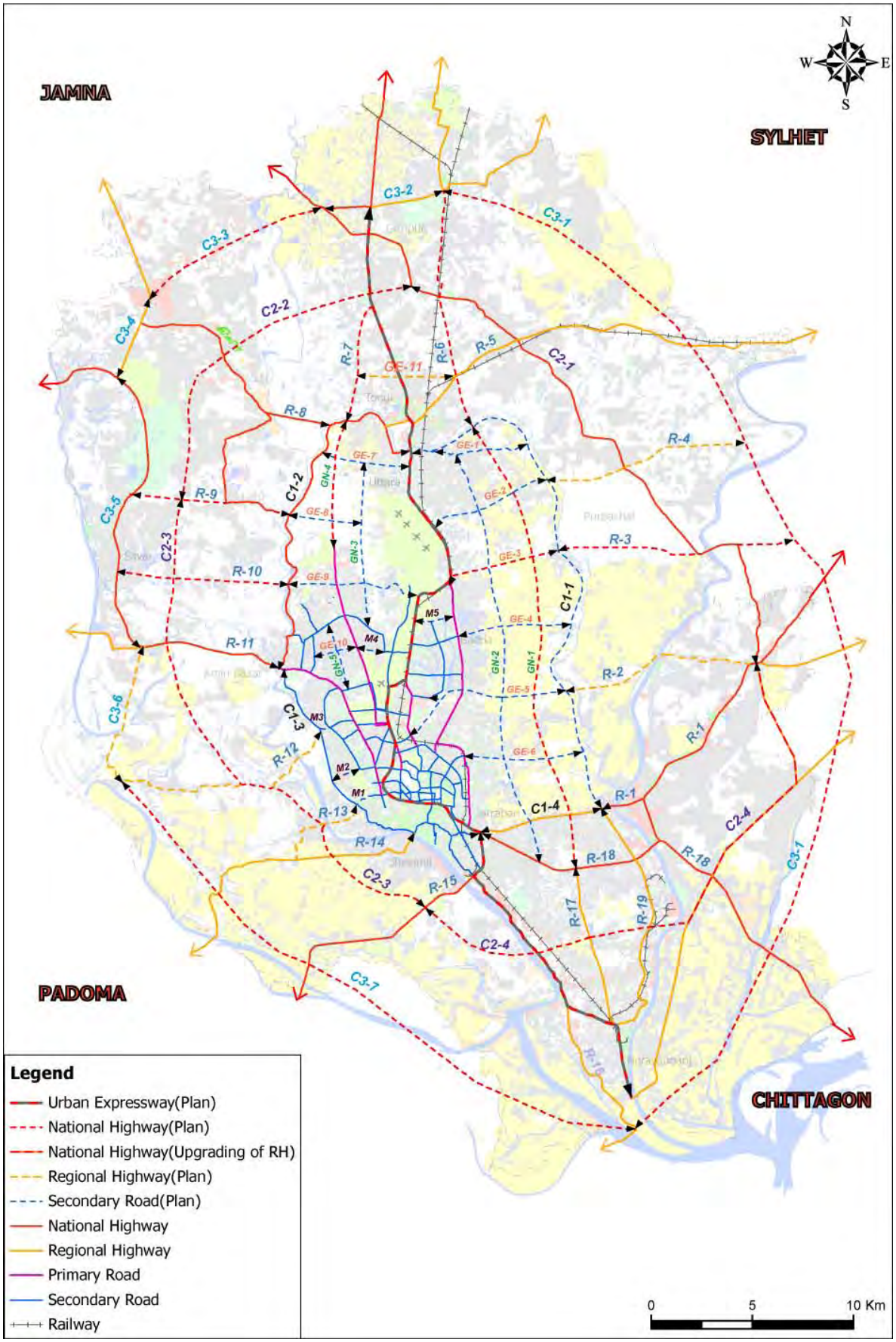


Figure 15.4-2 Proposed Road Network in the RAJUK Area

15.5 Proposed Road Development Projects

15.5.1 Proposed Road Project List and Preliminary Cost

(1) Proposed Road Projects

The proposed road projects, which classified into five (5) sub categories, are summarized in Table 15.5-1.

Table 15.5-1 Proposed Road Development Projects (Summary)

Project Components	Length (km)	Cost (million Tk)
1. Urban Expressway	54.00	64,328
2. Missing Link	6.33	179
3. Grid Roads	123.80	14,868
3.1 National Highway	37.19	8,944
3.2 Regional Highway	4.86	372
3.2 Secondary Road	81.75	5,552
4. Ring Roads	304.57	20,303
4.1 Inner Ring Road	65.75	3,406
4.2 Middle Ring Road	105.50	6,577
4.3 Outer Ring Road	133.32	10,320
5. Radial Roads	194.90	9,185
5.1 National road	106.28	5,064
5.2 Regional Road	88.62	4,121
Total	683.60	108,863

Source; JICA Study Team

Detailed road projects are described and listed up in Table 15.5-2 (1) ~ (4).

15.5.2 Prioritization of Proposed Road Project

The proposed road projects are prioritized on the basis of assessment from the following four (4) viewpoints;

a) Planning Aspect

i. Compatibility with Development Plans

ii. Impact on Socio Economic Activities
iii. Multifunction of Road

b) Technical Aspect

i. Urgency (Degree and Scale of Problems)
ii. Role in Road Network
iii. Technical Difficulty

c) Environmental Aspect

i. Social Impact
ii. Social Acceptance

d) Economical Aspect

i. Traffic Demand
ii. Cost
iii. Benefit Scale

Table 15.5-3 shows the prioritization criteria for each aspect. Based on the criteria, each of road projects is computed their score as shown in Table 15.5-4 and is given their priority in the following terms;

a) Short term
b) Medium Term
c) Long Term
d) Major projects are listed as follows;
e) Urban Expressway
f) Eastern Fringe Road
g) Missing section of middle ring road

15.5.3 Implementation schedule of Proposed Road Project

Since Table 15.5-4 above, Table 15.5-5 shows an Implementation Schedule of Proposed Road Project, when all proposed roads in the Table 15.5-4 are to be improved by 2025.

In addition, Overall Project Implementation Schedule will be discussed in Chapter 21.

Table 15.5-2 (1) Proposed Road Development Project in the Study Area

Item	Road Class	Estimated Length (km) ( ) : Total Length	Traffic Volume (100xpcu /day)	No. of Lanes	Major Works	Cost (Million Dollars)	Social Impact	Natural Impact	Implementation Priority
1. Urban Expreessway						**935.0**			
UE-1	Expressway	13.55	420	4	Elevated 4-lane Construction	238.0	- Reduction of traffic jam, vehicle oparating cost, vehicle time cost - Resettlement - Livelihood loss - Impoverishment of vulnerable - Traffic jam at construction	- Air Pollution, Noise and Vibration - Loss of trees on center strip	Short term
		26.79				464.0			Medium term
		13.66				233.0			Long term
2. Missing Link						2.6			
M-1	Secondary	1.00	120	4	4-lane Construction with NMV	0.4	- Reduction of traffic jam, vehicle oparating cost, vehicle time cost - Resettlement - Livelihood loss - Impoverishment of vulnerable - Traffic jam at construction - Loss of agricultural/ commercial/industrial land -Impact to irrigation canals	- Air Pollution, Noise and Vibration - Impact on Hydrological Situation	Medium term
M-2	Secondary	1.50	200	4	4-lane Construction with NMV	0.6			Short term
M-3	Secondary	0.47	430	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	0.2			Short term
M-4	Secondary	1.40	210	4	4-lane Construction with NMV	0.6		- Air Pollution, Noise and Vibration	Short term
M-5	Secondary	1.96	200	4	4-lane Construction with NMV	0.8			Short term
3. Grid Road						216.1			
GE-1	Secondary	5.20	130	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	2.9	- Reduction of traffic jam, vehicle oparating cost, vehicle time cost - Resettlement - Livelihood loss - Impoverishment of vulnerable - Traffic jam at construction - Loss of agricultural/ commercial/industrial land -Impact to irrigation canals	- Air Pollution, Noise and Vibration - Impact on Hydrological Situation	Long term
GE-2	Secondary	6.30	200	4	4-lane Construction with NMV	7.0			Medium term
GE-3	National Highway	5.90	260	4+4	under Construction by RAJUK	-			Under construction
GE-4	Secondary	5.70	190	4	4-lane Construction with NMV	6.3			Medium term
GE-5	Secondary	9.00	390	4	4-lane Construction with NMV	10.0			Short term
GE-6	Secondary	5.90	370	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	3.3			Short term
GE-7	Secondary	4.47	210	4	4-lane Construction with NMV	5.0			Medium term
GE-8	Secondary	3.60	90	4	4-lane Construction with NMV	4.0			Long term
GE-9	Secondary	6.80	210	4	4-lane Construction with NMV	7.5			Medium term
GE-10	Secondary	2.18	70	4	4-lane Construction with NMV	0.9		- Air Pollution, Noise and Vibration	Medium term

Table 15.5-2 (2) Proposed Road Development Project in the Study Area

Item	Road Class	Estimated Length (km) ( ) : Total Length	Traffic Volume (100xpcu /day)	No. of Lanes	Major Works	Cost (Million Dollars)	Social Impact	Natural Impact	Implementation Priority
GE-11	Regional Highway	4.86	200	4	4-lane Construction with NMV	5.4		- Air Pollution and Noise - Loss of Vegetation	Long term
GN-1	National Highway	23.10	390	6	6-lane Construction with NMV	96.0	- Reduction of traffic jam, vehicle oparating cost, vehicle time cost - Resettlement - Livelihood loss - Impoverishment of vulnerable - Traffic jam at construction - Loss of agricultural/ commercial/industrial land -Impact to irrigation canals		Short term ~ Medium term
GN-2	Secondary	21.00	280	4	4-lane Construction with NMV	23.3		- Air Pollution and Noise - Loss of Vegetation - Impact on Hydrological Situation	Long term
GN-3	Secondary	8.20	290	4	4-lane Construction with NMV	9.1			Long term
GN-4	National Highway	8.19	140	6	6-lane Construction with NMV	34.0			Medium term
GN-5	Secondary	3.40	260	4	4-lane Construction with NMV	1.4		- Air Pollution, Noise and Vibration	Medium term
4. Ring Road						295.1			
Inner Ring Road						49.5			
C1-1	Secondary	26.85	220	4	4-lane Construction with NMV	29.8	- Reduction of traffic jam, vehicle oparating cost, vehicle time cost - Resettlement - Livelihood loss - Impoverishment of vulnerable - Traffic jam at construction - Loss of agricultural/ commercial/industrial land -Impact to irrigation canals	- Air Pollution and Noise - Loss of Vegetation - Impact on Hydrological Situation	Medium term
C1-2	Secondary	17.40	330	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	9.7			Short term
C1-3	Secondary	11.50	520	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	6.4			Medium term
C1-4	Regional Highway	10.00	480	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	3.6			Short term
Middle Ring Road						95.6			
C2-1	National Highway	29.00	280	6	6-lane Construction with NMV	under Con-	- Reduction of vehicle oparating cost, vehicle time cost - Resettlement - Livelihood loss - Impoverishment of vulnerable group - Loss of commercial/ industrial land	- Air Pollution and Noise - Loss of Vegetation	under Con-struction
C2-2	National Highway	18.00	230	6	6-lane Construction with NMV	22.5			Medium term
C2-3	National Highway	29.30	230	6	6-lane Construction with NMV	36.6			Short term
C2-4	National Highway	29.20	280	6	6-lane Construction with NMV	36.5			Short term
Outer Ring Road						150.0			
C3-1	National Highway	58.75	-	6	6-lane Construction with NMV	73.4	- Reduction of traffic jam, vehicle oparating cost, vehicle time cost - Resettlement - Livelihood loss - Impoverishment of vulnerable group - Traffic jam at construction - Loss of agricultural/ commercial/industrial land -Impact to irrigation canals	- Air Pollution and Noise - Loss of Vegetation	Long term
C3-2	National& Regional	6.13	-	6	6-lane Construction with NMV	3.9			Medium term
C3-3	National Highway	9.79	-	6	6-lane Construction with NMV	12.2			Long term
C3-4	Regional Highway	4.35	-	4 → 6	4-lane Improvement & 2-lane additional construction with NMV	2.8			Medium term
C3-5	National Highway	15.00	-	4 → 6	4-lane Improvement & 2-lane additional construction with NMV	9.6			Medium term
C3-6	Regional Highway	7.60	-	6	6-lane Construction with NMV	8.5			Long term
C3-7	National Highway	31.70	-	6	6-lane Construction with NMV	39.6			Long term

Table 15.5-2 (3) Proposed Road Development Project in the Study Area

Item	Road Class	Estimated Length (km) ( ) : Total Length	Traffic Volume (100xpcu /day)	No. of Lanes	Major Works	Cost (Million Dollars)	Social Impact	Natural Impact	Implementation Priority
5. Radial Road						133.5			
R-1	National Highway	16.60	150	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	10.6			Medium term
R-2	Regional Highway	9.83 (13.43)	120	4	4-lane Construction with NMV	7.4			Medium term
R-3	National Highway	10.00 (12.00)	320	4	4-lane Construction with NMV	under Con-			under Con-struction
R-4	Regional Highway	10.24	120	4	4-lane Construction with NMV	7.7			Long term
R-5	Regional Highway	16.00	230	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	12.0			Medium term
R-6	National Highway	12.00	420	6	6-lane Construction with NMV	15.0			Medium term
R-7	National Highway	6.00	280	4	4-lane Construction with NMV	5.2			Medium term
R-8	National Highway	11.90	210	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	7.6			Short term
R-9	National Highway	5.60 (8.10)	100	4	4-lane Construction with NMV	4.9			Long term
R-10	National Highway	8.48	190	4	4-lane Construction with NMV	7.4	- Reduction of traffic jam, vehicle oparating cost, vehicle time cost		Long term
R-11	National Highway	5.86	120	4 → 6	4-lane Improvement & 2-lane additional construction with NMV	3.8	- Resettlement - Livelihood loss - Impoverishment of vulnerable group	- Air Pollution and Noise - Loss of Vegetation	Short term
R-12	Regional Highway	10.13 (11.78)	280	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	7.6	- Traffic jam at construction - Loss of agricultural/ commercial/industrial land -Impact to irrigation canals		Medium term
R-13	Regional Highway	5.12	160	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	3.8			Medium term
R-14	Regional Highway	11.50	190	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	6.6			Medium term
R-15	National Highway	12.14	210	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	7.8			Short term
R-16	Regional Highway	5.00	180	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	2.9			Medium term
R-17	Regional Highway	8.00	60	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	4.6			Medium term
R-18	National Highway	17.70	420	4 →6	4-lane Improvement & 2-lane additional construction with NMV	11.3			Medium term
R-19	Regional Highway	12.80	60	2 → 4	2-lane Improvement & 2-lane additional construction with NMV	7.3			Long term

Table 15.5-2 (4) Proposed Road Development Project in the Study Area

Item	Road Class	Estimated Length (km) ( ) : Total Length	Traffic Volume (100xpcu /day)	No. of Lanes	Major Works	Cost (Million Dollars)	Social Impact	Natural Impact	Implementation Priority
6. Flyover						13.7			
1	Mogh Bazar	1.20	427	4	4-lane Flyover construction	Commited	- Reduction of traffic jam, vehicle oparating cost, vehicle time cost - Resettlement - Livelihood loss - Impoverishment of vulnerable - Traffic jam at construction	- Air Pollution and Noise - Loss of Vegetation	Committed
2	Hotel Sonargaon	1.57		4	4-lane Flyover construction	8.4			Short term
3	Kuril	0.60	317	4	4-lane Flyover construction	1.7			Short term
4	Gulshan-1	0.70		4	4-lane Flyover construction	1.8			Short term
5	Gulshan-2	0.70		4	4-lane Flyover construction	1.8			Short term

Table 15.5-3 Prioritization Criteria of Proposed Road Project

Aspect	Evaluation Item		Indicator	Priority Score		
				3 points	2 points	1 point
Planning Aspect	1) Compatibility with Development Plans		Relative to Municipality's Development Plan	Essential	Support Development	Little Effect
	2) Impact on Socio-Economic Activities/ Basis Human Needs		No. of Public Facilities, Tourist Spots	3 or more	1 to 2	None
	3) Multifunction of Road		Degree of importance of Function other than Transport	High Importance	Medium Importance	Low Importance
Technical Aspect	1) Urgency	Existing Road	Present Level of Service *	E, F	D	A,B,C
		New Road	Status of Land Development	Developing	Development to Start	Development in Future
	2) Role in Road Network		Function Classification	Arterial	Collector	Major Local
	3) Technical Difficulty		Type of Work Required	Mostly Earth Work/Pavement	Minor Structure	Large Scale Structure
Environmental Aspect	1) Social Impact		Right of Way Acquisition and Resettlement of People	Minimal	Intermediate	Extensive
	2) Social Acceptance		Degree of Acceptance	Very High Acceptance	High Acceptance	Medium Acceptance
				5 points	**3 points**	**1 point**
Benefit Aspect	1) Traffic Demand		Traffic Volume in 2025	Over 30,000	10,000 - 30,000	Less than 10,000
	2) Cost		Construction Cost	Small	Medium	Large
	3) Benefit Scale		Relative Benefit Scale	Large	Medium	Small

* : A: Free flow: with low volumes and high speeds, B: Stable flow: speeds beginning to be restricted by traffic conditions. C: In stable flow zone: but most drivers are restricted in freedom to select own speed. D: Approaching unstable flow: drivers have little freedom to maneuver. E: Unstable flow: short stoppages may occur. F: Forced or breakdown flow. ***Source*** : *Location and Design Manual.* Vol 1. *Roadway Design* Ohio Department of transportation with Permission.

Table 15.5-4 Prioritization of Proposed Road Projects

Item	Road Class	Development Length (km) ( ) : Total Road Length		Implement											Total Scoring	Ranking of Priority
				Planning Aspect			Technical Aspect			Environmental Aspect		Benefit Aspect				
				1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)		
1. Urban Expreessway		**54.00**														
UE-1	Expressway-1	13.55		3	2	3	3	3	1	1	1	5	5	5	32	1
	Expressway-2	26.79		3	2	3	3	3	1	1	1	5	3	3	28	2
	Expressway-3	13.66		3	2	3	3	3	1	1	1	3	1	1	22	3
2. Missing Link		**6.33**														
M-1	Secondary	1.00		3	1	3	3	2	2	1	3	3	5	3	29	15
M-2	Secondary	1.50		3	1	3	3	2	2	1	3	3	5	5	31	3
M-3	Secondary	0.47		3	1	3	3	2	2	1	3	5	5	5	33	1
M-4	Secondary	1.40		3	1	3	3	2	2	1	3	3	5	5	31	3
M-5	Secondary	1.96		3	1	3	3	2	2	1	3	3	5	5	31	3
3. Grid Road		**123.80**		National Road		37.19	Regional Road		4.86	Sec. Road		81.75			123.80	
GE-1	Secondary	5.20		3	1	1	1	2	3	1	1	3	5	3	24	40
GE-2	Secondary	6.30		3	1	2	2	3	3	2	2	3	3	1	25	27
GE-3	National Highway	5.90		Under construction												
GE-4	Secondary	5.70		3	2	1	2	3	3	2	2	3	3	1	25	27
GE-5	Secondary	9.00		3	1	3	2	3	3	2	2	5	1	5	30	9
GE-6	Secondary	5.90		3	1	2	2	2	3	2	1	5	5	5	31	3
GE-7	Secondary	4.47		3	2	2	2	3	2	2	2	3	3	1	25	27
GE-8	Secondary	3.60		1	1	2	2	2	3	2	2	1	5	1	22	45
GE-9	Secondary	6.80		2	2	2	3	3	2	2	2	3	3	1	25	27
GE-10	Secondary	2.18		3	1	3	3	2	2	2	2	1	5	1	25	27
GE-11	Regional Highway	4.86		1	1	3	3	2	2	2	2	3	3	1	23	42
GN-1	National Highway	23.10		3	1	3	2	3	3	3	3	5	1	3	30	9
GN-2	Secondary	21.00		1	1	2	2	2	3	2	2	3	1	1	20	47
GN-3	Secondary	8.20		1	1	2	2	2	2	2	2	3	3	3	23	42
GN-4	National Highway	8.19		3	1	3	2	2	2	3	3	3	3	1	26	24
GN-5	Secondary	3.40		3	1	2	3	2	2	1	1	3	5	3	26	24
4. Ring Road		**304.57**														
Inner Ring Road		65.75														
C1-1	Secondary	26.85		3	1	3	1	3	3	3	3	3	1	5	29	15
C1-2	Secondary	17.40		3	1	3	2	3	2	2	2	5	3	5	31	3
C1-3	Secondary	11.50		3	1	3	3	2	2	1	1	5	3	5	29	15
C1-4	Regional Highway	10.00		3	1	3	3	2	2	2	2	5	5	5	33	1
Middle Ring Road		105.50														
C2-1	National Highway	29.00		completed												
C2-2	National Highway	18.00		3	1	3	2	3	3	2	3	5	1	3	29	15
C2-3	National Highway	29.30		3	1	3	2	3	3	3	3	5	1	3	30	9
C2-4	National Highway	29.20		3	1	3	2	3	3	3	3	5	1	3	30	9
Outer Ring Road		133.32														
C3-1	National Highway	58.75		1	1	2	1	2	3	2	2	3	1	1	19	49
C3-2	National& Regional	6.13		1	1	2	3	3	3	2	2	3	5	3	25	27
C3-3	National Highway	9.79		1	1	2	1	2	3	2	2	3	1	1	18	51
C3-4	Regional Highway	4.35		1	1	3	3	3	2	2	2	3	5	3	25	27
C3-5	National Highway	15.00		2	2	3	3	3	2	2	2	3	3	3	25	27
C3-6	Regional Highway	7.60		1	1	2	1	2	3	2	2	3	3	1	20	47
C3-7	National Highway	31.70		1	1	2	1	2	3	2	2	3	1	1	18	51
5. Radial Road		**194.90**		National Road		106.28		Regional Road		88.62					194.90	
R-1	National Highway	16.60		3	1	3	2	3	2	2	2	3	1	3	25	27
R-2	Regional Highway	9.83	(13.43)	3	1	2	2	3	3	2	2	3	3	1	25	27
R-3	National Highway	10.00	(12.00)	On going												
R-4	Regional Highway	10.24		1	1	2	1	3	3	2	2	3	3	1	22	45
R-5	Regional Highway	16.00		3	1	3	3	3	2	1	2	3	1	3	25	27
R-6	National Highway	12.00		3	1	2	3	3	3	1	2	5	1	5	29	15
R-7	National Highway	6.00		1	1	3	2	3	3	2	2	3	3	3	26	24
R-8	National Highway	11.90		3	1	3	3	3	2	2	2	3	3	5	30	9
R-9	National Highway	5.60	(8.10)	1	1	2	1	2	3	2	2	3	5	1	23	42
R-10	National Highway	8.48		1	1	2	1	3	3	2	2	3	3	3	24	40
R-11	National Highway	5.86		3	1	3	3	3	3	3	2	3	5	1	30	9
R-12	Regional Highway	10.13	(11.78)	3	1	2	3	2	2	2	2	3	3	5	28	20
R-13	Regional Highway	5.12		3	1	2	3	2	2	1	2	3	5	3	27	21
R-14	Regional Highway	11.50		1	1	3	3	2	2	1	1	3	3	5	25	27
R-15	National Highway	12.14		3	1	3	3	3	2	2	2	3	3	5	30	9
R-16	Regional Highway	5.00		3	1	2	2	2	2	2	2	3	5	3	27	21
R-17	Regional Highway	8.00		3	1	3	3	3	2	1	2	1	5	1	25	27
R-18	National Highway	17.70		1	1	3	3	3	2	1	2	5	1	5	27	21
R-19	Regional Highway	12.80		1	1	2	2	2	2	2	2	1	3	1	19	49

Legend : : Short term : Medium term : Long term

Table 15.5-5 Implementation Schedule of Proposed Road Project

Item	Road Class	Length (km)	Cost (Million Dollars)	Planed Term																Remarks
				Short term					Medium Term					Long Term						
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
1. Urban Expreessway		54.00	935.0			238.0		25%			464.0		50%				233.0		25%	
UE-1	Expressway	13.55	238.0			238.0														
	Expressway	26.79	464.0								464.0									
	Expressway	13.66	233.0														233.0			
2. Missing Link		6.33	2.5			2.1					0.4						0			
M-1	Secondary	1.00	0.4								0.4									
M-2	Secondary	1.50	0.6			0.6														
M-3	Secondary	0.47	0.2			0.2														
M-4	Secondary	1.40	0.6			0.6														
M-5	Secondary	1.96	0.8			0.8														
3. Grid Road		123.80	216.1			61.3					110.1						44.8			
GE-1	Secondary	5.20	2.9														2.9			
GE-2	Secondary	6.30	7.0								7.0									
GE-3	National Highway	5.90	under Construction																	
GE-4	Secondary	5.70	6.3								6.3									
GE-5	Secondary	9.00	10.0			10.0														
GE-6	Secondary	5.90	3.3			3.3														
GE-7	Secondary	4.47	5.0								5.0									
GE-8	Secondary	3.60	4.0														4.0			
GE-9	Secondary	6.80	7.5								7.5									
GE-10	Secondary	2.18	0.9								0.9									
GE-11	Regional Highway	4.86	5.4														5.4			
GN-1	National Highway	23.10	96.0			48.0					48.0									
GN-2	Secondary	21.00	23.3														23.3			
GN-3	Secondary	8.20	9.1														9.1			
GN-4	National Highway	8.19	34.0								34.0									
GN-5	Secondary	3.40	1.4								1.4									
4. Circumferential Road		304.57	295.3			86.5					75.1						133.8			
Inner Ring Road		65.75	49.6			13.3					36.2						-			
C1-1	Secondary	26.85	29.8								29.8									
C1-2	Secondary	17.40	9.7			9.7														
C1-3	Secondary	11.50	6.4								6.4									
C1-4	Regional Highway	10.00	3.6			3.6														
Middle Ring Road		105.50	95.6			73.1					22.5						-			
C2-1	National Highway	29.00	under Construction																	
C2-2	National Highway	18.00	22.5								22.5									
C2-3	National Highway	29.30	36.6			36.6														
C2-4	National Highway	29.20	36.5			36.5														
Outer Ring Road		133.32	150.1			0.0					16.3						133.8			
C3-1	National Highway	58.75	73.4														73.4			
C3-2	National & Regional Highway	6.13	3.9								3.9									
C3-3	National Highway	9.79	12.2														12.2			
C3-4	Regional Highway	4.35	2.8								2.8									
C3-5	National Highway	15.00	9.6								9.6									
C3-6	Regional Highway	7.60	8.5														8.5			
C3-7	National Highway	31.70	39.6														39.6			
5. Radial Road		194.9	133.3			19.1					86.9						27.2			
R-1	National Highway	16.60	10.6								10.6									
R-2	Regional Highway	9.83	7.4								7.4									
R-3	National Highway	10.00	under Construction																	
R-4	Regional Highway	10.24	7.7														7.7			
R-5	Regional Highway	16.00	12.0								12.0									
R-6	National Highway	12.00	15.0								15.0									
R-7	National Highway	6.00	5.2								5.2									
R-8	National Highway	11.90	7.6			7.6														
R-9	National Highway	5.60	4.9														4.9			
R-10	National Highway	8.48	7.4														7.4			
R-11	National Highway	5.86	3.8			3.8														
R-12	Regional Highway	10.13	7.6								7.6									
R-13	Regional Highway	5.12	3.8								3.8									
R-14	Regional Highway	11.50	6.6								6.6									
R-15	National Highway	12.14	7.8			7.8														
R-16	Regional Highway	5.00	2.9								2.9									
R-17	Regional Highway	8.00	4.6								4.6									
R-18	National Highway	17.70	11.3								11.3									
R-19	Regional Highway	12.80	7.3														7.3			
6. Flyover		4.77	13.7			13.7					-						-			
1	Mogh Bazar	1.20	Commited																	
2	Hotel Sonargaon	1.57	8.4			8.4														
3	Kuril	0.60	1.7			1.7														
4	Gulshan-1	0.70	1.8			1.8														
5	Gulshan-2	0.70	1.8			1.8														
Total cost without Expressway			(M. US$)			182.7		28%			272.5		41%				205.8		31%	661.0
Cost per Year (M. US$)						36.5					54.5						34.3			

15.6 Intersection Improvement

15.6.1 Study Methodology

Many intersections face serious peak hour congestion and traffic accidents. Among these, 20 major intersections, which become bottlenecks of traffic and black spots due to enormous traffic accidents, are selected by the Study Team for urgent improvement measures are illustrated in Figure 15.6-1.

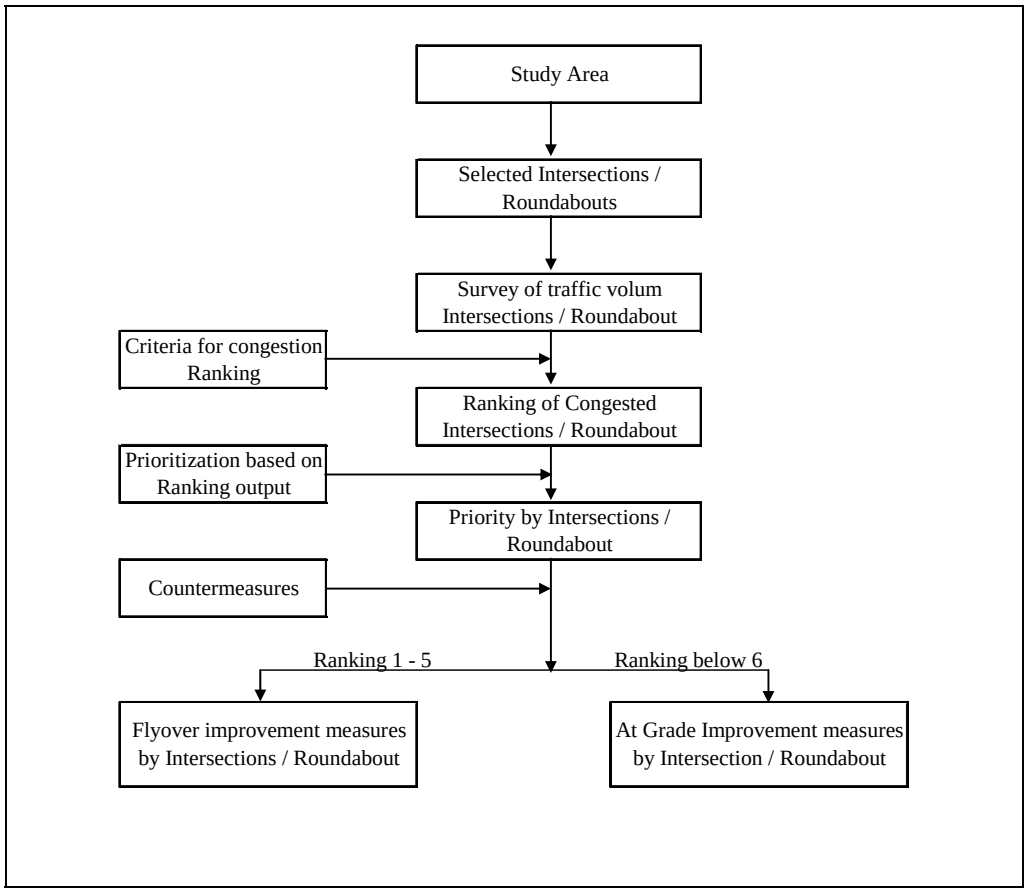


Figure 15.6-1 Study Methodology

15.6.2 Selection of Intersections and preparation of Countermeasures

Selected intersections and roundabout examined in this study are shown Figure 15.6-2.

The intersections and roundabouts are ranked on the basis of traffic situation, geometric design, environmental and social impacts, operations and maintenance, and traffic safety.

Table 15.6-1 shows the criteria for congestion ranking of Intersections and Table 15.6-2 shows the ranking of intersection's improvement.

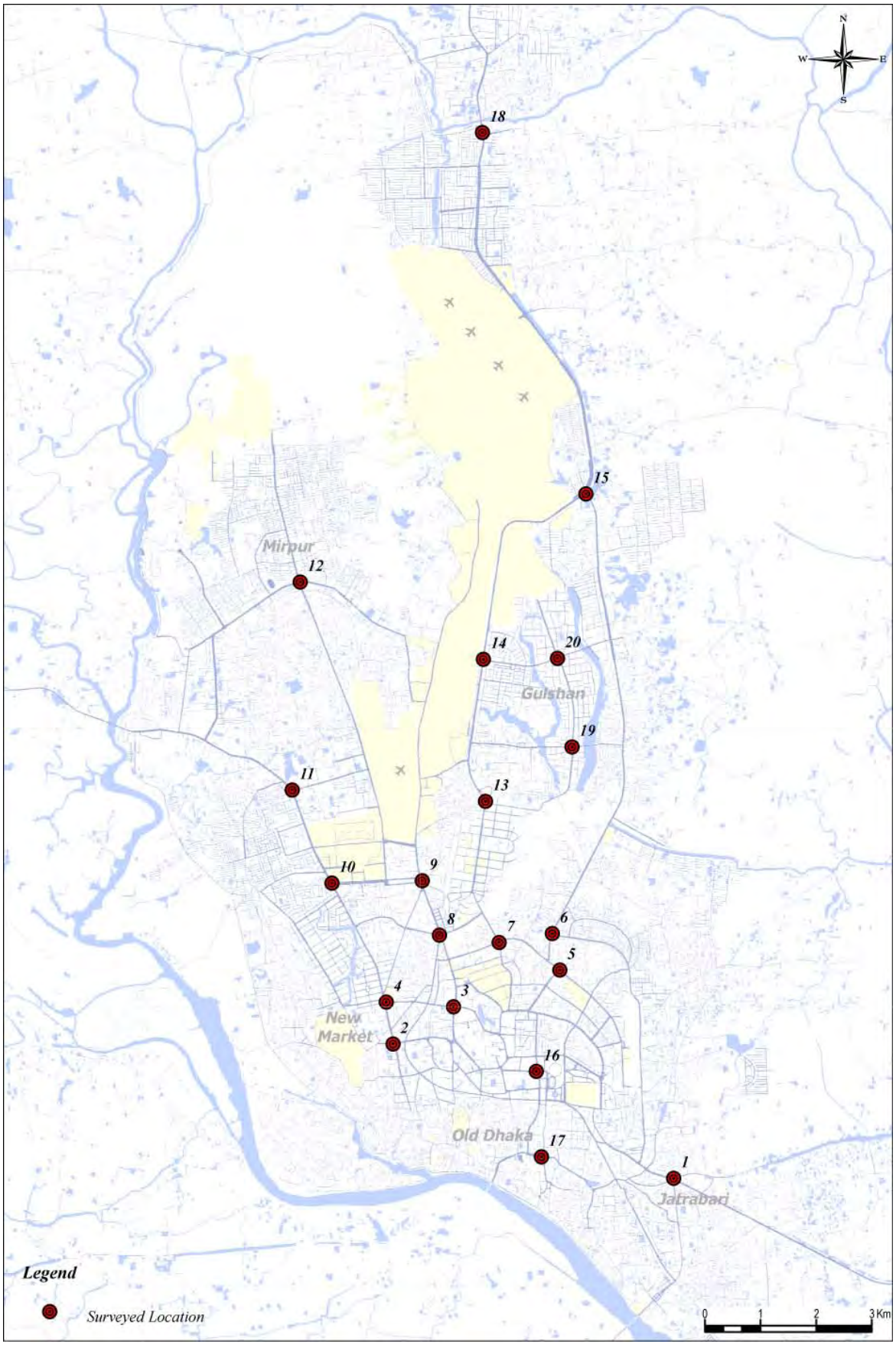


Figure 15.6-2 Location of Intersections Examined

Table 15.6-1 Ranking Criteria for Selecting Intersection Improvement

Criteria			5 points	3 points	1 point	Remarks
Necessity	Traffic	Total Peak Hour	More Than 9,000	More Than 6,000	More Than 3,000	Current pcu/hr
	Volume	Traffic Volume				
		Through	More Than 50%	More Than 40%	More Than 30%	Grade Separation for Through Traffic
		Traffic Volume				
		Right Turn	More Than 50%	More Than 40%	More Than 30%	Grade Separation for Right Turn Traffic
		Traffic Volume				
		Cat-1&2 (2/3W) Traffic Volume	Less Than 10%	Less Than 20%	Less Than 30%	Not Recommendable for More Than 30%
		Cat-3 (LV)	More Than 50%	More Than 40%	More Than 30%	Not Recommendable for
		Traffic Volume				Less Than 30%
		Cat-4&5 (MV&HV)	Less Than 10%	Less Than 20%	Less Than 30%	Not Recommendable for
		Traffic Volume				More Than 30%
Efficiency	Volume Capacity Ratio	Flyover / Underpass	Less Than 0.75	Less Than 1.0	Less Than 1.25	After Construction
		At-Grade	Less Than 1.00	Less Than 1.25	Less Than 1.50	- Ditto -
	Required Number of Lane for Flyover/Underpass		2 Lanes	4 Lanes	6 Lanes	Not Recommendable for More Than 8 Lanes
	Right of Way		More Than 45m (150ft)	More Than 36m (120ft)	More Than 27m (90ft)	Not Recommendable for Less Than 27m (90ft)
	Required Cost		Less Than 30 M.USD	Less Than 50 M.USD	More Than 100 M.USD	Depending on
	(Length of Flyover/Underpass)		(Less Than 0.5 km)	(Less Than 1.0 km)	(Less Than 1.5 km)	Required Width

		1 Point	2 Points	3 Points	
Extendibility	Other Same Route Projects	Expressway	BRT / MRT	None	Including Other Donor / Local Authority Projects

Source: JICA Study Team

Table 15.6-2 Ranking of Improved Intersections

Proposed Grade Separation Location		Peak Hour Traffic Volume by Classification (pcu/hr)						Cap.	Traffic Movements (pcu/hr)				Current Road Width	Required No. of Lane	Other Projects			Total	Ranking
									Major Streets		Minor Streets								
		2/3W NMT	2/3W MT	LV	MV	HV	All	VCR	TH	RT	TH	RT			Express way	BRT	MRT		
1	Jatrabari-Saidabad (19h:00-20h:00)	1,110	488	1,451	2,151	168	5,368	6,000	2,944	586	196	881	36m	4	Y	Y	Y		19
		21%	*9%*	*27%*	*40%*	*3%*	*100%*	*0.89*	*55%*	*11%*	*4%*	*16%*							
		1		*1*			*1*		*5*				*3*	*3*	*1*	*2*	*2*	*19*	
2	New Market (10h00-11h:00)	1,389	354	1,604	777	6	4,130	4,500	1,261	204	1100	809	27.7m	2	N	Y	N		18
		34%	*9%*	*39%*	*19%*	*0%*	*100%*	*0.92*	*31%*	*5%*	*27%*	*20%*							
		0		*4*			*1*		*1*				*1*	*5*	*3*	*2*	*3*	*20*	
3	Shabagh (18h:00-19h:00)	88	973	2,821	2,035	4	5,921	6,000	1,832	540	1728	866	36m	4	N	N	Y		14
		1%	*16%*	*48%*	*34%*	*0%*	*100%*	*1.01*	*31%*	*9%*	*29%*	*15%*							
		3		*3*			*1*		*1*				*3*	*3*	*3*	*3*	*2*	*22*	
4	Science Laboratory (17h:00-18h:00)	989	906	2,848	1,745	4	6,492	6,000	4,102	185	0	1721	40m	4	Y	Y	N		6
		17%	*15%*	*48%*	*29%*	*0%*	*110%*	*1.08*	*63%*	*3%*	*0%*	*27%*							
		3		*4*			*3*		*5*				*3*	*3*	*1*	*2*	*3*	*27*	
5	Malibagh (19h:00-20h:00)	2,875	246	769	647	4	4,541	4,500	1,609	369	0	1486	24-27m	4	Y	Y	N		17
		63%	*5%*	*17%*	*14%*	*0%*	*100%*	*1.01*	*35%*	*8%*	*0%*	*33%*							
		0		*3*			*4*		*4*				*1*	*3*	*1*	*2*	*3*	*21*	
6	Malibagh Rail Crossing (17h:00-18h:00)	1,913	342	1,069	773	102	4,199	6,000	2,944	1,008	0	501	29m	4	N	Y	N		14
		46%	*8%*	*25%*	*18%*	*2%*	*100%*	*0.70*	*70%*	*24%*	*0%*	*12%*							
		0		*3*			*1*		*6*				*1*	*3*	*3*	*2*	*3*	*22*	
7	Mogh Bazar (16h00-17h00)	476	955	2,456	1,025	22	4,934	4,500	2,920	225	810	638	30m	2	N	Y	N		2
		10%	*19%*	*50%*	*21%*	*0%*	*100%*	*1.10*	*59%*	*5%*	*16%*	*13%*							
		3		*6*			*3*		*5*				*1*	*5*	*3*	*2*	*3*	*31*	
8	Hotel Sonargaon (8h00-9h00)	61	1,497	5,499	2,277	24	9,358	6,000	5,826	1,363	846	384	36m	4	N	N	Y		2
		1%	*16%*	*59%*	*24%*	*0%*	*100%*	*1.56*	*62%*	*15%*	*9%*	*4%*							
		3		*6*			*3*		*5*				*3*	*3*	*3*	*3*	*2*	*31*	
9-1	Farmgate_ Kamabari (11h:00-12h:00)	8	680	1,830	1,034	18	3,570	6,000	2,534	0	0	904	33m	4	Y	N	Y		13
		0%	*19%*	*51%*	*29%*	*1%*	*100%*	*0.595*	*71%*	*0%*	*0%*	*25%*							
		3		*4*			*1*		*5*				*1*	*3*	*1*	*3*	*2*	*23*	
9-2	Farmgate_ Tejgaon (11h:00-12h:00)	15	1,202	2,864	1,415	114	5,610	6,000	1,560	0	0	0	33m	4	Y	N	Y		21
		0%	*21%*	*51%*	*25%*	*2%*	*100%*	*0.935*	*28%*	*0%*	*0%*	*0%*							
		1		*4*			*1*		*0*				*1*	*3*	*1*	*3*	*2*	*16*	
10	Manik Mir Avenue (11h:00-12h:00)	39	1,034	4,525	2,007	6	7,611	6,000	3,441	1,480	0	938	35-38m	4	Y	Y	N		6
		1%	*14%*	*59%*	*26%*	*0%*	*100%*	*1.27*	*45%*	*19%*	*0%*	*12%*							
		3		*6*			*3*		*3*				*3*	*3*	*1*	*2*	*3*	*27*	
11	Shishu Mela (11h:00-12h:00)	180	1,359	2,737	1,523	26	5,825	6,000	3,927	424	0	912	38m	4	Y	Y	N		8
		3%	*23%*	*47%*	*26%*	*0%*	*100%*	*0.97*	*67%*	*7%*	*0%*	*215%*							
		1		*4*			*4*		*5*				*3*	*3*	*1*	*2*	*3*	*26*	
12	Mirpur 10 (9h:00-10h:00)	213	530	1,688	1,403	18	3,852	4,500	1,380	339	981	384	32-38m	4	N	N	Y		14
		6%	*14%*	*44%*	*36%*	*0%*	*100%*	*0.86*	*36%*	*9%*	*25%*	*10%*							
		3		*3*			*1*		*1*				*3*	*3*	*3*	*3*	*2*	*22*	
13	Nabisco (19h:00-20h:00)	127	920	2,441	1,226	42	4,756	4,500	3,345	994	0	274	24-27m	4	N	Y	N		8
		3%	*19%*	*51%*	*26%*	*1%*	*100%*	*1.06*	*70%*	*21%*	*0%*	*6%*							
		3		*5*			*1*		*5*				*1*	*3*	*3*	*2*	*3*	*26*	
14	Katkoli (9h:00-10h:00)	43	687	3,212	1,829	2	5,773	6,000	4,114	1,209	0	205	37-38m	4	Y	Y	N		8
		1%	*12%*	*56%*	*32%*	*0%*	*100%*	*0.96*	*71%*	*21%*	*0%*	*4%*							
		3		*5*			*1*		*5*				*3*	*3*	*1*	*2*	*3*	*26*	
15	Kuril (19h:00-20h:00)	19	839	4,498	2,541	464	8,361	6,000	6,209	200	0	1080	36m	4	Y	Y	N		4
		0%	*10%*	*54%*	*30%*	*6%*	*100%*	*1.39*	*74%*	*2%*	*0%*	*13%*							
		3		*6*			*3*		*5*				*3*	*3*	*1*	*2*	*3*	*29*	
16	GPO (17h:00-18h:00)	921	702	1,986	1,655	54	5,318	4,500	2,712	625	1,606	222	37-41m	4	N	N	N		11
		17%	*13%*	*37%*	*31%*	*1%*	*100%*	*1.18*	*51%*	*12%*	*30%*	*4%*							
		3		*1*			*1*		*5*				*3*	*3*	*3*	*3*	*3*	*25*	
17	English Road (11h:00-12h:00)	2,110	189	672	423	10	3,404	4,500	1,804	234	473	695	24-27m	2	N	Y	N		11
		62%	*6%*	*20%*	*12%*	*0%*	*100%*	*0.76*	*53%*	*7%*	*14%*	*20%*							
		0		*3*			*3*		*5*				*1*	*5*	*3*	*2*	*3*	*25*	
18	Abdullapur (19h:00-20h:00)	460	235	1609	2052	76	4,432	6,000	1,516	1701	0	675	36m	4	Y	N	N		19
		10%	*5%*	*36%*	*46%*	*2%*	*100%*	*0.74*	*34%*	*38%*	*0%*	*15%*							
		3		*1*			*1*		*1*				*3*	*3*	*1*	*3*	*3*	*19*	
19	Gulshan-1 (17h:00-18h:00)	75	725	3415	204	0	4,419	4,500	2,198	541	1198	340	30m	2	N	N	N		1
		2%	*16%*	*77%*	*5%*	*0%*	*100%*	*0.98*	*50%*	*12%*	*27%*	*8%*							
		3		*5*			*4*		*5*				*2*	*5*	*3*	*3*	*3*	*33*	
20	Gulshan-2 (17h:00-18h:00)	143	610	3462	119	0	4,334	4,500	1,267	744	1401	674	30m	2	N	N	N		4
		3%	*14%*	*80%*	*3%*	*0%*	*100%*	*0.96*	*29%*	*17%*	*32%*	*16%*							
		3		*5*			*4*		*1*				*2*	*5*	*3*	*3*	*3*	*29*	

The countermeasures considered for these intersections are the following:

(1) Ranking 1~5

Table 15.6-3 Location of Flyover Improvement Plan

No.	Location of Intersection	Description
7	Mogh Bazar	Figure 15.6-3(1) ~ Figure 15.6-33(3)
8	Hotel Sonargaon	Appendix
15	Kuril	
19	Gulshan-1	
20	Gulshan-2	

(2) Ranking below 6

The following factors should be considered in Improvement of Intersection for at grade.

a) Geometric improvement
b) Installation and improvement of traffic signals
c) Pavement marking
d) Traffic signs

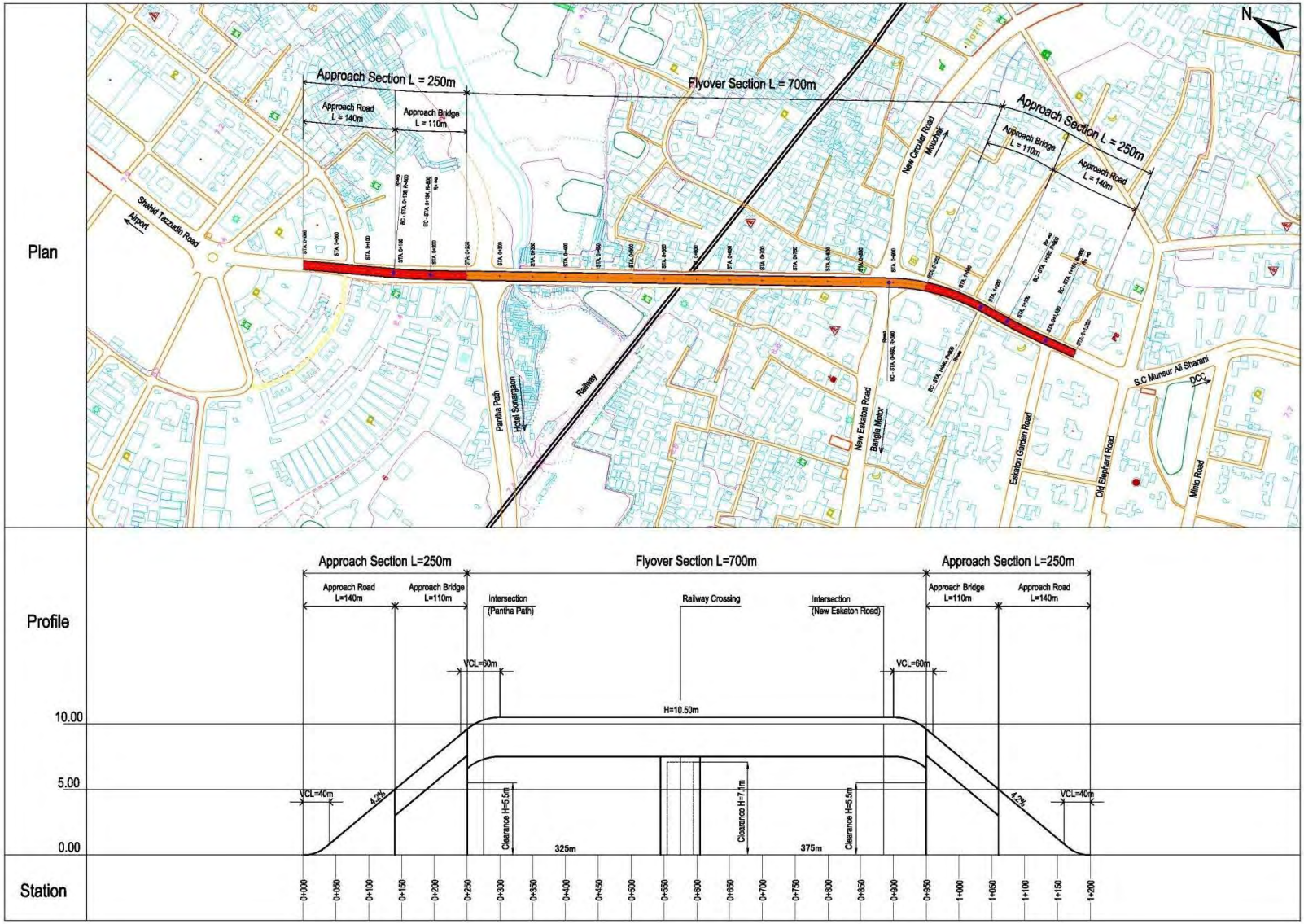


Figure 15.6-3 (1) Layout Plan and Profile

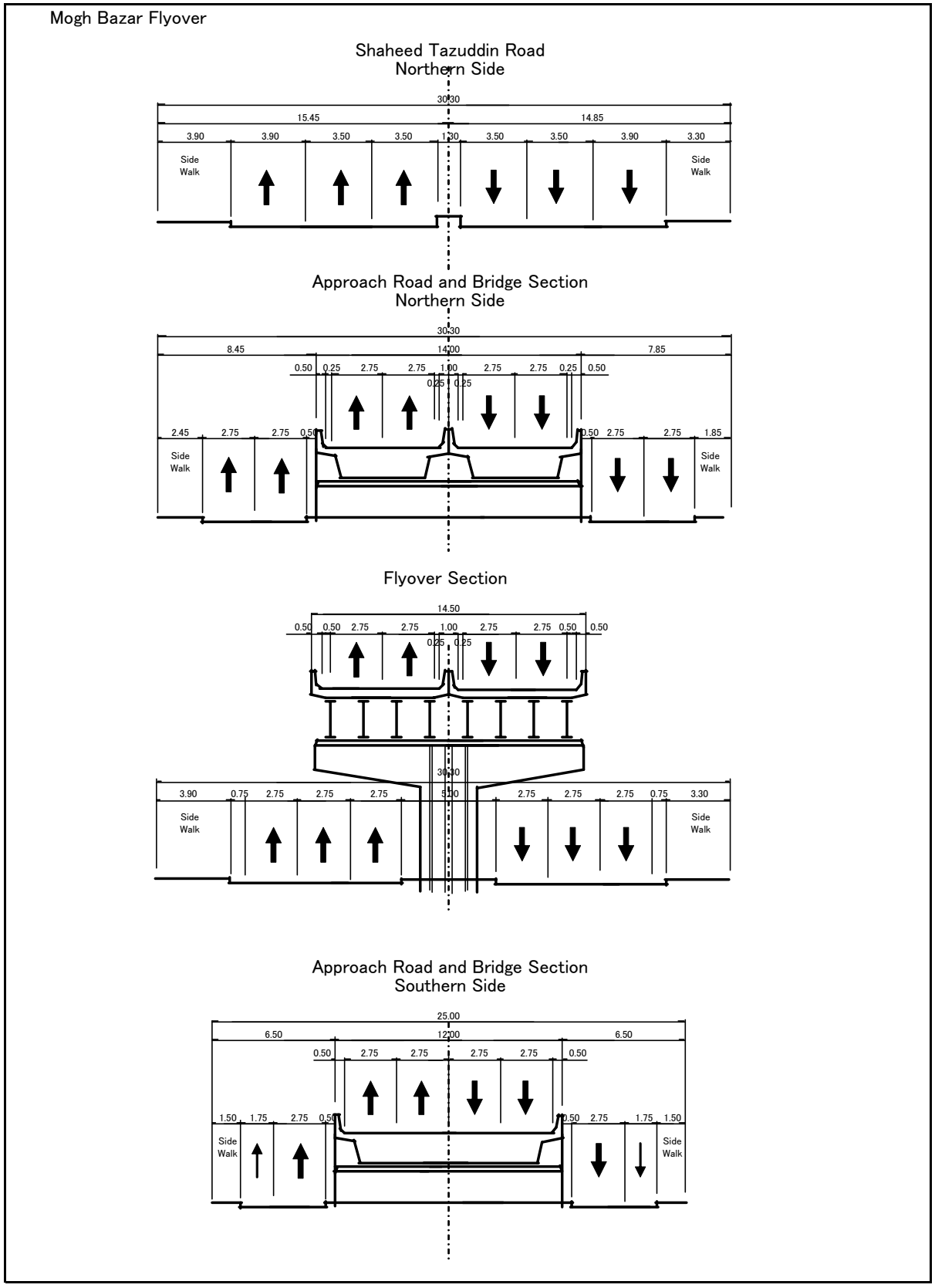


Figure 15.6-3 (2) Typical Cross Section

Shaheed Tazuddin Road

S. Captain Munsur Ali Sharani Street

New Circular Road

New Eskaton Road

Figure 15.6-3 (3) Photos on Mogh Bazar Intersection

15.7 Expressway Development Plan

15.7.1 The Route of the Expressway

The route of the Expressway plan considers in this study based on an STP route.

A route of the Expressway by STP in the entire alignment is shown in Figure 15.7-1.

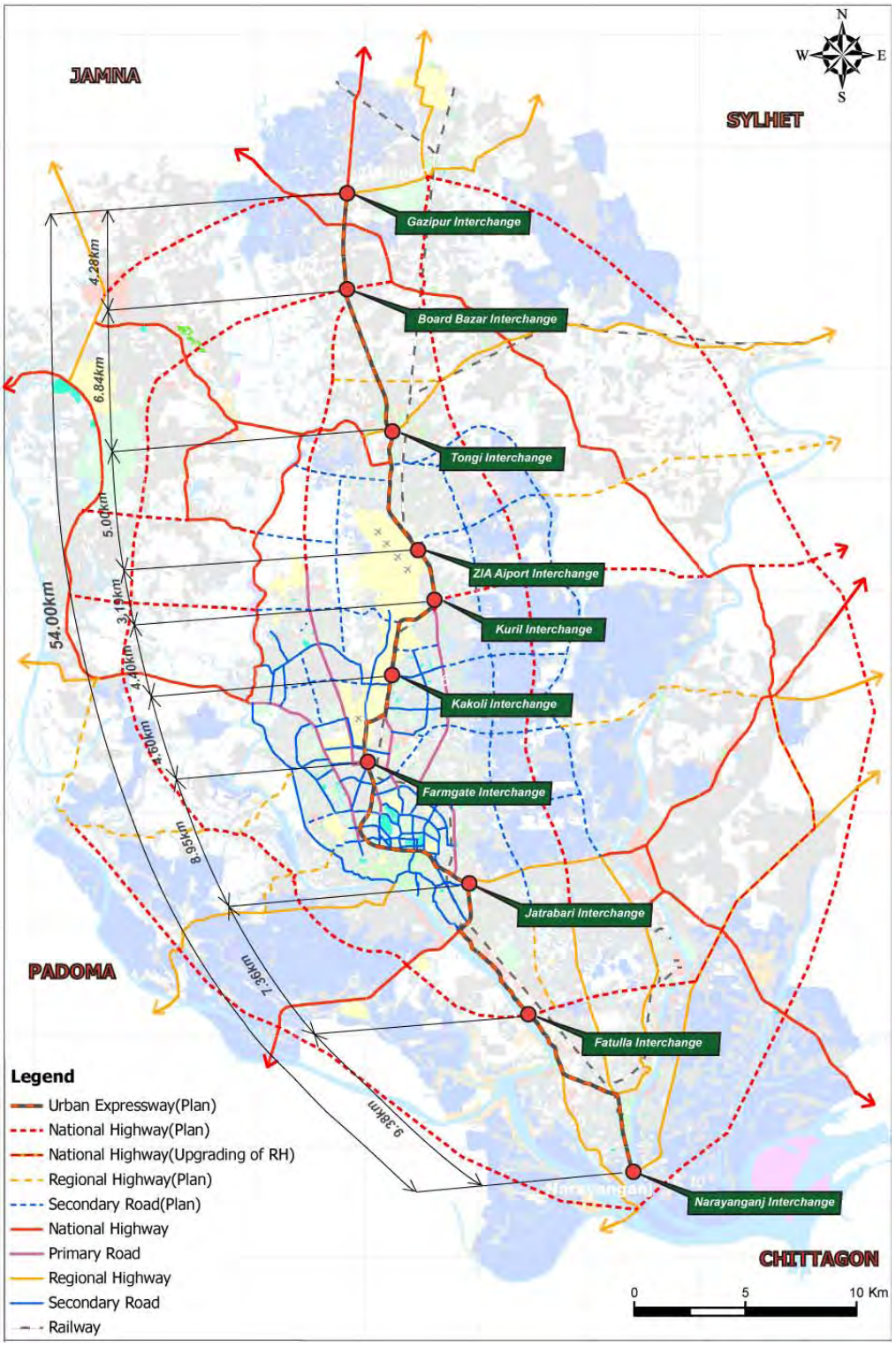
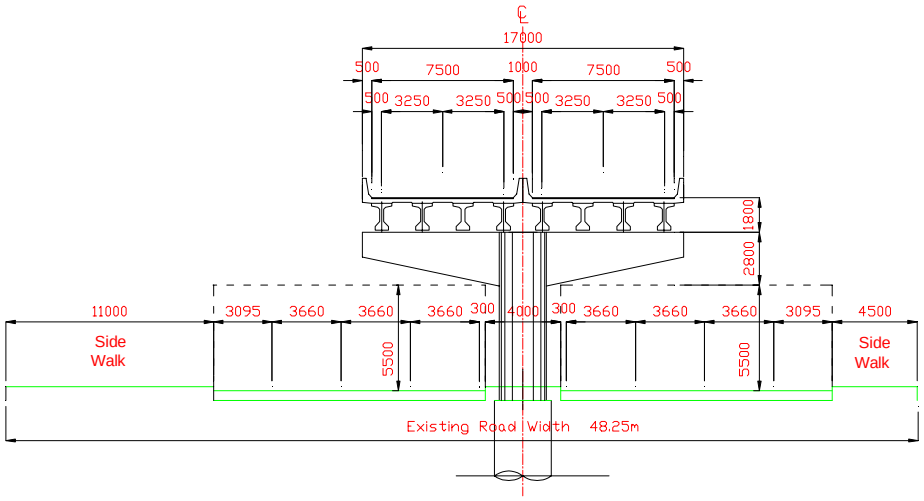
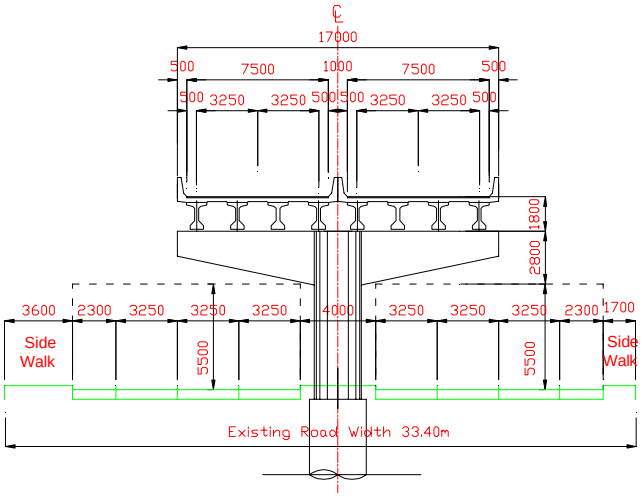


Figure 15.7-1 Proposed Route of Expressway and Interchange Locations

This route consists of three class roads National Highway, Primary Road, Secondary Road and one Flyover section. When it puts a Expressway plan section in the width of these roads based on Road Inventory Survey which it carried out by this study, it is shown in Figure 15.7-2. Although narrowest Secondary Road becomes two lanes one side traffic lanes (traffic lane 2.80m in width) when Expressway is installed, however National highway and Primary Road can find three or four lanes one side traffic lanes.

Expressway Plan on the National Highway	
Expressway Plan on the Primary Road	

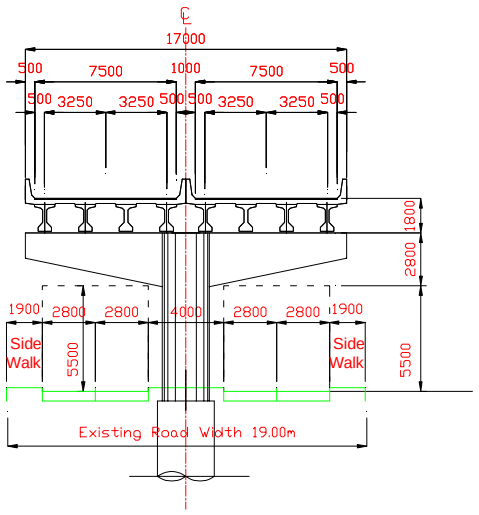
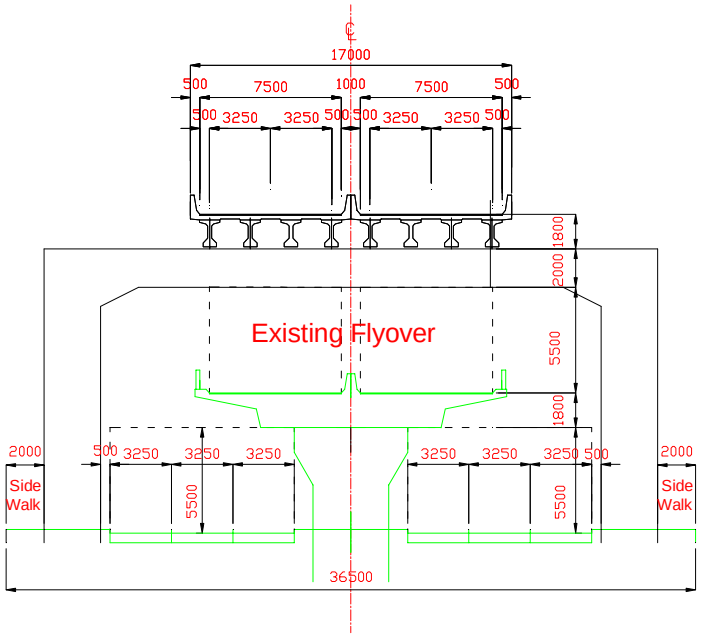
Expressway Plan on the Secondary Road	
Expressway Plan on the Flyover Section	

Figure 15.7-2 Expressway Plan on the Three Class Roads and Flyover Section

15.7.2 Interchange Locations along Expressway Route

Expressway plan section was confirmed that these are able to install in existing road width in 14.5.1. The Expressway should be connected a general road by Interchange. The following factors should be considered in selection of Interchange location.

a) urban expressway interchange is about 5-10km interval
b) the place that needs access in a road network
c) The place that it is easy to secure of the additional land acquisition

The interchange locations in the entire alignment are shown in Figure 15.7-1.

15.8 Eastern Fringe Road Plan

Eastern Fringe Road shows the location in Figure 15.8-2 on a road running through Fringe Area of the eastern part in the north to south. When the development of the eastern part district advanced in the future, this road will become the main artery road from north to south.

On the basis of the above, the proposed number of lanes this road will have six (6) lanes with NMV and keep sufficient right-of-way (ROW) corridor of 60m to allow eight (8) lanes with NMV and MRT, if the need arises in the future.

In this case, Eastern Fringe Road is proposed to be constructed in three (3) stages based on the traffic growth and development this eastern area as follows (see Figure 15.8-1):

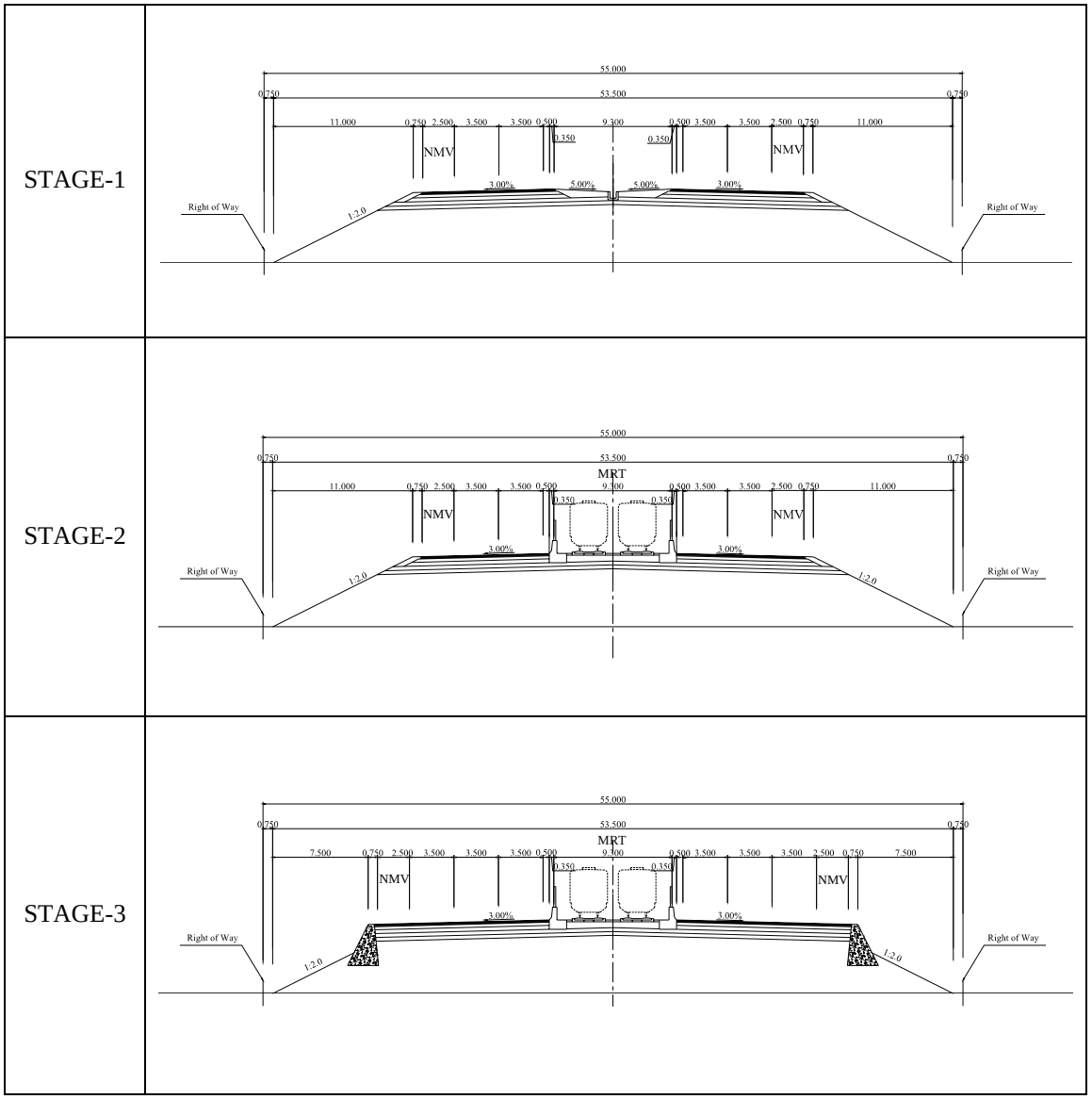


Figure 15.8-1 Road Section Stage Construction

For a road running from the east to west intersecting this Eastern Fringe Road, there are 100m road under construction by RAJUK and Tarabo bridge under construction in Jatorabari-Trabo

road. The proposed the intersection methods with these roads are shown in Figure 15.8-2 .

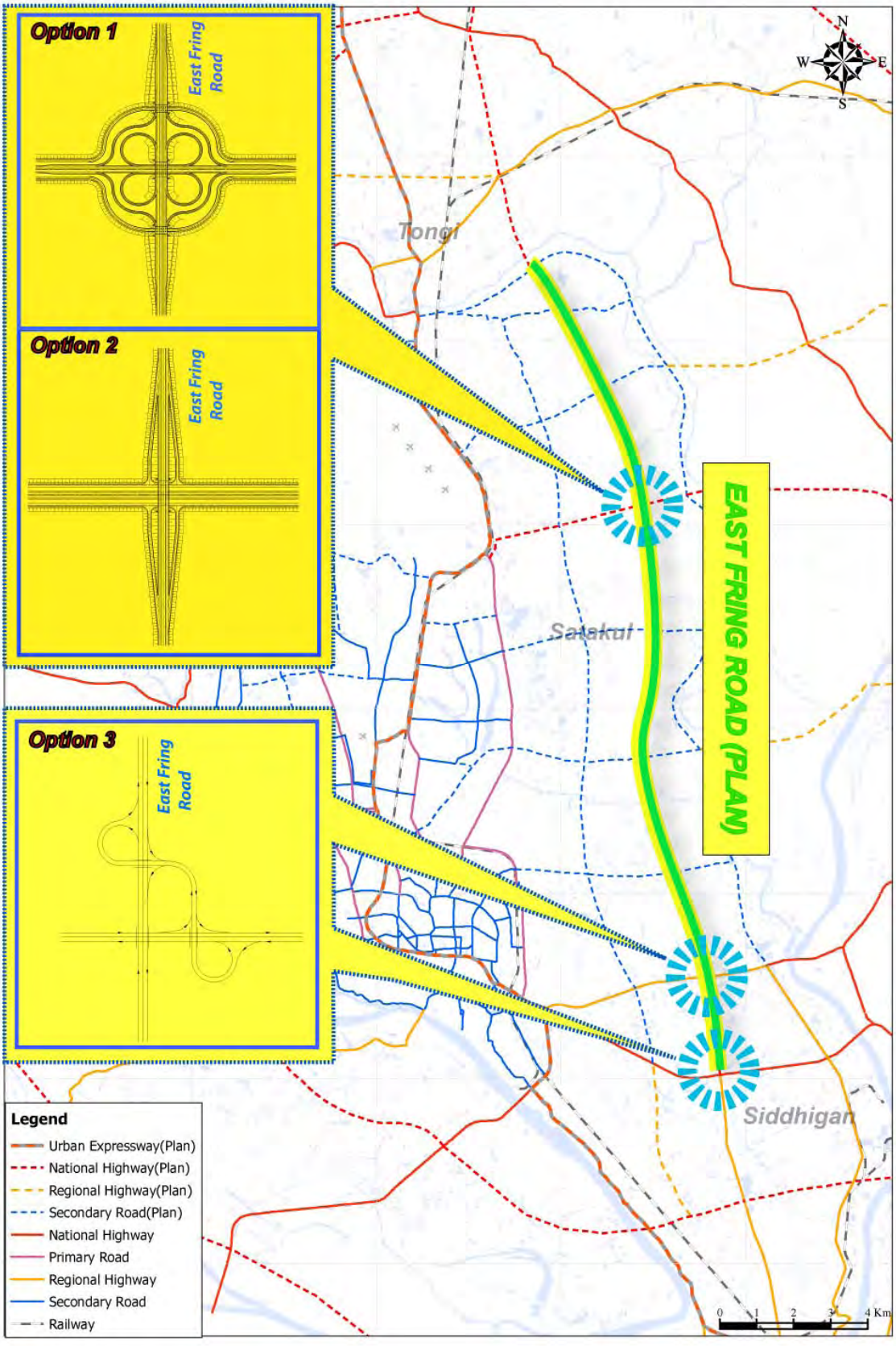


Figure 15.8-2 Eastern Fringe Road Plan