

# The Project on the Revision and Updating of the Strategic Transport Plan for Dhaka

## FINAL REPORT / Summary



November 2016

ALMEC Corporation  
Oriental Consultants Global, Co., Ltd.  
Katahira & Engineers International

EI
JR
16-173

**Japan International Cooperation Agency (JICA)**

**Dhaka Transport Coordination Authority (DTCA)**

**The Project on the Revision and Updating of the Strategic  
Transport Plan for Dhaka**

**SUMMARY  
Final Report**

**November 2016**

**Almec Corporation  
Oriental Consultants Global Co., Ltd.  
Katahira & Engineers International**

# Table of Contents

1.	INTRODUCTION	
1.1	Background	1
1.2	Goals and Objectives	2
1.3	Project Area	2
1.4	Related Agencies and Implementation Structures	3
2.	CURRENT URBAN STRUCTURE & SOCIO-ECONOMIC PROFILE	
2.1	Description of the Project Area	4
2.2	Existing Land Use Patterns	7
3.	CURRENT URBAN TRANSPORT SYSTEM	
3.1	Non-motorized and Motorized Transport Modes	11
3.2	Public Transport	13
3.3	Urban Road Network	16
4.	ENVIRONMENTAL CONDITION	
4.1	Natural Environment	18
4.2	Natural Disasters and Flooding	21
5.	FINANCIAL STRUCTURES AND BUDGETING	
5.1	Current Status of National Budget	23
5.2	Financial Resources	25
6.	URBAN DEVELOPMENT CONTEXT	
6.1	Vision and Key Spatial Development Strategies	26
6.2	Urban Development Scenario	27
6.3	Future Traffic Demand	36
7.	URBAN TRANSPORT NETWORK DEVELOPMENT SCENARIO	
7.1	RSTP Overall Transport Development Policy	39
7.2	Land Use and Transport Integration	42
7.3	Roads	43
7.4	Public Transport	44
7.5	Traffic Management and Safety	44
7.6	Financing Capacity of the Government for Investment in the Transport Sector	46

8. FORMULATION OF THE URBAN TRANSPORT MASTER PLAN

- 8.1 Development of the RSTP Urban Transportation Master Plan .....49
- 8.2 Road Network Development Plan .....50
- 8.3 Public Transportation Plan .....60
- 8.4 Bus Transport System .....63
- 8.5 Traffic Management and Traffic Safety .....66
- 8.6 Inland Waterways .....69

9. EVALUATION OF THE MASTER PLAN

- 9.1 Results of Economic Evaluation and Financial Evaluation .....70
- 9.2 RSTP 2035 Environmental Evaluation of Projects .....71
- 9.3 Project Evaluation .....72

10. IMPLEMENTATION PROGRAM

- 10.1 Overall Implementation Strategy .....75
- 10.2 Implementation Schedule and Responsible Agency .....76
- 10.3 Investment Plan .....78
- 10.4 Short-term Action Plan .....80

11. CONCLUSION AND RECOMMENDATIONS

- 11.1 Conclusion .....83
- 11.2 Recommendations .....85

## List of Figures

Figure 1.1	Project Areas .....	2
Figure 1.2	Project Organization Chart .....	3
Figure 2.1	Annual Average Growth Rate by Union in 2001–2011 .....	6
Figure 2.2	Existing Land Uses in Greater Dhaka Area .....	7
Figure 2.3	Land Uses within RAJUK Administrative Area, 2013 .....	9
Figure 3.1	Number of Private Cars in the GDA, 2001–2013 .....	12
Figure 3.2	Share of Buses and Minibuses in GDA, 2001–2013 .....	14
Figure 3.3	Major Road Network within RAJUK Administrative Area .....	17
Figure 6.1	Conceptual Structure Plan for RDP Area, 2016–2035 .....	29
Figure 6.2	Proposed Spatial and Transport Framework for RAJUK Area .....	31
Figure 6.3	Population within RAJUK Area by District .....	34
Figure 6.4	Population Densities within RAJUK Area in 2014 and 2035 .....	34
Figure 6.5	Estimated Composition of Income Groups .....	36
Figure 6.6	Modal Share of Intercity Trips in 2025 and 2035 .....	37
Figure 6.7	Number of Trips by Mode in 2025 and 2035 excluding Intracity Trips .....	37
Figure 6.8	Desire Lines in 2025 and 2035 .....	38
Figure 7.1	Indicative Target for Modal Share for 2035 .....	39
Figure 7.2	Major Features and Policies of RSTP .....	41
Figure 7.3	Population Density of Trend Scenario and RSTP Scenario .....	42
Figure 8.1	RSTP, Urban Transport Master Plan .....	49
Figure 8.2	3 Rings and 8 Radials Road Network System in RAJUK Area .....	50
Figure 8.3	Proposed Road Network in RAJUK area .....	51
Figure 8.4	Proposed Road Networks .....	52
Figure 8.5	Current <sup>1</sup> Construction Status of the Three Ring Roads .....	53
Figure 8.6	Highway Assignment Results for 2025 and 2035 .....	54
Figure 8.7	Investment Schedule for Urban Roads .....	56
Figure 8.8	Network .....	61
Figure 8.9	MRT/BRT Network in 2035 .....	61
Figure 8.10	Transit Assignment Results of Master Plan Case in 2025 and 2035 .....	62
Figure 8.11	Traffic Management Improvement Directions .....	68
Figure 10.1	Implementation Schedule of MRT/BRT Projects .....	77
Figure 10.2	The High Priority Project .....	82
Figure 10.3	Eastern Fringe .....	82

## List of Tables

Table 2.1	GRDP in the Study Area .....	5
Table 2.2	Greater Dhaka Population and Area by District .....	5
Table 2.3	Per Capita Income by District, 1999 .....	6
Table 2.4	Existing Land Uses in the RDP Area <sup>1</sup> .....	8
Table 2.5	SWOT Analysis on Land Use in GDA and within RAJUK Administrative Area .....	10
Table 4.1	National Ambient Air Quality Standards for Bangladesh .....	20
Table 4.2	Measured Noise Levels in Some Sensitive Areas of Dhaka .....	21
Table 5.1	Recent Trends in Consolidated Receipts and Expenditures .....	23

Table 5.2	Recent Trend in the Government Revenue Budget, 2004–2013	24
Table 5.3	Development Expenditure by Sector, 2004–2013	25
Table 5.4	Historical Trend of Financing for Development Expenditures	25
Table 6.1	Vision and Objectives of Regional Development Planning	28
Table 6.2	Urban Hierarchy in Regional Development Planning	28
Table 6.3	Comparison of Population Estimates	32
Table 6.4	Selected Future Population Framework	33
Table 6.5	Summary of Forecast Population	33
Table 6.6	Employed Population by Industrial Sector	35
Table 6.7	Forecast Number of Students by Education Level	35
Table 6.8	Summary of Number of Trips	36
Table 7.1	Classification of Traffic Management Measures	45
Table 7.2	GDP Growth Projections	46
Table 7.3	Revenue and Expenditure Projections (Case 1)	47
Table 7.4	Revenue and Expenditure Projections (Case 2)	48
Table 7.5	Projected Budget for Transport Sector	48
Table 8.1	Proposed Road Development Projects (Summary)	51
Table 8.2	Road Network Performance	53
Table 8.3	Prioritization of Proposed Road Projects (Summary)	55
Table 8.4	Road Development Projects under Phase 1	57
Table 8.5	Road Development Projects under Phase 2	58
Table 8.6	Road Development Projects under Phase 3	58
Table 8.7	Road Development Projects under Phase 4	59
Table 8.8	Summary of MRT/BRT System Plan	62
Table 8.9	Number of Passengers of MRT and BRT in 2025 and 2035	63
Table 8.10	Estimated Development Cost of MRT/BRT lines	63
Table 8.11	Priority Bus Development Projects	65
Table 8.12	Traffic Management Policies	66
Table 8.13	Traffic Management Improvement Directions by Area	67
Table 8.14	Project Costs of Traffic Management and Traffic Safety	69
Table 9.1	Public Transportation Project Economic Evaluation Results	70
Table 9.2	Road Project Economic Evaluation Results	70
Table 9.3	Public Transportation Project Financial Evaluation Results	70
Table 9.4	Representative Impact Items and Indices	71
Table 9.5	Comparative Analysis of MRT and BRT Networks	72
Table 9.6	Number of MRT/BRT passengers by Line, 2025 and 2035	73
Table 9.7	MCA Evaluation Results of MRT/BRT projects	74
Table 9.8	Effects of Traffic Management Measures	74
Table 10.1	Implementation Schedule of Public Transport Projects	76
Table 10.2	Implementation Schedule of MRT/BRT Projects	77
Table 10.3	Implementation Schedule of Traffic Management Projects	78
Table 10.4	The Projected Budget for Transport Sector in GDA	78
Table 10.5	Investment Requirement for Major Master Plan Projects	79
Table 10.6	Recommended Domestic Income Sources for Road Fund	79

## ABBREVIATIONS

ADB	Asian Development Bank
AFD	Agence Francaise de Developpement
BBA	Bangladesh Bridge Authority
BIWTA	Bangladesh Inland Water Transport Authority
BIWTC	Bangladesh Inland Water Transport Corporation
BR	Bangladesh Railway
BRT	Bus Rapid Transit
BRTA	Bangladesh Road Transport Authority
BRTC	Bangladesh Road Transport Corporation
BUET	Bangladesh University of Technology
C&B	Construction & Building
CASE	Clean Air and Sustainable Environment
CNG	Compressed Natural Gas
DAP	Detail Area Plan
DCC	Dhaka City Corporation
DF/R	Draft Final Report
DFID	Department for International Development
DHUTS	Dhaka Urban Transportation Network Development Study
DMA	Dhaka Metropolitan Area
DMDP	Dhaka Metropolitan Development Plan
DMP	Dhaka Metropolitan Police
DMTA	Dhaka Metropolitan Transport Authority
DMTC	Dhaka Mass Transit Company
DNCC	Dhaka North City Corporation
DPP	Department of Printing and Publications
DRTM	Directorate of Road Transport Maintenance
DSCC	Dhaka South City Corporation
DTCA	Dhaka Transport Coordination Authority
DTCB	Dhaka Transport Coordination Board
ECNEC	Executive Committee of the National Economic Council
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
F/R	Final Report
FIRR	Financial Internal Rate of Return
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GIBR	Government Inspector of the Bangladesh Railways
GOB	Government of Bangladesh
GOJ	Government of Japan
GPS	Global Positioning System
HIS	Household Interview Survey
IC/R	Inception Report
IT/R	Interim Report
JICA	Japan International Cooperation Agency
LDC	Least Developed Country
LGD	Local Government Division

LGED	Local Government Engineering Department
MOC	Ministry of Communication
MOHPW	Ministry of Housing and Public Works
MOR	Ministry of Railways
MRT	Mass Rapid Transit
NGO	Non-Governmental Organizations
OD	Origin and Destination
ODA	Official Development Assistance
PPPO	Public Private Partnership Office
PT	Project Team
RAJUK	Rajdhani Unnayan Karttripakkha
RD	Record of Discussions
RHD	Road and Highway Department
RTC	Regional Transport Committee
SC	Steering Committee
SEA	Strategic Environmental Assessment
SPA	Survey and Plan Area
STP	Strategic Transport Plan for Dhaka
TDM	Traffic Demand Management
TOR	Terms of Reference
UMRT	Urban Mass Rapid Transit
WB	World Bank
WG	Working Group



# 1. INTRODUCTION

## 1.1 Background

Dhaka City is the capital of the People's Republic of Bangladesh. In 2011, the Dhaka Metropolitan Area (DMA) had a population of 9.3 million. Currently, urban transportation in the DMA relies heavily on road transport, and traffic in the city is characterized by a chaotic mixture of cars, buses, auto-rickshaws, rickshaws, motorcycles, etc. This condition has resulted in serious traffic gridlocks and problems in the DMA, which in turn has added to the city's growing social and economic problems, such as serious health hazards due to air pollution. With Bangladesh's continued development and population increase, the number of private automobiles is expected to rise in the coming, further worsening the traffic gridlock and pollution problem in the city. Therefore, improving the urban (public) transportation system in the DMA has become a critical issue not only to ease traffic congestion but also to arrest environmental deterioration.

In 2005, the Government of Bangladesh (GOB) formulated the "Strategic Transport Plan for Dhaka" (STP) in cooperation with the World Bank (WB). The implementing agency was the Dhaka Transport Coordination Board under the Ministry of Communication (MOC).<sup>1</sup> The STP included a "20-Year Urban Transportation Policy (2004–2024)" and identified priority issues, such as the improvement of mass transit systems (buses and rail transportation), the development of urban expressways, and the establishment of an institution. Since the STP is the official transport framework approved by the GOB to improve the current urban transportation situation, it was expected that each donor would provide assistance based on the provisions of the STP.

It was in this light that the Japan International Cooperation Agency (JICA) conducted the "Dhaka Urban Transportation Network Development Study" (DHUTS) Phase 1 in March 2009 to 2010, which recommended the development of the MRT Line 6 as the 1<sup>st</sup> priority project. In May 2010 to March 2011, JICA conducted the feasibility study on the MRT Line 6 under DHUTS Phase 2. In February 2013, the GOB and JICA signed the loan agreement to carry out the "Dhaka Mass Rapid Transit Development Project," which was the blueprint for the construction of Line 6. On the other hand, the World Bank has finished the detailed design of the BRT Line 3, while the Asian Development Bank (ADB) has already completed the basic design of the BRT Line 3 extension project. Since April 2013, ADB has been conducting the activities for the corridor's detailed design.

The STP, which was formulated and approved in 2005 and describes the vision for the city's transportation network, identified three MRT/BRT lines that were supposed to commence before 2010. However, except for MRT Line 6 and BRT Line, other projects envisioned in the STP have yet to get off the ground. Compounding the lack of transport development is the fact that some new towns have sprouted in the study area even as new towns are being planned in areas under the jurisdiction of RAJUK.

Under these circumstances, the GOB requested the Government of Japan (GOJ) in October 2012 for technical assistance to review and modify the STP as well as help build the capacity of the DTCA. In response to the request, JICA selected a consultant to carry out "The Project on the Revision and Updating of the Strategic Transport Plan for Dhaka" and to provide the required technical assistance. In May 2014, JICA dispatched the Project Team to Dhaka to confirm the details of the GOB request.

---

<sup>1</sup> The DTCB was renamed to Dhaka Transport Co-ordination Authority (DTCA) and is now under the Ministry of Road Transport and Bridges (MORTB).

## 1.2 Goals and Objectives

The objectives of the Project are: (i) To revise and update the STP which was approved by the GOB in 2005, and (ii) To select plans and formulate a roadmap comprising high priority projects to solve current urban transport issues.

Specifically, the expected output of this project is an urban transportation master plan, comprising short-, medium-, and long-term development scenarios and a list of high-priority projects, which will be included in the revised STP.

The goals, which are expected to be attained after this Project is completed, are as follows:

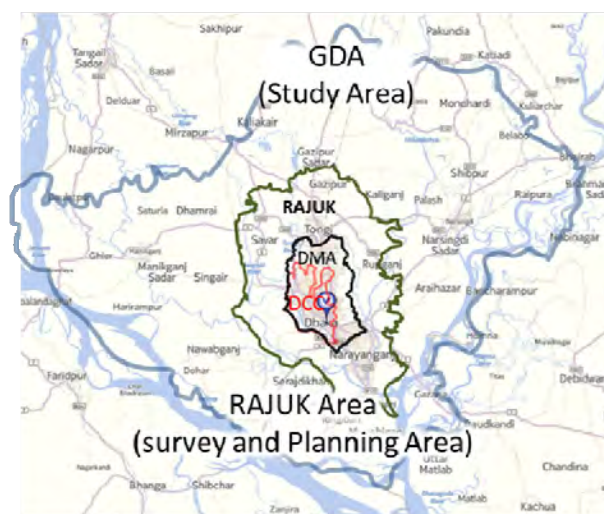
**Goal of the Proposed Urban Transportation Master Plan:** To promote an effective and efficient urban transportation development in the districts of Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, and Narsingdi.

**Goal to be attained by utilizing the Proposed Urban Transportation Master Plan:** To be included in the revised STP by implementing urban public transportation projects, economic growth, alleviation of traffic congestion, and elimination of air pollution are expected.

## 1.3 Project Area

The Record of Discussions (RD) dated 10 October 2013 mentioned that the project area would be the same as that of the original STP, that is, Greater Dhaka covering Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, and Narshingdi districts. The areas included in the traffic survey and in transport planning, i.e., the survey and planning area (SPA), were decided based on population, development plans, transportation situation, etc., and through consultations with JICA and the DTCA.

The actual project area comprised two areas, i.e., the “Study Area” which covered the Greater Dhaka Area (GDA) and included the area covered by the STP, and the “Survey and Planning Area” which covered the areas under RAJUK. Because the urban transport master plan would be formulated based on a person-trip survey, the master plan was prepared only for those areas where people make daily trips. For this reason, the entire Greater Dhaka, which covers 347 square kilometers of predominantly agricultural land, undeveloped areas, and special areas, such as low marshlands, was not included in the survey and planning area. The SPA was confined to RAJUK administrative area only.



Source: JICA Study Team

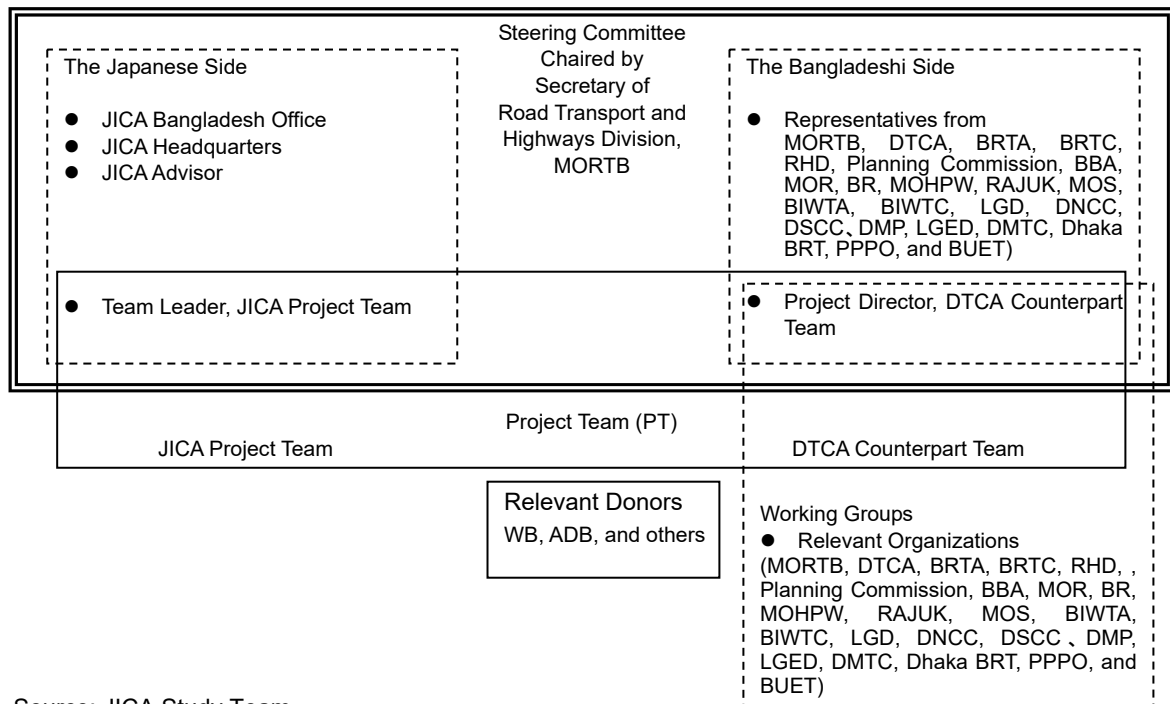
**Figure 1.1 Project Areas**

### 1.4 Related Agencies and Implementation Structures

Bangladesh has various government agencies that are responsible for urban transport, and these agencies are described in Figure 1.2 below. While it's very important to streamline these various agencies into one transport super body, doing so would be difficult. Although the DTCA is responsible for coordinating urban transport projects, this role is not enough.

To help delineate the roles and responsibilities of various transport agencies, the project created a Steering Committee (SC), a Project Team (PT), and working groups (WGs). The Steering Committee was established in order to: (i) coordinate interests and resolve conflicts in related subjects and among related stakeholders, and (ii) share project findings and results. SC meetings were held whenever necessary and chaired by the secretary of the MOC's Road Division (renamed to the MORTB's Road Transport and Highways Division).

The Project Team (PT) was established mainly to implement the project, while working groups, comprising representatives from relevant agencies, were established in order to discuss and share information. PT and WG meetings were held every one or two weeks and chaired by the project director of the DTCA or the team leader of the JICA Project Team. Invitations to meetings were issued depending on the agenda.



Source: JICA Study Team

**Figure 1.2 Project Organization Chart**

## 2. CURRENT URBAN STRUCTURE & SOCIO-ECONOMIC PROFILE

### 2.1 Description of the Project Area

#### (1) General

The project area covered the whole of Greater Dhaka Area (GDA) which consists of Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, and Narshingdi districts with a total area of 7,500 km<sup>2</sup> and a population of about 24.4 million in 2011. RAJUK area, which is this project's survey and planning area, is the more developed, covering 1,500 km<sup>2</sup> and 14.8 million residents. In contrast to the low population density of the entire GDA (31 persons/ha), RAJUK area had very high density in 2011 (111 persons/ha). It was expected that the center of RAJUK area had a much higher population density than the entire RAJUK area.

The project area is generally low, flat, fertile, and flood-prone. While most of the developed areas under RAJUK have an elevation of 6-8 meters above sea level, the elevation of those under the Dhaka City Corporation (DCC) varies from 2 to 13 masl. Due to the topographical and geological characteristics of Greater Dhaka, it is inevitable to experience floods and overflows during the rainy season. In the past there were water channels, natural drainages, and low-lying areas in and around Dhaka which contributed to the retention or discharge of rain water. However, the acceleration of urban sprawl has negatively affected the function of these water retention areas.

In 2005, 25% of the national gross domestic product (GDP) was contributed by the gross regional domestic product (GRDP) of Greater Dhaka. In particular, the GRDP of Dhaka contributed 15% of the national GDP as it is the capital and economic center of Bangladesh. The agricultural sector is still the dominant economic sector outside RAJUK area, while within industrialization has been promoted as evidenced by two export processing zones (EPZs) in Savar and Narayanganj. At the same time, the informal economic sector provides a significant number of job opportunities in Dhaka.

Like other parts of Bangladesh, Greater Dhaka is largely dominated by agricultural land use, while residential areas are spread along the main road and river networks. Large industrial areas and commercial/business areas can be found only within RAJUK area, while residential or housing development has focused on rich households. Therefore, many immigrants from outside RAJUK area and low-income households are forced to live in slums where people do not have access to basic infrastructures and services. One of the many reasons for the delayed urban development outside the RAJUK administrative area is the lack of transport infrastructures, without which people and goods cannot be moved.

In Greater Dhaka the provision of basic infrastructures varies by district. While the electrification rate in GDA is only 63%, about 97% of households in Dhaka district have access to electricity. The coverage of piped drinking water varies from 37% to 95%, with Narayanganj district having the highest coverage in Greater Dhaka. The provision of sanitary services with water seal is very low, at 38% in GDA.

#### (2) GDP and Foundation of Economic Development

The project area (GDA) is known to be the most developed and urbanized in Bangladesh. As shown in Table 2.1, the GRDP of the project area accounted for up to 25% of the country's GDP in 2005. Dhaka, in particular, which is the center of Bangladesh economy, contributed about 15% to the national GDP and had the highest

growth rate (AAGR = 5.9) in the period of 1999–2005. Gazipur, Narayanganj, and Narsingdi also showed high growth rates of more than 5% per year in the same period.

**Table 2.1 GRDP in the Study Area**

	GDP at Current Market Price (Million \$US)						AAGR (%)	
	1995		1999		2005		1995-1999	1999-2005
	Million \$US	National %	Million \$US	National %	Million \$US	National %	AAGR (%)	AAGR (%)
Bangladesh	39,065	100.0%	45,447	100.0%	59,748	100.0%	3.9%	4.7%
Study Area	9,206	23.6%	10,762	23.7%	15,004	25.1%	4.0%	5.7%
- Dhaka	5,714	14.6%	6,742	14.8%	9,497	15.9%	4.2%	5.9%
- Gazipur	1,132	2.9%	1,309	2.9%	1,850	3.1%	3.7%	5.9%
- Manikganj	342	0.9%	401	0.9%	503	0.8%	4.1%	3.8%
- Munshiganj	325	0.8%	372	0.8%	465	0.8%	3.4%	3.8%
- Narayanganj	1,097	2.8%	1,246	2.7%	1,751	2.9%	3.2%	5.8%
- Narsinghdi	596	1.5%	692	1.5%	938	1.6%	3.8%	5.2%

Source: Growth, Income Inequality and Poverty Trends in Bangladesh: Implications for Development Strategy by Center for Policy Dialogue (CPD)

### (3) Population

In 2011, the total population of Greater Dhaka was 24.4 million, which accounted for 16.3% of the national population. Among the districts in the project area, Dhaka had the largest population at 51.3%. Gazipur showed the most rapid increase in population in the period of 2001-2011 and had the second-largest population among all the districts. On the other hand, the population of Manikganj, Munshiganj, and Narsingdi grew slowly compared to that of Greater Dhaka, which suggests a centralization of population (see Table 2.2).

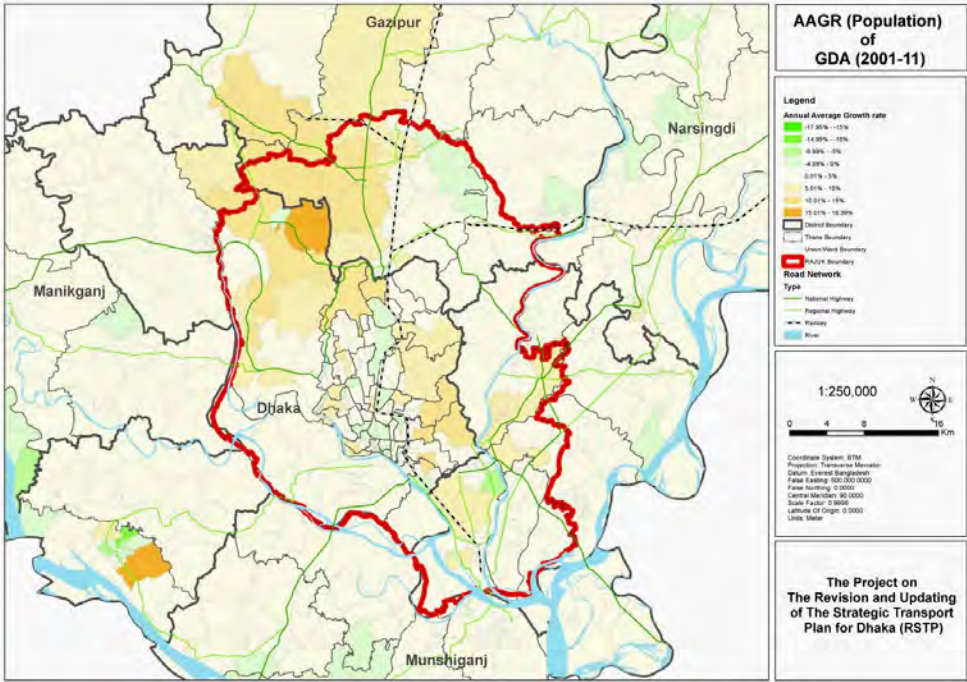
**Table 2.2 Greater Dhaka Population and Area by District**

District	Area (km <sup>2</sup> ) <sup>1)</sup>	Population (000)		AGR (%/year)	
		2001	2011		
GDA	Dhaka	1,464	9,037	12,517	3.31
	Gazipur	1,806	2,143	3,548	5.17
	Manikganj	1,384	1,344	1,447	0.75
	Munshiganj	1,004	1,353	1,502	1.56
	Narayanganj	684	2,301	3,074	2.94
	Narsingdi	1,150	1,983	2,315	1.05
	TOTAL	7,493	18,161	24,404	3.00
% to National	5.1	13.9	16.3	-	
National	147,570	130,523	149,772	1.39	

Source: Population and Housing Census 2011

1) Data in 2011

Bangladesh is ranked first among all countries with more than 10 million people. And among the densely populated cities in the world, RAJUK area is at the top with 11,094 persons/km<sup>2</sup>. There are numerous units with population densities of more than 1,000 persons/ha in areas under the DCC. The change in population distribution is observed in detail in the following figures: From 2001 to 2011, the population in the north and west increased, while population densities in the unions under the DCC decreased.



Source: JICA Study Team

**Figure 2.1 Annual Average Growth Rate by Union in 2001–2011**

(4) Employment Centers

Among the major employment centers, the DCC area has the largest number of employees, and within the DCC area employee numbers in the Old Dhaka are the largest.

The employment ratio reflects the character of the place as a center for employment. In this context Savar, Gazipur, and Gulshan are employment centers, followed by Cantonment, Badda, Khilgaon, and Tongi. As for Savar and Gazipur, their populations are growing very rapidly, which suggests that these areas have achieved high urban growth through industrialization and employment generation.

As shown below, the income from the manufacturing sector manifests Gazipur’s dependence on it. The same applies to Narayanganj and Dhaka.

**Table 2.3 Per Capita Income by District, 1999**

Item	Dhaka	Gazipur	Narayanganj	Narshingdi	Manikganj	Munshiganj
Per Capita Income (currency)	36,554	30,291	27,269	16,860	14,011	12,931
From Manufacturing (currency)	12,397	12,216	10,455	4,220	1,392	1,782
Share to Income (%)	33.9	40.3	38.3	25.0	9.9	13.8

Source: Sixth Five Year Plan, Part3 Statistical Annex and Technical Framework General Economics Division, Planning Commission, Ministry of Planning

## 2.2 Existing Land Use Patterns

### (1) Existing Land Uses in Greater Dhaka Area

Non-urban land uses are still dominant in Greater Dhaka's land use such as agricultural land, forest, and unused area. The total area of GDA is 74,400 ha. Of this, only 33% is composed of settlements found along major roads and rivers. These settlements have expanded from the Dhaka Central Region to the north and northeast direction, i.e., Gazipur and Narsingdi. The north has relatively higher elevations. In addition, the rivers surrounding Dhaka Central Region (i.e., Buriganga River, Shitalakshya River, and Dhaleshwari River) serve as buffers against urban sprawl towards the east and west.

Forested areas spread around Gazipur District. The Bhawal National Park in Gazipur, which was established in 1974, covers an area of 5,022 ha. It was once covered by a lush forest canopy created by Sal (*Shorea robusta*) trees; unfortunately, illegal loggers have stripped the area of much of its natural vegetation. Aside from the Bhawal National Park, there is also the Bangabandhu Sheikh Mujibur Safari Park where the largest safari park in Asia is being constructed on 1.2 ha of the land.

An industrial area is located in Narayanganj District. The river port of Narayanganj is one of the oldest in Bangladesh. It has made the district the center of business and industry in the country, especially in the jute trade, processing plants, and the textile sectors. The district is a pioneer in merchandising yarn and in dyeing.



Source: JICA Study Team based on LGED data

**Figure 2.2 Existing Land Uses in Greater Dhaka Area**

### (2) RAJUK Area

The total RAJUK area is 152,000 ha, of which the Northern Region accounts for the largest area with 23.4%, followed by Dhaka Central Region with 19.8% and Western Region with 16.6%. In terms of land use, agricultural use is still dominant, which accounts for more than 40% of the total area under RAJUK. These agricultural lands are spread towards the Northern and Western regions. Residential area is the

second-largest land use under RAJUK with 56,024 ha, mostly in Dhaka Central Region and Northern Region. The development direction of residential areas is the same as the direction of urban expansion. Other urban land uses, such as commercial and mixed-use areas, can also be found mainly in Dhaka Central Region and Northern Region.

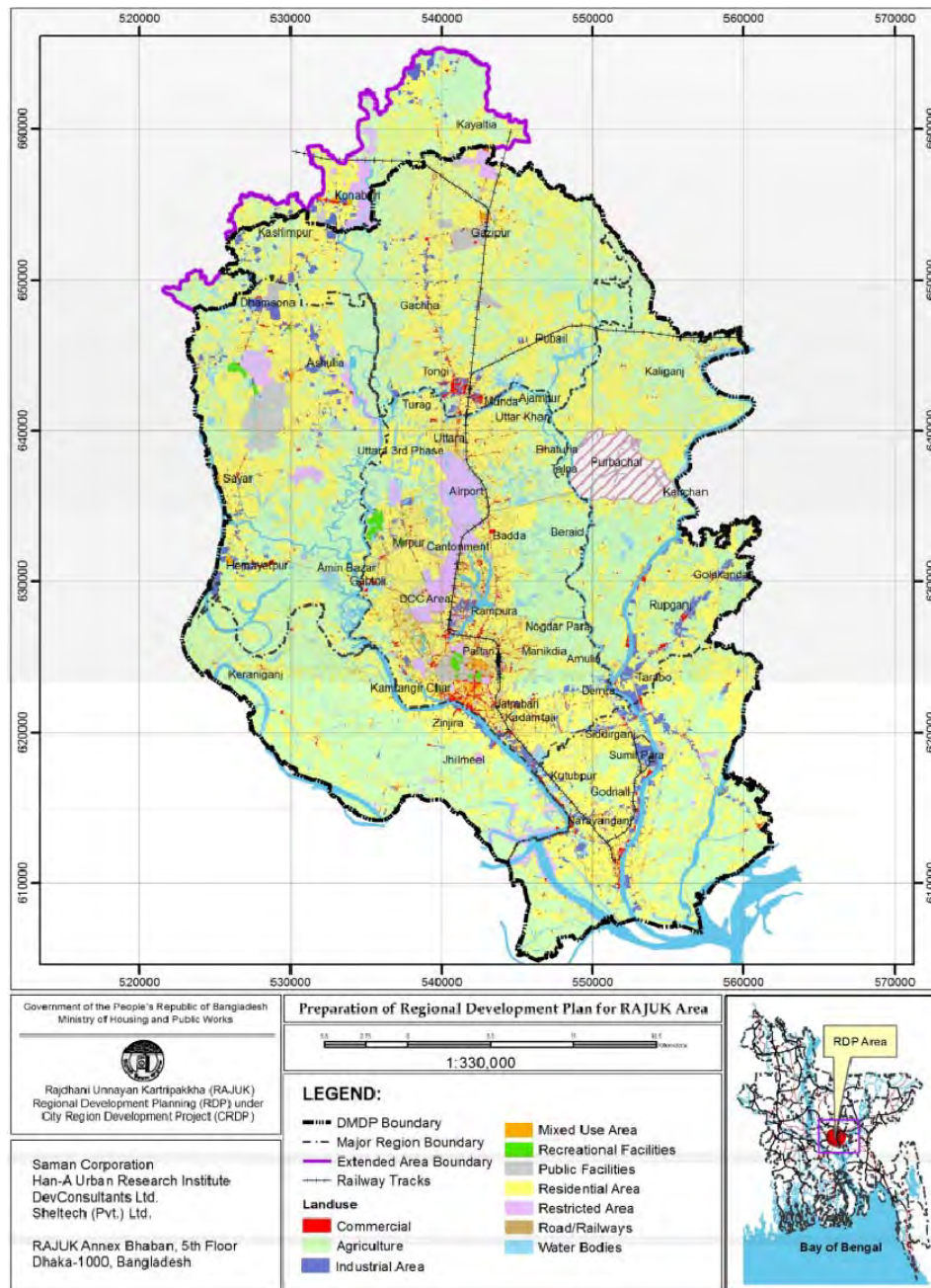
On the other hand, industrial areas are concentrated in the Northern Region and Southern Region, while the Western Region has a relatively high share of public facilities and recreational areas.

**Table 2.4 Existing Land Uses in the RDP Area<sup>1</sup>**

Land Use Type	Area (ha)							Total
	Region <sup>2</sup>							
	DCR	NR	ER	WR	SR	SWR		
Agriculture	7,105 11.2%	16,560 26.0%	9,813 15.4%	11,156 17.5%	8,095 12.7%	10,997 17.3%	63,713 100.0%	
Industrial Area	541 14.2%	864 22.7%	557 14.6%	727 19.1%	909 23.9%	144 3.8%	3,810 100.0%	
Commercial	694 44.1%	291 18.5%	134 8.5%	139 8.8%	242 15.4%	71 4.5%	1,572 100.0%	
Mixed Use Area	612 63.0%	128 13.2%	4 0.4%	82 8.4%	124 12.8%	21 2.2%	971 100.0%	
Residential Area	12,988 23.2%	14,248 25.4%	7,022 12.5%	8,852 15.8%	8,759 15.6%	4,154 7.4%	56,024 100.0%	
Purbachal New Town	6 0.3%	0 0.0%	2,392 100.5%	0 0.0%	0 0.0%	0 0.0%	2,379 100.0%	
Public Facilities	1,294 34.4%	780 20.7%	90 2.4%	1,178 31.3%	337 8.9%	89 2.4%	3,767 100.0%	
Recreational Area	289 74.1%	4 1.0%	0 0.0%	87 22.3%	9 2.3%	0 0.0%	390 100.0%	
Restricted Area	2,030 47.2%	931 21.6%	30 0.7%	754 17.5%	321 7.5%	303 7.0%	4,302 100.0%	
Road/Railways	1,859 50.8%	553 15.1%	212 5.8%	418 11.4%	423 11.6%	192 5.3%	3,657 100.0%	
Waterbody	2,643 22.5%	1,203 10.2%	1,273 10.8%	1,902 16.2%	2,416 20.5%	1,966 16.7%	11,758 100.0%	
<b>Total</b>	30,061 19.7%	35,562 23.3%	21,528 14.1%	25,296 16.6%	21,635 14.2%	17,937 11.8%	152,343 100.0%	

1. The JICA Project Team prepared the table based on the "Regional Development Planning (RDP) Survey Report" (RAJUK, 2014). The RDP area covers RAJUK area
2. DCR = Dhaka Central Region, NR = Northern Region, ER=Eastern Region, WR = Western Region, SR = Southern Region, SWR = Southwestern Region





Source: Regional Development Planning (RDP) Survey Report (RAJUK, 2014)

**Figure 2.3 Land Uses within RAJUK Administrative Area, 2013**

### (3) Findings on Land Use Development

Greater Dhaka is generally low lying and flood-prone, which restrains land development and socio-economic development. In order to accelerate urbanization, it is inevitable to convert agricultural land and water bodies into urban land such as residential areas. However, due to the lack of an appropriate land-use plan and management, privately developed residential areas tended to be unorganized which has caused urban problems including widening the disparity between middle-income and low-income groups.

The socio-economic development of GDA still relies significantly on the Dhaka Central Region under RAJUK. Therefore, the urbanization in other areas is much behind that of the Dhaka Central Region. In order to promote the urbanization in other areas, transport accessibility to the Dhaka Central Region should be improved. Without good transport connectivity to the urban growth center, the environment and vegetation will be destroyed by spontaneous and erratic land development.

Comparably, areas under RAJUK are also dominated by agricultural land. However, the function of each region is relatively clear. The Dhaka Central Region is the center of administration and commerce; the Southern Region is the industrial hub; and the Northern Region focuses on industrialization and the development of new towns or satellite cities. However, the lack of proper residential areas and job opportunities in the urbanized RAJUK areas contributes to the increasing numbers of the urban low income group. In parallel to the urban development in the urban fringes, revitalization of the Dhaka Central Region is required.

Another point of concern is the location of the airport; it is currently in the center of RAJUK area and is an obstacle to the transport circulation in the city.

**Table 2.5 SWOT Analysis on Land Use in GDA and within RAJUK Administrative Area**

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Rich forest area in Gazipur District which is protected by IUCN</li> <li>• High availability of lands for development including unused land and many agricultural lands in GDA</li> <li>• Relatively clear role-sharing among the regions under RAJUK</li> </ul>	<ul style="list-style-type: none"> <li>• Presence of huge flood-prone areas</li> <li>• Widely scattered, low-density settlement in rural areas</li> <li>• Weak connectivity to the Dhaka Central Region from other areas</li> <li>• Lack of capacity for land-use management resulting in failure to control private developers</li> <li>• Concentration of public facilities and restricted area in the city center which occupies prime area for urban development</li> <li>• Lack of appropriate housing development plan for low income group</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• Ongoing preparation of a Regional Development Plan</li> <li>• Ongoing new town development by public and private sector</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of vegetation and infilling of water bodies due to conversion to disorderly land development</li> <li>• Increase in unplanned developments due to Industrialization and commercialization</li> <li>• Significant increase in land value within the Dhaka Central Region</li> </ul>

Source: JICA Study Team

### 3. CURRENT URBAN TRANSPORT SYSTEM

#### 3.1 Non-motorized and Motorized Transport Modes

##### (1) Pedestrian

Walking is the common transport mode by the majority of people in Dhaka City. In 2009, almost 20% of the people of Dhaka City walked, based on results of DHUTS1. Despite the large share of pedestrians, the facilities for them are not properly ensured. The convenience of the pedestrians is not taken care of whenever a road or an intersection in Dhaka City is constructed or improved.

There are various types of obstruction along footpaths and foot bridges in Dhaka City, creating enormous inconvenience to pedestrians. Some common obstructions are the following:

- Temporary shops by hawkers,
- Parked motor vehicles,
- Stored construction materials,
- Uncollected wastes,
- Temporary houses,
- Absence or broken drainage covers, and
- Beggars.

Pedestrians also face difficulties at intersections caused by:

- Broken walk sign;
- Preference of traffic enforces for vehicle, instead of pedestrian, traffic;

On the other hand, it is also observed that many pedestrians do not follow traffic rules: Many do not use pedestrian crossings or cross intersections even when it is the turn of vehicle traffic to move.

##### (2) Rickshaws

Dhaka City is known to be a city of rickshaws. The registered number of rickshaws in Dhaka City, according to the DNCC and DSCC, is around 100,000 (Source: DHUTS). Many reports have said that quite a number of unregistered rickshaws are operating in Dhaka. People in the city mostly use rickshaws for travelling short distances, say, 1-3 kilometers. Students and business persons account **for** more than 90% of these rickshaw trips (Source: DHUTS). In 2009 the share of trips made by rickshaws was 38%.

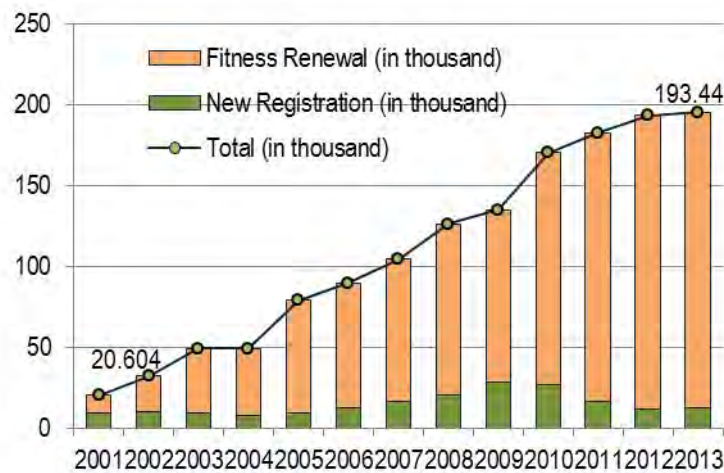
Some rickshaw-related problems are shown below.

- Due to the rickshaw's low speed, traffic signal phasing is difficult to design efficiently;
- Lack of willingness of rickshaw pullers to maintain their queue, thereby disturbing the flow of motorized vehicles;
- No driving license is required to operate rickshaws; thus pullers do not get proper traffic education;
- As there is no parking space for rickshaws, pullers mostly wait for passengers at intersections, which is a common reason for traffic congestion; and
- Rickshaw pullers make U-turns at mid-block, creating traffic congestion.

(3) Private Cars

In GDA, private cars are mainly classified into three types: sedan, four-wheeled jeep, and 6- to 10-seater microbus. Basically, private cars are used by the middle- and high-income people, with some families owning more than one vehicle. As shown in Figure 3.1, private cars account for 30% of the vehicle share in the GDA. One of the reasons for the increasing number of private cars is the low operating cost of using compressed natural gas (CNG). Because CNG is being produced locally, its cost is quite low compared to other types of fuel that needs to be imported from abroad. According to Navana CNG, a renowned CNG conversion company in Bangladesh, 1m<sup>3</sup> CNG is equivalent to 1.23 liters of fuel. Considering the overall cost (assuming yearly travelling distance is 60,000 km), it was found that a 1,800 cc CNG-driven sedan can save around 0.30 million taka every year.

The number of private cars in the GDA is increasing year by year at a rapid rate. According to the Bangladesh Road Transport Authority (BRTA), the registered number of private cars in the GDA as of 2013 was approximately 193,000.



Source: BRTA

**Figure 3.1 Number of Private Cars in the GDA, 2001–2013**

The Government of Bangladesh has tried to control the number of these types of vehicles by imposing different types of duties and taxes since 2009. There had been a restriction on importing reconditioned cars which are older than 5 years. In case of importing reconditioned cars, duties are applicable depending on their age. To import a car into Bangladesh, several types of taxes are imposed such as import duty (5%), value added tax (15%), advance income tax (5%), and advance trade VAT (3%). Aside from these, a supplementary duty is also applied that varies from 30% to 500%, depending on vehicle type, engine capacity, etc. Therefore, the overall tax burden of importing a private car may vary from around 100% to 600%, which is the reason for the sudden decline in the number of newly registered private cars since 2010.

At present, the government is encouraging the import of environment-friendly cars by decreasing the supplementary duty for hybrid cars.

The major problems of cars in the GDA are:

- Lack of parking spaces inside shopping malls, big hospitals, super shops, and restaurants;
- Residential apartments mostly do not have a visitor’s car parking area;

- CNG cars need to wait longer time for filling CNG on the main road which creates traffic congestion; and
- Some cars violate traffic rules such as driving in the opposite direction, traffic signal violations, etc.

#### (4) Motorcycles

Motorcycles are becoming a popular mode of transport in Dhaka City as they can be driven through narrow spaces and are useful during traffic congestion. Besides, fuel consumption is quite low compared to other private vehicles.

The number of registered motorcycles increased from 2001 to 2011. Bangladesh used to import motorcycles from Japan like Honda, Yamaha, etc. But recently most of the motorcycles are imported from India and China. There are few local companies like Walton and Runner which assemble motorcycle parts and sell at lower prices. In 2011, the government increased the supplementary duty on importing complete units of motorcycle to up to 45% which resulted in a decreasing number of new motorcycles. Although the government initiated a policy to encourage local motorcycle assembly, most people still prefer imported motorcycles.

Some problems created by motorcycle riders in Bangladesh are stated below.

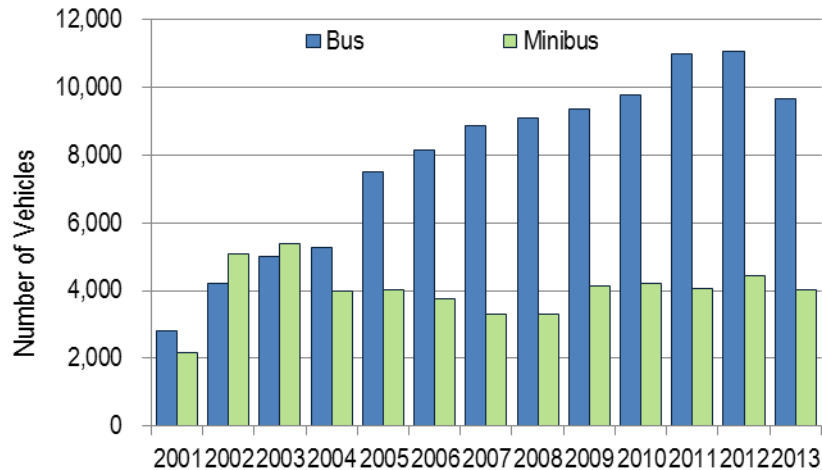
- Some motorcycle riders take the footpaths;
- They frequent disobey traffic signals;
- They frequently disobey lane driving, posing danger to everyone;
- They lack a concern for safety but not wearing helmets; and
- Due to a lack of proper parking spaces, motorcycles are parked illegally.

## 3.2 Public Transport

### (1) Buses and Minibuses

Currently, buses and minibuses are the major modes of transport for GDA residents. The number of bus routes is increasing every year to meet travel demand. However, the number of trips is still insufficient to meet the present demand. One of the reasons for the low bus trips in the GDA is the inability to complete the planned daily trips due to traffic congestion.

The number of registered buses is increasing than that of minibuses. In 2003, minibuses had a bigger share compared with buses; however, the number has totally changed as the government has encouraged the introduction of large buses into the public transport system of Dhaka. In particular, funds for importing CNG buses have been included in the national budget in the last few years.



Source: BRTA

**Figure 3.2 Share of Buses and Minibuses in GDA, 2001–2013**

An intercity permission known as “Route Permit” is required to operate buses on certain routes. The route permit for public buses is issued by the Bangladesh Road Transport Authority (BRTA). At present, the BRTA has a plan for 182 routes within the RAJUK area, out of which, 155 are currently operational with a total of 6,458 buses. Right now, BRTC city buses are operating on 11 routes within Dhaka City. This year BRTC has introduced 50 articulated buses which can carry more than 80 passengers at a time. From 2008 to 2013, 530 non-airconditioned CNG buses, 290 double-decker buses, and 88 air-conditioned buses were added to the BRTC fleet. Meanwhile, air-conditioned city buses are operating only on one route, which is from Motijheel to Uttara. The BRTC is now importing buses from China, India, and South Korea. They previously operated double-decker Volvo (made in Sweden) buses **but are** currently not operating due to maintenance needs.

Some major problems of bus transport in the GDA are as follows:

- Absence of proper bus stops;
- Some bus stops are illegally occupied by hawkers;
- Almost no bus stop signage which encourages bus drivers to stop anywhere they please;
- Buses make U-turns at midblock, creating traffic congestion;
- Bus conductors are impolite;
- Dirty and broken seats;
- Broken windows and poor condition of bus bodies;
- No advance information of arrival or departure of buses;
- No designated parking space for city buses;
- No provision for barrier free use;
- Competition among bus drivers to reach destinations and get passengers;
- Some bus drivers drive at high speeds;
- Passengers get off from the bus in the middle of the road;
- Lack of proper repair of the bus leads to dilapidated condition;
- Most buses do not have regular maintenance check-up; and
- Bus companies have no workshops.

## (2) Trains

In the GDA, people of Gazipur and Narayanganj use trains quite often for commuting to Dhaka City. At present, a total 16 pairs of commuter trains between Dhaka and Narayanganj and 4 pairs of commuter trains between Dhaka and Joydebpur operate on weekdays. Between Dhaka and Joydebpur, there are also other trains carrying passengers. However, these trains do not stop at all the stations.

Commuter trains have positive effects over reducing the volume of road traffic. Everyday almost 15,000 passengers from Narayanganj and another 10,000 passengers from Gandaria, Fatullah, and Chashara commute to Dhaka on commuter trains. Currently, Bangladesh Railway is conducting two different projects to upgrade the Dhaka-Narayanganj rail line to double tracks (up and down) and the Dhaka-Joydebpur rail line to double-double tracks. After completion of these projects, trip frequency of commuter trains is expected to increase.

Kamalapur, the main terminal in Dhaka, is located in the center of Dhaka City and is known to be the largest station in Bangladesh. Another large station where a quite high number of passengers go out from Dhaka is the Airport Station. In June 2014, an estimated 3 million passengers departed from Kamalapur Station while approximately 0.2 million passengers departed from Airport Station to different destinations in Bangladesh. Basically, trains which start from Kamalapur take a 5-minute break at Airport Station. So, these two stations are very important from a multimodal integration point of view. Daily 44 pairs of passenger trains travel to and from Kamalapur Station except Narayanganj commuter trains.

The most common train-related issues are as follows:

- Delays in train arrivals and departures;
- Station waiting rooms for passengers are in poor condition;
- Demand for train tickets is higher than the availability, so shortage of tickets for inter-city trains creates disturbances;
- In Dhaka City there are 29 level crossings between Kamalapur and Tongi section (Source: Railway Master Plan, 2013), and they need to be closed 88 times daily when trains pass, creating road traffic congestion; and
- Because the ticket system is still paper-based, this allows passengers to ride the train even without paying for tickets, and this generates quite a significant system loss.

## (3) Water Transport

The project on the circular waterway route was completed in two phases. The first phase, from Sadarghat to Ashulia (29.50 km), was completed in 2005 and the second phase, from Ashulia to Kanchpur (40.50 km), was completed in 2013. Currently, the Bangladesh Inland Water Transport Company (BIWTC) operates water buses using this circular waterway around Dhaka. The planned route for the service was Sadarghat to Kanchpur via Gabtoli and Tongi.

In 2004, BIWTC launched a water bus service between Sadarghat and Gabtoli but was stopped due to lack of passengers. The reasons identified for the lack of passengers are inadequate frequency and insufficient intermodal facilities, among others. In 2010, the service resumed with only two water buses which eventually shut down due to a lack of landing facilities, inadequate trips, and higher fares compared to buses. From these two failed attempts, it was learned that unless the frequency is increased, the service wouldn't be popular to majority of the people. The BIWTC arranged 4 new waterbuses (81 seats) and dredged the river to ensure continuous flow of water. Finally,

BIWTA resumed the service in July 2013 between Sadarghat and Gabtoli with 6 water buses. The fares for this service ranged from 10 to 40 taka. At this stage, the service suffered financial losses because the number of passengers was quite low. Nevertheless, BIWTC plans to increase the number of water buses to 12 by this year (2016). With the failure to attract passengers to use the circular waterway, many commercial water vessels are using the route to carry soil or sand as construction materials. According to BIWTA, this service has decreased the number of daily trips into the city of trucks carrying the same construction materials.

Some of the issues related to the circular waterway service in Dhaka are as follows:

- Inconvenient waiting facilities;
- Lack of intermodal facilities at stations;
- Lack of publicity is one of the reasons for the low passengers numbers;
- Smell coming from the river is very bad;
- Insufficient approach roads to the stations;
- Low height of bridges at some locations prevent the use of big water buses; and
- River is too narrow and shallow at some points.

#### (4) CNG (Three-wheeler) Auto Rickshaws

CNG auto rickshaws are basically owned by individuals unlike taxicabs. The owner leases his rickshaw to a driver for 8 hours and can officially charge 600 taka. Most drivers complain, however, that they are being charged 800 to 1000 taka. Another common practice among CNG owners is leasing the vehicle to two different drivers for 8-hour shifts which will earn him twice the amount.

Though there is an approved fare rate for CNG auto rickshaws in Dhaka, most of the time the fare is negotiated between the driver and the passenger. When caught by the traffic police, the driver is fined for not following the rule. The main reason for this arrangement is the high demand for, and low supply of, CNG auto rickshaws. In 2002, baby taxis did not have fare meters so fares were always negotiated between drivers and passengers. The government required the use of meters but due to the uncooperative behavior of drivers and owners, the system was not fully established yet.

Some common issues raised against CNG auto rickshaws are as follows:

- Unwillingness of most drivers to use fare meters;
- Unsafe driving behavior of drivers; and
- Most CNG auto rickshaws are in very poor condition with dilapidated bodies, broken seats, etc.

### 3.3 Urban Road Network

Figure 3.3 illustrates the major national highway network in the GDA. Most of the national highways extend radially from Dhaka City to connect to major cities and infrastructure, such as Chittagong, Sylhet, Mymensingh, Jamuna Bridge, Aricha Port, and Mawa (proposed Padma Bridge).

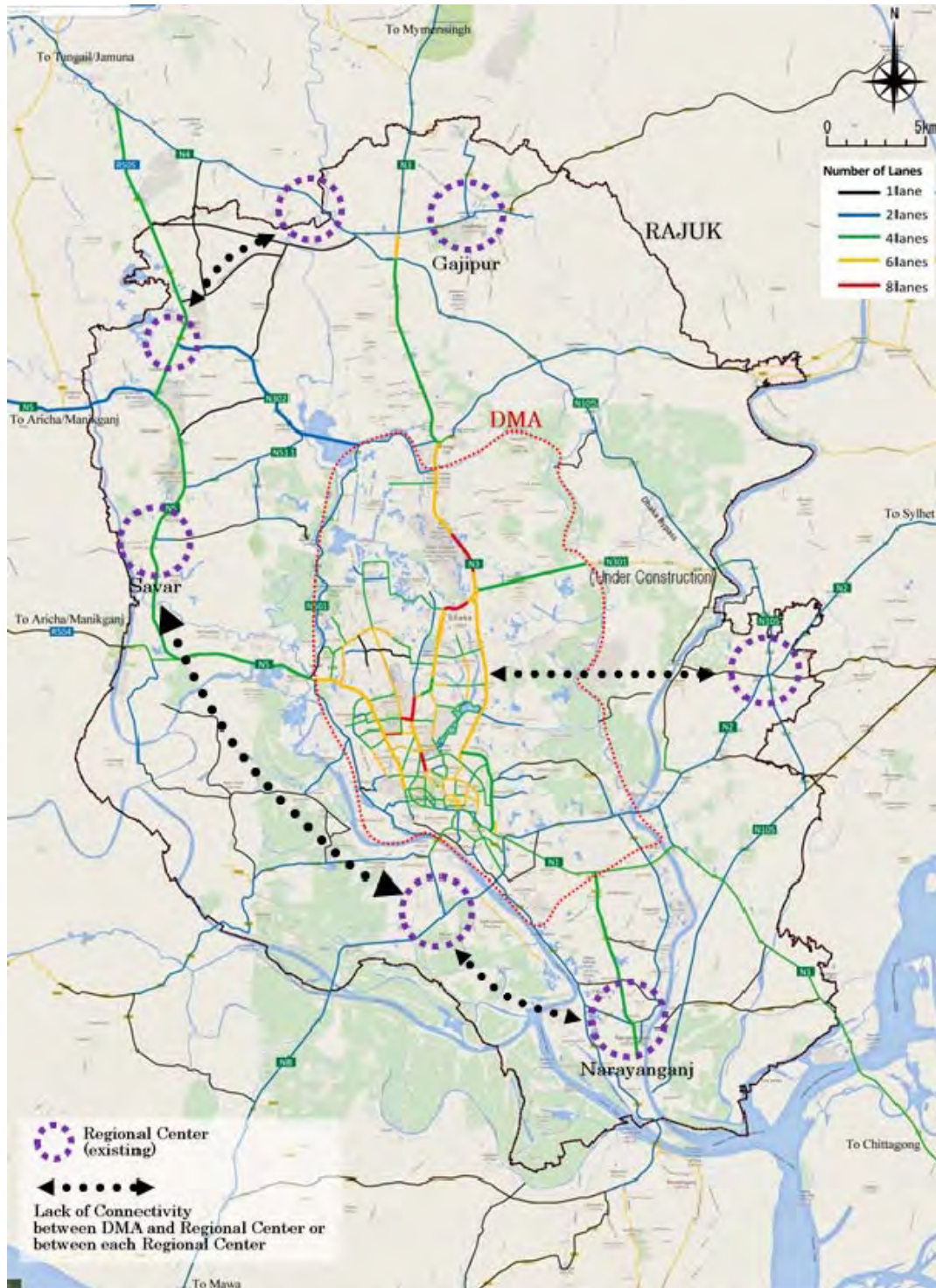
On the other hand, all national highways except NH105 (Dhaka Bypass) that enter the DMA area eventually cause traffic congestion in the urban area. One is the urban network which serves through traffic in urban centers (DMA). The other is the regional network which serves regional traffic movement in suburban areas (RAJUK areas outside the DMA).

The DMA is situated in the middle of RAJUK area and surrounded by the Buriganga, Turag,



and Balu rivers. Although the major roads in DMA have multiple lanes and have good pavement conditions, as reported in DHUTS, severe traffic congestion chronically occurs due to insufficient roads, missing links, and poor traffic management.

As for the road network in suburban areas, road density is lower than that in urban areas and connectivity to some adjacent regional centers is lacking. Such a situation hampers regional coordination and promotes the intense concentration of population and advanced urban functions in the DMA.



Source: JICA Study Team

**Figure 3.3 Major Road Network within RAJUK Administrative Area**

## 4. ENVIRONMENTAL CONDITION

### 4.1 Natural Environment

#### (1) Topography, Soils, Geological Characteristics

Low-lying swamps and marshes located in and around the city are other major topographic features. The elevation of the DCC area varies from 2 to 13 m above the mean sea level. Most of the developed areas under RAJUK are at an elevation of 6 to 8 meters above the mean sea level. (Regional Development Planning, RAJUK, 2014)

Part of the RAJUK area is covered by Pleistocene Madhupur clay and Holocene sediments of the Ganges-Brahmaputra floodplain. The Madhupur clay is situated in the north-west and extends from the middle of the north to the south of the project area, and these are oxidized Pleistocene sediments. The east, south, and western half of the RAJUK area are covered by the Ganges-Brahmaputra floodplain sediments. The area is divided into 6 geological units, i.e.: i) Chandina alluvium, ii) alluvial silt and clay, iii) alluvial sand, iv) alluvial silt, v) marsh clay and peat and vi) Madhupur clay residuum.

Dhaka District shows greater variety of soils than any other district in Bangladesh. The soils of the RJUK area are described under the headings of the six major geomorphologic units within which the different parent materials occur, viz.-i) Madhupur Tract, ii) Arial Beel, iii) Ganges floodplain, iv) Old Brahmaputra floodplain, v) Jamuna floodplain, and vi) Middle Meghna floodplain. The Madhupur Tract (deposit), which has recorded a fascinating history of uplift and subsidence, erosion and deposition, changes of sea levels and in climate and vegetation, has contributed to the distinctive aspects it bears today. Floodplain deposits of Brahmaputra, Ganges, Jamuna, and Meghna are the next important deposits after Madhupur clay in the RDP area. There are three layers in most soils: topsoil, sub-soil, and substratum.

Most parts of Dhaka City and its surrounding areas have already been occupied. As a result, the city is expanding on reclaimed sites. Most of these sites are developed by filling in lowlands (3~12 m) using dredged materials. (Regional Development Planning, RAJUK, 2014)

#### (2) Hydrological Characteristics

Dhaka City is surrounded by tributaries and branches of three major rivers, while the urban district of Dhaka is delimited by Turag River, Buriganga River, etc. on the east, and Balu River, Situlakhya River, etc. on the west. Water levels in these rivers vary in sync with the water level in the major rivers, and rise from about 1.0 to 2.0 m (in the dry season) to as high as 5.0–6.0 m in an ordinary rainy season.

Dhaka has a yearly precipitation of 1,400 to 2,400 mm, 80% of which is concentrated in the rainy season (June to September). Because river water levels rise in the rainy season, an intense rainfall can easily cause flood damage especially due to drainage failure in the city of Dhaka.

#### (3) Protected Areas

Based on Bangladesh Wildlife Preservation Order 1973, protected areas (PAs) are classified into national parks, wildlife sanctuaries, game reserves, and private game reserves. Bangladesh has 37 nationally designated protected areas (17 national parks, 17 wildlife sanctuaries, and others). Covering approximately 266,000 ha, these PAs cover 10.72% of the total forest area in the country. Part of the Sundarbans Reserved

Forest (59,600 ha from its east, west, and south sites) and 9,772 ha of Tanguar Haor have been designated as Ramsar sites in the country. In addition, since 4 February 1999, UNESCO has classified 139,700 ha of land in the Sundarbans covering three regions - east, west, and south - as World Heritage sites. Under the RAJUK area, there is only one national park, Bhawal National Park in Gazipur.

In addition to protected areas, the 1995 Bangladesh Environment Conservation Act includes provision for Ecologically Critical Area (ECA) declarations by the director general of the Department of the Environment in certain cases where the ecosystem is considered to be in danger of reaching a critical state.

There are two environmentally sensitive areas within RAJUK: Gulshan Banani-Baridhara Lake and River ECAs (Buriganga, Turag, Balu and Shitalakshya). Conservation of water bodies is essential to protect the eco-system, which, in turn, will clean up the city's environment. The lakes of Dhaka City should be conserved properly, because they help reduce water logging, improve the drainage system, provide fresh water, and increase water retention capacity, among others, during monsoon. The lakes also help preserve biodiversity and recharge groundwater.

Each of the ecosystems has many sub-units with distinct characteristics as well. IUCN Bangladesh in 2002 classified the country into 25 bio-ecological zones, some of which constitute one or more than one type of ecosystems.

Within the RAJUK area, moist deciduous forest (sal forest), agro-ecosystem, homestead ecosystem and wetland ecosystem are observed.

#### (4) Ambient Air Quality

Like other major metropolises in developing countries, deterioration of air quality in the Dhaka area is a key environmental concern.

The main air pollutants in Dhaka are nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), particulate matter (PM), usually expressed as PM with diameter of 10 microns or smaller: PM<sub>10</sub>, or PM<sub>2.5</sub> microns or smaller: PM<sub>2.5</sub>, carbon monoxide (CO), ozone, and lead. Motor vehicles and traditional brick kilns contribute predominantly to air pollution. Motor vehicles are a major source of PM pollution which contributes to the risk of developing cardiovascular and respiratory diseases, as well as lung cancer. Most of the PM pollution comes from diesel-run vehicles. Hundreds of brick kilns operate during the dry season from November to April in the low agricultural land surrounding Dhaka City and generate smoke dust including SO<sub>2</sub>, NO<sub>x</sub>, and hydrocarbons that contribute to worsening ambient air and the resulting damage to public health.

**Table 4.1 National Ambient Air Quality Standards for Bangladesh**

Pollutant	Unit	Averaging Period	Bangladesh Standards	WHO Guideline Values
CO	mg/m <sup>3</sup>	8 hours(a)	10 (9 ppm)	10
	mg/m <sup>3</sup>	1 hour(a)	40 (35 ppm)	30
Pb	µg/m <sup>3</sup>	Annual	0.5	0.5
NOx	µg/m <sup>3</sup>	Annual	100 (0.053 ppm)	40 (as NO <sub>2</sub> )
PM <sub>10</sub>	µg/m <sup>3</sup>	Annual (b)	50	20
	µg/m <sup>3</sup>	24 hours (c)	150	50
PM <sub>2.5</sub>	µg/m <sup>3</sup>	Annual	15	10
	µg/m <sup>3</sup>	24 hours	65	25
O <sub>3</sub>	µg/m <sup>3</sup>	1 hour (d)	235 (0.12 ppm)	-
	µg/m <sup>3</sup>	8 hours	157 (0.08 ppm)	100
SO <sub>2</sub>	µg/m <sup>3</sup>	Annual	80 (0.03 ppm)	-
	µg/m <sup>3</sup>	24 hours (a)	365 (0.14 ppm)	20

Source: Statutory Rules and Order No. 220, GOB (2005); Air Quality Guidelines for Europe, 2nd ed., WHO (2005); and Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide, WHO (2006).

Notes:

(a) Not to be exceeded more than once per year.

(b) The objective is attained when the annual arithmetic mean is less than or equal to 50 µg/m<sup>3</sup>.

(c) The objective is attained when the expected number of days per calendar year with a 24 hour average of 150 µg/m<sup>3</sup> is equal to or less than 1.

(d) The objective is attained when the expected number of days per calendar year with the maximum hourly average of 0.12 ppm is equal to or less than 1 (Source: AQMP, DOE).

The most serious pollutant from the health point of view in Dhaka is particulate matter (PM). Usually in the dry seasons the pollution level reaches its highest peak, gradually decreasing during the wet season. The 24-hour average for both PM<sub>10</sub> and PM<sub>2.5</sub> concentrations were found noncompliant with national standards during the dry season, i.e., from November to May.

Gaseous pollutants except NOx measured at different CAMS did not exceed national air quality standards. Because NOx is measured only annually, daily 24-hour average concentration levels were compared with the annual average. The maximum 24-hour NOx concentration at some stations was found to exceed the annual standard value during the dry season.

#### (5) Noise Environment

To prevent noise pollution, the Government of Bangladesh enacted Noise Pollution (Control) Rules in 2006. However, the actual situation has not improved, as the data collected by several different researches suggests. Examples of noise pollution in Dhaka City are presented in Table 4.2.

**Table 4.2 Measured Noise Levels in Some Sensitive Areas of Dhaka**

Location (outside the facility)	Measured Noise Level (dBA)	
	Morning	Afternoon
Shaheen School	74	83
Motijheel Govt. High School	79	83
Dhanmondi Govt. Boy's High School	75	80
Azimpur Girl's College	78	80
Tejgaon Women's College	67	75
P.G. Hospital	78	82
Dhaka Medical College Hospital	69	80
Mitford Hospital	73	76
Children's Hospital	69	72

Source: Dey, A. R., N. Kabir and D. Efroymson. 2010. Noise Pollution in Dhaka: Current Situation and Suggestions for Action.

## 4.2 Natural Disasters and Flooding

### (1) Flood and Inundation Characteristics

Dhaka City lies in a delta formed by rivers, and the ground is believed to be formed almost solely from silt and fine sand. As a result, river banks are subjected to erosion by fluctuating water levels and flowing river water.

Inundation by river water in Dhaka is characterized by a very slow receding process of floodwater, resulting in longer periods of inundation. In the last 50 years, inundations typically last from 15 to 45 days, during which the residents continue to suffer from direct and indirect consequences.

Another form of inundation that affects Dhaka is the inundation from stormwater. In case water levels in rivers rise during a torrential rain, inundation caused by stormwater occurs because it cannot drain into rivers. Inundation caused by stormwater is usually shallow, and there is no risk of many lives to be lost. Halcrow (2006) postulates that an inundation which is due to poor drainage and causes property damage is brought about by 10-year flood, a deluge having the probability of occurring once in 10 years.

A recent case of inundation from stormwater took place in 2004 which affected a large part of the urban Dhaka. This inundation occurred when rising water levels in the rivers caused Balu River in eastern Dhaka to overflow, thus inundating the city's lowlying areas. In western Dhaka, overflow from Turag River flooded the city through culverts and open regulators. The inundation damage from stormwater was caused by an intense rainfall in Dhaka and the regulators were closed to protect urban Dhaka from overflowing rivers.

Daily rainfall in Dhaka on 14 September 2004 when the inundation occurred was recorded at 341 mm. This means that such an amount of rainfall which occurred in one day exceeded the mean monthly precipitation of 284 mm recorded during rainy seasons (June to September) in the previous five years, and the large amount of rain water remained in the urban area without being drained. This caused, it is estimated, about 40% of the urban area in western Dhaka to become waterlogged.

There were water channels, natural drainage, and lowlands in and around Dhaka in the past, contributing to the retention and discharge of rain water. However, rapid urban sprawl in recent years has decreased the water retention areas, leading to a loss of water-retaining capability of the urban district. In addition, haphazard urban

development without regard for topography, coupled with the failure of building stormwater drainage and lack of maintenance, has aggravated the problem of rainwater inundation in the urban district.

Rainwater inundation which remains for an extended period of time not only causes inconvenience to residents, traffic, and other activities, but also causes environmental and hygienic problems such as bad smell and health hazards.

(2) Flood control policy of Dhaka City

The flood control policy of Dhaka City was established as part of FAP in the 1990s, with the basic idea of preventing inundation by river water through building embankments and pumping rainwater from urban areas to water bodies. The flood control policy is intended to prepare for disasters having a probability of occurring once in 100 years. The construction of a stormwater drainage system in the city, on the other hand, is planned to cope with events having the probability of occurring once every five years.

Under this policy, the western embankment (crown height from 7.5 m to 10 m) and three pump stations (total discharge capacity=44.5 m<sup>3</sup>/s) are under construction. In the existing urban district, there are retarding basins such as Gulshan Lake, while a new retarding basin has been built in Tejgaon District to receive and retain drained rainwater.

With regard to the embankment and the pump stations on the eastern edge, the revision and F/S of the plan have been completed, but the prospect of commencing the construction has not been obtained. At present, the DIT Road in the east serves as an embankment to prevent overflows from rivers (height of road surface is said to be around 8 m). For this reason, channels crossing the DIT Road are equipped with gates, while two have pumping stations built alongside the river.

In the central part of the city, a multipurpose waterfront is now being constructed and it includes flood control function.

(3) Challenges facing the flood control policy in the eastern Dhaka development project

Dhaka is one of the most densely populated cities in the world. This and the trend toward nuclear families make it increasingly difficult to meet housing demand within the existing urban district. To tackle this problem, projects to develop housing lands have been carried out by the public and private sectors, making the urban district continue to sprawl. There has been a restriction on housing development in eastern Dhaka because it is low-lying with elevations of 5 to 6 m only. However, the demands for housing development in this district have grown because it is located near the existing urban district.

The most challenging issue about the housing development in eastern Dhaka is the need for flood control measures. As described above, a project to construct an embankment, reservoirs to keep stormwater, and pumping stations has been put into place in eastern Dhaka under the revised Eastern Bypass Study (2006).

## 5. FINANCIAL STRUCTURES AND BUDGETING

### 5.1 Current Status of National Budget

#### (1) Current Status of National Revenue and Expenditure

The main source of government revenue is tax revenue. Public revenue principally consists of direct and indirect taxes and they account for more than 80 percent of the total receipts. Tax receipts consist of taxes on income and wealth (direct), taxes on commodities and transaction (indirect), and other taxes and duties. The rest comes from different non-tax revenues such as income from property, fees, charges, and tolls. The revenue-GDP ratio is an accepted determinant of the stage of economic development of a country.

Public expenditure comprises non-development expenditure and development expenditure. Non-development expenditure relates to “revenue budget” and development expenditure to “development budget”. Revenue expenditure mainly consists of consumption expenditure (salaries, wages & services), transfer payments (interest payments and grants to local bodies, city corporations, and autonomous bodies), subsidies, and pension payment. Development expenditure is expenditure for agriculture, flood control, industry, infrastructure, and other service development.

**Table 5.1 Recent Trends in Consolidated Receipts and Expenditures**

Unit: Billion BDT

Heads	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	AAGR 2004-12
Revenue Receipts	392	449	495	605	692	795	962	1,184	1,397	17.21
Development Receipts	216	222	212	373	293	356	400	508	599	13.6
Total Receipts	608	671	707	979	985	1,150	1,351	1,692	1,996	16.02
Revenue Expenditure (gross)	328	352	414	522	627	687	771	1,029	1,131	16.75
Development Expenditure	187	195	179	185	197	259	329	349	500	13.07
Total Expenditure	515	546	593	707	824	946	1,100	1,378	1,632	15.51
GDP at current producer's price	3,707	4,157	4,725	5,458	6,148	6,943	7,967	9,148	11,413	15.09
GDP growth rate (%)	5.96	6.63	6.43	6.19	5.74	6.07	6.46	6.52	6.01	
% of revenue receipts to GDP (%)	10.60	10.80	10.50	11.10	11.30	11.50	12.10	12.90	12.20	
% of total receipts to GDP (%)	16.40	16.10	15.00	17.90	16.00	16.60	17.00	18.50	17.50	
% of Development Expenditure to Total Expenditure (%)	36.40	35.60	30.20	26.20	23.90	27.40	29.90	25.30	30.70	

Source: Statistical Yearbook of Bangladesh, 2012

(2) Current Status of Revenue Budget

The National Board of Revenue (NBR) under the Internal Resources Division (IRD) of the Ministry of Finance is the central authority for tax administration and policy formulation in Bangladesh. In consideration of national revenue, Bangladesh has one of the lowest levels of tax revenues in the world though revenue collection has significantly increased in recent years.

Table 5.2 shows the recent trend in national revenue collection. The structure of revenue is shared at 67% by taxes on commodities and transaction including VAT. The share of taxes on income and wealth is 29%. However, the AAGR is 16.98 percent in the FY 2004–2005 to FY 2011–2012.

**Table 5.2 Recent Trend in the Government Revenue Budget, 2004–2013**

Unit: Billion BDT

Item	2004 -2005	2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	2011 -2012	2012 -2013	AAGR 04-12 (%)
1. Total Tax Revenue	320	362	392	480	555	640	791	958	1,163	17.53
A. Taxes on Income and Wealth	64	77	96	118	139	170	226	281	391	25.28
B. Taxes on Commodities & Transactions	255	285	296	345	391	441	539	637	739	14.22
C. Other Taxes and Duties	12	13	13	17	24	29	25	39	38	16.15
2. Total Non-Tax Revenue	73	87	102	125	137	155	161	226	228	15.43
Total Revenue Receipts	392	449	495	605	692	795	952	1,184	1,397	17.21
GDP	3,707	4,157	4,725	5,458	6,148	6,943	7,967	9,148	11,413	15.09
% to GDP	10.60	10.80	10.50	11.10	11.30	11.40	11.90	12.90	12.24	

Source: Statistical Yearbook of Bangladesh, 2013

(3) Current Status of Development Budget

Public sector plays a crucial role in promoting economic growth to increase public expenditures on infrastructure, health, and human resource development which have direct impact on poverty reduction. Table 5.3 shows that the transport sector is one of the major recipients of public sector allocations. Though the development expenditure on transport in FY 2010–2011 was only BDT 38,471 million, it increased to BDT 52,642 million in FY 2011–2012 because of some mega projects such as the Padma Bridge and railway sector investment. It could be assumed that the expenditure will increase even more due to future mega projects such as the construction of a metro rail in Dhaka City, the improvement of the Eastern Bangladesh Bridge, and railway investments.



**Table 5.3 Development Expenditure by Sector, 2004–2013**

Unit: Billion BDT

Heads	2004 -2005	2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	2011 -2012	2012 -2013
Agriculture	6	6	6	6	12	16	21	20	27
Industry	5	5	5	5	4	4	4	4	17
Flood Control & Water Resources	9	9	9	9	8	11	12	13	16
Rural Institution	24	25	23	24	33	36	45	43	68
Power & Natural Resources	39	40	37	38	25	33	69	68	105
<b>Transport</b>	31	22	29	30	20	35	38	53	82
(% to Total)	(16.42)	(11.90)	(16.43)	(16.43)	(10.14)	(13.61)	(11.71)	(15.11)	(16.40)
Communication	11	11	10	11	2	4	3	7	7
Education & Training	20	21	19	20	32	42	49	52	65
Health	13	14	13	13	21	27	29	30	35
Population Control & Family Planning	NA	NA	NA	NA	NA	NA	NA	NA	NA
Physical Planning & Housing	23	24	22	23	31	39	43	51	58
Others	6	6	6	6	9	11	17	8	20
<b>Total</b>	<b>187</b>	<b>185</b>	<b>179</b>	<b>185</b>	<b>197</b>	<b>259</b>	<b>329</b>	<b>348</b>	<b>500</b>

Source: Statistical Yearbook of Bangladesh, 2013

## 5.2 Financial Resources

The financial resources for development expenditure consist of domestic resources and foreign assistance. As shown in Table 5.4 below, about 64% of “development expenditure” is “domestic assistance,” which increased yearly. In FY 2010, the share of “project assistance” was 31% and “non-project assistance” was only 4%.

**Table 5.4 Historical Trend of Financing for Development Expenditures**

Unit: Billion BDT

Item	2004 -2005	2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	2011 -2012	2012 -2013	AAGR 2004–2013
Development Expenditure	205	215	216	225	290	285	359	457	601	14.4
Domestic Resources	152	182	174	167	165	281	429	427	737	21.8
Foreign Assistance	115	114	112	174	151	182	151	236	264	19.2
Project Assistance	66	75	85	95	112	125	134	207	240	17.5
Non-Project Assistance	46	35	23	73	35	55	14	25	21	-9.5
Others	4	4	4	6	4	2	4	4	4	1.8
Total Resources	268	296	286	341	317	463	580	739	1,001	17.9
Balance	-63	-81	-70	-116	-27	-178	-222	-282	-400	

Source: Statistical Yearbook of Bangladesh-2013

## 6. URBAN DEVELOPMENT CONTEXT

### 6.1 Vision and Key Spatial Development Strategies

In the RSTP, vision for Dhaka and strategies from a standpoint of urban transport are defined based on Dhaka Structure Plan (2016-2035). In addition, the vision for Dhaka and strategies are interlinked with the fact that it is the nation's capital as it plays the forefront of Bangladesh's march toward future growth and be the anchor for its identity as a proud and robust nation.

Dhaka's rich natural environment, the rivers, ponds and lakes which are widely distributed around the urban areas showcase its uniqueness, adding to the beauty are the ancient trees, parks and the greenery of Dhaka streets. However, the rapid growth in population and economy of the country has resulted into lack of control on public services, industrial development, infrastructure development and natural environment.

Therefore, it is proposed that the concept of "water" and "greeneries" be clearly incorporated in the city plan to ensure that such basis of Dhaka's identity is developed, sustained, and enhanced. For this reason, the RSTP's vision for Dhaka is "**Green Dhaka with Blue River and Green Urban**" and has the following concepts:

(1) Blue River (creating water and greenery network)

Reducing urban industrial wastes by relocating industrial areas from the CBD to the suburbs and developing logistics arteries such as the three ring roads and bypasses.

Preserving designed greeneries in city areas, creating accessible waterfront space, and enriching greenery along trunk motorways to create a network of water bodies and green spaces.

(2) Green Urban (creating beautiful urban space and higher residential standard)

Reducing environmental strains through urban transport projects and developing an urban transport backbone comprising the three ring roads and public transport system, to reduce CO<sub>2</sub> emissions and promote the development of a low-carbon city.

Promoting urban living to establish a residential environment with work/living proximity, and establishing a high quality and environmentally friendly residential housing by developing urban transport infrastructures to raise the residential standard.

Realizing this vision will be done through the following urban transport strategies:

Strategy 1: Develop public-transport-oriented urban areas to ensure people's mobility and to promote an environment-friendly society.

Strategy 2: Upgrade and revitalize existing built-up areas in the city center and urban fringe areas.

Strategy 3: Develop modern and competitive new urban centers to attract diversified quality investments that will generate employment opportunities.

Strategy 4: Develop efficient infrastructure and services to ensure convenient and competitive socio-economic activities and affordable services.

Strategy 5: Prepare effective disaster prevention measures to protect against natural and man-induced disasters.

Strategy 6: Strengthen institutions for effective urban management and capacity building.

Since an integral part of the general strategy is to help guarantee that the people of Dhaka will have safe and healthy lives, engage in convenient and comfortable socio-economic activities, and have better incomes and livelihoods, it is therefore essential that new types of industries that will generate better jobs and employment be introduced and encouraged. These will include knowledge-based, high-end technologies, high value-added urban services, expanded higher education, advanced urban agriculture, and other economic sectors or activities that are expected to provide quality employment. A further opening up of an economy reflective of a better investment environment, the development of modern commercial and industrial areas, and high-quality foreign or domestic investments in strategic locations are the driving forces for the continuous economic development of Dhaka. Furthermore, efficient and better managed infrastructures, including a high-quality public transportation, will make it possible for the public to commute safely without the hassle of traffic congestion; transporting goods will likewise become more efficient. At the same time, the preservation and the enhancement of the city's greeneries and water spaces will create magnificent landscapes and incomparable sceneries.

## 6.2 Urban Development Scenario

### (1) Introduction

The urbanization in Dhaka has been rapidly progressing. More people begin living and working in central areas, which has led to the increase in urban population. Economic growth and motorization have expanded the urban area. RAJUK area shows a potential for future urban development because of its prospective increase in population. Effective future management of the growing urban areas is one of the most fundamental and critical issues the city needs to address.

RAJUK area has its own spatial plan, known as the "Regional Development Plan: (RDP). It is an urban structure development plan, showing the future urban structure and land use supported with a population framework. The said plan promotes a polycentric urban structure moving outward in all directions from the existing CBD. However, the actual urban development that takes place differs from those indicated in the RDP. The developments are heading towards the north and northwest of the city along the existing primary roads. Further densification of the existing built-up areas is also notable.

It is also noticeable that transport and land use are interdependent. This is a common situation in developing cities where land use control is not careful or strict enough, and the direction and pattern of urban development are greatly affected by the availability of transport infrastructure especially roads. This project aims to assist the city to manage its future growth and progress more effectively through the integrated planning of transport and urban development. The project area addresses this trend and needs to establish a pragmatic strategy to manage fast-growing urban areas.

### (2) Regional Development Plan's Urban Development Orientation

In the year 2015, the existing Structure Plan will expire. Hence, a Regional Development Plan (RDP) was undertaken in order to prepare a new Structure Plan for

RAJUK area from 2016–2035. As of July 2014, the Interim Report was already submitted which reviewed related plans, programs and policies; formulated strategic land use zones as well as the vision and objective of the Structure Plan 2016–2035; identified urban management strategy; and identified sector issues which the revised Structure Plan would address. In this report, the vision and objectives of the Dhaka Structure Plan 2016–2035 are stated as shown below.

**Table 6.1 Vision and Objectives of Regional Development Planning**

Vision	Creating a functional and vibrant city where development is sensitive to socio-cultural framework & environmental sustainability
Objectives	<ul style="list-style-type: none"> <li>a. To enhance the functionality of Dhaka as a centre of economic activities through intra-regional distribution of economic and lifestyle opportunities</li> <li>b. To create efficient inter-and intra-urban connectivity with and within the project area</li> <li>c. To ensure environmentally sustainable urban development</li> <li>d. To encourage development that respects the social &amp; cultural fabric of the city and distributes its benefits in an inclusive way</li> </ul>

Source: Preparation of Regional Development Planning for RAJUK under CRDP (Interim Report, July 2014)

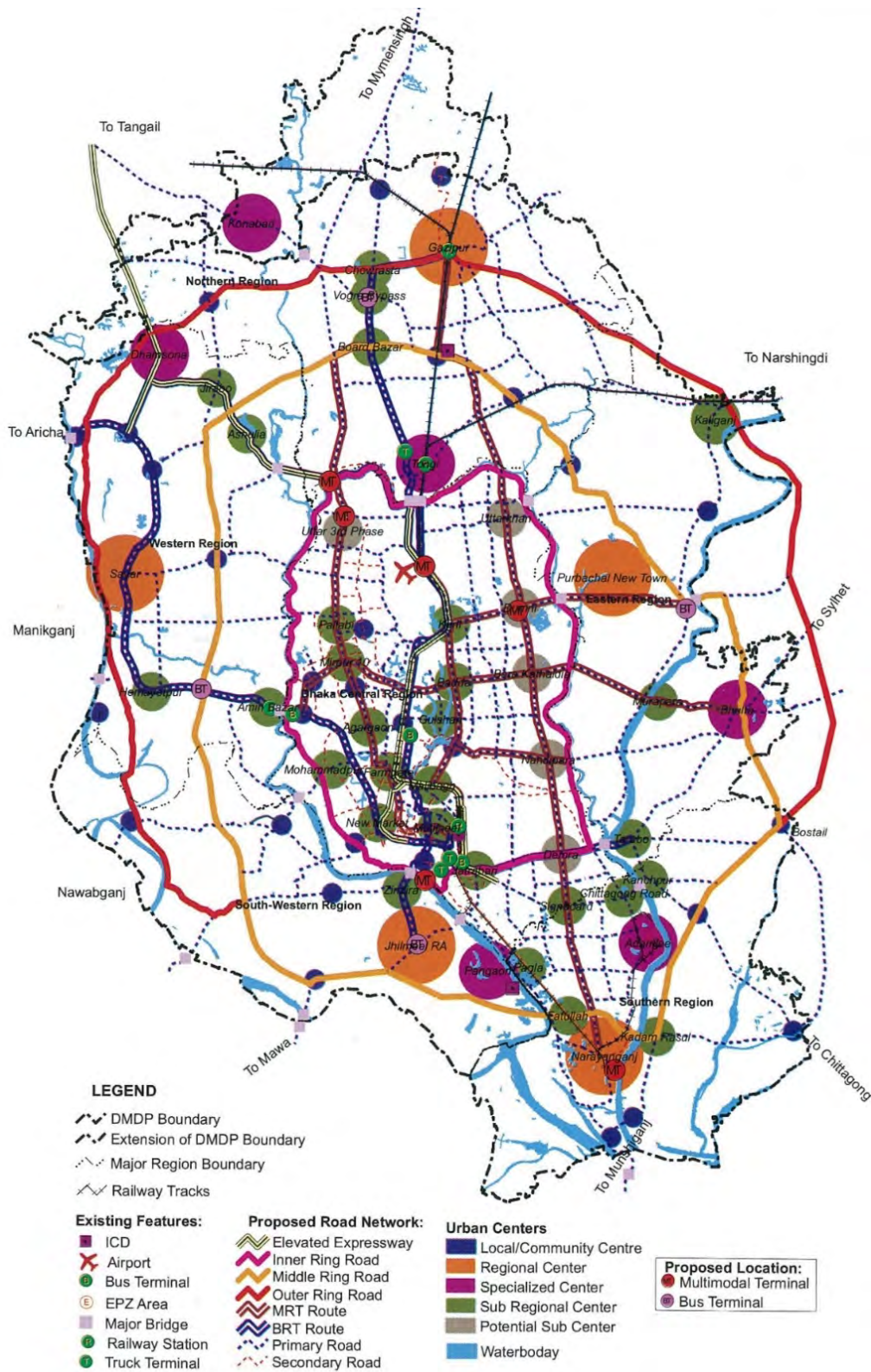
As the above objectives imply, the main theme of the spatial structure is to promote local decentralization. The decentralization of urban functions and services can release the pressure currently experienced by the city. Moreover, the required urban services will be provided nearer to living spaces. Local decentralization will be supported by establishing an urban centre hierarchy within RAJUK area. Designating a hierarchy of urban centres based on the level of service and function will create a structured urban space pattern. These urban centres will be connected to each other through transport corridors. Thus, urban centres with higher importance will be developed along major public transport corridors. In addition, in order to develop the urban centres effectively and efficiently, compact development will be promoted.

The proposed urban hierarchy is shown in Table 6.2 and Figure 6.1.

**Table 6.2 Urban Hierarchy in Regional Development Planning**

Hierarchy	Function/Feature	Location/Area
Core	Central focal point for the entire planning area High density, varied range of housing, sophisticated, high skill and highly paid knowledge-based jobs, full range of business and professional services, historic and landmark public spaces and sites and a destination for national and international art, culture and entertainment	Dhaka City Corporation area
Regional Centre	Function as the capital of each region The focal point of regional development and generally an urban administrative headquarters Provide full range of services. Wide range of economic activity and employment	Other City Corporation Major Pouroshava
Sub-regional/ Major Centre	Major business and shopping centre for its sub-region Supporting local employment Providing goods and services of wide range to meet the local demand	DCC Wards Union Headquarters
Specialized Centre	Centre of economic activities and major employment	Important employment destination such as Dhamsona, Tongi, etc.
Local Centre	Cluster of activities serving local needs Supporting convenience of residents	City Corporation Wards Neighbourhoods Para/Mahallah

Source: Preparation of Regional Development Planning for RAJUK under CRDP (Interim Report, July 2014)



Source: Dhaka Structure Plan 2016–2035(Draft), 2015

**Figure 6.1 Conceptual Structure Plan for RDP Area, 2016–2035**

(3) Assessment of Alternative Urban Growth Scenarios

1) Alternative Urban Growth Scenarios

In order to identify the ideal spatial development direction for the sustainable development of RAJUK area, the following scenarios were developed and evaluated:

**Trend Scenario:** This scenario shows a future urban development situation where in the current trend of urbanization and population continues without significant intervention to the growth of urban areas. Urbanization will progress along arterial roads and in areas adjacent to existing urbanized areas. The future population of RAJUK area will reach to 32.5 million or 203 persons/ha in terms of population density.

**RDP Scenario:** This scenario refers to the future land use and population framework indicated in the RDP. Aiming for a polycentric urban structure, the population will be dispersed into suburban areas. The future population of RAJUK area will reach to 24.5 million or 153 persons/ha.

**RSTP Scenario:** This scenario is the combination of Trend Scenario and RDP Scenario, wherein new suburban areas will be developed comprising housing, business, and shopping areas. Thus, residential areas and workplaces will be put in closer proximity to each other. This concept can help reduce traffic congestion. Selected growth corridors will be developed to connect the CBD and suburban areas. The future population of RAJUK area will reach 25.4 million or 159 persons/ha.

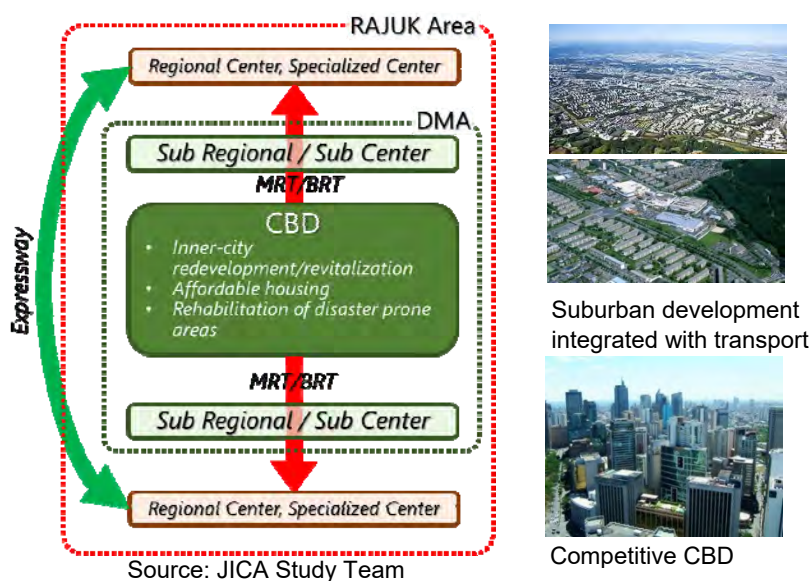
2) RSTP Scenario

Development Concept

The re-development and revitalization of the urban core, as well as the old town (Old Dhaka Area), are occurring mostly due to private sector initiatives. What the government can do is to enhance the transformation by investing in the appropriate infrastructure - transport and other public works, and lowering the barriers against consolidation of small and blighted parcels into a size and scale where aggregation economics would apply.

In the development of new growth centers, it is in the urban fringe where the public sector can probably exert a greater influence. Most of the transport infrastructures in these emerging areas are still not clear, and the complementary services and housing facilities are still not visible. Delineating the future road network, and protecting their right of way, may well be more effective than the current emphasis on land use zoning which is rarely enforced. At the local level, connectivity between subdivisions and other property ventures (which, in practice, gets developed in a fragmented manner) should be the focus.

The core concept is that the region is broadly classified into five clusters as shown in Figure 6.2 which are connected firmly with a strong transport axis. The CBD should remain as the central function area and this should be developed rather than be independent from it. The Regional Center is expected to serve the core for the development of the regional cluster in RAJUK area and should function as an independent city and connect directly to growth centers internationally.



**Figure 6.2 Proposed Spatial and Transport Framework for RAJUK Area**

### Proposed Spatial Structure

The basic concept of the RSTP Scenario is the same as that of the RDP Scenario but with a proposal on several concerns mentioned earlier. Under this scenario, the functions of major urban centers are proposed as follows:

- i **DCC Area (Urban Core):** As the capital of Bangladesh, the DCC area functions as the administrative and economic center which focuses on the service sector. Commercial and business activities can be dispersed in the old and new central business districts (CBDs), such as Motijheel, Tejgaon, Gulshan, and Cantonment. It is expected that Tejgaon Airport would be converted to urban use.
- ii **Purbachal (Regional Centre):** This will be developed as a new town which can provide residential and work spaces, as well as basic public services. Providing workplaces within the new town will show a new concept of urban development.
- iii **Gazipur (Regional Centre):** This will be the regional center in the northern region, providing social and economic services. This will also be the gateway to northern Bangladesh.
- iv **Savar (Regional Centre):** This will be the regional center in the western region. Because several universities, training centers, and research institutes are located in this area, Savar can be the educational center of RAJUK and Bangladesh. The accumulation of R&D centers here can also attract high-tech industries including IT parks. This area is one of the candidate relocation sites for tertiary education facilities currently located in the DCC area;
- v **Jhilmill (Regional Centre):** This will be a bedroom community for people commuting to the DCC area. Its larger residential areas can provide better living environment. Mass transit service will ease the commute from Jhilmill to the DCC area; and,
- vi **Narayanganj (Regional Centre):** This will be the regional center in the southern region. Considering the strategic location of Narayanganj in terms of logistics and the significant number of industrial establishments, it will be an industrial center of the RAJUK area.

Together with major urban centers and considering current urbanization trends and land conditions, the following corridors were identified as growth corridors with high

development potentials. Improvement of connectivity among major urban centers will accelerate the multiplication of urban functions in the RAJUK area.

- East–West Corridor (Purbachal–Savar)
- North–South Corridor (Gazipur–Narayanganj)
- North–South Corridor (Gazipur–Jhilmil)
- Ring Corridor

### 3) Recommended Scenario

The RDP Scenario is the base of the urban development plan, but due to the difficulty of controlling the current trend of development, the RSTP scenario is proposed. This is a combination of the RDP Scenario and the Trend Scenario and is expected to address the above imperfections. The RSTP Scenario will show the strategic development directions, which will be promoted through an efficient transport development. The following are the areas for improvement under the RSTP Scenario:

- Population in the inner core of Dhaka will decrease through decentralization;
- The decreased population of the inner core will be distributed in the eastern fringe and suburban areas along the selected growth corridors. For the distribution in suburban areas, new urban core areas will be emphasized which will become satellite towns and sub-CBDs of the metropolis;
- Industrial facilities in Dhaka’s inner city will be relocated to suburban areas (e.g., Narayanganj and Tongi), considering the government relocation policy and urban redevelopment movements;
- The western part of the RAJUK area will become the educational center and will be expected to generate new types of industry such as IT industry; and
- The trend of population growth in North-west area of RAJUK will be reflected.

### (4) Socio-Economic Framework

The comparison of the three cases of population projection is as follows: the population of RAJUK area by 2025 shows similar numbers; however, the results after 2025 differ greatly. Case C reflects population saturation in RAJUK area, while Case B ignores the population capacity of the area. For GDA, the results are almost the same except for Case B. For areas outside RAJUK, there are small differences among the estimates.

**Table 6.3 Comparison of Population Estimates**

(unit: million persons)

Case	Area	2020	2025	2030	2035
Case A	RAJUK	20.1	23.3	27.1	27.4
	Outside RAJUK	11.1	11.6	12.1	12.5
	Total (GDA)	31.2	34.9	39.2	39.9
Case B	RAJUK	20.6	24.0	27.6	31.3
	Outside RAJUK	10.3	10.9	11.4	11.9
	Total (GDA)	30.8	34.9	39.1	43.2
Case C	RAJUK	20.2	23.2	25.1	26.3
	Outside RAJUK	10.6	10.7	12.0	12.2
	Total (GDA)	30.8	33.9	37.1	38.5

Source: JICA Study Team



Considering the differences among the cases, Case C was selected as the future population framework for the study area. The following further explains the selection:

- i. The differences in the estimates were derived from how to consider the population of RAJUK area. The critical point regarding the population of RAJUK area is that it will nearly be saturated after 2025 and the pattern of population growth will change. Other than Case C, after 2030 the population seems to be rather over the capacity of the area.
- ii. On the contrary, areas outside RAJUK may grow since it can accommodate migration spill-over from RAJUK. Even though the results of estimation do not differ much, Case C gives the largest population estimates among them.

**Table 6.4 Selected Future Population Framework**

(unit: million persons)

Area	2020	2025	2030	2035
RAJUK Area	20.2	23.2	25.1	26.3
Outside Area	10.6	10.7	12.0	12.2
Total (GDA)	30.8	33.9	37.1	38.5

Source: RSTP Estimate

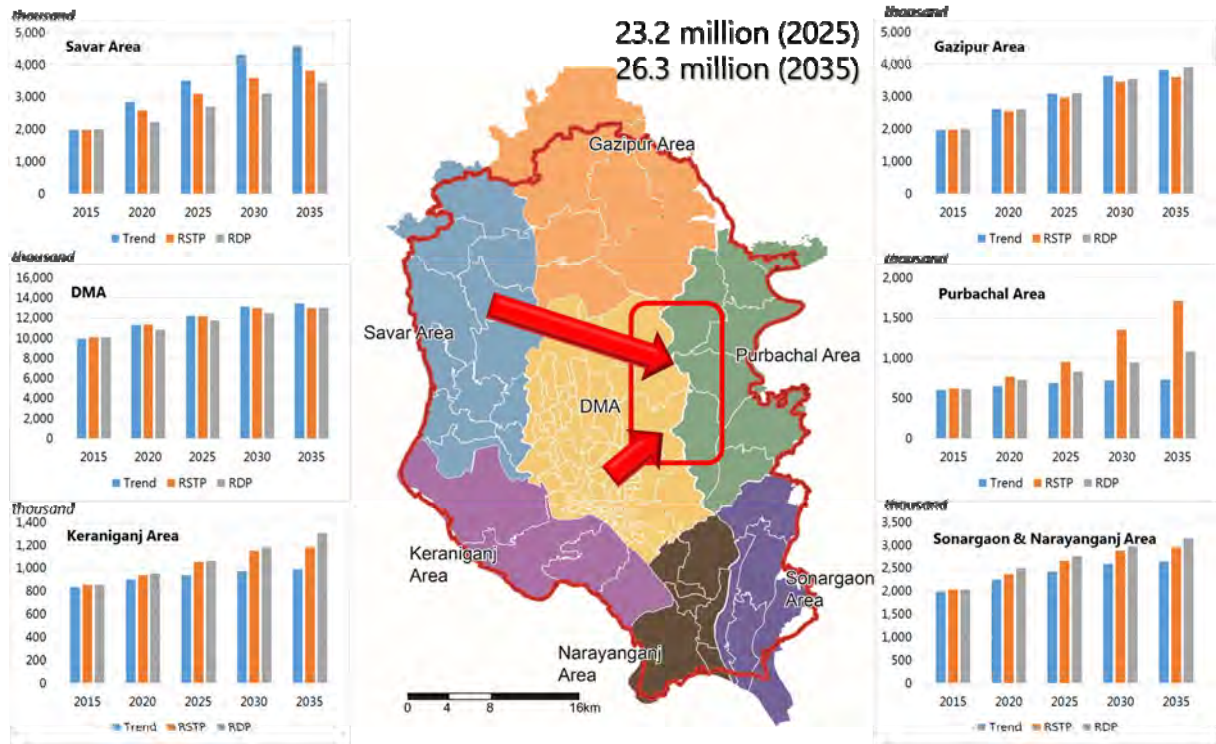
**Table 6.5 Summary of Forecast Population**

(unit: 000 persons)

Area	Case	2015	2020	2025	2030	2035
DMA	Trend	9,934	11,310	12,217	13,143	13,434
	RSTP	10,050	11,361	12,149	12,948	12,959
	RDP	10,066	10,834	11,756	12,461	13,046
Gazipur	Trend	1,969	2,617	3,100	3,642	3,824
	RSTP	1,984	2,554	2,977	3,462	3,603
	RDP	2,003	2,599	3,109	3,551	3,910
Purbachal	Trend	600	655	689	724	734
	RSTP	623	767	950	1,353	1,710
	RDP	614	729	829	948	1,081
Sonargaon +Narayanganj	Trend	1,993	2,250	2,419	2,591	2,645
	RSTP	2,034	2,366	2,654	2,878	2,946
	RDP	2,034	2,497	2,755	2,965	3,153
Keraniganj	Trend	837	897	936	973	985
	RSTP	854	939	1,055	1,151	1,180
	RDP	854	952	1,063	1,181	1,305
Savar	Trend	1,982	2,837	3,513	4,306	4,580
	RSTP	1,975	2,581	3,092	3,591	3,807
	RDP	1,997	2,214	2,694	3,110	3,444

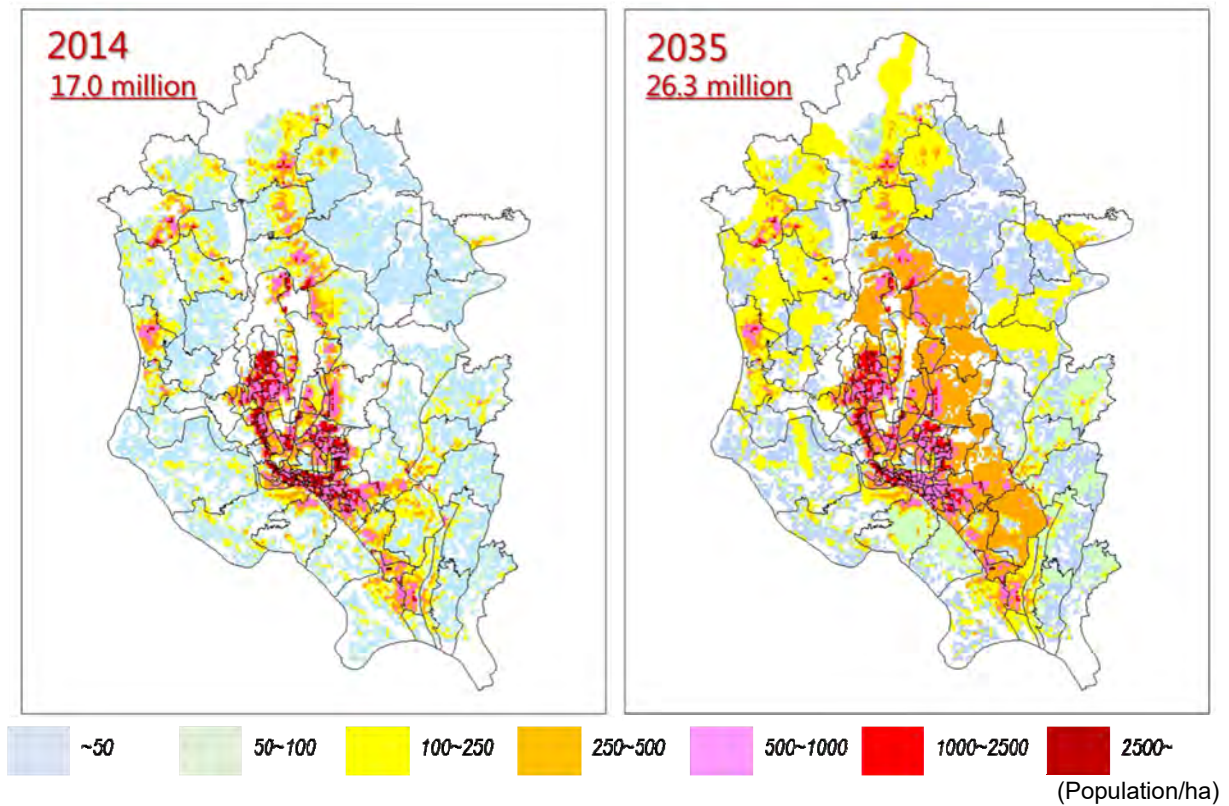
Source: JICA Study Team

The Project on The Revision and Updating of the Strategic Transport Plan for Dhaka (RSTP) Summary



Source: JICA Study Team

Figure 6.3 Population within RAJUK Area by District



Source: JICA Study Team

Figure 6.4 Population Densities within RAJUK Area in 2014 and 2035

1) Employed Population by Industrial Sector

Employed population by industrial sector in 2014, 2025 and 2035 was estimated as shown in Table 6.6. In RAJUK, employed population in primary sector composed of the small portion of the employment. The employed population in the tertiary sector consists of two third of all sectors in RAJUK in 2014 and would be on major industry in 2025 as well as in 2035.

**Table 6.6 Employed Population by Industrial Sector**

Unit: 000 persons

Sector	2014	2025	2035
Primary	150	130	120
Secondary	1,980	3,340	3,900
Tertiary	4,060	6,130	8,180
Total	6,190	9,600	12,200

Source: RSTP Estimate

2) Number of Students and Pupils by Grade of Education

In RAJUK area, more than 90 percent of children go to primary school although school enrolment rate of the low-income group is lower. Income factor affect school enrolment when they are at higher secondary school or in tertiary education level. Tertiary school enrolment among females is lower but secondary school enrolment shows a slightly higher rate than that of males.

The number of students and pupils was estimated based on 5-year age group population and school enrolment rate for male and female by income group. As indicated in Table 6.7, the number of students would increase from 2015 to 2025; however, the number would decrease from 2025 to 2035 due to a decline in the younger population.

**Table 6.7 Forecast Number of Students by Education Level**

Unit: 000 persons

		2015	2025	2035
Primary Education	Male	783	839	797
	Female	770	864	799
	Total	1,553	1,703	1,596
Secondary Education	Male	977	1,134	1,071
	Female	960	1,197	1,061
	Total	1,937	2,330	2,132
Tertiary Education	Male	635	952	916
	Female	436	794	825
	Total	1,071	1,746	1,741
All Types of Schools	Male	2,395	2,924	2,784
	Female	2,166	2,855	2,685
	Total	4,561	5,779	5,470

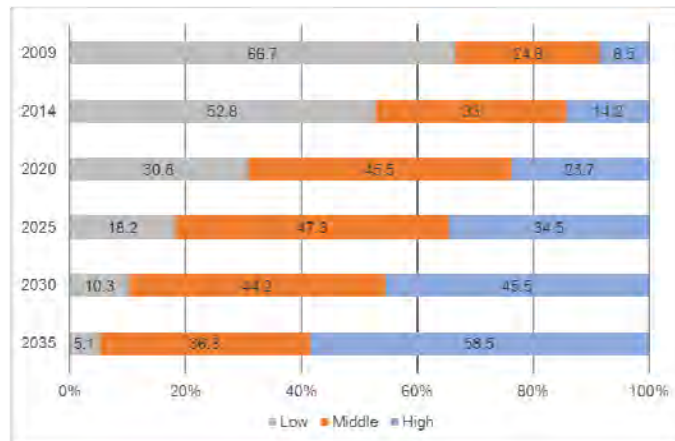
Source: RSTP Estimate

### 3) Gross Regional Domestic Product (GRDP)

Growth of GRDP in RAJUK has been assumed to be 6 percent for the period from 2015 to 2020, 6 percent for the next five-year period of 2020 to 2025. Then it is assumed to decrease to 5 percent for the period from 2025 to 2030. In the final period from 2030 to 2035, it is assumed to be 4 percent.

### 4) Household Income

Household income at real term is assumed to increase in proportion to the GRDP growth and composition of household income group; it has been changed accordingly with the increase of household income. This implies that about 60 percent of households would belong to high income group and their travel characteristics would be those of high income group at present.



Source: RSTP Estimate

**Figure 6.5 Estimated Composition of Income Groups**

## 6.3 Future Traffic Demand

### (1) Number of Trips

As projected, the total production trips within the study area by 2025 and 2035 will be 42 million and 51 million trips per day respectively as shown in Table 6.8. An increase of 13 million trips in 2025 and 22 million trips in 2035 from 2014 due to **population growth**, increasing incomes, higher education participation rates, and so on. The number of production trips from external and special generator zones is likewise expected to increase by triple in 2035 from 2014 due to the projected economic growth.

**Table 6.8 Summary of Number of Trips**

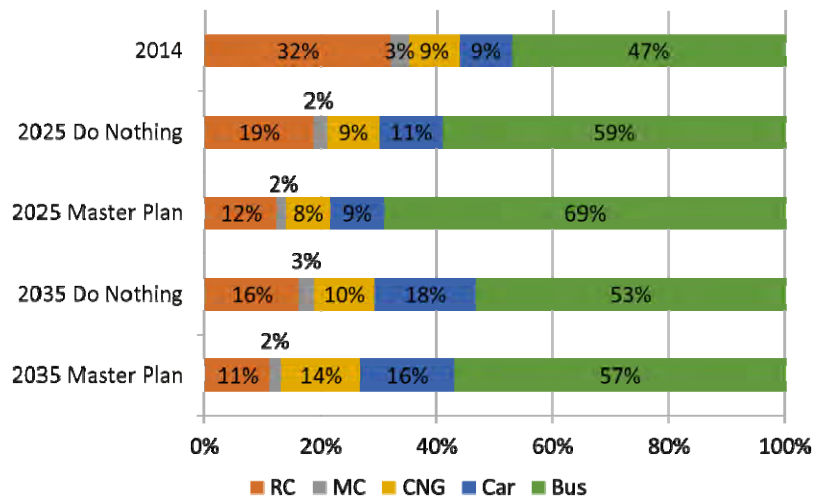
Year	2014 (Trips)	2025 (Trips)	2035 (Trips)
Total Production Trips (From study area, 1-141 zone)	29,824,387	42,702,370	51,179,487
Total Production Trips excluding intra trips (From study area, 1-141 zone)	14,386,514	20,828,071	23,749,687
Total Production Trips from External and Special Generator Zones (142-195 zone)	1,084,430	2,092,189	3,248,398
Assigned Trips	15,470,944	22,920,260	26,998,085

Source: JICA Study Team

(2) Modal Share

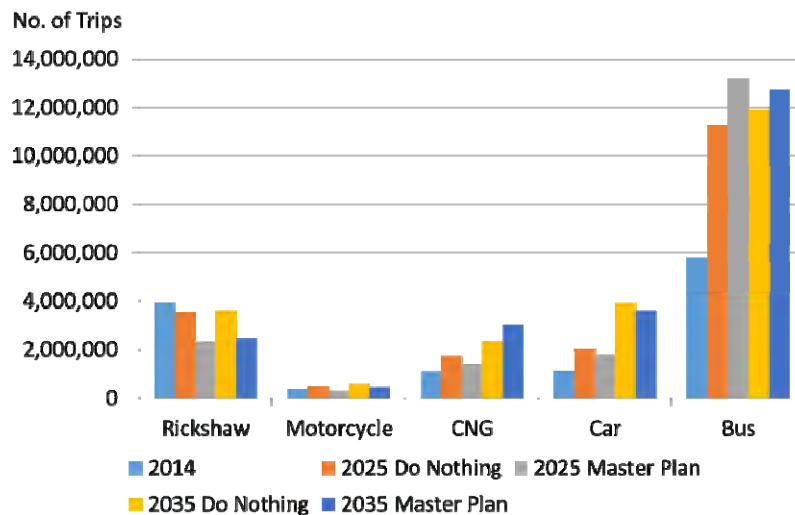
Modal share changes depending on the transport network. As shown in Figure 6.6, the rickshaw share will decrease while the bus share **will increase** at any given case. As per the master plan case in 2035, the bus share can be kept 57% as highest share due to the expansion of MRT and BRT lines. Meanwhile, car share will be expected to double due to upgrading of income.

Figure 6.7 shows the number of inter trips by mode as per each case. As projected, the number of rickshaw and motorcycle trips will be in constant or will show a slight decline while CNG, Car and Bus trips will increase significantly. As a result of increasing trip lengths, walking and rickshaw trips will be converted to other modes, particularly to bus trips. In here, rail trip is also included in bus trip.



Source: JICA Study Team

**Figure 6.6 Modal Share of Intercity Trips in 2025 and 2035**



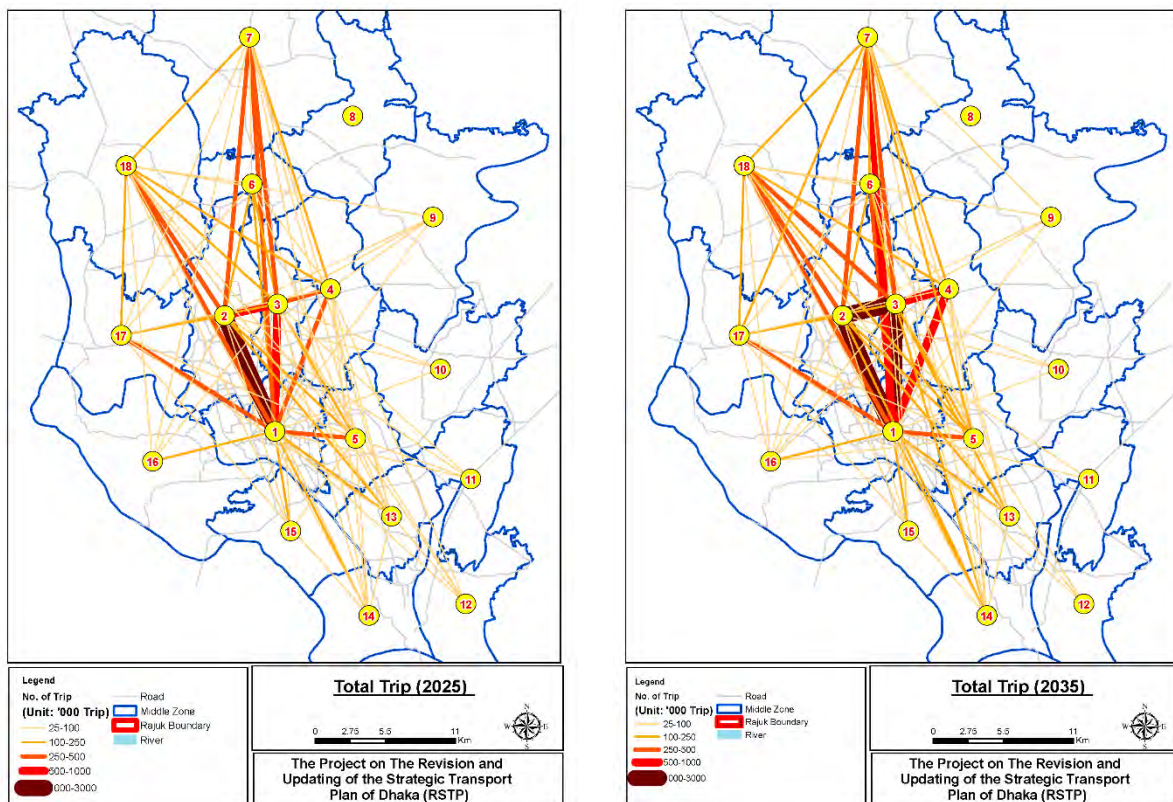
Source: JICA Study Team

**Figure 6.7 Number of Trips by Mode in 2025 and 2035 excluding Intracity Trips**

(3) Desire Line

The desire lines in 2025 and 2035 are presented in Figure 6.8. The trips within the DCC area are estimated to be still in huge number. The corridor between South and West Dhaka in 2035 is the busiest with 2.6 million trips per day, followed by the corridor between West Dhaka and Gulshan with 1.1 million trips and corridor between South Dhaka and Gulshan with 1.0 million trips.

The trips between DCC area and surrounding area will increase rapidly such as 0.6 million trips between South Dhaka and Gazipur, 0.5 million trips between Gulshan and Gazipur and 0.4 million trips between South Dhaka and North Savar. These are the result of an urban expansion to north and north-east direction.



Source: JICA Study Team

**Figure 6.8 Desire Lines in 2025 and 2035**

## 7. URBAN TRANSPORT NETWORK DEVELOPMENT SCENARIO

### 7.1 RSTP Overall Transport Development Policy

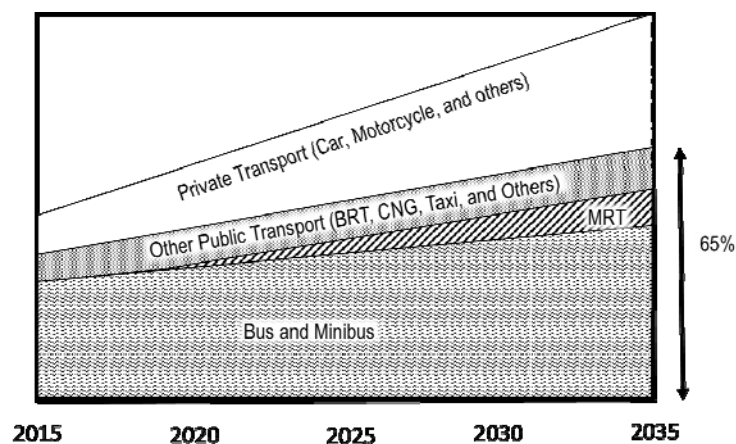
#### (1) Goal

A bleak future can be expected for the study area, without making some strategic interventions. Over-utilization of private cars is not tenable in a conurbation of nearly 10 million inhabitants with heightened expectations, active social lives, and diversified activities. An aging urban population will also demand a different quality of transport services. Dhaka of the future should be livable as well as globally competitive and attractive for industries, leading Bangladesh's international trade, and the transport sector must be designed to make this a possibility. The overall goal of urban transport is the following:

“Ensure mobility and accessibility to urban services that are vital for the people and the society, by providing a transport system characterized by safety, amenity, and equity and sustained by an efficient public transport system”

A combination of supply-type and demand-type policies is required to maintain the present advantage of high modal share of more than 65%.

It should be noted that the modal shift is indicative (Figure 7.1). If at least the 60% share for public transport is not maintained, the resulting plan would overestimate the requirement for bus-rail capacity, but underestimate vehicular volume on roads, thereby affecting feasibility of many road projects.



Source: JICA Project Team

**Figure 7.1 Indicative Target for Modal Share for 2035**

#### (2) Objectives and Strategies

The overall goal has been developed into eight specific objectives and strategies, as follows:

##### A. Promotion of Social Understanding about Urban Transport Problems and Issues

- A1. Conduct of consecutive transport campaigns;
- A2. Expansion of transport education;
- A3. Strengthening of transport studies;
- A4. Information Disclosure

**B. Effective Management of Urban Growth and Development**

- B1. Policy coordination within metropolitan area;
- B2. Integration of urban development M/P and urban transport M/P;
- B3. Development of hierarchical road network and road classifications to guide design (and parking provision);
- B4. Promotion of integrated urban and transport development, particularly Transit-Oriented Development (TOD);
- B5. Guidance for ideal urban development.

**C. Promotion and Development of Attractive Public Transport**

- C1. Development of a hierarchal mass transit system;
- C2. Early introduction of an integrated public transport system in the effort to maintain public transport share;
- C3. Development and improvement of bus transport system, including reform of management systems and the business model;
- C4. Exploitation of para-transit and NMVs;
- C5. Exploitation of water transport system;
- C6. Promotion of public transport use and expansion of services;
- C7. Providing an Affordable Public Transport system.

**D. Efficient Traffic Control and Management**

- D1. Establishment of comprehensive traffic management system balanced with better facilities for essential NMT modes such as cycling and walking;
- D2. Strengthening of traffic regulation, enforcement and management;
- D3. Management of freight transport;
- D4. Establishment of parking policy and controls;
- D5. Development of well-coordinated traffic control system.

**E. Effective Transport Demand Management (TDM)**

- E1. Integrating urban development and transport (TOD);
- E2. Providing efficient public transport alternatives;
- E3. Regulating motorized vehicle access and proper charging of road use and parking.

**F. Comprehensive Development of Transport Space and Environment**

- F1: Management of transport corridors;
- F2. Improvement of a safe transport environment for pedestrians and cyclists;
- F3. Redistribution of transport space and improvement of traffic environment in the city center;
- F4: Alleviation of air pollution;
- F5. Establishment of township transport development strategy

**G. Enhancement of Traffic Safety**

- G1. Establishment of traffic safety audit system;
- G2. Elimination of traffic accident black spots;
- G3. Improvement of licensing and vehicle inspection system;
- G4. Strengthening of traffic enforcement system;



G5. Strengthening of first aid response system

H. Strengthening of Transport Sector Administrative and Management Capacities

H1. Strengthening of transport- related organizations;

H2. Promotion of private sector participation;

H3. Improvement of infrastructure development and management system

H4. Strengthening of planning and management capacity;

H5. Securing of development funds.

(3) Main Features of RSTP

RSTP has identified a series of transport development policies as stated above. The major features of the Master Plan exist are the following:

1. Strengthening of Public Transport: development of sustainable public transport system, taking advantage of the present high share of public transport trips.
2. Improvement of Regional Competitiveness of the City: Construction of Efficient Transport System that supports 10-million multi-core hub city.
3. Realization of Well-managed Environment-friendly City: introduction of innovative institutional/operational schemes that enables world-class transport integration with living environment.
4. Adoption of Immediate Congestion Mitigation Measures: implementation of less expensive measures against traffic congestion that brings quick outcome.

The interrelationships between these features and the identified policies are illustrated below.



Source: JICA Project Team

Figure 7.2 Major Features and Policies of RSTP

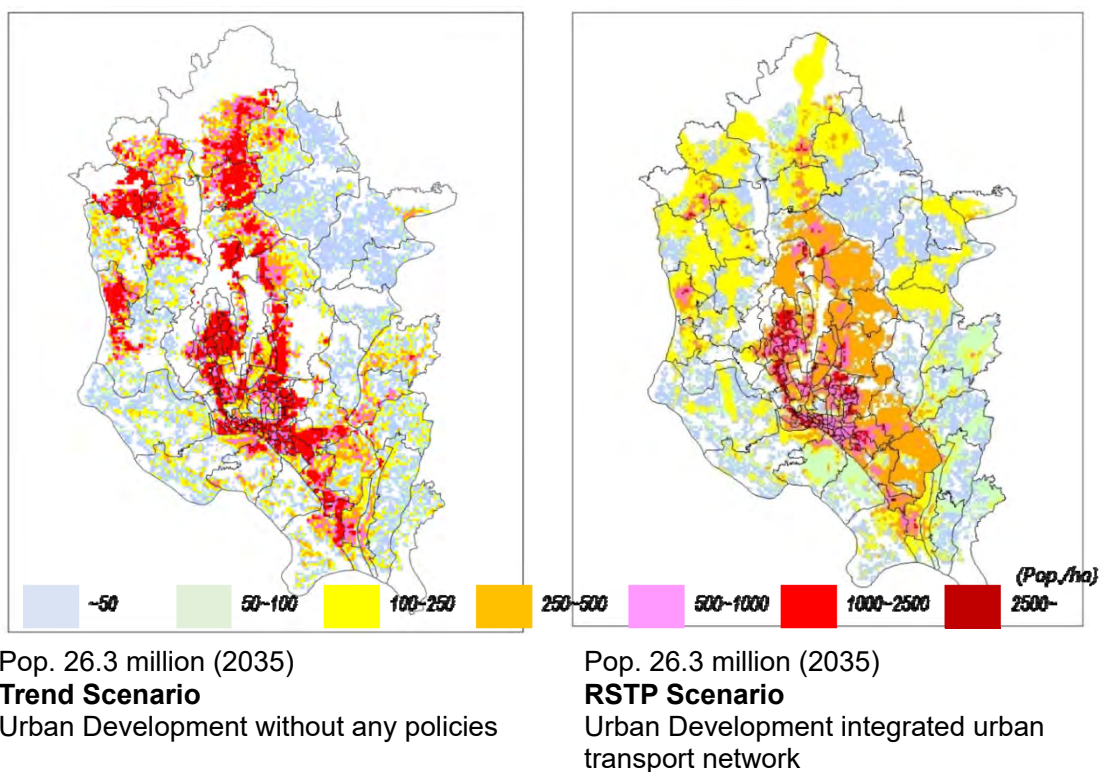
## 7.2 Land Use and Transport Integration

### (1) General Concept

RAJUK area has its own spatial plan, known as the “Regional Development Plan” (RDP). It is an urban structure development plan, showing the future urban structure and land use supported with a population framework. The said plan promotes a polycentric urban structure moving outward in all directions from the existing CBD. However, the actual urban development that takes place differs from those indicated in the RDP. The developments are heading towards the north and northwest of the city along the existing primary roads. Further densification of the existing built-up areas is also notable.

It is also noticeable that the transport and land use are closely interactive. This is a common situation in developing cities where land use control is not careful or strict enough, and the direction and pattern of urban development are greatly affected by the availability of transport infrastructure especially roads. This project aims to assist the city to manage its future growth and progress more effectively through the integrated planning of transport and urban development. The project area addresses to this trend and needs to establish a pragmatic strategy to manage the fast-growing urban areas.

The foundation of urban development is the transport infrastructure, as development takes place; it affects the transport facilities such as roads, MRT, and terminals. Roads provide important space for urban utilities such as water supply, drainage, electricity, and telecommunications, as well as a venue for the various activities of the people, opportunities for disaster prevention and improved landscape. Efficient transport system is critical in linking Dhaka to international gateways for trade and tourism, and at the same time to integrate it with other districts in Bangladesh thereby creating synergy from the growth and development being experienced in both areas.



Source: JICA Study Team

**Figure 7.3 Population Density of Trend Scenario and RSTP Scenario**

## (2) RSTP Concept

A public-transport-oriented city cannot be realized solely by introducing mass transit as a mode of transportation; it must also be associated with effective integrated urban areas and a corresponding shift of lifestyle of the people. Key considerations must be given to the following:

### 1) Integrated Urban Development

Land use and urban development must be reorganized along the mass transit corridors in a way that socio-economic activities are more effectively articulated with mass transit. This requires a review of the existing urban master plan which is rather road-transportation-based and infrastructure **development** to promote suburbanization and reduction of population density in the CBD.

- Satellite Regional Centers are connected with Urban Core by MRT/BRT
- Each Satellite Regional Center is connected by Regional Highways

Traffic management needs to be implemented in CBD urgently **for** (to meet up) increasing demand of private modes.

### 2) Adequate Role-sharing with Other Public Transport

Feeder transport, including buses, mini buses, CNG, rickshaws, and others, is also an equally important mode as the society becomes affluent and demands diversify. And those feeder public transport modes are also important services to mass transit systems.

## 7.3 Roads

The main principles to be considered are as follows:

- (a) Segregate interprovincial and urban transport: Interprovincial transportation must be segregated from urban transportation to prevent heavy traffic from passing through the city. Adequate interface between these two types of traffic must be provided at the peripheries of urban areas along the ring road which will be an access-controlled; semi-expressway provided with interchanges/flyovers at major intersections.
- (b) Establish clear ring and radial road systems: Urban roads must be developed in a hierarchical manner, i.e. primary, secondary, and tertiary, wherein the primary and secondary road networks must be in good condition. The primary road system, comprising clearly defined ring roads and radial roads, must be completed. The secondary road network should likewise be developed to distribute traffic to all urban areas efficiently.
- (c) Establish more effective mechanism for at-grade road development: Tertiary and lower-level roads must likewise be developed based on detailed local plans and together with urban development control measures. Developers must provide roads or road space as they are specified in the plan.

A proper road network contributes to the efficient development of an urban area. Since road network would play an essential role in various urban activities, road network plan should be developed based on comprehensive views such as: area potential, land use condition and space and environmental conditions besides the transport plan. The road network plan of RSTP has principally taken into account network pattern, road hierarchy, and road density in the process of developing the road network plan.

## **7.4 Public Transport**

### **(1) Development of MRT/BRT System**

The potential roles of the MRT/BRT system in Dhaka are manifested in two ways. One, it forms the backbone of the public transport system by providing efficient and high-quality services. Two, it promotes a more effective urban growth and land use through the integrated development of transport and urban development. MRT/BRT system development is a critical determinant of the future urban growth and the realization of a public transport-based city. Key principles to be considered are as follows:

- Define clearly the role and capability of Bangladesh Railway:
- Develop rapid mass transit system:
- Establish sustainable mechanism to develop MRT/BRT network:

### **(2) Strengthening of Bus Transport System**

Buses are and will be the most important mode of public transportation system in Dhaka. Although urban rail is expected to play a major role in the future, its coverage will be limited and many corridors and areas will remain unserved because it requires lengthy time and huge costs for construction of such system. Buses also provide important feeder services for the MRT/BRT. The major planning principles should be as follows:

- Develop an integrated and attractive bus system
- Establish a sustainable bus operation and management system
- Provide adequate environment

## **7.5 Traffic Management and Safety**

### **(1) Traffic Engineering Approach**

Travel time has increased due to congestion at bottlenecks and traffic accidents have become a serious social problem. With the expected increase in the number of vehicles in the study area in the coming years, traffic congestion will become severe. Simply constructing new roads or widening existing ones cannot solve this problem, even if funds are available. Dhaka can also not afford to keep converting lands into roads. This situation needs greater reliance on a more efficient use of the existing road network. To achieve this, and to realize an efficient and safe traffic, proper traffic management plays a very vital role.

The objectives of traffic management are twofold: (i) enhance mobility, accessibility, and safety, and (ii) support public transportation for better and effective services. These objectives can be achieved through the traffic management process.

### **(2) Traffic Management Process**

Traffic management process is an ordered group of related tasks and activities performed sequentially and repetitively to solve or alleviate traffic problems. Traffic conditions are not a static phenomenon; they gradually change over time with more motorcycles and cars joining the traffic and with the road network improving and expanding. Thus, it is important to establish a mechanism in which the traffic

management process can be regularly re-examined to cope up with the changes in traffic.

It normally starts with the identification of traffic management problems and issues. The cause of problem is then analyzed based on the data collected and a solution is formulated, which may include a hard component, like intersection geometry improvement or signal installation, and a soft component such as traffic discipline campaign or stricter enforcement. Since any traffic improvement measure will incur cost, it must first be estimated and the budget must be secured before implementation. It is important to review the results of the measures to determine their effectiveness and to accumulate experiences and knowledge.

### (3) Classification of Traffic Management Measures

There are a variety of traffic management measures. Some of them are intended to improve efficiency, while others aim to enhance safety. Table 7.1 lists them by applicable area. It is noted that one measure can be applied to intersection, corridor, or area. Moreover, most of the measures can be applied in combination with other measures to get maximum benefits.

**Table 7.1 Classification of Traffic Management Measures**

Area	Category	Measures
Intersection	Geometric Improvement	· Geometry, island, channelization, median, lane assignment · Wheelchair slope
	Signal	· New signal · Signal phase and timing updating · Flasher
	Marking	· Stop line, pedestrian crossing, lane line, directional arrow
	Regulation	· Turning restriction
	Public transit	· Transit signal priority · Exclusive bus lane at approach · Exemption of left turn ban
	Others	· Curve mirror, lighting
Corridor	Segregation	· Median, separator
	Pedestrian	· Mid-block pedestrian crossing
	Sidewalk	· Widening, guardrail, pavement, tree & plant
	Pavement marking	· Lane line, mid block pedestrian crossing,
	Regulation	· One-way, speed limit, truck ban, no parking, pedestrian mall, transit mall · Reversible lane
	Demand management	· Exclusive/priority bus lane · High occupancy vehicle (HOV) lane
	Sign	· Regulatory sign, guide sign
	Parking	· No parking, paid parking, free parking
	Public transit	· Exclusive/priority bus lane · Contra-flow bus lane
Others	· Street lighting	
Area	Demand management	· Traffic cell · Pedestrian mall, transit mall · Road pricing · Truck ban
	Signal	· Area traffic control (ATC) system
	Information	· Traffic information system · Parking guidance system
	Regulation	· School zone

Source: JICA Study Team.

## 7.6 Financing Capacity of the Government for Investment in the Transport Sector

The Study Team estimated the GDP growth rate in the near future and long term which is shown in the following table. Real GDP growth rate until 2020 is assumed to increase gradually based on the increased population/work force and capital stock but the political unrest is expected to occur regularly and so the figures are conservatively estimated.

**Table 7.2 GDP Growth Projections**

Unit: Billion Taka

	2014–15	2016	2017	2018	2019	2020	2030	2050
GDP growth rate	6.1%	6.5%	6.8%	6.8%	6.8%	6.9%	6.7%	6.0%
nominal GDP	13,395	14,342	15,356	16,442	17,605	18,763	30,768	68,230
GDP deflator index	200	214	229	245	262	279	455	996
real GDP	6,698	7,133	7,618	8,136	8,689	9,289	17,766	56,979

Source: JICA Study Team estimation based on IMF and GOB data.

### (1) Projection of revenue and development expenditure

Based on the above projected GDP, future revenues and expenditures were estimated assuming two scenarios.

#### Case1: Current rate of revenue collection (base scenario)

It is assumed that the tax revenue collection keeps the same rate in the future in case 1. In this case the basic assumptions are as follows.

- i. Ratios of Revenue, Development expenditure and Annual Development Plan budget to GDP is the value in 2014–15 projected by Bangladesh Government as follows.
  - Revenue: 14%
  - Tax revenue: 11%
  - Development expenditure: 6.4%
  - Annual Development Plan: 6.0%
- ii. Percent of GDP of budget for infrastructure investment from ADP is the actual figure during Sixth Five Year Plan and the target value of Seventh Plan. Actual annual average is 2.2% during Sixth Plan and it is assumed to make a small increase following Seventh Plan target which is 4.0%. However, it will not be able to reach the target annual average since the revenue will not be enough to increase the development expenditure.

**Table 7.3 Revenue and Expenditure Projections (Case 1)**

Unit: Billion TDB

Item	2014–2015	2016	2017	2018	2019	2020	2030	2050
GDP growth rate	6.1%	6.5%	6.8%	6.8%	6.8%	6.9%	6.7%	6.0%
nominal GDP	13,395	14,342	15,356	16,442	17,605	18,763	30,768	68,230
GDP deflator index	200	214	229	245	262	279	455	996
real GDP	6,698	7,133	7,618	8,136	8,689	9,289	17,766	56,979
Revenue	1,875	2,008	2,150	2,302	2,465	2,627	4,307	9,552
% of GDP	14%	14%	14%	14%	14%	14%	14%	14%
tax revenue	1,473	1,578	1,689	1,809	1,937	2,064	3,384	7,505
% of GDP	11%	11%	11%	11%	11%	11%	11%	11%
Development expenditure	857	918	983	1,052	1,127	1,201	1,969	4,367
% of GDP	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%
ADP among Development expenditure	804	861	921	987	1,056	1,126	1,846	4,094
% of GDP	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Infrastructure among ADP	295	430	461	493	528	563	923	2,047
% of GDP	2.2%	3%	3%	3%	3%	3%	3%	3%

Source: JICA Study Team

**Case2: Increase in tax revenue (optimistic scenario)**

Case 2 assumes that tax revenue collection rate will increase gradually through the efforts of the government. The assumed percentage of GDP of revenue, expenditure and budget are shown in the following table. It is assumed that in accordance with the percentage of GDP of revenue, development expenditure including budget of ADP and infrastructure development will increase. GDP growth rate projection is the same as Case1.

In this case, it is assumed that the collection rate will increase by 10% in 2016 and by 20% after 2017 until 2020. In 2030, the rate will rise to 18% (30% increase) and in 2050 19% (35% increase). As for the infrastructure investment from ADP, the percentage of GDP will start from 2.2% in 2015 and the target figure, 4% will be attained during the Seventh Plan.

However, for this scenario, the government's efforts to increase tax collection, improve public finance management and to implement projects is without delay.

**Table 7.4 Revenue and Expenditure Projections (Case 2)**

Unit: Billion TDB

Item	2014–2015	2016	2017	2018	2019	2020	2030	2050
GDP growth rate	6.1%	6.5%	6.8%	6.8%	6.8%	6.9%	6.7%	6.0%
nominal GDP	13,395	14,342	15,356	16,442	17,605	18,763	30,768	68,230
GDP deflator index	200	214	229	245	262	279	455	996
real GDP	6,698	7,133	7,618	8,136	8,689	9,289	17,766	56,979
Revenue	1,875	2,151	2,611	2,795	2,993	3,190	5,538	12,964
% of GDP	14%	15%	17%	17%	17%	17%	18%	19%
tax revenue	1,473	1,721	1,996	2,138	2,289	2,439	4,307	10,234
% of GDP	11%	12%	13%	13%	13%	13%	14%	15%
ADP among Development expenditure	857	1,004	1,229	1,315	1,408	1,501	3,077	6,823
% of GDP	6.4%	7.0%	8.0%	8.0%	8.0%	8.0%	10.0%	10.0%
ADP	804	932	1,075	1,151	1,232	1,313	2,461	5,458
% of GDP	6.0%	6.5%	7.0%	7.0%	7.0%	7.0%	8.0%	8.0%
Infrastructure among ADP	295	574	614	658	704	751	1,231	2,729
% of GDP	2.2%	4%	4%	4%	4%	4%	4%	4%

Source: JICA Study Team

(2) Investment for transport sector

According to the Strategy for Infrastructure Sector for Seventh Five Year Plan, transport sector accounts for about 23% of total ADP in 2015 which has been increasing from around 15%. The rate is assumed to keep the same level for a few years and gradually decrease with the range between 15% and 20%. Annual budget for transport sector among ADP based on the assumption is summarized in the following table. In 2015, the budget is twice as the ADP expenditure in 2014, 91.85 billion TDB. In the case of optimistic scenario, it will reach 328 billion TDB in 2020.

**Table 7.5 Projected Budget for Transport Sector**

Unit: Billion TDB

	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2030-2050	2050-
% of ADP	24%	24%	25%	25%	25%	25%	20%	20%
Case1	185	207	221	247	264	281	369	819
Case2	185	224	258	288	308	328	492	1,092

Source: JICA Study Team

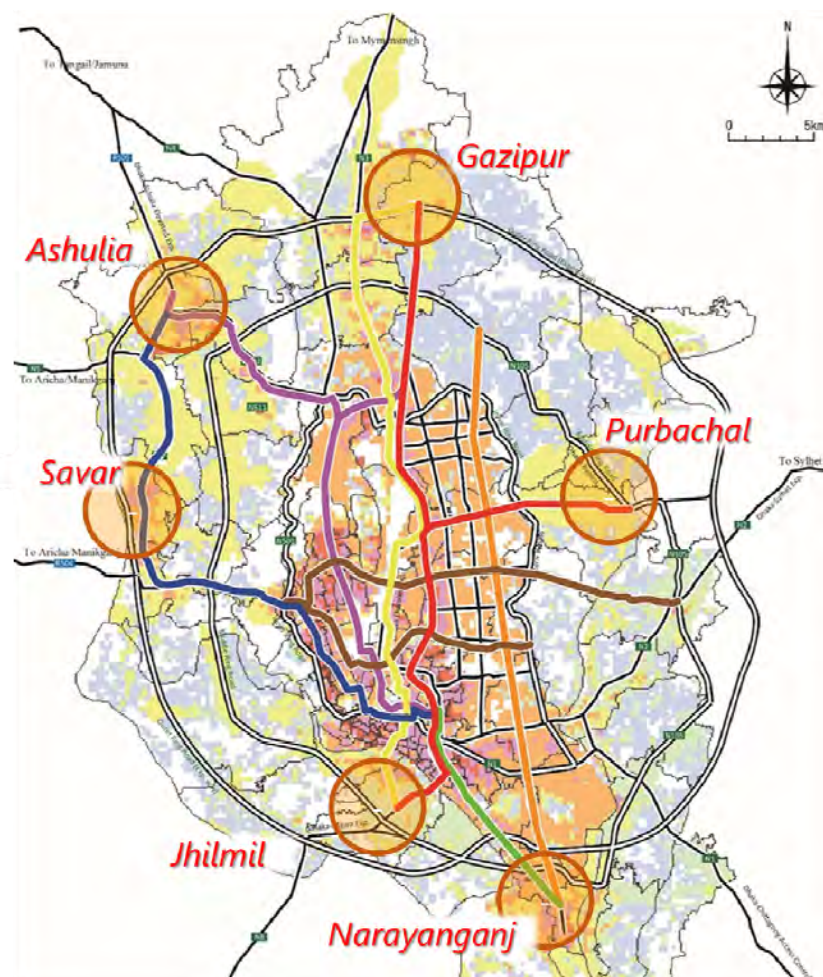


## 8. FORMULATION OF THE URBAN TRANSPORT MASTER PLAN

### 8.1 Development of the RSTP Urban Transportation Master Plan

The RSTP urban transportation network plan was developed based on a review and a modification of the STP network plan. The main points of the modification or adoption of the STP network master plan are as follows:

- i. Harmonization with future urban structure, land-use plan and development of network plan.
- ii. The supply of road space is in accordance with the network development strategy based on road hierarchy and level of demand.
- iii. RSTP retains the basic concept of STP.
- iv. Coordination of the highway network with public transportation development.
- v. Use of existing and future road space for the most efficient modes of transportation, such as MRT and BRT.
- vi. Prioritization of the CBD and immediate improvement of the urban environment.
- vii. Fully taking account of potential development areas and their need for efficient transportation systems, both public and private.



JICA Study Team

Source:

**Figure 8.1 RSTP, Urban Transport Master Plan**

## 8.2 Road Network Development Plan

### (1) Concept of “3 Rings and 8 Radials” Network System

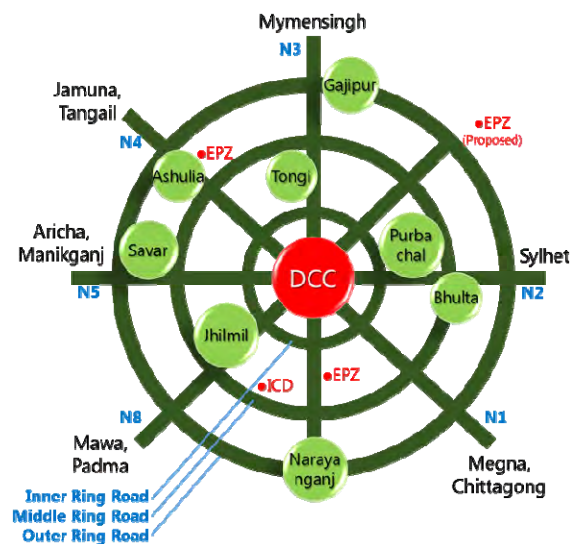
To alleviate excess concentration of population and industry in the Dhaka Metropolitan Area, measures of decentralization of city functions must be promoted in order to relieve overcrowding that will eventually improve the quality of life of urban residents and develop businesses in peripheral areas.

These measures will contribute in the reduction of commuting time and will alleviate traffic congestion while at the same time creating a balanced urban environment. A key measure is the development of ring and radial road network.

Ring and Radial road network provides the following two functions:

- i. Reduce through traffic and disperse incoming and outgoing traffic
- ii. Support the development of an optimal urban environment by creating independent urban spheres through the connection of core centers.

Figure 8.2 illustrates the concept of “3 Rings and 8 Radials” road network in RAJUK area. Satellite regional centers and specialized centers are connected by “Rings and Radials” Network System.



Source: JICA Study Team

**Figure 8.2 3 Rings and 8 Radials Road Network System in RAJUK Area**

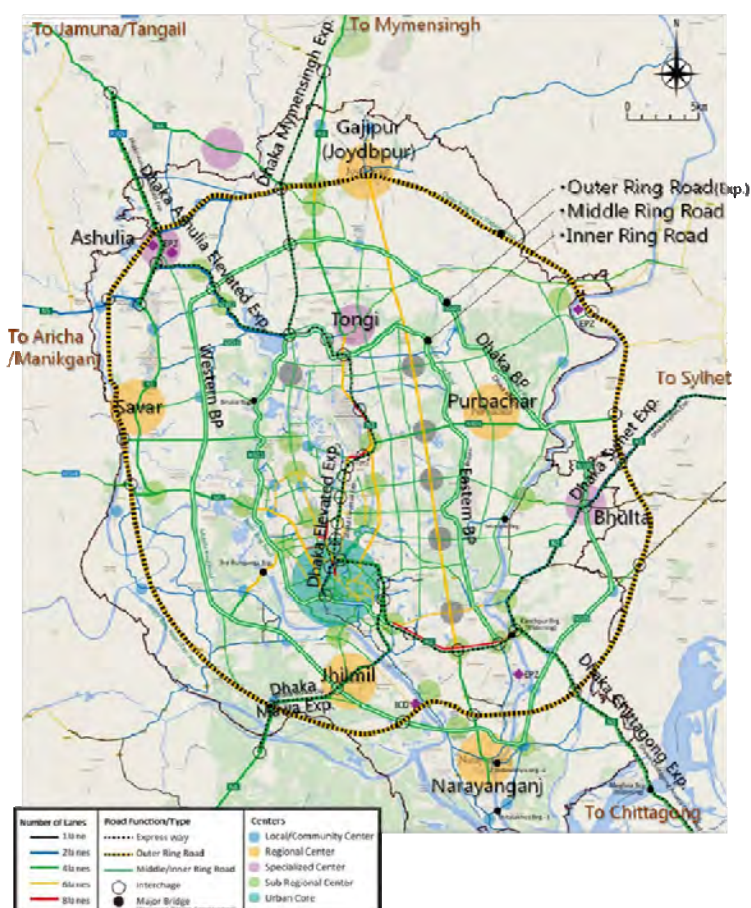
### (2) Road Network Develop in RAJUK area

Figure 9.3 illustrates the proposed future road network in RAJUK area based on “Planning Concept for Road Network Development.” The proposed network has also taken into account the road projects in STP, currently on-going projects, future projects proposed by the relevant authorities.

### (3) Proposed Road Development Projects

#### 1) Proposed Road Project List and Preliminary Cost

Table 8.1 shows the summary of proposed road development projects. The detailed road projects are described and listed in Figure 8.4.



Source: JICA Study Team

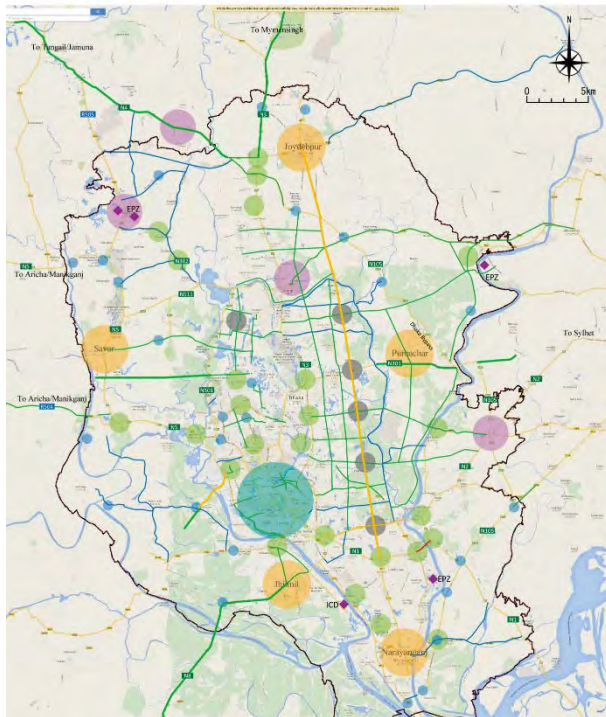
**Figure 8.3 Proposed Road Network in RAJUK area**

**Table 8.1 Proposed Road Development Projects (Summary)**

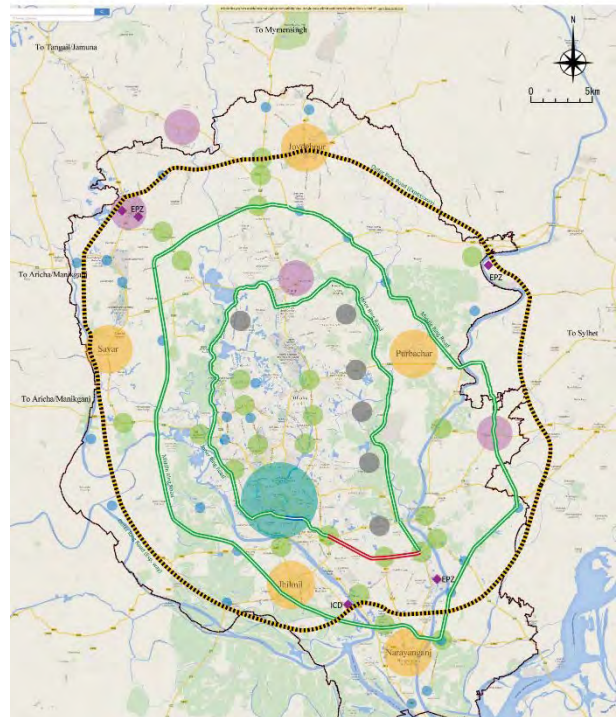
Project Component	Length (km)				Project Cost (BDT, Crore)
	Total	New Road	Widening	Completed	
Expressway	126	126	0	0	31,042
1.1 Dhaka Elevated Expressway	20	20	0	0	8,940
1.2 Dhaka Ashulia Elevated Expressway	38	38	0	0	13,654
1.3 Dhaka Chittagong Expressway	16	16	0	0	1,501
1.4 Dhaka Sylhet Expressway	16	16	0	0	795
1.5 Dhaka Mawa Expressway	18	18	0	0	5,169
1.6 Dhaka Mymensingh Expressway	19	19	0	0	983
Ring Roads	310	208	98	4	35,335
2.1 Inner Ring Road	73	31	38	4	11,319
2.2 Middle Ring Road	108	48	60	0	4,065
2.3 Outer Ring Road	129	129	0	0	19,951
Primary Roads	290	65	225	0	10,984
Secondary Roads	471	185	286	0	18,962
Total	1,198	585	609	4	96,324

Source: JICA Study Team

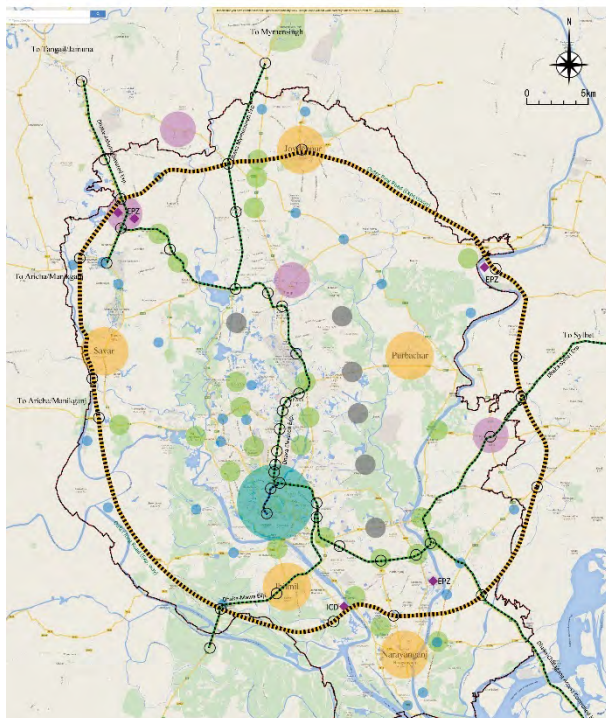
# The Project on The Revision and Updating of the Strategic Transport Plan for Dhaka (RSTP) Summary



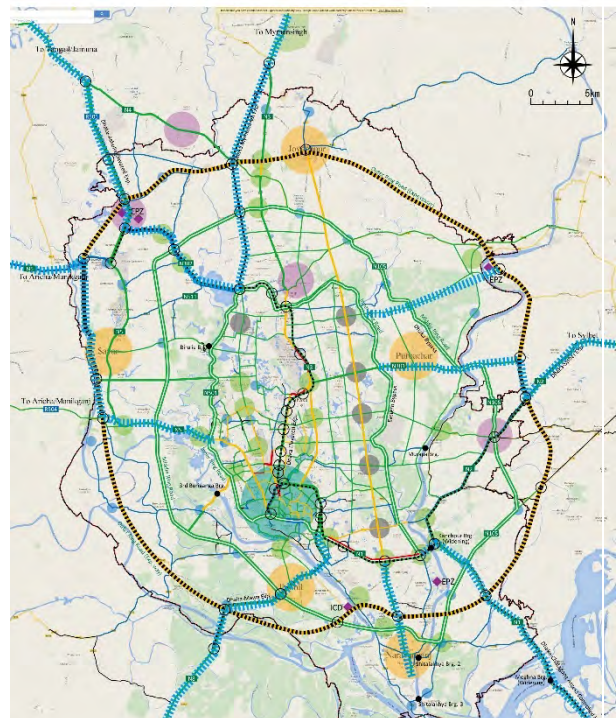
Primary and Secondary Roads



Ring Road



Expressways including Outer Ring Road



Radial roads

Number of Lanes	Road Function/Type	Centers
1 lane	Express way	Local/Community Center
2 lanes	Outer Ring Road	Regional Center
4 lanes	Middle/Inner Ring Road	Specialized Center
6 lanes	Interchange	Sub Regional Center
8 lanes	Major Bridge (Proposed/Under Construction)	Potential Sub Center
		Urban Core

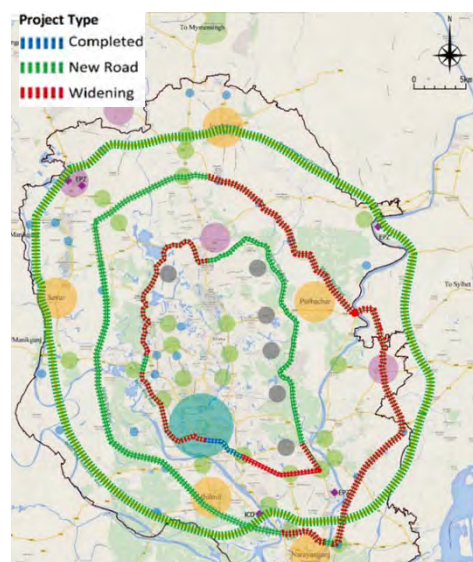
Source: JICA Study Team

Figure 8.4 Proposed Road Networks

## 2) Current Construction Status of Ring Roads

Three kinds of ring roads are proposed in the RSTP. The alignment of inner ring road is along the Balu River and the Buriganga River, located inside current urban area, while the alignment of middle ring road shares with the Dhaka Bypass Road and the outer ring road is a newly proposed alignment which falls along the boundary of RAJUK area.

	Inner Ring Road	Middle Ring Road	Outer Ring Road
Completed	4.0km (5.5%)	0.0	0.0
Widening/ Improvement	38.2km (52.2%)	59.9km (55.5%)	0.0
New Road	31.0km (42.3%)	48.1km (44.5%)	129.0km (100.0%)
Total	73.2km (100.0%)	108.0km (100.0%)	129.0km (100.0%)



<sup>1</sup> As of 2015  
Source: JICA Study Team

**Figure 8.5 Current<sup>1</sup> Construction Status of the Three Ring Roads**

### (4) 2014 and 2035 Road Network Performance

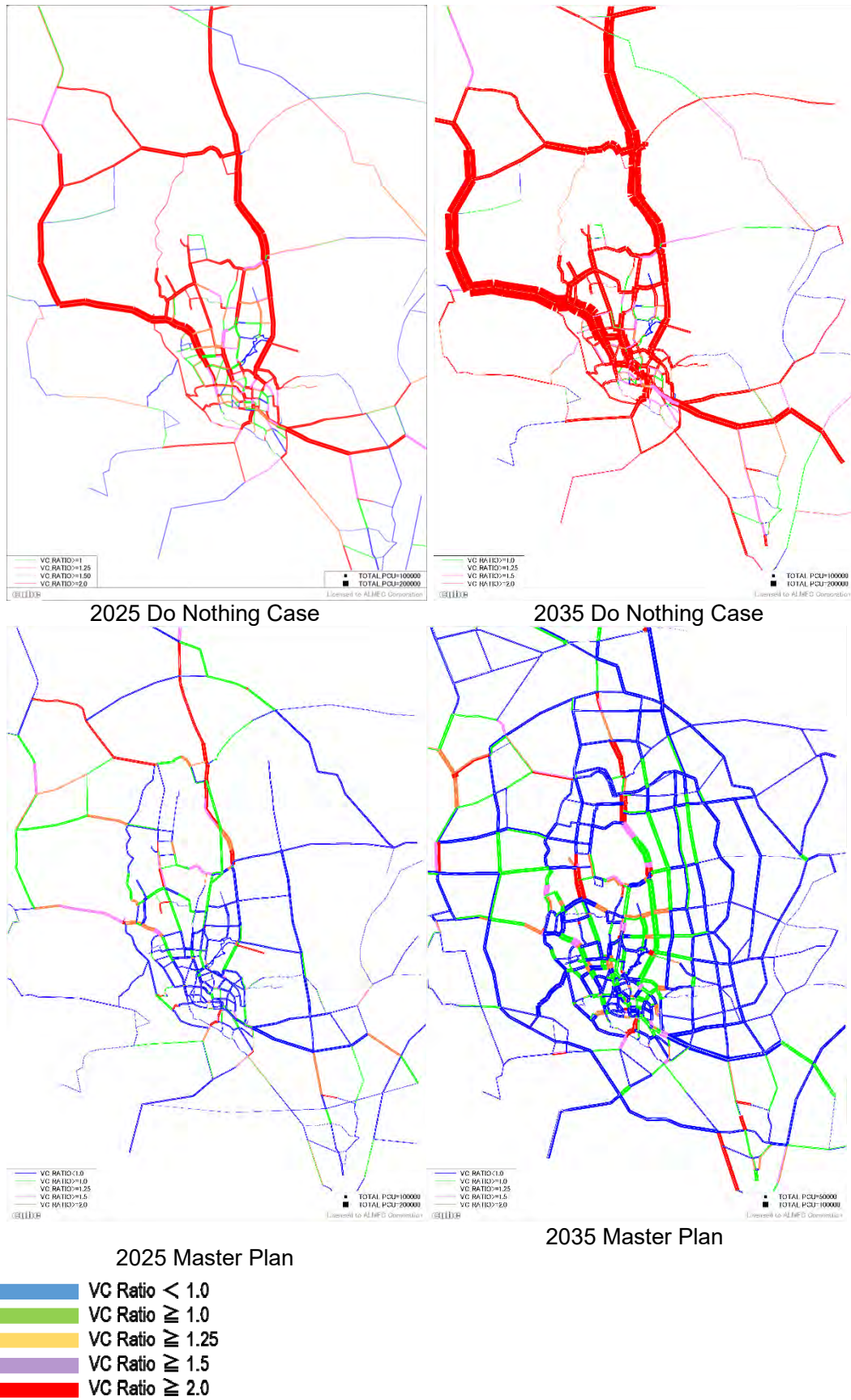
Figure 8.6 shows the highway assignment results of do nothing case in 2025 and 2035. Highway assignment results of do nothing case as shown in Figure 8.6 indicates that the road transport in Dhaka by 2035 will not be worked out due to heavy traffic congestion, if no additional roads are built and if public transport is not improved. The average congestion ratio by 2035 will be 3.7 compared to 1.2 in 2014 and the average travel speed will decline to 4.7 km/h from 6.4 km/h in 2014.

If the RSTP master plan gets implemented, the road congestion will be solved as presented in Figure 8.6. The average congestion ratio and the travel speed in 2035 will be 0.8 and 13.7 km/h. The person-hours can save 35 million hours per day compared to the do-nothing case.

**Table 8.2 Road Network Performance**

Case	Ave. V/C	Ave. Speed (kph)		Total VOC (mil. TK/day)	Total TTC (mil. TK/day)	VOC/trip (TK/day)	TCC/trip (TK/day)
		DMA	RAJUK				
2014	1.2	6.1	6.4	174	2,324	11.3	150.9
2025 Do-Nothing	2.1	5.1	5.1	338	8,594	14.8	375.3
2025 Master Plan	0.8	11.3	10.2	325	4,651	14.2	203.1
2035 Do-Nothing	3.7	5.0	4.7	692	11,587	25.6	429.1
2035 Master Plan	0.8	11.7	13.7	579	4,942	21.4	183.0

Source: JICA Study Team



Source: JICA Study Team

Figure 8.6 Highway Assignment Results for 2025 and 2035

### 1) Prioritization of Proposed Road Project

The proposed road projects are prioritized on the basis of assessment from some aspects, (i) Current status of the project, (ii) Urgency (Degree and scale of problems), (iii) Building a missing link, (iv) Composing rings and radials road system, (v) Providing main traffic axis in development area, (vi) Contributing to proper formation in urban area, (vii) Compatibility with relevant development plans, (viii) Traffic demand and (ix) Project cost.

And each road project is given the priority in the following terms and summarized in Table 8.3.

- Phase 1: 2016 to 2020
- Phase 2: 2021 to 2025
- Phase 3: 2026 to 2030
- Phase 4: 2031 to 2035

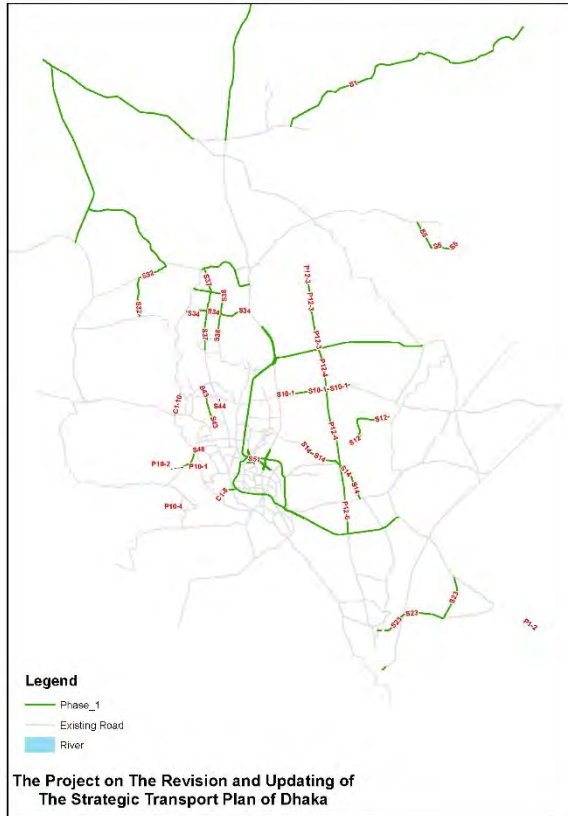
**Table 8.3 Prioritization of Proposed Road Projects (Summary)**

Implementation Phase	Project Length	Project Cost
Phase 1 (2016 to 2020)	380 km (31.7%)	23,759 Crore (24.7%)
Phase 2 (2021 to 2025)	274 km (22.8%)	24,542 Crore (25.5%)
Phase 3 (2026 to 2030)	256 km (21.3%)	24,317 Crore (25.2%)
Phase 4 (2031 to 2035)	288 km (24.1%)	23,706 Crore (24.6%)
Total	1,198 km (100.0%)	96,324 Crore (100.0%)

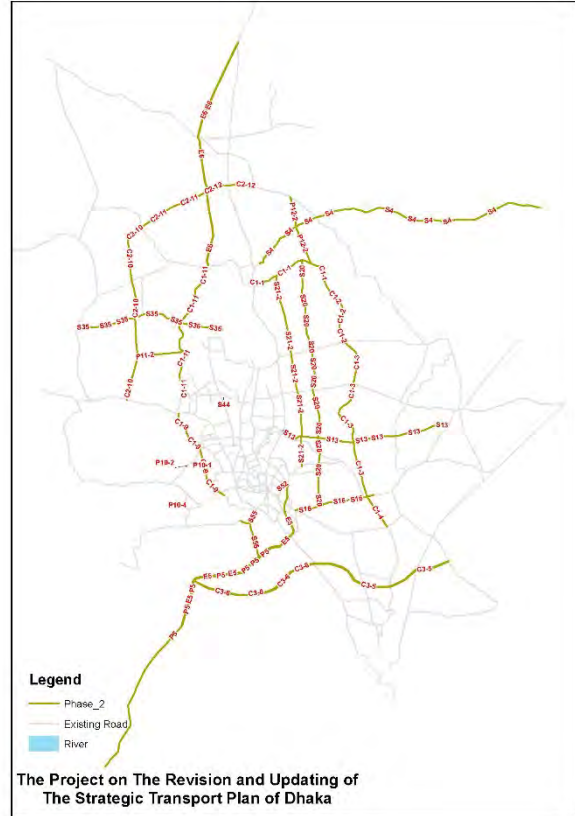
Note: Project costs are given from the relevant organization or estimated based on the average unit price obtained from several reports of the feasibility study on projects in RAJUK area by JICA Study team.

Source: JICA Study Team

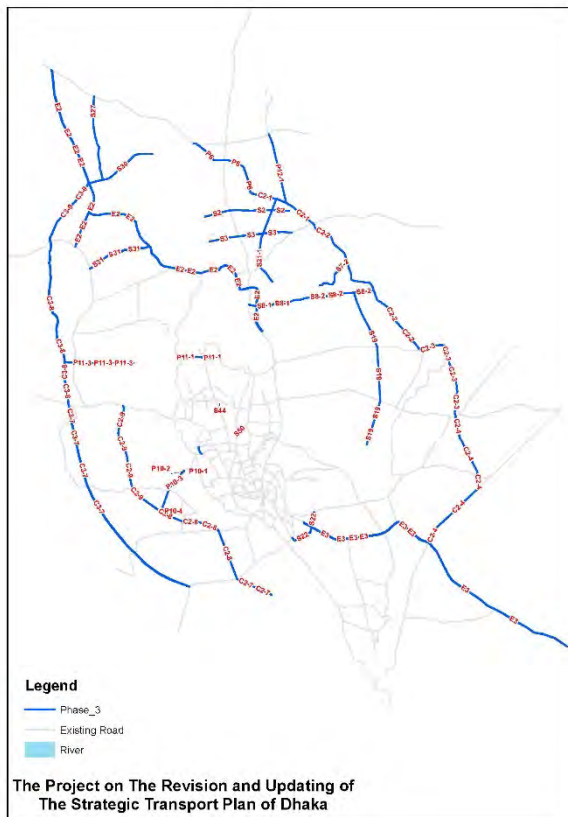
The Project on The Revision and Updating of the Strategic Transport Plan for Dhaka (RSTP)  
Summary



Phase 1 (2016–2020)



Phase 2 (2021–2025)



Phase 3 (2026–2030)



Phase 4 (2031–2035)

**Figure 8.7 Investment Schedule for Urban Roads**



**Table 8.4 Road Development Projects under Phase 1**

Sl. No.	Description	Type of Project
C1-5	Inner Ring Road / N1 (R110 to Toll Gate) / Jatrabari-Khanchpur bridge (widening of polder road to 8 lane)	Widening
C1-6	Inner Ring Road / Jatrabari-Gulistan FO (Toll Gate to Chankhar Pul Bus Stop)	Completed
C1-7	Inner Ring Road / Zahir Raihan Rd. (Chankhar Pul Bus Stop to Eden Girls College)	Widening
C1-8	Inner Ring Road (Rasulpur Bridge (Embankment)-Peelkhana road-Azimpur Old Grave yard Eden Girls College)	New Road
C1-10	Inner Ring Road / Circular Road over embankment (N5 to N501/Diabari Bot Tola: Flyover)	New Road
C1-12	Inner Ring Road / N302:Circular Road over embankment (N302 to N3)	Widening
E1	Dhaka Elevated Expressway	New Road
P1-1	N1 / 2nd Kanchpur Bridge and rehabilitation of existing Bridge	Widening (Bridge)
P1-2	N1 / 2nd Meghna Bridge and rehabilitation of existing Bridge	Widening (Bridge)
P1-3	N1 / 2nd Gomoti Bridge and rehabilitation of existing Bridge	Widening (Bridge)
P2	N2 / 4-Lane Flyover at Bhulta-Sylhet National Highway	Grade Separation
P3	N3 / Improvement of Joydevpur-Mymensingh Highway	Widening
P4-1	N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC	Widening
P4-2	N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC	Widening
P7-1	Kuril Flyover	Grade Separation
P7-2	N301 / From Airport Road near Khilket to First Balu Bridge (Isapura) via Baruna (Nikunja-Yousufganj)	New Road
P7-3	N301 / From first Balu Bridge near Tek Noadda to Sitalakhya River near Kanchan	New Road
P8	N302 / Ashulia to Aricha Road (C & B More)	Improvement
P9	R505 / Nabinagar - EPZ - Chandra road improvement	Widening
P10-1	Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (East side)	Widening
P12-3	Joydebpur-Narayanganj Highway (Inner Ring Road to N301)	New Road
P12-4	Joydebpur-Narayanganj Highway (N301 to Khilgaon)	New Road
P12-5	Joydebpur-Narayanganj Highway (Khilgaon to R110)	New Road
P12-6	Joydebpur-Narayanganj Highway (R110 to N1)	New Road
S1	Gazipur-Azmatpur-Itakhola Road (revised)	Widening
S5	New EPZ Link Road (R301 to New EPZ)	New Road
S10-1	Progati Sarani (Baridhara-Beraid-Balu River-Murapara) to Bhulta (Nawabganj) (DIT Rd. to Baru river)	New Road
S12	Majhina-Koetpara-Trimohini connecting Road	Widening
S14	Rampura-Demra Road	New Road
S15-2	Construction of bridge over Balu river at Keodata	New Bridge
S23	Improvement of Langolbandh-Kaikertek-Nabiganj Road	Widening
S26	3rd Shitalakkhya Bridge at Narayanganj Bandar Upazila	New Bridge
S32	Berulia (Dhour)-Ashulia-EPZ road	Improvement
S33	Uttara Sector-10 to West Embankment road to the West	New Road
S34	Uttara Sector-3 to West Embankment road to the West	New Road
S37	Pallabi (Mirpur) to Uttara 3rd Phase	New Road
S38	Pallabi (Mirpur) to Uttara Sector 11	New Road
S43	Argagaon Road (Bangladesh Betar) to Mirpur Section 2 through Senpara Parbata	Widening
S48	Mohammadpur Bus Stand Embankment Berry Bandh) - upgrading	Widening
S51	Mogbazar and Mouchak Flyover	Grade Separation

Note: P: Primary Road, S: Secondary, C: Circular Road, E: Expressway  
Source: JICA Study Team

**Table 8.5 Road Development Projects under Phase 2**

Sl. No.	Description	Type of Project
C1-1	Inner Ring Road / Dhaka Eastern BP (N3 to Termukh Rayerdia Link Rd.)	New Road
C1-2	Inner Ring Road / Dhaka Eastern BP (Termukh Rayerdia Link Rd. to N301)	New Road
C1-3	Inner Ring Road / Dhaka Eastern BP (N301 to R201)	New Road
C1-4	Inner Ring Road / R110 (R201 to N1)	Widening
C1-9	Inner Ring Road / Circular Road over embankment (Rasulpur Brg. to N5)	Widening
C1-11	Inner Ring Road / N501: Circular Road over embankment (Diabari Bot Tola to N302)	Widening
C2-10	Middle Ring Road (N5 to N302)	New Road
C2-11	Middle Ring Road (N302 to Dhaka–Mymensingh Exp.)	New Road
C2-12	Middle Ring Road (Dhaka–Mymensingh Exp. to Near Dhirashrom Rd.)	New Road
C3-5	Outer Ring Road (N1 to R111)	New Road
C3-6	Outer Ring Road (R111 to N8)	New Road
E5	Dhaka–Mawa Expressway	New Road
E6	Dhaka–Mymensingh Expressway	New Road
P5	N8 / Improvement into 4-lanes from 1st Buriganga Bridge to Padma Bridge Mawa link	Widening
P11-2	Mirpur to Outer Ring Road (West embankment to Middle Ring Road)	New Road
P12-2	Joydebpur–Narayanganj Highway (N105/Dhaka BP to Inner Ring Road)	New Road
S4	4-lanes road from S.A.M. (Shahid Ahsanullah Master) Flyover to Kaliganj Bypass along the railway line	Widening
S13	Badda–Golakandial Road (Merul Badda–Babur Jaiga–Balirpar–Parain–Golakandial)	New Road
S16	Jatrabari crossing to Demra Ghat (Tarabo bridge) road	Widening
S20	Uttara ABM city–Matuali Road	New Road
S21-2	Dhirasram–Basabo Road (Inner Ring Road to Basabo Madertek Road)	New Road
S35	West Embankment (Birulia Bridge) to Savar	Widening
S36	Pallabi to west Embankment via North Rupnagar	New Road
S52	Motijheel Shapla Chattar to Kamalapur Railway Station (Widening)	Widening
S55	Improvement of Z.K.D (Zinzira–Keraniganj–Dohar) Link Road into 4-lanes from 2nd Buriganga Bridge approach to Mawa link	Widening

Note: P: Primary Road, S: Secondary, C: Circular Road, E: Expressway

Source: JICA Study Team

**Table 8.6 Road Development Projects under Phase 3**

Sl. No.	Description	Type of Project
C2-1	Middle Ring Road (Near Dhirashrom Rd. to R301) / N105: Dhaka BP	Widening
C2-2	Middle Ring Road / N105: Dhaka BP (R301 to N301)	Widening
C2-3	Middle Ring Road / N105: Dhaka BP (N301 to N2)	Widening
C2-4	Middle Ring Road / N105: Dhaka BP (N2 to N1)	Widening
C2-7	Middle Ring Road (Zazira IC to N8)	New Road
C2-8	Middle Ring Road (N8 to 3rd Briganga Brg. access Rd.)	New Road
C2-9	Middle Ring Road (3rd Briganga Brg. access Rd. to N5)	New Road
C3-7	Outer Ring Road (N8 to R504)	New Road
C3-8	Outer Ring Road (R504 to N5)	New Road
C3-9	Outer Ring Road (N5 to R505)	New Road
E2	Dhaka–Ashulia Elevated Expressway	New Road
E3	Dhaka–Chittagong Access Controlled Highway (Kutubkhali–Outer Ring Road)	New Road
P6	N105 / Upgrading of Dhaka Bypass to 4 Lane (Joydevpur–Debogram–Bhulta–Madanpur)	Widening
P10-2	Construction of Buriganga 3rd bridge near Basila	Widening (Bridge)
P10-3	Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (West side)	Widening
P10-4	Extension of Buriganga 3rd Bridge access roads to Middle Ring Road	New Road
P11-1	Mirpur to Outer Ring Road (Kalshi Road to West embankment)	New Road
P11-3	Mirpur to Outer Ring Road (Middle Ring Road to N5)	New Road
P11-4	Mirpur to Outer Ring Road (N5 to Outer Ring Road)	New Road
P12-1	Joydebpur–Narayanganj Highway (Joydebpur to N105/Dhaka BP)	New Road
S2	Gacha–Jiraitali Road	Widening/New Road
S3	Sataish–Karamtola Road	Widening/New Road
S7-2	Improvement of Abdullahpur–Teromukh–Ulukhola Road (Balu river embankment to Dhaka BP)	Widening

(continue)

(continuation)

S8-1	Azampur–Kaliganj Road (N3 to Joyedbupur–Narayanganj Hwy.)	Widening
S8-2	Azampur–Kaliganj Road (Joyedbupur–Narayanganj Hwy. to Dhaka BP)	New Road
S19	S8 (Azampur–Kaliganj Road) to S13 (Badda–Golakandial Road)	New Road
S21-1	Dhirasram–Basabo Road (Dhaka BP to Inner Ring Road)	New Road
S22	Improvement of Matuail (Mridhabari)–Shayampur (Dhaka–Narayanganj) Road	Widening
S27	Baipayl–Mouchak Road	Widening/New Road
S30	Sreepur–Kashimpur Road	Widening
S31	Dewan Idris Sarak	Widening
S47	Mohammadpur Shia Mosque (near Japan Garden City)–Mohammadpur Bus Stand (Widening)	Widening
S50	Flyover and underpasses at Jahangir gate area	Grade Separation

Note: P: Primary Road, S: Secondary, C: Circular Road, E: Expressway

Source: JICA Study Team

**Table 8.7 Road Development Projects under Phase 4**

Sl. No.	Description	Type of Project
C2-5	Middle Ring Road (N1 to R111)	Widening/ New Bridge
C2-6	Middle Ring Road (R111 to Zazira IC)	Widening/ New Bridge
C3-1	Outer Ring Road (R310 to R301)	New Road
C3-2	Outer Ring Road (R301 to N2)	New Road
C3-3	Outer Ring Road (N2 to R114)	New Road
C3-4	Outer Ring Road (R114 to N1)	New Road
C3-10	Outer Ring Road (R505 to N4/N105)	New Road
C3-11	Outer Ring Road (N4/N105 to R310)	New Road
E4	Dhaka - Sylhet Expressway (N1 - Outer Ring Road)	New Road
P7-4	N301 / Extension from Dhaka BP to Outer Ring Road	New Road
S6	Tongi Embankment (Dhaka–Mymensing Exp. to Joydebupur–Narayanganj Hwy.)	New Road
S7-1	Improvement of Abdullahpur–Teromukh–Ulukhola Road (Uttara Sector-8 to Balu river embankment)	Widening
S8-3	Azampur–Kaliganj Road (Dhaka BP to New EPZ Link Road)	New Road
S9	Uttara Sector-4–Dakhinkhan–Khordi	Widening
S10-2	Progati Sarani (Baridhara–Beraid–Balu River–Murapara) to Bhulta (Nawabganj) (Baru river to Bhulta)	New Road
S11	Badda–Baru river Embankment Road	New Road
S15-1	Bashaboo Jame Mosque to Trimohini Ghdaraghat via Shekker Jaiga Bridge	Widening
S17	New EPZ Link Road to Dhaka BP	New Road
S18	Dhaka BP–Demra Road along Shitalakhya River	Widening
S24	Improvement of Sonargaon Museum link Road along with Baidderbazar–Mograpara–Kaikertek–Road	Widening
S25	2nd Shitalakhya Bridge at Narayanganj	New Bridge
S28	Improvement of Zirani Kashimpur Road	Widening
S29	Naojora (Kodda)–Kashimpur–Narsinghapur Road	Widening
S39	Mirpur Road to Matikata Road	New Road
S40	Mirpur Zoo to Embankment (Berry Bund) to the west	New Road
S41-1	Upgrading of Hemayetpur–Singair–Manikganj Road into 4-lane	New Road
S41-2	Upgrading of Hemayetpur–Singair–Manikganj Road into 4-lane	Widening
S42	Mirpur-14 (Sagorika) to Airport Road (Banani Railway Station) along the fringe of Kurmitola Golf Course	New Road
S44	Bangla College to Kafrul intersecting Rokeya Sharoni	Widening
S45	Mohammadpur Krishi Market to Mirpur Road (Sohrwardy Hospital)	Widening
S46	Krishi Market & Baitul Aman (Y Junction) to Embankment to the west	New Road
S49	Zikatala–Hazaribagh (Sikder Medical College) road	New Road
S53	Bashabo Kadamtola Road up to Manikdi	New Road
S54	Road connecting Buriganga 1st and 2nd bridges via Subhadia & Zinjira (South of Buriganga river)	New Road
S56	Konakhola to Hazratpur	Widening
S57	Hazratpur to Hemayetpur	Widening
S58	Improvement of Keraniganj (Konakhola)–Kholamura–Hazratpur–Itabhata–Mirpur (Hemayetpur) Road	Widening

Note: P: Primary Road, S: Secondary, C: Circular Road, E: Expressway

Source: JICA Study Team

### 8.3 Public Transportation Plan

#### (1) Planning Considerations

The Study's survey analysis shows that public transport (PT) mode share in Dhaka is ranging between 60-80% depending on the corridor and time of the day. It is significant to note that many Asian cities are spending hundreds of million Dollars to achieve even just 10% PT mode share. Thus, Dhaka's public transport system could be vastly improved at no great cost to the public purse and simultaneously reduced the subsidy or even removed it once and for all. This has been done in other big cities of Asia and the World and can also be done in Dhaka in view of the high mode share of buses.

For large urban areas, such as Dhaka, the only way to effectively meet transport demand is to provide the city with a high quality public transport system that must be developed in integration with urban development. The core network will be composed of MRT and BRT while secondary and feeder services will be by buses with different sizes and types of services. However, establishing a good public transport system is not an easy task, it requires a huge amount of money as well as operation and management capacities over a long period of time. Fares that can be collected from users will hardly pay the investment cost and poorly developed system will attract only a limited number of passengers. Experiences of successful cities clearly indicate that mass transit networks serve as the backbone of the urban structure and are integrated with urban land use and development.

A public transport-oriented city cannot be realized solely by introducing mass transit as a mode of transportation, it must also be associated with efficiently integrated urban areas and a parallel lifestyle shift by the people. Key considerations must be given to the following:

- (a) Integrated Urban Development: Land use and urban development must be re-organized along the mass transit corridors in such a way that socio-economic activities are more effectively articulated with mass transit. This requires a review of the existing urban master plan which is rather road-transportation-based.
- (b) Adequate Role-sharing with Private Transport: Private transport which includes cars, motorcycles and bicycles, is also an equally important mode as the society becomes affluent and demands diversify. Private transport modes also play as important feeder services to mass transit systems.
- (c) Long-term Commitment: A successful mass-transit-based city cannot be achieved in a short period of time as this needs to be long-termed and requires consistent policy intervention and people's good understanding and support.

#### (2) Urban Mass Transit System

Based on the two previously identified projects and the passenger demand forecasts, the conceptual master plan for the MRT/BRT system has consolidated the number of previously proposed lines into three BRT lines and three MRT lines as described briefly below and a more detailed discussion in succeeding sections.

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

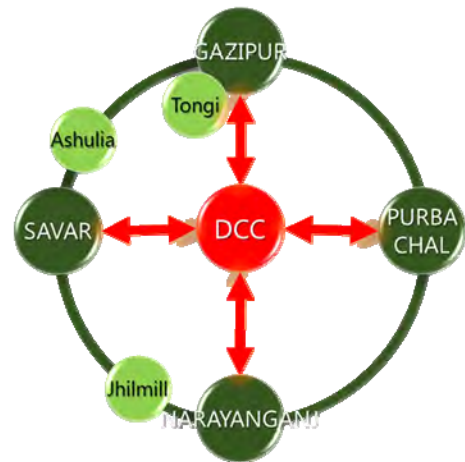
The keys of public transport to function are speed and capacity. BRT can carry 10,000 to about 16,000 PPHPD (passengers per hour per direction). But high capacity BRT operating in Curitiba, Sao Paulo, Bogota and others can carry more than 20,000 PPHPD. MRT, on the other hand, can accommodate 25,000–50,000 PPHPD at much higher speeds.

And STP proposed a bus-based rapid transit system, BRT as the backbone of the service in the first ten years with the eventual service based on Metro rail systems as demand increases. After 10 years, traffic demand in the study area will grow along with rising economy. After few years, traffic demand will overtake capacity of BRT network services.

## 2) Network Descriptions

From the initial passenger demand forecasts based on the existing public transportation network, there appears to be six distinct public transportation corridors serving Dhaka. These transportation corridors are indicated in Figure 8.8. In the RSTP, a high capacity public transport system, like MRT or BRT will be proposed in each corridor.

Based on the above-mentioned urban structure and major issues of the STP Plan, the future MRT/BRT network plan toward 2025 is proposed in Figure 8.8 and Table 8.8. The proposed MRT/BRT development plan is seven (7) lines, of which five (5) lines are proposed for MRT system and the remaining two (2) lines are BRT Line.



Source: JICA Study Team

**Figure 8.8 Network**



Source: JICA Study Team

**Figure 8.9 MRT/BRT Network in 2025**

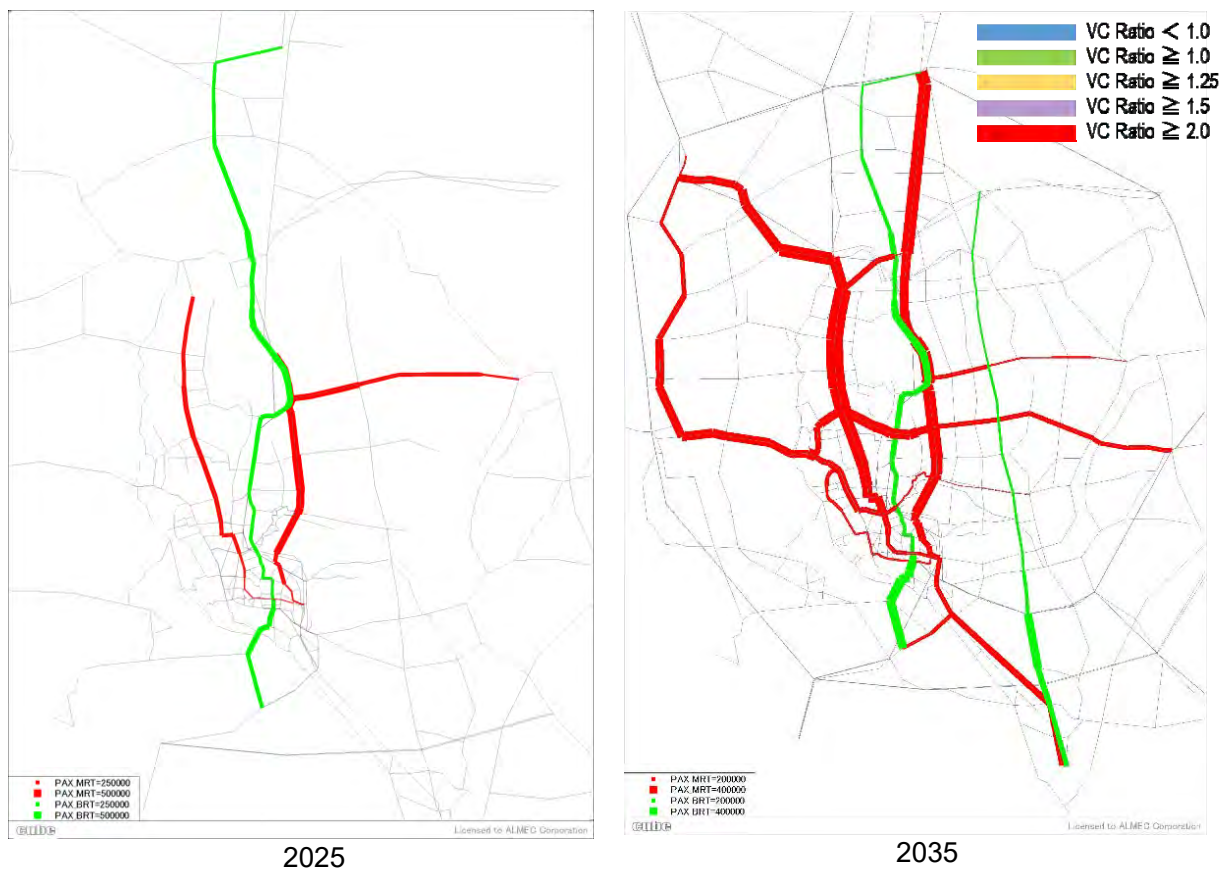
**Table 8.8 Summary of MRT/BRT System Plan**

	Section	Proposed System	Length (km)	notes
Line 1	Gazipur–Airport–Kamalapur–Jhimill Pulrbachal–Khilkhet	MRT	52	
Line 2	Ashulia–Savar–GabtaI–Dhaka Unv. –DSCC–Kamalapur	MRT	40	
Line 3	Gazipur–International Airport–Jhimill	BRT	42	Ongoing
Line 4	Kamalapur–Narayanganj	MRT	16	
Line 5	Bulta–Badda–Mirpur Road–Mirpur 10–Gabtoli Bus Terminal–Dhanmondi–Bashundhara City–Hatir Jheel Link Road	MRT	35	
Line 6	Ashulia–Uttara north –Pallabi–Tejgaon–Motijheel–Kamalapur	MRT	41.8	Ongoing
Line 7	Eastern Fringe Area	BRT	36	

Source: JICA Study Team

### 3) Daily Ridership of MRT and BRT

The transit assignment results of master plan case in 2025 and 2035 are shown in Figure 8.10. The total daily ridership of MRT and BRT in 2025 and 2035, as estimated, will be 3.7 million and 9.0 million respectively. Particularly, MRT1, BRT3, and MRT6 are projected to have a huge number of passengers, i.e., 1.8 million. The highest PPHPD will be recorded by MRT6 at 45,860 persons in 2035, followed by MRT1 at 37,770 persons.



Source: JICA Study Team

**Figure 8.10 Transit Assignment Results of Master Plan Case in 2025 and 2035**

**Table 8.9 Number of Passengers of MRT and BRT in 2025 and 2035**

Line	2025		2035	
	Daily Ridership (Pax/day)	PPHPD	Daily Ridership (Pax/day)	PPHPD
MRT1	1,365,800	34,740	1,887,200	37,770
MRT2	-	-	1,084,600	23,020
BRT3	1,832,700	23,730	1,814,100	25,960
MRT4	-	-	332,000	17,930
MRT5	-	-	1,478,600	28,340
MRT6	483,200	16,440	1,816,700	45,860
BRT7	-	-	541,800	22,330
Total	3,681,700	-	8,955,000	-

Source: JICA Study Team

#### 4) MRT/BRT Development Cost

The project cost to develop the MRT and BRT network is as follows:

**Table 8.10 Estimated Development Cost of MRT/BRT lines**

Unit: for Distance (km), for cost (Million)

Line	Year	At-Grade	Elevated	Under Ground	Total	Cost
MRT Line 1	2025	0	20.6	6.0	26.6	BDT 219,846 (USD 2,827)
	2035	0	42.7	9.3	52	BDT 456,256 (USD 5,867)
MRT Line 2	2035	0	40.0	0	40.0	BDT 285,636 (USD 3,673)
MRT Line 4	2035	0	16.0	0	16.0	BDT 129,170 (USD 1,661)
MRT Line 5	2035	0	24.9	9.1	35.0	BDT 326,619 (USD 4,200)
MRT Line 6 (extension)	2035	0	21.8	0	41.8	BDT 162,454 (USD 2,089)
BRT Line 7	2035	36.0	0	0	36.0	BDT 19,986 (USD 257)

Source: JICA Study Team

Note: 1) Cost estimated by unit cost assumption  
2) Excluding land acquisition and compensation

## 8.4 Bus Transport System

At present, the bus is the main transport mode in Dhaka. Based on the demand forecast, this will be the same in the future; the modal share of bus will remain high. Modal share of MRT and BRT is about 20%, thus bus transport system needs to be revised as soon as possible.

Since bus network integrated with MRT/BRT will be implemented by stages until 2035, the network will tend to have shorter bus routes that intersect with MRT/BRT service corridors, hence not overlap with them. Consequently, the quality of the future public transport network will highly rely on the adequacy of its connections with MRT/BRT system.

In order to enhance connecting conditions, some affordable measures are recommended:

- i. First priority around the MRT/BRT stations, particularly in case of a connection with bus

services, is to have an enhanced pedestrian environment with wide footpaths.

- ii. As long as no major traffic disruptions are created, the bus stop should be located near the MRT/BRT station accesses with an objective of minimizing transfer times.
- iii. If there's no connectivity between MRT/BRT and bus network, bus services shouldn't pose a potential obstruction to MRT operation in addition to minimized impacts of these interchanges on traffic condition.

As the transport demand model has the capacity to provide forecasts for the number of passengers interchanging between bus, BRT and MRT, the Consultants have identified the main interchanging points of the study area.

The proposed bus system is composed of a primary network and a secondary network. Moreover, within the primary network, there is a priority bus network which gives buses precedence over other modes - public and private.

As previously explained, the primary bus route network will initially form the backbone of the system and will thus fulfill the role until the completion of the future MRT/BRT network. So, when MRT/BRT starts service in some corridors, the primary bus service will stop in the same corridors. Once the whole MRT/BRT network is designed, the primary bus routes will be modified to improve the connection to and between each MRT/BRT line.

#### (1) Bus Terminals

A large-scale transport facility like an inter-city bus terminal should be developed in planning future land use, urban structure and urban transport system. There are presently three inter-city bus terminals in Gabtoli, Mohakali, and Saidabad. These bus terminals are located in urbanized area and terminal capacities are limited which causes huge traffic jams around those areas.

Dhaka is currently having about 14,000 inner-city buses (bus and minibus) and about 8,000 inter-district buses in operation. If ridership goals are to be met, then the number of buses should be substantially increased. Development of service, maintenance facilities and terminal capacity will be essential which requires current bus terminal to be expanded and streamlined. In addition to buildings and equipment, there is a need for technical assistance, training and management development.

#### (2) Bus System Modernization

This builds on the current model bus scheme of the city, which focuses on fleet expansion, and eventually will broaden it towards the creation of modern forms of managing and operating the bus fleet. Based on the experience of other cities, bus operation is better accomplished by the private sector than by the government. However, there are too many private operators which the government is not fully managing as they are operating buses without proper timetable, no fixed route and bus stops, non-agreeable environment and so on. One reason for such condition is probably due to cheap rate which private operators are opted to use un-maintained or old buses that leaves passengers no choice but to use current bus services.

Public transport strategy for Dhaka will involve three to five large bus fleet companies operating in exclusive transport corridors which would require a huge number of private bus operators to be merged or abolished. These large bus fleet companies are expected to manage 500 to 1,000 standard buses each. However, **no** existing operator in Dhaka **has** the track record nor the resources to handle such task. The external advisory assistance will be formed to assist in the formation of large fleet operators as well as assist these companies in adapting modern transit practices and advise the



government on policy reforms conducive for long-term private sector participation. This project is intended to accomplish the following:

- Define in more detail the set of bus routes to be included in each corridor and assignable to one of the bus operators;
- Determine the demand of each route and the factors that will push growth of such demand;
- Determine the appropriate combination of bus services and fleet in order to meet the demand by year 2035. Required number of bus fleets are estimated;
- Conduct engineering studies for depot sites, and other transit infrastructure such as bus sheds/stops, and ticketing systems;
- Design the organization and staffing model, including modern IT-enabled management systems, in providing these bus services;
- Provide financial management advice to the large fleet operators;
- Conduct economic analysis from the Government's point of view;
- Prepare business or promotional materials to convince private investors to take over and assume a bigger role in the management of bus system; and,
- Provide technical assistance to BRTA, BRTC, DTCA and the other fleet operators in the performance of their respective roles.

The WB Project "Dhaka Bus Network and Regulatory Reform Implementation Study and Design Work" was done in 2004 and the follow-up study is currently being conducted. The outputs of this WB project are very important and useful but need regular revision by the DTCA to adjust to changing needs and patterns.

### (3) Bus System Development Cost

All elements discussed above are taken into account to derive an estimated total cost for the provision of bus priority design, infrastructure development, depot, terminal and institutional development, as shown in table below.

**Table 8.11 Priority Bus Development Projects**

Area	Item	Cost (US\$ mil.)
Bus Priority Design	Design of a contiguous network of reserved lanes and traffic signal priority for buses. Technical assistance to coordinate with traffic management actions. Consultants, local consultants, staff, office, etc.	1
Infrastructure Development	Construction of bus lanes.	10
	Signal priority scheme.	10
	Bus stops and interchange bus terminals.	10
Depot Development	Buildings and equipment for 10 bus depots.	10
	Technical and management assistance.	3
Institutional Development	Establishment of a Public Transportation Authority, technical assistance, equipment.	2
Bus Terminals Development	Replacement and redevelopment of current three bus terminals.	300
Bus System Modernization	Replacement buses, new bus stop development and others	300
Subsidies		6 per year
Total Cost		+ 646

Source: JICA Study Team

## 8.5 Traffic Management and Traffic Safety

### (1) General

There are various measures of traffic management. These involve the so called 3Es, i.e., engineering, education and enforcement. Engineering measures include signaling, intersection improvement, safety facilities, pedestrian facilities, flyovers, parking facilities, and others. Education covers safety education, safety campaign and others. Enforcement not only covers traffic enforcers but also includes traffic surveillance, traffic control, vehicle inspection and so on. Some of the effective ways of managing traffic demand are color coding (number coding scheme), staggered work hours and pricing (e.g., road pricing). However, implementing a comprehensive traffic management study is highly recommended to determine the effective and efficient traffic management for Dhaka.

**Table 8.12 Traffic Management Policies**

Short-term Policy	Action (Measure)	Remark
Control of Motorization Growth	Garage registration for car owners. Designated district for TDM. Traffic control ex. one way, no entry, etc. Increase of tax on vehicle ownership and operation (gasoline). Enhancement of public transportation system	Development of the detail roles and regulations TDM for CBD  Including enhancement of the changes from motorcycle to public transport use
Effective Usage of the Limited Road Space by Traffic Control and Management Measures	Strengthening of ban on illegal parking and vendors. Intersection improvement and effective signal operation. Improvement of pedestrian environment including provision of crossing facilities. Control of safety in traffic flows (no mixed traffic flows). Promotion of comprehensive traffic control and management measures.	Parking control on the sidewalk  Provision of the hard median and one-way system for narrow streets Corridor or area comprehensive traffic management system
Enhancement of the Traffic Safety Measures	Elimination of accident black spots.  Strengthening of traffic enforcement Improvement of traffic education systems. Improvement of emergency medical services. Development of comprehensive traffic safety program.	Not only engineering improvement, also should coordinate with enforcement and education program  3Es or 4Es comprehensive approach (Engineering, Education, Enforcement and Emergency)
Development of Efficient Parking Systems	Development of roadside parking plan. Imposition of parking fees and parking development fund. Encouragement of off-road parking facilities. Parking facility provision regulation for commercial buildings, institutions, etc. Development of parking information systems.	Development of the parking management system taking into consideration the road functional classification, particularly in the ancient and old urban areas. Parking ban for primary roads and secondary or tertiary roads with less traffic demand will be useful for the road side parking)
Capacity Development	Traffic Police Traffic inspectors Traffic engineers Traffic Safety Committee Improvement of the design standard, roles and regulations.	Capacity for the planning and implementation for the comprehensive traffic management and safety, including institutional capability

Source: JICA Study Team

(2) Overall Objectives and Approach

**Objectives:** Management of traffic and its safety is one of the serious weaknesses which limit the efficient use of available facilities as well as protection of life and property. Poor traffic management also causes environmental degradation and negative impacts on landscape and overall amenity in urban areas.

With the number of vehicles in the study area expected to grow in the coming years, traffic congestion will become severe. Road widening or constructing new roads will not solve this problem as there might even be an eventual issue if Dhaka can continue converting land into roads. This situation therefore calls for greater reliance to be placed on a more efficient use of existing road network. Traffic management plays an important role to achieve this and established an efficient and safe traffic. The objectives of traffic management are twofold: (i) enhance mobility, accessibility, and safety, and (ii) support public transportation for better and effective services. These objectives can be achieved through the traffic management process.

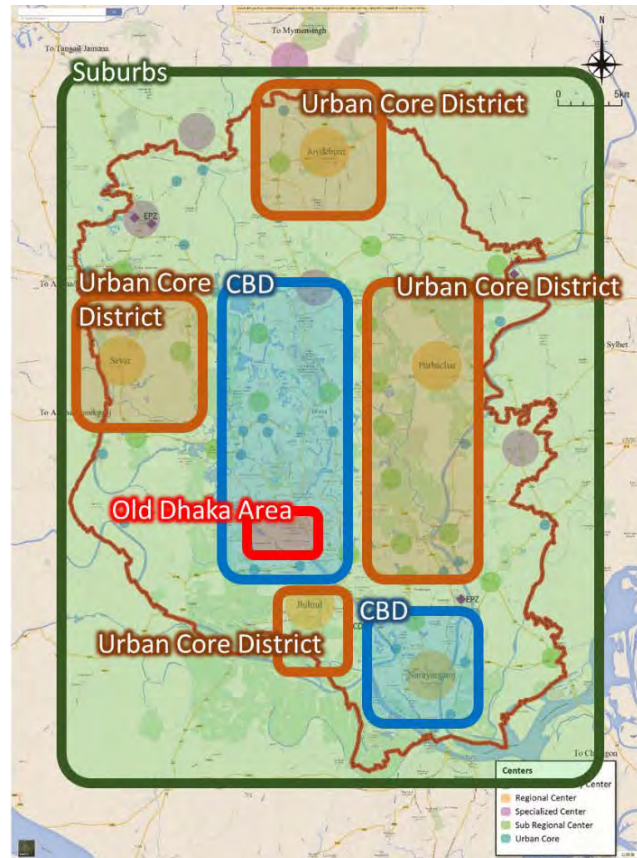
**Traffic Management Process:** The traffic management process is an ordered group of related tasks and activities performed sequentially and repetitively to solve or alleviate traffic problems. Traffic conditions are not a static phenomenon; they gradually change over time with more motorcycles and cars joining the traffic and with the road network improving and expanding. Thus, it is important to establish a mechanism in which the traffic management process can be regularly reexamined to cope with the changes in traffic.

**Approach:** Traffic management and safety issues were comprehensively assessed by corridor and area since infrastructure/facilities, travel characteristics, land use, enforcement, etc. are interactive. The nature of the problems also differs by area.

**Table 8.13 Traffic Management Improvement Directions by Area**

Area	Direction	Key Intervention
Old Dhaka Area	Enhance mobility by walking, and using NMVs. Accessible by public transportation.	Eliminate through traffic. Prioritize public transportation. Enhance pedestrian environment.
CBD	Good mobility within the area. Accessible by public transportation.	Ensure efficient traffic operation at intersections. Maintain and upgrade existing traffic control facility. Manage parking.
Urban Core Districts	Secure maximum capacity while enhancing traffic safety. Prioritize public transportation.	Improve bottlenecks. Upgrade traffic control facilities. Segregate 2- and 4- wheel vehicles.
Suburbs	Provide basic traffic management facilities. Prioritize public transportation.	Provide basic facility. Segregate 2- and 4-wheel vehicles. Protect pedestrians and bicycle users. Analyze and improve accident-prone spots and sections.

Source: JICA Study Team



Source: JICA Study Team

**Figure 8.11 Traffic Management Improvement Directions**

(3) Traffic Management Measures for Rickshaws

Some primary roads have been restricted from rickshaws since 2004 like New Airport Road, Mirpur Road and other main roads. In Delhi, for instance, the number of people using rickshaws has steadily increased after the opening of MRT services which might also be the future pattern of number of rickshaws in Dhaka. Therefore, the government needs to work on further measures aside from Rickshaw-Free Project. In STP, some recommendations were proposed such as the licensing system, the numerical control, operating network and design improvements.

- The Licensing Systems: Establish a program for the re-licensing of rickshaw owners and operators and a means to improve the skills of the drivers and the quality of the vehicles.
- The Numerical Control: Rely upon travel demand and market forces to determine the number of rickshaws in operation, rather than through the control of license numbers.
- Operating Network: Continue with the planning and implementation of a gradual program that redefines the role for rickshaws as one of a neighborhood circulation system and a feeder service to mass rapid transit stations, including suitable facilities to provide such services.
- Design Improvements: Encourage and support efforts to improve the design of rickshaws as well as the associated maintenance facilities and procedures.

Even after the completion of MRT/BRT, the network will not function efficiently if related facilities are not available. It is essential to establish feeder services from/to station and

station plaza as transfer facility in order to operate the railway properly. In fact, many people use rickshaws to access and egress from MRT/BRT stations and it is therefore expected that MRT/BRT stations will be flooded with MRT/BRT commuters, rickshaws and other modes of transport.

In this regard, the following measure is added in RSTP.

- MRT/BRT station designed with TOD policy including NMT

#### (4) Project Cost

Table 8.14 is the estimated project costs for the short-term projects of the traffic management and traffic safety programs.

**Table 8.14 Project Costs of Traffic Management and Traffic Safety**

Project	Project Item	Cost (million US\$)
Signals and Associated Systems	Intersection Improvement Traffic Signal System Installation and Replacement	150 - 200
Parking Management and Development	New parking slot development Parking management	300
Sidewalk and Pedestrian Way Development		50
Traffic Management Capacity Building	Almost 2 years training period for DMP, DTCA and other related agencies	0.5
Traffic Safety Program	Around 10 programs	50
Traffic Enforcement	Illegal parking, Rickshaw control	n/a
TOTAL	600+ About 47 billion TK	

Source: JICA Study Team

## 8.6 Inland Waterways

At present, an inland waterways project called “Introduction of Waterways around Dhaka City” has been conducted by Bangladesh Inland Water Transport Authority (BIWTA) with the 1<sup>st</sup> phase being completed at the cost of 36 core Taka (almost 4.7 million USD) providing 29.5 km of the river. Main objectives of this project is to improve navigability of 40 km waterways along the Balu River and Tongi Khal between Ashulia and Khachpur and to develop cargo and passenger facilities of inland river port at Tongi and three landing stations located at Khachpur, Isapura, and Kayetpara. Moreover, stations of inland waterways need to be connected with MRT/BRT stations, bus stops and parking stations of rickshaw and CNG.

## 9. EVALUATION OF THE MASTER PLAN

### 9.1 Results of Economic Evaluation and Financial Evaluation

This chapter explains the evaluation of the proposed major urban transportation network and projects completely from the economic, financial, social and environmental aspects. This process is very important to clarify the nature of the projects and the priorities for its implementation. The evaluation was made both for the Master Plan as a network and for major individual projects after the joint network performance was considered sustainable, individual projects or project packages were evaluated.

EIRR was shown in following tables. All projects are economically viable as the threshold of EIRR is 12%.

**Table 9.1 Public Transportation Project Economic Evaluation Results**

Projects	Capital Cost (US\$ million)	O & M Cost in opening year (US\$ million / year)	EIRR (%)
MRT1	5,869	97.8	22.1
MRT2	3,673	115.4	19.4
MRT4	1,661	46.2	13.2
MRT5	4,200	101.0	16.1
MRT6 extension	2,089	63.5	33.5
BRT7	257	40.0	47.9

Source: JICA Study Team

**Table 9.2 Road Project Economic Evaluation Results**

Projects	Capital Cost (US\$ million)	O & M Cost in opening year (US\$ million / year)	EIRR (%)
Dhaka - Ashulia Elevated Exp.	1,421.2	19.9	16.9
Dhaka - Chittagong Exp.	156.2	2.2	28.3
Dhaka - Sylhet Exp.	82.8	1.2	35.0
Dhaka - Mawa Exp.	538.0	7.5	16.2
Dhaka - Mymensingh Exp.	102.3	1.4	30.7
Inner - Ring Road	1,178.3	16.5	34.4
Middle - Ring Road	423.0	5.9	54.6
Outer - Ring Road	2,076.7	29.1	17.2
Primary - Road Package	1,143.5	16.0	29.5
Secondary - Road Package	1,076.2	27.6	41.7

Source: JICA Study Team

FIRR of MRT/BRT projects are shown in the following table.

**Table 9.3 Public Transportation Project Financial Evaluation Results**

Projects	Capital Cost (US\$ million)	O & M Cost in opening year (US\$ million / year)	FIRR (%)
MRT1	5,869	97.8	4.5
MRT2	3,673	115.4	3.0
MRT4	1,661	46.2	3.8
MRT5	4,200	101.0	4.0
MRT6 extension	2,089	63.5	9.7
BRT7	257	40.0	4.3

Source: JICA Study Team

## 9.2 RSTP 2035 Environmental Evaluation of Projects

### (1) Procedure of IEE

The Environmental and social impacts are associated with proper planning. Thereby, proposed projects should be assessed and examined thoroughly right from the earliest planning stage and this could be realized through and in accordance from the viewpoint of Strategic Environmental Assessment (SEA). The implementation of effective alternative options and reduction measures is necessary to avoid or minimize the adverse impacts on the natural and social environment as well; these should be examined carefully and be incorporated into the specific plans and projects. Hence, the Initial Environmental Examination (IEE) is being formed for the priority projects of the urban transport development scenario.

Primarily, a comprehensive analytical study based on the viewpoints of environmental and social impacts should be made for the proposed projects of the urban transport development scenario and the selected impact items would be used for the proposed projects of (RSTP). To be followed by the scoping of the priority projects so as to determine the alternatives and the expected impacts respectively. Then, the draft of the environmental management plans will be presented to identify the specific reduction measures. The Terms of Reference (TOR) draft of the priority projects is needful for the succeeding feasibility study.

### (2) Scoping for IEE

In order to conduct IEE for the projects of the urban transport development scenario from the viewpoint of Strategic Environmental Assessment (SEA), the representative items are selected to compare the proposed projects. The impacts are assessed in terms of the impact indices shown in the table below.

**Table 9.4 Representative Impact Items and Indices**

Viewpoint	Impact Items	Impact Indices
Social environment	Land acquisition and Involuntary Resettlement	• Number of Affected household
Natural Environment	Protected Area	• National Park
	Biodiversity	• Wetland and Water Retention Area • Forest, Agricultural land
	Flood Risk	• Flood Flow Zone • Potential Flood Area where Elevation is less than 7.1m
Pollution Control	Noise and vibration	• Residential area (population density) • Sensitive receptors (Schools, Hospitals, Religious facilities)
	Air Pollution	• Residential area (population density) • Sensitive facilities (Schools, Hospitals, Religious facilities)
	Water pollution	• Surface water bodies (rivers, lakes, etc.)

Source: JICA Study Team

(3) MRT and BRT Networks

It is then assumed that the required width of row of the MRT line will be 25 meters, considering the width of the constructing stations. Because the alignment of the MRT network will be built mostly on existing roads, the number of people who will be displaced will be estimated through satellite images multiplied by population densities.

On the Eastern Fringe Road, the BRT Line 7 will be built; however, presently there is no road row. The proposed number of lanes of this road will be (6) lanes with BRT and will have enough row corridor of 60m to allow (8) lanes of MRT. Thus, the affected people to leave the area by land acquisition of 60m width along the whole route will be estimated.

Note that the estimated number of affected households shown in the table below does not include those in the depot. The structure type for all MRT lines is assumed to be elevated.

**Table 9.5 Comparative Analysis of MRT and BRT Networks**

MRT Line1	MRT Line 2	MRT Line 4	MRT Line 5	BRT Line 7
<p>O: The lowest number of affected households both all elevated case and partial underground case</p> <p>O: Less impact on protected area and biodiversity</p> <p>O: Low risk of flooding</p> <p>X: Impact due to noise and vibration at the elevated section.</p> <p>The smallest number of affected households and fewer impacts on natural environment. Recommended as a priority project from the viewpoints of environmental and social considerations.</p>	<p>X: The largest number of affected households</p> <p>X: Impact on biodiversity in the wetland</p> <p>X: Risk of flooding</p> <p>X: Impact due to noise and vibration</p> <p>The largest number of affected households and moderate impacts on natural environment. The BRT should be considered for the short to midterm term plan in CBD.</p>	<p>Δ: A large number of informal settlers occupy the BR ROW.</p> <p>O: Less impact on protected area and biodiversity</p> <p>O: Low risk of flooding</p> <p>X: Impact due to noise and vibration</p> <p>A large number of informal settlers occupy the BR ROW. If the BR line will be double tracked, then the plan has to be reconsidered. Fewer impacts on natural environment.</p>	<p>O: The second lowest number of affected households in the partial underground case.</p> <p>X: Impact on biodiversity in the wetland</p> <p>X: Risk of flooding</p> <p>X: Impact due to noise and vibration</p> <p>The second lowest number of affected households. The extension to the Eastern Fringe will cause a significant impact on natural environment and increase the risk of flooding.</p>	<p>X: The second largest number of affected households</p> <p>X: Impact on biodiversity in the wetland</p> <p>X: Risk of flooding</p> <p>O: Impact due to noise and vibration</p> <p>The large number of affected households. A significant impact on natural environment. The risk of flooding is very high. The eastern fringe road should be carefully planned to minimize the environmental impacts.</p>

Source: JICA Study Team

Note: 1) The number of family members in one household is assumed to be five (5) based on the statistics.

**9.3 Project Evaluation**

(1) Evaluation of MRT/BRT Project

1) Demand Forecast

Initial results of the 2025/2035 patronage demand forecasts for the proposed four MRT and BRT have been prepared and are as noted in Table 9.6. Depending on the particular patronage demand forecast on each MRT/BRT corridor, the Study Team has selected the most appropriate technology be it MRT or BRT system.



A brief summary of the passenger demand forecasts would indicate that MRT Line 1, MRT Line 2, MRT Line 4, MRT line 5 and MRT Line 6 daily passenger boarding would require a MRT system as the most appropriate technology, while BRT Line 7 would be more suited to be developed into a BRT project.

During the feasibility stage, a more detailed study of the selected MRT/BRT project will be required to determine the boarding and alighting at each of the MRT station in the network.

**Table 9.6 Number of MRT/BRT passengers by Line, 2025 and 2035**

Line	2025		2035	
	Daily Ridership (Pax/day)	PPHPD	Daily Ridership (Pax/day)	PPHPD
MRT Line 1	1,365,800	34,740	1,887,200	37,770
MRT Line 2	-	-	1,084,600	23,020
BRT Line 3	1,832,700	23,730	1,814,100	25,960
MRT Line 4	-	-	332,000	17,930
MRT Line 5	-	-	1,478,600	28,340
MRT Line 6	483,200	16,440	1,816,700	45,860
BRT Line 7	-	-	541,800	22,330
Total	3,681,700	-	8,955,000	-

Source: JICA Study Team

## 2) Evaluation

When the public sector invests in transport facilities, the primary purpose is “the public service”, or the social benefit. The proposed projects were evaluated for their economic IRRs to assign priority accordingly. The social benefit of a given project can be paraphrased as its impact in serving the two purposes of reducing the operational cost of all the available transport means and reducing the travel time of all passengers on the available transport means (both users and non-users).

In addition, the projects are evaluated on the following aspects of implementation.

- A. Economic Achievability
- B. Traffic Demand (Contribution to the improvement of transport capacity), Operational aspects
- C. Consistency with Land Use
- D. Financial Achievability
- E. Environmental and Social Impacts

As the result, the rankings by five criteria were combined into a single rank, taking such process as (1) to give five points to rank “A”, three points to rank “B” and one point to rank “C”, (2) to add up each point after multiplication with “weight”, and (3) Classify into

the first priority project. Results of the evaluation are given in Table 9.8 for MRT/BRT project proposed in RSTP.

**Table 9.7 MCA Evaluation Results of MRT/BRT projects**

		MRT Line 1	MRT Line 2	MRT Line 4	MRT Line 5	BRT Line 7
A. Demand in 2035	0.15	5	3	1	3	3
B. Economic Return	0.40	5	3	1	3	5
C. Financial Return	0.15	5	3	3	5	5
D. Consistency with Urban Development Scenario	0.15	5	4	5	5	5
E. Environment	0.15	4	1	4	2	2
		4.9	2.9	2.4	3.5	4.3

Source: JICA Study Team

MRT Line 1 is the highest score and will be interpreted as the first priority project. And BRT Line 7 is the second highest score, but FIRR of this BRT Line is very high and will be implemented by PPP.

(2) Project Evaluation of Traffic Management Project

In STP, it was estimated that up to 50% of the capacity of the expressway system is wasted due to poor operating conditions. Based on this analysis, the effects of traffic management measures on the current traffic situation were evaluated. As a result, average V/C, average speed, and total TTC have become better compared with the current situation.

**Table 9.8 Effects of Traffic Management Measures**

Indicators	Current Situation	Traffic Managed Situation
Ave. V/C	1.2	0.9
Ave. Travel Speed	6.4 km/h	8.2km/h
Total VOC	174 million TK/day	177 million TK/day
Total TCC	2,324 million TK/day	1.789 million TK/day
Total Cost	2,498 million TK/day	1,966 million TK/day

Source: JICA Study Team

Total benefit cost of traffic management situation will be 532 million TK/ day. And the RSTP project cost of the short-term traffic management and safety is estimated around 47 billion TK. If the short-term traffic management project is implemented in one year, the total benefit cost will be 194 million TK and the project benefit cost will be higher than project cost.

## 10. IMPLEMENTATION PROGRAM

### 10.1 Overall Implementation Strategy

The major components of the RSTP include the public transportation system, consisting of four 5 MRT lines and 2 BRT lines, and road projects consisting of 3 ring roads. Due to limited resources, these major projects cannot be developed at the same time, thereby necessitating a clear strategy of prioritization and ordering of projects so that the RSTP will be implementable and at the same time be able to efficiently and effectively meet the transportation demands of Dhaka resulting from the planned urban development scenario and even guide the development itself.

#### (1) Prioritization for Proposed Projects in RSTP

Because there are many components of the proposed projects and the scheduling of their developments compared with other projects is very important, the prioritization of the proposed projects was examined carefully. Initial prioritization among the RSTP proposed projects was carried out based on the economic analysis as mentioned in preceding sections. However, the final prioritization should be decided not only by a principal economic evaluation but also by several indices such as continuity of network, coordination with the land-use plan, and so on. Especially, RSTP is a comprehensive Master Plan, and the integrated planning between urban and transportation is essential. The initial results by economic evaluation were reprioritized to ensure actual situation for implementation.

#### (2) Concepts and Projects of Short-, Mid- and Long-term

##### Short-term Project (~2020)

The concepts of the short-term project in the first 5 years are (i) Control of through traffic, (ii) Control of urban development, (iii) Decentralization of population and (iv) Improvement of current infrastructures. And major projects are as follows;

- MRT Line 6 and BRT Line 3 to be opened
- Implementation of Traffic Management and Traffic safety
- Arterial road development at Mirpur and Eastern Fringe Area to support urban development
- South part of ring road to be opened before completion of Padma bridge
- Restructuring of bus network, BRF (bus route franchization) & replacement of bus terminals

##### Mid- and Long-term Project (~2035)

The concepts of the mid- and long-term project are (i) Leading an appropriate urban development, (ii) Formation of urban development and transport framework and (iii) Traffic demand control. And major projects are as follows;

- New MRT lines development in CBD
- Implementation of TDM measures
- Arterial road and ring road development outside DMA
- East-West MRT line development
- Development of new MRT lines for connection between CBD and regional centers
- Redevelopment of inter-urban roads

## 10.2 Implementation Schedule and Responsible Agency

The major component of the RSTP includes the public transport system consisting of 7 MRT/BRT lines, public bus services, inland waterways and road development projects including expressways. Due to limited resources, these major projects cannot be developed at the same time; thereby a clear strategy of prioritization and ordering of projects is necessary so that the RSTP will be achievable and be able to efficiently and effectively meet the transport demands of Dhaka. This will result to the planned development scenario and even guide the development itself

The proposed major master plan projects are categorized into four (4) implementation stages on the basis of the overall project evaluation as described in Chapter 9. The implementation schedule and those responsible agencies are summarized as follows:

**Table 10.1 Implementation Schedule of Public Transport Projects**

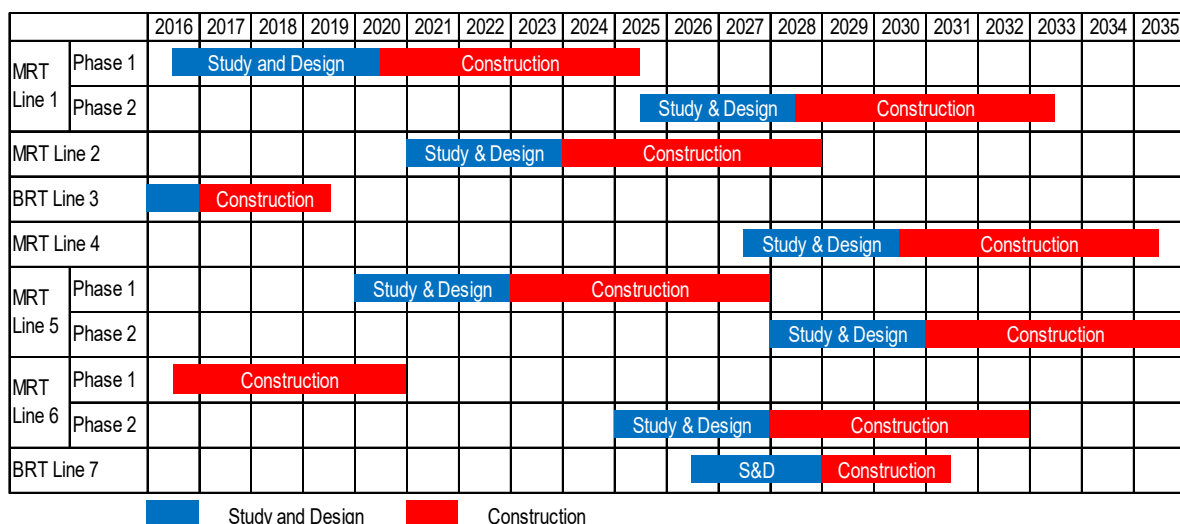
(Unit: million USD)

Project Component	Responsible Agency	Cost	Implementation Period				
			Phase 1 2016-2020	Phase 2 2021-2025	Phase 3 2026-2030	Phase 4 2031-2035	
Expressway	BBA, RHD	3,973	1,144	787	1,940	102	
Primary Road	Inner Ring Road	BWDB RHD	1,449	212	1,237	0	0
	Middle Ring Road	RHD	520	0	71	230	219
	Outer Ring Road	BBA, RHD	2,554	0	562	526	1,466
	Others	RHD	1,406	1,078	79	239	11
Secondary Road	RHD, LGED	2,427	607	406	177	1,237	
Total		12,329	3,041	3,141	3,113	3,034	

Source: JICA Study Team

The implementation of MRT services will take more time than that of the public bus services with a duration between seven to nine years from the beginning to completion of construction and the start of passenger services, which is the standard for a modern urban mass rapid transit system. The implementation of BRT services will be earlier than the MRT services but it will still take longer time than the public bus services, but traffic demands will increase rapidly and continue to exceed in just a short time. Therefore, the recommendation is for a staged development of MRT system to be done in a gradual manner and with a bus system being used to start a passenger revenue service and develop the backbone of a high-capacity transit network using a rail-based technology.

The phased, or step by step, approach allows the possibility of developing a high-capacity urban mass rapid transit (MRT) network using a combination of improved public bus services which will provide the necessary passenger capacity to meet the strategic goals of the city authorities which will serve the public transportation needs of Dhaka for 2035 and beyond.



Source: JICA Study Team

**Figure 10.1 Implementation Schedule of MRT/BRT Projects**

**Table 10.2 Implementation Schedule of MRT/BRT Projects**

(Unit: million US\$)

Project	Responsible Agency	Cost	Implementation Period			
			Phase 1 2016–2020	Phase 2 2021–2025	Phase 3 2026–2030	Phase 4 2031–2035
MRT Line 1	DMTCL	5,867	283	2,544	1,520	1,520
MRT Line 2	DMTCL	3,673	0	1,469	2,204	0
BRT Line 3	Dhaka BRT	400	400	0	0	0
MRT Line 4	DMTCL	1,661	0	0	166	1,495
MRT Line 5	DMTCL	4,200	0	1,260	840	2,100
MRT Line 6	DMTCL	4,089	2,000	0	1,253	836
BRT Line 7	Dhaka BRT	257	0	0	206	51
<b>Total</b>		<b>20,147</b>	<b>2,683</b>	<b>5,274</b>	<b>6,189</b>	<b>6,002</b>

Source: JICA Study Team

### **Other Public Transport Projects and Traffic Management Projects**

In RSTP, Other public transport projects and traffic management projects are proposed as the important urban transport project in Chapter 8.

**Restructuring and Improvement of Bus Service Project:** They are (1) to restructure current bus network, (2) to design the priority bus service, (3) to replace and improve the current bus terminals, and (4) Institutional Development

**Multimodal and Interchange Station Project:** In RSTP, 21 multimodal and interchange station are proposed to allow the smooth transfer of passenger from one transport mode to another.

**Traffic Management and Traffic Safety Project:** In RSTP, some traffic management and traffic safety projects are proposed.

**Inland Waterway Project:** The main objectives of the project are (i) to improve navigability of 40km of waterways along the Balu River and Tongi Khat between Ashulia and Khanpur, and (ii) to develop cargo and passenger facilities of one inland river port at Tongi and three landing stations located at Kanchpur, Isapura and Kayetpara. Estimated project cost will be 6,500 lakh Taka (almost 8.4million USD).

**Table 10.3 Implementation Schedule of Traffic Management Projects**

(Unit: Million USD)

Project Name	Responsible Agency	Cost	Implementation Period			
			Phase 1 2016–2020	Phase 2 2021–2025	Phase 3 2026–2030	Phase 4 2031–2035
Improvement Project of Bus Services	DTCA, BRTA, BRTC	646	446	100	100	0
Traffic Management and Traffic Safety	DTCA, DMP, City Corp., Others	600	400	200	0	0
Inland Waterway	DIWATA	9	9	0	0	0
<b>Total</b>		<b>1,255</b>	<b>855</b>	<b>300</b>	<b>100</b>	<b>0</b>

Source: JICA Study Team

### 10.3 Investment Plan

#### (1) Budget for Transport Sector in GDA

In Chapter 7, the projected procurable budget for transport sector was estimated. According to the Strategy for Infrastructure Sector for 7th Five Year Plan, transport sector accounts for about 23% of total ADP. Case 1 is the current ration, and case 2 is the increasing tax revenues. In addition, the GRDP of Greater Dhaka is almost 25% that of Bangladesh, so urban transport development budget in GDA will be 25% of the total transport sector budget. Table 10.4 shows the projected procurable budget for each phase.

#### Case 1: Current rate of revenue collection (base scenario)

Revenue: 14% of GDP

Tax Revenue: 11% of GDP

Development Expenditure: 6.4% of GDP

Annual Development Plan: 6.0% of GDP

#### Case 2: Increase in Tax revenue (optimistic scenario)

Revenue: 17% of GDP

Tax Revenue: 13% of GDP

Development Expenditure: 8.0% of GDP

Annual Development Plan: 7.0% of GDP

**Table 10.4 The Projected Budget for Transport Sector in GDA**

(Unit: million USD)

Item	Phase 1 2016–2020	Phase 2 2021–2025	Phase 3 2026–2030	Phase 4 2031–2035
% of ADP	25%	25%	20%	20%
Case 1	19,776	19,392	22,208	28,416
in GDA (25%)	4,944	4,848	5,552	7,104
Case 2	23,245	23,616	28,864	37,888
in GDA (25%)	5,811	5,904	7,216	9,472

Source: JICA Study Team

#### (2) Investment Cost

Based on the previous section, investment requirement for the Major Master Plan Projects are summarized in Table 10.5.

**Table 10.5 Investment Requirement for Major Master Plan Projects**

(Unit: Million USD)

Project		2016–2020	2021–2025	2026–2030	2031–2035	
Road	Expressway	1,144	787	1,940	102	
	Primary	Inner RR	212	1,237	0	0
		Middle RR	0	71	230	219
		Outer RR	0	562	526	1,466
		others	1,078	79	239	11
	Secondary	607	406	177	1,237	
	Total	3,041	3,142	3,112	3,035	
UMRT	MRT Line 1	283	2,544	1,520	1,520	
	MRT Line 2	0	1,469	2,204	0	
	BRT Line 3	400	0	0	0	
	MRT Line 4	0	0	166	1,495	
	MRT Line 5	0	1,260	840	2,100	
	MRT Line 6	2,000	0	1,253	836	
	BRT Line 7	0	0	206	51	
	Total	2,683	5,274	6,189	6,002	
Others	Bus	446	100	100	0	
	TM&TS	400	200	0	0	
	IW	9	0	0	0	
	Total	855	300	100	0	
Grand Total		6,579	6,579	8,716	9,401	

Source: JICA Study Team

Required investment cost for the major master plan projects is compared with the available future fund estimated in Chapter 8. As shown in the Table 10.6, available fund for transport sector is not enough to cover the required cost, particularly in the short/mid-term. Therefore, it is necessary to consider the potential fund sources such as surplus revenues from on/off street parking operation and urban expressways, and road funds.

The recommended income sources for the road fund in Bangladesh, recommended road fund sources in the table below was proposed in the same report.

**Table 10.6 Recommended Domestic Income Sources for Road Fund**

Income Source	Justification
Vehicle License Fees (Road Tax)	Charge for access to the road network
Fuel levy	Charge for use of the road network
Road and bridge tolls	Point of use charge at specific points on the road network
International Transit charges	Charge at point of entry to network (non-Bangladeshi vehicles only)

Sources: Report for the discussion on the operating modalities of a road fund for Bangladesh

## 10.4 Short-term Action Plan

### (1) General

Many urban transport projects are proposed in the RSTP in order to reduce traffic congestion, improve the traffic environment, and provide affordable services. But enormous amounts of time and money are required. Actually, the construction of MRT Line 6 will begin from 2016 and the construction of BRT Line 3 will begin soon. But the MRT Line 6 between Uttara North and Agargaon will open in 2019. For the next 5 years from 2016, large-scale projects, like the Dhaka Elevated Expressway, MRT Lines 1 and 5, BRT Line 3, and other flyovers, will begin construction all over Dhaka, but new public transport services and new roads will not be developed.

The government should thus compare what should be done first or later in view of the limited time and budget.

### (2) Approach for Plan Formulation

The Short-term Action Plan encompasses solutions to the current urban transport problems and lays the foundation for the long-term development plan. It sets out tasks that could and should be done over the next five years and which should be consistent with the long-term strategies of the Master Plan (RSTP). The criteria in selecting the short-term actions are as follows:

- Those which address urgent problems concerning road-based public transport;
- Those which do not require substantial financial resources other than the funds already mobilized or committed;
- Those which can be implemented within existing agencies and institutions of the city or national government; and,
- Those which clear obstacles and pave the path for the smooth realization of medium and long-term plans.

### (3) Components of Short-term Action Plan

#### 1) Impending urban transport issues

Traffic congestions are common in Dhaka but the situation will worsen in a short while. Major priority projects like MRT, BRT, Expressway and others require a considerable amount of money and time to take effect. And it will be harder than ever to manage and control mushrooming traffic demands resulting from the rapidly growing economy. The following issues are clear and present dangers.

- Rapid increase of population in RAJUK area
- Growing traffic demands resulting from the rapidly growing economy
- Rapid increasing private cars and motorbikes without any control
- Inflow of through traffic from the Padma Bridge into urban area

#### 2) Countermeasures

The RSTP defines the three (3) components of the Short-term Action Plan: improvement of bus services (modernization and bus corridor management), traffic management & traffic safety improvement, and southern ring road development. Under these components, the following four focused issues are elaborated and concrete measures feasible for short-term implementation are proposed:



(4) Short-term Action Plan

1) Phased Bus Route Network Development

In the future, with the progress of suburbanization, job opportunities will be created not only in urban areas but also in suburban areas. This expansion will need the expansion of the public transport network. In the RSTP, a total of seven MRT/BRT lines are proposed to connect the CBD and suburban areas. But there are no planned MRT/BRT stations in some suburban areas. Affordable feeder services need to be developed in such areas to connect them to the nearest MRT/BRT stations.

2) Traffic Management during Construction

Current traffic management during construction is very poor. This has contributed to serious traffic congestion aggravated by construction materials piled on roads and streets which obstruct traffic flow.

3) Traffic Management and Safety

In STP, it was estimated that up to 50% of the capacity of the expressway system is wasted due to poor operating conditions. Based on this analysis, the effect of traffic management measures on the current traffic situation **was** evaluated. As a result, average V/C, average speed, and total TTC have become better than the current situation.

Total benefit cost of traffic management situation will be 532 million TK/ day. And the RSTP project cost of the short-term traffic management and safety is estimated around 47 billion TK. If the short-term traffic management project is implemented in one year, the total benefit cost will be 194 million TK and the project benefit cost will be higher than project cost.

So there is no reason why the government doesn't implement any traffic management measures.

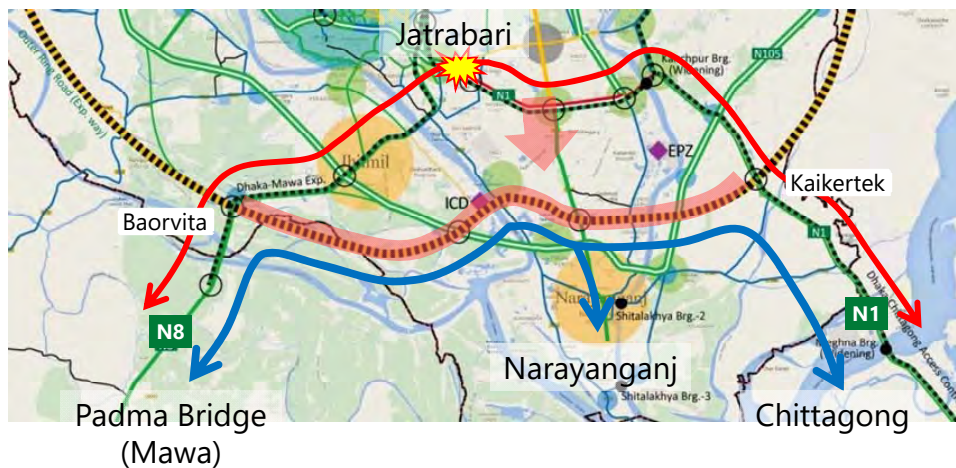
4) Road Developments

As already mentioned before, southern part of the outer ring road and road network development in the eastern fringe area are included in the short-term action plan. Road network development in the Eastern Fringe Area will promote the designed urban development and reduce congestion of DIT road (especially during the construction period of MRT Line 1). And southern part of ring road will respond to Padma Bridge Project

Southern Part of the Outer Ring Road

The Padma Multipurpose Bridge will open to traffic by 2018 that will connect Louhajong, Munshiganj to Shariatpur and Madaripur, linking the south-west of the country to northern and eastern regions. Once the bridge is opened, expected huge number of vehicles will flow from southern-west side to Jatrabari area.

Jatrabari is currently famous for traffic congestion and after the opening of Padma Bridge, traffic situation there will worsen. Therefore, the southern section of the middle or the outer ring road should be constructed as soon as possible.



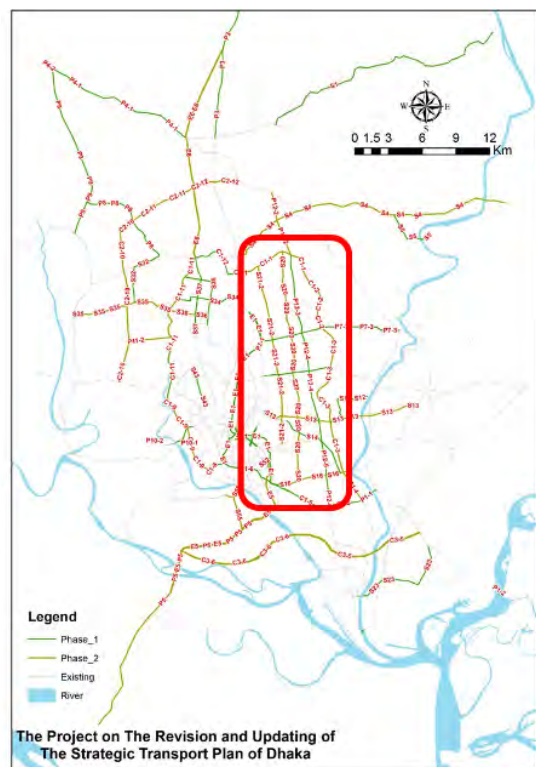
Source: JICA Study Team

**Figure 10.2 The High Priority Project**

Road Network in the Eastern Fringe Area

At the Eastern Fringe Area including Purbachal, RAJUK and many private developers have a new housing development plan, but for a long time, little progress has been made in the development of this area, because social infrastructures including public transport services and roads still does not supply.

So a quick and effective social infrastructures development are needed in the eastern fringe area. On the other hand, if one private developer has fulfilled the standard requirements for road ratio for housing area, they have sole discretion to development roads. So in order to realize the ideal urban structure proposed in RAJUK Structure Plan and RSTP, the Government needs take a strong initiative and negotiate with private developers to build the social infrastructures for the Eastern Fringe Area development.



Source: JICA Study Team

**Figure 10.3 Eastern Fringe**

With the start of development of MRT Line 1 around 2020, heavy traffic congestion will occur on DIT road including Pragati Avenue and Bir Uttam Rafiqul Islam Avenues, an alignment of the MRT Line 1. So new road networks need to be constructed in the eastern fringe area as the bypass road.

## 11. CONCLUSION AND RECOMMENDATIONS

### 11.1 Conclusion

The RSTP proposes the overall goal of urban transport as shown below and eight objectives to achieve this overall goal, to wit:

“Ensure mobility and accessibility to needed urban services for its people and society, through safety, amenity and equity - towards the development of a public-transport-based city with more than 60% share of the total urban transport demand.”

The RSTP has identified a series of transport development policies as stated below. The main focuses or features of the Master Plan exist on the following points:

1. Strengthening of Public Transport: development of sustainable public transport system, taking advantage of the present high share of public transport trips.
2. Improvement of Regional Competitiveness of the City: Construction of Efficient Transport System that supports 10-million multi-core hub city.
3. Realization of a Well-managed Environment-friendly City: introduction of innovative institutional/operational schemes that enables world-class transport integration with living environment.
4. Adoption of Immediate Congestion Mitigation Measures: implementation of less expensive measures against traffic congestion that brings quick outcome.

The following are conclusions and activities for each objective:

#### (1) Promotion of Social Understanding about Urban Transport Problems and Issues

No transport policy and project would work effectively unless a wide and profound understanding of transport problems, issues and future directions is shared by the society. To achieve this objective the following four policies are suggested:

- Activity 01: Conduct of consecutive transport campaigns;
- Activity 02: Expansion of transport education;
- Activity 03: Strengthening of transport studies;
- Activity 04: Information Disclosure.

#### (2) Effective Management of Urban Growth and Development

Defining a vision of the future is highly important in the study area because a fast-growing population and economy will have huge impact on urban development and people's lives. The transport sector is a critical part of urban growth and management. To achieve this objective, the following five policies are suggested:

- Activity 05: Policy coordination within metropolitan area;
- Activity 06: Integration of urban development Masterplan and urban transport Masterplan;
- Activity 07: Development of hierarchical road network and road classifications to guide design (and parking provision);

Activity 08: Promotion of integrated urban and transport development, particularly Transit-Oriented Development (TOD);

Activity 09: Guidance for ideal urban development.

(3) Promotion and Development of Attractive Public Transport

Without public transport, the city's future is untenable. Future public transport must be provided in sufficient quantity and quality. An attractive public transport system is the only solution which both city authorities and the people expect. Suggested policies are:

Activity 10: Development of a hierarchical mass transit system;

Activity 11: Early introduction of an integrated public transport system in the effort to maintain public transport share;

Activity 12: Development and improvement of bus transport system, including reform of management systems and the business model;

Activity 13: Exploitation of para-transit and NMVs;

Activity 14: Exploitation of water transport system;

Activity 15: Promotion of public transport use and expansion of services;

Activity 16: Providing an Affordable Public Transport system.

(4) Efficient Traffic Control and Management

The current road capacity is not efficiently utilized due to widespread on-road parking, various types of encroachments and poor traffic control and management. Infrastructure capacity is largely dependent on how it is operated, managed and maintained. Better traffic management will improve capacity as well as improve safety, amenity, and environment of the city and its people. It is also reliant on better regulation, management and enforcement combined with facility improvement and ICT technology.

Suggested policies are:

Activity 17: Establishment of comprehensive traffic management system balanced with better facilities for essential NMT modes such as cycling and walking;

Activity 18: Strengthening of traffic regulation, enforcement and management;

Activity 19: Management of freight transport;

Activity 20: Establishment of parking policy and controls;

Activity 21: Development of well-coordinated traffic control system.

(5) Effective Transport Demand Management (TDM)

The problem of traffic congestion should not be addressed merely from the supply side, i.e. expansion of infrastructure capacity. To ensure smooth traffic as well as share in a more equitable manner the cost and benefit of traffic and transport among stakeholders, various demand management measures (TDM) would need to be introduced, such as:

Activity 22: Integrating urban development and transport (TOD);

Activity 23: Providing efficient public transport alternatives;

Activity 24: Regulating motorized vehicle access and proper charging of road use and parking.

(6) Comprehensive Development of Transport Space and Environment

Transport infrastructure provides important public space for traffic and transport, comprising different modes including walking, and for various urban services and activities. For this, it is important to design and develop transport infrastructure and services comprehensively to enhance the form of urban areas and the quality of activities. Suggested policies are:

Activity 25: Management of transport corridors;

Activity 26: Improvement of a safe transport environment for pedestrians and cyclists;

Activity 27: Redistribution of transport space and improvement of traffic environment in the city center;

Activity 28: Alleviation of air pollution;

Activity 29: Establishment of township transport development strategy.

(7) Enhancement of Traffic Safety

Worsening traffic safety and an increase in traffic accidents are threatening the well-being of the city and its inhabitants; especially pedestrians. Road safety is also a priority issue at local government level. Suggested actions include:

Activity 30: Establishment of traffic safety audit system;

Activity 31: Elimination of traffic accident black spots;

Activity 32: Improvement of licensing and vehicle inspection system;

Activity 33: Strengthening of traffic enforcement system;

Activity 34: Strengthening of first aid response system.

(8) Strengthening of Transport Sector Administrative and Management Capacities

The tasks to be accomplished for the city's present and future are enormous and require a comprehensive and coordinated approach involving a wider range of players. The role of the related authorities in leading the process is very important. Suggested measures are:

Activity 35: Strengthening of transport-related organizations;

Activity 36: Promotion of private sector participation;

Activity 37: Improvement of infrastructure development and management system

Activity 38: Strengthening of planning and management capacity;

Activity 39: Securing of development funds.

## 11.2 Recommendations

The recommendation by the consultant of RSTP to the Bangladesh Government is to realize the projects proposed in this master plan. Although every project is an integral part of the proposed master plan, the most essential are as follows; A. Traffic Management and Traffic Safety Management (short-term), B. Improvement of Bus Services (short-term), C. MRT Development (short to long-term), and D. Road Development (short to long-term).

Other related recommendations are as follows:

- (1) Authorize and get the RSTP as the urban transport master plan of Dhaka duly approved by the concerned agencies and disseminate its content to all stakeholders and finally, the RSTP be approved by the Cabinet.
- (2) Enhance the Dhaka Transport Coordination Authority (DTCA) to make decisions on various transport projects. Allocate the implementation of responsibilities of projects clearly to the concerned government agencies. The DTCA will oversee and monitor the implementation of these projects. The establishment of DTCA is crucial for Dhaka in order to have the basis to absorb various types of technical and financial assistance from donor organizations.
- (3) Raise funding capability of the government by seeking various additional revenue sources and developing current revenue resources under the institutional arrangement of the government. The feasible fund source is to be implemented in the Traffic Management and to exist in the TOD (Transit Oriented Development)
- (4) Take necessary actions the soonest time possible to launch the short-term projects as proposed in the master plan. Specifically, for those projects that need feasibility studies or prior coordination among relevant organizations; initiatives from the Bangladesh Government to donate or other related organizations should be applied immediately.
- (5) Service network of bus and mini-bus needs modification depending on the development progress of the proposed MRT and BRT. The public transport network should be formulated with MRT, BRT and Bus.
- (6) In this master plan, the fare rate for MRT is assumed to be the same as the fare rate of MRT Line 6. Although it is assumed that the rate will increase in the future in proportion to per capita GDP, it is still very low compared to the international level, and this level cannot be easily raised due to the sensitive elasticity of demand against fare rate. This reveals as one of the reasons of the poor financial performance. Considering the promotion of the participation of the private sector and the possible greatness of public subsidy, the toll/ fare rate however should be carefully looked into in the feasibility study.
- (7) This master plan assumes that normal situation will continue for a long period of time (20 years or more). If unusual situation occurs, such as long financial distress and war, this master plan cannot be used and will lose its validity. On the other hand, this master plan could be updated periodically if normal situation continues and a series of traffic surveys are conducted again (except for the personal trip survey). The conclusion and methodology of the said master plan could be handed over to the future with the periodical updating (basically every 5 years).