**Japan International Cooperation Agency (JICA)**

**Dhaka Transport Coordination Authority (DTCA)**

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

## DRAFT FINAL REPORT

**November 2015**

**Almec Corporation**

**Oriental Consultants Global**

**Katahira & Engineers International**

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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 Kartripakkha |
| 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 Raid 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 to serious traffic gridlocks and problems in the DMA which in turn has added to the city's growing social and economic problems, such as posing serious health hazards to its citizens due to air pollution. With Bangladesh's continued development and the continued increase of its population the number of privately owned automobiles is expected to rise in the coming years and these phenomena will worsen the traffic gridlock and pollution problem in the city. Therefore, improving the urban (public) transportation system in the DMA has become a critical issue to ease traffic congestion and arrest environmental deterioration.

Amid this situation, the Government of Bangladesh (GOB) formulated the "Strategic Transport Plan for Dhaka" (STP) in 2005 in cooperation with the World Bank (WB). The implementing agency is the DTCA (known then as the Dhaka Transport Coordination Board) under the Ministry of Communication (MOC), present the Ministry of Road Transport and Bridges (MORTB), old. The STP included a "20-Year Urban Transportation Policy (2004-2024)", and the identification of priority issues, such as the improvement of mass transit systems (buses and rail transportation), development of urban expressways, and the establishment of an institution that will implement and maintain the necessary transport projects.

Since the STP is the official transport framework approved by the GOB, it is expected that each donors are expected to provide assistance based on the provisions of the STP to improve the current urban transportation situation.

It was in this backdrop that the Japan International Cooperation Agency (JICA) conducted the Dhaka Urban Transportation Network Development Study (DHUTS) Phase 1 from March 2009 with the DTCA as its counterpart agency. The study's objectives were to conceptualize basic urban development scenarios for the DMA up to 2025 and to select priority projects that would be integrated into the scenarios. That study recommended the prioritization of constructing an MRT Line 6. As a result, JICA conducted the feasibility study on MRT Line 6 under DHUTS Phase 2. Following this study, the GOB and JICA concluded the loan agreement on the "Dhaka Mass Rapid Transit Development Project" on February 2013 which was the blueprint for the construction of an MRT Line 6. On the other hand, the World Bank in 2012 finished the feasibility study and basic design of the BRT Line 3 which runs from the Hazrat Shahjalal International Airport to Sadarghat. The World Bank is now preparing the project's detailed design. On the same vein, the Asian Development Bank (ADB) has already completed the basic design of the BRT Line 3 extension project which runs from the airport to Gazipur. Since April 2013 the ADB has conducted the activities for corridor's detailed design stage. As for visions on the transportation network plan, the STP, which was formulated in 2006, identified three BRT lines (i.e., BRT Lines 1, 2, and 3) that were supposed to commence before 2010. However, except for MRT Line 6 and BRT Line 3 above, other projects envisioned in the STP have yet to take off the ground. Compounding the lack of transport development is the fact that some new towns have sprouted in the study area even as other towns are being planned to rise up in the area under the jurisdiction of Rajdhani Unnayan Kartripakkha (RAJUK) [1]. Another development that happened during this

[1] RAJUK or the Capital Development Authority of Bangladesh was established on 30 April 1987 by replacing the Dhaka Improvement Trust. Its principal intention was to develop, improve, extend, and manage Dhaka City and its peripheral areas through proper development planning and development control (Source: http://www.rajukdhaka.gov.bd/rajuk/aboutusHome).

interregnum was the expansion of the DTCA's jurisdiction from covering just the Dhaka Metropolitan Area, into expanding its covering into the neighboring districts of Gazipur, Manikganj, Munshigabi, Narayanganj, and Narshindi. These changes necessitate the need to review and update the STP.

Under these circumstances the GOB requested the GOJ in October 2012 for technical assistance in the review and modification of the STP as well as to help build the capacity of the DTCA. In response to the request JICA has selected Joint-venture Consultant, ALMEC Corporation, Oriental Consultants Co., LTD. And Katahira & Engineers International to carry out "The Project on the Revision and Updating of the Strategic Transport Plan for Dhaka" and provide the needed technical assistance. On May 2014, JICA dispatched the Project Team to Dhaka to confirm the details of the GOB request.

## 1.2 Goals and Objectives

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

The following are the expected goals which will be attained after this Project is completed:

**Goal of the Proposed Plan:** The STP will be revised appropriately to promote an effective and efficient urban transportation development in Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, and Narshingdi districts.

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

**Outputs:** A revised STP that will reflect short-, medium-, and long-term perspectives and a list of high-priority projects.

## 1.3 Project Area

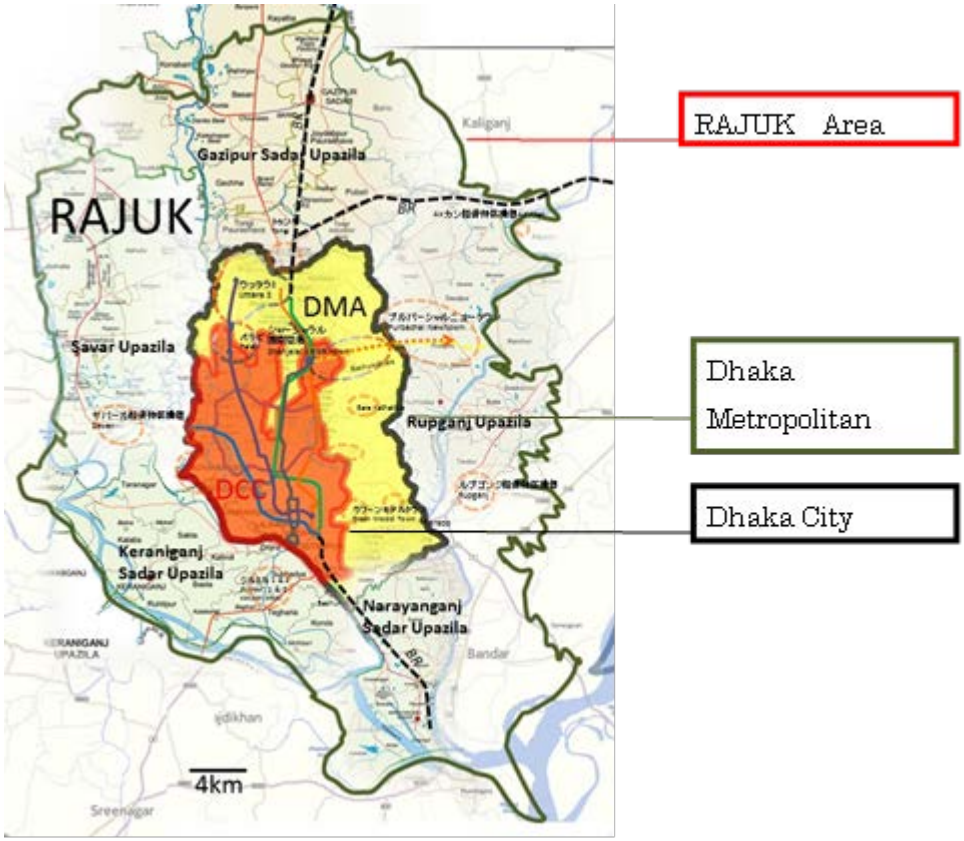
The Record of Discussions (RD) dated 10 October 2013 mentioned that the project area would be the same as that of the original STP, that is, Greater Dhaka covering Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, and Narshingdi districts. The areas to be included in the traffic survey and in transport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

In the Project, project area will be studied in two areas, one is "Study Area" which is revised and updated based on STP as necessary, and the other is "Survey and Planning Area" for urban transport master plan. Because an urban transport master plan will be formulated based on a person-trip survey. The master plan will be prepared only for the area where a person travels daily. And Greater Dhaka includes agricultural land, undeveloped areas, and special areas, such as low marshlands, and also too large (347 square kilometers) to move about daily, the SPA will be confined to RAJUK area only.

**Study Area**


Source: JICA Study Team

**Survey and Planning Area**

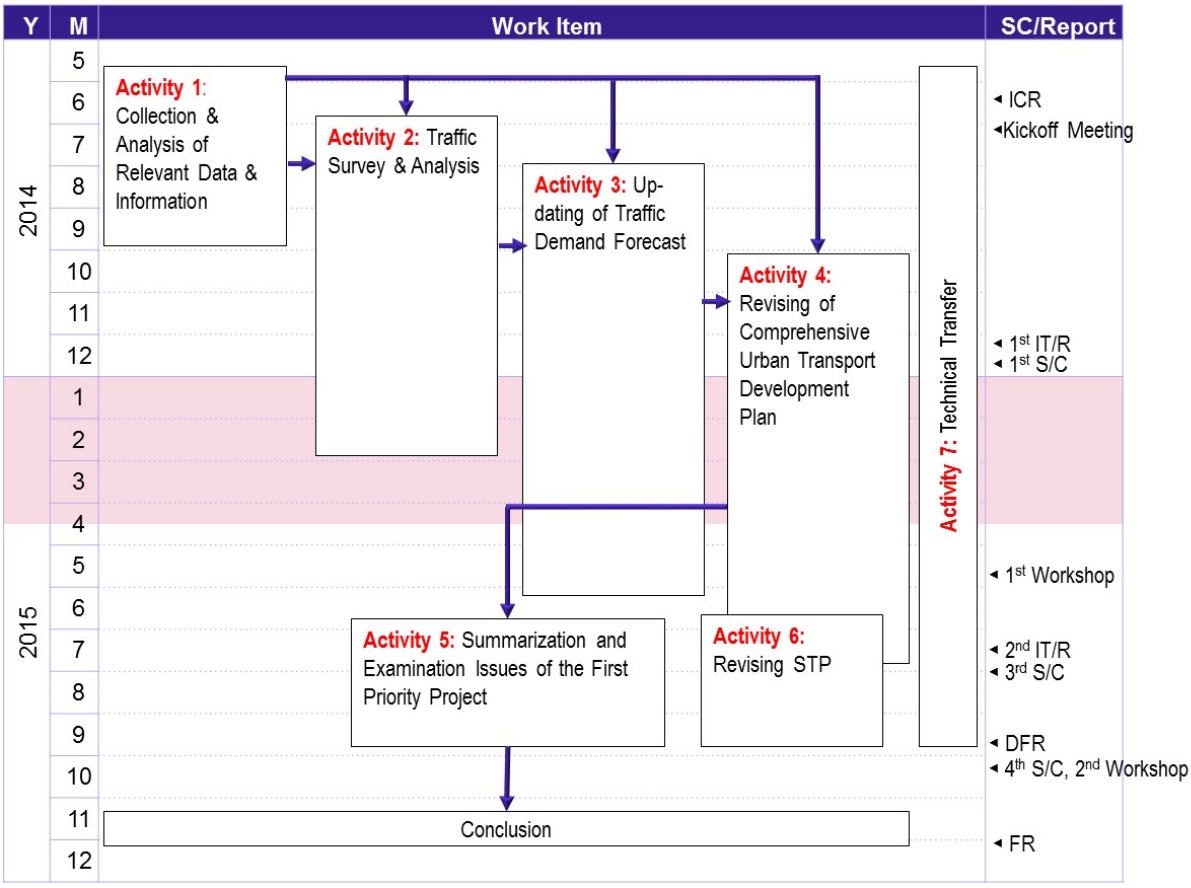



Source: JICA Study Team

**Figure 1.1 Target Areas**

## 1.4 Study Schedule and Framework

The study commenced in June 2014 and will end in December 2015. The scope of the study included the entire transport and traffic system of the study area with exception of internal distribution of goods, solid waste and others. The overall framework of the Study is shown in Figure 1.2.




Source: JICA Study Team

**Figure 1.2 Overall Study Framework**

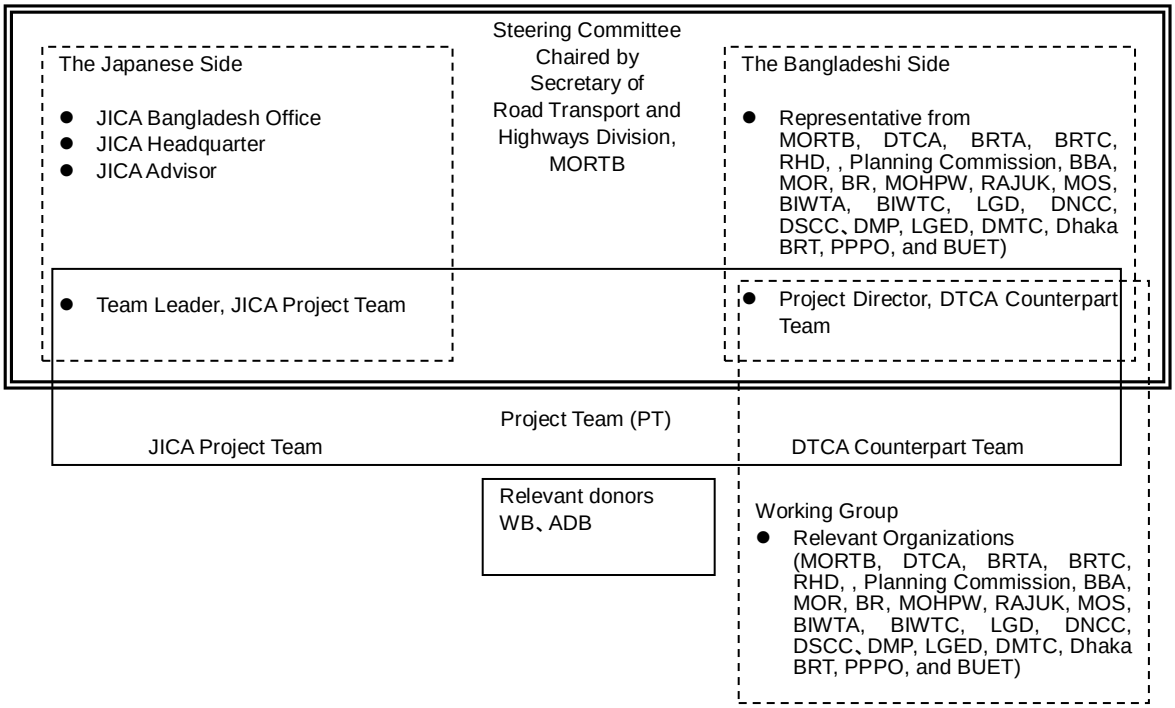
## 1.5 Related Agencies and Implementation Structures

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 and unify these various agencies into one transport super body, doing so would be difficult. Although DTCA is responsible for coordinating urban transport projects its role is still not enough.

To help classify roles and responsibilities among the various transport agencies the project will create a Steering Committee (SC), a Project Team (PT), and a Working Group (WG). The Steering Committee will be 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 will be held whenever necessary and will be chaired by the secretary of the MOC's Road Division (present the MORTB's Road Transport and Highways Division).

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

SC meeting will be held at the timing of reports, on June and November 2014, and April and June 2015. And also SC meeting will be held if necessary. Project Team meeting will be held at every Thursday and WG meeting will be held with Project Team Meeting when needed. Donor meeting will be held every quarter period.




Source: JICA Study Team

**Figure 1.3 Project Organization Chart**

**Table 1.1 Project-related Agencies in Bangladesh**

| | SC | PT | WG |
|---|---|---|---|
| Ministry of Road Transport and Bridges (MORTB) | | | |
| -Bridge Division | | | |
| Bangladesh Bridge Authority (BBA) | Mm | | |
| - Road Transport and Highways Division | Ch | | |
| Dhaka Transport Coordination Authority (DTCA) | Mm | Ch | Ch |
| Road and Highway Department (RHD) | Mm | Mm | Mm |
| Bangladesh Road Transport Authority (BRTA) | Mm | Sm | Mm |
| Bangladesh Road Transport Corporation (BRTC) | Mm | Sm | Mm |
| Dhaka Mass Transit Company (DMTC) | | Sm | Mm |
| Dhaka BRT | | Sm | Mm |
| Ministry of Railways (MOR) | | | |
| Bangladesh Railway | Mm | Mm | Mm |
| Ministry of Housing and Public Works (MOHPW) | | | |
| RAJUK | Mm | Mm | Mm |
| Ministry of Local Government, Rural Development and Co-operatives (LGRD & Cooperatives) | | | |
| -Local Government Division | Mm | | |
| Local Government Engineering Department (LGED) | Mm | Sm | Mm |
| Dhaka North City Corporation (DNCC) | Mm | Sm | Mm |
| Dhaka South City Corporation (DSCC) | Mm | Sm | Mm |
| Ministry of Shipping | Mm | | |
| Bangladesh Inland Water Transport Authority (BIWTA) | | Sm | Mm |
| Bangladesh Inland Water Transport Corporation (BIWTC) | | Sm | Mm |
| Ministry of Planning | | | |
| Transport Coordination Wing, Planning Commission | Mm | Sm | Mm |
| Ministry of Finance | | | |
| Economic Relations Division | Mm | | |
| Ministry of Home Affairs | Mm | | |
| Dhaka Metropolitan Police (DMP) | Mm | Sm | Mm |
| Regional Transport Committee (RTC) | | Sm | Mm |
| Others | | | |
| Public Private Partnership Office (PPPO) | | Sm | Mm |
| Bangladesh University of Technology (BUET) | Mm | Sm | Mm |

Ch: Chairman, Mm: Main Member, Sm: Sub-member
Source: JICA Study Team

# 2. CURRENT URBAN STRUCTURE AND SOCIO-ECONOMIC PROFILE

## 2.1 Description of the Project Area

The Project Area covers the whole of Greater Dhaka Area (GDA) which consists of Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, and Narshingdi districts. The total area of 7,500 km2 has 24.4 million or more residents since 2011. Of which, RAJUK area which was more developed has 14.8 million residents in 1,500 km 2 of its area. In contrast to the low population density of the entire GDA (31 person/ha), RAJUK area has very high density (111 person/ha). It can also be expected that the center of RAJUK area has much higher population density than that of the entire RAJUK.

The Project Area is generally low, flat, fertile and flood-prone. While most of the developed area within the RAJUK area is at an elevation of 6 – 8 m above sea level, the elevation of DCC varies from 2 – 13 m above sea level. Due to the topographical and geological characteristics of GDA, it is inevitable to experience floods and overflow during the rainy season. There were water channels, natural drainages and low land areas in and around Dhaka in the past which contributed to the retention and discharge of rain water. However, the acceleration of urban sprawl has interrupted those water retention areas.

As of 2005, 25% of the national gross domestic product (GDP) was contributed by the gross regional domestic product (GRDP) of GDA. In particular, the GRDP of Dhaka contributed 15% of the national GDP as it is a capital and economic centre of Bangladesh. While the agricultural sector is still dominant economic sector outside RAJUK, and industrialization has been promoted within RAJUK. There are also three export processing zones (EPZs) in Gazipur and Dhamsona. Moreover, the informal economic sector provides significant number of job opportunities in Dhaka.

Like other parts of Bangladesh, GDA is largely dominated by the agricultural land use; whilst residential areas are spread along the main road and river networks. The large industrial areas and commercial/business areas can be found only in RAJUK area. The residential or housing development in RAJUK area mainly focused on the 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 the required basic infrastructures. One of the many reasons of delayed urban development outside RAJUK area is because of lack of transport infrastructures. Without transport networks, people and goods cannot be mobilized.

The provision of basic infrastructures are varied by the district of GDA. However, the electrification rate of GDA is only 63% while 97% of the households in Dhaka district can access to electricity. Coverage of piped drinking water varies 37 – 95%. Narayanganj district has the highest coverage in GDA. Provision of sanitary with water seal is very low with 38% in GDA.

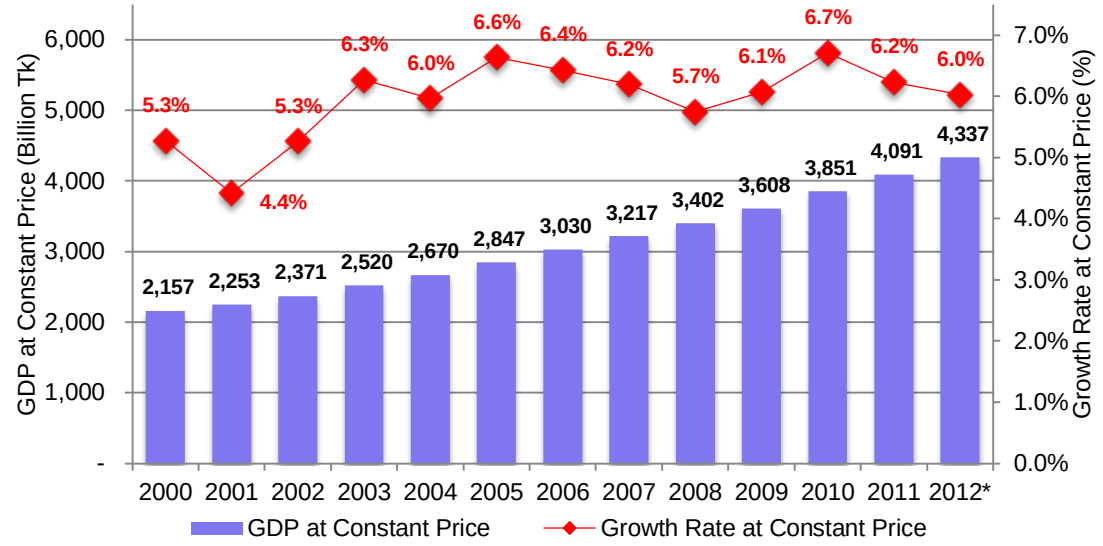
## 2.2 Socio Economic Conditions

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

#### 1) National GDP and GDP Growth

Since 2003, Bangladesh has been consistent in continuing to achieve high Gross Domestic Product (GDP) with almost more than 6% GDP growth rate. In spite of the world recession and European financial crisis in 2007-08, Bangladesh total GDP showed an increase of more than twice while the GDP per capita also went up with 1.7times than in year 2000.

The International Monetary Fund (IMF) has published in the "World Economic Outlook, September 2014" that Bangladesh's forecasted GDP growth rate will increase up to 7.0% by the year 2017 on the basis of economic development and potential. Likewise, Bangladesh got a high evaluation from international finance institutions where, in 2005, it was regarded as one of the Goldman Sach's Next11 recognizing its potential of becoming one of the world's larger economies after the BRICs (Brazil, Russia, India and China) and JP Morgan's Frontier in 2007.




Note: * Provisional
Constant Price base year :1995-96
Source :National Accounting Statistics 2003, 2008 and 2013, BBS

**Figure 2.1 GDP Growth of Bangladesh (2000-12)**

**Table 2.1 GDP Growth of Bangladesh (2000-12)**

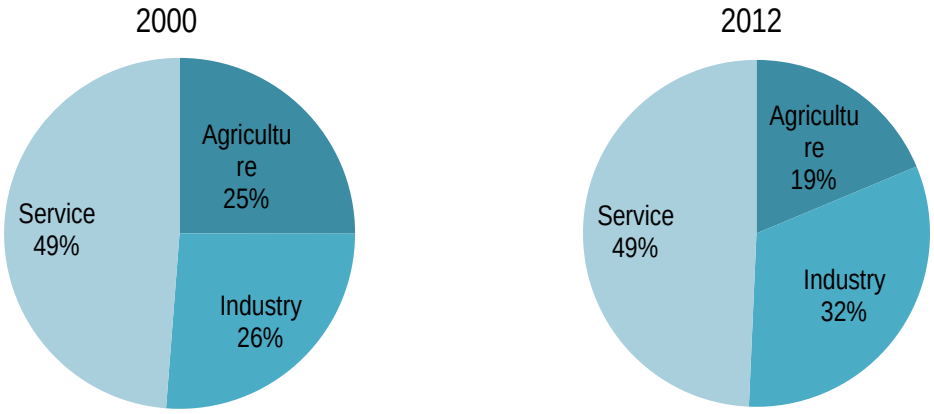
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP at Constant Price (Billion Tk) | 2,157 | 2,253 | 2,371 | 2,520 | 2,670 | 2,847 | 3,030 | 3,217 | 3,402 | 3,608 | 3,851 | 4,091 | 4,337 |
| Growth Rate (%) | 5.3% | 4.4% | 5.3% | 6.3% | 6.0% | 6.6% | 6.4% | 6.2% | 5.7% | 6.1% | 6.7% | 6.2% | 6.0% |
| GDP per Capita at Constant Price (Tk) | 16,613 | 17,112 | 17,772 | 18,637 | 19,489 | 20,512 | 21,550 | 22,593 | 23,588 | 24,705 | 25,730 | 26,986 | 28,237 |

Note: * Provisional
Constant Price base year :1995-96
Source: National Accounting Statistics 2003, 2008 and 2013, BBS

2) National GDP by Industrial Sector

Figure 2.2 and Table 2.2 shows the GDP by industrial sector at constant price from the year 2000 to 2012. In this period, the share of agriculture in GDP is gradually decreasing from 25% to 19% which was a result of industrial growth (hence, industrial sector increased share from 26% in 2000 to 32% in 2012).

With the underlying "Perspective Plan of Bangladesh 2010-2021 (Vision 21), 2012", Bangladesh government has set a goal to become middle-income country by the year 2021. Accordingly, target total GDP growth rate was set to 8% by 2015 and gradually increase to 10% by the year 2021. In addition, the government is aiming to increase GDP by industrial sector to go up to 37% by 2021 which is being assessed through yearly achievement report.




Note: * Provisional
Constant Price base year :1995-96
The service including Hotel and Restaurant, Retailtrade and Wholesale trade, Transportation and Communication, Real state and Renting, Financial Institution, Public Administration and Defense, Education, Health and Social Services, Community and Personal Services
Source :National Accounting Statistics 2003, 2008 and 2013, BBS

**Figure 2.2 GDP by Industry Sector at Constant Price of Bangladesh (2000-12)**

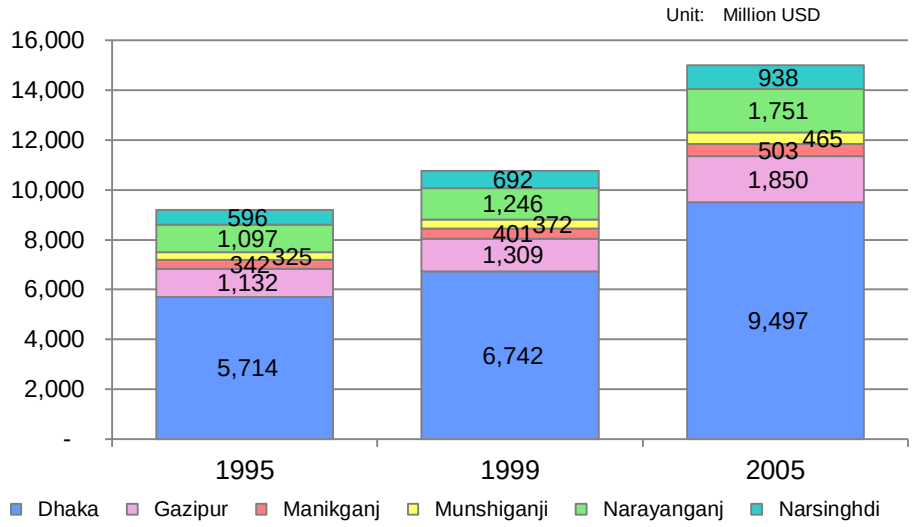
**Table 2.2 GDP by Industry Sector at Constant Price of Bangladesh (2000-12)**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP of Agriculture Sector (Billion) | 520 | 520 | 536 | 558 | 570 | 599 | 626 | 646 | 672 | 708 | 744 | 767 | 784 |
| GDP of Industry Sector (Billion) | 545 | 580 | 622 | 669 | 725 | 796 | 862 | 921 | 980 | 1,044 | 1,129 | 1,230 | 1,340 |
| GDP of Service Sector (Billion) | 1,014 | 1,069 | 1,126 | 1,190 | 1,266 | 1,347 | 1,440 | 1,533 | 1,630 | 1,736 | 1,844 | 1,954 | 2,066 |
| Share of Agriculture Sector (%) | 25% | 24% | 23% | 23% | 22% | 22% | 21% | 21% | 20% | 20% | 20% | 19% | 19% |
| Share of Industry Sector (%) | 26% | 27% | 27% | 28% | 28% | 29% | 29% | 30% | 30% | 30% | 30% | 31% | 32% |
| Share of Service Sector (%) | 49% | 49% | 49% | 49% | 49% | 49% | 49% | 49% | 50% | 50% | 50% | 49% | 49% |

Note: * Provisional
Constant Price base year :1995-96
Source :National Accounting Statistics 2003, 2008 and 2013, BBS

3) Gross Regional Domestic Product in Study Area

The study area (GDA) is known to be the most developed and urbanized area in Bangladesh. As shown in Figure 2.3 and Table 2.3, the Gross Regional Domestic Product (GRDP) of the study area has taken up to 25% of the National GDP. Dhaka, in particular, which is the centre of Bangladesh economy, contributes about 15% of national GDP and with the highest growth rate (AAGR = 5.9). Subsequently Gazipur, Narayanganj and Narsinghdi has high growth rate of more than 5% per year.




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

**Figure 2.3 GRDP in the Study Area**

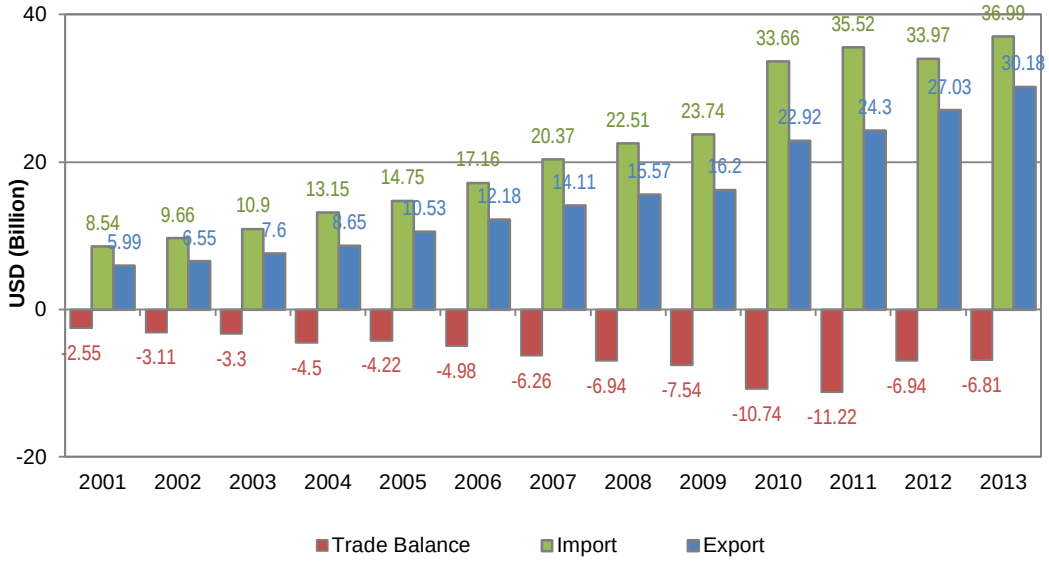
**Table 2.3 GRDP in the Study Area**

| | 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% |
| - Munshiganji | 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 byCenter for Policy Dialogue (CPD)

(2) Recent Trend in the Bangladesh Foreign Trade

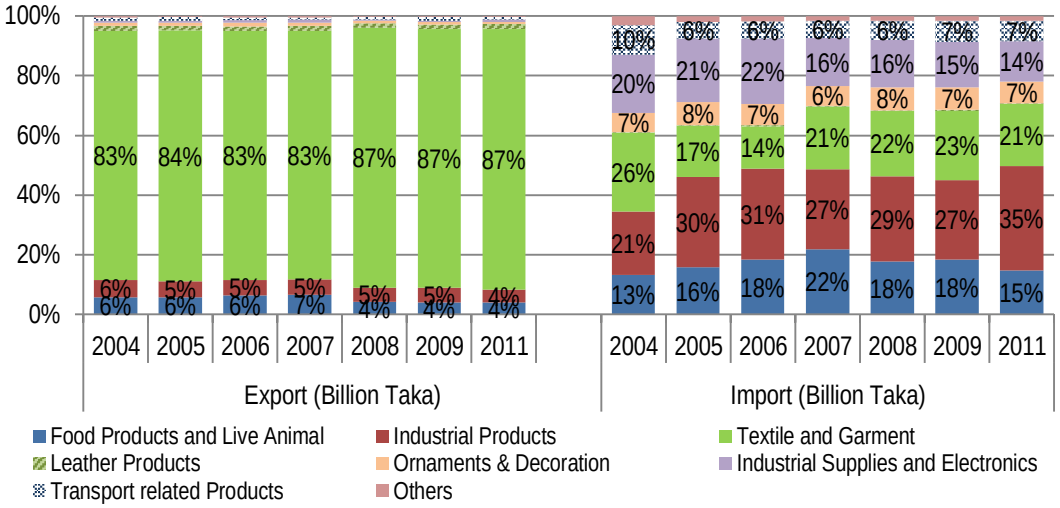
Foreign trade plays an important role in a country's economic development whereas total of Bangladesh Import and Export shows an increasing trend since 2001. In 2013, total amount of import has come closer to 37 billion USD which is 4.3 times higher than that of year 2001 while the amount of export has also increased by more than 5 times against cheap domestic labour. The difference between import and export has gradually increased up to 11 billion USD from year 2001 to 2011 and it is recently decreasing, as shown in Figure 2.4. However, it is still considerably a large trade deficit. The trade deficit has complemented to an increasing amount of overseas employee's remittance up to current account surplus.




Source: Ministry of Commerce

**Figure 2.4 Increasing Trend of Overall Import and Export of Bangladesh**

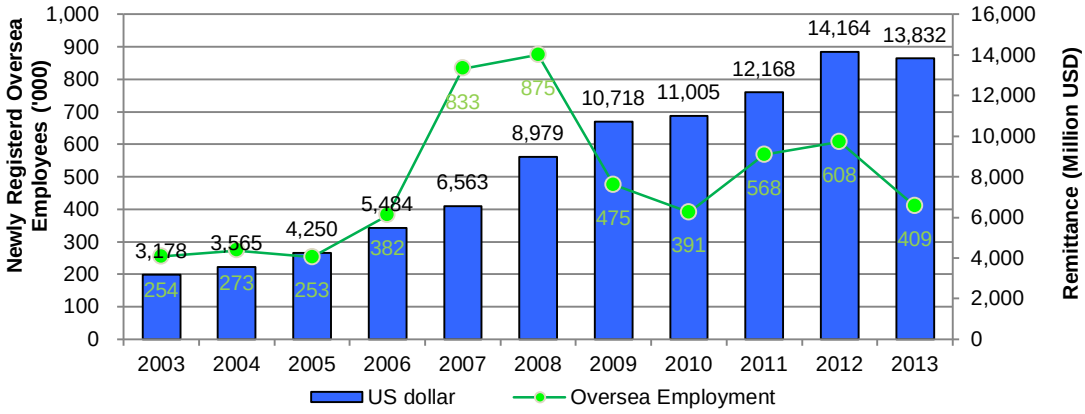
Figure 2.5 shows the breakdown of the export and import items for the past 7 years, of which, share of textile industry has increased up to almost 90% by the year 2011. This export trend has made Bangladesh the second largest RMG (Ready-made Garments) exporter in the world after China in 2013.




Source: Statistical Year Book 2012, BBS

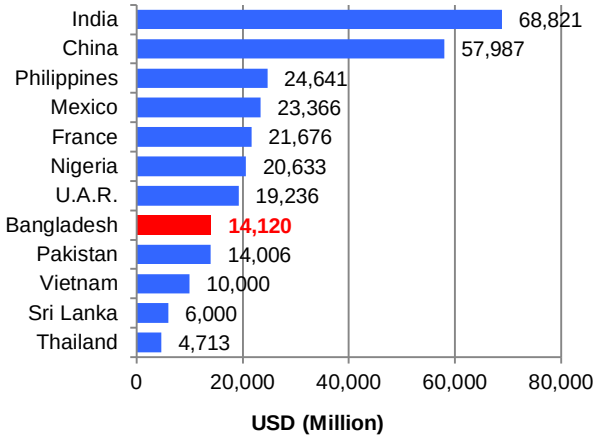
**Figure 2.5 Breakdown of Export and Import Items of Bangladesh**

The overseas employee's remittance shows an increasing figure of up to US$ 14,228 million which is almost 4.4 times higher than that of 2003. This had placed Bangladesh on 8th position in world's overseas employee's remittance in 2012. On the other hand, number of newly registered overseas employees of Bangladesh had decreased by almost 2.1 times from 2008 due to discontinuation of working visa implemented by some Arab countries like United Arab Emirates, Kuwait etc.



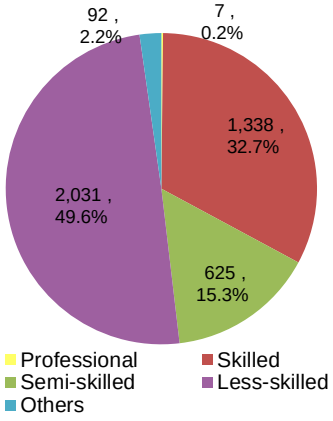

Source: Bureau of Manpower, Employment and Training, Ministry of Expatriates Welfare and Overseas Employment

**Figure 2.6 Amount of Foreign Remittance by the Newly Registered Overseas Employees**




Source: Migration and Remittance Data, 2012, World Bank,

**Figure 2.7 Remittance Inflow in 2012 in Different Countries**



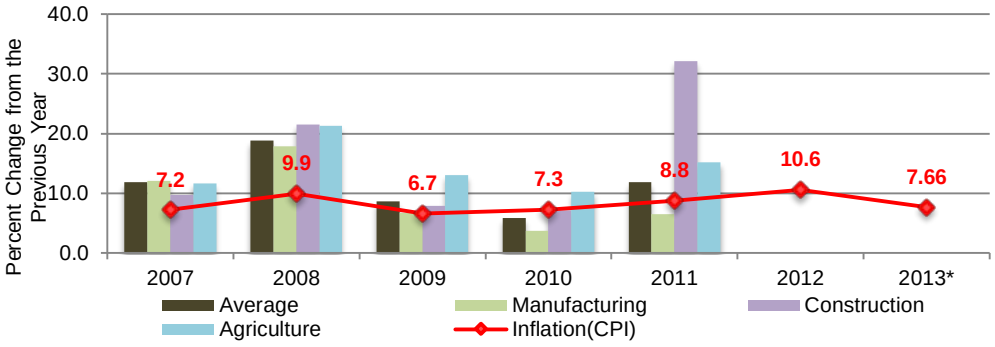

Source: Bureau of Manpower, Employment and Training, Ministry of Expatriates Welfare and Overseas Employment

**Figure 2.8 Overseas Employment by Category in 2013**

(3) Consumer Price Index and Acceleration of Inflation

1) Consumer Price Index and Acceleration of Inflation

Bangladesh inflation and nominal wage rate are continuously increasing from 2007 as shown in Figure 2.9. The graph shows an increased of inflation rate from 2007 to 2013 with an average annual inflation growth rate of 8.42% for CPI during this period. While prices of daily commodities became almost 1.5 times in 2013 compared with 2007, the increment of nominal wage rate has been considerably higher than the inflation rate except in 2010. This trend indicates an improved standard of living.

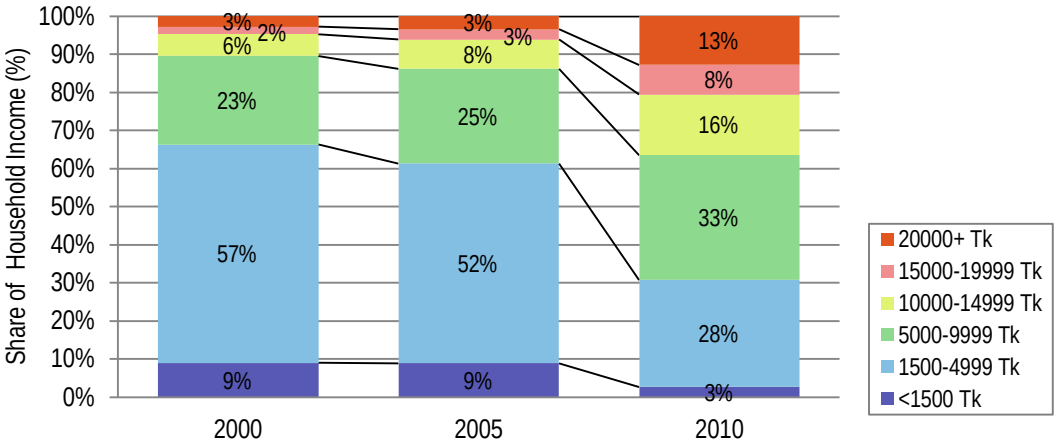



Note: * Provisional
Source: Nominal wage rate was obtained from Statistical Year book of Bangladesh 2012, and Inflation rate was obtained from National Account Statistics 2013, BBS

**Figure 2.9 Yearly change of Nominal Wage and Inflation (CPI)**

2) Distribution of Household Income and Expenditure

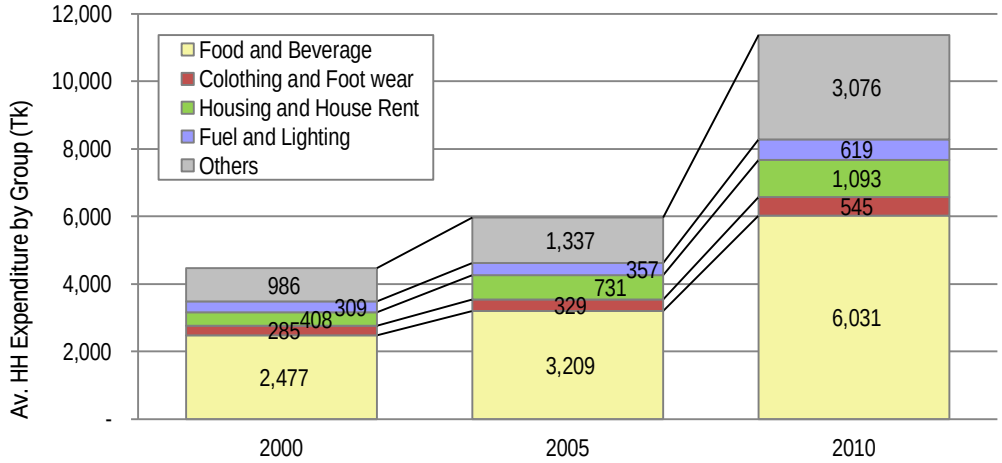
Bangladesh household income and expenditure is likewise increasing from 2000 to 2010 against economic development. As per the Household Income and Expenditure Survey, average household income was almost 12,000 Taka in 2010. As shown in Figure 2.10, share of low income households (monthly household income of less than 5000 Taka) is decreasing while high monthly income households (monthly household income of more than 5000 Taka) is increasing every year.




Source: Household Income and Expenditure Survey, 2000, 2005,and 2010, BBS

**Figure 2.10 Share of Household Income from 2000 to 2010**

Figure 2.11 shows an increasing rate of average household expenditure that went up to 11,003 Tk monthly in 2010 at the national level. The monthly average consumption in 2010 increased by 84.5% compared with year 2005 and by 142.5% with year 2000. Expenditure in food and beverage in particular, shows a tremendous increase.



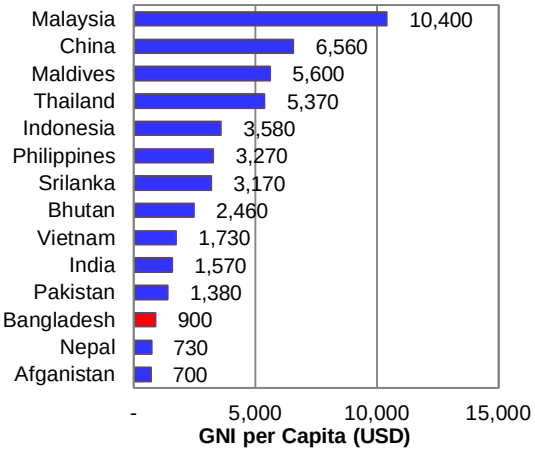

Source : Household Income and Expenditure Survey, 2010, BBS

**Figure 2.11 Increasing Trend of Household Expenditure in Bangladesh**

(4) Poverty Indices

1) GNI per Capita among Asian Country

Bangladesh economy recently shows a rapid growth, however Bangladesh still remains as one of the poorest country in the world. According to World Bank, in 2013, GNI per capita of Bangladesh was the 3rd lowest position in the South Asia with almost 60% that of India and less than 30% that of Sri Lanka. In order to curb the economic condition, the Bangladesh government resorted for an increased minimum wage. For instance, in the case of garment workers, minimum monthly wage got increased from 1,661 TK in 2006 to 3,000 Tk in 2010 and continuously went up to 5,300 Tk in the year 2014.




Source :World Bank

**Figure 2.12 GNI per Capita of Asian Country (2013)**

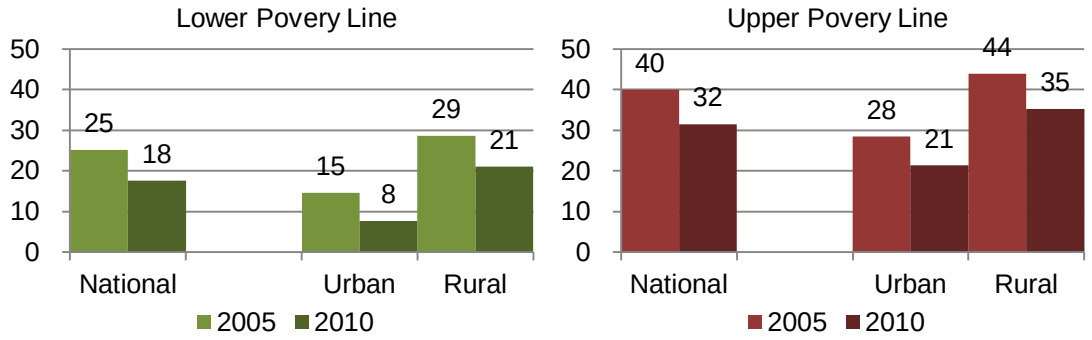
2) Population of the Poor

Gross National Income of Bangladesh is quite low due to large number of poor population. In order to estimate the number of poor people, Bangladesh Bureau of Statistics is using the Cost of Basic Needs (CBN) method since 1995-96. In this method, two poverty lines are estimated: Lower poverty line (Extreme Poor) and Upper poverty line (Moderate Poor).

**Lower Poverty Line (Extreme Poor):** The households whose total expenditures on combined food and non-food items equal or less than the food poverty line i.e. less than 2,122 K.Cal per person in a day are considered to be under the extreme Poor bracket.

**Upper Poverty Line (Moderate Poor):** The households whose total expenditures are equal to or less than the upper poverty line i.e. summation of food and non-food poverty lines are known as Moderate poor.

As stated in the Perspective Plan, the government is aiming to reduce the number of upper poverty population from 32% to 13.5% by the year 2021. In reference to Figure 2.13 data, the percentage of lower and upper poverty line people is decreasing from 2005 to 2010.




Source: Upper Poverty Line: Household Income and Expenditure Survey, 2010 and Target: Perspective Plan of Bangladesh, Planning Commission Bangladesh, April 2012, BBS

**Figure 2.13 Change of Percentage of Poor People in National Level**

(5) Slum Population

People who are unable to afford their livelihood in the rural areas, ventures by moving in to Dhaka or sub-urban area to get any kind of job where they eventually engage into different types of low skilled job such as day labourer, rickshaw puller, luggage carrier and the like. According to “Slums of Urban Bangladesh, Mapping and Census 2005”, slum is defined as a neighbourhood or residential area with a minimum of 10 households or a mess unit with at least 25 members having four of the following conditions prevailing within the area.

- Predominantly poor housing;
- Very high population density and room crowding;
- Very poor environmental services, particularly water and sanitation facilities;
- Very low socio-economic status for the majority of residents;
- Lack of security of tenure

According to above assumption, number of slum population in Dhaka Metropolitan Area is doubled from 1995 to 2005 (from 1.5 to 3.4 million people), while the number of slum communities increased by roughly 70% (from 3,007 to 4,966). Also, the share of slum population increased from 20% to 37%.

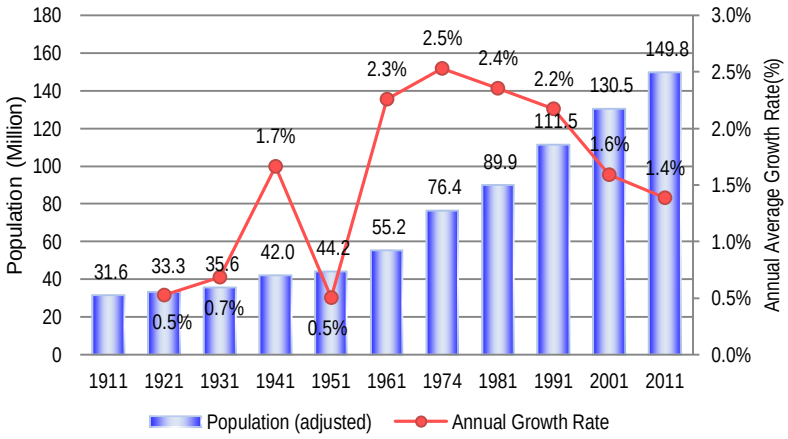
## 2.3 Social Characteristics and Household

### (1) Population Growth

#### 1) Population Growth in Bangladesh and Study Area

Bangladesh Bureau of Statistics has been carrying out Population and Housing Census since 1872. As shown in Figure 2.14, average annual population growth rate (population AAGR) increased from 0.5% in 1921 to 2.5% in 1974 except in between 1941 to 1951 due to World War II and starvation. It was assumed that more than 3 million people died due to starvation and malnutrition. However, after 1974, population AAGR started decreasing from 2.5% to 1.4% in 2011.

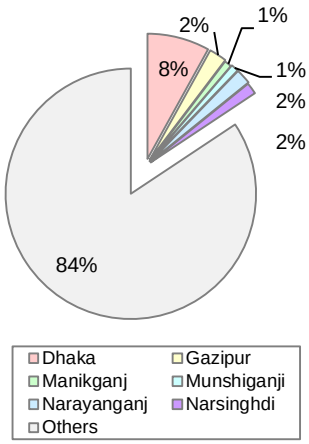
Population of GDA consists 15.7% of Bangladesh population with a population AAGR of 3.2% against a large number of social growth where only covers 5% land area of Bangladesh as shown in Table 2.4. Among the districts of GDA, population of Dhaka covers more than half of GDA population. While Gazipur and Narayanganj's population are lower than Dhaka, the population AAGRs are higher against convenient locations which give an easy commute to Dhaka and a relatively lower land value.




Note: Adjusted Population

Source : Statistical Yearbook of Bangladesh 2012, BBS

**Figure 2.14 Population and Average Annual Growth Rate**




Source : Population and Housing Census 2011, BBS

**Figure 2.15 Population Distribution in GDA (2011)**

**Table 2.4 Population Growth Rate in the Study Area**

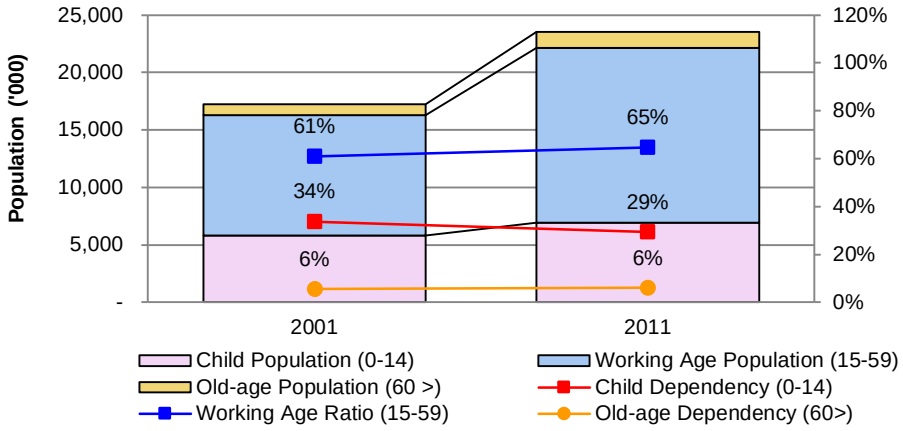
| | Area (sq. km.) | Population ('000) | | Population Share (%) | | Growth Rate (%) | Population Density ('000 person/sq.km) | |
|---|---|---|---|---|---|---|---|---|
| | | 2001 | 2011 | 2001 | 2011 | 2001-2011 | 2001 | 2011 |
| Bangladesh | 147,570 | 130,523 | 149,772 | 100.0% | 100.0% | 1.4% | 884 | 1,015 |
| GDA | 7,492 | 17,112 | 23,460 | 13.1% | 15.7% | 3.2% | 2,284 | 3,131 |
| - Dhaka | 1,464 | 8,511 | 12,044 | 6.5% | 8.0% | 3.5% | 5,814 | 8,227 |
| - Gazipur | 1,806 | 2,032 | 3,404 | 1.6% | 2.3% | 5.3% | 1,125 | 1,885 |
| - Manikganj | 1,384 | 1,205 | 1,393 | 0.9% | 0.9% | 1.5% | 871 | 1,007 |
| - Munshiganji | 1,004 | 1,294 | 1,446 | 1.0% | 1.0% | 1.1% | 1,289 | 1,440 |
| - Narayanganj | 684 | 2,174 | 2,948 | 1.7% | 2.0% | 3.1% | 3,178 | 4,310 |
| - Narsinghdi | 1,150 | 1,896 | 2,225 | 1.5% | 1.5% | 1.6% | 1,649 | 1,935 |
| Rajuk Area | 1,429 | 10,804 | 15,853 | 8.3% | 10.6% | 3.9% | 7,561 | 11,094 |

Source : Population and Housing Census 2011, BBS

2) Increase of Working Age Population in GDA

Bangladesh government considers age group from 15 to 59 years as the working age population which is showing an increasing trend as shown in Figure 2.16. Data shows that the demographic dividend based on share of working age group has increased by 4% from 2001 to 2011 while the share of old-age dependency has been consistent with 6% in 2001 and 2011.

Figure 2.17 and Figure 2.18 shows the variation of 5 years age group in 2001 and 2011. Since, the population growth in GDA is not only referring to natural growth but to social growth as well, therefore the population growth in 2011 did not follow the same trend as that of 2001.



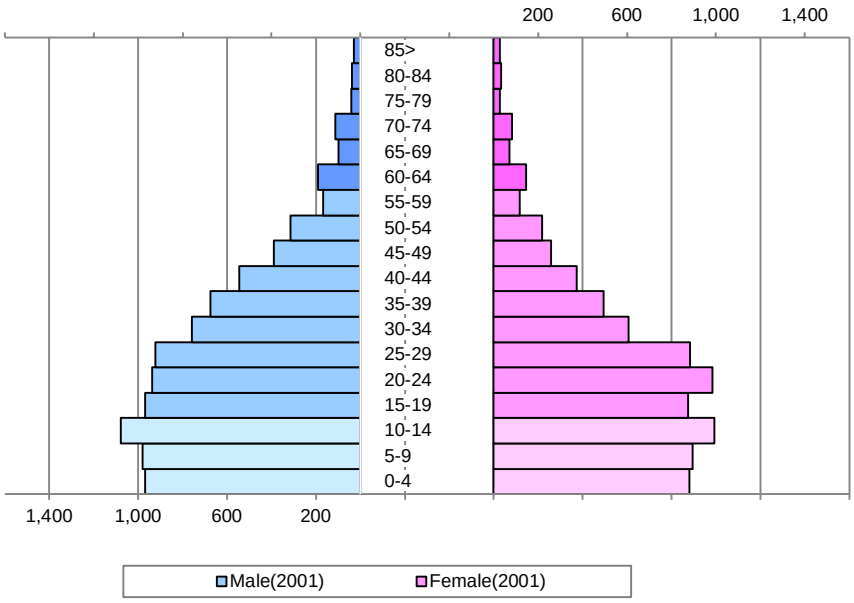

Source : Population and Housing Census 2001 and 2011, BBS

**Figure 2.16 Population and Average Annual Growth Rate in GDA**

**Table 2.5 Population and Average Annual Growth Rate in GDA**

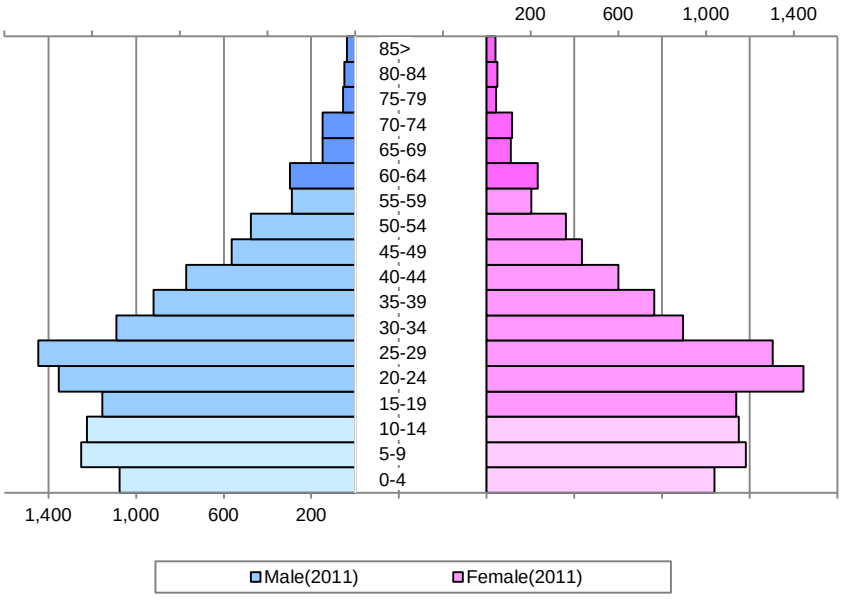
| | | 2001 | 2011 |
|---|---|---|---|
| Population ('000) | Child Population (0-14) | 5,799 | 6,918 |
| | Working Age Population (15-59) | 10,490 | 15,213 |
| | Old-age Population (60 >) | 961 | 1,408 |
| | Total | 17,250 | 23,539 |
| Share (%) | Child Dependency (0-14) | 34% | 29% |
| | Working Age Ratio (15-59) | 61% | 65% |
| | Old-age Dependency (60>) | 6% | 6% |
| | Total | 100% | 100% |

Source: Population and Housing Census 2001 and 2011, BBS




Source: Population and Housing Census 2001 , BBS

**Figure 2.17 Population Change of 5-year age Group From 2001 in GDA**

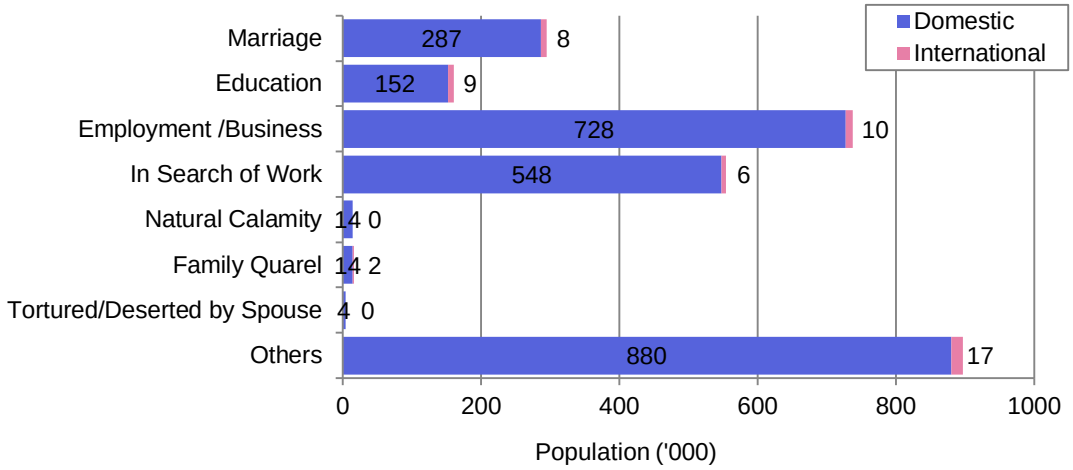



Source: Population and Housing Census 2011 , BBS

**Figure 2.18 Population Change of 5-year age Group 2011 in GDA**

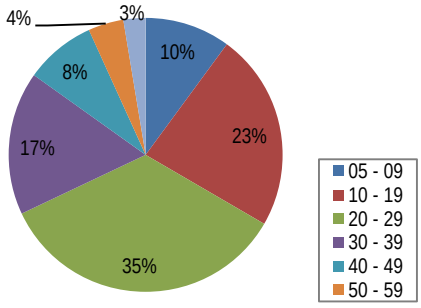
3) Characteristic of In-Migrant in GDA

One main reason of rapid population growth of GDA has been indicated due to social growth brought by the migrants. It is a known fact that people from outside GDA consider this region a potential location of employment, better income, remittances etc. As shown in Figure 2.19, “employment” and “in search of works” are the main reasons of internal migration. While migrants in “Others” are those who came for treatment, political anxiety or those with no clear purpose. As per the survey in 2011, Dhaka, Gazipur and Narayanganj are the 3 main districts of GDA which taken 96% of total migrants wherein 64% of it goes to Dhaka district. Meanwhile, Figure 2.20 shows that more than 90% of the migrants are less than 40 years of age and around 70% are less than 30 years of age. This data clearly indicates the attraction of GDA to a younger generation for its economic importance.




Source: Population and Housing Census 2011, BBS

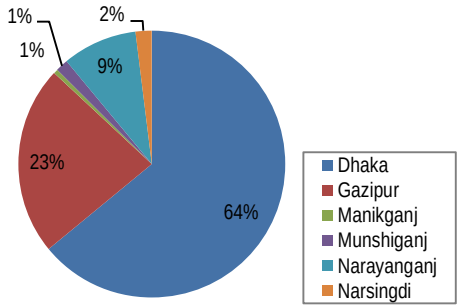
**Figure 2.19 Number of In-Migrant by Purpose (Domestic/International)**




Note :Below 5 years were excluded

Source :Population and Housing Census 2011, BBS

**Figure 2.20 Composition by Age Group**




Source :Population and Housing Census 2011, BBS

**Figure 2.21 Composition by District**

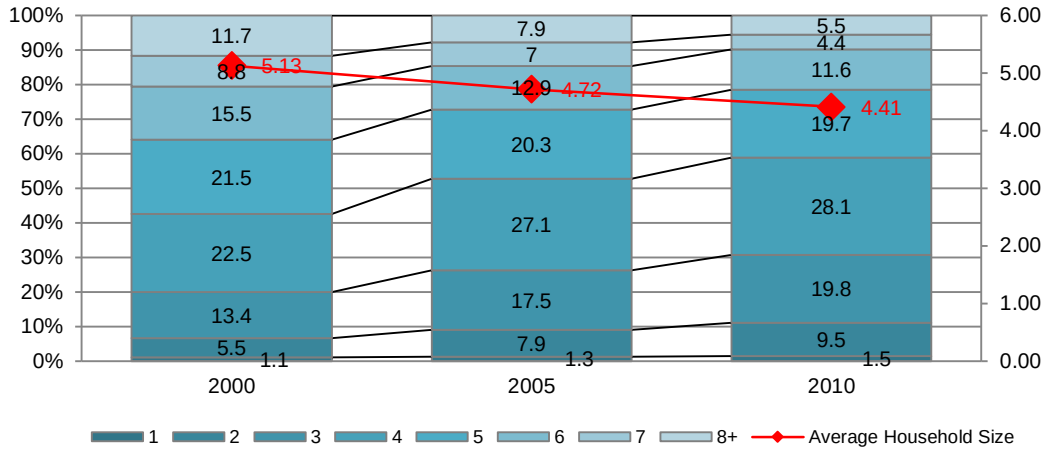
**Table 2.6 Number of In-Migrants by District (Domestic/International)**

| | Number of In-Migrants | | | Share of In-Migrants (%) | | |
|---|---|---|---|---|---|---|
| | Domestic | International | Total | Domestic | International | Total |
| Dhaka | 1,666,759 | 48,220 | 1,714,979 | 63.5% | 92.7% | 64.0% |
| Gazipur | 613,057 | 1,012 | 614,069 | 23.3% | 1.9% | 22.9% |
| Manikganj | 14,029 | - | 14,029 | 0.5% | 0.0% | 0.5% |
| Munshiganj | 39,221 | 1,294 | 40,515 | 1.5% | 2.5% | 1.5% |
| Narayanganj | 241,475 | 1,105 | 242,580 | 9.2% | 2.1% | 9.1% |
| Narsingdi | 52,133 | 395 | 52,528 | 2.0% | 0.8% | 2.0% |

Source: Population and Housing Census 2011, BBS

4) Change of Household Structure

As for the variation of average household size, Figure 2.22 shows the comparison between year 2000, 2005 and 2010. In urban area of Bangladesh, extended family is decomposing into nuclear families against increase of income per capita, migrants to urbanized area, and so on. As a result, the number of average household members is gradually decreasing from 2000 to 2010 of 5.13 persons to 4.41 persons respectively. However, Dhaka district shows a slightly lower trend with an average household members of 4.66 in 2001 and 4.21 in 2011.




Source: Household Income and Expenditure Survey, 2010, BBS

**Figure 2.22 Variation of Average Household Size in Bangladesh (Urban)**

5) Improving of Public Health Indices

In the past, Bangladesh health sector was in a poor condition with children suffering from various kinds of diseases like malnutrition, polio, influenza, diphtheria etc., wherein mortality rates were at high level. In this regard, the Government formed Vision 2021 which aimed to improved public health and prepared future target of different health indices for 2015 and 2021 and had been successful in improving the condition by reducing the death rate of children and mother. Infant mortality rate has been reduced to less than half in 2011 compared with 1991 while maternal mortality rate reduced to 2.18 in 2001 from 4.72 in 1991. Also, a success on Crude Death Rate was reflected as it was reduced by 50% for the past 20 years. Furthermore, Bangladesh succeeded to create awareness about birth control to majority of people which contributes to gradual reduction of Crude Birth Rate from 1991 to 2011. Bangladesh aims to reduce the fertility rate to 2.1 by 2021 but has already been achieved as early as 2011. As a combined effect of the indicators, life expectancy of Bangladeshi people is increasing every year. With this achievement, Bangladesh

target of life expectancy to 68 years by 2015 has already been realized as 69 years in 2011.

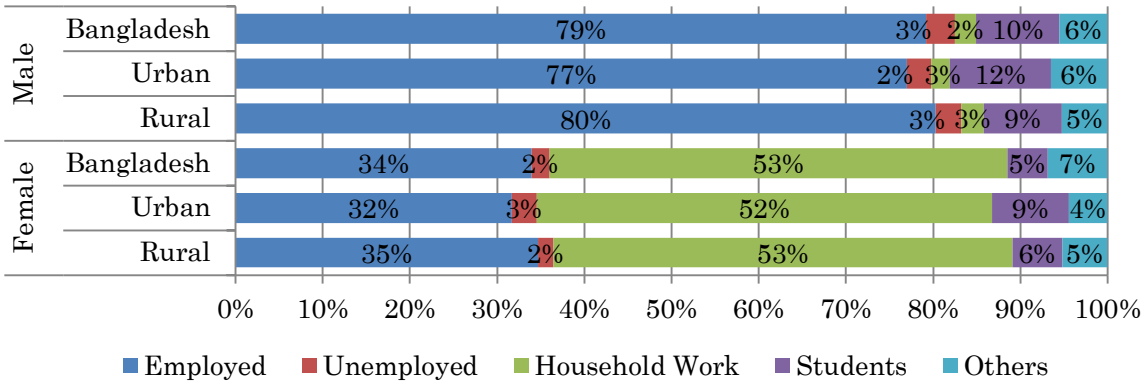
**Table 2.7 Public Health Indicators of National Level**

| Indicator | 1991 | 2004 | 2011 | Target 2015 | Target 2021 |
|---|---|---|---|---|---|
| Crude Birth Rate | 28.5 | 20.8 | 17.88 | - | - |
| Crude Death Rate | 9.7 | 6.1 | 4.8 | - | - |
| Total Fertility | 3.67 | 2.51 | 2.1 | 2.4 | 2.1 |
| Infant Mortality | 87 | 54 | 37.3 | 32 | 15 |
| Maternal Mortality | 4.72 | 3.4 | 2.18 | 1.43 | 0.57 |
| Life Expectancy | 56.1 | 65.1 | 69.0 | 68 | 70 |

Source: Population and Housing Census 2011; Socio-economic and demographic report 2012 and Statistical Year book of Bangladesh 2012, BBS

(2) Social Status

As for the social status, Figure 2.23 shows a comparison between urban and rural status by gender. In Bangladesh, share of employed population has a huge difference with respect to gender; hence, 79% of male population are employed while only 34% for female population. In the Labour force survey in Bangladesh, population of more than 15 years of age are categorized as labour force population. In the 2010 survey on population who are more than 15 years old, only 57% are employed, 27% engaged in household works, 7% students and 3% are unemployed at that time.



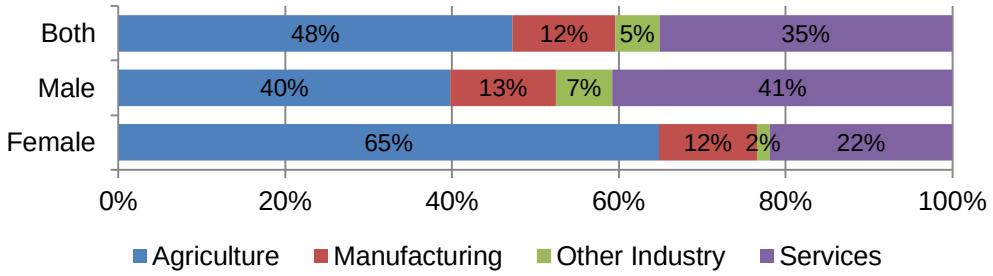

Source: Labour Force Survey Report 2010, BBS

**Figure 2.23 Social Status of Working Age (15+) Population in Bangladesh**

(3) Employment

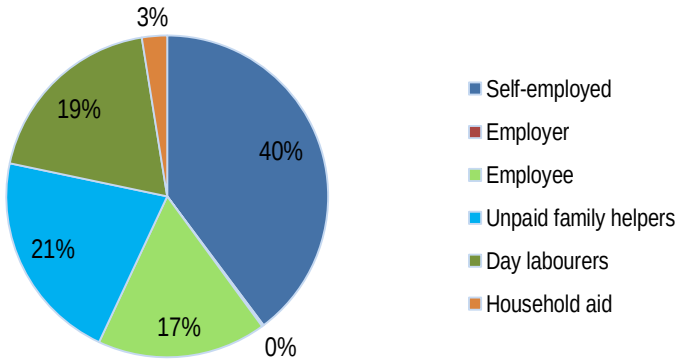
Share of employed population records are available in Labour Force Survey, however, data's available are only by major industries. The detailed records of employed population such as district wise or industrial sector wise are not available. As shown in Figure 2.24, agricultural sector covers 48% and 35% goes to service sector. With regards to female employed population, almost 65% are engaged in agricultural sector. Survey of employed population in 2010 shows that 40% are self-employed and 17% are employee,

as shown in Figure 2.25. Further detailed characteristic in GDA will also be available after person trip survey.




Source: Labor Force Survey Report 2010, BBS

**Figure 2.24 Sector wise Share of Employed Population in 2010**



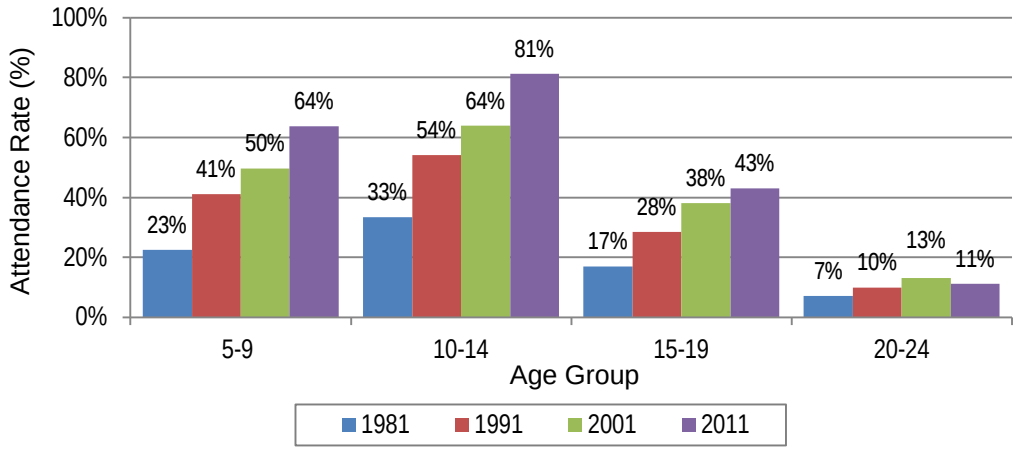

Source: Labor Force Survey Report 2010, BBS

**Figure 2.25 Share of the Status in Employment (2010)**

(4) Education

1) School Attendance Rate

Bangladesh's primary education system has grown and undergone significant progress after the independence. As part of an international Agreement, Bangladesh signed the "World Declaration on Education for All" in 1990. Primary education became a compulsory and free for all the children aged between grade 1 to grade 5 as mandated by law since 1990. As a result, school attendance rate by age groups were improved, particularly that of the 5-9 years group which improved from 23% in 1981 to 60% in 2011.

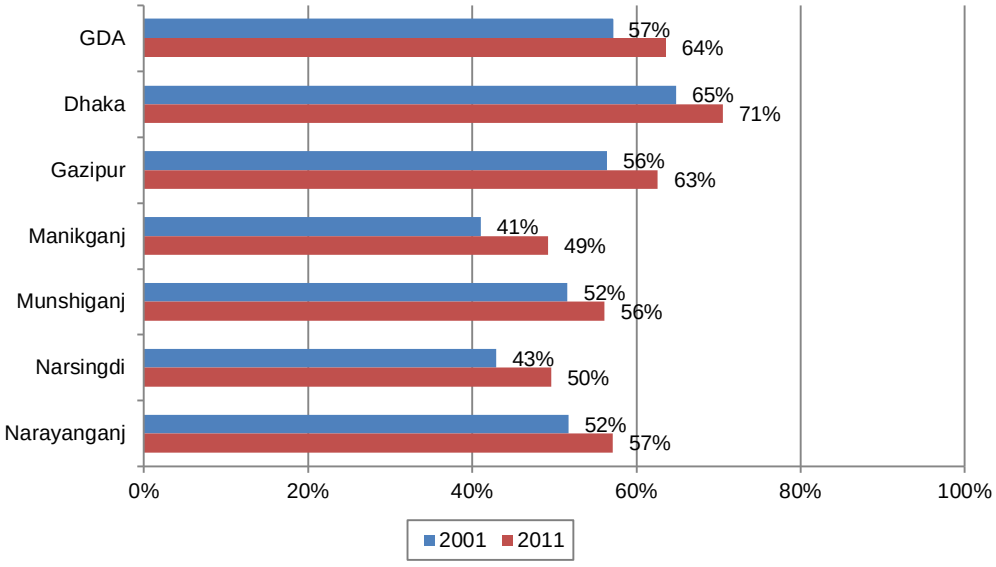



Source :Population and Housing Census 1981, 1991, 2001 and 2011, BBS

**Figure 2.26 Increasing of School Attendance Rate by Age group of Bangladesh (from 1981 to 2011)**

2) Literacy Rate

In Vision 2021, Government aimed to achieve 100% literacy rate by 2014. Though school attendance rate has increase as shown in Figure 2.26, Bangladesh still faces serious situation related to its level of education. For example, literacy rate of more than 6 years of age in GDA was improved by 7% in 2011 (from 57% to 64%), however it is still one of the lowest literacy rate in the world. In order to increase the literacy rate, the government is processing school attendance and planning to extend the duration of primary education up to grade 8.




Source: Population and Housing Census 2011, BBS

**Figure 2.27 Change of Literacy Rate of Greater Dhaka Area**

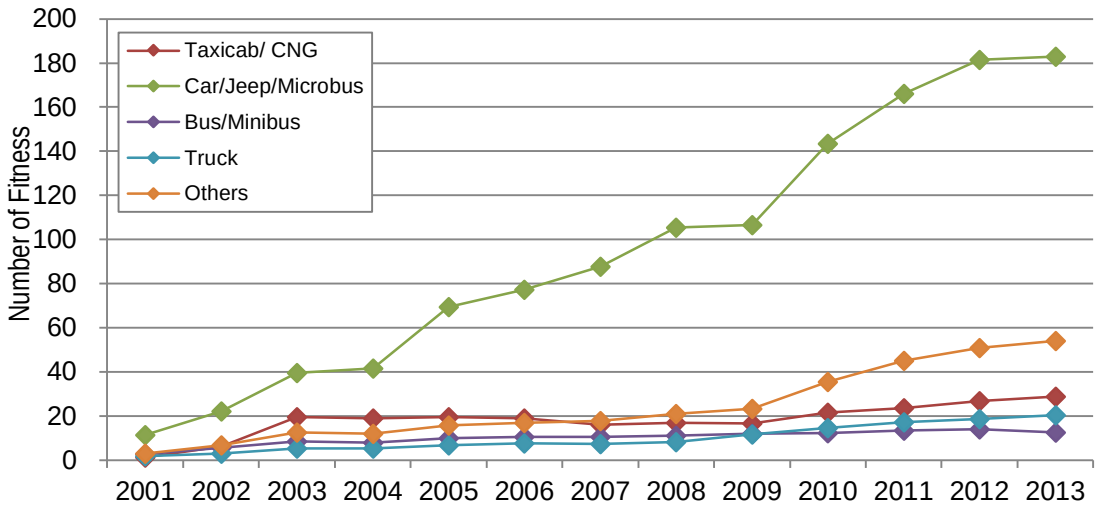
(5) Increasing of Vehicular Ownership

1) Vehicle Population based on Fitness Vehicles (without Motorcycle)

In Bangladesh, process of acquiring new vehicle starts with registration to Bangladesh Road Transport Authority (BRTA), reporting where it will be used or where the owner of the vehicle resides. Registration has to be renewed every year through the process of fitness checking and tax payment.

Vehicle population based on fitness vehicle, the number of car, jeep and microbus had increased from 11,332 in 2001 to182,801 in 2013 which shows almost 16 times more. The number of CNG has increased rapidly with almost 26 times more compared to 2001. This remarkable increase in the number of vehicles is causing more and severe traffic gridlock in the urban areas.

Vehicle populations from 2001 to 2013 are shown in Figure 2.28 and Table 2.8 .




Source: Bangladesh Road Transport Authority (BRTA)

**Figure 2.28 Vehicle Population based on Fitness Vehicle**

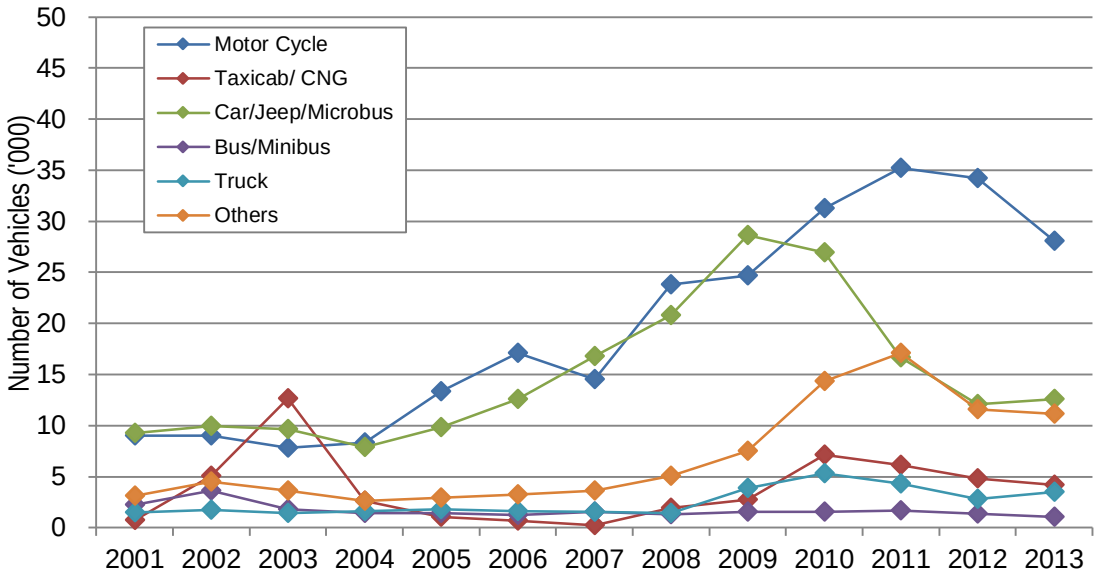
**Table 2.8 Vehicle Population based on Fitness Vehicle**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Taxicab/ CNG | 1,098 | 6,014 | 19,434 | 18,841 | 19,476 | 18,784 | 16,051 | 16,871 | 16,613 | 21,566 | 23,672 | 26,875 | 28,667 |
| Car/Jeep/Microbus | 11,332 | 22,254 | 39,637 | 41,488 | 69,376 | 77,402 | 87,585 | 105,436 | 106,605 | 143,343 | 166,159 | 181,340 | 182,801 |
| Bus/Minibus | 2,743 | 5,685 | 8,570 | 7,832 | 10,061 | 10,635 | 10,619 | 11,046 | 11,882 | 12,365 | 13,376 | 14,139 | 12,610 |
| Truck | 1,939 | 3,092 | 5,270 | 5,173 | 6,793 | 7,659 | 7,361 | 8,244 | 11,575 | 14,441 | 17,172 | 18,544 | 20,360 |
| Others | 2,945 | 6,694 | 12,464 | 11,957 | 15,880 | 16,842 | 17,634 | 20,847 | 23,236 | 35,430 | 45,114 | 50,733 | 53,944 |

Note: number of motorcycle was not obtained
Source: Bangladesh Road Transport Authority (BRTA)

2) Number of New Registered Vehicle

Number of new registered vehicles is drastically changing depending on the Bangladesh government tax policy. Although the number of new registered vehicle is generally increasing compared with 2001, the numbers of new registered vehicle recently is considerably low due to increase of import tax imposed by the government. Among the vehicle types, numbers of motorcycle is the highest and next are the car, jeep, minibus and CNG.




Source: Bangladesh Road Transport Authority (BRTA)

**Figure 2.29 Number of New Registered Vehicles from 2001 to 2013**

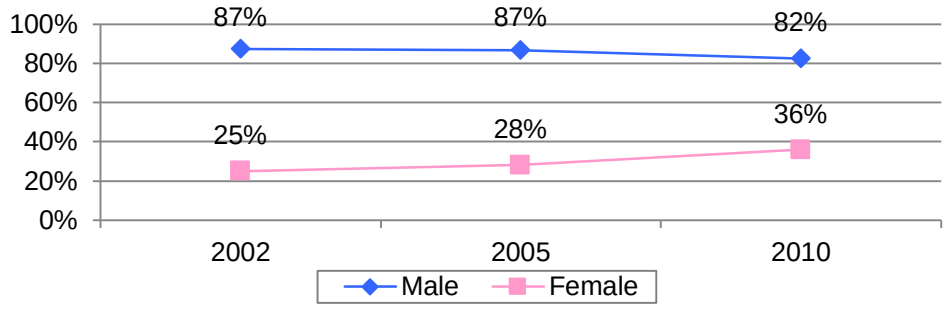
**Table 2.9 Number of New Registered Vehicles from 2001 to 2013**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Motor Cycle | 9,007 | 8,987 | 7,798 | 8,305 | 13,362 | 17,117 | 14,520 | 23,834 | 24,675 | 31,239 | 35,195 | 34,198 | 28,086 |
| Taxicab/ CNG | 731 | 5,090 | 12,647 | 2,634 | 1,059 | 659 | 235 | 1,909 | 2,741 | 7,132 | 6,135 | 4,791 | 4,203 |
| Car/Jeep/Microbus | 9,272 | 9,963 | 9,667 | 7,863 | 9,803 | 12,579 | 16,802 | 20,800 | 28,632 | 26,918 | 16,688 | 12,100 | 12,588 |
| Bus/Minibus | 2,266 | 3,622 | 1,826 | 1,434 | 1,457 | 1,252 | 1,546 | 1,332 | 1,584 | 1,579 | 1,665 | 1,342 | 1,079 |
| Truck | 1,504 | 1,745 | 1,411 | 1,640 | 1,830 | 1,611 | 1,562 | 1,423 | 3,846 | 5,290 | 4,281 | 2,838 | 3,528 |

Source: Bangladesh Road Transport Authority (BRTA)

(6) Movement Women into Society (Gender Equality Indices)

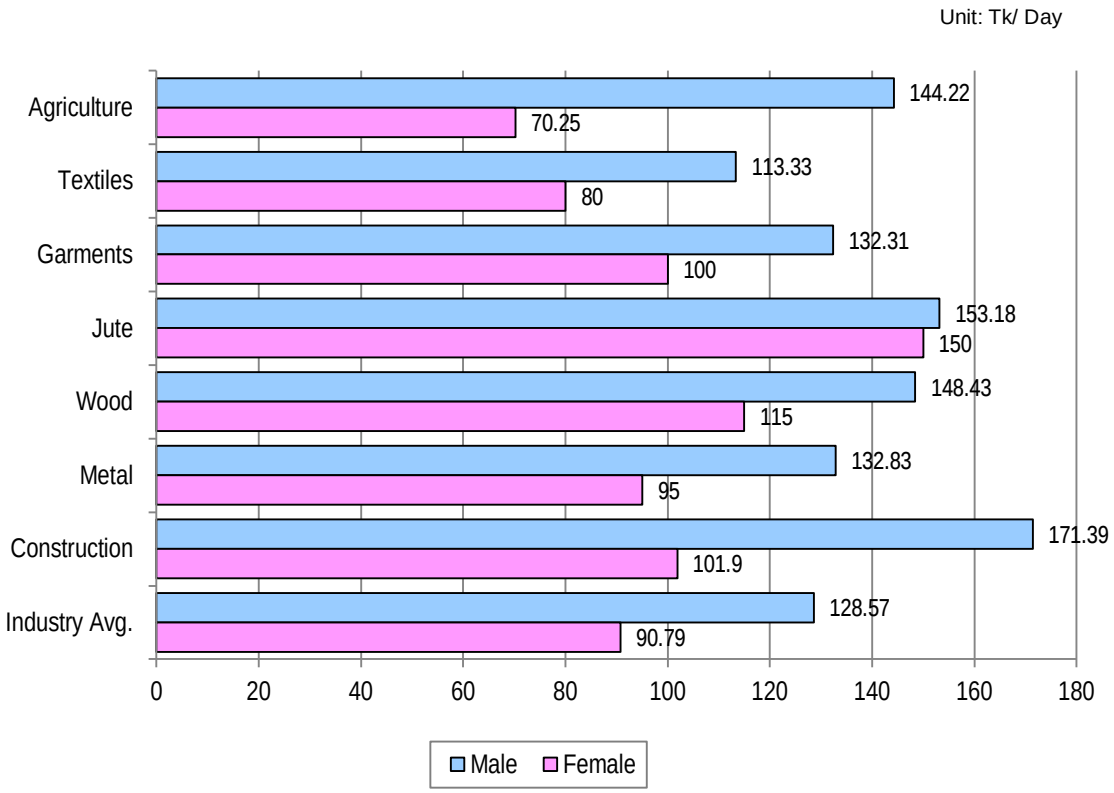
Bangladesh is concerned about the society's gender inequality and it is aiming to improve the participation rate of women in labour force of at least 40% by 2021. As shown in Figure 2.30, gradual change of women's labour force participation from 1999 to 2010 is reflected but still the percentage is quite low (36%) compared with male (82%). Participation rate of female population in GDA area in labour force is 3% lower than the country average.




Source: Key Findings of Labour Force Survey 2010, BBS

**Figure 2.30 Increasing Trend of Female Participation in Labor Force**

Figure 2.31 shows daily wage rate of some major industries in Bangladesh. As per the given Wage Rate Survey by BBS, female daily workers are generally paid less than male workers. While in industries like Agriculture and Construction, the wage of female workers is even below than the average industrial wages.




Source: Wage Rate of Working Poor in Bangladesh, 2009-10, BBS

**Figure 2.31 Daily Wage Difference of Male and Female Workers in Bangladesh**

## 2.4 Present Population and Employment

### (1) Population

#### 1) Population of the study area

The total population of GDA in 2011 was 24.4 million which 16.3% of the national population was. Among districts, Dhaka has the largest population with 51.3% of GDA; however Gazipur showed the most rapid increase of population in the period of 2001-2011; moreover, Gazipur has the second largest population among all the districts. On the other hand, the population of Manikganj, Munshiganj and Narsingdi grew slowly compared to GDA, which suggests centralization of population (see Table 2.10).

**Table 2.10 Population and Area of GDA District**

| District | | Area (km2)[1)] | 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

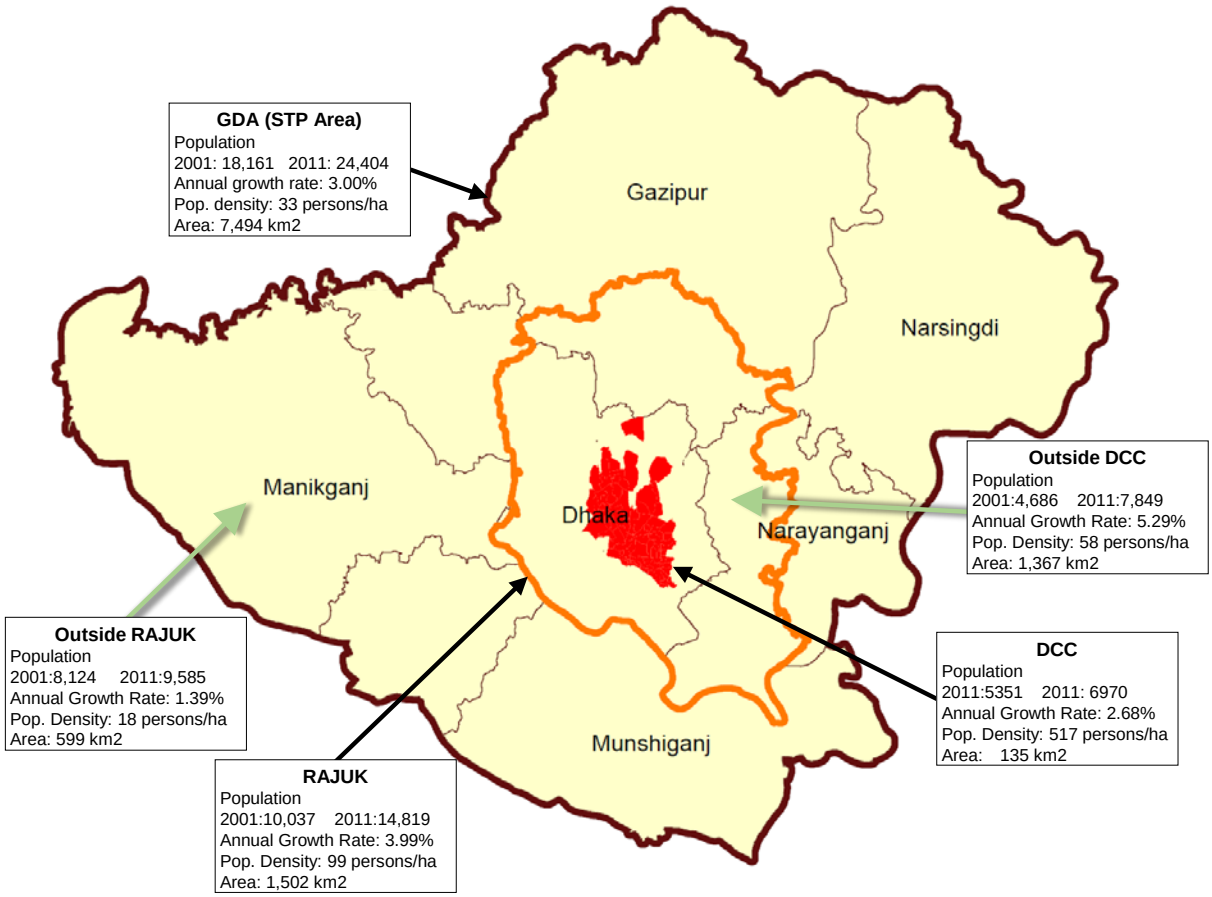
RAJUK planning area covers some parts of Dhaka and Gazipur Districts as well as Narayanganj with 20.1% of the GDA. As per population, RAJUK area has 14.9 million in 2011, and the share of its share to the GDA increased from 55.3% in 2001 to 60.7% in 2011 due to its rapid population increase (see Table 2.11).

On the contrary, the exterior of RAJUK area recorded lower growth ratio of population, except Gazipur District. RAJUK area which does not fall within the DCC South and North has been developing intensively for urbanization and population. The shape of expanding urbanized area becomes elongated from the north to south.

**Table 2.11 Population and Area of RAJUK Area**

| | Area (Km2) | Population | | AGR (%/year) |
|---|---|---|---|---|
| | | 2001 | 2011 | |
| RAJUK Area | 1502.3 | 10,037,120 | 14,819,160 | 3.99 |
| Outside RAJUK Area | 5,990.2 | 8,123,970 | 9,585,030 | 1.39 |
| TOTAL | 7,493 | 18,161 | 24,404 | 3.00 |

Source: Population and Housing Census 2011



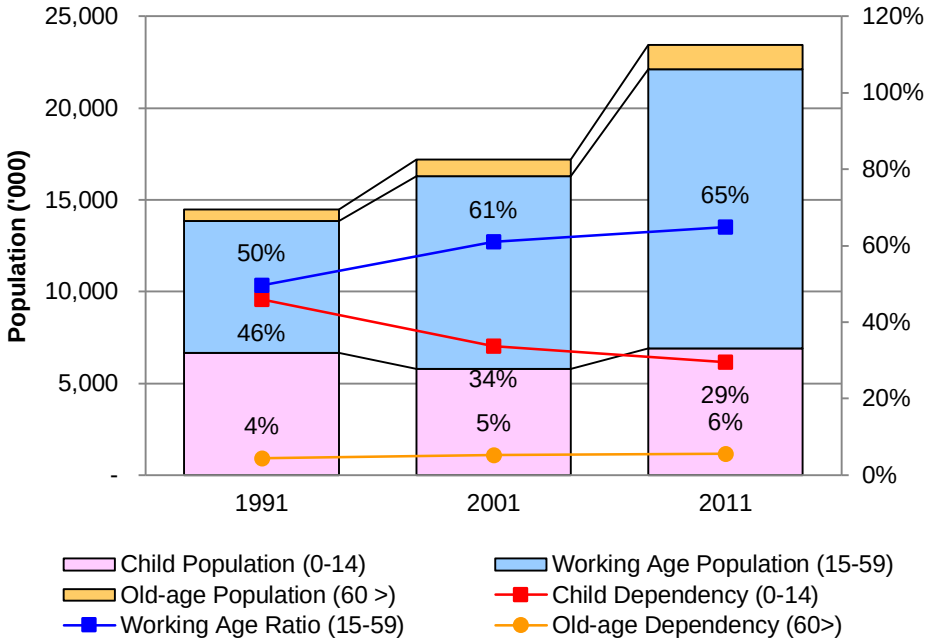

Unit of Population: thousand

Source: JICA Study Team

**Figure 2.32 The Recent Population Trend by the areas**

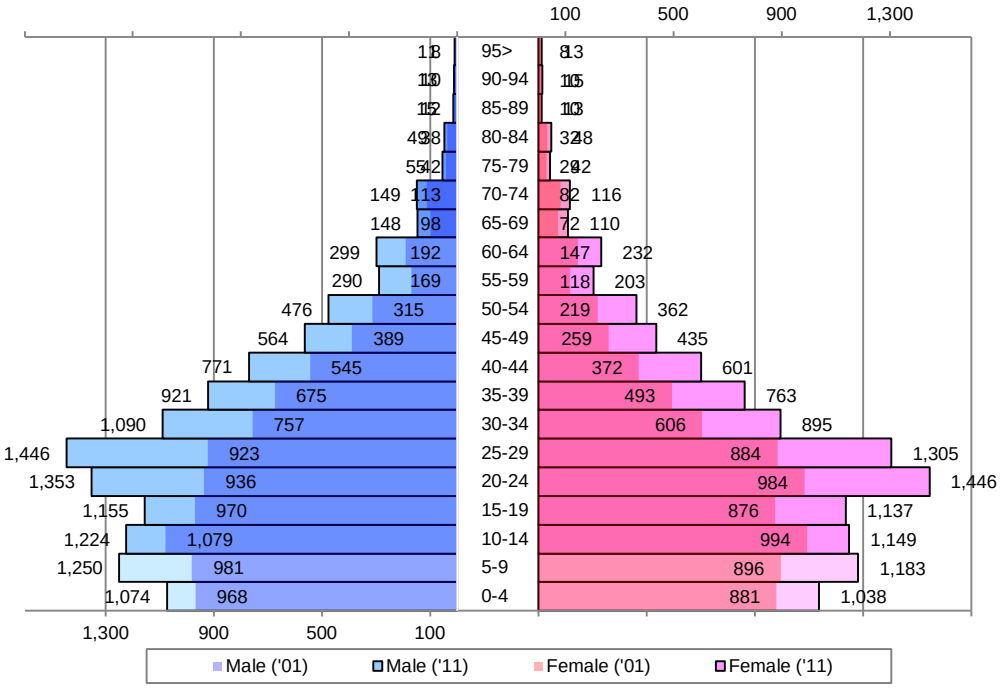
2) Population Share in the Study Area

The age group from 15 to 59 is considered as the working age population. In GDA the percentage of working age group has been increased drastically in the last 20 years. On the other hand, child population i.e. less than 14 years of age has decreased from 1991 to 2001, which is positive for the economic growth.




Source: JICA Study Team worked out based on Population and Housing Census 2011

**Figure 2.33 Population of the age group**




Source: JICA Study Team worked out based on Population and Housing Census 2011

**Figure 2.34 Population by 5-year Group**

3) Location and Population of Major Cities

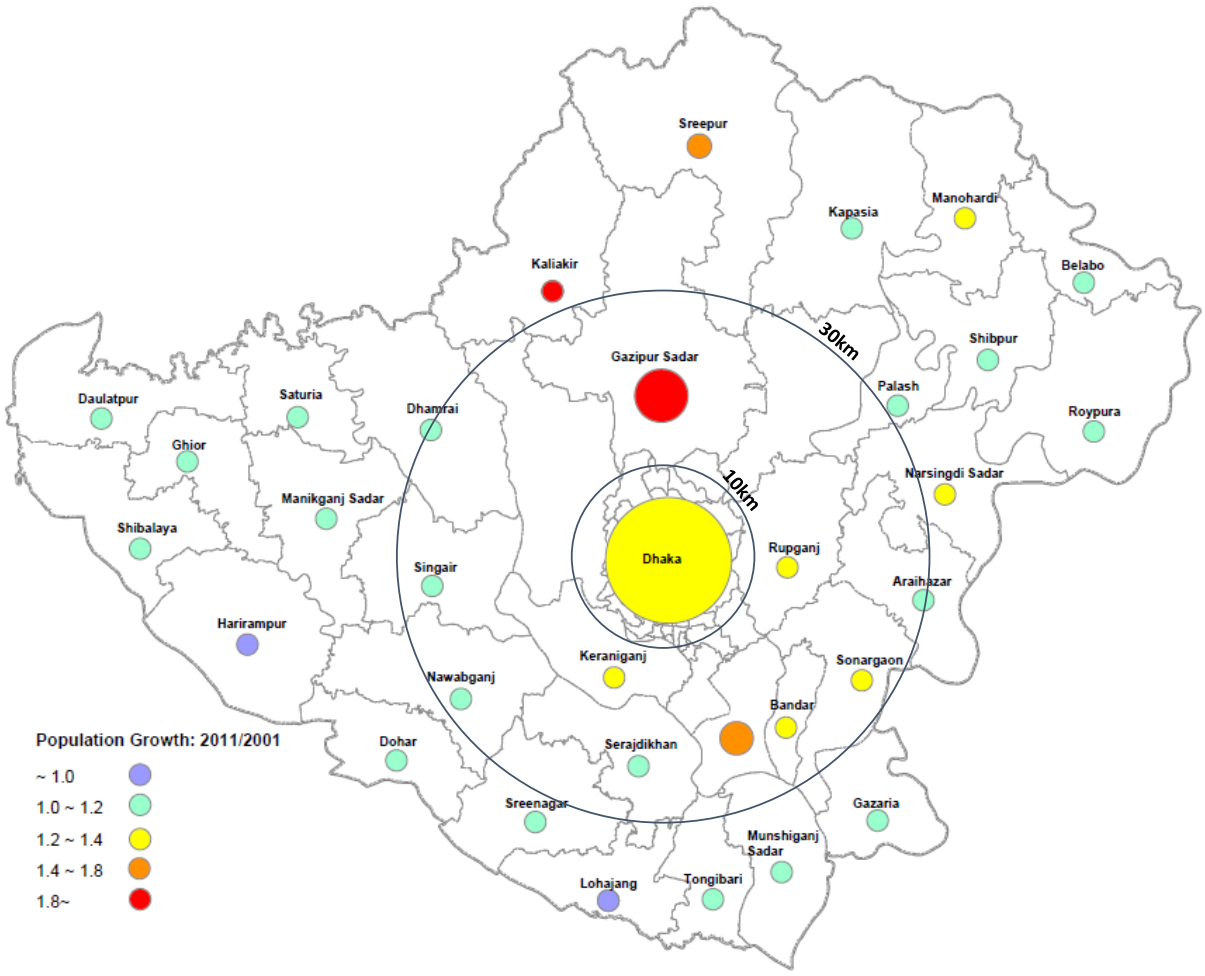
There are 29 cities (Upazila) besides Dhaka district and 26 cities outside of RAJUK area. Cities over one million of population are Gazipur Sadar, Narayanganj Sadar and Savar, which grow extremely fast. In case of outside RAJUK area, Narsingdi is the largest and Rajupura, Sreepur and Kaliakoir exceed 500,000 persons.

Among cities, Gazipur, Savar and Kaliakoir have achieved an extremely rapid increase of population, while the remote cities from Dhaka show rather gentle growth of population.

**Table 2.12 List of Major Cities (Upazila)**

| District | City (Upazila) | Population | | |
|---|---|---|---|---|
| | | 2001 | 2012 | 2011/2001 |
| Gazipur | Gazipur Sadar | 925,454 | 1,899,575 | 2.05 |
| | Sreepur | 352,543 | 513,352 | 1.46 |
| | Kaliakoir | 278,967 | 503,976 | 1.81 |
| | Kapasia | 335,959 | 355,196 | 1.06 |
| | Kaliganj | 250,277 | 276,016 | 1.10 |
| Manikganj | Manikganj | 274,206 | 322,213 | 1.18 |
| | Singair | 259,790 | 298,763 | 1.15 |
| | Shibalay | 161,208 | 178,416 | 1.11 |
| | Saturia | 162,113 | 178,032 | 1.10 |
| | Daulatpur | 162,695 | 173,390 | 1.07 |
| | Ghior | 144,714 | 151,868 | 1.05 |
| | Harirampur | 179,023 | 144,614 | 0.81 |
| Narsingdi | Narshingdi | 606,474 | 737,362 | 1.22 |
| | Belabo | 171,340 | 197,365 | 1.15 |
| | Rajpura | 474,904 | 556,685 | 1.17 |
| | Shibpur | 277,131 | 315,667 | 1.14 |
| | Monohardi | 225,544 | 285,831 | 1.27 |
| | Palasn | 198,108 | 221,976 | 1.12 |
| Narayanganj | Narayanganj Sadar | 946,205 | 1,381,796 | 1.46 |
| | Rupganj | 421,675 | 558,192 | 1.32 |
| | Sonargaon | 319,396 | 416,046 | 1.30 |
| | Araihazar | 346,517 | 390,895 | 1.13 |
| | Bandar | 267,021 | 327,149 | 1.23 |
| Munshiganj | Munshiganj Sadar | 342,957 | 399,560 | 1.17 |
| | Sirajdikhan | 252,757 | 299,063 | 1.18 |
| | Srinagar | 239,072 | 269,801 | 1.13 |
| | Tongibar | 199,057 | 204,712 | 1.03 |
| | Lohajang | 173,316 | 165,305 | 0.95 |
| | Gazaria | 144,327 | 164,008 | 1.14 |
| Dhaka | Keraniganj | 649,373 | 824,538 | 1.27 |
| | Savar | 629,695 | 1,422,885 | 2.29 |
| | Nawabganj | 309,943 | 330,969 | 1.07 |
| | Dohar | 200,896 | 235,572 | 1.17 |
| | Dhamrai | 365,713 | 426,924 | 1.17 |

Source: Population and Housing Census 2011
Note: City within RAJUK area

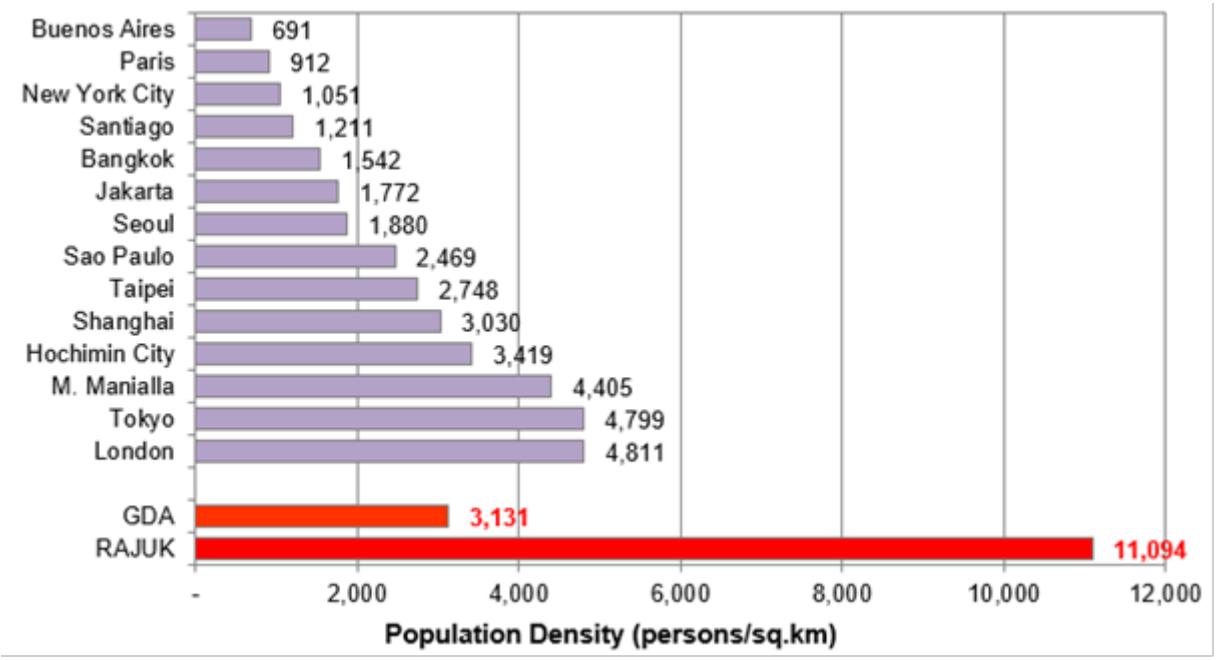



Source: JICA Study Team

**Figure 2.35 Distribution of Major Cities (Upazila) in GDA**

4) Population Density by Union

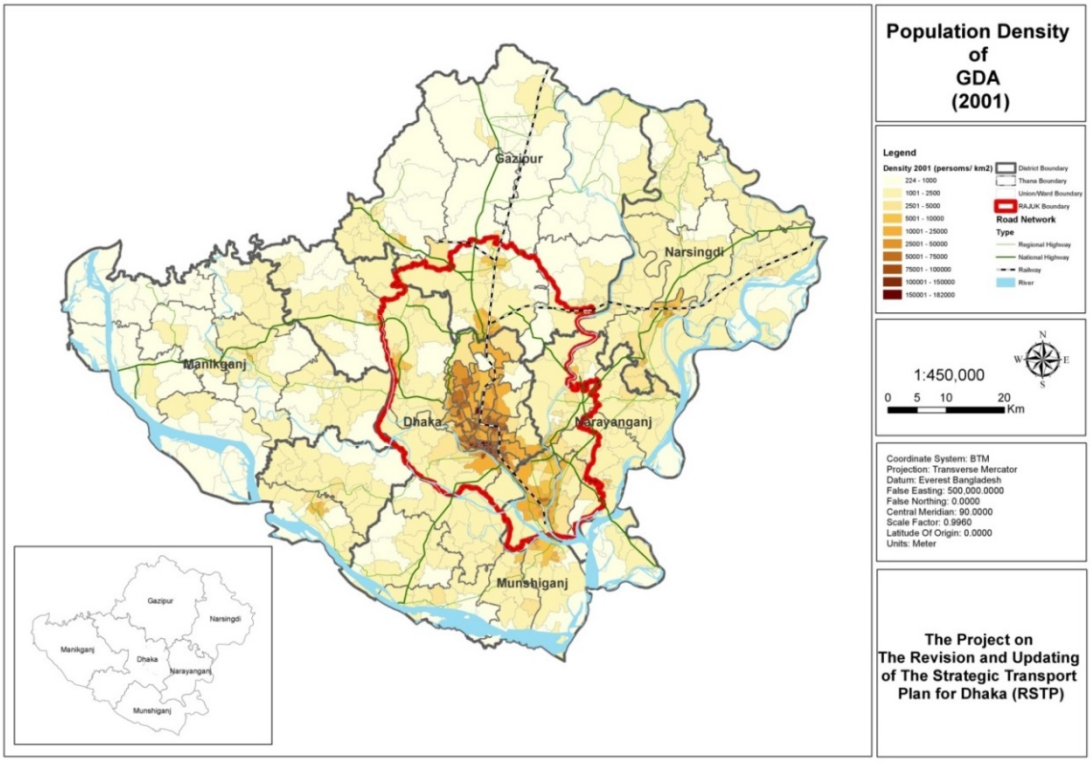
Bangladesh is ranked first among all countries with more than 10 million people. And among the densely populated cities in the world, RAJUK area is at the top with11,094 persons/km$^2$.




Source: JICA Study Team compiled several data source

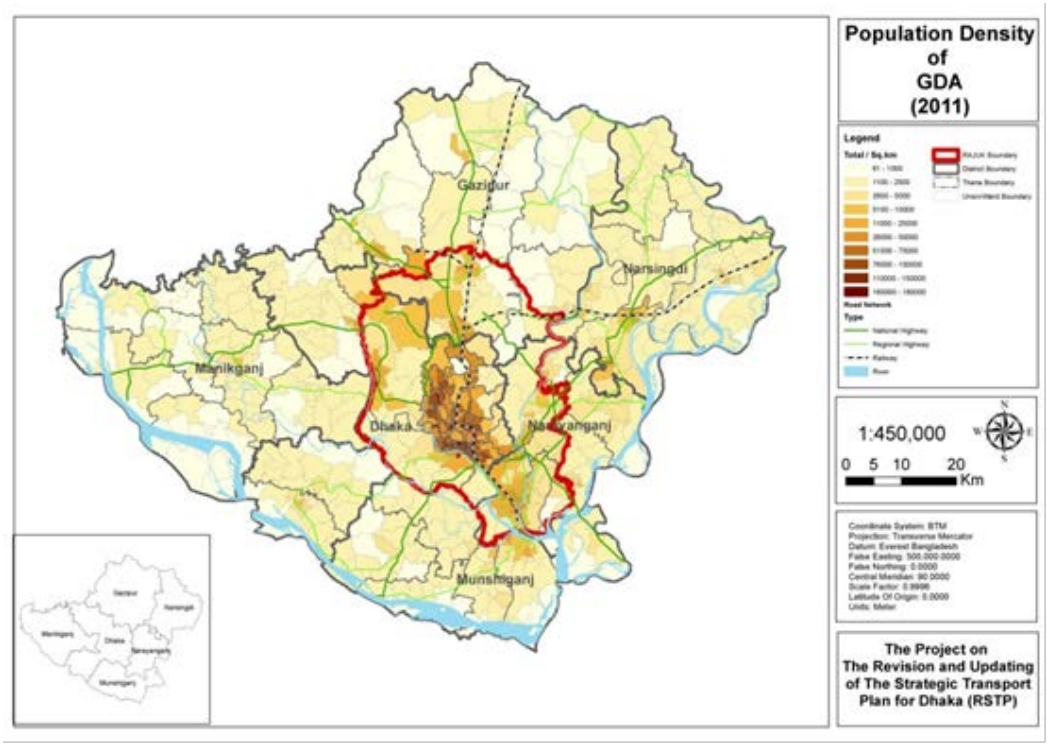
**Figure 2.36 Population Density in Metropolitan Are**

There are numerous unit with the population density of more than 1,000 persons/ha in DCC. The change of population distribution is observed in detail in the following figures.




Source: JICA Study Team

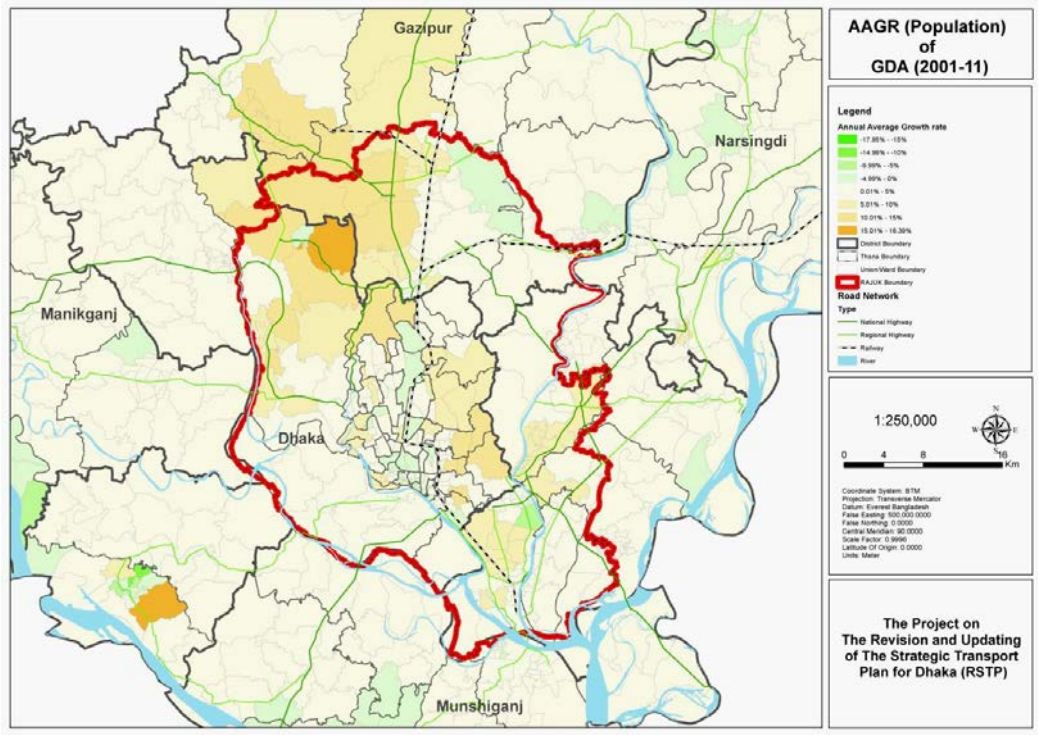
**Figure 2.37 Population Density by Union in 2001**




Source: JICA Study Team

**Figure 2.38 Population Density by Union in 2011**

From 2001 to 2011, the population has increased at the north-west direction of DCC, while the unions within DCC decreased in density.




Source: JICA Study Team

**Figure 2.39 Annual Average Growth Rate by Union during 2001-2011**

(2) Employment Centers

Among the major employment centers, DCC area has the largest number of employment, and within the DCC area the employment at the “Old Dhaka” is 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, the population is growing very rapidly, which suggest that these areas have achieved the high urban growth by industrialization and providing job opportunities.

**Table 2.13 Main Employment Centers**

| | Employment | Population | E/P ratio |
|---|---|---|---|
| Old Ddhaka | 959,694 | 1,573,292 | 0.61 |
| Kafrul & Pallabi | 560,055 | 719,962 | 0.78 |
| Badda & Khilgaon | 399,062 | 481,911 | 0.83 |
| Mohammadpur | 276,593 | 402,825 | 0.69 |
| Gulshan | 261,335 | 226,000 | 1.16 |
| Mirpur | 191,091 | 284,659 | 0.67 |
| Tejgaon | 170,401 | 245,997 | 0.69 |
| Cantonment | 124,123 | 134,765 | 0.92 |
| Ramna | 115,239 | 167,827 | 0.69 |
| Motijheel | 84,216 | 134,706 | 0.63 |
| Dhanmmondi | 79,993 | 134,272 | 0.60 |
| Hazaribagh | 61,035 | 89,389 | 0.68 |
| Sub Total | 3,282,837 | 4,595,605 | 0.71 |
| Savar | 854,286 | 675,737 | 1.26 |
| Gazipur | 784,171 | 691,576 | 1.13 |
| Narayanganj | 185,229 | 364,449 | 0.51 |
| Tongi | 57,984 | 65,968 | 0.88 |
| Munshiganj | 46,756 | 88,836 | 0.53 |
| Narshingdi | 45,067 | 96,593 | 0.47 |
| Manikganj | 26,153 | 67,377 | 0.39 |
| Total | 5,282,483 | 6,646,141 | 0.79 |

Source: Survey Report “Preparation of Structure Plan (2016-2035) for RAJUK under CRDP”

The income from the manufacturing sector of the country manifests Gazipur’s dependence on it as well as Dhaka and Narayanganj follow.

**Table 2.14 Per Capita Income by Districts ( 1999)**

| | Dhaka | Gazipur | Narayanganj | Narshingdi | Manikganj | Munshiganj |
|---|---|---|---|---|---|---|
| Per Capita Income | 36,554 | 30,291 | 27,269 | 16,860 | 14,011 | 12,931 |
| By Manufacturing | 12,397 | 12,216 | 10,455 | 4,220 | 1,392 | 1,782 |
| Ratio (%) | 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

## 2.5 Existing Land Use Patterns

(1) Existing Land Uses in Greater Dhaka Area

1) Overview

Non-urban land uses are the still dominant in Greater Dhaka Area's land use such as agricultural land, forest and unused area. The total area of GDA is 74,400 ha. Of which, only 33% is settlement area. Those settlement area can be found along the major road and river network (see Figure 2.40). The settlement area has been expanded from Dhaka Central Region towards north and northeast side, i.e., Gazipur and Narasingdi. Most of the GDA is low, flat and flood-prone areas. However, northern part has relatively higher elevation. In addition, the rivers surrounding Dhaka Central Region (i.e. Buriganga River, Sitarakhya River and Dhaleswai River) play the role of buffer zone to control the urban sprawl towards east and west.

Forest area is spread around Gazipur District. The Bhawal National Park in Gazipur was established in 1974 with the goal of protecting the park's most important habitants. The Bhawal National Park covers an area of 5,022 ha. The area was once covered by a lush forest canopy created by Sal (Shorea robusta) trees, but unfortunately, illegal deforestation has stripped the area of much of this natural vegetation. Aside from the Bhawal National Park, the Bangabandhu Sheikh Mujib Safari Park which will be the largest Safari Park in Asia is being constructed with 1.2 ha of the total land.

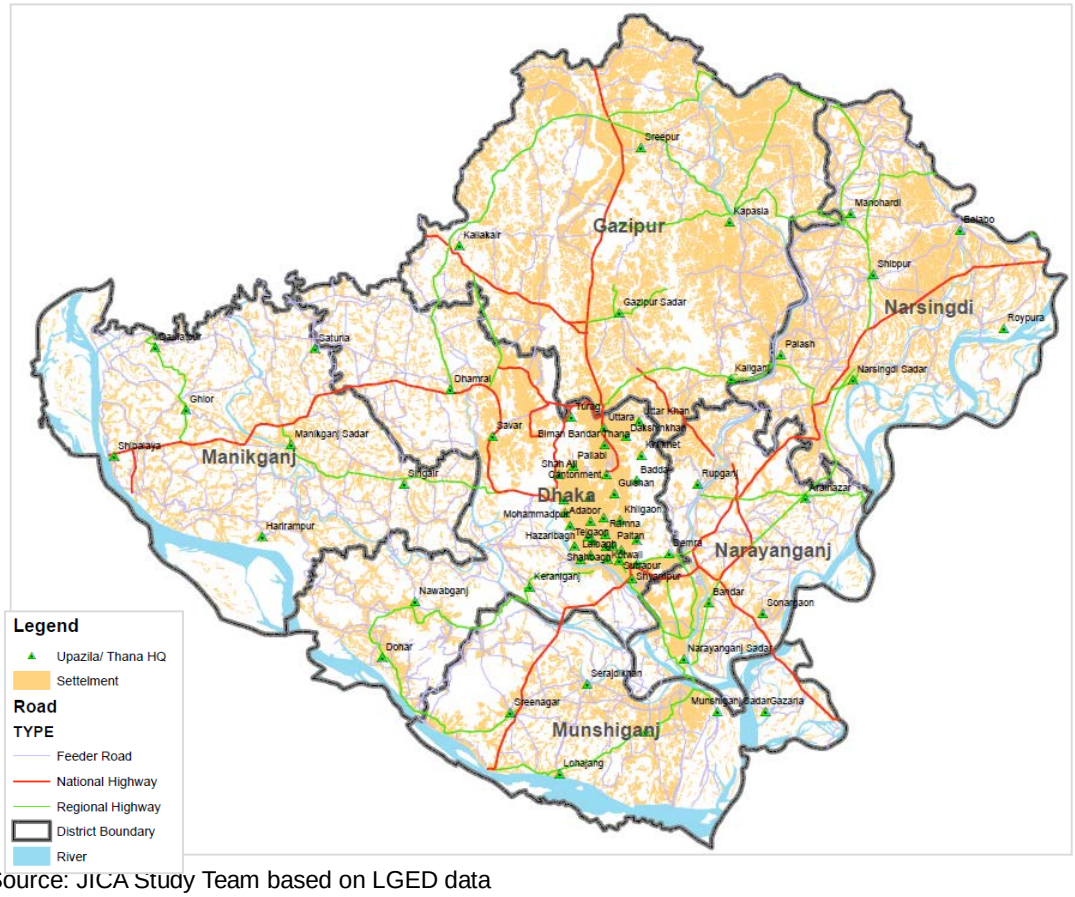
Industrial area is located in Narayanganj District. The river port of Narayanganj is one of the oldest in Bangladesh. This port made the district as a center of business and industry, especially the jute trade, processed plants, and the textile sector of the country. The district is pioneer in merchandising yarn and dying items (see Figure 2.41).

2) Dhaka District

Dhaka District has an inverted doglegged shape with 146,400ha. The urban development of the district has been concentrated on its Central Region. A big disparity is evident between the land use in Dhaka Central Region and the land uses in northwest and southwest portion of the district.

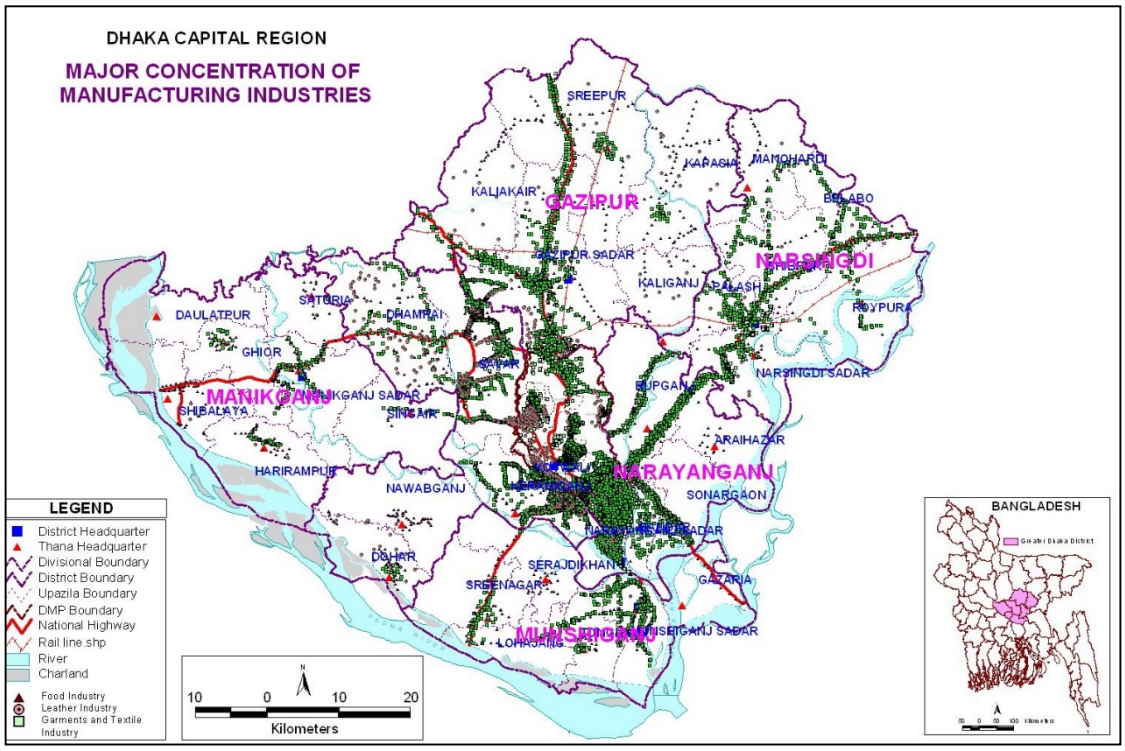
The northwest portion has the same land use character as the Manikganj District. The southern portion are the same as those of the neighboring Munshiganj District, except that it lacks connections to the south bank of the Padma River. Although the development of northwest and southwest portion is behind of that in Dhaka Central Region, Dhaka District has still the second highest share of settlement area in GDA.

More than half of industrial establishments in GDA locate in Dhaka Division. They are mainly concentrated in the area bounded with Narayanganj District.




Source: JICA Study Team based on LGED data

**Figure 2.40 Settlement Pattern of GDA**




Source: Competitive Cities in the 21 Century (ADB, 2011)

**Figure 2.41 Distribution of Manufacturing Industries**

3) Gazipur District

Gazipur District is located in the northern part of GDA. It has the largest area with 18,000 ha in GDA. Land uses are predominantly agricultural with some industrial and other uses along the major road corridors.

Gazipur accounts 47% of the entire settlement area in GDA, which is the highest share in GDA. The urban development has been promoted along Dhaka – Mymensingh Road. 17% of the textile and ready-made garments factories and SMEs in GDA are located mainly along Dhaka-Mymensingh road.

Bhawal National Park (also known as Rajendrapur National Park) is one of the few surviving forest areas in Bangladesh. The forested area is located approximately 40 kilometres north of Dhaka. Part of the area has been "notified as a protected area in 1982 under the International Union for Conservation of Nature (IUCN's) Category 5."

The western part is traversed by the Jamuna Bridge-Chittagong Corridor. Kaliakair is the only significant urban settlement in the corridor which is an agricultural marketing centre. Land uses along the Corridor are predominantly agricultural.

4) Manikganj District

With 137,900ha of the total land in Manikganj District, land uses are predominantly agricultural; while only 20% of the total land is use a settlement area. Manikganj Sadar is the only significant urban settlement in this district.

In its vast agricultural land, the district has 107,897 ha of cultivatable land and 16,193 ha of fallow land. Main crops include paddy, jute, sugarcane, wheat, tobacco and among others.

While some industrial land uses are found in the district headquarter area (Manikganj Sadar), the concentration of the industrial establishment in the district is the lowest in GDA. The main concentrated industry in this area is food and beverage.

5) Munshiganj District

Similar with Manikganj District, the land uses of Munshganj District are predominantly agricultural with potatoes, rice and jute as its major crops. Since several ferry ghat and launch ghat are located along Dhaleshwari River and Padma River, the settlement area and industrial establishment area are situated around those ghats.

Moreover, Lauhajang and Srinagar upazilas in the district of Mushiganj could be developed as satellite towns of Dhaka. The upazilas are situated by the river Padma from where the proposed Padma Bridge would begin. The land of the upazilas is very low and remains under water half of the year. Low-valued land of the upazilas from agriculture point of view can help convert it into a satellite town that would facilitate habitation to millions of people and reduce ever-increasing pressure of population in the capital.

Due to the Rivers Padma, Meghna River and Dhaleshwari, 15% of the total area is occupied by water body. In addition, a strip of sandy land rising out of the bed of a river (called Char in Bengal) accounts for 14% of the entire land. Thus, more than 30% of the entire area is not suitable for development.

6) Narayanganj District

Narayanganj has the smallest area in GDA (approximately 70,000 ha). While the settlement area accounts for relatively small rate of 29%, this district has the second

largest concentrations of manufacturing establishment. In terms of the growth center, Narayanganj Sadar is the largest urban settlement in Narayanganj District.

The industrial area is spread between the Dhaleshwari River and the Sitalakhya River as well as along the Dhaka – Chittagong Road. These areas have the advantage for logistics. Garments and textile products are one of the main products.

Near the modern industrial river port of Narayanganj, is a famous historical place called Sonargaon with 72ha.

7) Narsingdi District

Land uses in Narsingdi District are predominantly agricultural with rice, sugar, bananas and sugar cane among its major crops. 45,000 ha of settlement area are spread mainly along National Highway (N2). The main township is locate in Balabo area; the industrial area is located along the same corridor. Textiles, paper and fertilizer are the main industries.

This district has a strong history and heritage in diversified culture with indigenous with old civilization of Buddhist Period. Therefore, the historical and cultural places which includes old mosque are located in the north-eastern part of the district. One of the famous historical places is called Wari-Bateshwar ruin.

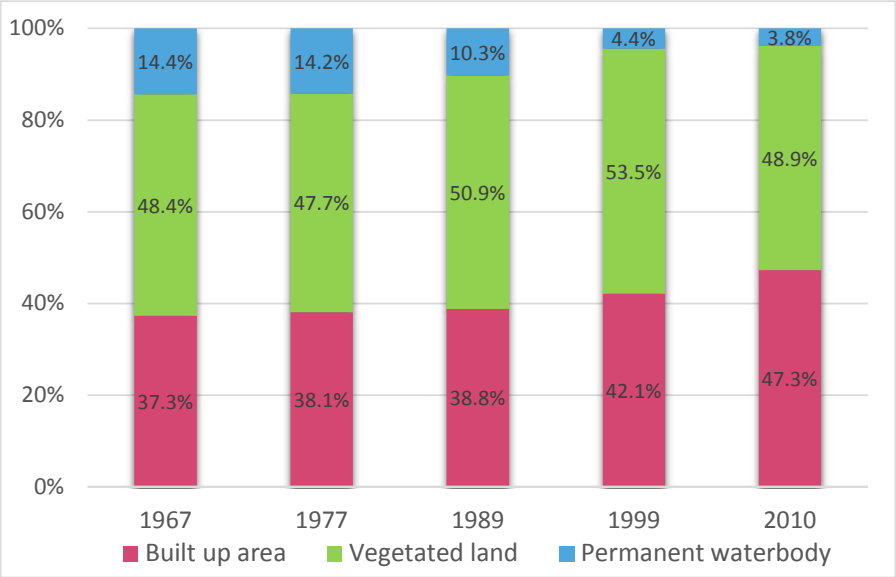
(2) RAJUK Area

1) Overview

Similar with other developing cities, the growth of Dhaka's land use has been changing since 1967. While the vegetation of area is almost fixed at 70,000 ha in the past 40 years, the current water body became a quarter since 1967, which is 5,520 ha in 2010 from 20,6868 ha in 1967 as shown in Figure 2.4.3. Thus, the waterbody has been converted to buil-up area. The lack of growth management and planned urbanization causes extensive urban poverty, recurrent episodes of flash flooding, substantial growth of slums, exploitation of resources, and the mismanagement of limited land resources.

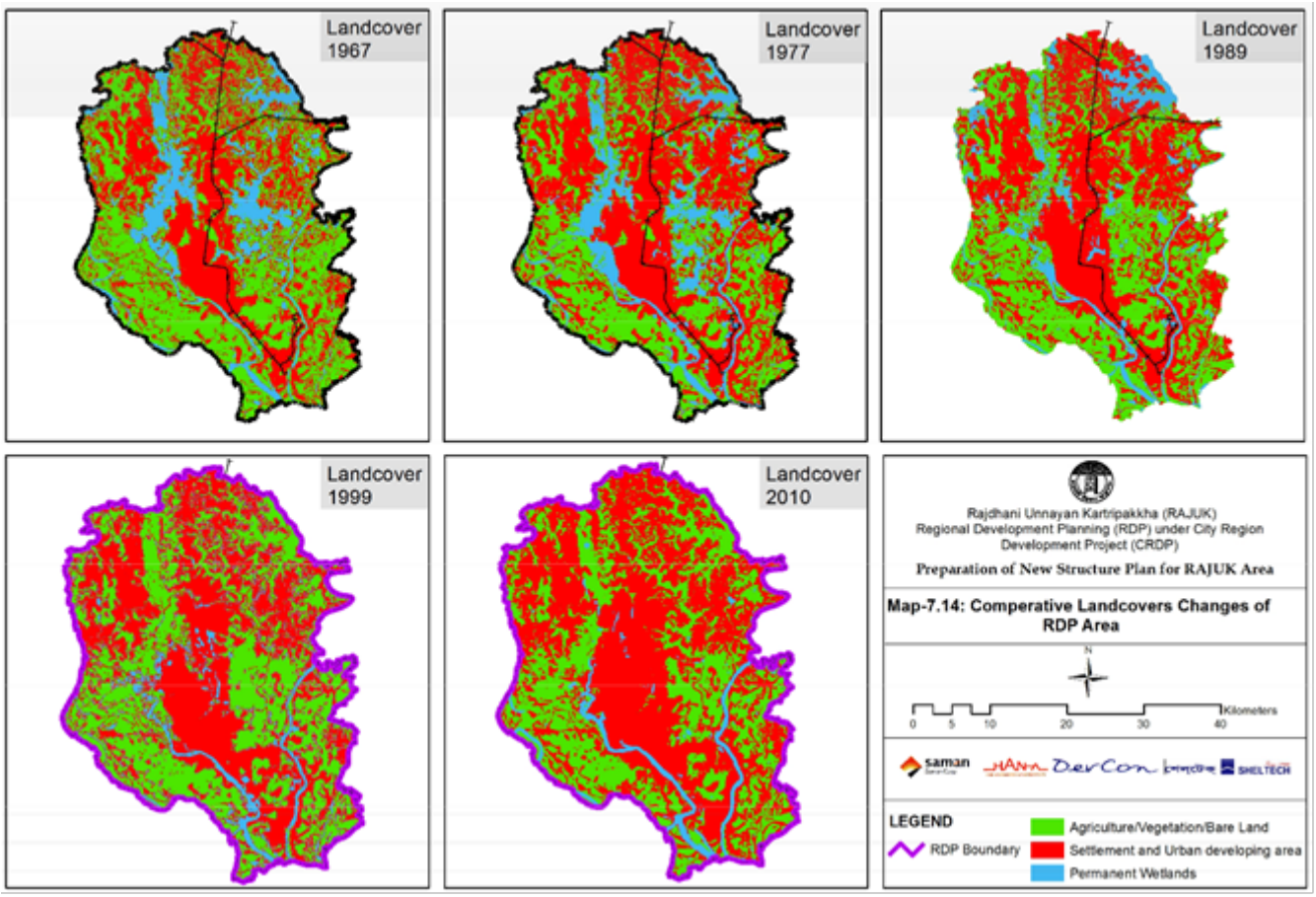
In 1967 to 1989, the built-up area had increased gradually from 53,727ha to 55,921ha with 0.2%/year of the annual increase rate. After that period, the urbanization has been accelerated. The built-up area increased by about 5,000ha in the period of 1989 to 1999 and by 7,500ha in the period of 1999 to 2010, respectively.

Figure 2.43 indicates the speedy expansion of built up area within RAJUK area through transformation of permanent water bodies and vegetation areas. The expansion of built up area mainly occurred to the northern region of RAJUK area specifically towards Savar, Ashulia and Uttara areas.




Source: JICA Study Team worked out based on Regional Development Planning (RDP) Survey Report (RAJUK, 2014)

**Figure 2.42 Land Cover Changes between 1967 and 2010**




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

**Figure 2.43 Land Cover in 1967, 1977, 1989, 1999 and 2010**

RAJUK area is further divided into six regions, namely Dhaka Central Region, Northern Region, Eastern Region, Western Region, Southern Region and South-Western Region. The coverage of each region is as follows:

- **Dhaka Central Region:** the existing Dhaka City consisting of 41 Thanas of DMA;
- **Northern Region:** all the unions (except Mirzapur union) of Gazipur Sadar Upazila and the entire area of Gazipur City Corporation;
- **Eastern Region:** two Paurashava (Kanchan and Tarabo) and six union of Rupjanj Upazila and one Paurashava (Kaliganj) and two unions of Kaliganj Upazila;
- **Western Region:** Savar Paurashava and 11 unions of Savar Upazila;
- **Southern Region:** Two Paurashavas (Narayanganj and Siddhiraganj) and seven unions of Narayanganj Sadar Upazila, one Paurashava (Kadam Rasul Paurashava) and five unions of Bandar Upazaila, and one Paurashava (Sonargaon) and seven unions of Sonargaon Upazila (part); and
- **South-western Region:** eleven unions of Keraniganj Upazila of Dhaka District.

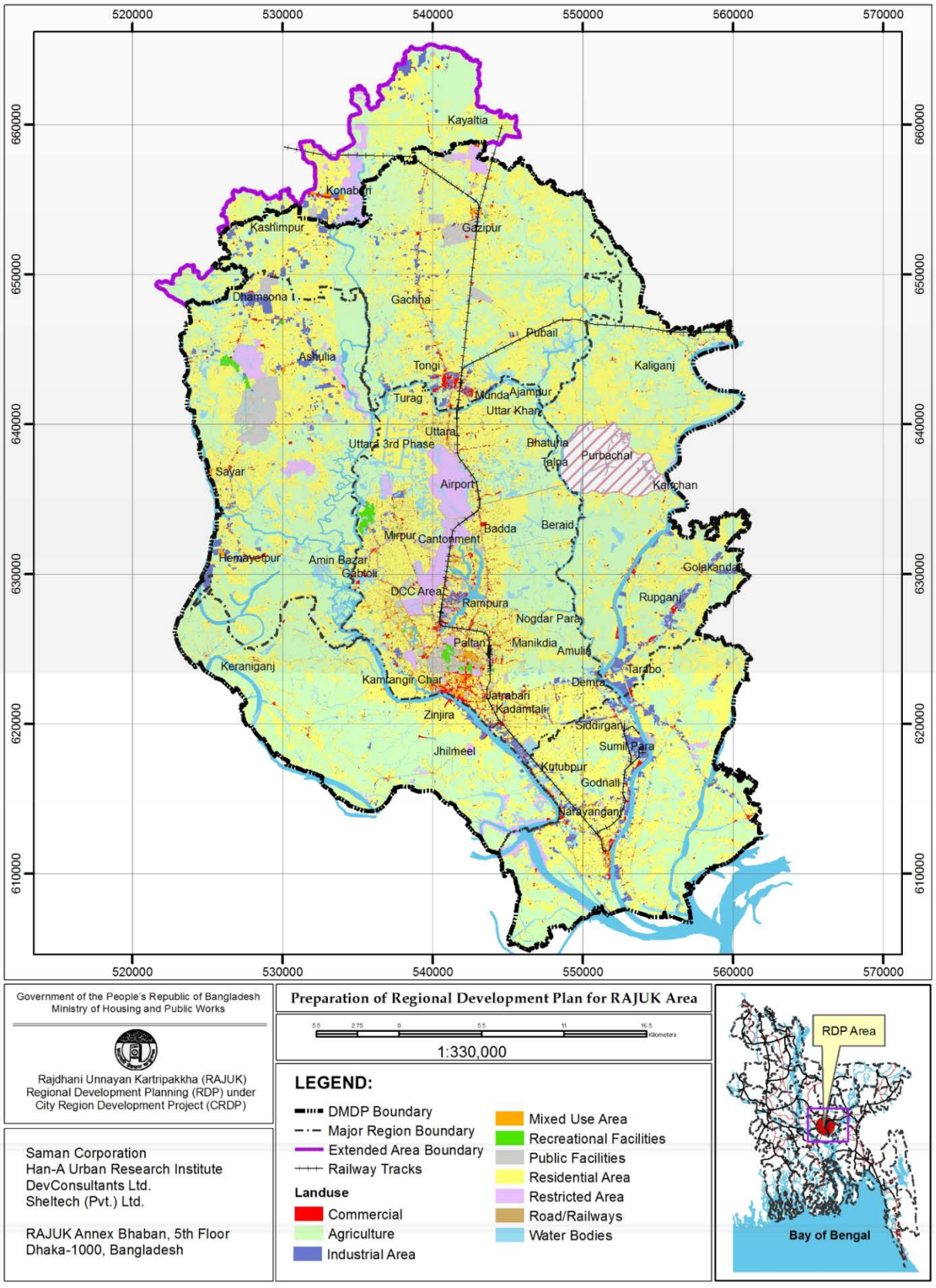
The total RAJUK area is 152,000ha; in which the Northern Region accounts the largest area with 23.4%, followed by Dhaka Central Region with 19.8% and Western Region with 16.6%. In terms of land use type, the agricultural use is still dominant, which shares more than 40% of the total area in RAJUK. These agricultural land are expanded towards north and west regions. Residential area is the second largest area with 56,024ha, which has been developed in Dhaka Central Region and Northern Region. The development direction of residential areas is the same as the direction of urban expansion. Other urban use of land 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 is concentrated more in Northern Region and Southern Region. The Western Region has relatively high share of public facilities and recreational area.

**Table 2.15 Existing Land Use of the RDP Area**

| Land Use Type | Area (ha) | | | | | | | Share (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Region | | | | | | Total | Region | | | | | | Total |
| | DCR | NR | ER | WR | SR | SWR | | DCR | NR | ER | WR | SR | SWR | |
| Agriculture | 7,105 | 16,560 | 9,813 | 11,156 | 8,095 | 10,997 | 63,713 | 11.1 | 26.0 | 15.4 | 17.5 | 12.7 | 17.3 | 100.0 |
| Industrial Area | 541 | 864 | 557 | 727 | 909 | 144 | 3,810 | 14.5 | 23.1 | 14.9 | 19.4 | 24.3 | 3.9 | 100.0 |
| Commercial | 694 | 291 | 134 | 139 | 242 | 71 | 1,572 | 44.2 | 18.5 | 8.5 | 8.8 | 15.4 | 4.5 | 100.0 |
| Mixed Use Area | 612 | 128 | 4 | 82 | 124 | 21 | 971 | 63.0 | 13.1 | 0.4 | 8.5 | 12.7 | 2.2 | 100.0 |
| Residential Area | 12,988 | 14,248 | 7,022 | 8,852 | 8,759 | 4,154 | 56,024 | 23.2 | 25.4 | 12.5 | 15.8 | 15.6 | 7.4 | 100.0 |
| Purbachal New Town | 6 | 0 | 2,392 | 0 | 0 | 0 | 2,379 | 0.3 | 0.0 | 99.7 | 0.0 | 0.0 | 0.0 | 100.0 |
| Public Facilities | 1,294 | 780 | 90 | 1,178 | 337 | 89 | 3,767 | 34.3 | 20.7 | 2.4 | 31.3 | 8.9 | 2.4 | 100.0 |
| Recreational Area | 289 | 4 | 0 | 87 | 9 | 0 | 390 | 74.1 | 1.0 | 0.0 | 22.4 | 2.4 | 0.0 | 100.0 |
| Restricted Area | 2,030 | 931 | 30 | 754 | 321 | 303 | 4,302 | 46.5 | 21.3 | 0.7 | 17.3 | 7.4 | 6.9 | 100.0 |
| Road/Railways | 1,859 | 553 | 212 | 418 | 423 | 192 | 3,657 | 50.8 | 15.1 | 5.8 | 11.4 | 11.6 | 5.3 | 100.0 |
| Waterbody | 2,643 | 1,203 | 1,273 | 1,902 | 2,416 | 1,966 | 11,758 | 23.2 | 10.6 | 11.2 | 16.7 | 21.2 | 17.2 | 100.0 |
| Total | 30,061 | 35,562 | 21,528 | 25,296 | 21,635 | 17,937 | 152,343 | 19.8 | 23.4 | 14.2 | 16.6 | 14.2 | 11.8 | 100.0 |

Source: JICA Study Team worked out based on Regional Development Planning (RDP) Survey Report (RAJUK, 2014)
Note: DCR = Dhaka Central Region, NR = Northern Region, ER=Eastern Region, WR = Western Region, SR = Southern Region, SWR = South-western Region




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

**Figure 2.44 Land Use of RAJUK Area, 2013**

2) Dhaka Central Region

Large portion of the Dhaka Central Region is already urbanized, and 60% of the area is built-up area. The built-up area is dominated by residential area with 43%, followed by commercial area with 2.3%, mixed use with 2.0% and industrial area with 1.8% (see Table 2.16). This region also covers Motijheel, Panthapath and Gulshan which are usually referred to as the central business district (CBD) of Dhaka. The land price and property price in this region has increased incredibly in the period of 2000 – 2010.

About 13,000ha of residential area is occupied mainly by middle and high income groups. Other residential areas have developed spontaneously which are being occupied by the low income group. The spontaneous or unplanned development of residential areas in the region has increased urban problems.

There are 540ha of industrial area which are mainly in Pallabi, Mirpur and Hazaribag Thanas; and 690ha of commercial area in the southern side of DCC. Main commercial area is the old part of Dhaka city such as Kotwali, Lalbag and Sutrapur Thanas. Other commercial concentration can also be found in Motijheel, Ramna, Tejgaon, Khilgaon Thanas in the central part of DCC; and Gulshan, Mirpur, Badda and Uttara Thanas are in the northern part of DCC. All major commercial activities are situated along the major roads.

Besides the urbanized area, 7,100ha of agricultural land are spread in the peripheral area near the DMA boundary. Agricultural lands are mostly located in Uttar Khan, Beraid, Starkul, Badda, Demra, Sabujbag and Khilgaon areas. Since the urban areas of the region are highly dense, these agricultural lands and water bodies have been converted for private housing projects.

This region also has 2,030ha of restricted area occupied by military or government establishments. Important establishments include President's Office and Residence at Banga Bhaban, Prime Minister's Office and Residence, National Parliament Building, Zia International Airport, Secretariat near Paltan and Old Airport Area at Tejgaon. These restricted areas are located at the significant valuable land in terms of the urban development aspect and became a constraint for the transport development. Besides restricted area, large public facilities include government offices and universities also occupy prime land and cause congestions. Moreover, the share of recreational area and transport facilities are still insufficient to provide the better living conditions for residents and to ensure the sustainable development.

**Table 2.16 Land Use Composition in Dhaka Central Region**

| Land Use Type | Ha | % |
|---|---|---|
| Agriculture | 7,104.9 | 23.6 |
| Industrial Area | 541.4 | 1.8 |
| Commercial | 694.2 | 2.3 |
| Mixed Use area | 611.9 | 2.0 |
| Residential Area | 12,987.9 | 43.2 |
| Purbachal RA | 6.3 | 0.02 |
| Public Facilities | 1,293.6 | 4.3 |
| Recreational Area | 289.0 | 0.96 |
| Restricted Area | 2,030.0 | 6.8 |
| Road/Railways | 1,858.8 | 6.2 |
| Waterbody | 2,643.4 | 8.8 |
| Total | 3,0061.4 | 100.00 |

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

3) Northern Region

Since most of the Northern Region is high land, the urbanization of Dhaka Central Region is expanded to the north. The total urbanized land with 17,200ha is the second largest in RAJUK area, followed by Dhaka Central Region with 18,000ha. Agricultural area is still dominant in the region with 47% of the total area, but residential area also shares more than 40% (see Table 2.17).

About 14,000ha of residential area is a mix of urbanized housing areas in Gazipur and Tongi Pourashava and rural homestead areas around the agricultural land. In general, urbanized housing areas have been developed for middle income group, and the rural homestead areas are for low income group. New planned residential areas are also being developed as private housing projects.

This region is known as one of the industrial cities of Bangladesh. Some industrial development can be seen along the Dhaka-Mymenshing Highway. In particular, Tongi area is the major industrial area composed of many garment factories. The high land along this highway has increased in industrial development. At the same time, industrial development causes disorder in residential and commercial development which resulted in large slums. Another industrial zone is in the eastern side of the Upazila in Kashimpur union and Konabari union. Beximco Industrial park is situated near by the Zirani Bazar. Small industrial areas are also scattered along the rivers and major roads where the industrial establishment can have good accessibility for logistics.

Similarly, commercial areas are developed mainly along Dhaka-Mymenshing highway. Gazipur and Tongi areas are the major commercial center in this region. In particular Tongi area has the most commercial activity area within this region.

Large part of the agricultural land is considered to be relatively “high value agricultural land”. In addition to agricultural area, some seasonal crops are also grown in the water body during the dry season. The swampy areas used for agriculture are situated by the side of the river Turag in the south-eastern and eastern part of the region.

Restricted land with 860ha is mainly occupied by the Army Machine Tools Factory in the northern side of the region, Bangladesh Ordnance Factory (BOF) and Security Printing Press. Public facilities area has several research institute and universities.

**Table 2.17 Land Use Composition in Northern Region**

| Land Use Type | Ha | % |
|---|---|---|
| Agriculture | 16,560.0 | 46.6 |
| Industrial Area | 931.0 | 2.6 |
| Commercial | 291.5 | 0.8 |
| Mixed Use area | 127.7 | 0.4 |
| Residential Area | 14,247.8 | 40.1 |
| Public Facilities | 780.3 | 2.2 |
| Recreational Area | 4.1 | 0.01 |
| Restricted Area | 863.5 | 2.4 |
| Road/Railways | 552.8 | 1.6 |
| Waterbody | 1,203.1 | 3.4 |
| Total | 35,561.8 | 100.0 |

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

4) Eastern Region

The Eastern Region is predominantly agricultural area which occupies more than 45% of the entire region. The built-up area occupies only 36%, which is mainly residential (see Table 2.18). 9,800ha of agricultural land covers mostly the eastern fringe area with low lying land. Some part of waterbody with 1,300ha is also used for agriculture during the dry season.

Residential area accounts for 33% of the total land with 7,000 ha. Since the eastern region is located at the peripheral area of DMA, sub-urban housing areas are situated on both sides of the roads within this area. Other residential areas are rural homestead area which is situated beside the agricultural land and occupied by the low income group. Purbachal new Town which is developed by RAJUK is located in this region as well (see Chapter 2.5). Because it is within the vicinity of the urbanized area, more urbanization would occur surrounding the peripheral semi-urban area of this zone.

Since the road network is not fully developed, the industrial development which covers less than 3% of the total area has been concentrated by the river side of Balu, and Shitalakhaya River, and Bhulta area. Other industrial areas are located along the national highways, regional highways and some important feeder roads. While the residential development is increased, the commercial area occupies only 0.6% of the total area. As similar to industrial area, commercial activities are developed mainly by the side of the national highways, regional highways and some important feeder roads. The industrial and commercial developments along the major roads also contributed to the additional unplanned development in those areas.

**Table 2.18 Land Use Composition in Eastern Region**

| Land Use Type | Ha | % |
|---|---|---|
| Agriculture | 9,813.5 | 45.6 |
| Industrial Area | 557.3 | 2.6 |
| Commercial | 134.3 | 0.6 |
| Mixed Use area | 3.9 | 0.02 |
| Residential Area | 7,022.3 | 32.6 |
| Purbachal RA | 2,391.5 | 11.1 |
| Public Facilities | 89.8 | 0.4 |
| Restricted Area | 30.2 | 0.1 |
| Road/Railways | 212.1 | 1.0 |
| Waterbody | 1,273.5 | 5.9 |
| Total | 21,528.5 | 100.0 |

5) Western Region

The land use composition of the Western Region is similar to the Eastern Region (see Table 2.19). The main difference is that the western region has more public facilities area and recreation area while the eastern region has the relatively large area for Purbachal new town development. More than 50% of the total land of the Western Region is agricultural land or waterbody which is considered as flood prone. In general, Keraniganj Upazila is low lying and flood prone are while Savar Municipality is relatively high land. Therefore, Savar Municipality has been developed as an urban center with residential, industrial and commercial use.

About 9,000 ha of residential area is mainly located along the road side area of Dhaka-Arich, Nabinagar-Tangail road, Ashula road and Dhaka- Keraniganj road.

Urbanized residential area is generally developed for the middle income group. Remaining rural homestead areas are for low income people.

About 700ha of the industrial area includes the Savar Export Processing Zone located along the Nabinagar-Tangail road. Some other industrial establishment is located along Dhaka-Arich highway, Hemayetpur-Singair road and Ashulia road. The total area is small, but the western region has the third largest industrial area among six regions of RAJUK area.

Similarly, commercial land is also small with 140ha which has the smallest share of the land in the region (0.6%). The major commercial activity areas are the Hemayetpur, Savar Bazar, Nabinagar, Ganak Bari and Zirani area. Some commercial activity is also located along the river side of Buriganga and the Dhaka-Keraniganj road.

Public facilities area includes Jahangir Nagar University, Savar Dairy Farm, Public Administration Training Center (PATC), City University, Daffodil University, BRAC Training Center, Bangladesh Atomic Commission, Bangladesh Livestock Research Institute, etc. Those areas cover about 1,200ha. There are also about 750ha of restricted areas including Savar Cantonment area which is the prime restricted area.

There are some high value agricultural land as well as some low lying areas. Besides that, about 8% of the total area is waterbody which can be used partially for growing some seasonal crops in dry season.

**Table 2.19 Land Use Composition in Western Region**

| Land Use Type | Ha | % |
|---|---|---|
| Agriculture | 11,156.2 | 44.1 |
| Industrial Area | 727.2 | 2.9 |
| Commercial | 138.8 | 0.6 |
| Mixed Use area | 82.4 | 0.3 |
| Residential Area | 8,852.0 | 35.0 |
| Public Facilities | 1,177.8 | 4.7 |
| Recreational Area | 87.3 | 0.4 |
| Restricted Area | 753.7 | 3.0 |
| Road/Railways | 418.4 | 1.7 |
| Waterbody | 1,901.8 | 7.5 |
| Total | 25,295.5 | 100.0 |

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

6) Southern Region

Residential land use is central in the southern region which occupies more than 40% of the total land (see Table 2.20). This is followed by the agricultural land with 37%. Urbanized housing area are located in Kadam Rasul, Sidhhirganj and Narayanganj Pourashavas (NCC Area), Fatullah, Kanchpur, Madanpur, Islamia Bazar, Bandar Upazila head quarter, Mugrapara, etc. In addition, almost all are rural home stead area for low income group which resulted from the lack of approved detailed plan.

Southern region, espeically Narayanganj is known as the industrial city of Bangladesh. Therefore, this region has the largest industrial area with 910ha in RAJUK. Industrial activities have been mainly developed along the Shitalakhhaya River, Buriganga River, Old Brahmaputra River, Dhaka-Chittagong highway and Dhaka-Sylhet highway. The Adamjee Export Processing Zone (EPZ) which was established in 2006 has 99.2ha of the land and is located 15 km away from Dhaka

City center. 61 companies with Bangladeshis as the main investors are located in the EPZ generating more than 36,000 employments. Other industries are located eastern side of Shitalokhhaya River in Bandar Upazila, by the Brahmaputra River on Sonargaon Upazila.

240ha of commercial area is all located in City Corporation area along side the Buriganga River and the Shitalakhhaya River. Mugrapara, Islamia Bazar, Katchpur, Ekuria Bazar, Fatulla, Kutubpur, Shimulpara, Narayanganj, Kadam Rashul, Siddhirganj are the main commercial activity centers in this zone.

About 8,800ha of agricultural land and 2,400ha of water body contribute to the agricultural activities of the region. The agricultural area is spread around the southern portion of Narayanganj Sadar Upazila, Bandar and Sonargaon Upazila which parts of it has low lying area.

**Table 2.20 Land Use Composition in Southern Region**

| Land Use Type | Ha | % |
|---|---|---|
| Agriculture | 8,094.6 | 37.4 |
| Industrial Area | 909.1 | 4.2 |
| Commercial | 242.1 | 1.1 |
| Mixed Use area | 123.7 | 0.6 |
| Residential Area | 8,758.8 | 40.5 |
| Public Facilities | 336.9 | 1.6 |
| Recreational Area | 9.4 | 0.04 |
| Restricted Area | 321.1 | 1.5 |
| Road/Railways | 423.1 | 2.0 |
| Waterbody | 2,416.5 | 11.2 |
| Total | 21,635.4 | 100.0 |

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

7) South-Western Region

Although the south-western region is bound with the urbanized area of the Dhaka Central Region, agricultures are the dominant land use of this region. More than 60% of the total area is occupied by agricultural land and about 10% are water body. In addition, some parts of the region were converted into brick field.

Residential area shares the second highest with 23% of the total area. The RAJUK's Jheelmil New Town and the urbanized residential area for the middle income group has been developed by the road side area of Dhaka-Keraniganj road and Dhaka-Mawa road. And the remaining area is the scattered and unplanned rural homestead for low income group.

Other urban land use in this region such as Industrial and Commercial are insignificant since they only occupy 0.8% (145ha) and 0.4% (71 ha) of the total area, respectively. Moreover, commercial area is located along the side of the Buriganga River and the Shitalakhhaya River.

**Table 2.21 Land Use Composition in South-western Region**

| Land Use Type | Ha | % |
|---|---|---|
| Agriculture | 10,996.9 | 61.3 |
| Industrial Area | 144.5 | 0.8 |
| Commercial | 71.4 | 0.4 |
| Mixed Use area | 21.2 | 0.1 |
| Residential Area | 4,153.8 | 23.2 |
| Public Facilities | 88.6 | 0.5 |
| Recreational Area | 0.0 | 0.0 |
| Restricted Area | 302.9 | 1.7 |
| Road/Railways | 192.4 | 1.1 |
| Waterbody | 1,965.6 | 11.0 |
| Total | 17,937.3 | 100.0 |

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

(3) Findings on Land Use Development

GDA is generally low land and flood prone area, which restrains land development as well as socio-economic development. In order to accelerate urbanization, it is inevitable to convert agricultural land and water body into urban use land such as residential areas. However, due to lack of the appropriate land use plan and management, private investors have developed residential area disorderly which causes urban problems including widening the disparity between middle income group and low income group.

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

Comparably, RAJUK areas are also dominated by agricultural areas. However, the function of each region is relatively clear. Dhaka Central Region is the center of administration and commercial, the southern region is the industry hub; and the northern region is focused for industrialization and development of new towns or satellite cities. However, due to lack of proper residential area and job opportunities in the urbanized RAJUK areas contributes to the increased urban low income group. In parallel to the urban development in the fringe areas, revitalization of the Dhaka Central Region is required.

Another point of concern is the location of the airport which is in the center of RAJUK and is an obstacle to the transport circulation in the city.

**Table 2.22 SWOT Analysis on Land Use of GDA and RAJUK**

| Strengths | Weaknesses |
|---|---|
| • Rich forest area in Gazipur District which is notified as protected area by IUCN's<br>• High availability of lands for development including unused land and many agricultural lands in GDA<br>• Relatively clear role-sharing among the regions in RAJUK | • Presence of huge flood prone areas<br>• Widely scattered low density settlement in the rural area<br>• Weak connectivity to the Dhaka Central Region from other areas<br>• Lack of capacity for land-use management failing control to private developers<br>• Concentration of public facilities and restricted area in the city center which occupies the prime area for urban development<br>• Lack of appropriate housing development plan for low income group |
| **Opportunities** | **Threats** |
| • On-going preparation of Regional Development Planning<br>• On-going new town development by public and private | • Reduction of vegetation areas and waterbody due to conversion to disordered land development<br>• Increase in spontaneous development led by Industrialization and commercialization<br>• Significant increase in land value of the Dhaka Central Region |

Source: JICA Study Team

## 2.6 Review of Existing Plans and Urban Development Projects

(1) Review of Existing Plans

1) Dacca Master Plan (1958 – 1978)

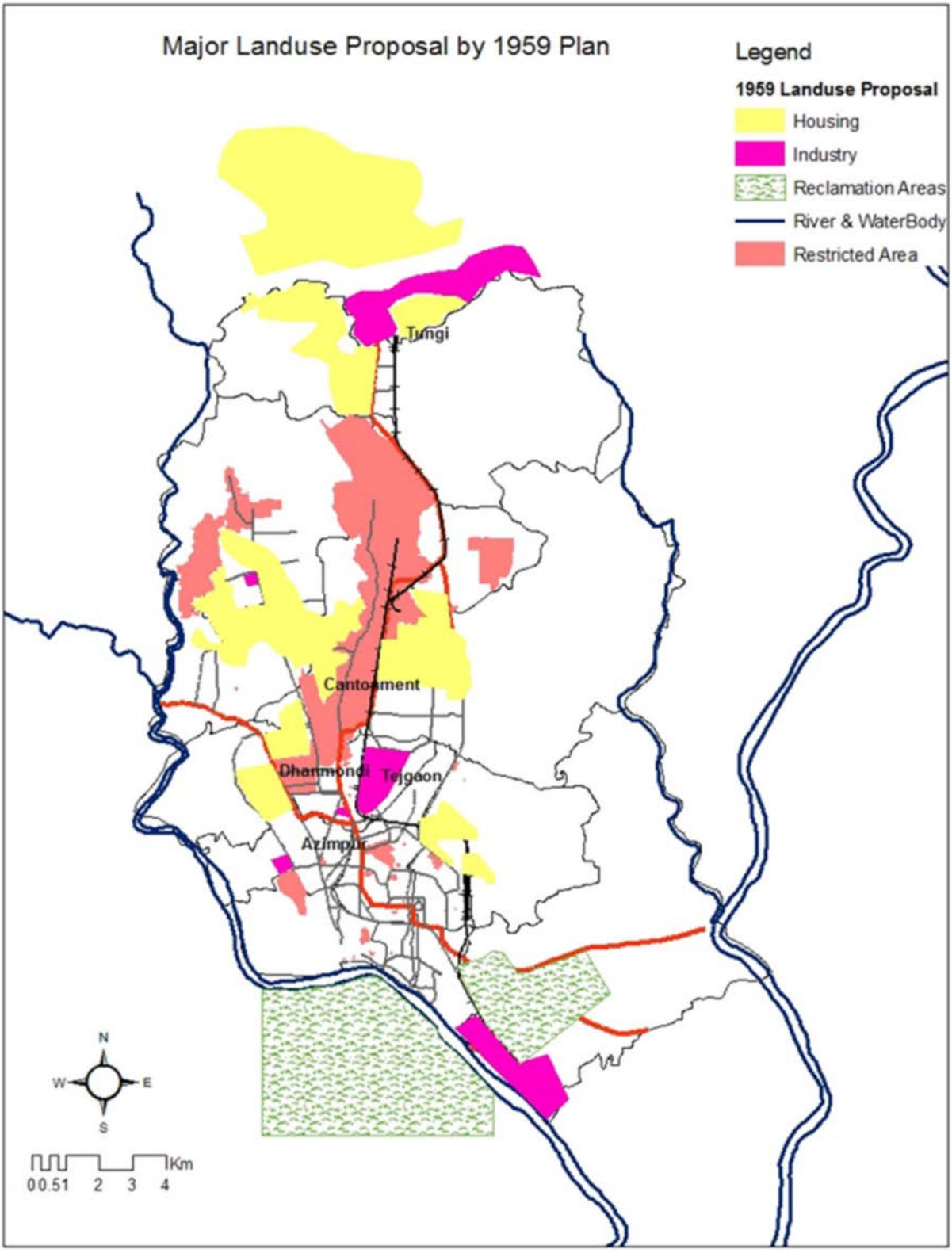
The first comprehensive master plan was formulated in 1958 with the objective to establish planning principles rather than to lay down a detailed and inflexible scheme. In this master plan, two main problems of Dhaka City were identified such as; shortages of flood free land, and the congestion in the old central area. The plan was estimated and prepared for 1958 to 1978 with a population increase by 1.75%/year. Moreover, it was expected that population would increase from 575,000 to 816,000 in the main city and from 1,035,000 to 1,466,000 in the metropolis. The plan defined the land use pattern, zoning, water bodies, and flood prone and development suitable zones (see Figure 2.45).

This plan recommended two major changes to the boundary of the area under the jurisdiction of the Dacca Improvement Trust (now known as RAJUK, Capital Development Authority). Dhaka did not have much scope to expand to the south, east or west; therefore, the northern boundary should be extended to include all the land in Tongi which are suitable for building. Finally, it was concluded that this area should be sufficient to accommodate the growth of Dhaka until 1978. The plan also recommended taking control of the land on the south bank of the Buriganga River. Other suggestions included the followings:

- To formulate a national planning policy for encouraging the expansion of industry and commerce outside Dhaka;
- To give serious considerations of setting up substantial new industries which stimulate administrative and university centre;
- To develop additional 4,481 acres of industrial zones and housing for 402,700 people;
- To develop (i) Tongi as a self-sufficient and independent new town with a balanced community of houses and a center for industrialization; and (ii) Mirpur as a residential satellite with good commuting options to the main city; and,
- To extend residential areas on the reclaimed land in the south (Keraniganj and Postogola) to accommodate growth of the old part of the city.

However, the plan was not realized due to the unusual growth, increase of population[1] and changes in socio- political conditions. The implementation process is marked more by breach and deviation rather than adherence to the plan. RAJUK had made efforts to develop new areas for residential, administrative and commercial purposes, and made changes in land use pattern and detailed structure plans which would never be executed. While many proposals for transport sector were implemented fully or partially, the proposals for housing, open space, commercial/industrial and other sectors were rarely enacted. For transport sector, the projects for the north-south axis were prioritized for implementation.

[1] While the estimated population by 1978 was about 1.5 million, the actual population was already 2.2 million in 1975 and more than 3.2 million in 1980.



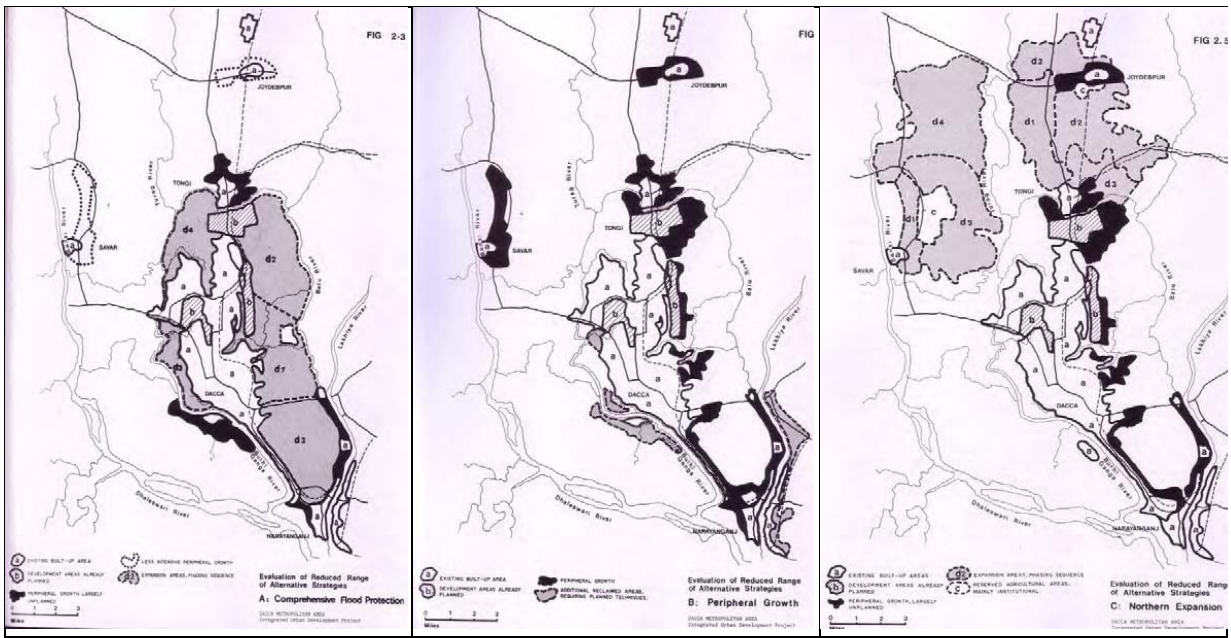

Source: Planning and Developmnet of Dhaka – A Story of 400 Years

**Figure 2.45 Land Use Proposal by 1959 Master Plan**

2) Dhaka Metropolitan Area Integrated Urban Development Project (DMAIUDP), 1981

The second Master Plan for Dhaka called Dhaka Metropolitan Area Integrated Urban Development Plan (DMAIUDP) was prepared in 1981 with the assistance of the UNDA and ADB. This is the first urban development strategic plan in Bangladesh. The purpose of this plan was to provide a long term growth strategy for urban expansion. In order to implement the plan, DMAIUDP referred this as projects rather than plans. Since the major problems of the city were flooding and drainage, DMAIUDP recommended to develop a north south corridor (mass-transit) with branches towards Savar and, ultimately, to Aricha. Institutional re-arrangements were also suggested. The strategy plan took a long-term view of the city up to 2001. However, the recommendations of this strategy plan were never taken seriously and the reports only served to become a superficial reference work like many other project reports. This is mainly because the recommendations were not adopted as future Dhaka development policies by the highest body of the government. Moreover, DMAIUDP was formulated under Planning Commission which was not empowered to execute a plan or policy. Nevertheless, many of the assumptions of the plan proved to be accurate, and these later provided a comprehensive basis for the future urban growth of Dhaka.

However, the floods in 1987 and 1988 forced government to formulate National Flood Action Plan (FAP) which was in line with the recommendation of DMAIUDP. Dhaka was covered by two FAPs: (i) Dhaka Integrated Flood Protection Project (FAP-8B) and (ii) Greater Dhaka Flood Protection Project (FAP-8A).




| A. Comprehensive Flood Protection strategy | B. Peripheral Growth Strategy | C. Northern Expansion Strategy |
|---|---|---|

Source: Dacca Metropolitan Area Integrated Urban Development Project, 1981

**Figure 2.46 Alternative Growth Strategies for Urban Expansion in DMAIUDP**

3) Dhaka Metropolitan Development Plan (DMDP), 1995-2015

The Dhaka Metropolitan Development Plan (DMDP) was prepared in 1995 by RAJUK for Dhaka Metropolitan Area within the RAJUK administrative area with the assistance of UNDP, World Bank and ADB. The DMDP which was administered by RAJUK under the Town Improvement Act 1953, consisted of Structure Plan, Urban Area Plan (UAP) and Detailed Area Plans (DAP). The DMDP is a top multi-sector development plan.

The Structure Plan provides a long-term strategy for metropolitan region development up to 2015. This identified the magnitude and direction of spatial growth and sets forth spatial and sector policies (see Figure 2.47). The future population was also projected to reach 15.6 million by 2016. UAP which includes interim policies, rules and regulations by 2005 provided mid-term development strategies for the existing urban area and potential urbanized areas. It was expected that DAP would provide the planning proposals for specific sub-areas which has a high priority due to the present urgent problems. However, because of lack of resources, DAP was not prepared by 2008.

Development policies in the DMDP Structure Plan are composed of four sectors. Their policies are as follow:

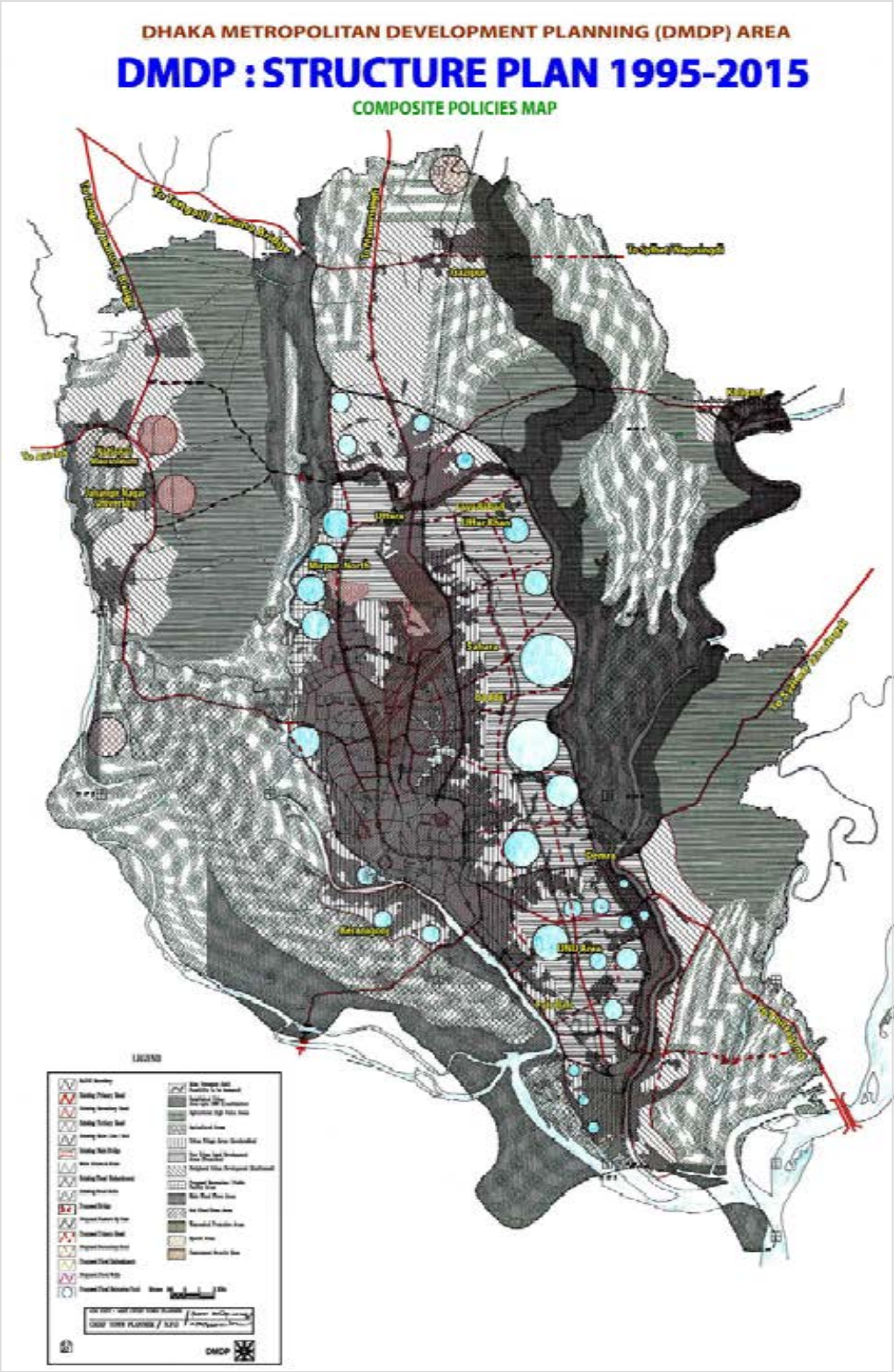
i **Spatial and Environmental Sectors:** To conserve and promote areas of high agricultural value; to expand winter cropping and culture fisheries in Narayanganj-Narsingdi FCDI project area, to control land development within flood flow zone; to prevent pollution at Lakhya River and its tributary and the Balu River; to control development activities in flood retention ponds; to respect the integrity of the functions of the special area and maintain its lands; and to amend RAJUK's development control boundary;

ii **Urban Area Policies:** To optimize land resources within the defined urban area; to implement infrastructure consolidation programs; to develop community-based initiatives; to establish urban neighborhood action programs; to accelerate urban fringe development; to promote new urban land growth; to promote infrastructure initiatives; and to prioritize peripheral urban development areas (Tongi/Gazipur and Savar/Dhamsona).

iii **Socio-economic Sector:** To improve operational procedures and cost effectiveness of Industrial estates (Tejgaon and Tongi); to encourage foot-loose industry; to improve and relocate polluting industries; to encourage informal sector activities; to support and encourage the dispersal of public administration and government institutions; to promote the gradual dispersal of commercial activities; to improve access to CBD and mobility within CBD; to ensure up-to-date available information for education and health sector; to augment city open space; and to secure future open space;

iv **Infrastructure Sectors:** To prioritize constructing eastern bypass; to promote incremental network development; to expand bus services; to develop a long-term commuter rail network; and to implement FAP-8A (flood protection).

The total number of policies was 29, however only few were implemented or partially implemented such as, control of land development within flood flow zone and expansion of bus services. According to RAJUK, the main reasons of failure of DMDP were lack of implementing agencies, inter-agency coordination, monitoring mechanism, resources, and no periodical revision of the DMDP.




Source: DMDP Structure Plan

**Figure 2.47 DMDP Structure Plan 1995 – 2015**

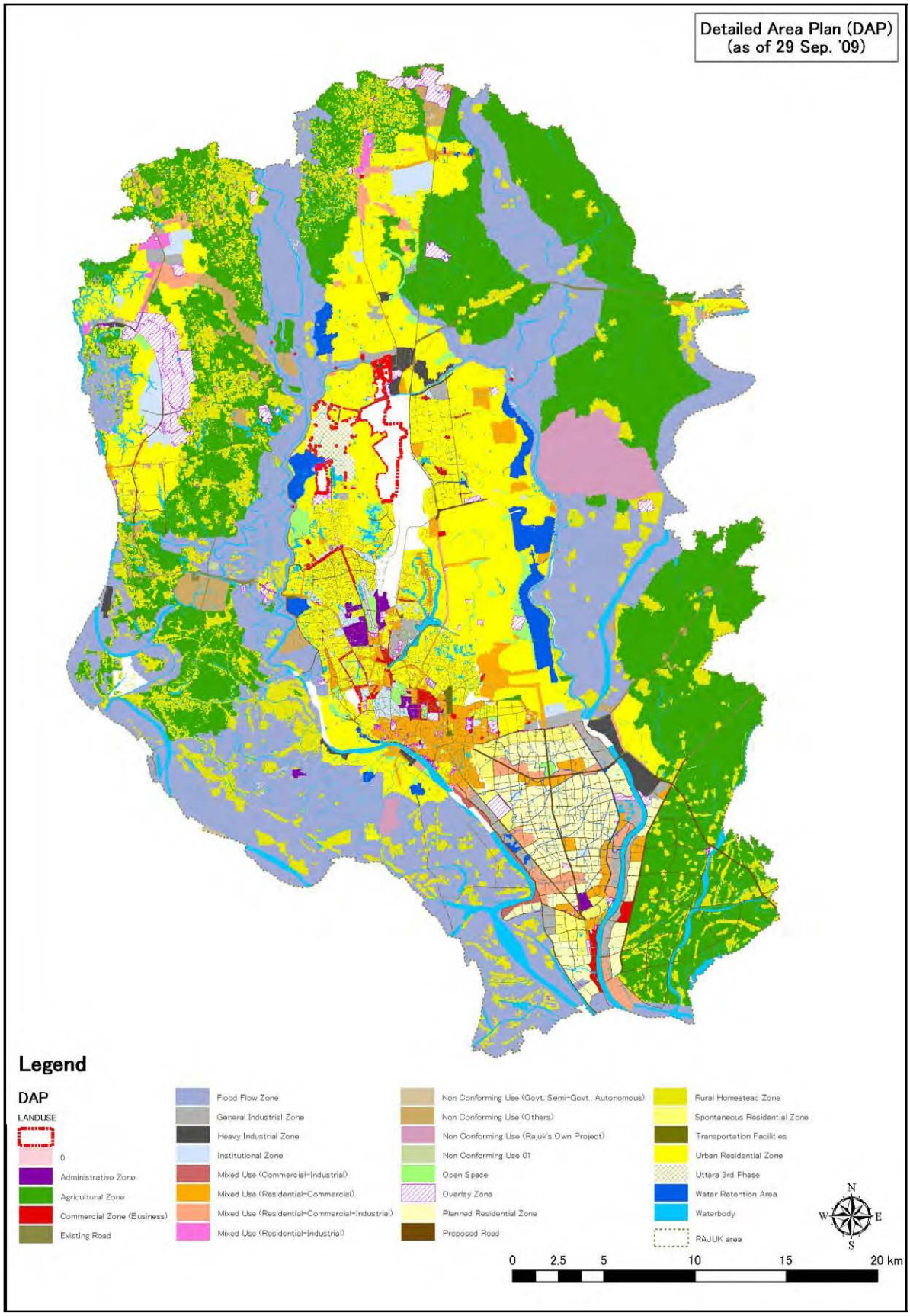
Based on the Structure Plan, UAP was prepared, covering the existing urban area and its adjacent areas. The UAP describes the salient features for each of the 26 Spatial Planning Zones (SPZ), including DCC, Narayanganj, Jinjira, Uttara, the Eastern Fringe, Tongi, Gazipur, Savar and Dhamarai/Dhamsona. The contents of UAP were similar to the Structure Plan.

Following the concepts of Structure Plan and UAP, a draft of DAP was prepared in 2008. It provided more detailed planning proposals for specific sub-areas named Detailed Planning Zone (DPZ), which are smaller than SPZ used in the UAP. The drafted UAP included the proposed land use plan by 2015 (see Figure 2.48). However, this land use plan did not indicate the actual land use conditions as well as future population growth (see Table 2.23).

**Table 2.23 Comparison of Land Use Composition in Detailed Area Plan (2015) and Actual Condition (2013)**

| Land Use Type | DMA (%) | | RAJUK (%) | |
|---|---|---|---|---|
| | DAP (2015) | Actual (2013) | DAP (2015) | Actual (2013) |
| Public | 3.4 | 4.3 | 1.4 | 2.5 |
| Commercial | 1.4 | 4.3 | 0.5 | 1.7 |
| Industrial | 2.1 | 1.8 | 1.8 | 2.5 |
| Transportation | 7.0 | 6.2 | 3.0 | 2.4 |
| Residential | 65.1 | 43.2 | 34.8 | 36.8 |
| Agriculture and Open Space | 3.6 | 24.6 | 26.1 | 42.1 |
| Water body | 12.0 | 8.8 | 28.6 | 7.7 |
| Others | 5.4 | 6.8 | 3.9 | 4.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |

Source: DHUTS (JICA, 2010) and Survey Report “Preparation of Structure Plan (2016-2035) for RAJUK under CRDP




Source: DHUTS (JICA, 2010)

**Figure 2.48 Proposed Land Use Plan of 2015 in DAP**

(2) Housing and Town Development Projects

1) Projects by RAJUK

RAJUK, as the national government agency, has been empowered to control urban development. RAJUK provided the urban master plan and area for housing while developing infrastructures. To compare with the developments by private sector, the development being done by RAJUK reflects governmental policies to conform the public concerns. The development of PURBACHAL new town which is the largest town development of Bangladesh is giving an influence to the regional urbanization trend.

On-going Projects

i. Purbachal

Purbachal will be developed as independent town, and will be one of the municipalities.

- Area Size: 2,502ha (6150 acres)
- Future Population: 1,000,000 persons
- Population Density: 400 persons/ha (in gross)
- Land Use:
  - Residential 38.7%
  - Administrative & Commerce 6.4%
  - Institution & Industrial Park 3.2%
  - Education, Health, Social Infrastructure 8.0%
- Date of Completion: 2015

ii. Uttara 3rd Phase

- Area Size: 817ha (2008 acres)
- Future Population: 600,000 persons
- Population Density: 734 persons/ha (in gross)
- Date of Completion: December 2014, however not yet occupied.

iii. Jhilmil Residential Area

This residential area will meet for the demand of lower and middle income group.

- Area Size: 155ha (381acres)
- Future Population: 133,000 persons
- Population Density: 860 persons/ha (in gross)
- Date of Completion: waiting for implementation, if the construction will start, within 5-6yeras it will be completed

iv. Uttara Apparent Construction Project

High rise flats for Low & middle income group will be constructed in Sector18 U3 of Uttara 3rd. F/S has been prepared.

- Future Population: 90,000 persons (20,000unit)

Planned Projects

i. Construction of Apartment Project at Kamrangirchar: F/S is under implementation. Actual site is not decided.

Ii Savar Satellite Town (906ha): RAJUK intends to develop the satellite town including housing and industrial estate. Land acquisition, however, will meet

difficulties due to the low purchasing price from the government. Possibility may lie in the development by private sector.

iii. Gazipur Satellite Town (1,749ha): Project of Gazipur is similar with the situation of Savar.

iv. Narayanganj- Demra- Dhaka Delta: This area spreads from Dhaka-Chittagong Road to the north, the urbanized area of Narayanganj to the south, Buriganga River to the west and Sitalakhya River to the east. This location makes the area flood free by the embankment and/or by the roads. Previously, the embankment was to protect agriculture from flood; however, recently the area is open for urban land use. Presently, there is no concrete plan from RAJUK, but development by private sector will likely to prevail.

v. Kamurangirchar P.S. (For low income group): Is the housing project for lower and middle income group with assistance of Republic of China, but it has not been authorized yet.

vi. East Baridhara: The area is about 2000acres and aims to absorb urban functions located in the west of the area. The project has not been approved yet.

Total Volume of Housing Area by RAJUK

The on-going or under planning projects of new towns and the satellite towns does not manifest whether all of these will be completed or not. If all projects will be completed, the total development volume will occupy a large share of the future housing demand.

**Table 2.24 Development Volume of Major Projects by RAJUK**

| | No. of Project | Area (ha) | Estimated Population |
|---|---|---|---|
| On-going | 3 | 3,474ha | 1,733,000 |
| Satellite | 3 | 4,816ha | 2,408,000 |
| Total | 6 | 8,290ha | 4,141,000 |

Source: RAJUK
Note: The population density of the satellite towns is assumed to be the same as the average of on-going projects

2) Housing and Town Development Projects by Private Sector

The private developers play major roles in the housing market of Dhaka. The demand arose from a rapid population increase; even though private developers cater mostly to middle and upper income group, the group has also increased by the high economic growth. Naturally urban expansion has been influenced by the housing developments made by private developers.

The private sector builds flats and lands mainly for the group with the income of more than 30,000 TK/month which occupies around 13% of total household in Dhaka .

An affordable housing has been provided by the private developers, but the major target of affordable houses is the income group with 30,000TK/month and more, which means that the majority acquires their home through personal funds and benefits.

At this moment 77 projects are officially approved, however the recent economic situation has restrained the smooth implementation of projects. Total number of projects under implementation is 18 as shown in the following table.

**Table 2.25 On-going Housing Projects by Private Developers**

| no | Name of the project | Project Area | Area (ha) |
|---|---|---|---|
| 1 | Ashulia Land development Limited | Dakhshin Khan | 17.4 |
| 2 | Xenovaly Properties Limited | Boro Kathalya | 40.5 |
| 3 | Bangladesh Development Company | North town , Tangi /Baagier | 129.5 |
| 4 | Bangladesh Development Company | North town , Kerano ganji /Baagier | 404.7 |
| 5 | Bangladesh Development Company | East Town Kachpur / Madanpur | 40.5 |
| 6 | Sun valley Residential Project | Badda, Suti vula | 121.4 |
| 7 | Notun Dhara Housing Company | Badda, Suti vula | 55.0 |
| 8 | Mission Energy and Property Limited | Dhaor Rana Vola | 36.4 |
| 9 | M N Housing Limited | Baunya | 35.2 |
| 10 | Hazi M gafur Land Development Limited | Amuliya , Sunnya | 39.7 |
| 11 | AshuliaModel town Project | Ashulia, savar | 161.9 |
| 12 | Madhumoti Model Town Residential Project | Amin Bazar Savar | 80.9 |
| 13 | Bashundhara River view | Kerani Ganja | 202.4 |
| 14 | BCS Police Officers Projectsooperative housocng | Savar | 48.6 |
| 15 | Hamid real Estate Limited, Prto Prangon, | Kerani Ganja | 34.4 |
| 16 | Concord Land Real Estate Limited, Rajdhani Housing Project | Matuail Demra | 43.7 |
| 17 | Tanin Kunja Housing Project Limited | Deol, DND | 12.1 |
| 18 | Vuluya Royel City Private Limited | Borua | 20.2 |
| Total | | | 1524.5 |

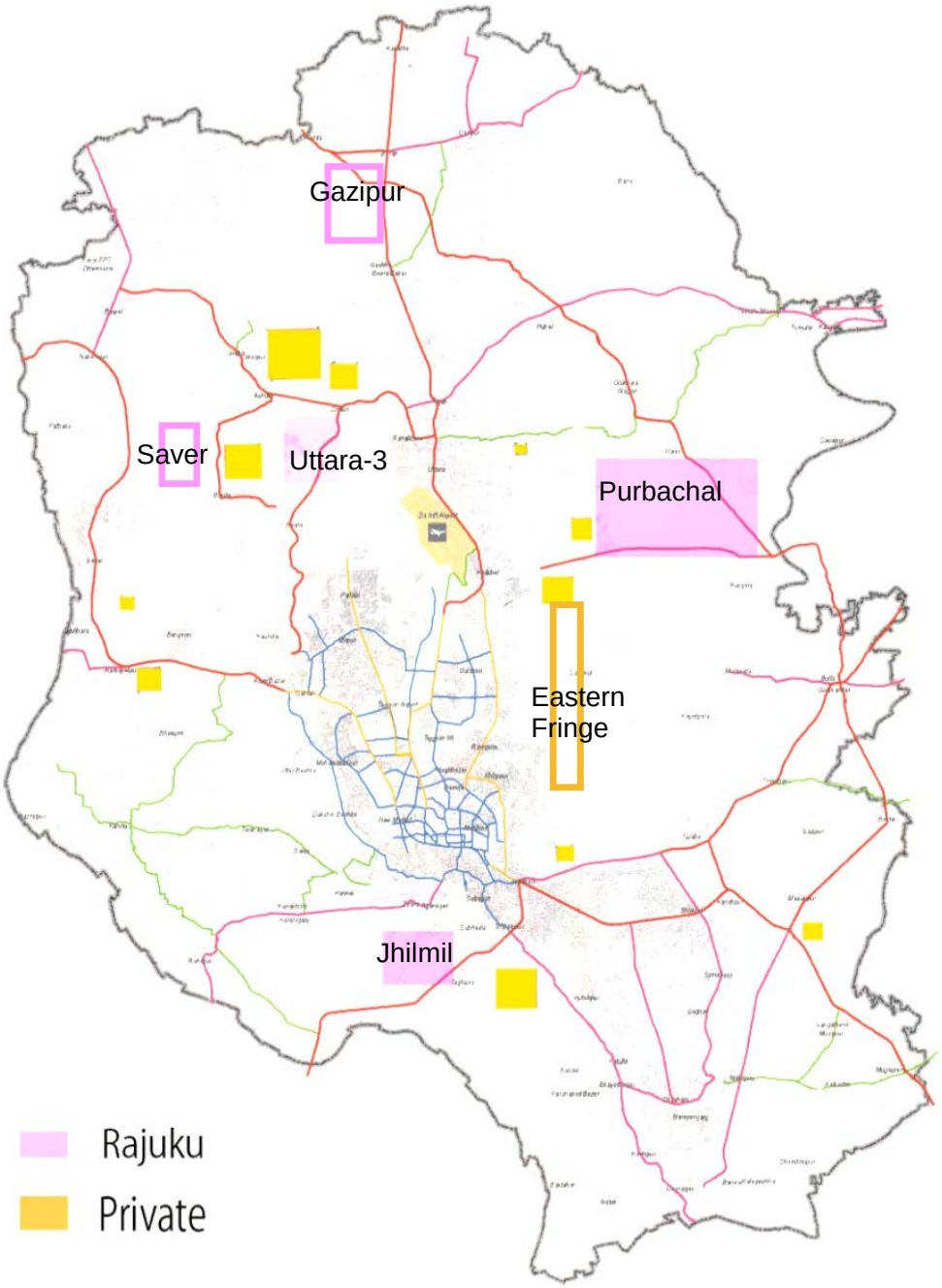
Source: RAJUK

Most of these projects distribute around the perimeter of the urbanized area of Dhaka and near the main roads, which expands the present urban areas beyond the RAJUK area. Presently, the location of housing projects is within RAJUK area, and the private developers take interests in extending their business beyond the RAJUK area.

Aside from the on-going projects, there are another 59 approved projects which have been postponed due the recent economic conditions. If the area size of these projects will be the same as that of the on-going projects, the total amount of area will be about 5,000ha.

If these projects will begin its operation, the area size of private developers will be around 6,500ha.

There are also small projects from the private sector with the area of less than 4 acres which does not require an official approval; the area size of private projects may nearly equal to the size of RAJUK projects.




Source: RAJUK and other sources

**Figure 2.49 Distribution of Major Housing Projects**

3) Evaluation of the Present Housing Projects

(I) Imbalance between Demand and Supply

The total volume of developing housing projects both by RAJUK and private developers is estimated to be around 17,000ha. The area may accommodate around 8-9million of population. Since the increase of population especially in RAJUK area which has about 10million so far, the present volume of projects has huge backlog for more than 10years.

Moreover the price of houses provided by such housing projects can only meet the demand of middle and high income group which is 13% of the population.

In conclusion, the present housing projects supply is beyond the actual demand, which indicates that the development may be sustained. And as speculated, the private sectors will be required to dispose a huge backlog.

(II) Rise of Price

The price of apartment has been increasing by 14.9% annually in average during 2000-2010, while GDP per capita has increased by 6.4% annually in average.

**Table 2.26 Average Price of Apartment in Dhaka**

| | 2000 | 2010 |
|---|---|---|
| Taka/Sq. feet | 2,016 | 8,047 |

Source: "Comprehensives study on the real estate sector of Bangladesh"
Real Estate and Housing Association of Bangladesh, July12, 2012
Note: The figures are the average of 17places in Dhaka

If the present situation continues, more and more the people will have difficulties to purchase house and will tend to select remote places from Dhaka.

Considering these issues, various public policies must be introduced such as social housing, and housing loan systems to provide affordable spaces accessible to ordinary people.

4) Industrial Estates

(I) Industrial Estate for Small and Cottage Industry

The popular type of industrial estate in Bangladesh is the one by Bangladesh Small and Cottage Industries Corporation. It is developed in various regions of Bangladesh aimed to promote manufacturing with less than 50 employees. In the area studied, ten estates were found to be developed. These are shown in the following table.

**Table 2.27 Industrial Estates for Small and Cottage Industries by BSCIC**

| Name | Area (ha) | Companies on Production | Location | |
|---|---|---|---|---|
| | | | Town | District |
| Dhaka | NA | NA | NA | Dhaka |
| Dhamrai | 7.7 | 28 | Dhamrai | Dhaka |
| Electoronics | 0.1 | 20 | Mirpur | Dhaka |
| Tannery | 81.0 | 0 | Savar | Dhaka |
| Keranigonj | 10.1 | 32 | Keranigonj | Dhaka |
| Narayanganj | 10.1 | 114 | Kachipur | Narayanganj |
| Hosicery | 23.7 | 646 | Narayanganj | Narayanganj |
| Manikganj | 4.2 | 22 | Manikganj | Manikganj |
| Tongi | 36.3 | NA | Tongi | Gazipur |
| Munsiganj | 5.4 | 50 | Munsiganjl | Munsiganjl |

Source: Website of BSCIC

(II) Export Processing Zone

EPZ is nationwide industrial estate with the purpose to enhance the export of Bangladesh as well as introducing foreign investors in the country; however different from BSCIC. In the area being studied, there are two EPZ, one in Savar and another in Narayanganj.

**Table 2.28 Export Processing Zones in Study Area**

| Name | Area (ha) | Companies on Operation | Location | |
|---|---|---|---|---|
| | | | Town | District |
| Adamjee | 99.2 | 36 | Siddirganj | Narayanganji |
| Dhaka | 144.2 | 102 | Savar | Dhaka |

Source: Bangladesh Export Processing Zones Authority

(III) Hi-Tech Park

Bangladesh Hi-Tech Park Authority (BHTPA) established in 2010 is in charge of the development of the only high-technology Park in Bangladesh, which will be located at Kaliakoir, Gazipur.

**Table 2.29 The High-Tech Park in Study Area**

| Name | Area (ha) | Companies on Operation | Location | |
|---|---|---|---|---|
| | | | Town | District |
| Kaliakoir HTP | 93.8 | Under construction | Kaliakoir | Gazipur |

Source: Bangladesh Hi-Tech Park Autority

(IV) Industrial Estates by RAJUK

RAJUK also developed the industry estates as shown in the table below.

**Table 2.30 Industrial Estates Developed by RAJUK**

| Name | Location | |
|---|---|---|
| | Town | District |
| Tongi Industiral Estate | Tongi | Gazipur |
| Shyampur-Kadamtali Industrial Estate | Shampur | Dhaka |
| Postagola Industrial Estate | PosTagola | Dhaka |

Source: RAJUK

(V) Industrial Estates by Private Developers

Private developers are developing industrial estates; however, most of them are unidentified.

# 3. TRAFFIC SURVEY AND ANALYSIS

## 3.1 Introduction

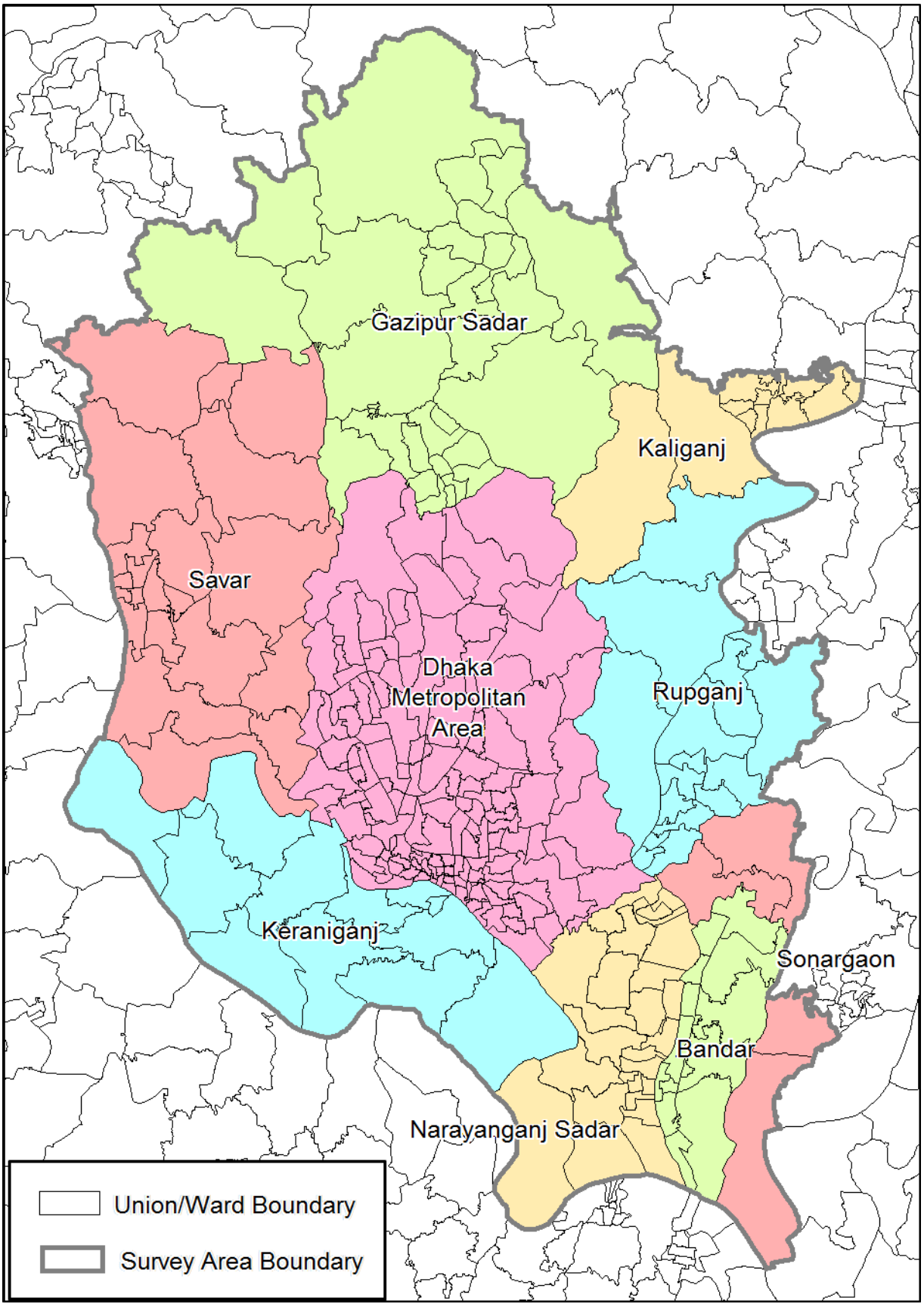
The study conducts four traffic surveys, namely; the Household Interview Survey, the Cordon Line Survey, the Screen Line Survey and the Public Transportation Users' Opinion Survey. Although DHUTS earlier conducted similar traffic surveys, it would not be appropriate to develop database for this study by just updating DHUTS survey data with some supplemental surveys due to a larger survey area, newly developed areas and a growing economy and population.

Objectives of the four traffic surveys are as follows:

- The Household Interview Survey (HIS) aims to obtain family and personal socio-economic data and actual trip records. The results will be utilized for the analysis of current travel behaviors of people in order to develop traffic demand models and to forecast future traffic demand. Both the Cordon Line Survey and the Screen Line Survey are necessary to calibrate the HIS data obtained.
- The Cordon Line Survey aims to determine trips to/from the Survey Area made by the residents living inside and outside the Survey Area and to calibrate the distributed traffic volume obtained from the HIS. Required data are gathered through surveys conducted at the boundary of the Survey Area and public transportation terminals (i.e., airport terminals, bus terminals, ferry terminals and railway stations).
- The Screen Line Survey aims to provide vehicular and passenger traffic volume in order to calibrate the distributed traffic volume obtained from the HIS. Required data are obtained through surveys conducted at road sections across an imaginary "Screen Line" dividing the Survey Area into northern and southern parts.
- The Public Transportation Users' Opinion Survey aims to gather passenger's trip information, willingness to pay for saving travel time, perception on existing public transport services. A further survey is done on personal socio-economic characteristics in order to evaluate existing public transport services and to estimate the value of time.

The Survey Area for the traffic survey cannot be exactly the same as RAJUK's jurisdiction as a matter of practical convenience since the population data is officially available by union or ward. It has been determined to cover the entire Survey Area which is shown in Figure 3.1.

Table 3.1 shows the actual survey timeline. All traffic surveys have been finalized by January 2015.




Source: JICA Study Team

**Figure 3.1 Survey Area**

**Table 3.1 Traffic Survey Timeline**

| Survey Item | Aug | September | | | | October | | | | | November | | | | December | | | | | January | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 24 | 31 | 7 | 14 | 21 | 28 | 5 | 12 | 19 | 26 | 2 | 9 | 16 | 23 | 30 | 7 | 14 | 21 | 28 | 4 | 11 |
| Household Interview Survey | | ■ | ■ | ■ | ■ | ■ | Eid al-Adha | ■ | ■ | | Big Hartar | ■ | | | | | | | | | ▲ |
| Screen Line Survey | ■ | ■ | ■ | ■ | | ▲ | | | | | | | | | | | | | | | |
| Public Transport Users' Opinion Survey | | | | ■ | ■■ | | | | ■▲ | | | | | | | | | | | | |
| Cordon Line Survey (Inner Cordon) | | | | | ■ | | | | | | | ■ | ■ | ■ | | ▲ | | | | | |
| Cordon Line Survey (Outer Cordon) | | | | | | | | | ■ | ■ | | ■ | | | | | | ▲ | | | |
| Cordon Line Survey (Terminals) | | | | | | | | | | | | ■ | ■ | | | | ■ | | ▲ | | |

Legend: ■ Survey ▲ Data Finalization

Source: JICA Study Team

## 3.2 Household Interview Survey (HIS)

(1) Survey Method

The HIS is an interview survey conducted by visiting target households and interview the respective household heads and every household member according to the prepared survey forms.

The respondent households are randomly selected at field in all designated unions and wards in the Survey Area. Samples from each union/ward are taken from at least three different streets and the first house to be surveyed is randomly selected with succeeding samples to be selected based on the density of the area.

The survey is conducted from 9 AM to 6 PM on Mondays to Fridays while the survey on Saturdays is only for call-back or revisit to households previously visited but whose information is not complete. The survey collects actual trip records on the day before the survey date and thus trips made on weekdays (i.e., Sundays to Thursdays) are interviewed.

After filling out survey forms in the field, guided by zone code tables, a numerical code is assigned to each area representing a respondent's residence, work place, school, trip origin, trip destination and transfer point.

(2) Survey Items

In order to keep consistency with the data collected in DHUTS, survey forms were prepared based on information used in DHUTS HIS as shown in Annex. Survey items had been reduced to minimize respondents' load if the question apparently has no connection to transport planning. The survey forms include items as listed below.

- Form 1 Household Information: This questionnaire covers household's contact information, residential location, real estate ownership, payment of the house and electricity, etc.
- Form 2 Household Member Information: This questionnaire covers the socio-economic characteristics of each household member. These include gender, age, possession of driver's license, occupation, employment sector, work and/or school address, monthly personal income, etc.
- Form 3 Household Vehicle Information: This questionnaire is about the number of vehicles owned by the household and whose household member frequently used the vehicle.
- Form 4 Trip Records: This questionnaire covers the characteristics of weekday trips made by each household member. These include trip origin and destination, departure and arrival times, trip purpose, trip cost, travel mode, and transfer points.

The survey is conducted among all household members in each respondent household. Forms 1, 2 and 3 are to be answered by the household head or his/her representatives while Form 4 is for each household member if he or she is 10 years old or above.

(3) Survey Coverage

The HIS covers only 192 out of 271 unions and wards in the Survey Area since the rest has already been surveyed in DHUTS[1]. Target households are selected from each of 192

[1]Although DHUTS covered the whole area of DCC North and South, the HIS under DHUTS was found to have missed 15 wards and have collected a few samples in 10 wards due to unknown reasons. The HIS under this Study complements those wards. The 192 zones include them.

unions and wards[2]. The survey targets a total of 16,000 sample households and this number is distributed to each union/ward in proportion to the census population in 2011.

The number of households and persons actually sampled, and the sampling rate by upazila is shown in Table 3.2.

**Table 3.2 Number of Sampled Households/Persons and the Sampling Rate by Upazila**

| Upazila | Number of Target Unions/Wards | Census Population (2011) | Number of Sampled Households | Number of Sampled Persons | Actual Sampling Rate (%) |
|---|---|---|---|---|---|
| Dhaka Metropolitan Area | 61 (140)* | 3,715,171 (8,906,039)* | 5,960 | 24,750 | 0.67 |
| Gazipur Sadar | 29 | 1,659,792 | 2,657 | 11,085 | 0.67 |
| Savar | 21 | 1,296,687 | 2,113 | 8,435 | 0.65 |
| Keraniganj | 12 | 794,360 | 1,293 | 5,674 | 0.71 |
| Narayanganj Sadar | 25 | 1,323,600 | 2,165 | 9,022 | 0.68 |
| Bandar | 14 | 312,841 | 507 | 2,077 | 0.66 |
| Sonargaon | 4 | 167,888 | 274 | 1,080 | 0.64 |
| Rupganj | 15 | 451,392 | 730 | 3,272 | 0.72 |
| Kaliganj | 11 | 109,939 | 198 | 851 | 0.77 |
| **Total** | **192 (271)*** | **9,831,670 (15,022,538)*** | **15,897** | **66,246** | **0.67** |

Note *: Figures in parentheses include unions and wards surveyed in DHUTS as well.
Source: JICA Study Team

(4) Survey Results

Expansion factors are assigned to each collected record according to population by union/ward projected by the Study Team. The expansion factors are also adjusted according to Bangladesh's official statistics on the population composition by gender and age and on registered vehicles. Trip records are furthermore adjusted with the number of trips observed in the Screen Line Survey.

### 3.3 Cordon Line Survey

(1) Survey Method

The Cordon Line Survey covers several kinds of survey stations and the survey method varies depending on the survey station type. The survey stations roughly fall into two types; roadsides and public transport terminals. Survey forms are shown in Annex.

1) Roadside Surveys

In any roadside survey station, vehicular traffic volume is taken in every 30 minutes by vehicle type and direction. Depending on the survey station, another kind of survey will be simultaneously conducted alongside with the vehicular traffic count survey.

[2]Those 192 zones also include Cantonment in Dhaka, Gazipur and Savar but the survey was not allowed in those three areas for security concerns. The following analyzes do not cover those three zones due to the lack of present data.

At DMA's boundary ("Inner Cordon Line" stations; IC01 to IC11 in Table 3.3), the number of occupants on vehicles chosen at random is taken and recorded. This survey is also done by vehicle type and direction for every 30 minutes. Moreover, the vehicle occupancy survey at the most congested road sections is ensured of a minimum 10% sample rate which is based on 16-hr (6 AM to 10 PM) vehicular traffic volume by vehicle type and direction.

At the Survey Area's boundary ("Outer Cordon Line" stations; OC01 to OC13 in Table 3.3), the OD interview survey is simultaneously conducted to gather trip information from randomly selected private vehicle drivers, public transport passengers and truck drivers. The minimum sample rate for the OD interview is 25% for buses and 10% for the other vehicle types. The sample rate is based on the 24-hour vehicular traffic volume by vehicle type and direction.

For the roadside surveys, vehicles are classified as follows;

- Bicycle
- Motorcycle
- Rickshaw
- CNG/Mishuk/Auto
- Car
- Taxi
- Auto tempo/Laguna/Maxi
- Microbus/Jeep
- Minibus/Bus
- AC Bus
- Staff Bus
- School Van
- School/College/University Bus
- 3-Axle Truck/ Trailer
- Tanker/Tank Lorry
- Medium Truck/2-Axle Truck
- Pick-up/Small Van
- Others (including ambulance, fire engine, towing car, construction vehicle, armored car, animal-driven cart etc.).

2) Terminal Surveys

Survey at airport terminals is done by counting departing passengers entering the departure gate for every 30 minutes. While an OD interview survey is simultaneously conducted to at least 20% of randomly selected departing passengers.

Survey at bus terminals is done by conducting an OD interview survey to at least 1,500 randomly selected departing passengers in every survey station. No passenger count surveys are performed at bus terminals.

Survey at ferry terminals is done by taking the number of departing passengers aboard each ferry or boat, departure time and destination. An OD interview survey is simultaneously conducted to at least 20% of randomly selected ferry's departing passengers.

Survey at railway stations is done by taking the number of departing passengers aboard each train, departure time and destination. An OD interview survey is simultaneously conducted to at least 20% of randomly selected train's departing passengers.

(2) Survey Coverage

DMA's boundary has 11 "IC" roadside survey stations and there are 13 "OC" survey stations for the roadside at the Survey Area's boundary. There are also 2 survey stations at Hazrat Shahjalal International Airport, 3 survey stations at bus terminals, 2 survey stations at ferry terminals including their surrounding areas and 4 survey stations at railway stations. All survey stations are listed in Table 3.3 with their corresponding survey duration while their locations are shown in Figure 3.2 and Figure 3.3. Actual latitude and longitude of the roadside survey stations are shown in Table 3.4.

For the roadside survey sites within the Inner Cordon Line, a 24-hour vehicle count survey, which starts from 6 AM to 6 AM the following day and a 16-hour vehicle occupancy survey, which starts from 6 AM to 10 PM, are conducted at all stations.

As for the roadside survey sites within the Outer Cordon Line, a 24-hour vehicle count and OD interview surveys are conducted at all stations. There are no constraints on the starting time as long as the surveys are conducted for 24 hours.

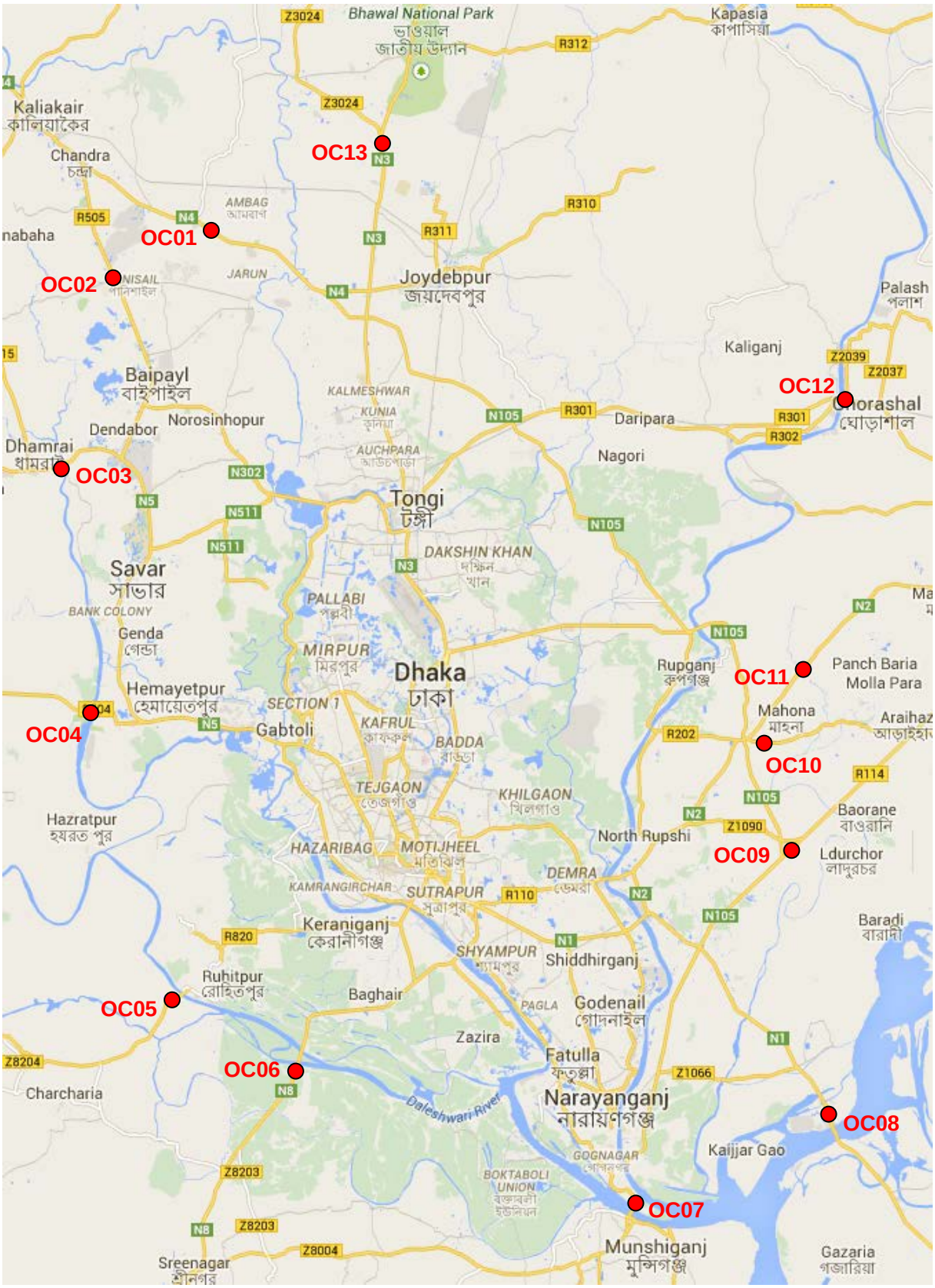
Passenger count and OD interview surveys are conducted in public transport terminals/stations excluding bus terminals where the passenger count survey is not required. Basically, survey period is 24 hours however in case of terminal that is not a 24-hour operation, the survey period adjusts as per the terminal's operating hours. Consequently, only departing passengers are counted and interviewed in these terminals.

Surveys are conducted on the days of Monday, Tuesday or Wednesday excluding holiday or a day with special festivities as well as during bad weather condition.

**Table 3.3 Cordon Line Survey Stations and Survey Periods**

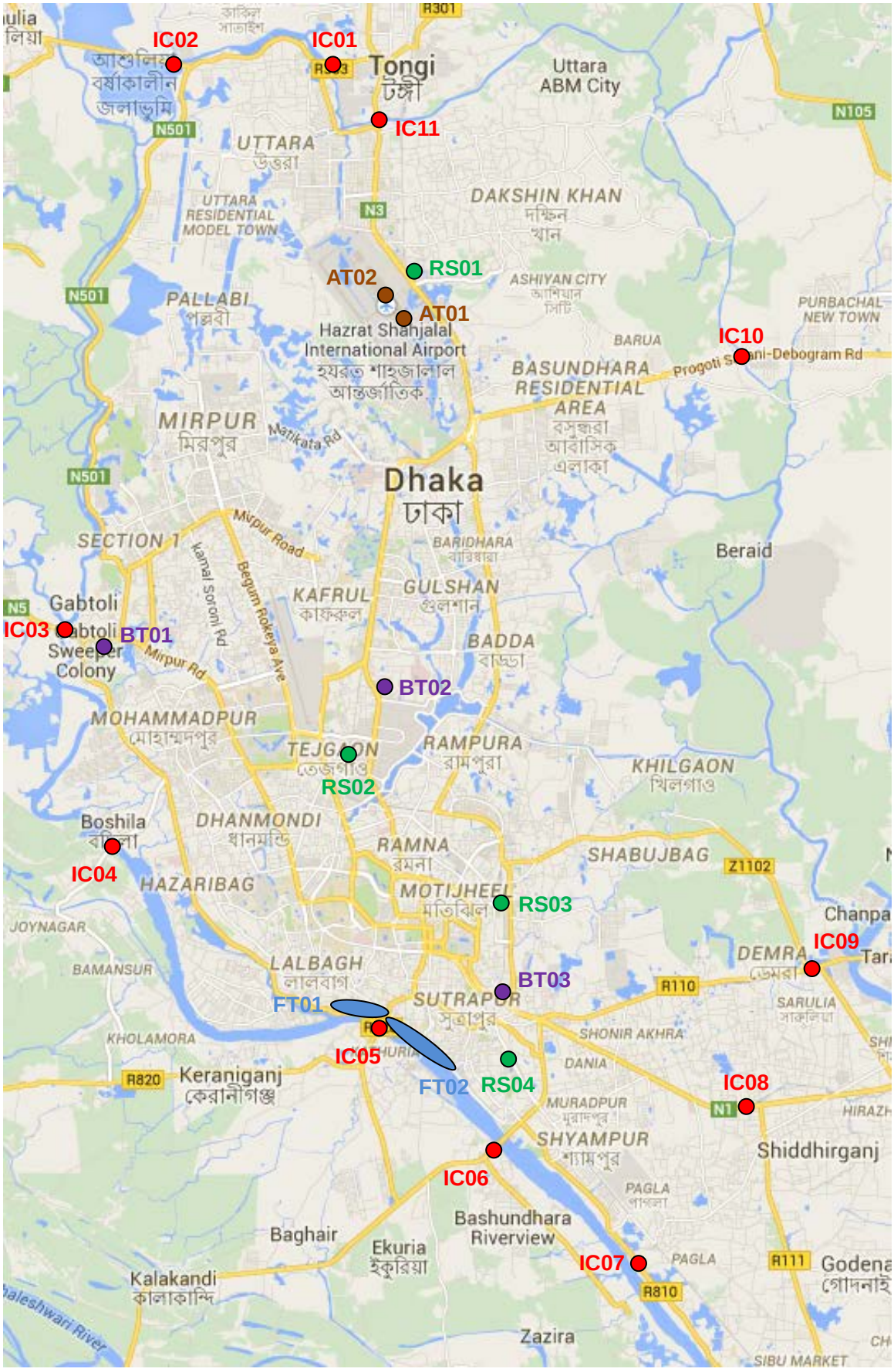
| Seq. | Category | Code | Survey Station | | Survey Period (hours) | | |
|---|---|---|---|---|---|---|---|
| | | | | | Traffic Count | OD Interview | Vehicle Occupancy |
| 1 | Roadside | IC01 | Tongi Bypass Road | Boundary of DMA | 24 | - | 16 |
| 2 | | IC02 | Tongi-Ashulia-Zerabo-EPZ Road | Boundary of DMA | 24 | - | 16 |
| 3 | | IC03 | Dhaka-Aricha Highway | Boundary of DMA | 24 | - | 16 |
| 4 | | IC04 | Third Buriganga Bridge | Boundary of DMA | 24 | - | 16 |
| 5 | | IC05 | Second Buriganga Bridge | Boundary of DMA | 24 | - | 16 |
| 6 | | IC06 | First Buriganga Bridge | Boundary of DMA | 24 | - | 16 |
| 7 | | IC07 | Dhaka-Narayanganj Highway | Boundary of DMA | 24 | - | 16 |
| 8 | | IC08 | Dhaka-Chittagong Highway | Boundary of DMA | 24 | - | 16 |
| 9 | | IC09 | Dhaka-Demra Highway | Boundary of DMA | 24 | - | 16 |
| 10 | | IC10 | Purbachal Express Highway | Boundary of DMA | 24 | - | 16 |
| 11 | | IC11 | Tongi Bridge | Boundary of DMA | 24 | - | 16 |
| 12 | | OC01 | Joydevpur-Tangail Highway | Bundary of the Survey Area | 24 | 24 | - |
| 13 | | OC02 | Nabinagar-Chandra Road | Bundary of the Survey Area | 24 | 24 | - |
| 14 | | OC03 | Dhaka-Aricha Highway | Bundary of the Survey Area | 24 | 24 | - |
| 15 | | OC04 | Savar-Manikganj Highway | Bundary of the Survey Area | 24 | 24 | - |
| 16 | | OC05 | Tulsikhali Bridge | Bundary of the Survey Area | 24 | 24 | - |
| 17 | | OC06 | Dhaka-Mawa Highway | Bundary of the Survey Area | 24 | 24 | - |
| 18 | | OC07 | Muktarpur Bridge | Bundary of the Survey Area | 24 | 24 | - |
| 19 | | OC08 | Dhaka-Chittagong Highway | Bundary of the Survey Area | 24 | 24 | - |
| 20 | | OC09 | Araihazar-Narsingdi Highway | Bundary of the Survey Area | 24 | 24 | - |
| 21 | | OC10 | Bhulta-Nabinagar-Radhika Road | Bundary of the Survey Area | 24 | 24 | - |
| 22 | | OC11 | Dhaka Sylhet Highway | Bundary of the Survey Area | 24 | 24 | - |
| 23 | | OC12 | Tongi-Ghorashal Highway | Bundary of the Survey Area | 24 | 24 | - |
| 24 | | OC13 | Dhaka - Mymensingh Highway | Bundary of the Survey Area | 24 | 24 | - |
| 25 | Airport | AT01 | Hazrat Shahjalal International Airport Domestic Terminal | | 24 | 24 | - |
| 26 | Terminal | AT02 | Hazrat Shahjalal International Airport International Terminal | | 14.5 | 14.5 | - |
| 27 | Bus | BT01 | Gabtoli | | - | 16 | - |
| 28 | Terminal | BT02 | Mohakhali | | - | 16 | - |
| 29 | | BT03 | Sayedabad | | - | 16 | - |
| 30 | Ferry | FT01 | Showari Ghat, Midford Ghat and surrounding areas | | 24 | 24 | - |
| 31 | Terminal | FT02 | Sadar Ghat, Badmtoli Boat Terminal and surrounding areas | | 24 | 24 | - |
| 32 | Railway | RS01 | Airport | | 24 | 24 | - |
| 33 | Station | RS02 | Tejgaon | | 24 | 24 | - |
| 34 | | RS03 | Kamalapur | | 24 | 24 | - |
| 35 | | RS04 | Gandaria | | 24 | 24 | - |

Source: JICA Study Team




Source: JICA Study Team

**Figure 3.2 Locations of Survey Stations (Outer Cordon Line Stations)**




Source: JICA Study Team

**Figure 3.3 Locations of Survey Stations (Inner Cordon Line Stations and Terminals)**

**Table 3.4 Actual Location and Survey Date and Time of the Cordon Line Survey**

| Seq. | Code | Survey Station | Latitude and Longitude | Date of Start | Time Started | Time Completed |
|---|---|---|---|---|---|---|
| 1 | IC01 | Tongi Bypass Road | 23° 53' 30.0" N 90° 23' 23.0" E | September 24, 2014 | 6:00 AM | 6:00 AM the following day |
| 2 | IC02 | Tongi-Ashulia-Zerabo-EPZ Road | 23° 53' 32.6" N 90° 21' 39.2" E | September 24, 2014 | 6:00 AM | 6:00 AM the following day |
| 3 | IC03 | Dhaka-Aricha Highway | 23° 47' 03.6" N 90° 20' 07.0" E | November 19, 2014 | 6:00 AM | 6:00 AM the following day |
| 4 | IC04 | Third Buriganga Bridge | 23° 44' 36.3" N 90° 20' 45.4" E | November 13, 2014 | 6:00 AM | 6:00 AM the following day |
| 5 | IC05 | Second Buriganga Bridge | 23° 42' 35.9" N 90° 24' 08.5" E | November 24, 2014 | 6:00 AM | 6:00 AM the following day |
| 6 | IC06 | First Buriganga Bridge | 23° 41' 18.6" N 90° 25' 42.5" E | November 24, 2014 | 6:00 AM | 6:00 AM the following day |
| 7 | IC07 | Dhaka-Narayanganj Highway | 23° 39' 35.9" N 90° 27' 28.2" E | November 13, 2014 | 6:00 AM | 6:00 AM the following day |
| 8 | IC08 | Dhaka-Chittagong Highway | 23° 41' 36.8" N 90° 28' 45.1" E | November 25, 2014 | 6:00 AM | 6:00 AM the following day |
| 9 | IC09 | Dhaka-Demra Highway | 23° 43' 11.3" N 90° 29' 25.9" E | November 25, 2014 | 6:00 AM | 6:00 AM the following day |
| 10 | IC10 | Purbachal Express Highway | 23° 50' 12.7" N 90° 28' 37.7" E | November 13, 2014 | 6:00 AM | 6:00 AM the following day |
| 11 | IC11 | Tongi Bridge | 23° 52' 54.8" N 90° 24' 03.0" E | November 19, 2014 | 6:00 AM | 6:00 AM the following day |
| 12 | OC01 | Joydevpur-Tangail Highway | 24° 01' 10.2" N 90° 17' 58.2" E | October 21, 2014 | 6:00 AM | 6:00 AM the following day |
| 13 | OC02 | Nabinagar-Chandra Road | 23° 59' 46.0" N 90° 15' 16.4" E | October 22, 2014 | 6:00 AM | 6:00 AM the following day |
| 14 | OC03 | Dhaka-Aricha Highway | 23° 54' 38.9" N 90° 13' 41.8" E | October 20, 2014 | 6:00 AM | 6:00 AM the following day |
| 15 | OC04 | Savar-Manikganj Highway | 23° 47' 54.5" N 90° 14' 47.6" E | October 21, 2014 | 6:00 AM | 6:00 AM the following day |
| 16 | OC05 | Tulsikhali Bridge | 23° 40' 00.3" N 90° 16' 58.4" E | October 22, 2014 | 6:00 AM | 6:00 AM the following day |
| 17 | OC06 | Dhaka-Mawa Highway | 23° 37' 55.9" N 90° 20' 40.6" E | October 27, 2014 | 6:00 AM | 6:00 AM the following day |
| 18 | OC07 | Muktarpur Bridge | 23° 34' 39.5" N 90° 30' 46.2" E | October 28, 2014 | 6:00 AM | 6:00 AM the following day |
| 19 | OC08 | Dhaka-Chittagong Highway | 23° 37' 01.1" N 90° 36' 35.4" E | October 29, 2014 | 6:00 AM | 6:00 AM the following day |
| 20 | OC09 | Araihazar-Narsingdi Highway | 23° 43' 54.5" N 90° 35' 17.7" E | October 27, 2014 | 6:00 AM | 6:00 AM the following day |
| 21 | OC10 | Bhulta-Nabinagar-Radhika Road | 23° 47' 05.8" N 90° 35' 29.0" E | October 28, 2014 | 6:00 AM | 6:00 AM the following day |
| 22 | OC11 | Dhaka Sylhet Highway | 23° 49' 08.7" N 90° 35' 58.5" E | October 29, 2014 | 6:00 AM | 6:00 AM the following day |
| 23 | OC12 | Tongi-Ghorashal Highway | 23° 56' 19.1" N 90° 37' 29.9" E | November 13, 2014 | 6:00 AM | 6:00 AM the following day |
| 24 | OC13 | Dhaka-Mymensingh Highway | 24° 03' 21.7" N 90° 23' 17.2" E | October 20, 2014 | 6:00 AM | 6:00 AM the following day |

Source: JICA Study Team

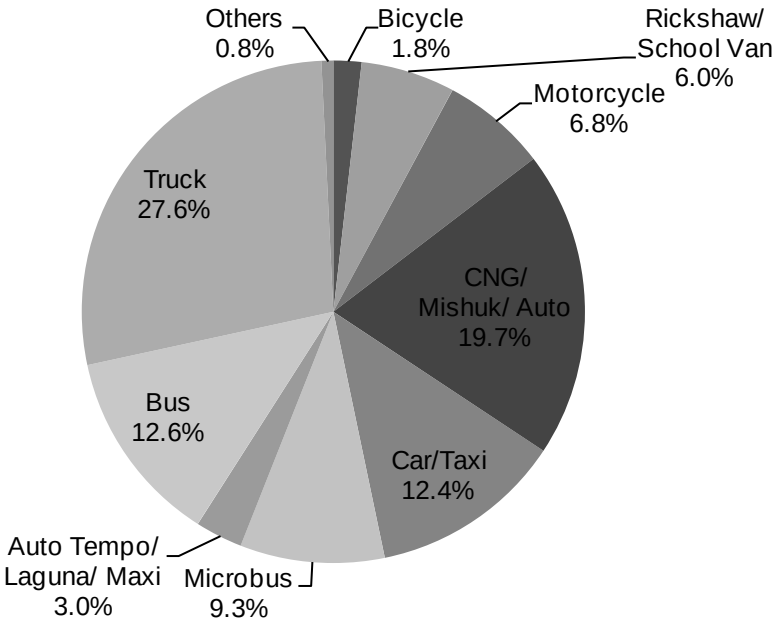
**Continued – Actual Location and Survey Date and Time of the Cordon Line Survey**

| Seq. | Code | Survey Station | Latitude and Longitude | Date of Start | Time Started | Time Completed |
|---|---|---|---|---|---|---|
| 25 | AT01 | Hazrat Shahjalal International Airport Domestic Terminal | - | December 1, 2014 | 6:00 AM | 6:00 AM the following day |
| 26 | AT02 | Hazrat Shahjalal International Airport International Terminal | - | December 1, 2014 | 6:00 AM | 8:30 PM |
| 27 | BT01 | Gabtoli Bus Terminal | - | November 12, 2014 | 6:00 AM | 10:00 PM |
| 28 | BT02 | Mohakhali Bus Terminal | - | November 10, 2014 | 6:00 AM | 10:00 PM |
| 29 | BT03 | Sayedabad Bus Terminal | - | November 11, 2014 | 6:00 AM | 10:00 PM |
| 30 | FT01 | Showari Ghat, Midford Ghat and surrounding areas | - | November 18, 2014 | 6:00 AM | 6:00 AM the following day |
| 31 | FT02 | Sadar Ghat, Badmtoli Boat Terminal and surrounding areas | - | November 17, 2014 | 6:00 AM | 6:00 AM the following day |
| 32 | RS01 | Airport Railway Station | - | November 10, 2014 | 6:00 AM | 6:00 AM the following day |
| 33 | RS02 | Tejgaon Railway Station | - | November 18, 2014 | 6:00 AM | 6:00 AM the following day |
| 34 | RS03 | Kamalapur Railway Station | - | November 11, 2014 | 6:00 AM | 6:00 AM the following day |
| 35 | RS04 | Gandaria Railway Station | - | November 12, 2014 | 6:00 AM | 6:00 AM the following day |

Source: JICA Study Team

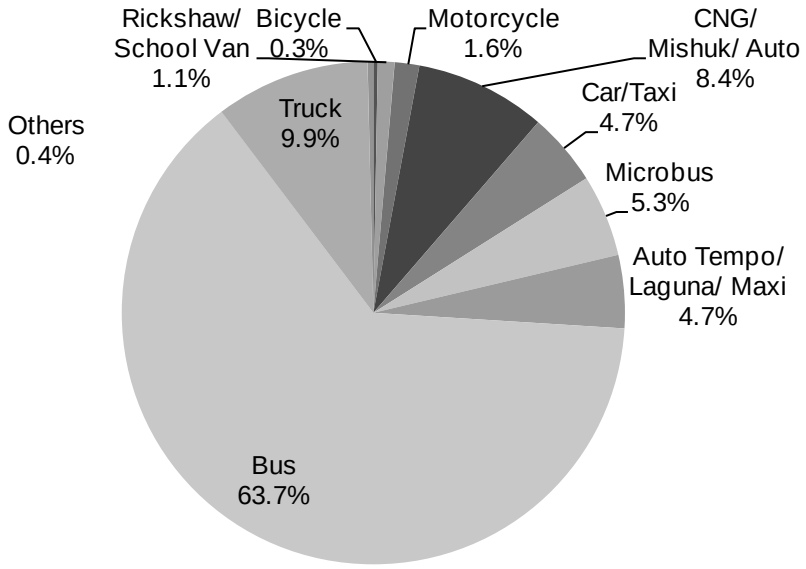
(3) Results of the Inner Cordon Line Survey

Observed daily traffic volumes across the Inner Cordon Line were 257 thousand vehicles and 1,882 thousand passenger trips except walk, railway and boat trips. Figure 3.4 and Figure 3.5 illustrate observed modal shares based on vehicular and passenger volumes. The result shows public transportation modes (i.e., bus, laguna, microbus, CNG and rickshaw) account for more than 80% of the traffic between Dhaka Metropolitan Area and its adjoining areas and in particular buses dominate those public modes. Vehicular traffic volume and average vehicle occupancy are shown in Table 3.5 and Table 3.6.




Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.4 Modal Share of the Vehicular Traffic across the Inner Cordon Line**




Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.5 Modal Share of the Passenger Trips across the Inner Cordon Line**

**Table 3.5 Daily Vehicular Traffic Volume at the Inner Cordon Line by Survey Station and Vehicle Type**

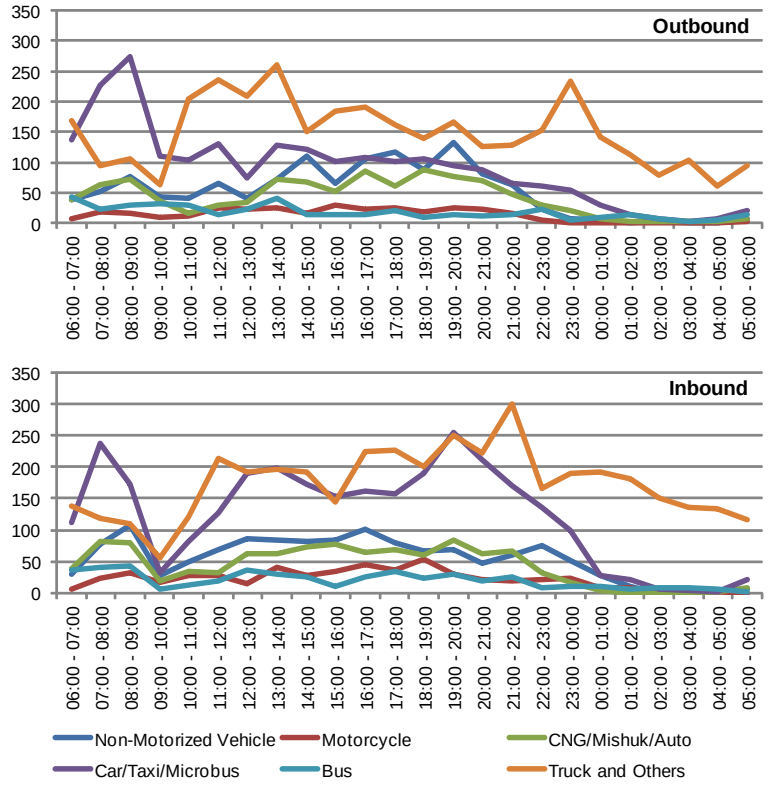
| Survey Station | Non-Motorized Vehicles | | | | Motorized Vehicles | | | | | | | | | | | | | | | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bicycle | Rickshaw | School Van | Total | Motorcycle | CNG/ Mishuk/ Auto | Car | Taxi | Auto Tempo/ Laguna/ Maxi | Microbus/ Jeep | Bus/ Mini-bus | AC Bus | Staff Bus | School/ Collage/ University Bus | 3-axle Truck/ Trailer | Tanker/ Tank Lorry | 2-axle Truck | Pick-up/ Small Van | Others | Total | |
| IC01 | 449 | 2,087 | 0 | 2,536 | 838 | 2,010 | 3,184 | 19 | 7 | 1,909 | 747 | 2 | 61 | 85 | 363 | 29 | 3,757 | 3,463 | 123 | 16,597 | 19,133 |
| IC02 | 108 | 132 | 10 | 250 | 1,575 | 1,935 | 5,817 | 0 | 1,168 | 4,260 | 3,364 | 87 | 64 | 8 | 1,519 | 164 | 5,422 | 5,642 | 323 | 31,348 | 31,598 |
| IC03 | 315 | 1,032 | 23 | 1,370 | 2,149 | 1,647 | 4,370 | 45 | 1,224 | 2,869 | 6,131 | 313 | 258 | 65 | 101 | 118 | 6,163 | 3,655 | 212 | 29,320 | 30,690 |
| IC04 | 784 | 402 | 10 | 1,196 | 1,606 | 7,243 | 879 | 3 | 49 | 537 | 68 | 0 | 0 | 1 | 3 | 0 | 366 | 637 | 45 | 11,437 | 12,633 |
| IC05 | 608 | 2,812 | 4 | 3,424 | 1,556 | 11,025 | 1,156 | 54 | 1,967 | 1,024 | 2,335 | 40 | 10 | 14 | 10 | 15 | 1,904 | 2,674 | 140 | 23,924 | 27,348 |
| IC06 | 796 | 1,741 | 0 | 2,537 | 2,096 | 11,644 | 846 | 6 | 119 | 652 | 687 | 5 | 4 | 0 | 36 | 31 | 1,993 | 1,087 | 73 | 19,279 | 21,816 |
| IC07 | 213 | 2,111 | 0 | 2,324 | 541 | 2,453 | 291 | 1 | 132 | 331 | 1,026 | 0 | 18 | 5 | 137 | 223 | 3,106 | 1,020 | 67 | 9,351 | 11,675 |
| IC08 | 218 | 1,126 | 6 | 1,350 | 2,427 | 5,910 | 5,273 | 20 | 202 | 3,283 | 6,318 | 309 | 79 | 36 | 688 | 480 | 5,169 | 3,601 | 225 | 34,020 | 35,370 |
| IC09 | 309 | 2,097 | 0 | 2,406 | 1,399 | 3,419 | 1,779 | 21 | 2,914 | 1,114 | 1,463 | 47 | 52 | 49 | 277 | 97 | 3,753 | 2,393 | 144 | 18,921 | 21,327 |
| IC10 | 60 | 8 | 0 | 68 | 550 | 487 | 1,430 | 1 | 7 | 1,321 | 0 | 0 | 5 | 0 | 19 | 40 | 161 | 510 | 27 | 4,558 | 4,626 |
| IC11 | 770 | 1,923 | 16 | 2,709 | 2,633 | 2,903 | 6,437 | 259 | 33 | 6,547 | 8,173 | 152 | 145 | 75 | 472 | 259 | 3,241 | 6,252 | 574 | 38,155 | 40,864 |
| Total | 4,630 | 15,471 | 69 | 20,170 | 17,370 | 50,676 | 31,462 | 429 | 7,822 | 23,847 | 30,312 | 955 | 696 | 338 | 3,625 | 1,456 | 35,035 | 30,934 | 1,953 | 236,910 | 257,080 |

Source: Cordon Line Survey 2014, JICA Study Team

**Table 3.6 Average Vehicle Occupancy at the Inner Cordon Line by Survey Station and Vehicle Type**

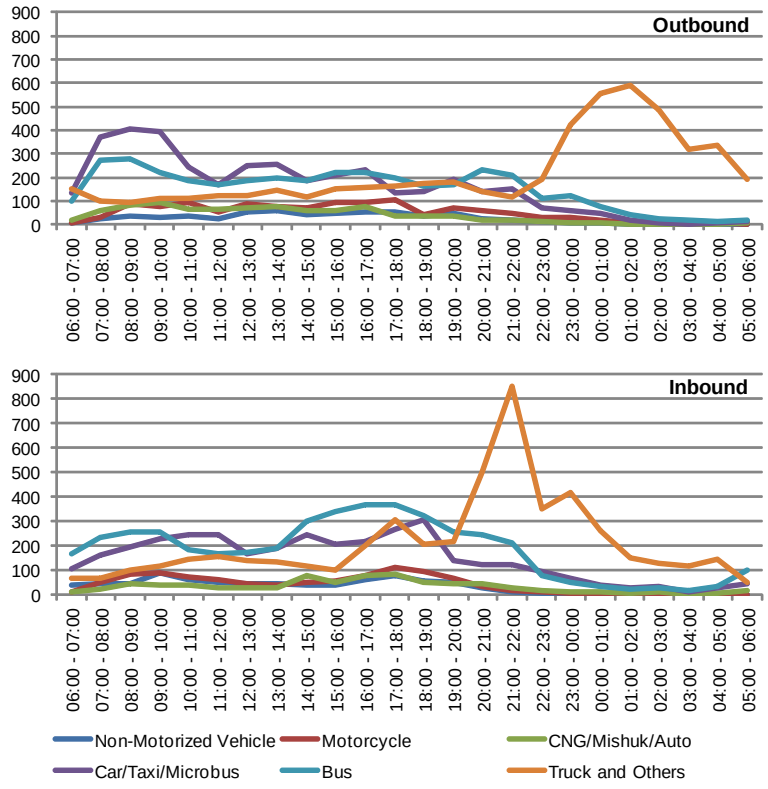
| Survey Station | Non-Motorized Vehicles | | | Motorized Vehicles | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bicycle | Rickshaw | School Van | Motorcycle | CNG/ Mishuk/ Auto | Car | Taxi | Auto Tempo/ Laguna/Maxi | Microbus/ Jeep | Bus/ Mini-bus | AC Bus | Staff Bus | School/ Collage/ University Bus | 3-axle Truck/ Trailer | Tanker/ Tank Lorry | 2-axle Truck | Pick-up/ Small Van | Others |
| IC01 | 1.23 | 2.53 | - | 1.72 | 4.16 | 2.66 | 3.58 | 3.67 | 4.59 | 30.35 | 35.00 | 25.10 | 24.55 | 2.40 | 2.07 | 3.10 | 2.65 | 2.27 |
| IC02 | 1.00 | 2.16 | 1.00 | 1.52 | 2.99 | 2.67 | - | 14.29 | 4.29 | 44.23 | 30.61 | 25.82 | 12.50 | 2.32 | 1.87 | 2.16 | 2.27 | 2.78 |
| IC03 | 1.03 | 2.15 | 7.33 | 1.46 | 2.97 | 3.01 | 3.15 | 10.11 | 6.44 | 39.01 | 41.79 | 19.19 | 30.08 | 2.53 | 2.26 | 3.02 | 2.27 | 4.11 |
| IC04 | 1.07 | 2.09 | 3.50 | 1.70 | 5.03 | 2.75 | 3.67 | 7.64 | 4.78 | 4.13 | - | - | 7.00 | - | - | 3.10 | 2.16 | 3.10 |
| IC05 | 1.10 | 2.26 | 3.50 | 1.76 | 4.58 | 2.63 | 3.38 | 13.27 | 5.38 | 41.00 | 49.68 | 25.75 | 36.33 | - | 2.60 | 3.17 | 2.21 | 4.19 |
| IC06 | 1.07 | 2.02 | - | 1.84 | 4.38 | 3.01 | 2.80 | 6.07 | 4.30 | 39.82 | 26.80 | 26.00 | - | 2.33 | 2.11 | 2.63 | 2.68 | 3.61 |
| IC07 | 1.14 | 2.45 | - | 1.85 | 4.69 | 2.88 | - | 8.38 | 5.35 | 39.09 | 11.00 | 26.45 | 45.00 | 2.47 | 2.43 | 2.79 | 2.66 | 3.03 |
| IC08 | 1.04 | 2.09 | 6.50 | 1.64 | 3.56 | 2.81 | 3.00 | 9.60 | 4.79 | 36.83 | 33.99 | 28.32 | 25.95 | 2.09 | 2.06 | 2.74 | 2.48 | 3.66 |
| IC09 | 1.04 | 2.39 | - | 1.84 | 2.82 | 2.25 | 2.71 | 12.52 | 6.46 | 31.58 | 28.00 | 23.14 | 26.08 | 2.58 | 2.26 | 2.67 | 2.44 | 3.27 |
| IC10 | 1.00 | 2.33 | - | 1.82 | 3.18 | 3.24 | 2.00 | 5.67 | 6.26 | - | - | 13.75 | - | 2.00 | 2.18 | 2.18 | 2.20 | 2.80 |
| IC11 | 1.33 | 2.34 | 3.44 | 1.78 | 2.71 | 2.75 | 2.96 | 8.00 | 5.14 | 39.04 | 26.52 | 20.21 | 32.32 | 2.29 | 2.29 | 3.12 | 3.04 | 3.89 |
| Average | 1.12 | 2.29 | 5.12 | 1.70 | 4.07 | 2.77 | 3.10 | 12.31 | 5.21 | 38.62 | 35.53 | 22.61 | 27.22 | 2.36 | 2.18 | 2.75 | 2.52 | 3.39 |

Note: Figures include drivers and conductors as well. Dashes ("-") indicate no samples were observed.
Source: Cordon Line Survey 2014, JICA Study Team



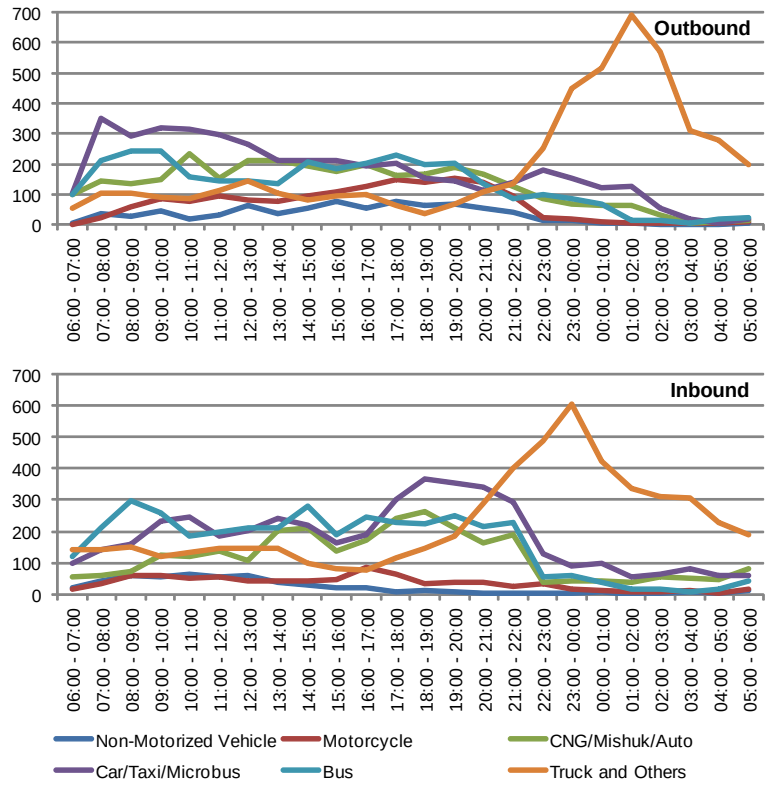

Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.6 Hourly Vehicular Traffic Volume at Tongi Bypass Road (Station IC01)**



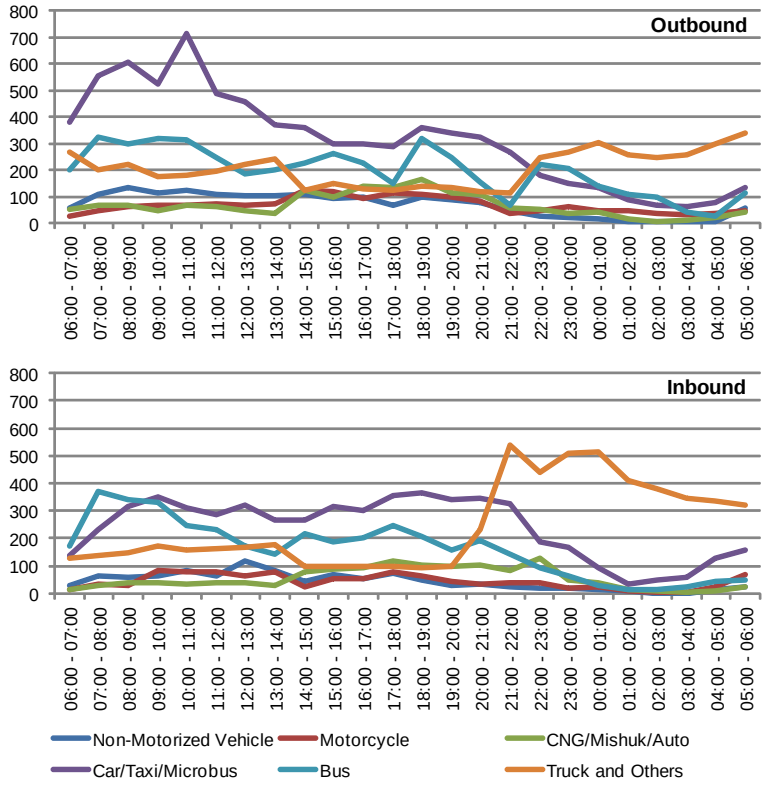

Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.7 Hourly Vehicular Traffic Volume at Dhaka-Aricha Highway (Station IC03)**




Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.8 Hourly Vehicular Traffic Volume at Dhaka-Chittagong Highway (Station IC08)**




Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.9 Hourly Vehicular Traffic Volume at Tongi Bridge (Station IC11)**

Figure 3.6 to Figure 3.9 show hourly vehicular traffic volumes by vehicle type in four busiest roads. In the Figures, the 18 vehicle types are aggregated into the following 6 categories for convenience:

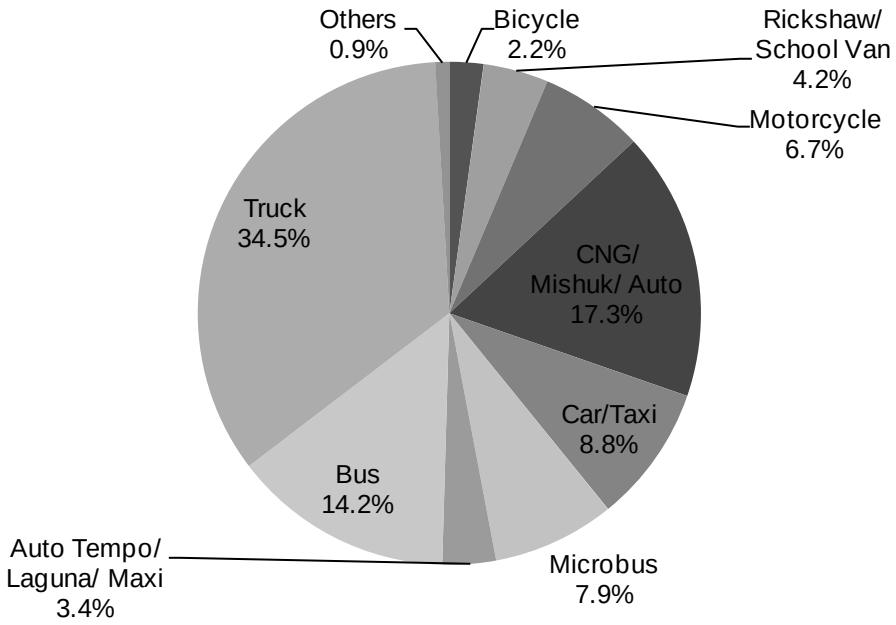
- Non-Motorized Vehicle: Bicycle, Rickshaw and School Van;
- Motorcycle: Motorcycle;
- CNG/Mishuk/Auto: CNG/Mishuk/Auto;
- Car/Taxi/Microbus: Car, Taxi, and Microbus/Jeep;
- Bus: Auto Tempo/Laguna/Maxi, Bus/Minibus, AC Bus, Staff Bus, and School/Collage/University Bus; and
- Truck and Others: 3-axle Truck/Trailer, Tanker/Tank Lorry, 2-axle Truck, Pick-up/Small Van, and Others.

While the time variability of the traffic volume looks low, outbound and inbound traffic tend to have peaks in the morning and in the evening, respectively. Those results suggest the inter-city traffic has a measurable share at the Inner Cordon Line. The prominent peaks of trucks after 9 PM show the heavy trucks and open trucks wait for the truck ban in the DMA to be lifted every night.

(4) Results of the Outer Cordon Line Survey

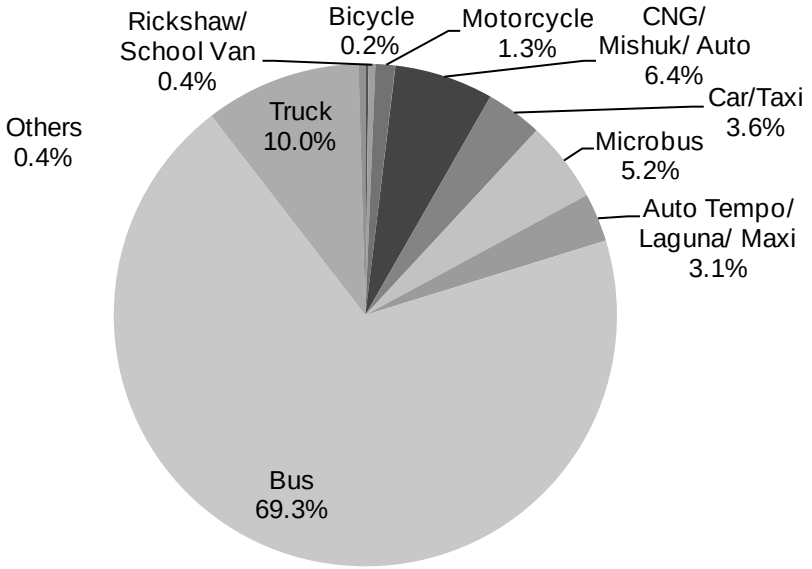
As for the roadside traffic count surveys, observed daily traffic volumes were 123 thousand vehicles and 916 thousand passenger trips. Figure 3.10 and Figure 3.11 illustrate observed modal shares based on vehicular and passenger volumes. The result shows public transportation modes have a share of 85% which is higher than that at the Inner Cordon Line. Vehicular traffic volume and average vehicle occupancy are shown in Table 3.7 and Table 3.8.

Figure 3.12 to Figure 3.15 show hourly vehicular traffic volumes by vehicle type in four busiest roads. In the Figures, the 18 vehicle types are aggregated into the 6 categories as described above.




Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.10 Modal Share of the Vehicular Traffic across the Outer Cordon Line**




Note: The data includes trips from the Survey Area to the external areas and vice versa (e.g., internal-to-external and external-to-internal trips) only.
Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.11 Modal Share of the Passenger Trips across the Outer Cordon Line**

**Table 3.7 Daily Vehicular Traffic Volume at the Outer Cordon Line by Survey Station and Vehicle Type**

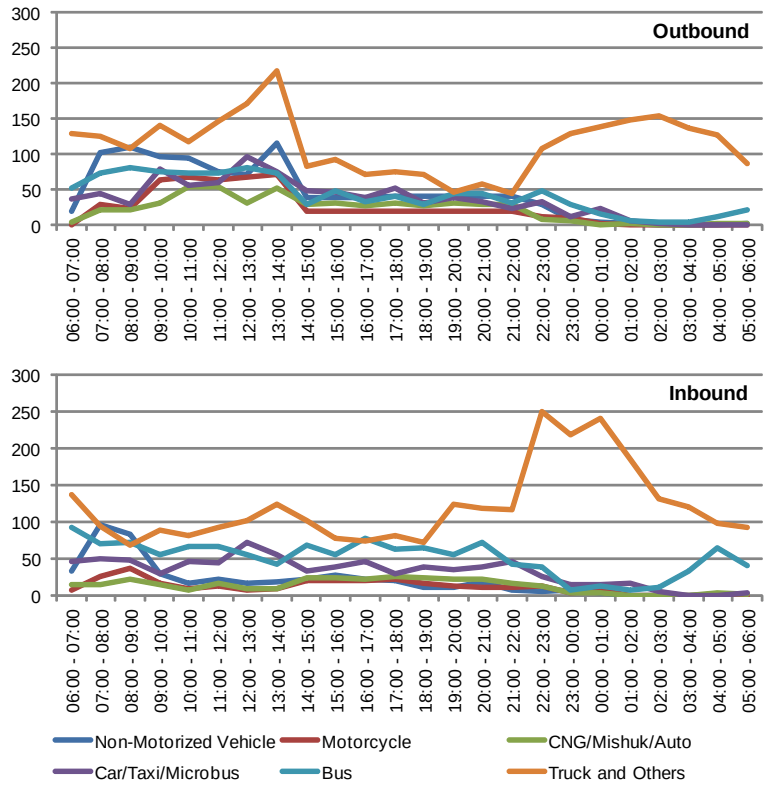
| Survey Station | Non-Motorized Vehicles | | | | Motorized Vehicles | | | | | | | | | | | | | | | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bicycle | Rickshaw | School Van | Total | Motorcycle | CNG/ Mishuk/ Auto | Car | Taxi | Auto Tempo/ Laguna/ Maxi | Microbus/ Jeep | Bus/ Mini-bus | AC Bus | Staff Bus | School/ Collage/ University Bus | 3-axle Truck/ Trailer | Tanker/ Tank Lorry | 2-axle Truck | Pick-up/ Small Van | Others | Total | |
| OC01 | 487 | 1,027 | 0 | 1,514 | 846 | 848 | 888 | 14 | 932 | 740 | 1,314 | 8 | 6 | 0 | 129 | 68 | 4,059 | 1,344 | 17 | 11,213 | 12,727 |
| OC02 | 470 | 288 | 0 | 758 | 836 | 667 | 1,076 | 24 | 30 | 1,139 | 2,199 | 15 | 31 | 19 | 39 | 53 | 2,170 | 1,463 | 52 | 9,813 | 10,571 |
| OC03 | 264 | 1,122 | 2 | 1,388 | 983 | 970 | 1,209 | 20 | 775 | 844 | 3,492 | 96 | 38 | 42 | 258 | 118 | 3,757 | 1,389 | 383 | 14,374 | 15,762 |
| OC04 | 124 | 419 | 0 | 543 | 899 | 1,753 | 566 | 14 | 46 | 256 | 203 | 0 | 1 | 0 | 6 | 2 | 517 | 326 | 42 | 4,631 | 5,174 |
| OC05 | 49 | 141 | 0 | 190 | 685 | 1,701 | 449 | 20 | 58 | 181 | 305 | 0 | 0 | 0 | 9 | 3 | 179 | 263 | 41 | 3,894 | 4,084 |
| OC06 | 49 | 334 | 0 | 383 | 589 | 1,457 | 951 | 13 | 45 | 748 | 2,073 | 44 | 8 | 4 | 49 | 60 | 1,287 | 945 | 72 | 8,345 | 8,728 |
| OC07 | 147 | 18 | 0 | 165 | 627 | 3,541 | 364 | 11 | 108 | 391 | 209 | 0 | 1 | 0 | 17 | 9 | 782 | 565 | 30 | 6,655 | 6,820 |
| OC08 | 15 | 0 | 0 | 15 | 171 | 1,126 | 1,712 | 10 | 3 | 1,832 | 2,555 | 260 | 2 | 2 | 661 | 183 | 5,693 | 1,546 | 240 | 15,996 | 16,011 |
| OC09 | 61 | 209 | 5 | 275 | 169 | 2,230 | 126 | 19 | 387 | 133 | 218 | 0 | 19 | 0 | 13 | 6 | 191 | 309 | 24 | 3,844 | 4,119 |
| OC10 | 377 | 589 | 0 | 966 | 443 | 2,953 | 210 | 0 | 45 | 224 | 85 | 0 | 43 | 0 | 1 | 6 | 314 | 234 | 11 | 4,569 | 5,535 |
| OC11 | 233 | 483 | 0 | 716 | 489 | 1,310 | 790 | 8 | 516 | 671 | 1,073 | 27 | 9 | 4 | 71 | 35 | 1,524 | 1,166 | 35 | 7,728 | 8,444 |
| OC12 | 252 | 312 | 0 | 564 | 678 | 1,573 | 1,140 | 0 | 145 | 1,307 | 1,352 | 34 | 0 | 0 | 216 | 176 | 2,812 | 1,714 | 73 | 11,220 | 11,784 |
| OC13 | 159 | 179 | 0 | 338 | 777 | 1,071 | 1,185 | 22 | 1,118 | 1,171 | 1,547 | 15 | 31 | 0 | 163 | 137 | 3,075 | 2,192 | 83 | 12,587 | 12,925 |
| Total | 2,687 | 5,121 | 7 | 7,815 | 8,192 | 21,200 | 10,666 | 175 | 4,208 | 9,637 | 16,625 | 499 | 189 | 71 | 1,632 | 856 | 26,360 | 13,456 | 1,103 | 114,869 | 122,684 |

Source: Cordon Line Survey 2014, JICA Study Team

**Table 3.8 Average Vehicle Occupancy at the Outer Cordon Line by Survey Station and Vehicle Type**

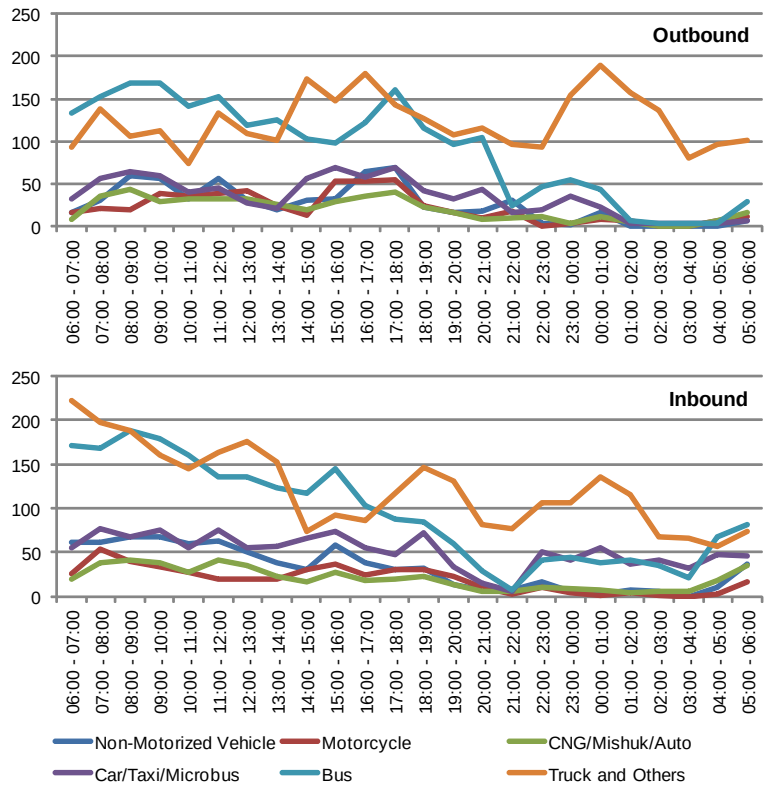
| Survey Station | Non-Motorized Vehicles | | | Motorized Vehicles | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bicycle | Rickshaw | School Van | Motorcycle | CNG/ Mishuk/ Auto | Car | Taxi | Auto Tempo/ Laguna/Maxi | Microbus/ Jeep | Bus/ Mini-bus | AC Bus | Staff Bus | School/ Collage/ University Bus | 3-axle Truck/ Trailer | Tanker/ Tank Lorry | 2-axle Truck | Pick-up/ Small Van | Others |
| OC01 | 1.06 | 2.31 | - | 1.79 | 3.35 | 2.98 | 4.20 | 13.04 | 6.13 | 40.27 | 47.00 | 29.00 | - | 2.57 | 2.44 | 2.31 | 2.64 | 4.65 |
| OC02 | 1.11 | 2.65 | - | 1.78 | 3.07 | 3.05 | 4.62 | 5.09 | 6.79 | 40.96 | - | 24.23 | 25.74 | 2.47 | 2.23 | 2.58 | 2.65 | 4.44 |
| OC03 | 1.10 | 2.23 | - | 1.72 | 3.66 | 3.04 | 3.74 | 9.84 | 5.21 | 37.06 | 36.31 | 33.68 | 21.67 | 2.91 | 2.77 | 3.37 | 2.77 | 3.83 |
| OC04 | 1.04 | 2.23 | - | 1.68 | 4.24 | 3.59 | 3.00 | 5.63 | 4.72 | 40.67 | - | - | - | 2.83 | 2.00 | 3.03 | 2.81 | 2.93 |
| OC05 | 1.36 | 2.22 | - | 2.00 | 4.14 | 3.46 | - | 10.98 | 5.62 | 45.54 | - | - | - | 2.00 | 2.00 | 3.10 | 2.22 | 4.55 |
| OC06 | 1.13 | 2.30 | - | 1.92 | 4.04 | 3.48 | 3.00 | 9.93 | 6.56 | 42.30 | 50.29 | 23.25 | 10.25 | 2.17 | 3.58 | 2.40 | 2.34 | 3.36 |
| OC07 | 1.06 | 2.38 | - | 1.69 | 4.55 | 2.98 | - | 8.94 | 5.41 | 36.76 | - | - | - | 3.40 | 2.00 | 2.31 | 2.78 | 3.00 |
| OC08 | 1.76 | - | - | 1.68 | 3.55 | 3.53 | 3.90 | 8.00 | 6.60 | 42.32 | 43.13 | - | 10.00 | 2.48 | 2.57 | 2.27 | 2.48 | 4.20 |
| OC09 | 1.09 | 2.26 | 7.00 | 1.82 | 4.72 | 3.94 | 3.90 | 7.79 | 6.44 | 31.35 | - | 25.67 | - | 1.53 | 2.67 | 3.13 | 2.52 | 4.56 |
| OC10 | 1.19 | 2.39 | - | 1.33 | 4.55 | 3.81 | - | 7.31 | 7.40 | 26.38 | - | 39.65 | - | - | 2.00 | 3.14 | 2.83 | 5.27 |
| OC11 | 1.04 | 2.52 | - | 2.02 | 4.08 | 3.57 | 2.69 | 9.70 | 5.57 | 37.75 | 40.18 | 27.22 | 23.54 | 2.51 | 2.57 | 2.53 | 2.57 | 3.64 |
| OC12 | 1.07 | 2.63 | - | 1.67 | 3.13 | 3.37 | - | 10.58 | 5.56 | 36.16 | 48.47 | - | - | 2.64 | 2.24 | 2.53 | 2.30 | 3.33 |
| OC13 | 1.09 | 2.30 | - | 1.62 | 3.29 | 3.25 | 3.00 | 11.59 | 6.67 | 32.95 | 35.00 | 14.07 | - | 2.82 | 2.86 | 3.10 | 2.61 | 4.30 |
| Average | 1.10 | 2.33 | 7.00 | 1.75 | 4.12 | 3.32 | 3.65 | 10.65 | 6.15 | 38.98 | 42.42 | 29.37 | 22.01 | 2.61 | 2.60 | 2.65 | 2.56 | 3.94 |

Note: Figures include drivers and conductors as well. Dashes ("-") indicate no samples were observed.
Source: Cordon Line Survey 2014, JICA Study Team



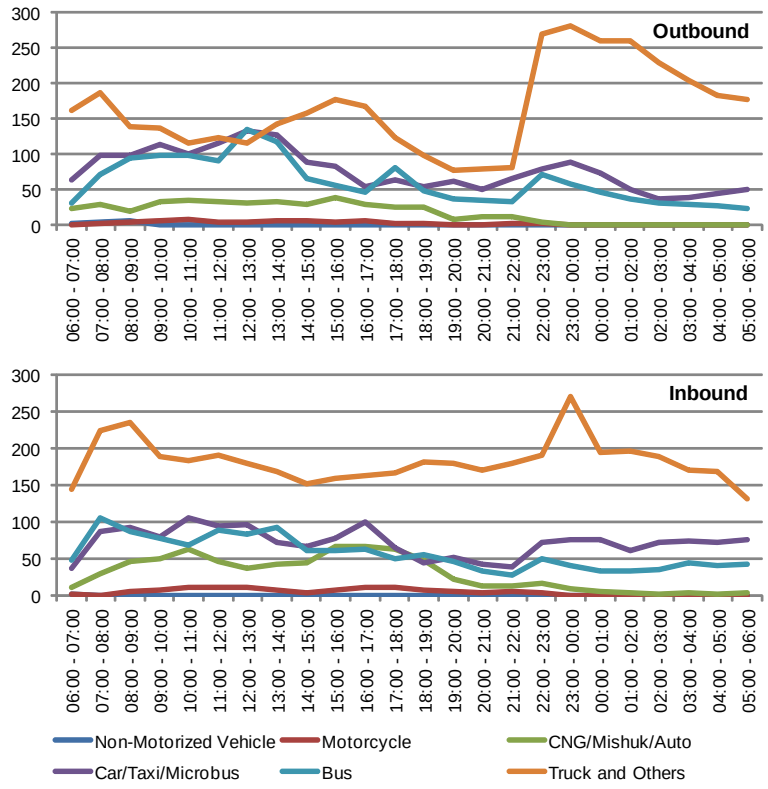

Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.12 Hourly Vehicular Traffic Volume at Joydevpur-Tangail Highway (Station OC01)**



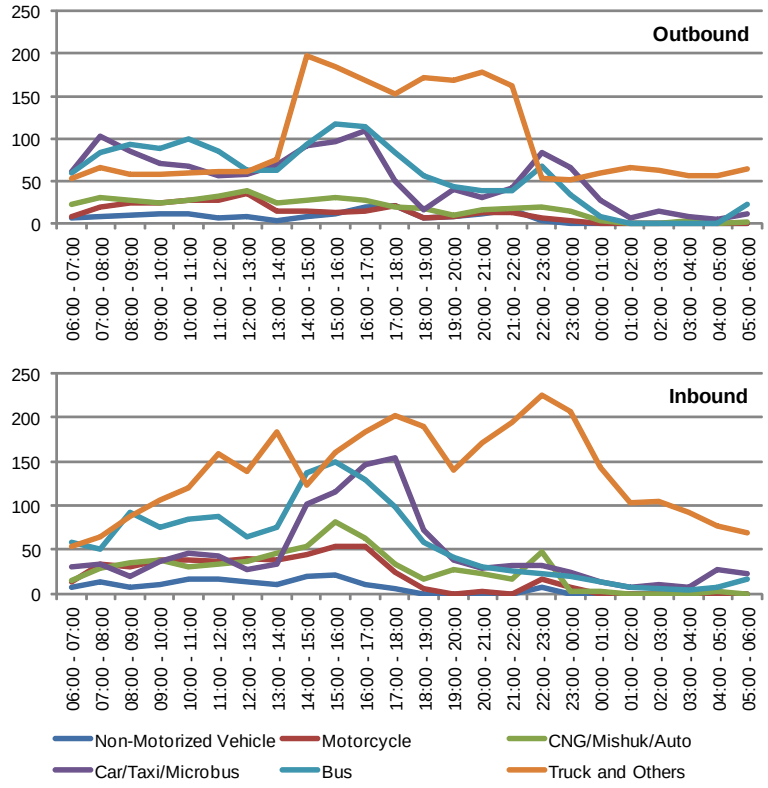

Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.13 Hourly Vehicular Traffic Volume at Dhaka-Aricha Highway (Station OC03)**




Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.14 Hourly Vehicular Traffic Volume at Dhaka-Chittagong Highway (Station OC08)**



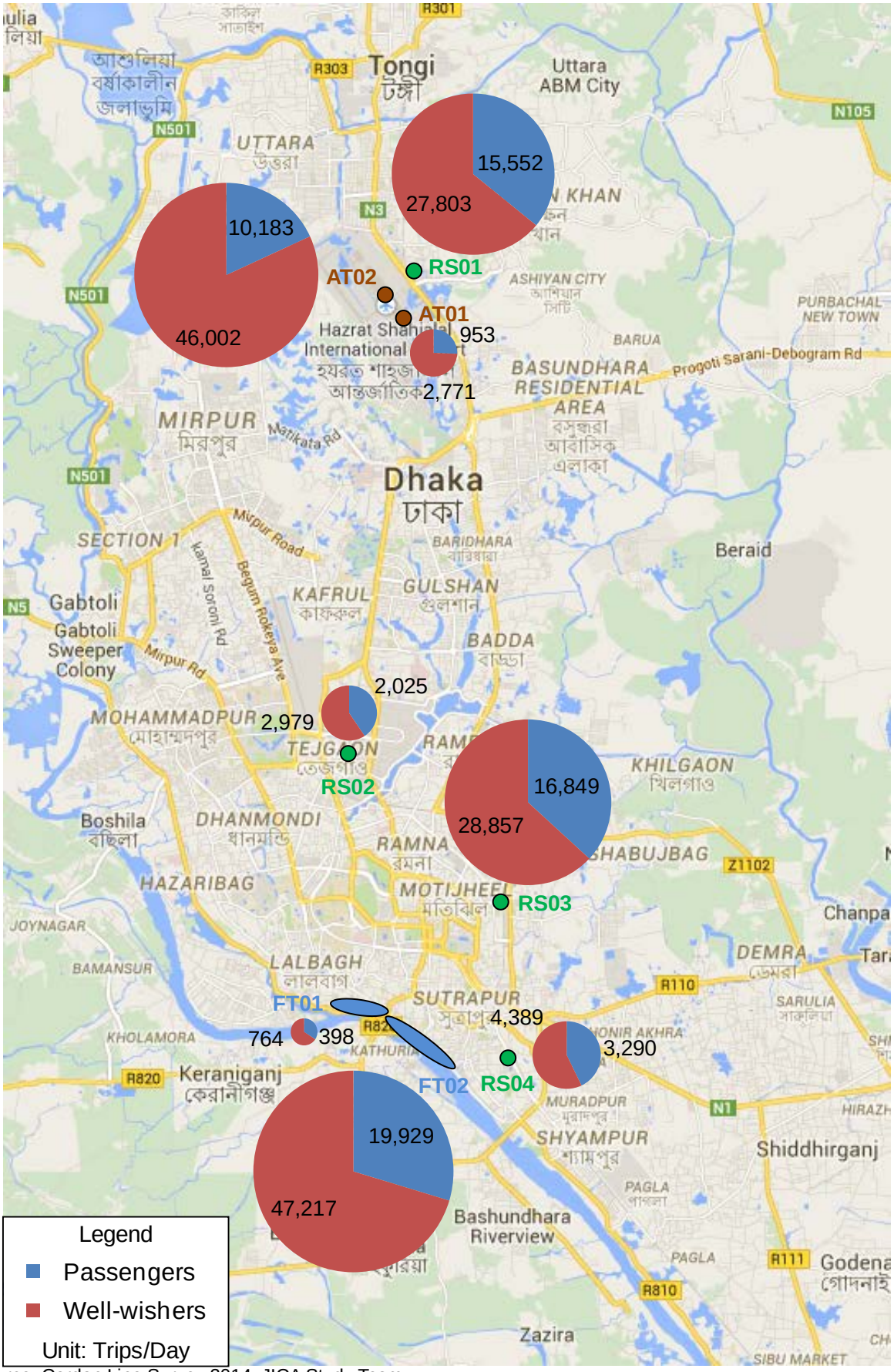

Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.15 Hourly Vehicular Traffic Volume at Dhaka-Mymensingh Highway (Station OC13)**

Figure 3.16 and Figure 3.17 show the trip attraction and the modal share of the terminal access by survey location, respectively. The International Terminal of the Airport, Sadar Ghat, Airport Railway Station and Kamalapur Railway Station have the biggest attractions of passengers and well-wishers. Although it is noteworthy that the public transportation is dominant in the terminal access except the Domestic Terminal of the Airport, the attraction of vehicles causes the road congestion around the terminals and poses safety risks of boarding and alighting passengers in front of the terminals.

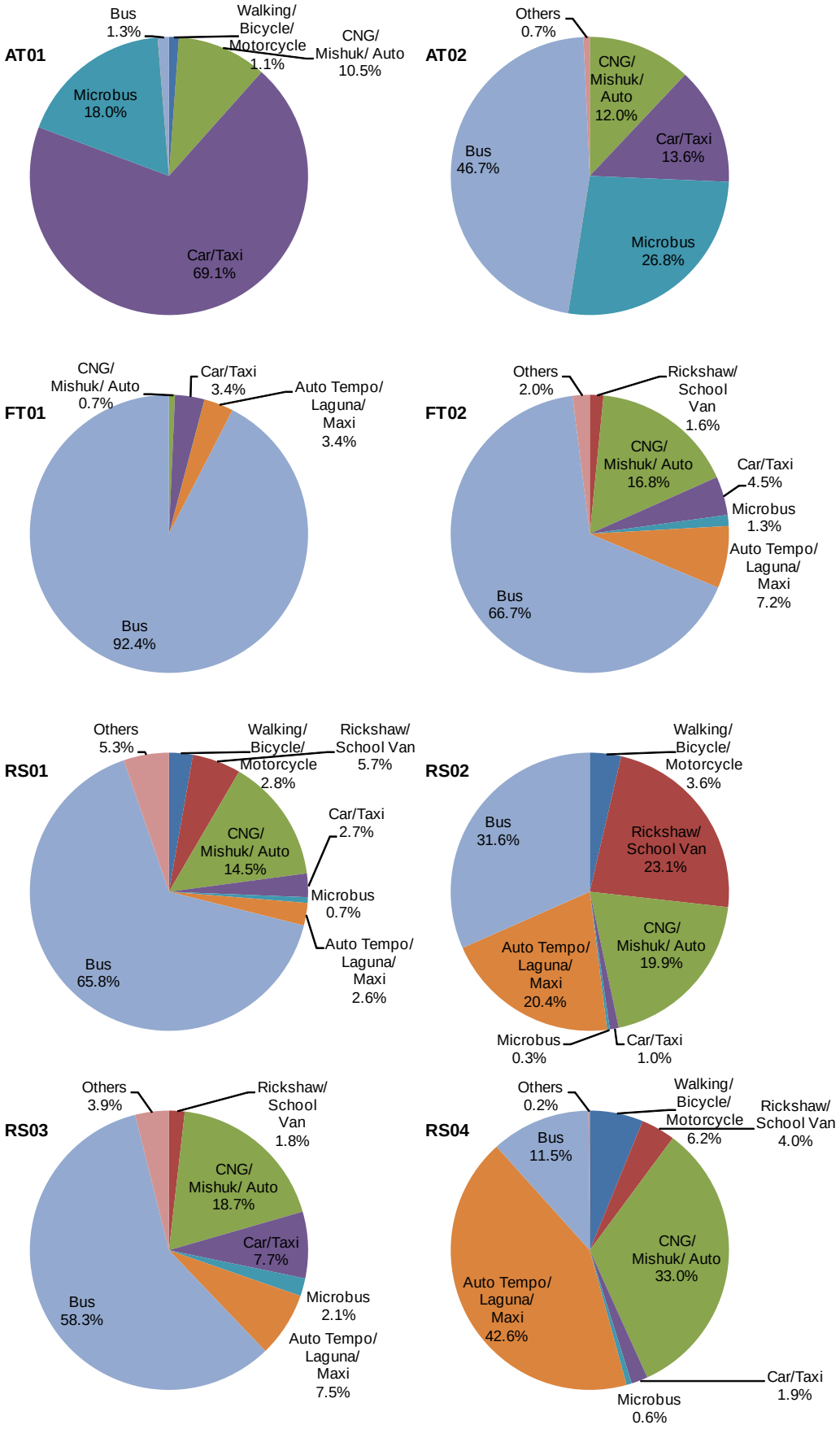
Figure 3.18 and Figure 3.19 show the daily number of trips by mode between the Survey Area and the other divisions and districts. Some 90% of long-haul trips rely on the road transport while there are higher demands of the inland water transport from/to various districts in Barisal and Chandpur, Chittagong.

The capacity of Route 1 between Dhaka and Chittagong, a vital corridor for the country's economy, will be saturated when the traffic demand becomes 4 – 5 times larger in the future although the road has an enough capacity for the time being. It is suggested to widen 2-lane sections to 4 lanes and/or to build a new high-standard expressway. It is also recommended to expand the capacity of the existing railway in order to cater much more passenger and freight demands. The Route 1 and railway (and the suggested expressway as well) will also serve as an alternative route of each other when the traffic on another route is disturbed.




Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.16 Daily Trip Attraction to Public Transportation Terminals**

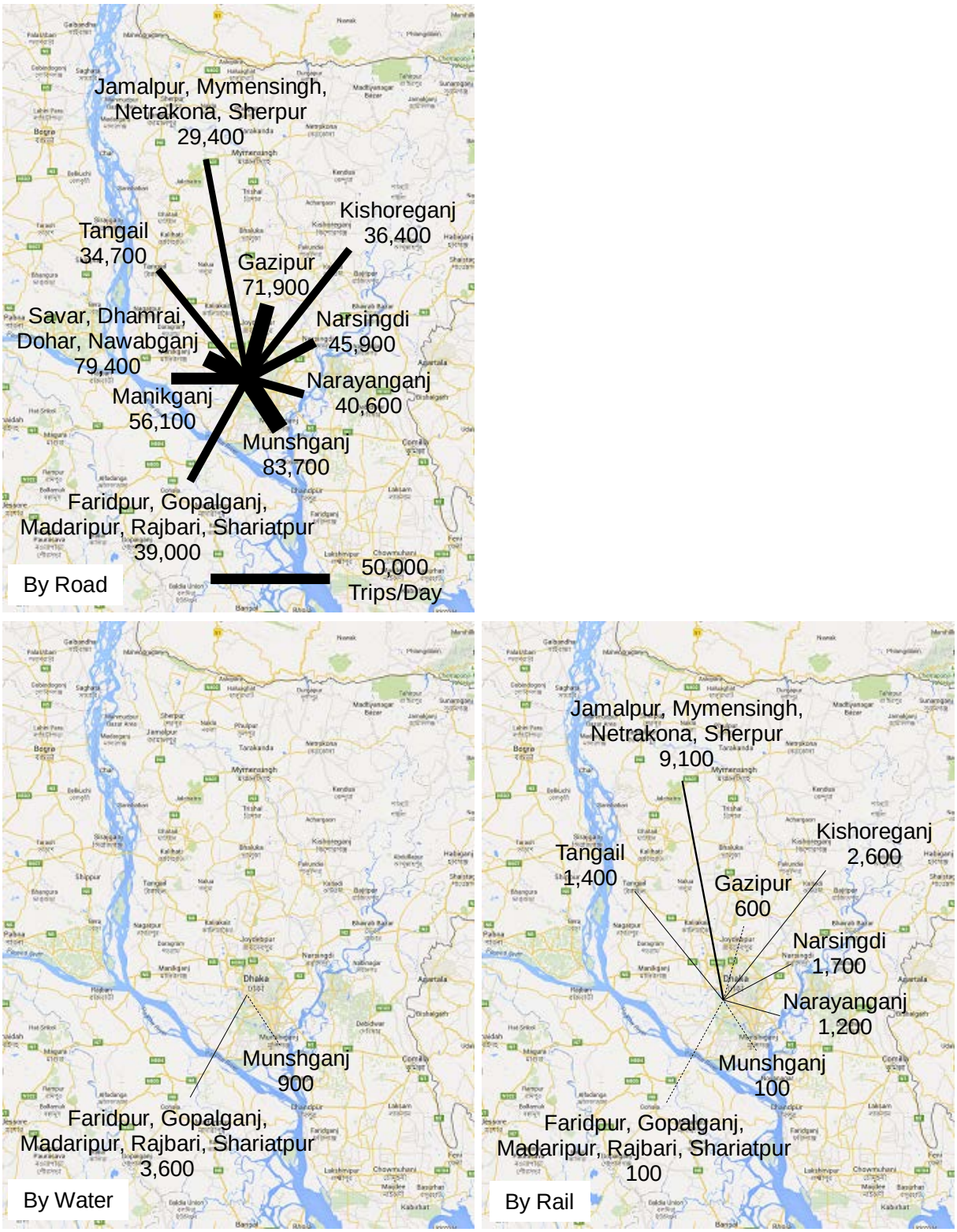



Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.17 Modal Share of the Public Transportation Terminal Access**


Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.18 Daily Number of Trips between the Survey Area and the Other Divisions**




Note: There are no air passengers between the Survey Area and external Districts of Dhaka Division.
Source: Cordon Line Survey 2014, JICA Study Team

**Figure 3.19 Daily Number of Trips between the Survey Area and Dhaka Division**

## 3.4 Screen Line Survey

(1) Survey Method

The Screen Line Survey includes vehicular traffic count and vehicle occupancy surveys. The vehicular traffic count for every 30 minutes as per the vehicle type and direction is conducted at roadside survey stations. Survey forms are shown in Annex.

The vehicle occupancy survey is done by counting the number of occupants of randomly chosen vehicle as per their type and direction. The minimum sample rate of 10% is ensured for the most congested road section. The sample rate is based on the 16-hour (6 AM to 10 PM) vehicular traffic volume as per vehicle type and direction. Survey forms are shown in Annex.

Vehicle classification for the Screen Line Survey is the same as that for the Cordon Line Survey (see Subsection 3.3).

(2) Survey Coverage

A total of 20 survey stations located at roadsides are listed in Table 3.9 while their locations are indicated in Figure 3.20. Actual latitude and longitude of the survey stations are shown in Table 3.10.

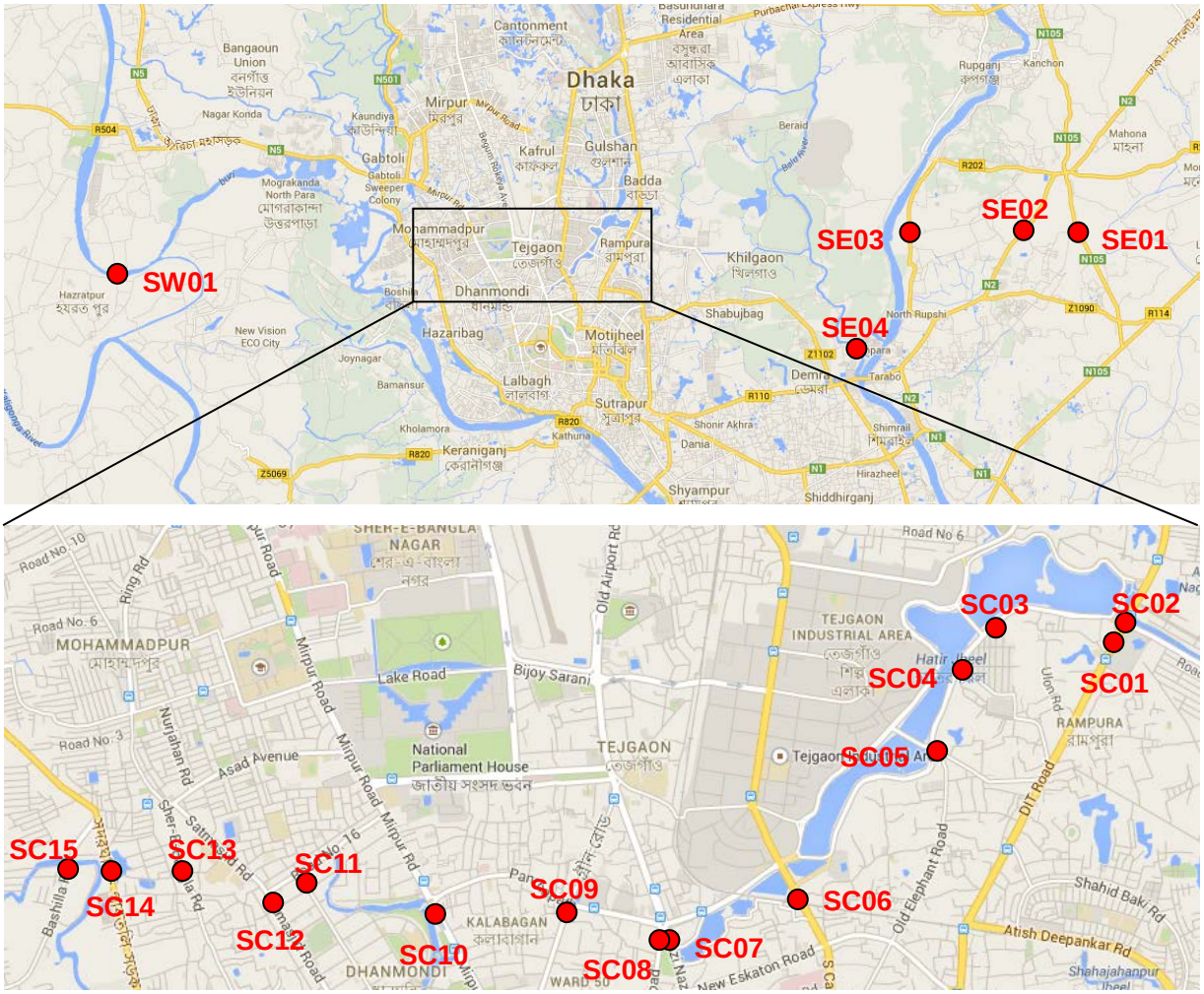
The vehicular traffic count survey is conducted for 24 hours from 6 AM to 6 AM the following day at all stations. The vehicle occupancy survey is conducted for 16 hours from 6 AM to 10 PM simultaneously with the vehicular traffic count survey at all stations except for the station SC02 where the vehicle occupancy is assumed to be the same as that observed at SC01.

Surveys are conducted on Mondays, Tuesdays or Wednesdays except on a holiday or any day with special festivities as well as during bad weather condition.

**Table 3.9 Screen Line Survey Stations and Survey Periods**

| Seq. | Code | Survey Station | Survey Period (hours) | |
|---|---|---|---|---|
| | | | Traffic Count | Vehicle Occupancy |
| 1 | SC01 | DIT Road | 24 | 16 |
| 2 | SC02 | DIT Road cor. Banasree Main Road | 24 | - |
| 3 | SC03 | Road No. 3 | 24 | 16 |
| 4 | SC04 | Mohanagar Housing Road | 24 | 16 |
| 5 | SC05 | Modhubagh Road | 24 | 16 |
| 6 | SC06 | Shaheed Tajuddin Ahmed Avenue | 24 | 16 |
| 7 | SC07 | Kazi Nazul Islam Avenue | 24 | 16 |
| 8 | SC08 | Sonargaon Road | 24 | 16 |
| 9 | SC09 | Green Road | 24 | 16 |
| 10 | SC10 | Mirpur Road | 24 | 16 |
| 11 | SC11 | Road No. 8A | 24 | 16 |
| 12 | SC12 | Satmasjid Road | 24 | 16 |
| 13 | SC13 | Sher-E-Bangla Road | 24 | 16 |
| 14 | SC14 | Sadarghat-Gabtoli Road | 24 | 16 |
| 15 | SC15 | Bashilla Road | 24 | 16 |
| 16 | SE01 | Bhulta Highway | 24 | 16 |
| 17 | SE02 | Dhaka-Sylhet Highway | 24 | 16 |
| 18 | SE03 | Bhulta Highway | 24 | 16 |
| 19 | SE04 | Bridge between Demra and Chanpara | 24 | 16 |
| 20 | SW01 | Bridge between Bhakurta and Hazratpur | 24 | 16 |

Source: JICA Study Team




Source: JICA Study Team

**Figure 3.20 Locations of Screen Line Survey Stations**

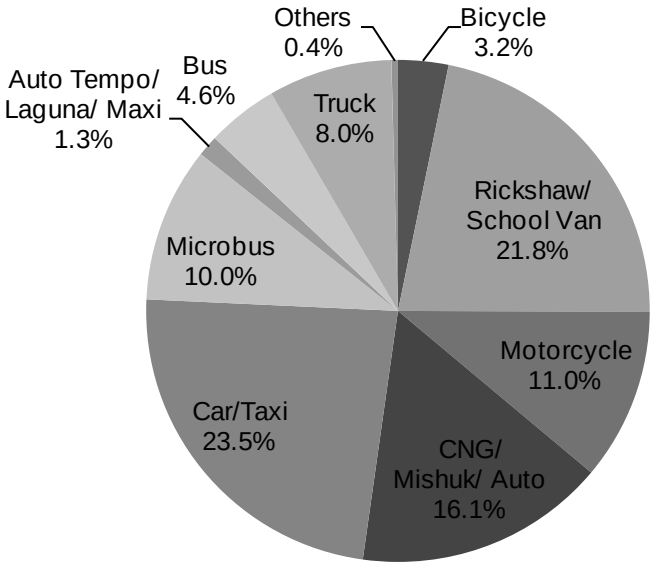
**Table 3.10 Actual Location and Survey Date and Time of the Screen Line Survey**

| Seq. | Code | Survey Station | Latitude and Longitude | Date of Start | Time Started | Time Completed |
|---|---|---|---|---|---|---|
| 1 | SC01 | DIT Road | 23° 45' 44.2" N 90° 25' 11.7" E | September 15, 2014 | 6:00 AM | 6:00 AM the following day |
| 2 | SC02 | DIT Road cor. Banasree Main Road | 23° 46' 03.6" N 90° 25' 23.0" E | September 15, 2014 | 6:00 AM | 6:00 AM the following day |
| 3 | SC03 | Road No. 3 | 23° 46' 02.4" N 90° 24' 52.9" E | September 2, 2014 | 6:00 AM | 6:00 AM the following day |
| 4 | SC04 | Mohanagar Housing Road | 23° 45' '53.8' N 90° 24' 45.8" E | September 2, 2014 | 6:00 AM | 6:00 AM the following day |
| 5 | SC05 | Modhubagh Road | 23° 45' 36.7" N 90° 24' 39.0" E | September 1, 2014 | 6:00 AM | 6:00 AM the following day |
| 6 | SC06 | Shaheed Tajuddin Ahmed Avenue | 23° 45' 06.2" N 90° 24' 06.2" E | September 1, 2014 | 6:00 AM | 6:00 AM the following day |
| 7 | SC07 | Kazi Nazul Islam Avenue | 23° 44' 57.3" N 90° 23' 36.6" E | September 16, 2014 | 6:00 AM | 6:00 AM the following day |
| 8 | SC08 | Sonargaon Road | 23° 44' 57.8" N 90° 23' 35.0" E | August 27, 2014 | 6:00 AM | 6:00 AM the following day |
| 9 | SC09 | Green Road | 23° 45' 02.1" N 90° 23' 13.2" E | August 26, 2014 | 6:00 AM | 6:00 AM the following day |
| 10 | SC10 | Mirpur Road | 23° 45' 03.5" N 90° 22' 42.4" E | August 26, 2014 | 6:00 AM | 6:00 AM the following day |
| 11 | SC11 | Road No. 8A | 23° 45' 09.2" N 90° 22' 11.6" E | August 25, 2014 | 6:00 AM | 6:00 AM the following day |
| 12 | SC12 | Satmasjid Road | 23° 45' 05.4" N 90° 22' 03.8" E | August 25, 2014 | 6:00 AM | 6:00 AM the following day |
| 13 | SC13 | Sher-E-Bangla Road | 23° 45' 23.9" N 90° 21' 40.4" E | September 3, 2014 | 6:00 AM | 6:00 AM the following day |
| 14 | SC14 | Sadarghat-Gabtoli Road | 23° 45' 17.5" N 90° 21' 25.1" E | September 3, 2014 | 6:00 AM | 6:00 AM the following day |
| 15 | SC15 | Bashilla Road | 23° 45' 13.6" N 90° 21' 17.7" E | September 10, 2014 | 6:00 AM | 6:00 AM the following day |
| 16 | SE01 | Bhulta Highway | 23° 45' 31.6" N 90° 34' 40.0" E | September 8, 2014 | 6:00 AM | 6:00 AM the following day |
| 17 | SE02 | Dhaka-Sylhet Highway | 23° 45' 41.5" N 90° 32' 57.4" E | September 8, 2014 | 6:00 AM | 6:00 AM the following day |
| 18 | SE03 | Bhulta Highway | 23° 45' 42.7" N 90° 30' 59.9" E | September 9, 2014 | 6:00 AM | 6:00 AM the following day |
| 19 | SE04 | Bridge between Demra and Chanpara | 23° 43' 56.4" N 90° 29' 45.0" E | September 9, 2014 | 6:00 AM | 6:00 AM the following day |
| 20 | SW01 | Bridge between Bhakurta and Hazratpur | 23° 45' 10.0" N 90° 14' 59.6" E | September 10, 2014 | 6:00 AM | 6:00 AM the following day |

Source: JICA Study Team

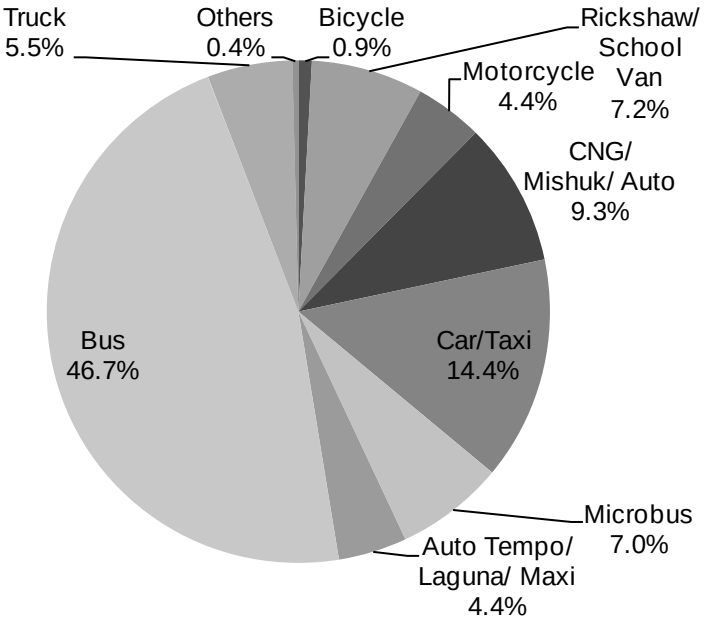
(3) Survey Results

Observed daily traffic volumes across the Screen Line were 622 thousand vehicles and 2,451 thousand passenger trips except walk and railway trips. Figure 3.21 and Figure 3.22 illustrate observed modal shares based on vehicular and passenger volumes. The result shows 75% of the intra-city traffic relies on public transportation modes. Vehicular traffic volume and average vehicle occupancy are shown in Table 3.11 and Table 3.12.




Source: Screen Line Survey 2014, JICA Study Team

**Figure 3.21 Modal Share of the Vehicular Traffic across the Screen Line**




Source: Screen Line Survey 2014, JICA Study Team

**Figure 3.22 Modal Share of the Passenger Trips across the Screen Line**

**Table 3.11 Daily Vehicular Traffic Volume at the Screen Line by Survey Station and Vehicle Type**

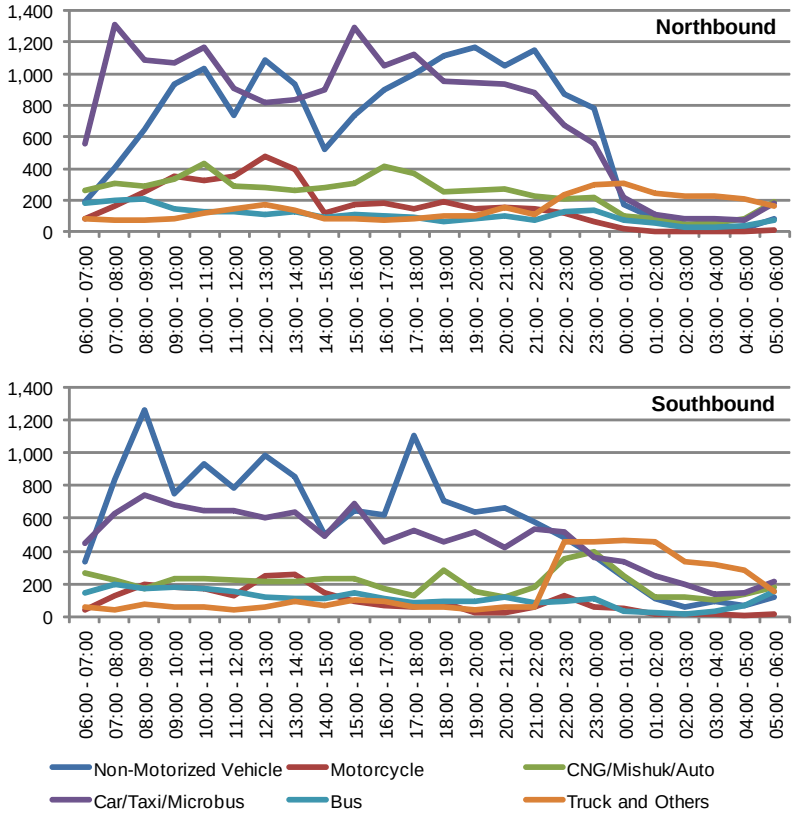
| Survey Station | Non-Motorized Vehicles | | | | Motorized Vehicles | | | | | | | | | | | | | | | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bicycle | Rickshaw | School Van | Total | Motorcycle | CNG/ Mishuk/ Auto | Car | Taxi | Auto Tempo/ Laguna/ Maxi | Microbus/ Jeep | Bus/ Mini-bus | AC Bus | Staff Bus | School/ Collage/ University Bus | 3-axle Truck/ Trailer | Tanker/ Tank Lorry | 2-axle Truck | Pick-up/ Small Van | Others | Total | |
| SC01 | 2,166 | 27,113 | 166 | 29,445 | 6,075 | 10,752 | 21,281 | 149 | 132 | 7,658 | 4,687 | 40 | 176 | 62 | 1,009 | 445 | 2,908 | 2,930 | 251 | 58,555 | 88,000 |
| SC02 | 1,493 | 11,463 | 202 | 13,158 | 4,300 | 2,543 | 7,805 | 70 | 196 | 2,941 | 461 | 0 | 10 | 36 | 8 | 15 | 345 | 942 | 103 | 19,775 | 32,933 |
| SC03 | 344 | 477 | 15 | 836 | 899 | 1,220 | 1,561 | 16 | 3 | 513 | 0 | 0 | 0 | 6 | 0 | 0 | 11 | 66 | 7 | 4,302 | 5,138 |
| SC04 | 637 | 385 | 6 | 1,028 | 1,680 | 2,623 | 1,714 | 9 | 10 | 691 | 0 | 0 | 0 | 8 | 0 | 0 | 31 | 222 | 17 | 7,005 | 8,033 |
| SC05 | 1,408 | 1,125 | 2 | 2,535 | 3,711 | 4,482 | 3,570 | 5 | 39 | 1,801 | 0 | 0 | 0 | 0 | 10 | 0 | 83 | 577 | 58 | 14,336 | 16,871 |
| SC06 | 1,598 | 6,368 | 40 | 8,006 | 5,598 | 4,761 | 7,456 | 69 | 49 | 4,345 | 1,928 | 11 | 70 | 14 | 73 | 37 | 956 | 1,515 | 182 | 27,064 | 35,070 |
| SC07 | 2,111 | 3,712 | 16 | 5,839 | 20,481 | 29,609 | 37,933 | 490 | 144 | 18,020 | 9,325 | 251 | 479 | 141 | 339 | 172 | 3,898 | 7,409 | 585 | 129,276 | 135,115 |
| SC08 | 1,251 | 2,771 | 8 | 4,030 | 4,011 | 1,974 | 3,585 | 11 | 10 | 2,144 | 7 | 5 | 18 | 18 | 7 | 1 | 23 | 434 | 52 | 12,300 | 16,330 |
| SC09 | 1,297 | 25,304 | 68 | 26,669 | 3,043 | 4,137 | 6,910 | 37 | 1,334 | 1,908 | 1 | 0 | 54 | 23 | 0 | 2 | 49 | 384 | 171 | 18,053 | 44,722 |
| SC10 | 1,426 | 3,376 | 45 | 4,847 | 6,706 | 7,539 | 27,539 | 62 | 11 | 11,694 | 5,033 | 35 | 126 | 163 | 77 | 127 | 1,382 | 1,399 | 347 | 62,240 | 67,087 |
| SC11 | 905 | 8,955 | 13 | 9,873 | 1,676 | 1,210 | 6,142 | 3 | 183 | 1,491 | 0 | 0 | 7 | 15 | 2 | 1 | 86 | 199 | 84 | 11,099 | 20,972 |
| SC12 | 2,292 | 34,698 | 58 | 37,048 | 4,856 | 4,012 | 20,190 | 131 | 3,267 | 6,710 | 1,391 | 4 | 128 | 156 | 39 | 17 | 198 | 512 | 140 | 41,751 | 78,799 |
| SC13 | 1,157 | 14,083 | 133 | 15,373 | 1,469 | 710 | 1,365 | 2 | 47 | 452 | 1 | 0 | 0 | 8 | 7 | 0 | 66 | 148 | 9 | 4,284 | 19,657 |
| SC14 | 955 | 2,580 | 22 | 3,557 | 1,287 | 3,594 | 1,429 | 8 | 1,481 | 744 | 1,034 | 1 | 5 | 9 | 124 | 18 | 2,818 | 2,068 | 335 | 14,955 | 18,512 |
| SC15 | 910 | 480 | 8 | 1,398 | 1,971 | 9,582 | 1,061 | 10 | 113 | 460 | 69 | 1 | 0 | 3 | 11 | 0 | 387 | 776 | 43 | 14,487 | 15,885 |
| SE01 | 42 | 128 | 0 | 170 | 282 | 1,685 | 353 | 2 | 16 | 594 | 77 | 0 | 3 | 0 | 596 | 79 | 3,273 | 1,178 | 37 | 8,175 | 8,345 |
| SE02 | 260 | 255 | 2 | 517 | 1,051 | 3,546 | 1,691 | 4 | 912 | 996 | 2,402 | 62 | 22 | 18 | 291 | 322 | 4,560 | 3,285 | 175 | 19,337 | 19,854 |
| SE03 | 249 | 309 | 5 | 563 | 429 | 2,349 | 316 | 4 | 35 | 476 | 0 | 0 | 2 | 10 | 49 | 3 | 406 | 223 | 12 | 4,314 | 4,877 |
| SE04 | 396 | 715 | 3 | 1,114 | 620 | 3,888 | 230 | 3 | 393 | 203 | 55 | 0 | 0 | 0 | 2 | 7 | 128 | 265 | 14 | 5,808 | 6,922 |
| SW01 | 63 | 126 | 0 | 189 | 341 | 2,061 | 230 | 0 | 112 | 55 | 0 | 0 | 0 | 0 | 2 | 4 | 199 | 260 | 48 | 3,312 | 3,501 |
| Total | 20,022 | 135,035 | 780 | 155,837 | 68,704 | 100,279 | 145,055 | 1,053 | 8,389 | 62,044 | 26,219 | 410 | 1,092 | 664 | 2,640 | 1,232 | 21,585 | 24,032 | 2,574 | 465,972 | 621,809 |

Source: Screen Line Survey 2014, JICA Study Team

**Table 3.12 Average Vehicle Occupancy at the Screen Line by Survey Station and Vehicle Type**

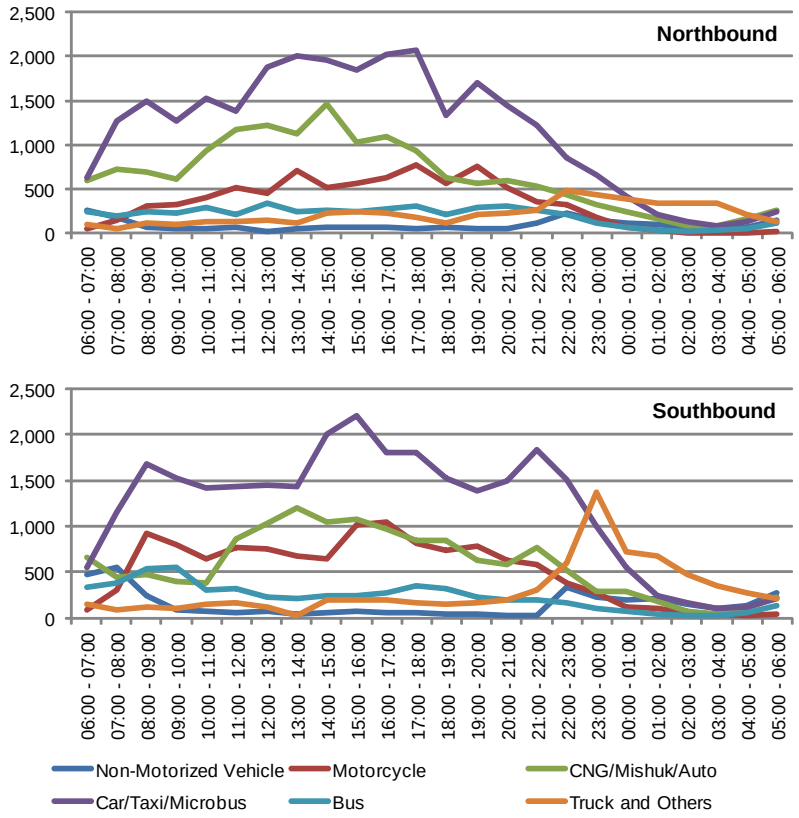
| Survey Station | Non-Motorized Vehicles | | | Motorized Vehicles | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bicycle | Rickshaw | School Van | Motorcycle | CNG/ Mishuk/ Auto | Car | Taxi | Auto Tempo/ Laguna/Maxi | Microbus/ Jeep | Bus/ Mini-bus | AC Bus | Staff Bus | School/ Collage/ University Bus | 3-axle Truck/ Trailer | Tanker/ Tank Lorry | 2-axle Truck | Pick-up/ Small Van | Others |
| SC01 | 1.01 | 2.52 | 4.84 | 1.41 | 2.84 | 2.42 | 3.16 | 7.09 | 4.87 | 41.55 | 32.96 | 18.44 | 24.03 | 2.18 | 2.23 | 2.77 | 2.62 | 5.13 |
| SC03 | 1.12 | 2.33 | 4.11 | 1.74 | 2.85 | 3.25 | 3.60 | 6.00 | 4.32 | - | - | - | 7.67 | - | - | 3.00 | 2.65 | 3.00 |
| SC04 | 1.01 | 2.19 | 4.57 | 1.52 | 2.68 | 2.68 | 3.67 | 5.60 | 4.58 | - | - | - | 7.75 | - | - | 3.00 | 2.48 | 4.11 |
| SC05 | 1.15 | 2.29 | 2.50 | 1.98 | 3.20 | 3.09 | 3.29 | 8.00 | 6.09 | - | - | - | 7.00 | - | - | 2.96 | 2.87 | 3.25 |
| SC06 | 1.02 | 2.07 | 3.05 | 1.44 | 2.84 | 2.30 | 2.94 | 4.33 | 3.53 | 47.00 | 32.50 | 23.46 | 11.83 | 4.47 | 2.38 | 2.84 | 2.96 | 3.33 |
| SC07 | 1.08 | 2.26 | 4.00 | 1.63 | 2.99 | 2.55 | 3.58 | 8.80 | 3.86 | 48.31 | 49.73 | 32.12 | 50.55 | 2.31 | 2.16 | 2.47 | 2.85 | 3.85 |
| SC08 | 1.06 | 2.01 | 5.50 | 1.40 | 2.71 | 2.30 | - | - | 2.80 | 16.00 | - | 13.50 | 13.50 | - | - | 4.00 | 2.46 | 3.62 |
| SC09 | 1.06 | 2.21 | 5.12 | 1.50 | 2.33 | 2.27 | 3.10 | 16.01 | 2.83 | 45.00 | - | 9.56 | 9.92 | - | 3.00 | 2.20 | 2.87 | 3.21 |
| SC10 | 1.02 | 2.13 | 3.91 | 1.40 | 2.72 | 2.24 | 2.20 | - | 2.76 | 36.79 | - | 30.42 | 16.87 | - | 2.86 | 2.50 | 2.61 | 3.47 |
| SC11 | 1.04 | 2.16 | - | 1.52 | 2.56 | 2.25 | 4.00 | 9.52 | 2.56 | - | - | 14.00 | 12.67 | - | - | 1.70 | 2.35 | 3.67 |
| SC12 | 1.08 | 2.26 | 1.86 | 1.42 | 2.68 | 2.20 | 3.00 | 14.94 | 2.94 | 34.52 | - | 12.08 | 15.94 | - | 2.00 | 3.50 | 2.42 | 3.12 |
| SC13 | 1.03 | 2.32 | 3.88 | 1.72 | 2.49 | 2.81 | 3.00 | 5.65 | 4.34 | - | - | - | 29.00 | 1.00 | - | 3.56 | 2.96 | 2.67 |
| SC14 | 1.11 | 2.51 | 4.25 | 1.61 | 4.60 | 3.35 | 3.00 | 14.68 | 5.77 | 35.18 | 35.00 | 25.00 | 20.80 | 3.13 | 2.89 | 3.43 | 2.65 | 3.77 |
| SC15 | 1.04 | 2.05 | 3.67 | 1.66 | 4.57 | 3.15 | 3.67 | 8.00 | 4.93 | 25.73 | 6.00 | - | 6.25 | 2.67 | - | 3.82 | 2.81 | 4.83 |
| SE01 | 1.17 | 2.51 | - | 1.97 | 4.63 | 3.62 | 2.50 | 5.25 | 6.86 | 37.89 | - | 32.33 | 2.42 | 2.35 | 2.19 | 2.48 | 2.42 | 2.68 |
| SE02 | 1.00 | 2.41 | 10.00 | 1.85 | 3.76 | 2.85 | 2.75 | 11.84 | 5.83 | 39.95 | 44.65 | 22.57 | 27.00 | 2.38 | 2.29 | 2.54 | 2.50 | 3.43 |
| SE03 | 1.09 | 2.50 | 5.00 | 2.00 | 4.04 | 3.07 | 3.00 | 7.84 | 6.58 | - | - | 35.00 | 17.17 | 3.20 | 2.67 | 2.60 | 2.08 | 3.00 |
| SE04 | 1.03 | 2.10 | 2.75 | 1.88 | 4.44 | 3.05 | 4.00 | 13.17 | 5.93 | 19.08 | - | - | - | 3.50 | 2.00 | 3.48 | 3.45 | 4.13 |
| SW01 | 1.16 | 2.31 | - | 1.88 | 4.86 | 3.08 | - | 12.61 | 5.64 | - | - | - | - | 2.67 | 1.75 | 3.03 | 2.83 | 3.39 |
| Average | 1.06 | 2.29 | 4.17 | 1.58 | 3.35 | 2.44 | 3.28 | 13.16 | 3.84 | 42.25 | 44.11 | 24.25 | 20.62 | 2.58 | 2.29 | 2.75 | 2.68 | 3.70 |

Note: Figures include drivers and conductors as well. Dashes ("-") indicate no samples were observed.
Source: Screen Line Survey 2014, JICA Study Team



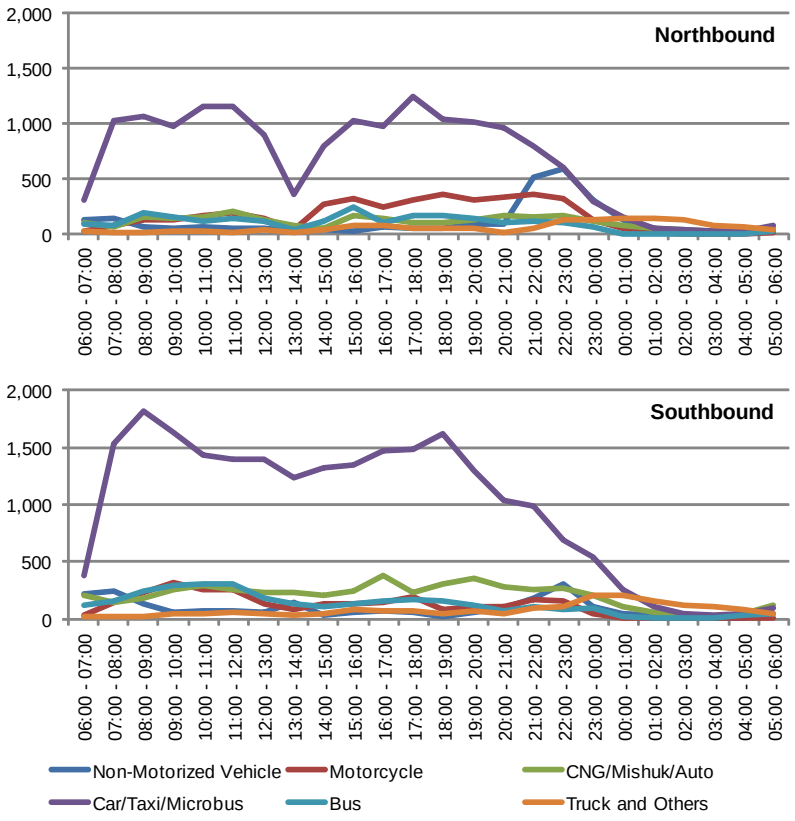

Source: Screen Line Survey 2014, JICA Study Team

**Figure 3.23 Hourly Vehicular Traffic Volume at DIT Road (Station SC01)**



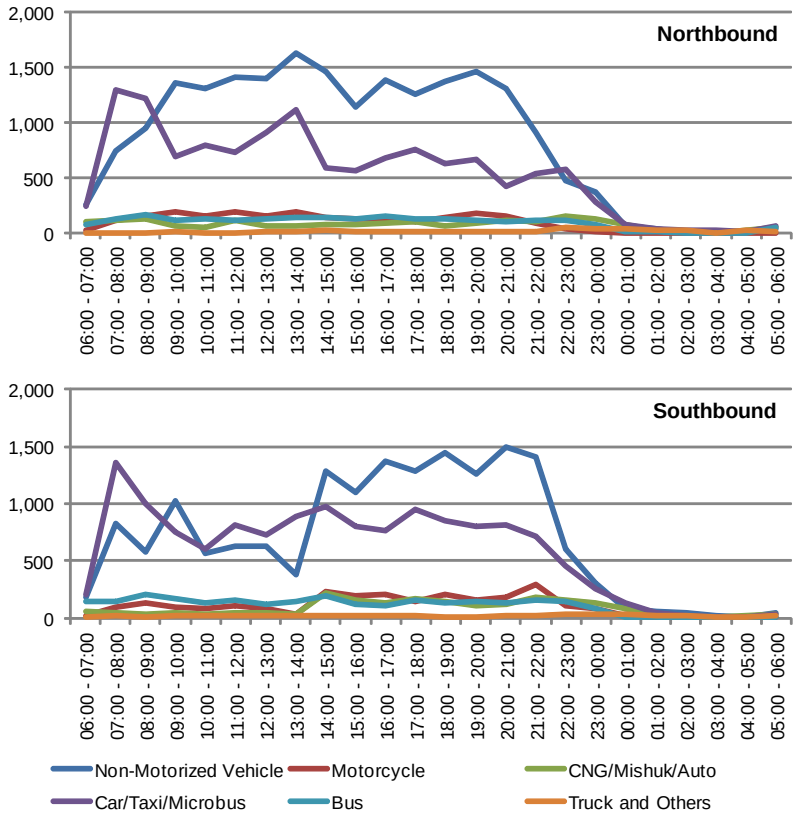

Source: Screen Line Survey 2014, JICA Study Team

**Figure 3.24 Hourly Vehicular Traffic Volume at Kazi Nazul Islam Avenue (Station SC07)**




Source: Screen Line Survey 2014, JICA Study Team

**Figure 3.25 Hourly Vehicular Traffic Volume at Mirpur Road (Station SC10)**




Source: Screen Line Survey 2014, JICA Study Team

**Figure 3.26 Hourly Vehicular Traffic Volume at Satmasjid Road (Station SC12)**

Figure 3.23 to Figure 3.26 show hourly vehicular traffic volumes by vehicle type in four busiest roads. In the Figures, the 18 vehicle types are aggregated into the 6 categories as previously described in Page 3-18.

The low time variability without apparent morning and evening peaks suggests that the traffic volume is beyond the road capacity and the travel speed is low for a whole day. Introducing mass transit systems and expanding the road capacity are seemingly imminent issues. On the other hand, the current modal share of public transportation is still as high as 80%. The fact suggests a chance to maintain the high modal share of public transport in the future by attracting people to mass transit systems.

## 3.5 Public Transportation Users' Opinion Survey

(1) Survey Method

Passengers arriving at public transport terminals are randomly sampled and interviewed according to the survey form shown in Annex. The survey form includes items as listed below:

- Passenger's trip information;
- Willingness to pay for time saving;
- Perceptions on the level of present public transport services; and
- Socio-economic characteristics of the passenger.

The following seven travel modes are evaluated with the survey:

- Railway;
- Inter-city air-conditioned bus;
- Intra-city bus;
- Intra-city minibus;
- Auto tempo/Laguna/Maxi;
- CNG/Mishuk/Auto; and
- Rickshaw.

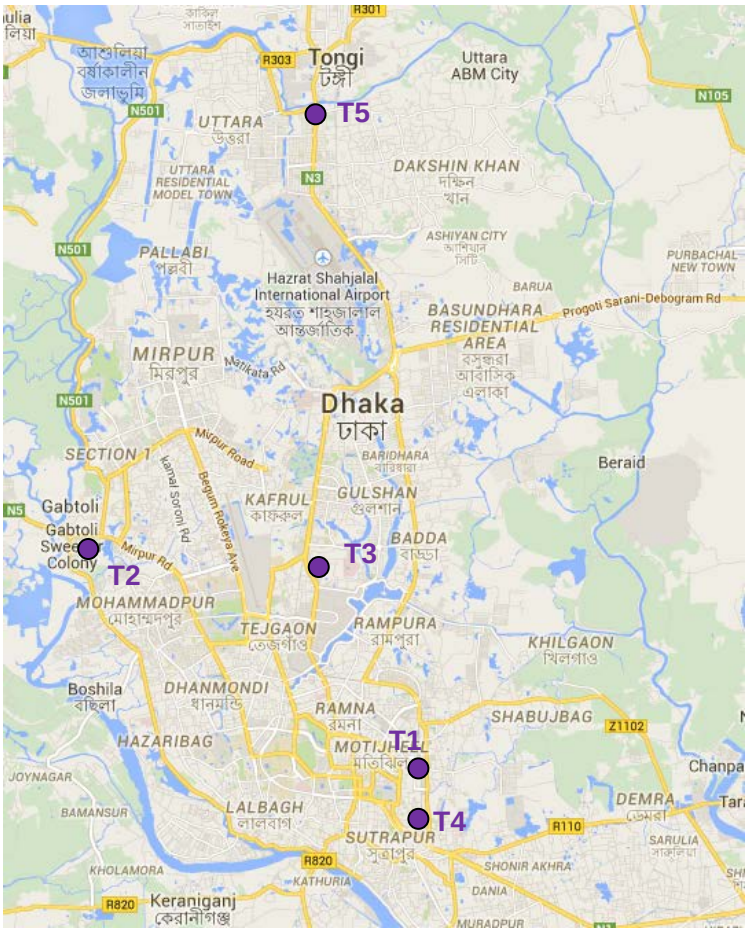
(2) Survey Coverage

A total of 5 survey stations listed in Table 3.13 and their locations are indicated in Figure 3.27. The target number of samples is 2,450 and the breakdown is shown in Table 3.13. Passenger interviews are conducted for 16 hours (from 6 AM to 10 PM) in each survey station. Surveys are on weekdays except on a holiday or a day with special activities or bad weather condition.

**Table 3.13 Public Transportation Users' Opinion Survey Stations and Numbers of Samples by Mode**

| Code | Survey Station | Number of Samples by Mode | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Railway | Intra city AC Bus | Intra city Bus | Intra city Mini Bus | Auto tempo/ Laguna/ Maxi | CNG/ Mishuk/ Auto | Rickshaw | Total |
| T1 | Kamalapur Railway Station | 400 | - | - | - | - | - | - | 400 |
| T2 | Gabtali and its surrounding area | - | 50 | 100 | 100 | 100 | 100 | 100 | 550 |
| T3 | Mohakhali and its surrounding area | - | - | 100 | 100 | 100 | 100 | 100 | 500 |
| T4 | Saidabad and its surrounding area | - | - | 100 | 100 | 100 | 100 | 100 | 500 |
| T5 | Abdullahpurand its surrounding area | - | - | 100 | 100 | 100 | 100 | 100 | 500 |

Source: JICA Study Team




Source: JICA Study Team

**Figure 3.27 Locations of Public Transportation Users' Opinion Survey Stations**

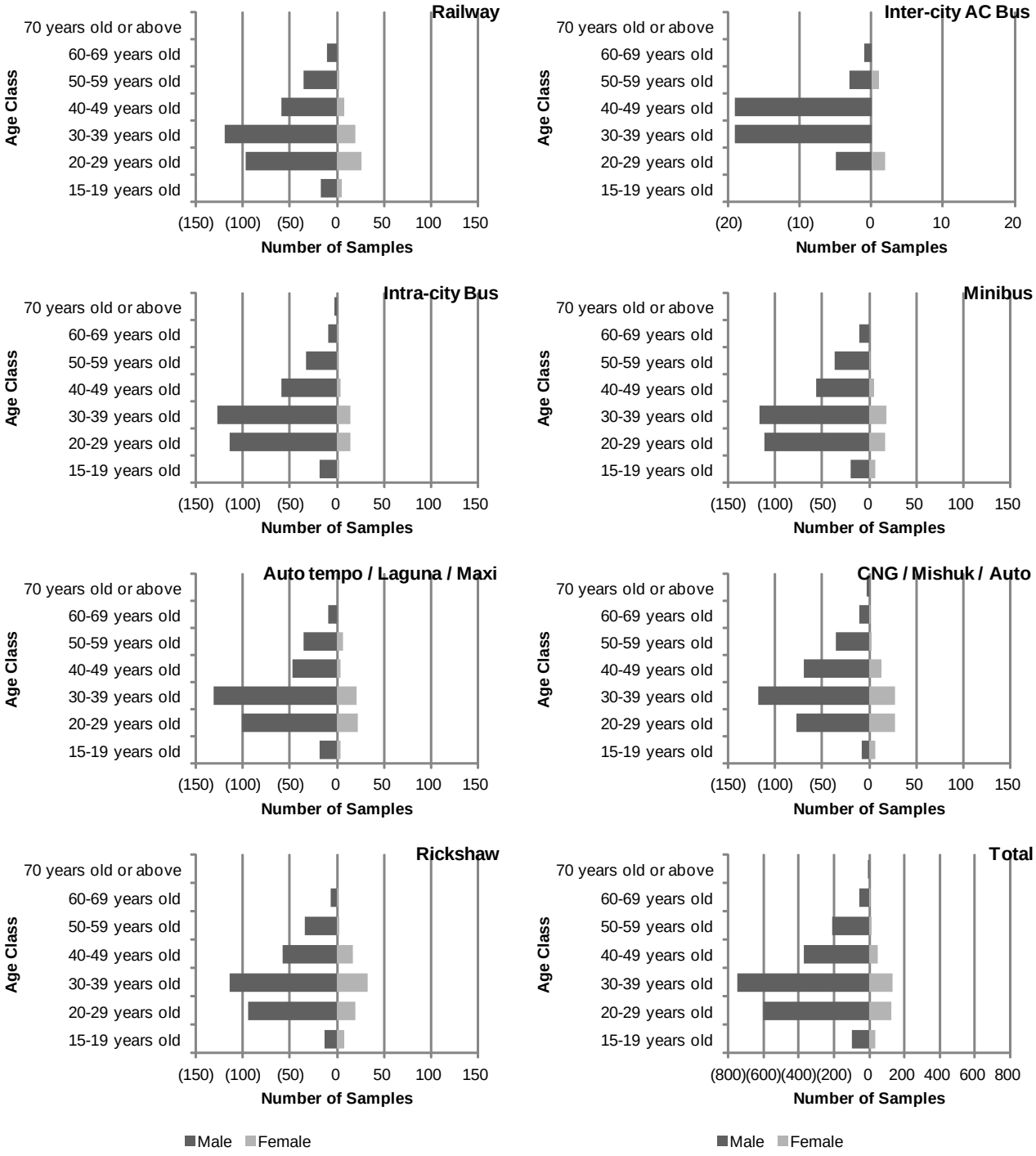
**Table 3.14 Survey Date of the Public Transportation Users' Opinion Survey**

| Code | Survey Station | Survey Dates |
|---|---|---|
| T1 | Kamalapur Railway Station | September 17 and October 23, 2014 |
| T2 | Gabtali and its surrounding area | September 25, 2014 |
| T3 | Mohakhali and its surrounding area | September 25, 2014 |
| T4 | Saidabad and its surrounding area | September 23, 2014 |
| T5 | Abdullahpurand its surrounding area | September 23, 2014 |

Source: JICA Study Team

(3) Survey Results

Samples have been collected as per the target as shown in Table 3.13 while the number of samples by transportation mode, gender and age class is shown in Figure 3.28.

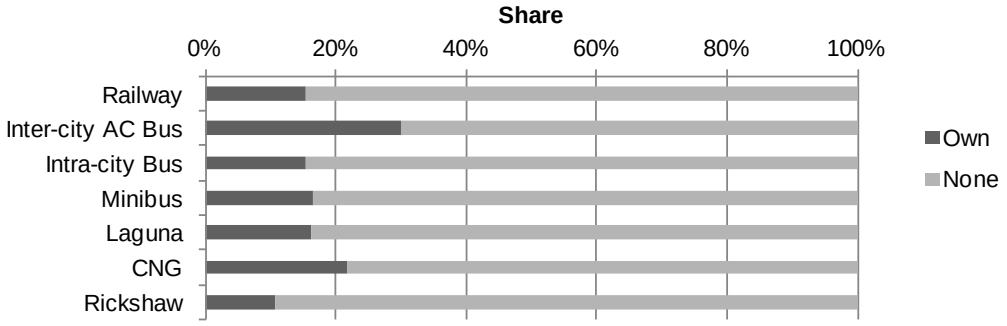



Source: Public Transportation Users' Opinion Survey 2014, JICA Study Team

**Figure 3.28 Numbers of Samples by Mode, Gender and Age Class**

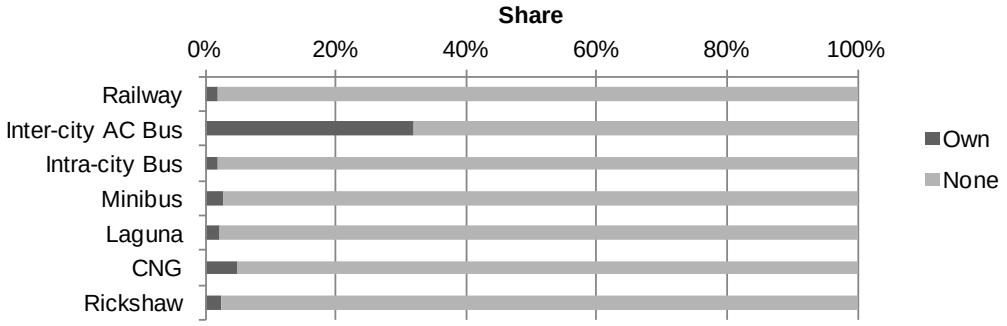
Few numbers of public transportation users have their own vehicle. Figure 3.29 and Figure 3.30 show motorcycle and car ownership of the interviewees. Excluding inter-city AC bus passengers, average motorcycle and car ownership rates are 16% and 3%

respectively. Figure 3.31 shows the distribution of monthly family income class by transportation mode. Although a wide variety of people from low and middle-income classes use public transportation, more or less 14% of the passengers seems to be below the absolute poverty threshold (i.e., about 10,000 Bangladeshi Taka a month for four family members). Serving public transportation is crucial to guarantee mobility rights of citizens in the Survey Area.



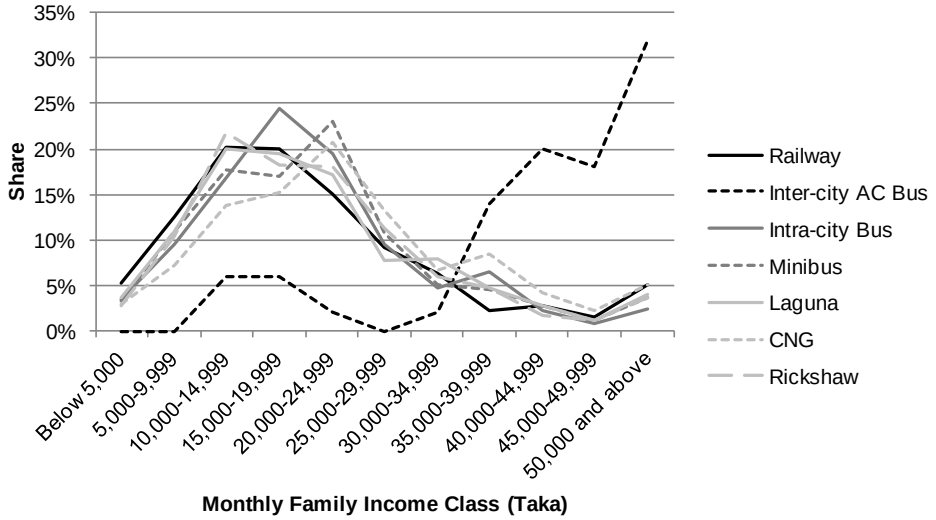

Source: Public Transportation Users' Opinion Survey 2014, JICA Study Team

**Figure 3.29 Motorcycle Ownership of Public Transportation Users**




Source: Public Transportation Users' Opinion Survey 2014, JICA Study Team

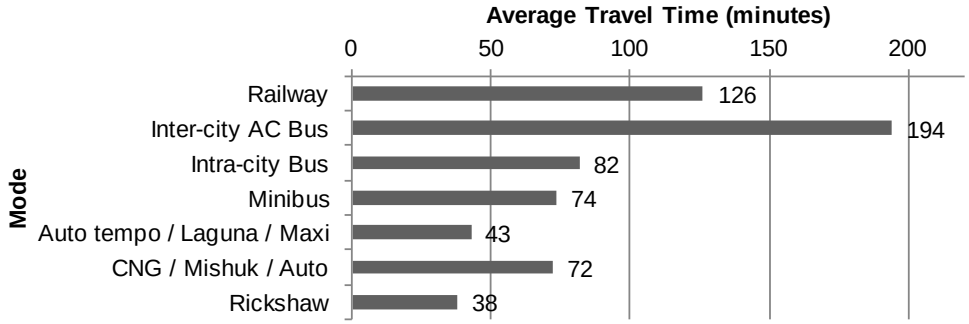
**Figure 3.30 Car Ownership of Public Transportation Users**




Source: Public Transportation Users' Opinion Survey 2014, JICA Study Team

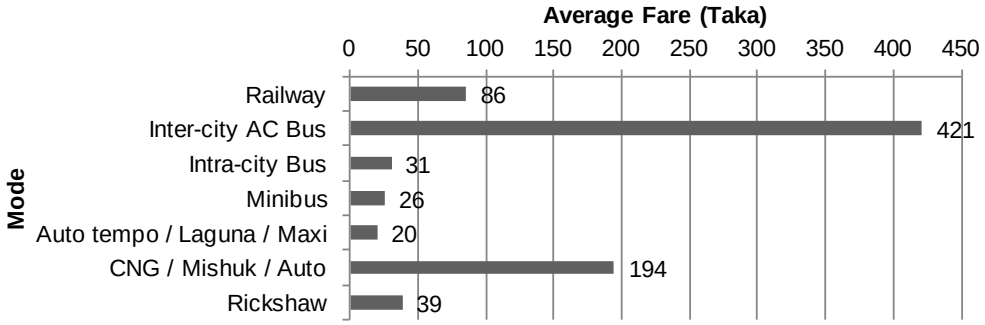
**Figure 3.31 Distribution of Monthly Family Income of Public Transportation Users**

Figure 3.32 and Figure 3.33 show average travel time and fare by transportation mode, respectively. Current fares are reasonable enough with respect to travel time but this does not necessarily mean that citizens are enjoying a reasonable travel cost with respect to distance travelled. Obviously, better and affordable fares could still be offered if easier road traffic allows public transportation vehicles to make more trips.




Source: Public Transportation Users' Opinion Survey 2014, JICA Study Team

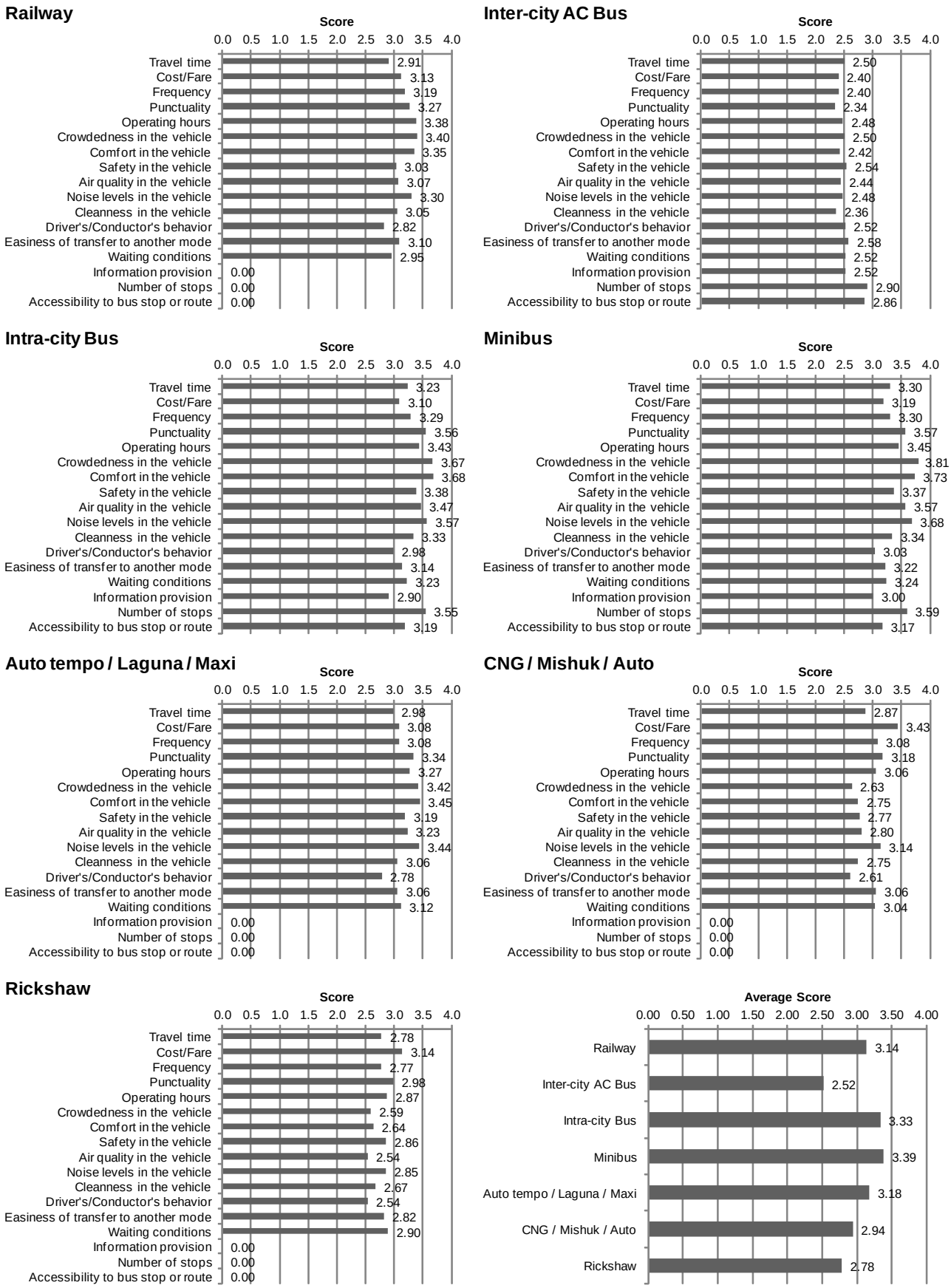
**Figure 3.32 Average Travel Time**




Source: Public Transportation Users' Opinion Survey 2014, JICA Study Team

**Figure 3.33 Average Fare**

Figure 3.34 shows evaluation of current level of service by each public transportation mode. The score is an arithmetic mean of answers to five-level choices from 1: very good to 5: very bad, hence the lower the score the better the service. Railway, bus, minibus and laguna got lower ratings due to unpleasant in-vehicle conditions mainly caused by congestion and noise. Bus passengers are also hesitant to long travel time due to frequent stops.




Note: Each score is an average of five-level evaluation from 1: Very good to 5: Very bad. Lower score is better.

Source: Public Transportation Users' Opinion Survey 2014, JICA Study Team

**Figure 3.34 Evaluation of Current Level of Service**

As discussed in Page 3.24, the attraction of vehicles causes the road congestion around public transportation terminals and poses safety risks of boarding and alighting passengers in front of the terminals. The predicted future population growth in the Survey Area will make the situations more serious.

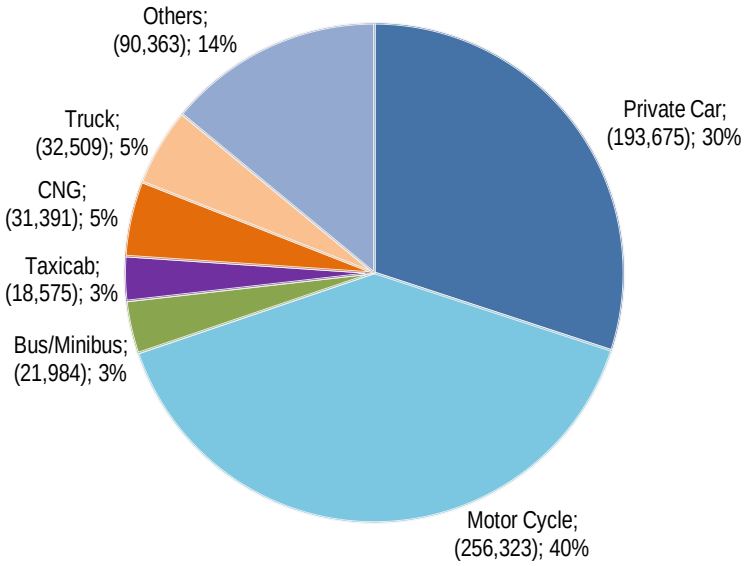
Public transportation terminals are especially encouraged to enhance the transport hub function which has to equip enough spaces for turnaround and parking of public and private vehicles for the terminal access. Terminals are also suggested to have wide, flat, shaded and lighted sidewalks to secure passengers' safe and comfortable walking environment between the terminal and vehicles.

In addition to making spaces for vehicles, it is also recommended to renovate terminal buildings with a lot of spaces for shops and restaurants. Encroachment by street vendors in the road side is another cause of the congestion around terminals. If the street vendors were just moved out, they would lose their jobs but the stores inside terminals would offer alternative employment opportunities to them. Business to passengers at terminals is generally profitable. Tenant fees from the shops and restaurants will be an essential resource of maintaining terminal buildings to continuously provide better services to passengers (e.g., keeping safe, spacious, clean and air-conditioned building, washrooms etc.), which will attract more public transportation users.

# 4. CURRENT URBAN TRANSPORT SYSTEM

## 4.1 Introduction

At present, major modes of transport in Greater Dhaka Area (GDA) are motorcycle, private car, microbus, truck, minibus and taxi. The number of registered public transport is quite less compared to private transport. In this section, various types of existing transports and performance as well as issues on public transport system in GDA are described.




Source: BRTA

**Figure 4.1 Share of Total Newly Registered (2001-2013) Vehicles in GDA**

## 4.2 Pedestrian & Non-motorized Transports

(1) Pedestrian

Walking is the common mode of transportation of the majority of people in Dhaka city. In 2009, almost 20% of the people of Dhaka city use walking as their mode of transportation according to DHUTS. One of the reasons to some of the people is their financial incapability to use public transport. Also quite a lot of garment workers commuting to the factories in the morning and evening by foot and some people walk as a mode of access to public transport like buses.

Even though large share of people are pedestrians, the facilities for pedestrians are not properly ensured. Convenience of the pedestrians is not taken care of whenever a road or an intersection is constructed or renovated in Dhaka city. There are around 66 pedestrian foot-over bridges and 4 underground pedestrian crossings in Dhaka city to ensure safe crossing of the users. It can be noticed that at some locations, pedestrians are trying to cross the road competing with the motorized vehicles due to insufficient facilities for crossing. However, it is also observed that some pedestrian foot-over bridges are not being used by the pedestrians.

There are several on-going projects under Dhaka City Corporation which focus on pedestrian walk way improvement. As a matter of fact, construction of foot path comes

before they start construction works such as drainage pipe installation, internet cable installation etc. However, some of the re-constructed footpath are not properly done like unlevel construction with rough surface where children and elderly people face difficulties to walk. In Bangladesh, there is hardly any consideration for the handicapped people in their footpath designs. This calls for a development of barrier free walk ways or crossing facilities in this country. Moreover, footpath's height practically varies from 15cm to 60cm as there is no predetermined height of the walkway. In March 2014, Dhaka North City Corporation (DNCC) inaugurated the construction of the first ever foot-over bridge with escalator (upward direction only) in Bangladesh located at the intersection of Banani Road Number 11 and Airport Road. DNCC has a plan of constructing 7 more of this type of bridge if they get a positive outcome.

New Foot-over bridge at Banani Road 11

Typical Design of Foot-over bridge

**Figure 4.2 Foot Over bridges of Dhaka city**

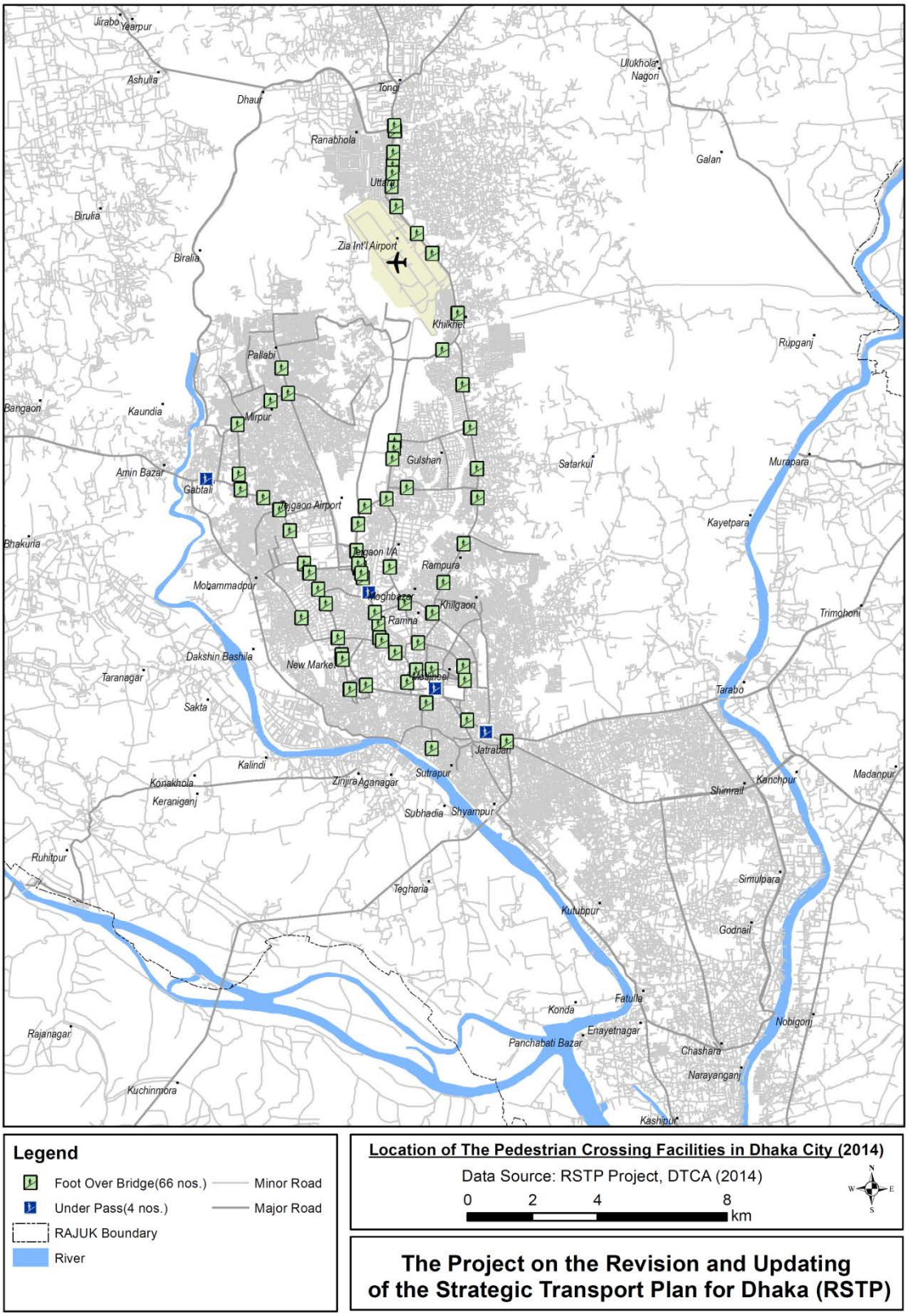



**Figure 4.3 Location of the Pedestrian Crossing Facilities in Dhaka City**

There are various types of obstruction in footpath and foot over bridges in Dhaka city which creates enormous sufferings to th Some commonly noted obstructions are:

- Installation of temporary vendor shops b n foot path and foot over bridge
- Parking of motorized vehicles on footpath
- Storing of construction material on footpath
- Piling of the wastes on foot path and foot over bridge
- Homeless people build temporary houses on foot path and foot over bridge
- Absence or broken drainage cover in the footpath
- Beggars occupy the spaces on foot path and foot over bridge

Temporary Shops on footpath

Inactive Green light for crossing

Broken drainage cover

Construction materials on footpath

Parking on footpath

Pedestrian crossing the barrier

**Figure 4.4 Different Types of Problems of pedestrian in Dhaka**

Pedestrian also faces difficulties at the intersection such as:

- Many green lights for pedestrians are not working properly

- Sometimes traffics at intersection are controlled manually, at that time not enough attention is drawn to pedestrians

On the other hand, it is also observed that many pedestrians do not follow traffic rules like using pedestrian crossing facilities, crossing the intersection during green cycle for pedestrian etc.

(2) Bicycle

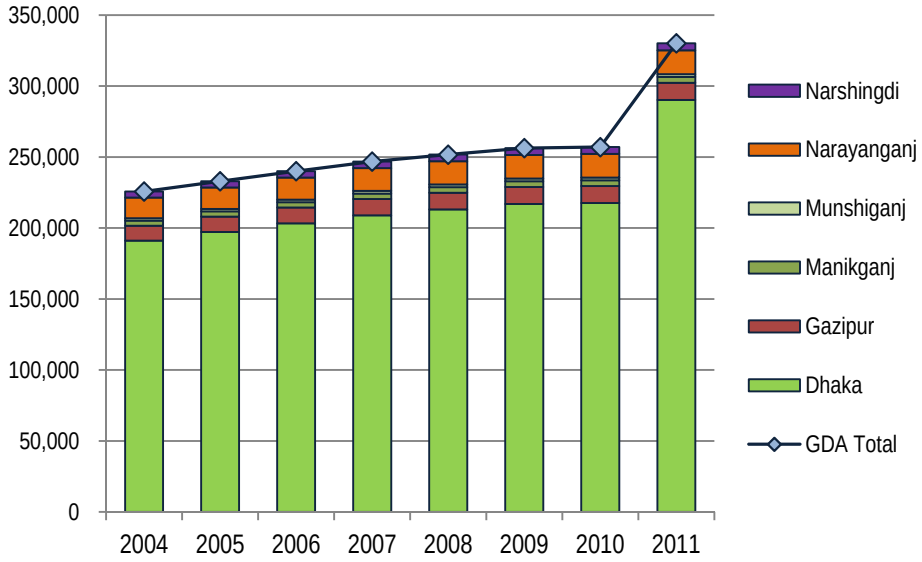
Bicycle is a useful and environment friendly transport which plays an important role as access for commuting in developed countries. However, only 2% bicycle trips were found on arterial roads in Dhaka city. In the past, bicycle was used for commuting to school and to office mostly in rural areas. As a matter of fact, due to religious conservativeness still many women are not using bicycle.

Some problems of using bicycles in Dhaka city are:

- Absence of dedicated bicycle lane, making it quite dangerous to ride
- No parking facilities for bicycle, making it difficult to use as access mode of transport
- Possibility of theft due to lack of parking facilities
- Due to high initial cost (app. 15,000 Taka) of good quality bicycle, it is an unaffordable item to low-income people

(3) Rickshaw

Dhaka city is known to be a city of rickshaws. The registered number of rickshaws in Dhaka city according to DNCC and DSCC are around 100,000 (Source: DHUTS). In many reports, it is published that quite a number of unregistered rickshaws are operating in Dhaka. In this reason, nobody knows the exact number of rickshaws running in the city. Total number of registered rickshaws from 2004 to 2011 in the urban area of Greater Dhaka area (GDA) is 330,143(Source: Statistical Yearbook of Bangladesh 2010 & 2012). Out of all the districts of GDA, Dhaka is holding 88% of the rickshaws while Narayanganj and Gazipur districts are at number 2 and 3 position respectively.




Source: Statistical Year Book of Bangladesh 2010 & 2012, BBS

**Figure 4.5 Trend of Registered Rickshaws in the Urban GDA**

People in Dhaka city mostly use rickshaw for travelling short distance 1-3 kilometre and students and business persons are using more than 90% of these rickshaw trips (Source: DHUTS).Share of trips made by rickshaw was 38% in 2009.

**Table 4.1 Number of Registered Rickshaws in Urban GDA**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|
| Dhaka | 191,144 | 197,261 | 203,277 | 208,969 | 213,148 | 216,985 | 217,636 | 290,247 |
| Gazipur | 10,463 | 10,798 | 11,127 | 11,439 | 11,667 | 11,877 | 11,913 | 12,056 |
| Manikganj | 3,569 | 3,683 | 3,795 | 3,902 | 3,980 | 4,051 | 4,064 | 4,112 |
| Munshiganj | 1,695 | 1,749 | 1,802 | 1,853 | 1,890 | 1,924 | 1,930 | 1,953 |
| Narayanganj | 14,617 | 15,085 | 15,545 | 15,980 | 16,300 | 16,593 | 16,643 | 16,843 |
| Narshingdi | 4,280 | 4,417 | 4,552 | 4,679 | 4,773 | 4,859 | 4,873 | 4,932 |
| GDA Total | 225,768 | 232,993 | 240,098 | 246,822 | 251,758 | 256,289 | 257,059 | 330,143 |

Source: Statistical Year Book of Bangladesh 2010 & 2012, BBS

Former DCC initiated NMT-Free Plan and some roads of Dhaka city are restricted from rickshaws since 2004. It was initially planned to make 11 major roads of Dhaka city as rickshaw free. However due to different view on political issues and lack of substitution after being declared as a rickshaw free road, the plan was not fully fulfilled. Nevertheless, Dhaka city is presently having an approximately 38 kilometre of road banned from rickshaws. The main objective of creating a rickshaw free road is to increase capacity of the arterial roads. Unfortunately, many of these rickshaw free roads are turned into unofficial parking spaces for cars. In this case, the main purpose of creating rickshaw free road, thus to have a wider carriage way, is still not achieved.

Rickshaw

Parked cars at rickshaw-free road

Dedicated lane for rickshaws near New Market

**Figure 4.6 Rickshaw free Road and Rickshaw Lane in Dhaka city**

In response to the high demand of rickshaws, former DCC created an exclusive rickshaw lane in some roads of Dhaka city. It was a good initiative to reduce the mixed traffic within the lane but it didn't work out well. In most cases, rickshaw drivers are not willing to use

the designated lane but rather ride through the main road competing with other motorized vehicles. Rickshaw lane nearby the New Market area is still on operation.

Bangladesh has no rickshaw fare fixed rate. It mainly depends upon the negotiation between the passenger and the rickshaw puller. In 2010, the roughly average fare of rickshaw was around 20 taka per trip (about 1.5 kilometer) and average travel time per trip was around 20 minutes (Source: DHUTS). Due to increase of inflation along with other commodities, rickshaw fare is also increasing every year. Some reasons of rickshaw fare variations are as below:

- Rickshaw fare varies depending on the location in Dhaka city. For instance: rickshaw fare for 1 kilometre in Dhanmondi area is 25 taka while it is only 15 taka in Uttara area.The reason is that, in Dhanmondi area the demand of rickshaw is more than the supply.
- Troublesome weather (too hot, rain etc.) is also one factor for the rickshaw pullers to demand more money from the passengers.
- Some rickshaw pullers just came in to Dhaka in a season. During this time, the supply is higher than the demand, thus rickshaw puller charges less. While during harvest season, the number of rickshaw puller in Dhaka is less and fare becomes higher.

Some rickshaw related problems are as below:

- Due to rickshaw's low speed, traffic signal phasing is difficult to design efficiently
- Lack of willingness of the rickshaw puller
- to maintain line which creates disturbance to other motorized vehicles.
- No driving license is required for rickshaw driving, thus no proper traffic knowledge obtained by the rickshaw puller.
- As there is no parking space for rickshaws, in most cases, rickshaw pullers wait for the passengers at the intersection which is a common reason of traffic congestion.

Rickshaw drivers make U-turn in the mid-block sections and create traffic congestion.

Rickshaws waiting for passengers at the intersection

Rickshaw riding through opposite direction

Rickshaws created obstacle to smooth traffic flow

**Figure 4.7 Problems created by Rickshaws**

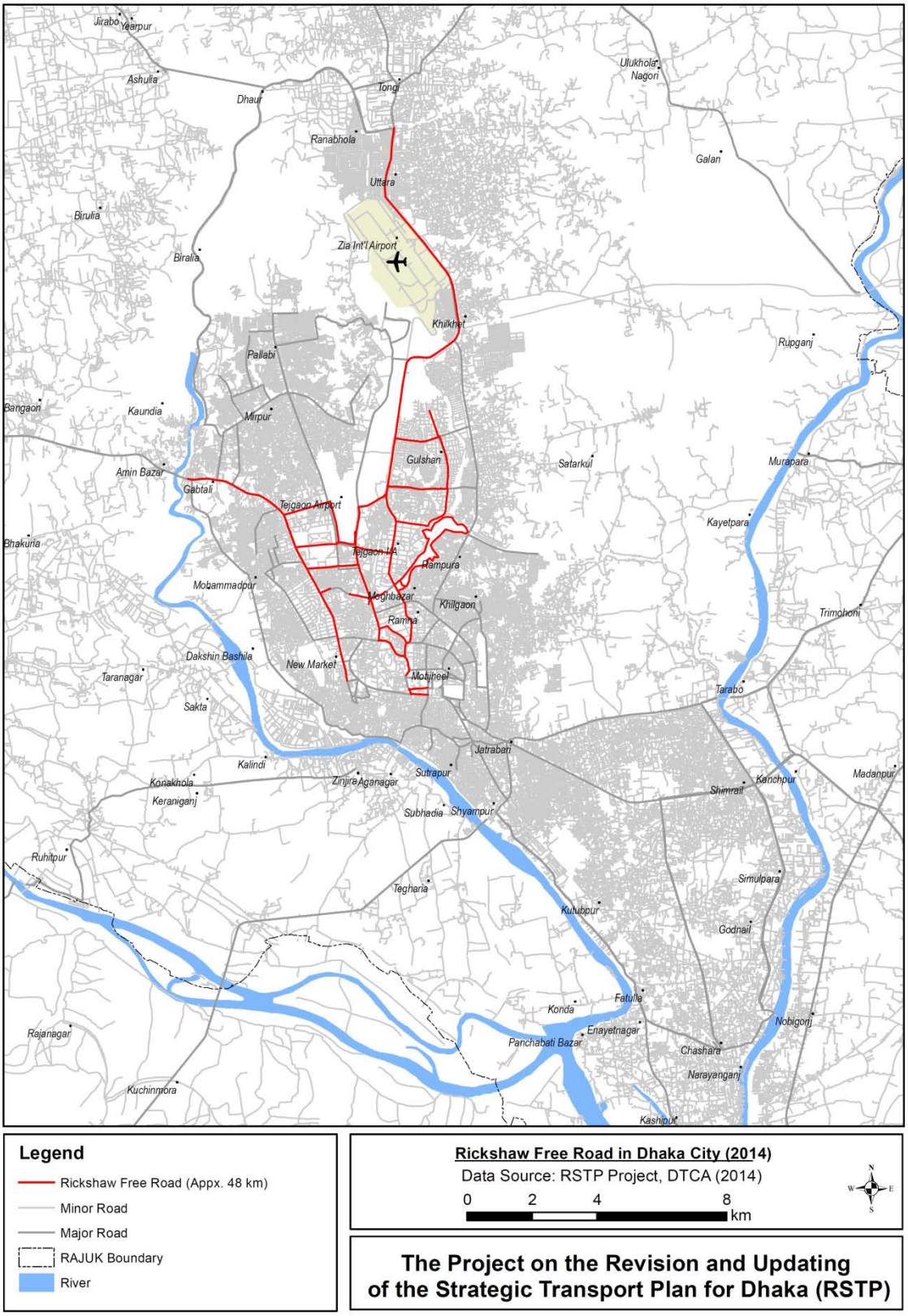



**Figure 4.8 Rickshaw Free Roads in Dhaka city**

(4) Others (Rickshaw van, Thela etc.)

In GDA, many people use rickshaw van and thela to transport goods due to its low fare charges. Rickshaw van or thela is a better option for people if they need to transport small amount of commoditites. However, Dhaka Metropolitan Police restricted rickshaw van or thela from using the rickshaw free roads. According to Dhaka City Corporations, there are around 8,000 registered rickshaw vans in Dhaka city (Source: Rickshaw Cycle Drivers in Dhaka: Assessing Working Conditions and Livelihoods).The number of thela is not available as there is no registration system for this transport. It has been observed also that rickshaw vans are used as a temporary vendor shop for vegetables, chicken etc.

Riskshaw Van transporting goods | Thela | Vegetables shop using Van

**Figure 4.9 Pictures of Rickshaw van and Thela**

## 4.3 Private Car, Motorcycle& Truck

(1) Private Car

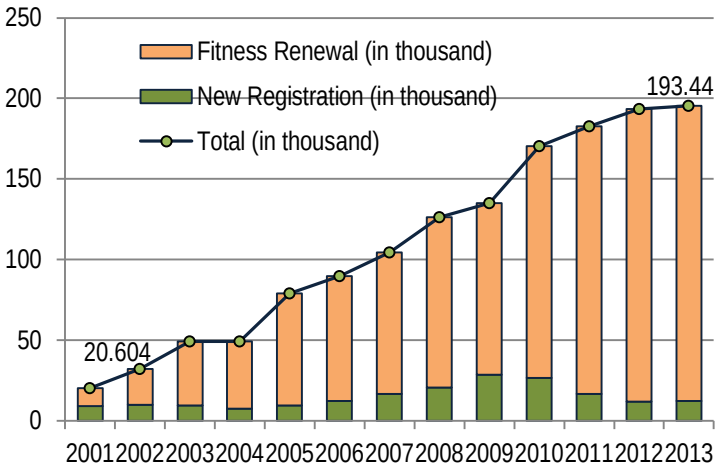
In GDA, private cars are mainly classifies into three types: sedan car, four-wheeled jeep and 6-10 seater microbus. Basically, private cars are used by the middle and high income people with some families owning more than one vehicle. As shown in Figure 4-1, private cars are accounted for 30% of vehicle share in GDA. One of the reasons of increasing number of private car is the low operating cost by using Compressed Natural Gas (CNG). Since CNG is being produced locally, its cost is quite low compare to other types of fuel including octane that needs to be imported from abroad. According to Navana CNG, a renowned CNG conversion company in Bangladesh, 1m3 CNG is equivalent to `1.23 litre of octane. Considering the over-all cost (assuming yearly travelling distance 60,000km) it is found that, a 1800 CC CNG driven sedan car can save around 0.30 million taka every year.

The number of private cars in GDA is increasing year by year at a rapid rate. As per BRTA, registered number of private cars in GDA, as of 2013 is approximately 193,000.

**Table 4.2 New Registered and Fitness Renewed Private Cars in GDA (2001~13)**

| | '01 | '02 | '03 | '04 | '05 | '06 | '07 | '08 | '09 | '10 | '11 | '12 | '13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| New Registered (in thousand) | 9.3 | 10.0 | 9.7 | 7.9 | 9.8 | 12.6 | 16.8 | 20.8 | 28.6 | 26.9 | 16.7 | 12.1 | 12.6 |
| Fitness Renewed (in thousand) | 11.3 | 22.3 | 39.6 | 41.5 | 69.4 | 77.4 | 87.6 | 105.4 | 106.6 | 143.3 | 166.2 | 181.3 | 182.8 |
| Total (in thousand) | 20.6 | 32.2 | 49.3 | 49.4 | 79.2 | 90.0 | 104.4 | 126.2 | 135.2 | 170.3 | 182.8 | 193.4 | 195.4 |

Source: BRTA




Source: BRTA

**Figure 4.10 Change of Number of Private Cars in GDA**

The Government is trying an effort 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 is more than 5 years old and in case of importing reconditioned car duties are applicable depending on its age. To import a car in 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, over-all tax burden in importing a private car may varies from around 100% to 600% which is the reason of sudden decline on number of newly registered private cars since 2010 as shown in Figure 4-10.

At present, the Government is encouraging importing of environment friendly cars by decreasing the supplementary duty for hybrid cars.

Major problems of car in GDA are:

- Lack of parking spaces inside shopping malls, big hospitals, super shops, restaurants
- Residential apartments mostly do not have visitor's car parking
- CNG driven cars need to wait longer time for filling CNG on the main road which creates traffic congestion

Some cars violate traffic rules like driving through opposite direction, traffic signal violation etc.

Private car running through opposite direction

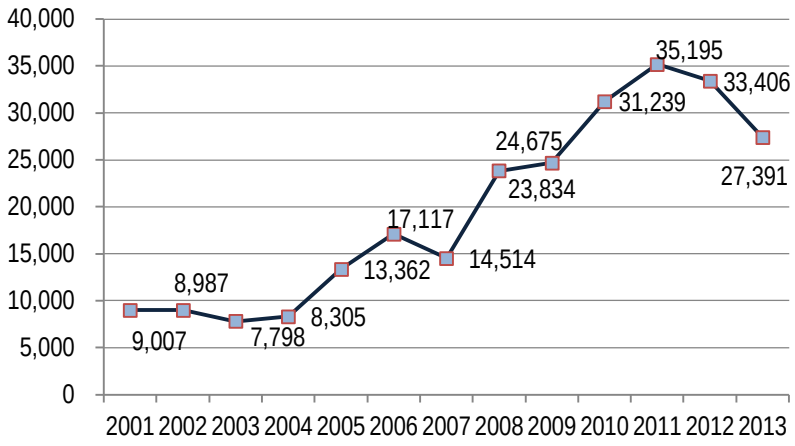
Long queue for CNG makes the road width narrow

**Figure 4.11 Common Problems Created by Private Car**

(2) Motorcycle

Motorcycle is becoming a popular mode of transport in Dhaka city as it can be driven through a narrow space and considered to be a useful transport to reach the destination in the midst of the city's 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, Runner which assemble motorcycle parts and sell at lower price. In 2011, the Government had increased up to 45% the supplementary duty of importing complete unit of motorcycle which resulted to a decreasing number of new motorcycles as shown in Figure 4-12. The Government initiated a policy to encourage motorcycle assembly industry but most of the people prefers for an imported motorcycles.




Source: BRTA

**Figure 4.12 Trend of Yearly Newly Registered Motor Cycles in GDA**

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

- Some motorcycle riders take the footpath
- Frequent disobedience of traffic signals

- Frequently disobey the lane driving, which creates safety issues
- Lack of safety concern such as riding a motorcycle without wearing a helmet
- Due to lack of proper parking spaces, motorcycles are parked illegally


Motorcycles on footpath

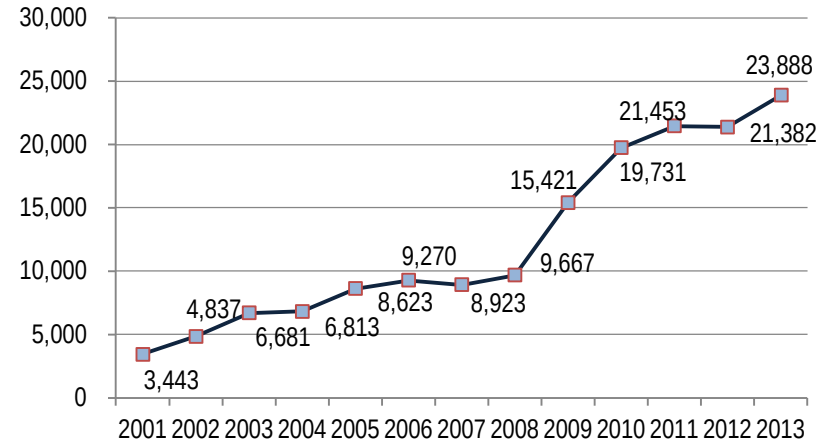
Violation of traffic signal

Motorcycle towards opposite direction

**Figure 4.13 Violating Traffic Rule by Motorcyclists**

(3) Truck

Truck is an important mode to transport goods within the districts of Bangladesh. In 2004-05, modal split of freight transportation was around 90% by road whereas only 3.7% by rail and 6.5% by water between two most important districts of Bangladesh: Dhaka and Chittagong (Source: DHUTS). There are different types of trucks in Bangladesh depending on carrying capacity: 1.5 ton, 3 ton, 5 ton and 10 ton. Aside from these trucks there are also covered van and trailer truck which are used for carrying containers. These vehicles are operating within Dhaka, Chittagong and other major districts to transport goods.




Source: BRTA

**Figure 4.14 Number of Trucks in GDA from 2001 to 2013**

The number of truck trips within Dhaka city is increasing every year. In 2009, a total of 28,706 trips were calculated within 24 hours (Source: DHUTS). Due to traffic congestion, Dhaka Metropolitan Police issued an order last July 2012, restricting trucks from entering

Dhaka city on a specified time table, thus trucks can only enter inside DMP area between 21:30 and 8:00. Meanwhile, DMP provides special permission to some trucks considering national importance like carrying government products. Trucks involved in construction work for government infrastructure projects are also allowed anytime inside the city. While trucks carrying export products can anytime use DIT road of Dhaka for going out and entering the city.

There are six major truck terminals in RAJUK area: Aminbazar, Dayaganj, Mohammadpur, Tejgaon, Shimrail and Kachpur.

**Table 4.3 List of Truck Terminal in RAJUK Area**

| Name of the Terminal | District | Capacity | Daily parking charge |
|---|---|---|---|
| Aminbazar | Dhaka | About 1000 | 20 Taka |
| Mohammadpur | Dhaka | About 500 | Free |
| Tejgaon | Dhaka | About 1200 | 20 Taka |
| Doyaganj | Dhaka | About 700 | 20 Taka |
| Shimrail | Narayanganj | About 1200 | 20 Taka |
| Kachpur | Narayanganj | About 500 | 20 Taka |

Source: Dhaka City Corporations

Some common issues regarding trucks are:

- Long wait at the entrance of Dhaka city till 21:30, at this time the entrance of Dhaka city becomes congested as many trucks are entering together.
- Very often trucks carry goods more than their capacity. These overloaded trucks create significant damage to city roads and bridges.
- Involvement of trucks in road accidents is quite common.
- Over speeding of some truck drivers.

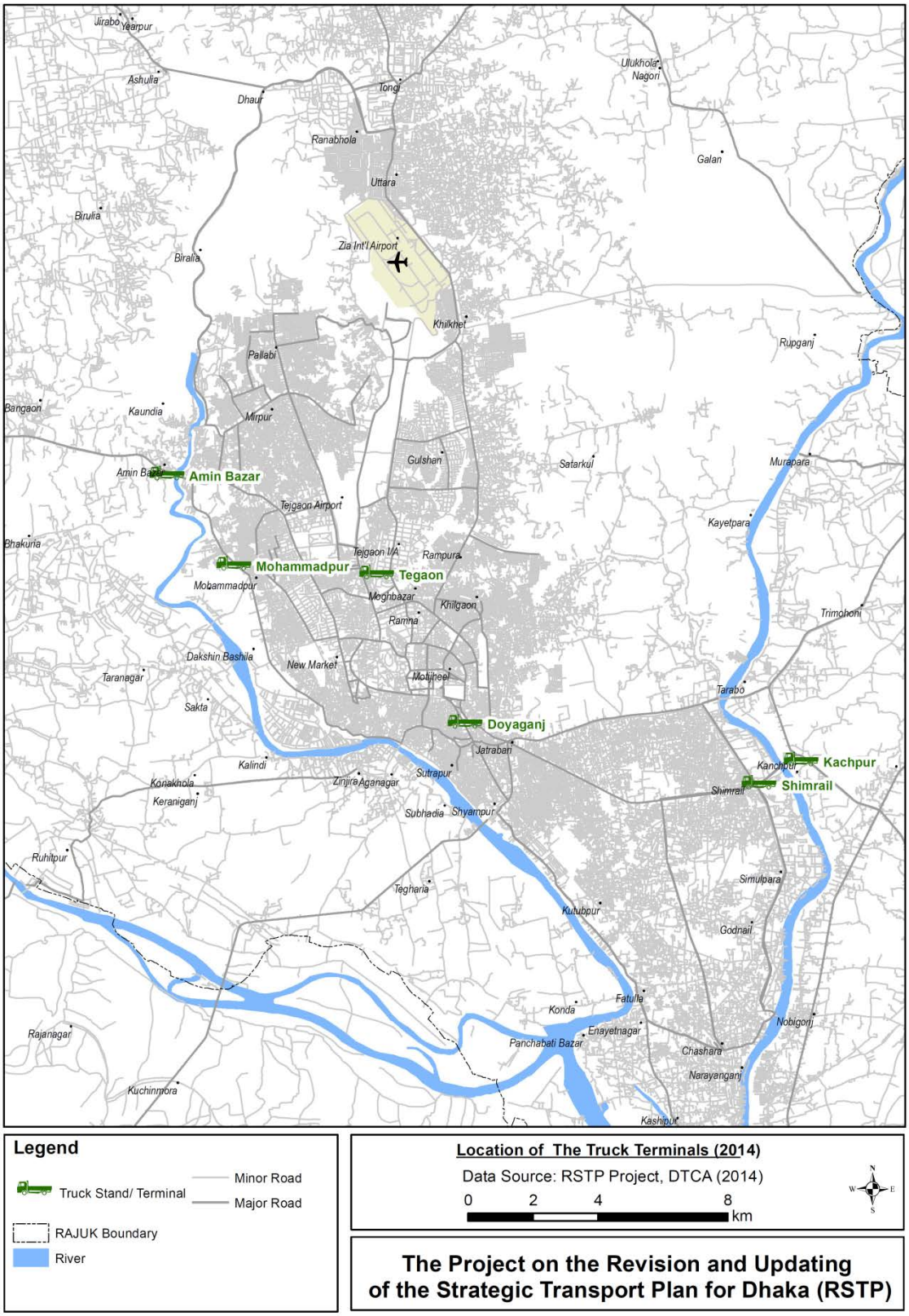
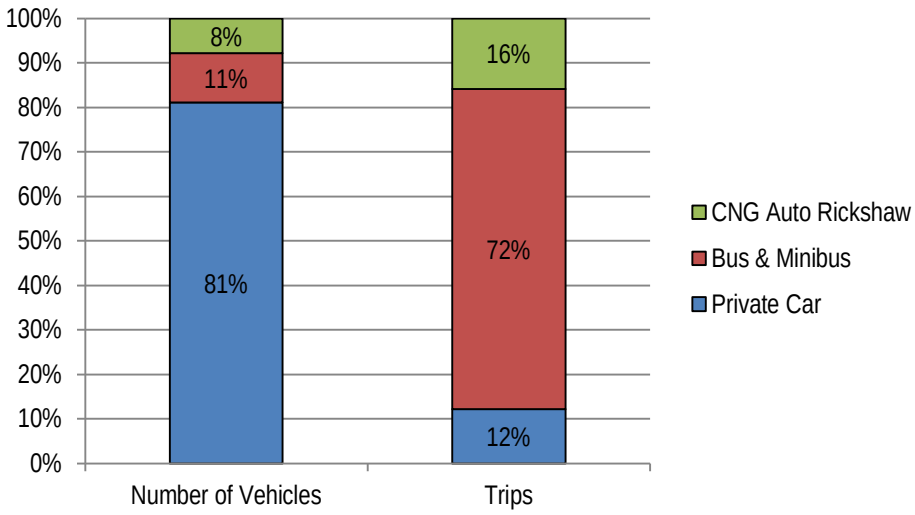



**Figure 4.15 Location of the Major Truck Terminals**

## 4.4 Public Transport

Main mode of public transport in GDA are bus, human hauler, train, water vessel, taxi cab, CNG and rickshaw. Recently, a new type of vehicle locally known as 'easy bike' which is basically battery operated rickshaw is also included to the public transport fleet in some areas.

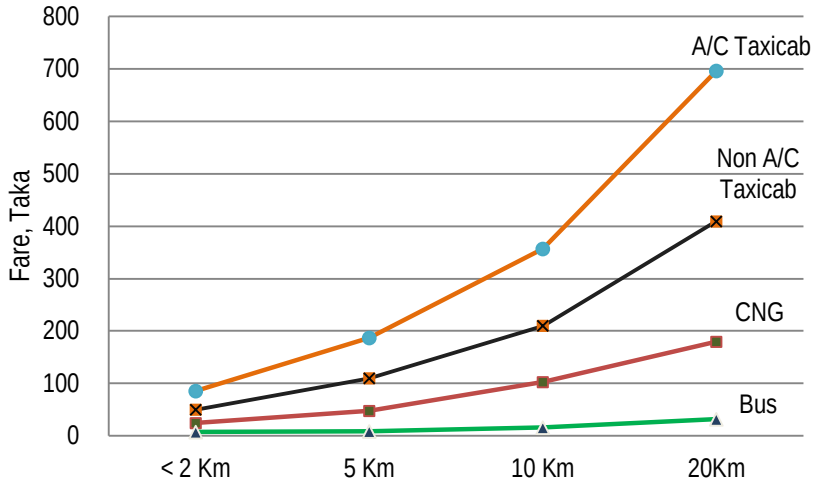
In Figure 4-16, generated trips by private cars, different types of buses and CNG in 2009 are shown with registered vehicles of each type. Buses and minibuses are generating 72% of person trips with only 11% of the share in registered vehicles.




Source: DHUTS & BRTA

**Figure 4.16 Modal Share and Generated Trips of Motorized Vehicles in 2009**

Public transport fare rate is under the regulation of 'Bangladesh Road Transport Authority' (BRTA), an agency formed by the Government. The fare structure of public transport is depicted in Figure 4-17.




Source: BRTA Website

**Figure 4.17 Comparative Analysis of Different Public Transport Fare**

Among all the public mode of transport, bus is the cheapest in Bangladesh. Although it has been regulated that CNG and Non A/C Taxicab should be operating by meter, practically most of the drivers negotiate with the passengers and occasionally charge even double which makes the passenger pay more than the indicative graph shown in Figure 4-17.

(1) Bus and Minibus

Currently, bus and minibus are the main mode of transport for dwellers of GDA. The number of bus routes is increasing every year to meet the travel demand of the people. However, the number of trips is still insufficient to meet the present demand. One of the reasons of low bus trips in GDA is inability to complete the planned daily trips due to traffic congestion.

According to Bangladesh law, 'Mini-bus' means any motor vehicle constructed or adapted or used to carry not more than 30 persons excluding the driver. If the number of passengers exceeds 30 persons excluding the driver then it is considered as bus. The number of registered buses is increasing than the mini-buses. In 2003, minibus has a bigger share compared with bus however the number has totally changed as the government encourages the introduction of large buses into the public transport system of Dhaka. In particular, importing of CNG driven buses has been encouraged in the national budget for the last few years.

**Table 4.4 Buses and Minibuses (in thousand) in GDA (2001-2013)**

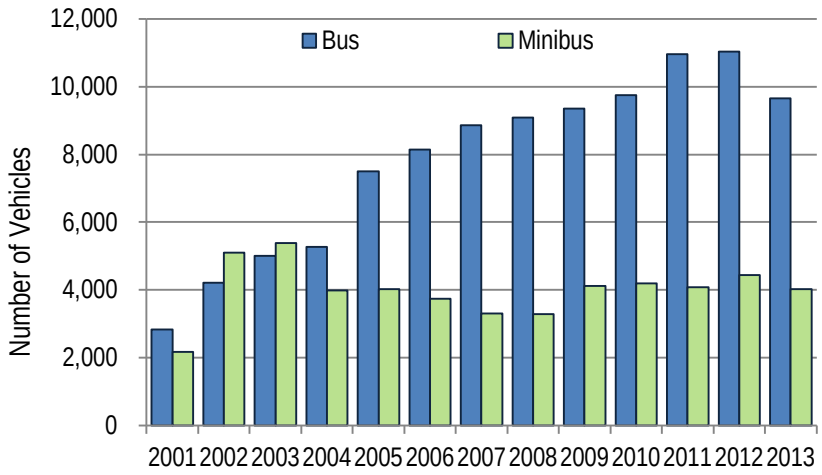
| **New Registered** | **'01** | **'02** | **'03** | **'04** | **'05** | **'06** | **'07** | **'08** | **'09** | **'10** | **'11** | **'12** | **'13** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bus | 1.2 | 1.3 | 0.7 | 1.0 | 1.2 | 1.1 | 1.4 | 1.1 | 1.4 | 1.3 | 1.5 | 1.2 | 1.0 |
| Minibus | 1.1 | 2.3 | 1.1 | 0.4 | 0.3 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 |
| Sub-total | 2.3 | 3.6 | 1.8 | 1.4 | 1.5 | 1.3 | 1.5 | 1.3 | 1.6 | 1.6 | 1.7 | 1.3 | 1.1 |
| **Fitness Renewed** | | | | | | | | | | | | | |
| Bus | 1.7 | 2.9 | 4.3 | 4.3 | 6.3 | 7.0 | 7.4 | 7.9 | 8.0 | 8.5 | 9.4 | 9.8 | 8.7 |
| Minibus | 1.1 | 2.8 | 4.3 | 3.6 | 3.7 | 3.6 | 3.2 | 3.1 | 3.9 | 3.9 | 3.9 | 4.3 | 3.9 |
| Sub-Total | 2.7 | 5.7 | 8.6 | 7.8 | 10.1 | 10.6 | 10.6 | 11.0 | 11.9 | 12.4 | 13.4 | 14.1 | 12.6 |
| Total | 5.0 | 9.3 | 10.4 | 9.3 | 11.5 | 11.9 | 12.2 | 12.4 | 13.5 | 13.9 | 15.0 | 15.5 | 13.7 |

Source: BRTA

Bus

Minibus

**Figure 4.18 Difference of Bus and Minibus**




Source: BRTA

**Figure 4.19 Share of buses and minibuses from 2001 to 2013 in GDA**

There are basically two types of bus operator in GDA: one is Bangladesh Road Transport Corporation (BRTC), a government owned company and the other is a mixture of many small entities which are considered as private companies. BRTC is serving the nation in initiating buses into different route including inter-district and intra-city trips. All buses in Dhaka city are operated by CNG but there are some BRTC buses which run by diesel.

An intercity permission known as “Route Permit” is required to operate buses at certain route. The route permit for public buses is being issued by Bangladesh Road Transport Authority (BRTA). At present, BRTA has a plan of 182 routes within the RAJUK area and out of these, 155 routes are currently operational with a total of 6,458 buses. Right now, BRTC city buses are operating in 11 routes within Dhaka city. This year BRTC introduced 50 articulated buses which can carry more than 80 passengers at a time. From 2008 to 2013, 530 CNG driven non A/C buses, 290 double decker buses and 88 Air-Conditioned buses were added into the BRTC fleet. Meanwhile, air-conditioned city buses are operating only at one route which is from Mothijheel to Uttara. BRTC is now importing buses from China, India and South Korea. They were previously operating Volvo (made in Sweden) double-decker buses but rcurrently out of operation due to maintenance issue.

Double Decker Bus


Articulated Bus


Air Conditioned Bus

**Figure 4.20 Different Types of Buses Operated by BRTC**

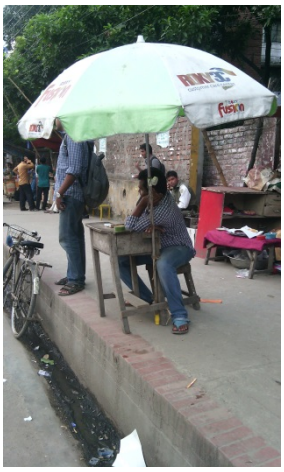
Both private and BRTC buses in Dhaka can be divided into two categories:

- Buses with ticket counters at regular interval en route also known as “counter bus” or “ticket bus”. Passenger of this bus has to purchase the ticket beforehand and wait till the bus arrives. Once it arrives, the passenger will just have to show the ticket and get into the bus. This service started almost 15 years ago in Dhaka city by some private bus company and became very popular that it spread throughout different routes of GDA. Right now, BRTC is also providing this type of service. However, the cost of the ticket is a bit expensive as some of the buses do not sell tickets for short distance.
- The other type is known as “local bus” where passengers can get into the bus by just raising the hand as a signal to the conductor of the bus. The fare has to be paid by the passenger while inside the bus and it’s also cheaper than the counter bus, consequently the level of service is also lower compare to counter buses.

There is another special type of bus service known as ‘Gate Lock’ in Mirpur area. Basically, they have some fixed stop areas where passengers can take a ride by getting into the line and this type of bus service doesn’t allow to take more passengers than its seating capacity. At certain stop, the bus is checked by a checker appointed by the company and once the checking is done, the gate is supposed to be closed where no new passenger can get into the bus. Also, the fare is fixed for certain distance.

Through a new project JICA introduced smart card system for fare collection in Dhaka in 2012. The card is known as SPASS and was initially introduced in all BRTC air-conditioned buses and selected non A/C bus routes. The passenger has to swipe the card twice on a reading machine hold by a person inside the bus.

Ticket Counter Operated by BRTC



Bus Ticket Counter Operated by Private Company

Waiting for bus after purchasing tickets

**Figure 4.21 Different Types of Ticket Counter for Bus**

In Dhaka city, there are 3 inter-district bus terminals where buses depart towards different districts of Bangladesh: Sayedabad, mohakhali and Gabtoli. Aside from these, in Gulistan there is a bus stand where passengers can take buses towards south east direction from Dhaka. Some inter-district buses also start from Fakirapul, Kalabagan, Kallayanpur and Abdullahpur (near Uttara). Ten years ago, all inter-district buses were allowed to enter Dhaka city and take passengers from these locations. But presently bus companies provide mini-buses to carry passengers from here to main terminal. There is no designated bus terminal for city buses in Dhaka city which creates traffic hazards as

most of the buses are parked along the road. Meanwhile, BRTC has five bus depots in different location of Dhaka city.

**Table 4.5 Summary of the Inter-District Bus Terminals**

| Name | Area | Capacity | Daily Trips | Number of routes |
|---|---|---|---|---|
| Sayedabad | App. 40,500m2 | App. 500 | App. 2000 | 87 |
| Mohakhali | App. 36,400 m2 | App. 300 | App. 800 | 60 |
| Gabtoli | App. 123,400 m2 | App. 700 | App. 2200 | 61 |

Source: DNCC, DSCC& BRTA

Gabtoli Inter-district Bus Terminal

BRTC Bus depot Kallayanpur

City Bus stand at Gulistan

**Figure 4.22 Inter-district Bus Terminal and Bus-stands**

The latest fare change for Dhaka city was implemented in September 2011. 'Regional Transport Committee' is the committee responsible for the fare regulation of public bus service. The committee determines two fares, considering CNG price hike and incremental cost of vehicle spare parts: minimum fare and per kilometre fare.

**Table 4.6 Fare of Bus and Minibus in Dhaka City**

| Type | Minimum Fare | Fare/kilometre |
|---|---|---|
| Bus | 7 taka | 1.60 taka/kilometre |
| Minibus | 5 taka | 1.50 taka/kilometre |

Source: BRTA website

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

- Absence of proper bus stops
- Some of the bus stops are illegally occupied by the hawkers.
- Almost no bus stops signage that leads bus drivers the tendency to stop anywhere
- Buses make U-turn at the midblock sections which creates traffic congestion
- Impolite behaviour of the conductors
- Dirty and broken seats
- Broken window and poor condition of bus body
- No advance information of arrival or departure of buses
- No designated parking space for city buses
- No provision for barrier free use

- Competition between bus drivers to reach the destination and to get the passengers
- Some of the bus drivers drive the bus at high speed
- Passengers getting off from the bus in the middle of the road
- Lack of proper repair of the bus leads to dilapidated condition
- Most of the buses do not have regular check-up
- Absence of own workshops of the bus companies

Passenger getting off in the middle of the road

Old and dilapidated bus

Roadside parking of city buses


U-turn of large bus creates congestion

**Figure 4.23 Problems of bus in Dhaka in picture**

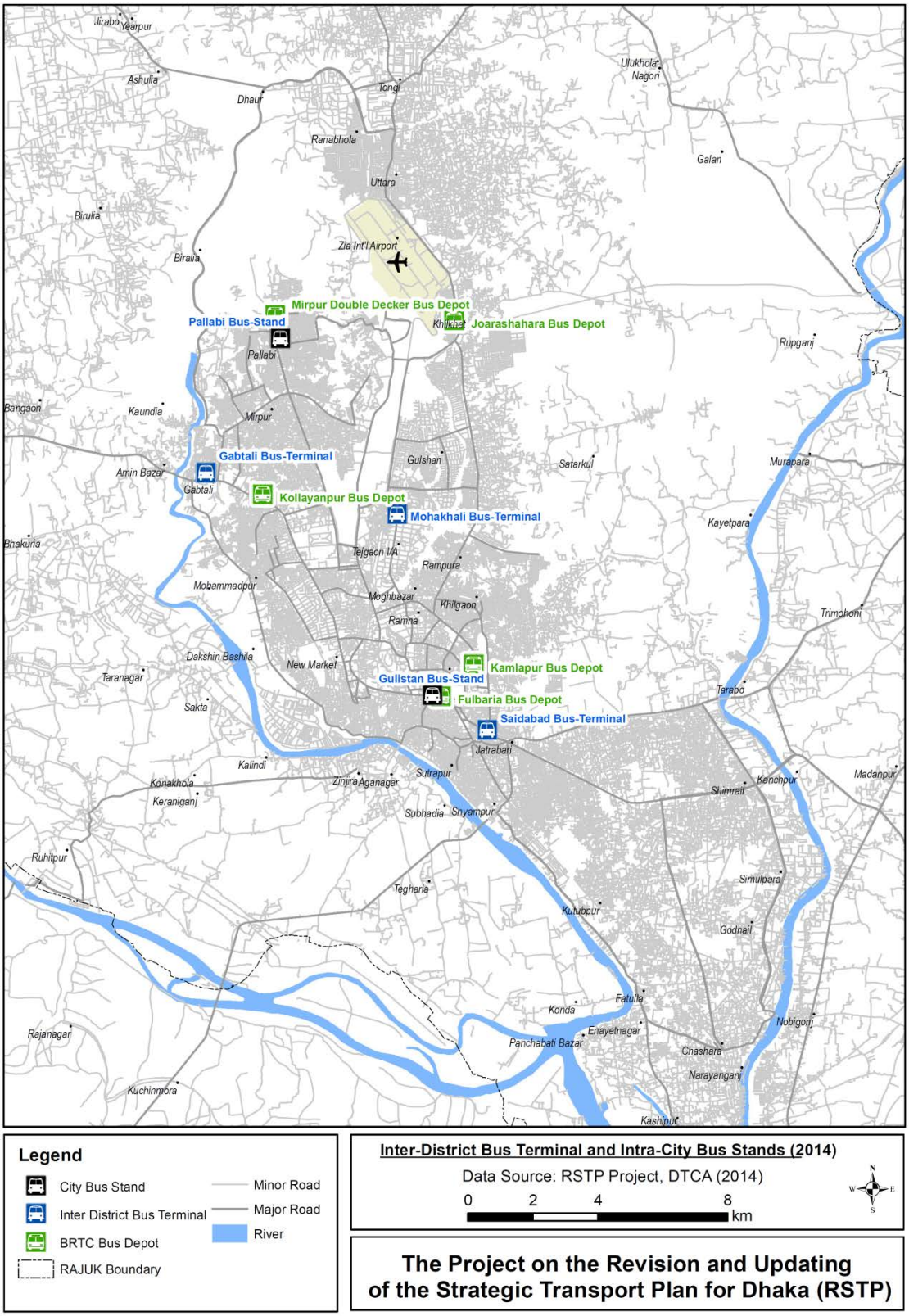



**Figure 4.24 Inter-District Bus Terminal and Intra-city Bus Stands in Dhaka**

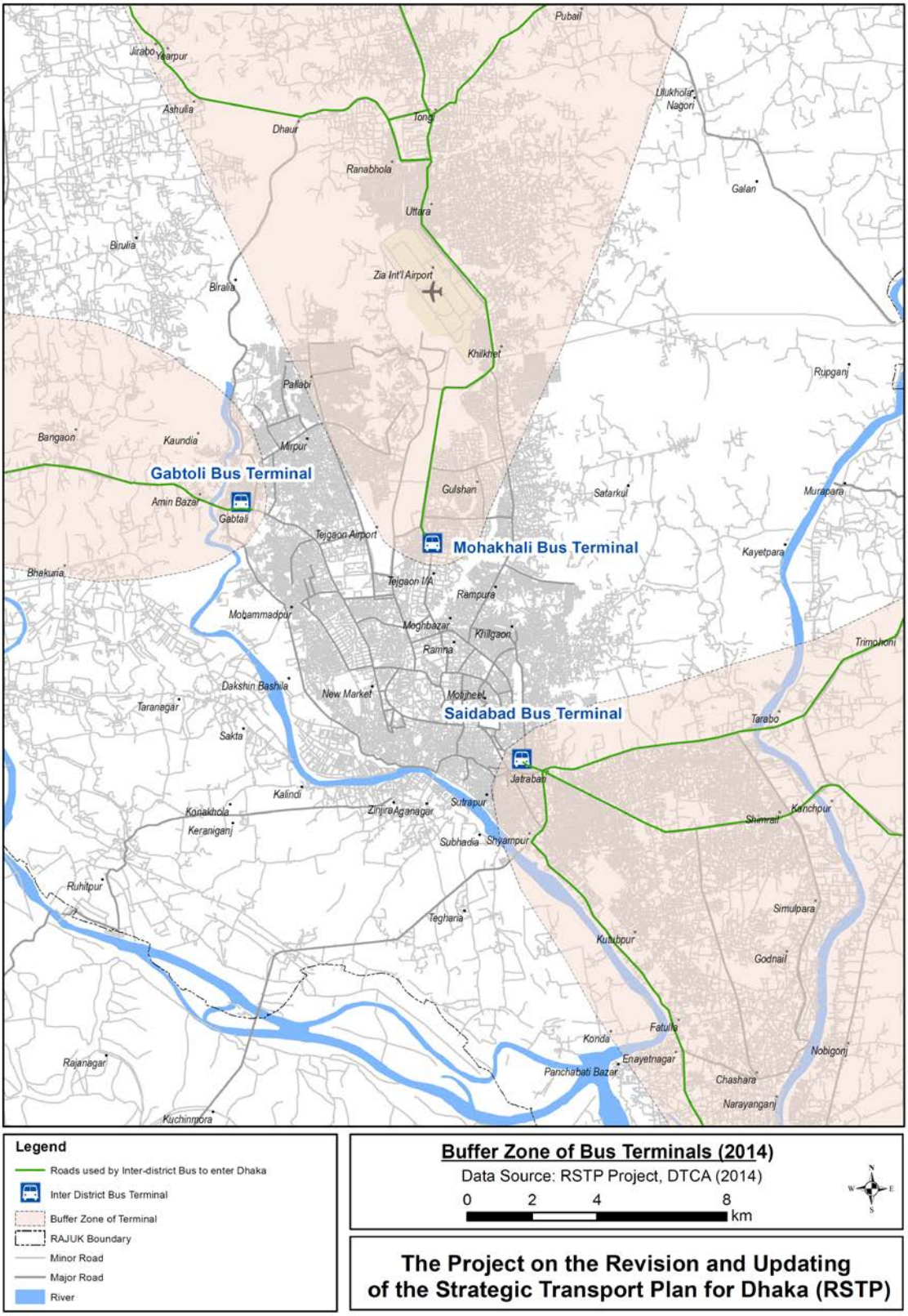



**Figure 4.25 Buffer Zone of the Inter-District Bus Terminal**

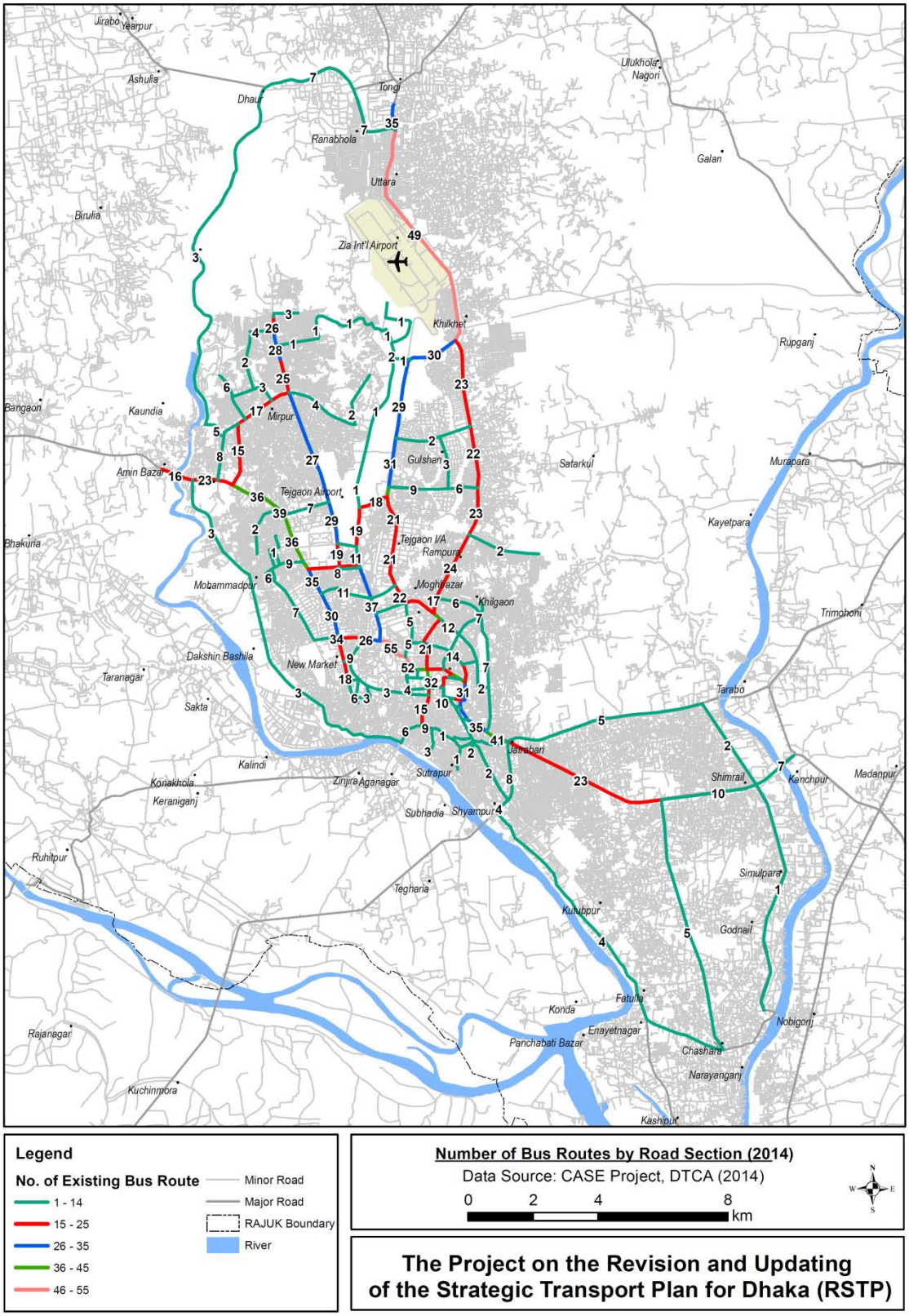



**Figure 4.26 Number of Bus routes by Road Section**

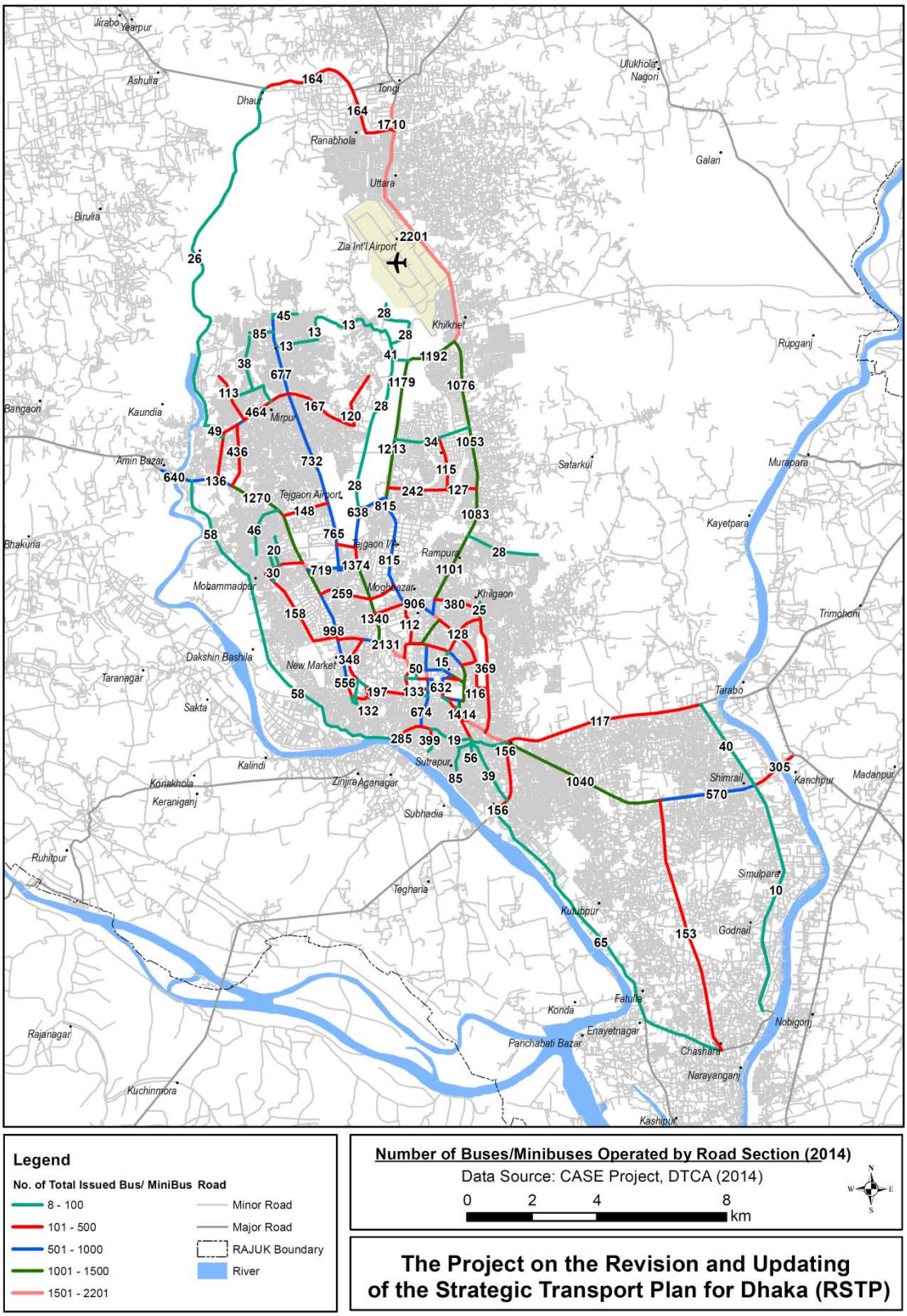



**Figure 4.27 Number of Buses/ Minibuses Operated by Road Section**

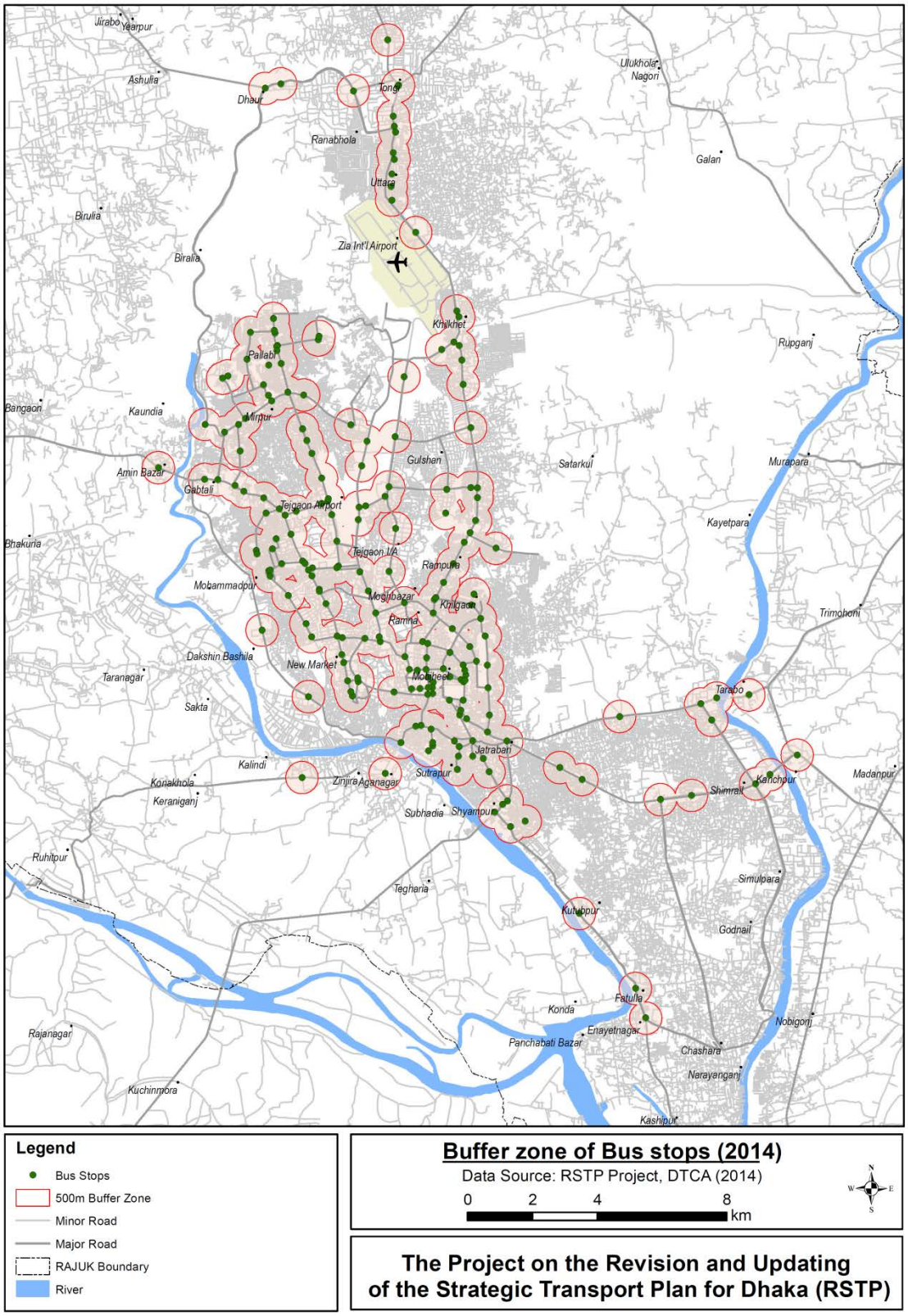



**Figure 4.28 Buffer zone of the Bus Stops**

(2) Human Hauler

Human hauler, which is smaller size than buses, is another type of public transport in Dhaka. Like the bus regulation, BRTA also issues route permission to Human Hauler services. As per BRTA records (March 2014), there are 106 planned routes for human haulers within Dhaka city and out of these, only 34 routes are currently operating with at least 1,733 human haulers on service. Different types of human haulers are: Tempoo, Bondhuparibahan, Laguna, Champion etc. Seating capacity of Tempoo and Laguna is around 10 to 12 persons while Bondhuparibahan and Champion have 14 to 20 seating capacity.

Laguna Bondhu Paribahan Champion

**Figure 4.29 Different Types of Human Hauler in Dhaka city**

Some human haulers are operating on the same route which is under bus operation and therefore sometime leads to a competition on taking passengers. Since it is smaller than buses, it can be easily filled with passengers without long wait. This is the reason why some users prefer human hauler whenever they want to travel faster.

Some common issues regarding human hauler are listed as below:

- Create side friction against traffic flow when waiting for the passengers in the middle of the road.
- Competing for passengers with buses and other human haulers create safety concern.
- In peak hours, most of the human haulers carry standing passengers which is unsafe.
- No designated parking space for the human haulers in Dhaka city.

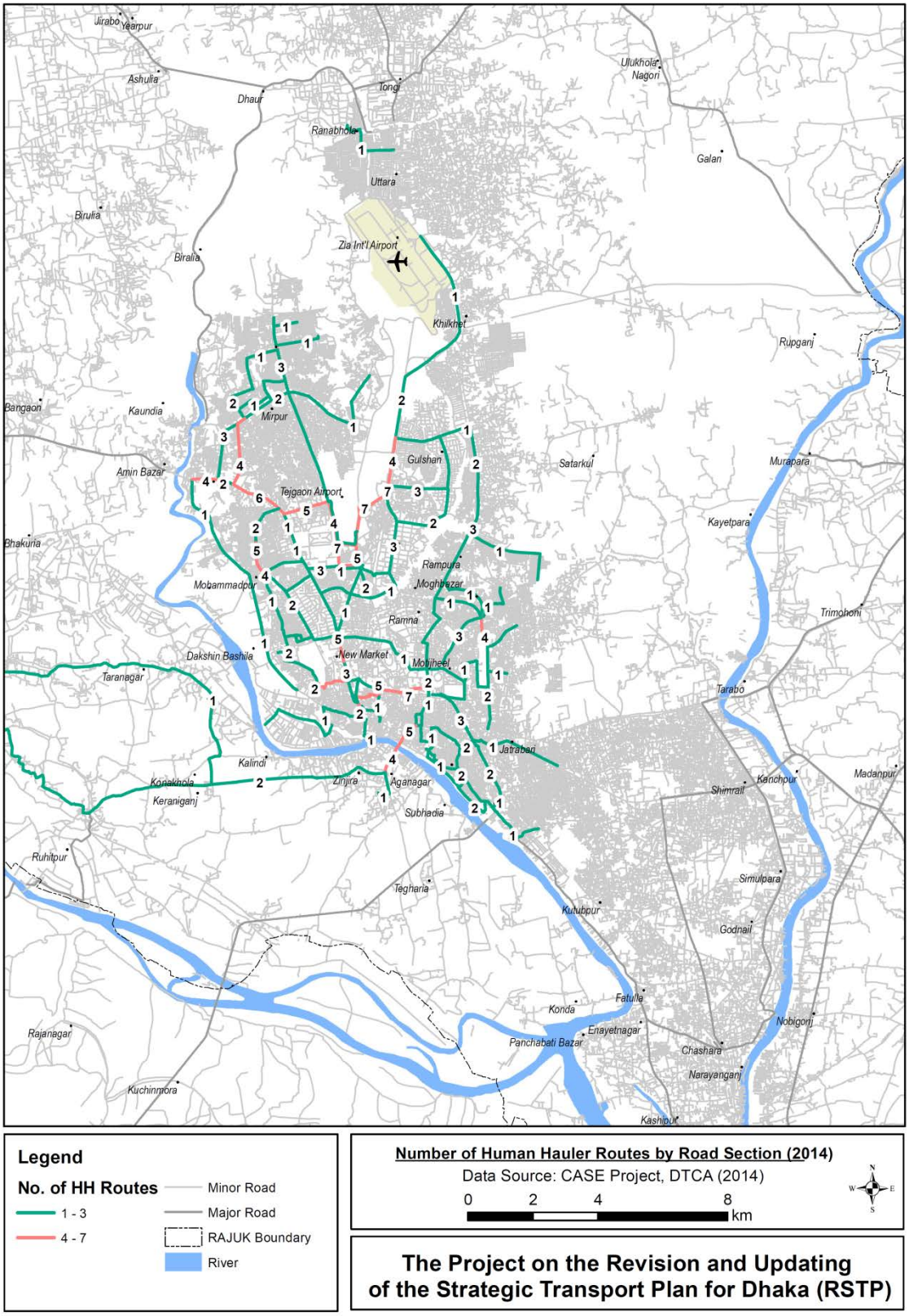



**Figure 4.30 Number of Human Hauler Routes by Road Section**

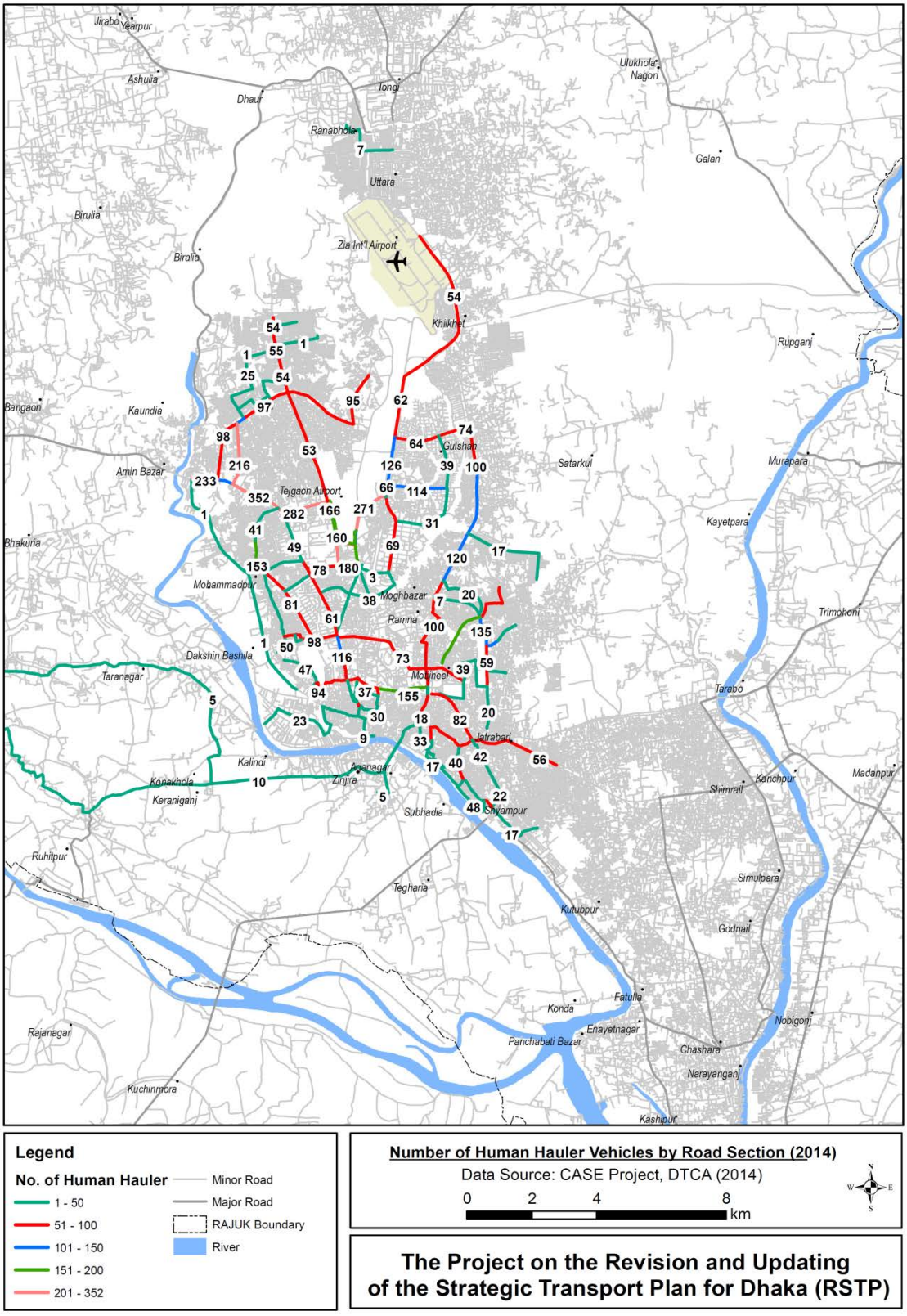



**Figure 4.31 Number of Human Hauler Vehicles by Road Section**

(3) Train

Cost and safety are the two main reasons why Bangladesh people use train as a transport. Train's fare is cheaper than that of buses and it is considered as a safer mode of transport since the number of accidents and casualties is very low compared to buses. However, some people are hesitant to take train due to sudden delay as most of the rail network in Bangladesh is single track, so if any accident occurs all train operation are affected.

Train service of Bangladesh is basically divided into two categories: Intercity and Mail. Commuter train is listed under mail train. These trains have several types of seating capacity depending on the route and train. Most exclusive one is the air-conditioned room which has sleeping arrangement and fare is almost 13 times higher than the cheapest class on the same route.

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

**Table 4.7 Summary of Commuter Train Fare of RAJUK Area**

| **Commuter Route: Dhaka (Kamalapur) - Joydevpur** | | | | | |
|---|---|---|---|---|---|
| From | To | Distance | Regular Fare | Special Fare | Stations |
| Kamalapur | Airport | 22 Km | 10 Taka | 35 Taka ; Intercity Train* | Tejgaon, Dhaka Cantonment |
| Kamalapur | Joydevpur | 39 Km | 15 Taka | | Tejgaon, Dhaka Cantonment, Tongi, Dhirasram |
| **Commuter Route: Dhaka (Kamalapur) - Narayanganj** | | | | | |
| From | To | Distance | Regular Fare | Special Fare | Stations |
| Kamalapur | Cahra | 14.5 Km | 8 Taka | 15 Taka ; Diesel Electric Multiple Unit (DEMU)Train | Gandaria, Fatullah |
| Kamalapur | Narayanganj | 16.1 Km | 10 Taka | | Gandaria, Fatullah, Cahra |

*Intercity trains do not stop at all the stoppages

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 Cahra are commuting to Dhaka by commuter trains. Currently, Bangladesh Railway is conducting two different projects, under which Dhaka-Narayanganj rail line will be upgraded to double tracks (up and down) and Dhaka-Joydevpur rail line will be upgraded to double-double tracks. After completion of these projects, frequency of the commuter train is expected to increase.

Kamalapur, the main terminal of Dhaka is located at the centre of Dhaka city and is known to be the largest station in Bangladesh. Another large station where a quite high number of passengers going 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 towards different direction of Bangladesh. Basically, all the trains that start from Kamalapur will have a 5-minute-break at Airport station. So these two stations are very important from multimodal integration

point of view. Daily 44 pairs of passenger trains are going to and fro Kamalapur station except Narayanganj commuter trains.

Most common train related issues related are as follows:

- Low timeliness service of train arrival and departure
- Station waiting room for the passengers are poor
- Demand of train tickets is higher than the availability, so shortage of tickets of inter-city trains creates disturbances.
- In Dhaka city there are 29 level crossings between Kamalapur and Tongi section (Source: Railway Master Plan, 2013), which need to be closed 88 times daily when the trains pass. This makes the road traffic congestion condition vulnerable.
- Some of the passengers do not want to buy tickets and travel by train as the ticket system is still paper based, this kind of system loss is quite significant.

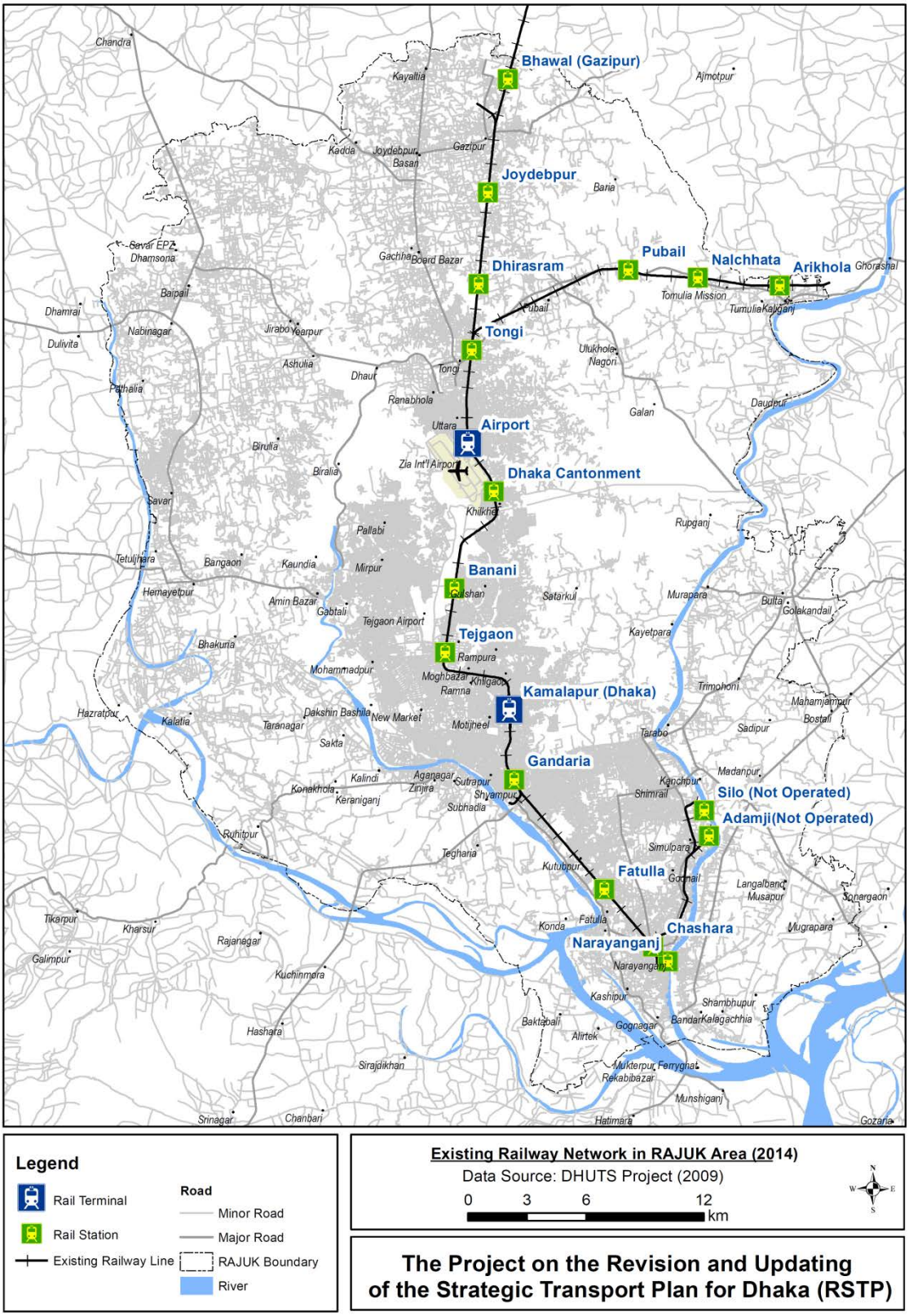



**Figure 4.32 Existing Railway Network in RAJUK area**

(4) Water Transport

In Bangladesh, transport via water plays an important role, particularly for people from the southern district who uses different types of water transports like launch, ferry, steamer etc. to come to Dhaka.

All long distance water vessels towards Dhaka arrives at the main water terminal called “Sadarghat”. At present, there are 48 different long distance routes from Sadarghat to other districts in Bangladesh. Out of these 48 routes, 3 routes are for both private and government operated water vessels, 7 routes are only for government operated vessels and 38 routes are for private operated water vessels. Bangladesh Island Water Transport Authority (BIWTA) is responsible of issuing the route permit and fare regulation while Bangladesh Island Water Transport Corporation (BIWTC) is responsible of operating government owned water vessels.

Long distance water vessels usually contain two classes: Deck class and Upper class. Upper class provides different types of facilities like bed, air condition etc. depending on the route and company. Upper class fare is usually 2-4 times higher than deck class.

**Table 4.8 Fare system of the Deck Class of Water Transport in Bangladesh**

| Item | Fare |
|---|---|
| First 100 Km | 1.70 Taka/Km |
| From 101 Km | 1.40 Taka/Km |
| Minimum Fare/person | 18 Taka |

Source: BIWTA Website

As Dhaka is surrounded by the Buriganga, Dhaleswari, Turag, Balu and Shitalakhya, introducing water transport service is highly potential. Based on the recommendation of Dhaka Integrated Transport Study (DITS, 1994), the project of circular waterway underwent. The construction was completed in two phases. 1st phase from Sardaghat to Ashulia(29.50 Km) was completed in 2005 and 2nd phase from Ashulia to Kachpur(40.50 Km) was completed in 2013.

Currently, BIWTC is operating water buses using this circular waterway around Dhaka. The planned route for the service was Sadarghat to Kachpur via Gabtoli, Tongi and Kanchpur. Description of the route is described in Table 4.9in details.

**Table 4.9 Description of Circular Waterway around Dhaka**

| Route | From | To | Length of Route (KM) | Width of Channel (M) | Depth of Channel (M) |
|---|---|---|---|---|---|
| 1 | Sadarghat | Mirpur Bridge | 16 | 60 | 4.28 |
| 2 | Mirpur Bridge | Ashulia Bridge | 13.50 | 37 | 2.44 |
| 3 | Ashulia Bridge | Kachpur | 40.50 | 37 | 2.44 |

Source: BIWTA

In 2004, BIWTC launched the water bus service in between Sadarghat and Gabtoli but was postponed due to lack of passengers. The reasons identified for the lack of passengers are inadequate frequency, insufficient intermodal facilities etc. In 2010, the service was resumed with only two water buses which eventually got shut down due to lack of landing facilities, inadequate trips and higher fares compare to buses. From these two failure stories it was learned that unless the frequency is increased, the service wouldn’t be popular to majority of people. BIWTC arranged 4 new waterbuses (81 seats) and BIWTA started to dredge the river to ensure continuous flow of water. Finally, BIWTA

resumed the service from July 2013 between Sadarghat and Gabtoli with 6 water buses. Lowest fare of this service was set at 10 taka, whereas the maximum was 40 taka. At this stage, the service is having financial loss as still the number of passengers is quite low. Nevertheless, BIWTC is planning to increase the number of waterbuses to twelve by this year.

Water Bus of BIWTC

Landing Terminal at Gabtoli

**Figure 4.33 Current Condition of Circular Waterway**

**Table 4.10 Fare of Water buses between Sadarghat and Gabtoli**

| Sl.No. | Station to Station | General Fare | Express Fare |
|---|---|---|---|
| 1 | Sadarghat/Badamtoli to Sowarighat | 10Taka | - |
| 2 | Sadarghat/Badamtoli to Kholamura | 20 Taka | - |
| 3 | Sadarghat/Badamtoli to Bashila | 30 Taka | 40 Taka |
| 4 | Sadarghat/Badamtoli to Gabtoli | 40 Taka | 50 Taka |
| 5 | Sowarighat to Kholamura | 20 Taka | - |
| 6 | Sowarighat to Bashila | 30 Taka | - |
| 7 | Sowarighat to Gabtoli | 35 Taka | - |
| 8 | Kholamura to Bashila | 20 Taka | - |
| 9 | Kholamura to Gabtoli | 30 Taka | - |
| 10 | Bashila to Gabtoli | 20 Taka | 30 Taka |
| 11 | Gabtoli to Sadarghat/Badamtoli | 40 Taka | 40 Taka |

Source: BIWTA

With the failure to attract the 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, the number of trips of water vessels carrying sand or soil is decreasing 2000 daily truck trips which are supposed to enter the city.

Some of the issues related to passenger service of Circular Waterway in Dhaka are:

- Inconvenient waiting facilities
- Lack of intermodal facilities from the stations
- Lack of publicity is one of the reasons for less passengers
- Quality of river is very bad and smelly
- Insufficient approach roads to the stations
- Low height of bridges at some locations cause difficulty to have access of big water buses
- River is too narrow and shallow in some point

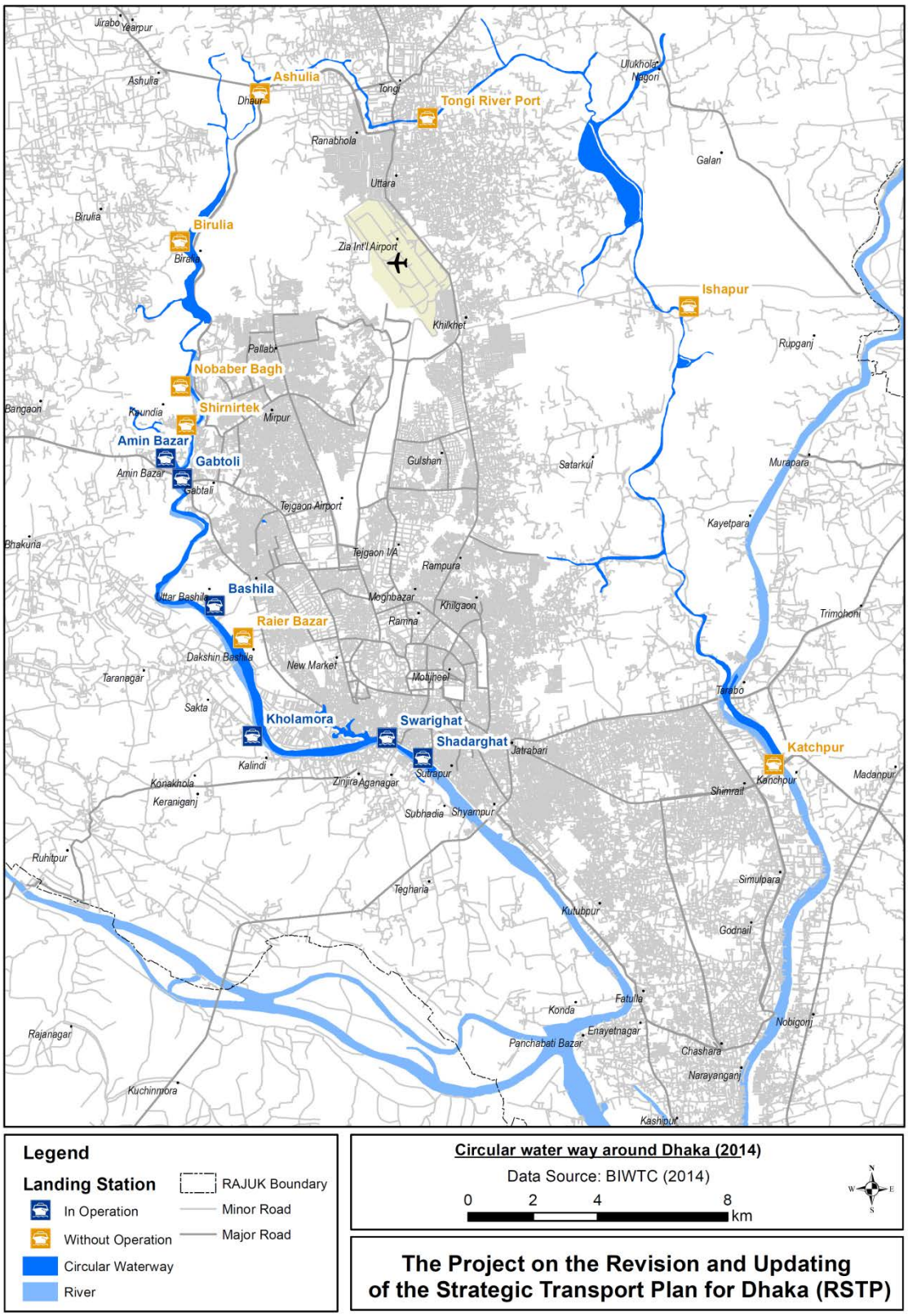



**Figure 4.34 Circular water way Network around Dhaka**

(5) Taxi cab

Taxi-cab service was launched in Dhaka city almost 16 years ago. There are two types of taxi cabs: Air Conditioned and Non-Air Conditioned. All the air-conditioned (A/C) taxicabs are yellow coloured and non A/C cabs are black or blue coloured. Most of the old taxicabs are in a very poor condition or low service quality and mostly are non-air-conditioned. Many of the old taxi cabs are now already off-road due to poor maintenance service. Some dilapidated cabs are still running in the roads with a pale gesture. As per BRTA, in 2013 there were around 9000 taxicabs in Dhaka city.

In April 2014, new taxi cab service was introduced in Dhaka city under two companies: Trust Transport Services and Toma Group. These taxi cabs have different types of modern features such as: air conditioner, radio communications, video recording inside the car, automatic vehicle tracking, on call service, issuing money receipt etc. However, fare of this service is more expensive than any other public transport services in the past.

**Table 4.11 Fare of Taxicab Services in Dhaka**

| Items | A/C Fare | Non A/C Fare |
|---|---|---|
| First 2 kilometre | 85 taka | 50 taka |
| Onwards everykilometre | 34 taka | 20 taka |
| Waiting charge every 2 minutes | 8.5 taka | 5 taka |
| Extra charge for calling Taxi | 20 taka | Service Not Available |

Source: Ministry of communications website and BRTA

Government has a plan to increase the number of A/C taxi cabs up to 600 gradually which will be used in Dhaka and Chittagong Metropolitan area.


New A/C Taxicab Old dilapidated Non A/C Taxicab

**Figure 4.35 Different Types of Taxicabs in Dhaka**

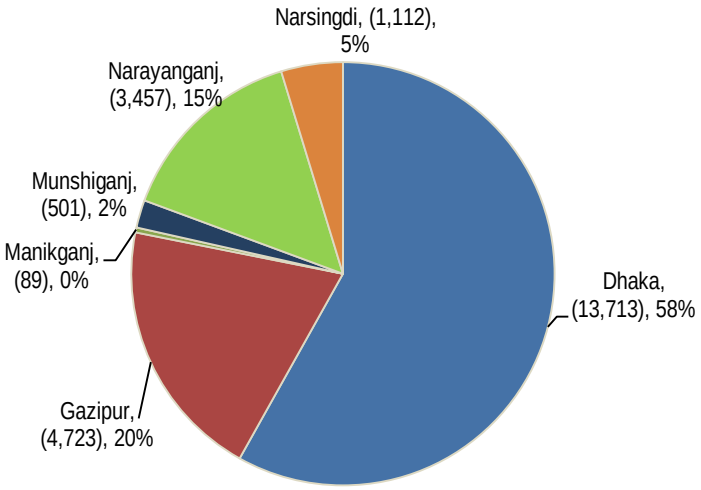
Some common taxicab related issues are:

- Almost all old taxicabs are in quite poor condition such as, broken window, broken door, dirty seat etc.
- Old taxi cab drivers (especially non A/C cabs) do not prefer to use the meter, so passengers has to go through bargain process.
- New taxicabs are presently very few in operation and it is difficult to get when needed.

(6) CNG (Three-wheeler Auto Rickshaw)

Three-wheeler auto rickshaw plays a vital role in public transportation system of Dhaka. Basically there are two major types: CNG and Mishuk. Mishuk is a special type of three-wheeler which was made in Bangladesh and driven with petrol. However, nowadays Mishuk has become very rare. Maximum two persons can sit comfortably in Mishuk whereas three persons in a CNG.

Before 2002, there were around 40,000 auto rickshaws driven by two stroke petrol engines and was known as “Baby-Taxi”. Due to huge air pollution emitted by a baby-taxi, the government decided to have it replaced. In 2002, Bangladesh Government declared to introduce 12,000 three wheelers in Dhaka city that will run by Compressed Natural Gas (CNG). The three wheeler auto-rickshaw is now known as “CNG”, which is also used in this report to describe this type of vehicle, since it is driven using CNG. In 2013, there are around 23.5 thousand CNG’s operating in GDA as per BRTA. Out of these, around 14,000 units are registered in Dhaka district while Gazipur and Narayanganj have also significant numbers of CNG among the other districts of GDA.




Source: BRTA

**Figure 4.36 Share in CNGs (2013) among GDA districts**

The life span of those CNG’s was predicted as 8 years from the time of introduction. However, in 2011, the government extended the life span by adding another 3 years and was supposed to be ended in 2013. But due to some protest from the owners and drivers, the government decided to increase the life span up to 15 years unless the vehicle meets the conditions set Bangladesh University of Engineering and Technology (BUET) which are: full overhauling of engine, replacement of hood cover and seats, necessary repairs of body, suspension and break transmission.

CNG’s are basically owned by an individual unlike the taxicab. The owner leases his CNG to a driver for 8 hours and can officially charge 600 taka but most drivers complain that they have been charged for 800 to 1000 taka by the owner. Another common practice by the CNG owners is, leasing the CNG to two different drivers in a day for an 8-hour shift which will make him earn twice from the same CNG.

**Table 4.12 Current fare system of the CNG**

| Item | Fare |
|---|---|
| First 2 kilometre | 25 taka |
| Onwards per kilometre | 7.64 taka |
| Waiting charge per minute | 1.40 taka |
| Minimum Fare | 25 taka |

Source: Ministry of Road Transport and Bridges website

Though there is an approved fare rate for CNG in Dhaka, most of the time the fare is negotiated between the driver and the passenger which at times being stopped by the traffic police and fined the driver as penalty for not following the rule. The main reason of this kind of monopoly is the demand of CNG is higher than the supply. In 2002, baby-taxis did not have a meter so the fare is always being negotiated between the driver and the passenger. In this regard, the government tried to impose a system of using a meter but due to uncooperative behavior of the drivers and owners, the system is not fully established yet.

CNG Mishuk Easy bike

**Figure 4.37 Different Types of Three-wheeler Auto Rickshaws in GDA**

Some common issues of CNGs are as follows:

- Unwillingness of most of the drivers to use a meter
- Unsafe driving behaviour of the drivers
- Most of the CNG auto rickshaws are in very poor condition: dilapidated body, broken seat etc.

(7) Easy bike

Over the last few years a new type of transport added to public transportation system of GDA. This is basically one type of rickshaw driven with rechargeable battery and is known as ‘Easy bike’. Cheap fare system is the reason of easy bike’s popularity as it can carry 4-6 passengers and the fare will be shared by each passenger, thus if the total fare used to be 20 taka per route then it will just be 5 taka each as it will be shared by all. However, easy bike is not regarded as a vehicle by the Ministry of Road Transport and Bridges and no registered license being issued by BRTA. Therefore, all easy bikes seen in different parts of GDA are illegally operated.

## 4.5 Urban Road Network

(1) Classification and Jurisdiction

1) Administrative Road Classification in Bangladesh

The concept of road classification which is widely adopted by road planners in many countries is classified based on their functions. In Bangladesh, a road classification has also been established as shown in Table 4.13.

**Table 4.13 Administrative Road Classification in Bangladesh**

| Responsible Institution | Classification | Primary Connection/ Function |
|---|---|---|
| RHD | National Highway | Connect the capital city with district headquarters, port cities and international highways |
| | Regional Highway | Connect between district headquarters, main river/land ports, unconnected with highways |
| | Zila Road | Connect district headquarters to Upazila headquarters, or between Upazila headquarters, by main single connection with national/ regional highway, through shortest distance/route |
| LGED | Upazila Road | Connect Upazila headquarters with growth center(s), or between growth centers by main single connection, or growth center with higher road system (national highways, regional highways and Zila roads) with shortest distance/route |
| | Union Road | Connect Union headquarters with Upazila headquarters, growth centers or local market |
| | Village Road (Type A) | Connect villages to Union headquarters, local markets, farms and ghats, or with each other |
| | Village Road (Type B) | Connect roads within a village |
| Municipalities | Municipal Road | Connect roads within urban areas |

Source: RMMS Database

2) Functional Road Hierarchy in DNCC and DSCC

Roads in DNCC and DSCC had been recently classified into five categories based on functional hierarchies as shown in Table 4.14.

**Table 4.14 Road Classification for Urban Road**

| Road Classification | Function |
|---|---|
| Primary Roads | Serving high volume through traffic; inter-regional needs; Inter-zonal roads; access control; full restriction of non-motorized traffic and grade separation at major intersection |
| Secondary Roads | Intra-zonal roads; access control; segregation of motorized and non-motorized traffic |
| Connector Roads | Intra-zonal roads, full frontage access; partial segregation of motorized and non-motorized traffic, and segregation of opposing traffic flow |
| Local Roads | Full frontage access; no segregation of traffic; and provision for possibility of using some traffic calming measures |
| Narrow Roads | Short segments providing access to small areas; predominantly for non-motorized traffic and pedestrians; and bituminous, brick paved, and earthen surface. |

Source: Dhaka Urban Transport Project, phase 11, 1994 by DCC

3) Road Jurisdiction in Study Area

Jurisdiction of road planning, construction and maintenance activities within the study area is summarized in Table 4.15.

**Table 4.15 Jurisdiction of Road Planning, Construction and Maintenance**

| Location | | Planning | Construction | Maintenance |
|---|---|---|---|---|
| DMA & RAJUK Area | National Highway | RHD | | |
| | Regional Highway | | | |
| | Zila Road | | | |
| | Upazila Road | LGED | | |
| | Union Road & Village Road | | | |
| | Road related to RAJUK Development | RAJUK | | RHD/LGED |
| DNCC & DSCC | Primary Road | RHD/LGED/ DNCC & DSCC /RAJUK | | DNCC & DSCC |
| | Secondary Road | | | |
| | Collector Road | DNCC & DSCC | | |
| | Local Road | | | |
| | Narrow Road | | | |
| | Road related to RAJUK Development | RAJUK | | DNCC & DSCC |

Source: JICA Study Team

(2) Existing Road Network Characteristics

1) National Road Network

Based on the statistics published by RHD, there are 67 routes of national highways that connect the capital city with district headquarter, port cities and international highways (economic corridor roads). There are 114 routes of Regional Highways that have been designated as main economic transport network.

Table 4.16 shows the national road length by classification and surface condition in Bangladesh. The total lengths of roads under RHD and LGED have increased by 3 % and 11%, respectively since 2006. The growth rate of RHD road length is not high but the ratio of paved roads has increased from 78% to 97%. It can be noted that the mobility on RHD roads has been improved to a large extent.

Figure 4.38 illustrates the major national highway network in GDA. Most of the national highways in the GDA extend radially from Dhaka City connecting with major cities and ports: such as Chittagong, Sylhet, Mymensingh, Jamuna Bridge, Aricha port, Mawa (proposed Padma Bridge). On the other hand, all national highways except NH105 (Dhaka Bypass) that come into DMA area eventually cause traffic concentration and congestion in the urban area.

**Table 4.16 Road Length by Classification and Surface Condition in Bangladesh**

| Domain | Classification | Road Length by Surface Condition (km) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2006 | | | 2014(2013) | | |
| | | Paved | Unpaved | Total | Paved | Unpaved | Total |
| RHD | National Highways | 3,428 | 58 | 3,486 | 3,604 | 29 | 3,633 |
| | | 98.3% | 1.7% | 100.0% | 99.2% | 0.8% | 100.0% |
| | Regional Highways | 3,717 | 402 | 4,119 | 4,160 | 112 | 4,272 |
| | | 90.2% | 9.8% | 100.0% | 97.4% | 2.6% | 100.0% |
| | Zila Roads | 9,044 | 4,116 | 13,160 | 12,927 | 502 | 13,429 |
| | | 68.7% | 31.3% | 100.0% | 96.3% | 3.7% | 100.0% |
| | S-Total | 16,189 | 4,576 | 20,765 | 20,691 | 643 | 21,334 |
| | | 78.0% | 22.0% | 100.0% | 97.0% | 3.0% | 100.0% |
| LGED in collaboration with Local Government Institutions(LGI) | Upazila Roads | 20,421 | 15,811 | 36,232 | 30,687 | 6,572 | 37,259 |
| | | 56.4% | 43.6% | 100.0% | 82.4% | 17.6% | 100.0% |
| | Union Roads | 11,014 | 30,859 | 41,873 | 24,159 | 19,858 | 44,017 |
| | | 26.3% | 73.7% | 100.0% | 54.9% | 45.1% | 100.0% |
| | Village Road (Type A) | 10,327 | 84,160 | 94,487 | 25,136 | 85,764 | 110,900 |
| | | 10.9% | 89.1% | 100.0% | 22.7% | 77.3% | 100.0% |
| | S-Total | 41,762 | 130,830 | 172,592 | 79,982 | 112,194 | 192,176 |
| | | 24.2% | 75.8% | 100.0% | 41.6% | 58.4% | 100.0% |
| Total | | 57,951 | 135,406 | 193,357 | 100,673 | 112,837 | 213,510 |
| | | 30.0% | 70.0% | 100.0% | 47.2% | 52.8% | 100.0% |

Source: RHD Road Maintenance Management System (RMMS) database 2006, LGED Road Inventory Survey 2006, HDM Circle of Roads and Highways Department 2014, Maintenance Unit of LGED, 2013

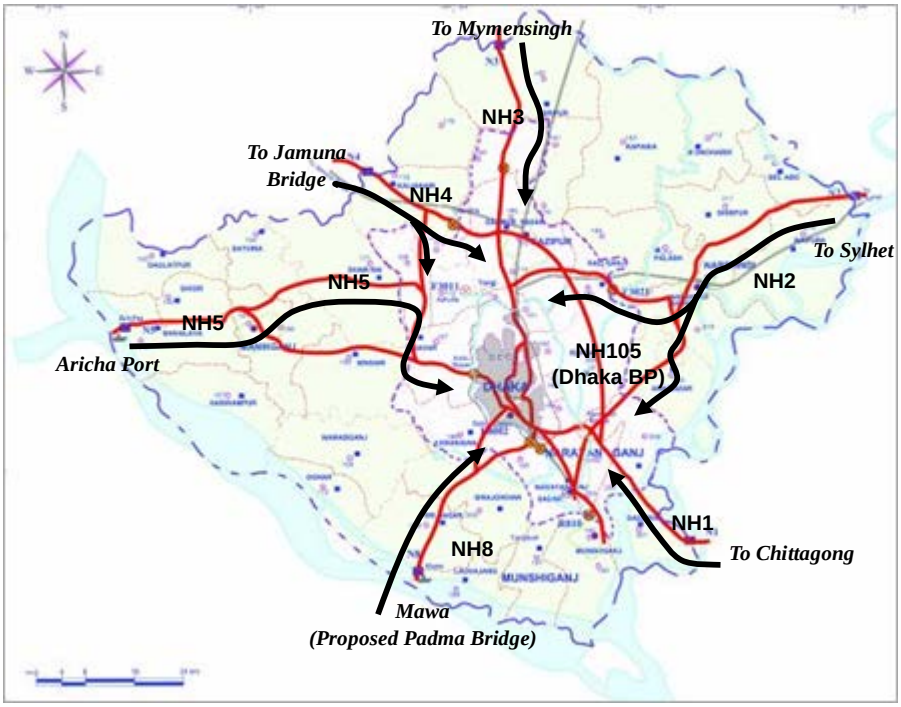



**Figure 4.38 Major National Highway in DMA**

Source: Revised by JICA Study Team based on STP

2) Road Network in RAJUK Area

The road network system in the Study Area can be divided into two major areas as shown in Figure 4.39. One is the urban network that serves for the traffic movement among the urban centers (DMA). The other is the regional network which serves for regional traffic movement in the suburban area (RAJUK area out of DMA).

DMA is situated in the middle of RAJUK area surrounded by Buriganga River, Turag River and Balu River. Although the major roads in DMA are having multi-lane and the current pavement conditions are generally good as reported in DHUTS but still severe traffic congestion chronically occurs due to insufficiency of functional road classification, some missing links, and inadequate traffic management.

As for the road network in the suburban area, road density is lower than that of the urban area and connectivity is not available with some adjacent regional centers. Such situation is assumed to hamper regional partnership and to promote the intense concentration of population and advanced urban functions to DMA.

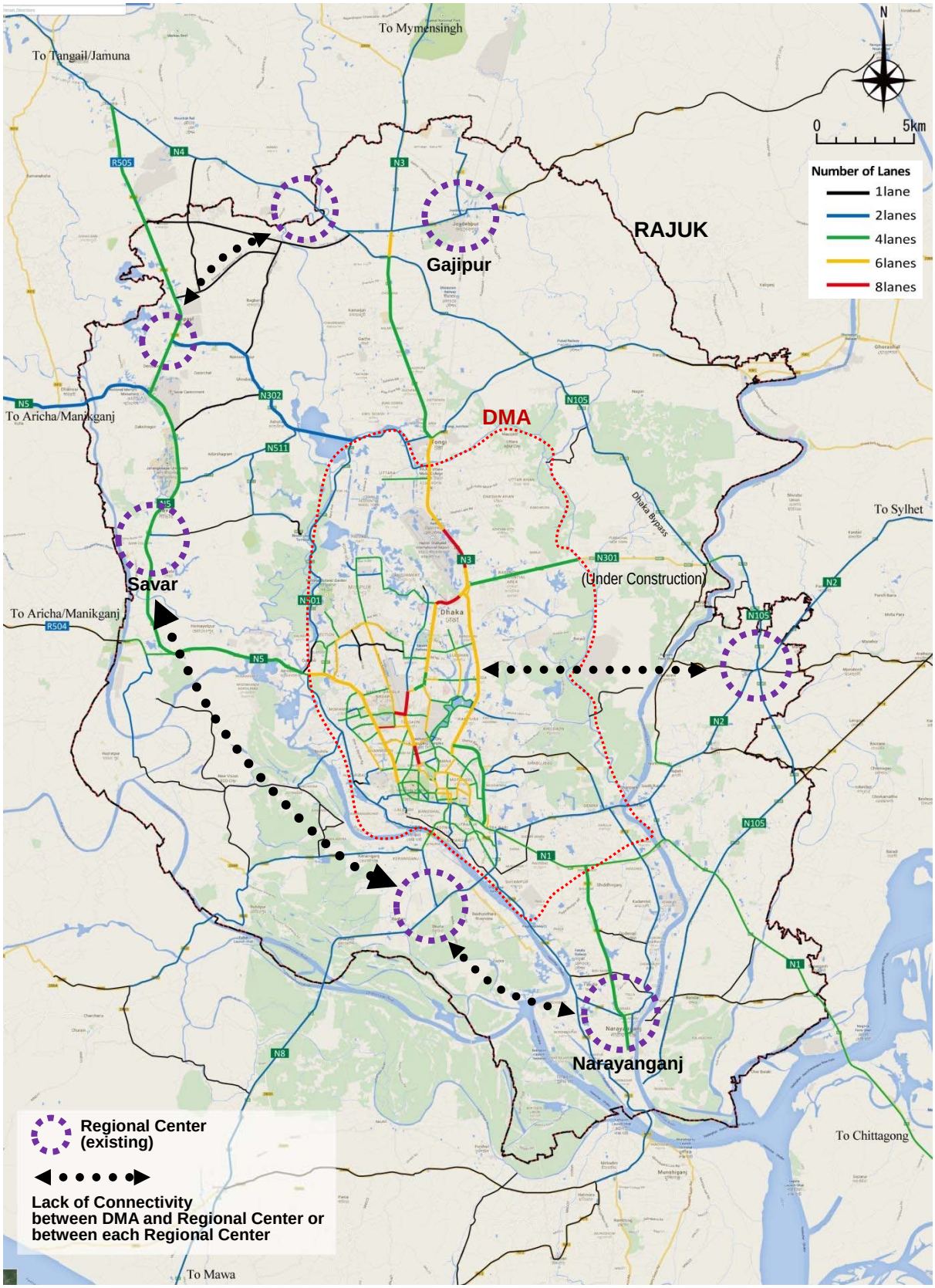



**Figure 4.39 Major Road Network in RAJUK Area**

Source: JICA Study Team

3) Intersection

A road network system consists of links and nodes: intersections. The total capacity of urban road network is to a large extent determined by the capacity of intersections.

At-grade Intersection

In DMA, although most major roads with multi-lane have enough traffic capacity for the current traffic demand, severe traffic congestion chronically starts at some at-grade intersections due to geometry problems such as inappropriate lane configuration and roundabout with large traffic demand, undisciplined stopped buses, street venders, and so on.

Traffic Signals

In DMA, some traffic signals are found not to be running. And drivers and pedestrians do not follow traffic signals at some intersections where even though traffic signals are running because police officers basically neglect traffic signals in guiding traffic movements.

It is because of such situation that the jurisdiction is divided into several institutions: DSCC and DNCC are responsible institutions for the installation and the operation of traffic signals, and DMP (Dhaka Metropolitan Police) is responsible for the traffic guidance at actual intersections.

Number of signalized intersections in DNCC and DSCC are around 70 and outside DNCC and DSCC and in RAJUK area, Planned for installing signals on the BRT route for its operation (Gazipur – Airport Road), the BRT project is funded by Asian Development Bank (ADB) as follows;

1. Airport Intersection
2. Jashimuddin Intersection
3. Sonargaon – Jonapath Intersection
4. Ashulia Intersection
5. Station Road Intersection
6. National University Intersection
7. Bhogra Intersection
8. Chawrasta Intersection
9. Joydedpur Railway Station Intersection

Flyover

Several flyovers have been constructed to mitigate traffic congestion in DMA by RAJUK and RHD as follows: Kuril flyover, Banani – Mirpur flyover, Banani overpass, Mohakhali flyover, Jatrabari Gulistan Flyover, Khilgaon flyover, and so on. And some new or extension flyovers are under construction around Moghbazar, Rampura, Khiligaon flyover etc.

Needless to say, each flyover project contributes to the mitigation of traffic congestion around the intersection. However, there still remain the traffic jam under flyover at some intersections while through vehicles can pass the intersection by using the flyover.

Meanwhile, because the jurisdiction of various transportation projects is different and the mutual cooperation between responsible institutions is insufficient, it can be found that some flyover projects have been made the implementation of other projects difficult due to physical interference.

Existing Flyovers in City Corporations, DMA and RAJUK

2.1 Mohakhali Flyover (Railway crossing)

2.2 Khilgaon Flyover

2.3 Banani Railway Crossing (Flyover)

2.4 Mirpur-Airport Road Flyover

2.5 Kuril Flyover

2.6 Mayor Hanif Flyover (Gulistan-Jatrabari Flyover)

2.7 Mogbazar-Mouchak Flyover (it is expected to open on October 2016)

2.8 Ahsanullah Master Flyover (Tongi Flyover - Railway Crossing)


**Figure 4.40 Traffic Confusion at At-grade Intersection**

(3) Existing Road Condition

1) Road Inventory Survey

Survey Location

Road inventory survey was conducted at 36 locations as shown in and Figure 4.41 to collect the data on the present condition of the existing roads which are located outside of DHUTS area: DMA.

**Table 4.17 Inventory Survey Locations**

| # | Road | Location |
|---|---|---|
| 1 | Dhaka-Chittagong highway / N1 | Sanarpar |
| 2 | Dhaka-Chittagong highway / N1 | Kanchpur |
| 3 | Dhaka-ChitCtagong highway / N1 | Langolband |
| 4 | Dhaka-Sylhet Highway/N2 | Between Rupali Bank Ltd and l & Hasem Food limited |
| 5 | Dhaka-Sylhet Highway/N2 | Along Dhaka-Sylhet Highway |
| 6 | Dhaka Mymensingh Highwya /N3 | Kunia |
| 7 | Dhaka Mymensingh Highwya/ N3 | Telipara |
| 8 | Joydefpur -Tangail Highway /N4 | Kodda Bus Stop |
| 9 | Dhaka-Aricha Highway/N5 | Near Dhaka-Aricha Highway/N5 |
| 10 | Dhaka-Aricha Highway/N5 | Ganda |
| 11 | Dhaka-Aricha Highway/N5 | Near Dhaka-Aricha Highway/N5 |
| 12 | Dhaka-Aricha Highway/N5 | Nayarhat Bus Stop |
| 13 | Dhaka -Mawa Highway | Near Dhaka -Mawa Highway |
| 14 | Bandor -Madanpur Hghway | Madanpur |
| 15 | Bostail - Madanpur highway / N105 | Madanpur |
| 16 | Bulta Highway/ N 105 | Near Bulta Highway/105 |
| 17 | Dhaka City Bypass/N105 | Near Dhaka City Bypass |
| 18 | Dhaka City Bypass/N105 | Dhakinkhan |
| 19 | Dhaka-Ashuliya Highway /N302 | Nishchintopur |
| 20 | Anarkoli Road /N511 | Near Anarkoli Road |
| 21 | Narayanganj highway | Barma bus Stop |
| 22 | Dhakeshori - Jalkuri Road / R111 | Near Jalkuri BRTC AC bus stop |
| 23 | Murapara College Main Road | Near Murapara College Road |
| 24 | Tongi -Gorashal Highway /R301 | Nimtoli |
| 25 | Savar Manignaj Highway /R504 | Shingair |
| 26 | Nabinagar -Chandra Road/R505 | Near Nabinagar -Chandra Road/R505 |
| 27 | Dhaka-Narayanganj Highway /R810 | Near Pagla |
| 28 | Keraniganj/R820 | Keraniganj |
| 29 | Keraniganj | Near Crown Melamine Industries |
| 30 | Taltola/Z1090 | Near banglar Tajmahal |
| 31 | Bangal bari /R820 | Near Bangal bari |
| 32 | Bosila | Near Bosila |
| 33 | Kolnapara Hazratpur Road | Kolatia |
| 34 | Birulia Road | Raj Ahsan |
| 35 | Mostur | Mostur |
| 36 | Purbachal Express Highway | Near National sports complex |

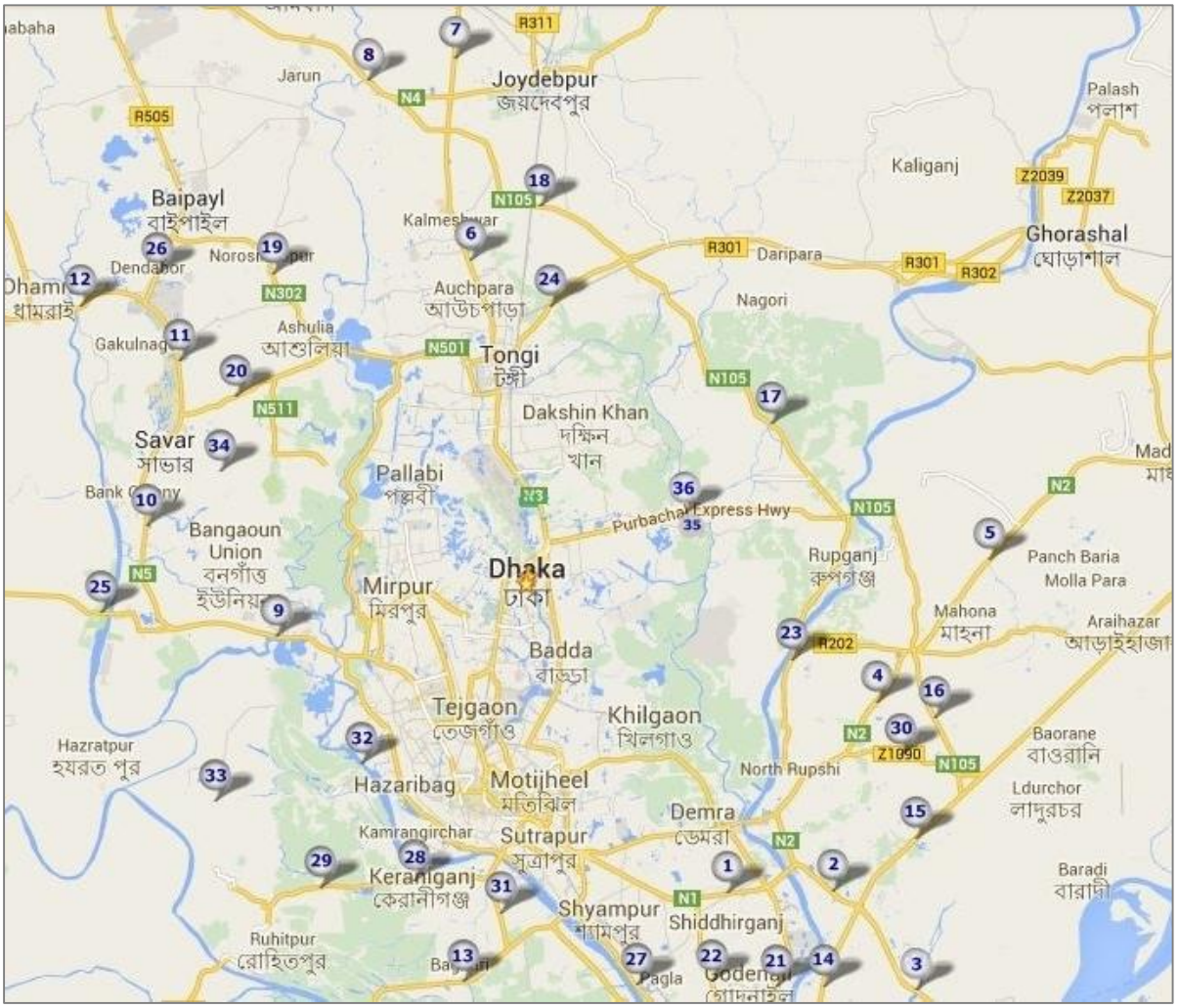



**Figure 4.41 Inventory Survey Locations**

Survey Results

The results of road inventory survey are summarized in Table 4.18 and Table 4.19.

**Table 4.18 Results of Inventory Survey (1)**

| No. | Road Name / Road No. | Typical Cross Section and Condition | | | | | | | | Survey Date |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Location Name | Landmark (Bus stop, School, Mosque, Gas station, Market etc.) | Carriageway | | | | Median | Rickshaw Road | |
| | | | | No. of Lanes | Width (m) | Pavement Type | Condition | | | |
| 1 | Dhaka-chittagong highway / N1 | Sanarpar | Gas station | 4 | 14.0 | AC | G | E | NO | 08.09.2014 |
| 2 | Dhaka-chittagong highway / N1 | Kanchpur | | 4 | 14.0 | AC | G | E | Yes | 08.09.2014 |
| 3 | Dhaka-chittagong highway / N1 | Langolband | | 4 | 14.3 | AC | G | E | NO | 08.09.2014 |
| 4 | Dhaka-Sylhet Highway/N2 | In between Rupali Bank Ltd and I & Hasem Food limited | Nano Textile Mill | 2 | 7.0 | AC | F | NE | Yes | 10.09.2014 |
| 5 | Dhaka-Sylhet Highway/N2 | Along Dhaka-Sylhet Highway | Near Pachrukhi Bridge | 2 | 7.0 | AC | F | NE | No | 10.09.2014 |
| 6 | Dhaka Mymensingh Highwya /N3 | Kunia | Fortuna Shoe Factory | 5 | 17.5 | AC | F | E | Yes | 11.09.2014 |
| 7 | Dhaka Mymensingh Highwya/ N3 | Telipara | World Chemical Ltd | 2 | 9.0 | AC | B (Under Construction) | NE | Yes | 11.09.2014 |
| 8 | Joydefpur -Tangail Highway /N4 | Kodda Bus Stop | Hotel | 2 | 10.8 | AC | G | NE | Yes | 11.09.2014 |
| 9 | Dhaka-Aricha Highway/N5 | Near Dhaka-Aricha Highway/N5 | Petrol Pump | 4 | 14.0 | AC | F | E | No | 15.09.2014 |
| 10 | Dhaka-Aricha Highway/N5 | Ganda | Shop | 4 | 14.0 | AC | B | E | No | 15.09.2014 |
| 11 | Dhaka-Aricha Highway/N5 | Near Dhaka-Aricha Highway/N5 | jahangir nagar University | 4 | 14.0 | AC | G | E | NO | 14.09.2014 |
| 12 | Dhaka-Aricha Highway/N5 | Nayarhat Bus Stop | Near Walton Shop | 4 | 15.5 | AC | F | NE | No | 14.09.2014 |
| 13 | Dhaka -Mawa Highway | Near Dhaka -Mawa Highway | | 2 | 7.0 | AC | G | NE | No | 09.09.2014 |
| 14 | Bandor -Madanpur Hghway | Madanpur | | 2 | 5.5 | AC | G | NE | Yes | 08.09.2014 |
| 15 | Bostail - Madanpur highway / N105 | Madanpur | | 2 | 7.0 | AC | F | NE | Yes | 08.09.2014 |
| 16 | Bulta Highway/ N 105 | Near Bulta Highway/105 | | 2 | 7.0 | AC | F | NE | No | 10.09.2014 |
| 17 | Dhaka City Bypass/N105 | Near Dhaka City Bypass | | 2 | 7.3 | AC | VB | NE | No | 10.09.2014 |
| 18 | Dhaka City Bypass/N105 | Dhakinkhan | Dhirasram Rail Crossing | 2 | 7.0 | AC | G | NE | No | 11.09.2014 |
| 19 | Dhaka-Ashuliya Highway /N302 | Nishchintopur | Building | 2 | 7.0 | AC | F | NE | Yes | 14.09.2014 |
| 20 | Anarkoli Road /N511 | Near Anarkoli Road | Shop | 2 | 7.0 | ST(Brick) | VB | NE | Yes | 14.09.2014 |

Note: Pavement Type: AC (Asphalt Pavement), ST (Surface Treatment), CC (Cement Concrete), G (Gravel), E (Earth)
Condition: G (Good), F (Fair), B (Bad), VB (Very Bad),
Median: E (Exist), NE (Non-Exist)
Riacshaw Road: Yes (Allow to pass), No (Non-Allow)

**Table 4.19 Results of Inventory Survey (2)**

| No. | Road Name / Road No. | Typical Cross Section and Condition | | | | | | | | Survey Date |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Location Name | Landmark (Bus stop, School, Mosque, Gas station, Market etc.) | Carriageway | | | | Median | Rickshaw Road | |
| | | | | No. of Lanes | Width (m) | Pavement Type | Condition | | | |
| 21 | Narayanganj highway | Barma bus Stop | Bus Stop | 2 | 5.7 | AC | F | NE | Yes | 09.09.2014 |
| 22 | Dhakeshori - Jalkuri Road / R111 | Near Jalkuri BRTC AC bus stop | Fakir Hotel | 4 | 14.4 | AC | G | E | Yes | 09.09.2014 |
| 23 | Murapara College Main Road | Near Murapara College Road | Jamidar Bari | 2 | 5.0 | AC | B | NE | Yes | 11.09.2014 |
| 24 | Tongi -Gorashal Highway /R301 | Nimtoli | Shop | 2 | 6.0 | AC | F | NE | Yes | 11.09.2014 |
| 25 | Savar Manignaj Highway /R504 | Shingair | Mosque | 2 | 5.2 | AC | F | NE | Yes | 15.09.2014 |
| 26 | Nabinagar -Chandra Road/R505 | Near Nabinagar -Chandra Road/R505 | Near Palli Bidyut Bus Stand | 4 | 14.0 | AC | G | E | Yes | 14.09.2014 |
| 27 | Dhaka-Narayanganj Highway /R810 | Near Pagla | | 2 | 8.7 | AC | F | NE | Yes | 08.09.2014 |
| 28 | Keraniganj/R820 | Keraniganj | Walton Shop | 2 | 5.6 | AC | B | NE | Yes | 09.09.2014 |
| 29 | Keraniganj | Near Crown Melamine Industries | | 2 | 5.5 | AC | F | NE | Yes | 09.09.2014 |
| 30 | Taltola/Z1090 | Near banglar Tajmahal | Near banglar Tajmahal | 1 | 3.7 | AC | B | NE | Yes | 10.09.2014 |
| 31 | Bangal bari /R820 | Near Bangal bari | Shop | 2 | 6.5 | AC | B | NE | Yes | 09.09.2014 |
| 32 | Bosila | Near Bosila | Bridge | 2 | 7.5 | AC | G | NE | Yes | 16.09.2014 |
| 33 | Kolnapara Hazratpur Road | Kolatia | Shop | 1 | 4.6 | AC | B | NE | Yes | 16.09.2014 |
| 34 | Birulia Road | Raj Ahsan | Shop | 1 | 3.3 | AC | B | NE | Yes | 15.09.2014 |
| 35 | Mostur | Mostur | Beside Bridge | 1 | 3.0 | AC | B | NE | Yes | 01.10.2014 |
| 36 | Purbachal Express Highway | Near National sports complex | Near National sports complex | 4 | 18.4 | AC | VB (Under Construction) | NE | No | 10.09.2014 |

Note: Pavement Type: AC (Asphalt Pavement), ST (Surface Treatment), CC (Cement Concrete), G (Gravel), E (Earth)
Condition: G (Good), F (Fair), B (Bad), VB (Very Bad),
Median: E (Exist), NE (Non-Exist)
Riacshaw Road: Yes (Allow to pass), No (Non-Allow)

2) Existing Road Conditions

Cross Section and Lane Configuration

The cross section of existing road network in the urban area is mainly based on the standard cross section while the primary and secondary roads are composed of carriageways, a median, sidewalks, and utility space as mentioned in STP and DHUTS.

The road markings at present are mostly worn out and practically non-existent if not visible while the division of lanes and shoulders are not clear. Such situation as deficiency of channelization confuses traffic movements and makes the travel speed and the capacity of roads low.

Usually, sidewalks are provided on both sides of the major arterial streets. However, the width of sidewalks is not enough for the current pedestrian demand. In addition, the sidewalks are quite often used as parking space and occupied by street venders. This leads to the tendency of pedestrian walking on the carriageway and it hampers smooth traffic flows.

In the suburban areas' two-lane national and regional highways, an unreasonable and dangerous speed of vehicles can be frequently found. Even though the traffic volume in the suburban areas is not very large, it is still recommended to have a more than four lanes considering road safety.

Worn-out lane marks

Sidewalk occupied by street vendors

**Figure 4.42 Existing Condition of Lane Configuration in Urban Area**

Pavement Condition

The pavement condition is relatively good on the major arterial roads both in the urban and suburban areas. However, the pavement is quite damaged at some sections due to heavy vehicles frequent use like in Dhaka Bypass and it hampers smooth traffic flow.

**Figure 4.43 Pavement Condition of Highways**

Road Safety

In 2008, a record of 559 fatal and injury traffic accidents occurred in DMA. This accounts for 16% of 3,531 accidents occurred nationwide. The rate of fatal and injury traffic accidents per population in DMA is approximately four times of the national average.

The number of fatalities while walking accounts for 74% of total fatalities, which is approximately six times that of drivers or passengers in DMA in 2008.

Early implementation of safety measures for pedestrians in DMA is assumed to be one of the most urgent issues.

**Table 4.20 Number of Traffic Accidents in DMA in 2008**

| | Number of Accidents | | | | Number of Accident per 10,000 Population | |
|---|---|---|---|---|---|---|
| | Fatal Crash | Incapacitating Crash | Non-incapacitating Crash | Total | Fatal | Total |
| DMA | 392 | 133 | 34 | 559 | 0.583 | 0.831 |
| Nationwide | 2,723 | 658 | 150 | 3,531 | 0.177 | 0.229 |

Source: BRTA "Road Traffic Accident Annual Report 2008"

**Table 4.21 Number of Fatalities in DMA in 2008**

| | Number of Fatalities | | | |
|---|---|---|---|---|
| | Drivers | Passengers | Pedestrians | Total |
| Person | 54 | 54 | 300 | 408 |
| Percentage | 13% | 13% | 74% | 100% |

Source: BRTA "Road Traffic Accident Annual Report 2008"

**Figure 4.44 Dangerous Street Crossing and Boarding at Intersection**

(4) Issues on Existing Road System

Some problems and issues related to the existing road system within the study area have been specified both in STP and DHUTS. However, most of the issues have not been solved so far due to several reasons such as rapid growth of motorization, difficulty of land acquisition, and financial and institutional matters.

The issues on the existing road system in the study area are re-summarized through reviews of STP and DHUTS in addition to the knowledge and information obtained through this study. The summary is as follows:

1) Functional Classification

All transport modes such as rickshaws, private vehicles and buses share the same space of every class of roads except in some rickshaw-free roads as there is no specific functional classification of road usage. This could be one of the major causes of traffic congestion.

**Figure 4.45 Traffic Confusion due to Insufficiency of Functional Classification of Roads**

Figure 4.46 is a conceptual description of the relative emphasis that each highway category places on the functions of providing "mobility" (i.e., continuous travel) on one hand and "accessibility" (i.e., direct access to abutting property) on the other.

Local roads should be predominantly designed for accessibility rather than mobility, whereas high-level facilities such as expressways and freeways should be predominantly designed for high-speed continuous movement.

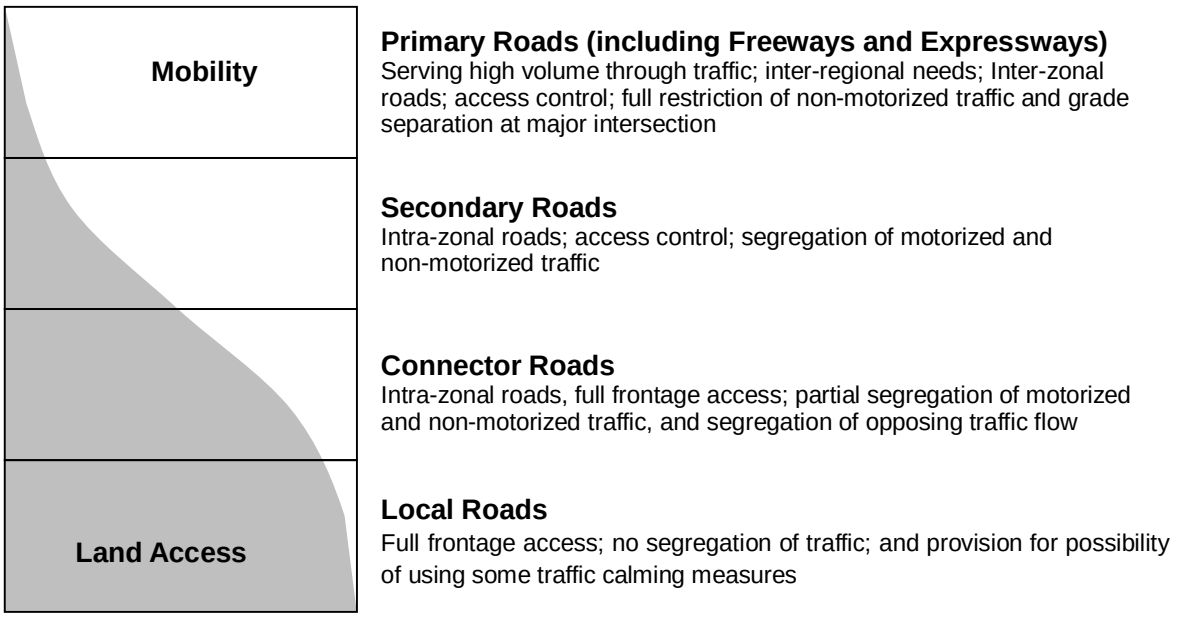



**Figure 4.46 Relationship of Functionally Classified Highways to Mobility and Land Access**

Source: JICA Study Team

2) Reliable Highway Network in Suburban Area

The density of highway network in the suburban area is relatively low and most of the highways are two-lane roads as shown in Figure 4.39. In addition, the condition of road pavement on some sections like in Dhaka Bypass is deteriorated wherein the traveling speed is reduced and the risk of freight damaged is inevitable.

Present poor condition of the national and regional highways in the suburban areas is hampering road's full function as part of the road network which eventually causes economic loss. Moreover, there are some areas, which process a potential future development that but have not yet served by the present road network.

Therefore, the improvement of road surface, the widening of the existing highways and the construction of several new highways are necessary in minimizing such economic loss.


**Figure 4.47 Existing Condition of Highways (Dhaka Bypass)**

3) Connectivity of Intra City Road Network

Although flyovers and missing links had been constructed such as Mirpur Flyover (in 2013), Bijoysharani–Tejgaon Industrial Area Link (in 2010), Tarabo Bridge (in 2011), and the on-going construction of the new road connecting Mirpur road with 3rd Buriganga Bridge, there are still remaining missing links in DMA. The construction of flyovers and missing links including the widening of narrow roads are significant to effectively mitigate traffic congestion and improve the mobility in urban area even if it is just a short section of the road.

4) Traffic Management and Travel Demand Management (TDM)

As mentioned in STP and DHUTS, the existing traffic congestion is to a large extent caused by inadequate road usage due to a poor traffic management in the urban area. Also the high ratio of traffic accident while walking is largely due to the same reason. An appropriate traffic management such as improvement of traffic signals, strengthening of traffic enforcement and traffic demand management (TDM) will be able to maximize the existing road capacity and to enhance road safety.


**Figure 4.48 Undisciplined Stopped Buses and Street Vendors**

# 5. ORGANAIZATION AND INSTITUTIONS

## 5.1 General

(1) Outline of Past Studies Related to Organization and Institution

All of the previous studies related to the transport system in Dhaka city has given special emphasis on the Transport Related Institutions. However, it has been noted that all the reports consistently state that a major strengthening and capacity enhancement should be done on institutions involved.

1) STP-2005

In April 2004, Strategic Transport Plan (STP) Dhaka 2004-2024 was commissioned under the DTCB (currently DTCA). This plan established a three part document in 2006 which was approved by the Government in 2008. The document consists of:

- Strategic Transport Plan (STP) document, Final Report,
- Urban Transport Policies, Final Report,
- Institutional Strengthening & Capacity Building-Final Report.

The role of the Institutions and Organization has given a major importance considering the fact that a separate volume of STP report was prepared focusing on their enhancement.

The key to a successful implementation of the projects and innovative concepts resulting from the STP would mainly depend upon the application of effective enforcement and a high standard of administration. Throughout the study, the STP team found out that most of the involved institutions are not fully capable of undertaking their mandated functions. The STP team identified five key agencies named DTCB, BRTA, RAJUK, DMP and DCC which has been recommended for further enhancement to strengthen them. However, more agencies like BRTC, BR, RHD, BBA, LGED etc also have influences on the transport system of Dhaka.

2) DHUTS-2010

Dhaka Urban Transport Network Development (DHUTS) conducted surveys and studies required for the feasibility study of the MRT Line-6. Moreover, the DHUTS Team also conducted studies on the existing transport related agencies regarding their organizational capacities and present functions. In this study, they looked into the agencies functions alongside with the operation of the proposed new organization to be responsible for the construction, operation and maintenance of MRT Line-6. The study examined different options for the proposed new agency and considered the possibility of forming an Authority named Mass Rapid Transit Authority (MRTA). Finally, the study recommended the formation of an independent corporation that will oversee the establishment of DMTC. However, the study failed to propose any recommendation about the capacity enhancement or institutional development of the existing agencies.

3) SISCETRA-2011

Institutional strengthening and Capacity building is the key to the implementation of any transport network and to the development of a transportation system which was recognized and reported by STP; and therefore proposes for the subject to be included in the total study package.

The study named as “Study for Institutional Strengthening and Capacity enhancement of Transport Related Agencies (SISCETRA) in Dhaka city was

undertaken by the DTCB engaging local consultants. The need to strengthen the capacity of the related agencies in order to have a substantive change in the transport scenario of Dhaka City is of utmost importance. The SISCETRA Team recommended the following elements as outlined by the STP Team in conjunction with the organizational weakness and present condition:

- Charter of duties and responsibilities for the agencies so that they can play their role with enhanced & effective capabilities in urban transportation,
- An effective organogram,
- Work distribution scheme,
- Manpower and skill required at different levels.

However, after the concept of the implementation of the MRT Line-6 by JICA, the Study Team came up with new objectives as mentioned below:

- To propose an organization named Dhaka Mass Transit Corporation (DMTC)
- Responsible for construction and operating MRT Line-6 (and other lines in future),
- Responsibilities of the proposed new organization,
- Legislation and relation of the proposed new organization with DTCA,
- Organizational Structure, manpower and required skill.

The SISCETRA Team prepared report and recommended for an organized structure, manpower and skills requirement, trainings, salary structure and logistics. The team suggested to form a new organization named Dhaka Mass Transit Company (DMTC) and proposed its relation with the MOC (as of now MORTB) and DTCA.

4) IBA-2011

During the prefeasibility stage of MRT Line-6, the Institutional Building Assistance (IBA) Team started to work on the structure of organization which will be responsible for the construction and operation of the MRT Line-6. Moreover, the IBA Team will also work on the strength and weakness of the DTCA and the interrelation of DMTC with DTCA and MOC.

The IBA Team agreed with the judgment and recommendations made by SISCETRA and modified the same to make a comprehensive report. The IBA proposed a budgetary requirement and a year fund requirement; and made a proposal and recommendations on:

- The Institutional building proposal for Dhaka MRT Line-6 project with a focus on organogram, regulatory regime, tasks and duties, budget estimate for the establishment of DTCA – the planning and coordinating/regulatory body and DMTC – the project implementation and service delivery body;
- Suggested legal framework for the project implementation and operation of the MRT system together with the road map for the establishment thereof;
- Suggested packages and scope of consulting services for implementation of the MRTLine-6 project.

5) BRT (ADB Project)

The main objective of this research was to survey and create a feasibility study of the BRT corridor from Gazipur to Hazrat Shahajalal International Airport station. The project was found to be feasible and Asian Development Bank (ADB) will be the financing body. This project is currently in design stage.

This study also discussed and analyzed the condition of the transport related agencies of Dhaka and made their observations and recommendations as follows:

Institutional issues such as fragmented institutional scheme which often not implemented are the main restrictions into realizing the STP's ambitious objectives to modernize the sector and implement challenging infrastructure projects. To improve the current scenario, the need to move toward a greater consensus on the formulation of a sound and efficient institutional framework was identified. The current DTCB under MOC lacks the capacity and empowerment to coordinate effectively. A clearer definition of its roles and responsibilities is needed. The decision to transform it into DTCA may improve the coordination situation only if they are equipped with proper manpower and authority. The creation of this new transport authority at the metropolitan level will focus on planning, management, and regulation of the transport system, while improving coordination with other agencies under MOC and other departments. However, because of the poor coordination between various public agencies, there is no organized effort to handle the situation. Even with few laws in place to manage transport flow, vehicle conditions, and road space utilization, they are still poorly enforced and often ignored. Traffic management and enforcement requires urgent attention to address the deteriorating urban transport system.

6) IDC-2014

The Institutional Development Consulting (IDC) aims to design and recommend an organization or agency responsible for the designing, construction, operation, and maintenance of the MRT Line-6 in which DMTC has already been in existence to provide such service. DMTC has been formed under company act of 1994 as a fully owned Government company and recommended by IBA team and SISCETRA. Since the design, construction, operation and maintenance of any MRT Line does not require full strength of manpower requirement at a time, the above two studies recommends the formation of DMTC in 5 (Five) Stages.

The first stage is called Special Project Organization (SPO) with 18 officers and supporting staff. The qualifications and skills requirement, job description and salary structures were completed. At present, the other 4 (Four) stages of the organization have to be finalized; and in addition, the IDC Team will have to make the final organizational set-up for DMTC along with service rules, recruitment rules, scope of work, etc.

7) The Dhaka Bus Network

The Dhaka Bus Network was planned for bus and related human hauler like rickshaw services within Dhaka area, local and suburban operations. The project aimed for an improved bus network for the Dhaka Metropolitan Area in conjunction with a new type of business model for franchising, allocation, operation and an effective planning and regulatory system for further bus network development and operation.

The main scopes of the works are to review the existing institutional and operational arrangements and evaluate the following:

I. The range of desirable new institutional/regulatory/licensing frameworks, business models and route/service restructuring options available for application to Dhaka area public transport;

II. The high probable options with a success rate within one year, 2-4 years, and 5 or more years, with the given industry, governmental and political constraints.

The objectives and output of the above past studies are summarized below Table 5.1.

**Table 5.1 Summary of Past Studies**

| Study Title | Year | Objective | Output |
|---|---|---|---|
| STP | 2005 | To guide the development of transportation Infrastructure over the next 20 years for greater Dhaka city. | Made effective recommendation for improvement of the transport situation of Dhaka city in three volumes, namely:<br>1. Strategic Transport Plan (STP) document,<br>2. Urban Transport Policies,<br>3. Institutional Strengthening & Capacity Building. |
| DHUTS | 2010 | To make recommendation about the feasibility of construction and operation of MRT Line-6 along with route alignment. | The team submitted the report recommending the MRT Line-6 feasible which is currently under design stage. |
| SISCETRA | 2011 | STP report (Vol.-3) identified the weakness and recommended for capacity enhancement and institutional strengthening of the transport related agencies in Dhaka. The aim of the study was to recommend the capacity enhancement and institutional development of these agencies. | 1. Recommended the capacity enhancement and institutional development of 5 transport related agencies.<br>2. Recommended the formation of DTCA and DMTC.<br>3. Recommended the formation of SPO to initiate the works of DMTC. |
| IBA | 2011 | Formation of the organization and institutional structure of DMTC for effective construction, operation and maintenance of MRT Line-6 | Recommended the formation of DMTC with detail structuring of the SPO- the initial set-up and a conceptual organization of the whole of DMTC. |
| BRT (ADB) | 2011 | To make recommendation about the feasibility of the construction and operation of BRT from Gazipur to Hazrat Shahajalal International Airport Station. | The team submitted the report recommending the construction and operation of the BRT line feasible and which is now at design stage. The project has been named as ”Greater Dhaka Sustainable Urban Transport Project” (GDSUTP) |
| IDC | 2014 | To make recommendation on the total organizational and institutional structure of DMTC for MRT Line-6 | 1. Establishment of institution for MRT Line-6<br>2. Design of DMTC management system<br>3. Operation and business plan of DMTC<br>4. Establishment of financial plan of DMTC<br>5. Plan of technology transfer to DMTC |
| DBN | 2014 | To improve travel performance and attractiveness of public transport;<br>To reduce congestion and pollution;<br>To support industry and effective regulation; and<br>To enhance traffic safety. | 1. Bus Network Restructuring<br>2. Business Model and Fleet Renewal<br>3. Safety Standards |

Source: JICA Study Team

(2) Current Organizations and Institutions Related to Transport Sector

Several agencies like the DTCA, BRTA, DMP, RAJUK, DCC, BRTC, BR, RHD, BBA and BIWTC etc. are directly responsible for the transport system’s improvement, management, and operation and enforcement activities of Dhaka city. However, most of these agencies are run on very old and out dated set of rules and regulations, which need

immediate improvement with modern approaches. Moreover, these agencies lack efficient, skilled and adequate manpower.

1) The Ministry of Road Transport and Bridges (MORTB) formerly known as MOC plays a vital role with six organizations under it, namely, DTCA, BRTA, BBA, BRTC, DMTC and RHD. Although BBA and RHD has little direct impact on the transport system of Dhaka, DTCA and BRTA are the major primary stake holder for regulating, coordinating, improvement, management, and operation and enforcement activities. In brief the functions of DTCA, BRTC, BRTA and DMTC are as follows:

   Dhaka Transport Co-ordination Authority (DTCA)

   Is responsible for the coordination of the whole of the transport system of greater Dhaka; as well as to carry out research, policy planning, development of traffic and transport rules and regulation, training and co-ordination in the transport sector. Additionally, it has been mandated to plan and develop Mass Rapid Transport (MRT) or Metro system and the Bus Rapid Transit (BRT) system for the STP.

   Bangladesh Road Transport Corporation (BRTC)

   The state owned statutory body operating bus services within Dhaka and also in intercity district routes. As per legislation, BRTC does not require route permit from BRTA/Transport committees to operate their buses in any route

   Bangladesh Road Transport Authority (BRTA)

   Regulatory authority of road transport system for the country; BRTA is the regulating body of the Government of Bangladesh (GOB) for all sorts of activities relating to motorized vehicles. The activities of BRTA are not confined within Dhaka Metropolitan Area (DMA) but are spread country wide.

   Dhaka Mass Transit Company (DMTC)

   After the final decision of construction of MRT Line-6 was taken and the agreement between the GOB and JICA was finalized, the pre-feasibility study of MRT Line-6 started immediately. The prefeasibility study team and the SISCETRA study team opined to form a separate agency to conduct the detailed design, construction, procurement of related items, contract management and the operation &maintenance of the MRT line-6.

   It is recommended that the formation of agency be done as a 100% Government owned company listed under Registrar of Joint Stock Company. JICA also formed the IBA team to make recommendations on the formation of an agency for this purpose. Both IBA and SISCETRA teams recommended the formation of DMTC; and the DTCA was entrusted the task of forming an agency. At present the DMTC is working as the implementing and executing agency of MRT Line-6, which in the future DMTC will continue the operation and maintenance of MRT Line-6.

2) Ministry of Housing and Public works (MOHPW) in cooperation with RAJUK also plays a very important role in the transport system of Dhaka city. It was indicated that the transport system of a large city like Dhaka mostly depends upon the proper land use planning in which it appears to be non-existent here.

   Rajdhani Unnayan Katripakkha (RAJUK)-

   Responsible for planning and preparation of the Detailed Area Plan (DAP), in order to make Dhaka a worthy capital city of Bangladesh. Mandate is the planning, regulatory and executing body for DMDP, and as well as for the development of roads in RAJUK planned areas.

3) Ministry of Home Affairs: is responsible for the enforcement of rules and regulations of different agencies engaged in the transport systems of Dhaka City.

Dhaka Metropolitan Police (DMP)

Responsible for the control of traffic movement and enforcement of traffic rules with the aim to keep the traffic flow smoothly. DMP also keeps record of violation of traffic law and accidents.

4) Ministry of Local Government and Rural Development (MOLGRD&C): With the DNCC and DSCC under it, it is responsible for the construction, maintenance and operation of city roads/lanes, as well as to keep the roads, foot path, overpass etc. clean.

Dhaka City Corporation (DNCC & DSCC)

The city corporation was split into two corporations, North and South, with the southern wing holding more territory than the north. Each corporation will be a self-governing entity, thus giving the city of Dhaka two mayors in future. At present, the activities of the mayors are being performed by appointed administrators. The government holds that bifurcation would ensure better quality of civic services to the residents of the city. They are responsible for the development and maintenance of city roads, traffic signals and control of Non-Motorized Traffic executing body in Dhaka City Corporation area.

The concern legislation is shown in.Table 5.2

**Table 5.2 Concern Legislation to Agency**

| Agency | Concern legislation | Remarks |
|---|---|---|
| MORTB | | |
| DTCA | DTCA Act ( Rule no. 8 of 2012) | Finally approved by the Parliament. |
| RHD | Government department under Revenue Budget | Guided by Government Rules and Regulations |
| BBA | Ordinance NO. XXXIV OF 1985. | Promulgated by Presidential Order and subsequently approved in Parliament. |
| BRTA | By amendment of Motor Vehicle Ordinance No LV of 1983 | This legislation is under amendment and a draft titled “Road Transport and Traffic Act (2011)” is under consideration for approval. |
| DMTC | Urban MRT Act (2012)<br>Companies Act (1994) | |
| BRTC | Ordinance No. VII of 1961 | |
| MOR | | |
| BR | Bangladesh Railway Board Ordinance, 1976 (XLI of 1976)<br>ORDINANCE NO. XXIV OF 1983 | Repealed in 1983 and activities came under a DG from Board |
| MOLGRD & C | | |
| LGED | Government Department under Revenue Budget | Was LGEB from Oct’1984 till Aug’1992 and upgraded to LGED |
| DNCC | Ordinance No. XL of 1983 | Divided into two parts in 2011 |
| DSCC | Ordinance No. XL of 1983 | Divided into two parts in 2011 |
| MOHPW | | |
| RAJUK | Town Improvement Act (1953) | |
| MOHA | | |
| DMP | Ordinance No. 3 of 1976 | |
| Prime Minister’s Office | | |
| Public Private Partnership Office | PPP Law (2013)<br>Guideline for VGF for PPP Project (2012)<br>Policy and Strategy for PPP (2010) | The law is drafted and yet to be enacted. |

Source: JICA Study Team

## 5.2 Transport Sector Administration

(1) National Integrated Multimodal Transport Policy (NIMTP)

The GOB wants a transport system that meets the need of the people and businesses at an affordable cost and in turn creates a better environment in which to live in and work. So the GOB approved the draft of NIMTP on the 26th August 2014. It aims to cut congestion, improve towns and cities and encourage vitality, help reduce the need to travel and to avoid urban sprawl, and excessive road building that consumed precious agricultural land. Planning and coordination will be reformed to bring together ideas about

better transport system and better environment at the planning stage. Multi-modal transport operations that bring efficiency will be fostered. The GOB will take steps to increase investment in railways and inland water transports; and develop strategies for improving integration between these two modes. The way forward is through an integrated transport policy. This means:

- Integration within and between different types of transport- so that each can contributes its full potential and people can move easily between them;
- Integration with the environment - so that transport choices will support a better environment;
- Integration with land use planning - at national, regional and local level, so that transport and physical planning can work together to support more sustainable travel choices and reduce the need to travel;
- Integration with policies for education, health, economic growth, gender and social equity and poverty reduction - so that transport will help to make a fairer, more inclusive society.

(2) Main Player of Transport Sector Project

The DTCA has the mandate to play the key role of coordinating the transport system of Dhaka city based on such an above NIMTP. This is the top body responsible for long term planning and policies. All other executing and implementing agencies are required to make effective coordination with DTCA before entering into any sort of intervention in transport sector. Also among other agencies BRTA, DMP, DCC (DNCC and DSCC) and RAJUK play important role in this sector.

**DTCA:** In the early 1990s a comprehensive transport study named Dhaka Integrated Transport Study (DITS) was conducted under funding from International Development Assistance (IDA). Following this, the Dhaka Urban Transport Project (DUTP) was formulated. While implementing the DUTP study in 1999, the need for an organization to coordinate other concerned agencies was observed. This need led to the formation of the Board. The Dhaka Transport Coordination Board (DTCB) was created by the Government in 2001 under DTCB Act (Act No. 19 of 2001).

However, as first step in forming a coordinating body, a Board named Greater Dhaka Transport Planning and Coordination Board (GDTPCB) was created in 1999, followed by formation of DTCB in 2001. The formation of GDTPCB and then DTCB were the result of need aroused from implementation of the DUTP study, the organizational set up were created under the project concept paper. After completion of the DUTP project in June 2006, a revenue structure of DTCB was created by the Government in 2007 with total of 70 manpower out of which there are only 18 posts of officers which shows the inherent weakness of the organization.

For efficient performance of this agency, the GOB decided to restructure it in the name of Dhaka Transport Coordination Authority (DTCA). The legislation of DTCA was finalized and DTCA came into existence in 2012 (Rule-8 of 2012) with the following objectives:

- To coordinate with transport related agencies in Dhaka city in order to deliver a road transport network that is integrated, efficient, cost-effective and sustainable to meet the commuter’s needs. To develop and implement policies to encourage commuters to choose the most appropriate and mass transportation mode,
- To make effective planning and coordination activities for proper implementation of STP recommendations; and for DTCA to make Public Transport Policies and Guidelines efficient and to implement Traffic Management Planning and Monitoring and safety initiatives.

- To effectively coordinate the planning and management of the implementation of the proposed MRT and BRT projects.

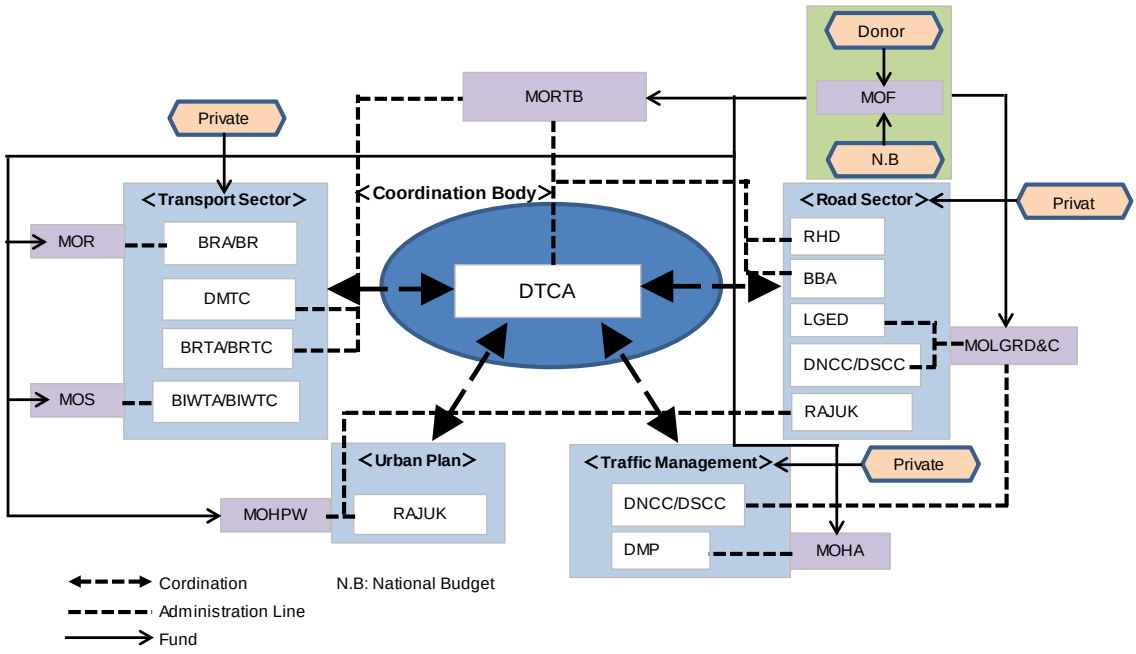
DTCA will be the central organization for research, policy development and planning, training, and coordination for traffic and transport in the STP area.

The primary functions of DTCB are:

- Formulation of strategic transport planning and urban transport policies;
- Coordination of transport related activities in the DMA;
- Management of public Transport policies and guidelines;
- Traffic management planning and monitoring and traffic safety initiatives.
- Coordination of land use and transport planning in Dhaka City
- Coordination of all projects mentioned in the STP.

The revenue with70 manpower was approved by the Government on September 2007 for DTCB organization. It was mentioned that after the formation of DTCA in 2012 a new organizational structure was proposed to the Ministry which is under active consideration. However, at present 70 (18 Officers + 52 support staff) manpower have been filled up but is undoubtedly insufficient for present requirement.

The DTCA being the central coordinating agency is responsible for the coordination of different agencies under the Ministries. This coordination is related with project implementation along with policy making and planning. Figure 7.1 illustrates the interrelation in terms of project implementation, policy and planning of different institutions.




Source: JICA Study Team

**Figure 5.1 Interrelation of Concern Agencies**

DTCA will work under the administrative control of MORTB and coordinate two Road Sector agencies namely RHD and BBA and three Transport Sector agencies namely DMTC, BRTA and BRTC.

It is expected that other Transport Sector agencies such as BR under the Ministry of Railway (MOR) and BIWTA & BIWTC under the Ministry of Shipping (MOS) will coordinate with DTCA before embarkation on remarkable interventions.

LGED under the Ministry of Local Government and Rural Development and Cooperatives (MOLGRD&C) shall coordinate with DTCA for all projects. However, DNCC & DSCC under the same ministry will coordinate on Traffic Management matters only.

Similarly, DMP under MOHA will coordinate on Traffic Management matters and RAJUK under MOHPW will coordinate on Urban Planning affairs.

As for the project financing is concerned, the Ministry of Finance (MOF) can arrange fund from foreign donors as well as from internal resources. Both sectors' project can be implemented under finance from MOF or it can be Public-Private Partnership (PPP).

(3) Function of Each Organizations

1) BRTA

BRTA is the regulating body of the Government of Bangladesh (GOB) for all sorts of activities related to motorized vehicles. In the past, the licenses for motor vehicle and driving were issued & controlled by Deputy Commissioner of Districts till 1983 and later by Deputy Commissioners (Traffic) of Metropolitan Police and district Police Superintendents up to 1988. Vehicle inspection for road worthiness, certification for maintenance of Government vehicles etc. were done by the Superintendent of Road Transport and Maintenance (SRTM). Afterwards it was renamed as Director of Road Transport and Maintenance (DRTM) under the MOC. These functions along with Route Permit, Fitness Certificates of vehicles etc. were administered under Motor Vehicle Act 1939 (Act IV of 1939) and regulation 1940 prepared under this Act. In 1983 a new Motor Vehicle Ordinance was promulgated titled as "Motor Vehicle Ordinance 1983" (Ordinance No. LV of 1983) repealing the previous one. BRTA was formed in 1987 making amendment of the 1983 Ordinance by inserting Section 2A of the Ordinance. BRTA actually started functioning during 1988-1989 with its Chairman as the Chief Executive Officer. Since the creation of this organization it has been working as a very weak and unorganized Government department under the MOC, presently MORTB.

The legislation, "Motor Vehicle Ordinance 1983" (Ordinance No.LV of 1983) was considered to be incompetent and unable to cope with the present day requirements; and the Government took initiative to update the same. Since 2009-2010 actions were taken to prepare a new Road Transport and Traffic Act (RTTA) under WB finance.

[Present Mandates]

- Regulation and registration of motor vehicles in Bangladesh,
- Issuance of driving licenses to individuals,
- Issuance of route permit for transport vehicles,
- Identification of new bus route and public transport services,
- Identification of defective and faulty vehicles,
- Issuance of certificates of road worthiness for motor vehicles,
- Responsibility for road safety and the control of overloading of trucks, motor vehicles,
- Formulation of rule and guidance for motorized transport in general,
- Inspection of government vehicles for repairing and condemnation,

- Inspection of vehicle involved in road accident; and registration of driver training schools, repair and maintenance of workshops.

An organogram of 573manpower was approved by the Government in 2006 for better operation of the authority. The number of registered vehicles has increased very rapidly and the manpower of BRTA was considered to be insufficient. Over and above the approved posts could not be filled up in due time. In the meantime, the requirement of manpower was increased to cope with the ever increasing vehicles. At present the total manpower approved for BRTA is 824 out of which only about 50% of posts are filled up. One of the problems of manpower in BRTA is that the concentrations of vehicles are in and around Dhaka and Chittagong.

BRTA is the regulating authority and does not execute transport sector projects. Rather, they have projects such as upgrading their working process into ICT based ones, establishing modern vehicle inspection centers etc.

2) DMP

Is a Regulatory and at the same time executing agency which is responsible for maintaining all sorts of law and order situation of the City. Traffic control and enforcement is a part of its total job.

The necessity of formation of a separate organization for the city area was considered due to the rapid urbanization and growth of population of the city. The growth of population was accelerated by in-immigration along with the natural growth. Since DMP was created in 1976 under Ordinance No. 3 of 1976, it has been noticed that it is difficult for the agency to maintain the law and order situation of the city.

The main mandated functions are:

- Control of crimes and maintenance of law and order in the city
- Control of traffic movement in the city
- Enforcement of traffic rules to ensure road safety
- Investigating road accidents, storing of data and the analysis of the accident data.

Out of the four mandated functions of DMP, the last three are directly related with traffic and transportation and therefore the need for STP.

The traffic police section of DMP was originally under two Deputy Commissioners and with a total of 2,111manpower. Later, considering the constraints of manpower and logistics, this part of the organization was reorganized and increased its manpower and spearheaded by a Joint Commissioner with a total manpower of 3,645. Although the set up was reorganized, there was no substantial increase in personnel working in the field level. On the other hand, considering the shortage of logistics, the WB financed Dhaka Urban Transport Project (DUTP) and provided DMP with a good number of Motorcycles, Wreckers, Walkie Talkie, etc in 2003-2004. These numbers are inadequate considering the present demand. The supplies provided in 2003-2004 have become old and out dated.

3) DCC

To meet the needs of the city dwellers, Dhaka Municipality was established in 1864. In 1978 the Municipality was upgraded to the status of a Corporation and it was renamed as Dhaka Municipal Corporation. In 1990 it was again renamed to Dhaka City Corporation Ordinance 1983. The Power of Taxation which was based on City Corporation (Taxation) Rules 1986 and the City Corporation Model Tax Schedules 1985 were updated in 2002.

On 29 November 201, the government dissolved the Dhaka City Corporation under the Local Government (City Corporation) Amendment Bill 2011 and divided it into two parts namely, Dhaka North City Corporation &Dhaka South City Corporation. As the city grown bigger in size and population, the Government considered the division to provide better civic services to the city dwellers.

[Dhaka North City Corporation (DNCC)]

Dhaka North City Corporation consists of 36 wards covering the Thanas of Mirpur, Mohammadpur, Sher-E-Bangla Nagar, Pallabi, Adabor, Kafrul, Dhaka Cantonment, Gulshan, Banani, Badda, Uttara & some others.

[Dhaka South City Corporation (DSCC)]

Dhaka South City Corporation consists of 56 wards covering the Thanas of Dhaka Kotwali, Motijheel, Sutrapur, Ramna, Bangsal, Wari, Gendaria, Chwokbazar, Lalbagh, Hazaribagh, Dhanmondi, Shahbagh, New Market, Khilgaon, Kamrangirchar & some others.

Before the dissolution, Dhaka City Corporation performed its transport related activities with a “Traffic Engineering Department (TED)” under the Chief Engineer. There were 2 (Two) Superintending Engineers and 6 (Six) Executive Engineers with support staff working under the TED. It is understood that the manpower strength could not have been increased in this period.

4) RAJUK

Dhaka Improvement Trust (DIT) was the predecessor of Rajdhani Unnayan Katripakkha (RAJUK) and came into existence in 1956 under the Town Improvement Act of 1953. The DIT was set up to provide for the development and expansion of the town of Dhaka and Narayangonj and other areas to their vicinity. Their charted functions included opening up congested areas, laying out or altering street, constructing new roads, providing open spaces for the purpose of ventilation and recreation, demolishing or reconstructing building, acquiring land for housing and re-housing of persons displaced due to implementation of development schemes. DIT was renamed as RAJUK in 1987and was made responsible for planning including the preparation of master plan of the Dhaka area in order to make Dhaka a worthy seat for the capital of Bangladesh.

The jurisdiction of RAJUK comprises an area of 590 Sq. mile (1550 Sq. kms) which includes the whole of Dhaka City Corporation, Narayangonj, Tongi, Savar and Joydevpur Powrashava and Keranigonj, Rupgonj and Siddhirgonj upazila.

The major functions of RAJUK are:-

[Planning & Regulation Functions]

- Preparation of Master Plan and development plan for Dhaka Metropolitan Area,
- Land use planning and Zoning Control,
- Detail Area Planning,
- Approval of Building Permit plans.

[Development Functions]

- Implementation of special project such as NAM Apartment project,
- Planning and construction of new major roads, link roads, bridges and culverts, housing area within city area,
- Development of planned Satellite Towns;

- Construction of markets and shopping centers.

The existing organizational set up has no emphasis on traffic and transport related positions. Moreover, until the IBA and SISCETRA studies are done, RAJUK has an organogram of only 1,095 posts out of which 580 are filled up.

5) DMTC

The need and justification of creating a new organization titled as DMTC was realized when the MRT Line-6 project got the go ahead signal. The important matter to be decided upon is the interrelation between the two organizations – DTCA and DMTC. Formation of the organizations and their mode of operation are equally important. Emphasis has been given to establish a corporate structure having the right number of human resources, both at the management and operational levels with relevant skills and competency to run the new company (proposed) efficiently.

Establish a corporate culture and environment built on integrity and good corporate governance as well as customer focused and financial sustainability. Business implementation of new management approaches, processes and systems so that proposed DMTC can achieve its strategic vision substantially and improve its operational efficiency and ultimately become financially self-sustaining.

However, the proposed new organization will face difficulties in recruiting properly skilled personnel since there is an acute shortage of skilled manpower in the field.

6) RHD

The Roads and Highways Department (RHD) was created in 1962 when the old 'Construction & Building (C&B) organization was split into 2 separate bodies (the other being Public Works Department). RHD is responsible for the construction and the maintenance of the major road and bridge network of Bangladesh. Since the Department was established, the size of the major road network in Bangladesh has grown from 2,500kms to the present network of appropriately 21,500kms.

The goal of RHD is “to provide the People of Bangladesh with a safe, cost effective and well maintained road network".

The RHD is capable to plan, manage and deliver its full range of responsibilities in respect of the main road and bridge network and will be accountable for these duties.

The Assets of the RHD have been conservatively estimated at Taka 46,000 crore (appropriatelyUS$8,000 million) of which the largest proportion is the value of the 21,500kms of road and the 18,258 bridges. These assets are probably the greatest asset of any organization in Bangladesh and maintaining their value is vital to its economy. Therefore, this lays down a great responsibility on the RHD.

The recent proposed structure for RHD consists of five Headquarter Wings/Zones and seven Field Zones, each headed by an Additional Chief Engineer who works directly under the Chief Engineer.

The functions and on-going projects of different transport related agencies are summarized below Table 5.3.

**Table 5.3 Main Agency Function**

| Agency | Function | On-going Project |
|---|---|---|
| RHD | 1. Design, construct and maintain roads and bridges on the main road network of the country. | 1.8-Laning of Jatrabari-Katchpur Road (GOB Finance)<br>2.Construction of Raypura-Narsingdi-Madangonj Road (GOB)<br>3.Demra- Amulia- Shekher Jayga- Rampura Road (GOB)<br>4.The 3rd Shitalakhya Bridge Construction Project (Saudi Fund)<br>5.Greater Dhaka Sustainable Urban Transport Project (BRT Gazipur-Airport) (ADB Fund) |
| BRTA | 1. Regulatory function of all motorized vehicles.<br>2. Collections of all types of taxes and fees related to motorized vehicles.<br>3. Issuing of driving license, route permit etc. | 1.Retroreflecting number plate with RFID tag<br>2.Smart card driving license with electronic chip<br>3. Online payment of taxes and fees through bank or by using Credit Card from home<br>( All Projects GOB Finance) |
| DNCC/ DSCC | 1. Maintain and develop city roads, streets, lanes, traffic signals etc.<br>2. Maintain and repair culverts, drains markets, footpaths etc. | |
| DMP | 1. To ensure smooth flow of traffic, and to take necessary measures against traffic rule violation. | |
| RAJUK | Preparation of Master Plan and development plan, land use planning and Zoning Control; detail Area Planning; approval of Building Permit plans; Planning and construction of new major roads, link roads, bridges and culverts, housing area within city area; development of planned Satellite Towns etc.<br>1. To Prepare Master Plan and Development plan for land use and zoning control;<br>2. Area Planning;<br>3. Approval of Building permits;<br>4. Planning and Construction of new major roads, link roads, bridges and culverts, housing area with Dhaka city;<br>5. Develop planned Satellite Towns, etc. | RAJUK Financed projects:<br>1.Purbachal New Town project<br>2.Multistoried Car Parking-cum-office Building at Gulshan-1<br>3.Purbachal Link Road (Debogram to Progoti Sharai)<br>4.Flyover at Golapsha Mazar (Gulisthan) to Babu Bazar for connecting Jhilmil Residential Area |
| DMTC | Planning, designing, constructing, operating and maintaining the MRT Line-6. | MRT Line -6 (JICA) |
| DTCA | 1. Strategic Transport Planning and Urban Transport Policies;<br>2. Coordination of transport related activities in the DMA;<br>3. Public Transport Policies and Guidelines;<br>4. Coordination of Land Use and Transport Planning in Dhaka City<br>5. Coordination of all projects mentioned in the STP. | 1.BRT Line -3 under design stage<br>2.Bus network and regulatory reform implementation study and design work<br>3.Review of DTCA Act and Motor Vehicle Ordinance (MVO)<br>( All projects WB Finance) |

Source: JICA Study Team

(4) Proposal of Measures over the Past Studies

The past studies described in section 1.1 pointed out the variety of weakness of transport related agencies e.g. ability of personnel and lack of coordination. Table 5.4 summarizes the proposed measures in the past and current position and progress to enhance the future improvement of transport sector.

**Table 5.4 Proposed Measures and Current Progress**

| Agency | Proposed Measures | Current Progress |
|---|---|---|
| DTCA | 1. DTCA legislation to be enacted;<br>2. Separate agency DMTC to be created for MRT/BRT;<br>3. Adequate and technically skilled manpower to be provided;<br>4. Jurisdiction to be clear and authority to be exercised;<br>5. Transport planning and MRT/BRT implementation to be trained | No.1 and No.2 have been done.<br><br>No.3,4 and 5are under progress. |
| DNCC/DSCC | 1. Strengthening of good governance, manpower and legal compliance;<br>2. Making training and logistic materials;<br>3. Coordination with other organizations;<br>4. Supplementary of expertise/skilled manpower | No or very little progress. |
| DMP | 1. Strengthening of personnel motivation & training;<br>2. Adequate manpower & logistics;<br>3. Improvement of work environment & inter-agency coordination;<br>4. Improvement of mixed traffic & improper location of bus/truck stands | No or very little progress |
| RAJUK | 1. Strengthening of staff skill and training;<br>2. Inviting of expertise;<br>3. Allocate the senior positions to RAJUK staffs only;<br>4. Strengthening of manpower & logistics;<br>5. Improvement of motivation & skills with high volume of works;<br>6. Improvement of technology of land use planning | No or very little progress |
| BRTA | 1. Strengthening of expertise/skilled manpower, and adequate Office infrastructure;<br>2. Allocation of adequate funds;<br>3. Improvement of adequate manpower and weak enforcement ;<br>4. Adequate training program and coordination;<br>5. Improvement of organizational setup and logistic support;<br>6. Improvement of monitoring system;<br>7. Practical Rules and Ordinance to be enacted | No or very little progress |

Source: JICA Study Team

(5) Approval Process of Candidate Project

The approval authority for the projects in Bangladesh is uniform and same for all the Ministries. It varies with the nature of the project as well as the amount of the project.

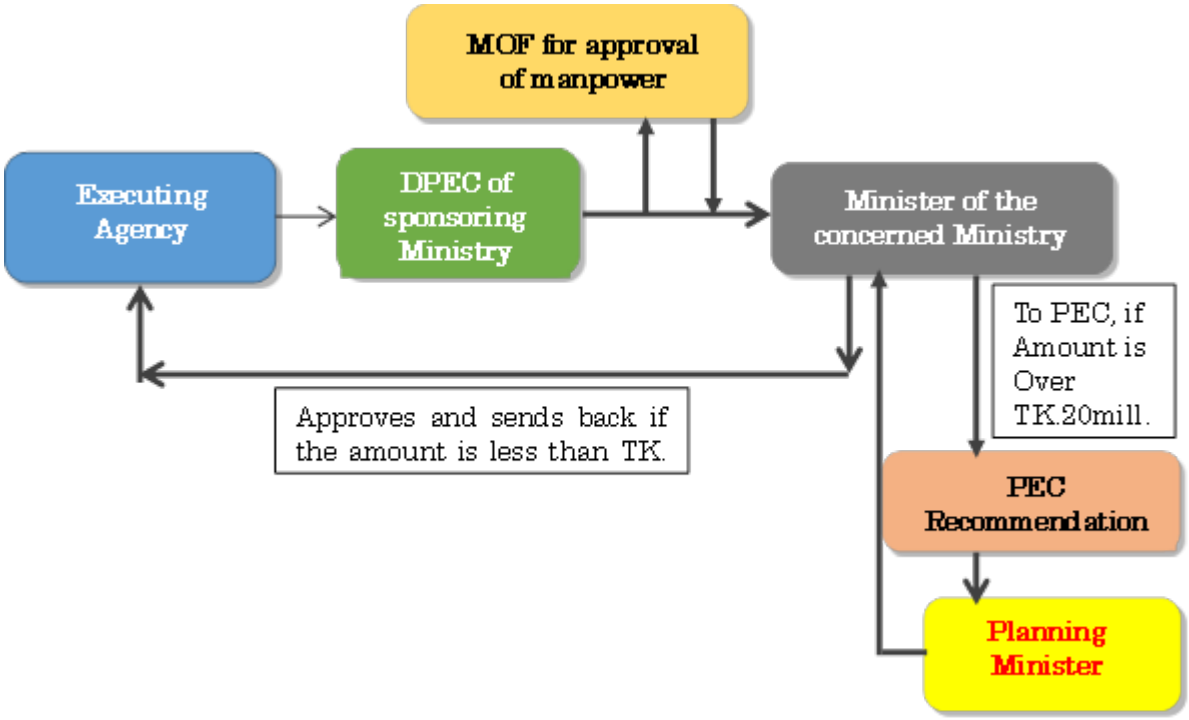
1) Approval authority for Survey/Study projects

Procedure for approval of Survey/Study projects under GOB finance.

I The Minister will approve a budget up to Tk 20.00 (Twenty) million, upon the recommendation of the Secretary of the Departmental Project Evaluation Committee (DPEC)

II If the amount is more, it will be sent to the Planning Commission for approval of the Planning Minister. The Planning Minister approves the projects upon recommendation of a committee chaired by the respective Member of the concerned Division of the Planning Commission. This committee is named as Project Evolution Committee (PEC).

After the recommendation of the DPEC, a proposal along with the copies of the Proforma for Study/Survey Proposal will be sent to the MOF for approval of the manpower along with salary structure. After receiving this approval, it will be sent for (i) approval of the Minister, (ii) signature of the Minister before sending it to the Planning Commission.




Source: JICA Study Team

**Figure 5.2 Flow Diagram of Approval Process 1**

The composition of DPEC and PEC along with their respective members is shown in Table 5.5 and Table 5.6.

**Table 5.5 Composition of Departmental Project Evaluation Committee (DPEC)**

| | | |
|---|---|---|
| 01 | Secretary of the concerned Ministry/Division | Chairperson |
| 02 | Representative of the concerned Wing/Sector/Division of the Planning Commission | Member |
| 03 | Representative of the General Economic Division of the Planning Commission | Member |
| 04 | Joint Chief/Deputy Chief of the concerned Ministry/Division | Member |
| 05 | Representative of the Programming Division of the Planning Commission | Member |
| 06 | Representative of the Finance Division | Member |
| 07 | Representative of the Economic Relation Division | Member |
| 08 | Representative of the Ministry of Establishment | Member |
| 09 | Representative of the concerned Sector of the IMED | Member |
| 10 | Representative of the Ministry of Environment and Forest | Member |
| 11 | Representative of the Ministry of Women and Children Affairs | Member |
| 12 | Head of the concerned Executing Agency | Member |

Source: JICA Study Team

**Table 5.6 Composition of Project Evaluation Committee (PEC)**

| | | |
|---|---|---|
| 01 | Member of the concerned Division of the Planning Commission | Chairperson |
| 02 | Division Chief of the Sector/Division of the Planning Commission | Member |
| 03 | Representative of the General Economic Division of the Planning Commission. | Member |
| 04 | Representative of the concerned sponsoring Ministry/Division | Member |
| 05 | Representative of the Programming Division of the Planning Commission. | Member |
| 06 | Representative of the Finance Division | Member |
| 07 | Representative of the Economic Relation Division | Member |
| 08 | Representative of the Ministry of Establishment | Member |
| 09 | Representative of the concerned Sector of the IMED | Member |
| 10 | Representative of the Ministry Environment and Forest | Member |
| 11 | Representative of the Ministry of Women and Children Affairs. | Member |
| 12 | Head of the concerned Executing Agency | Member |

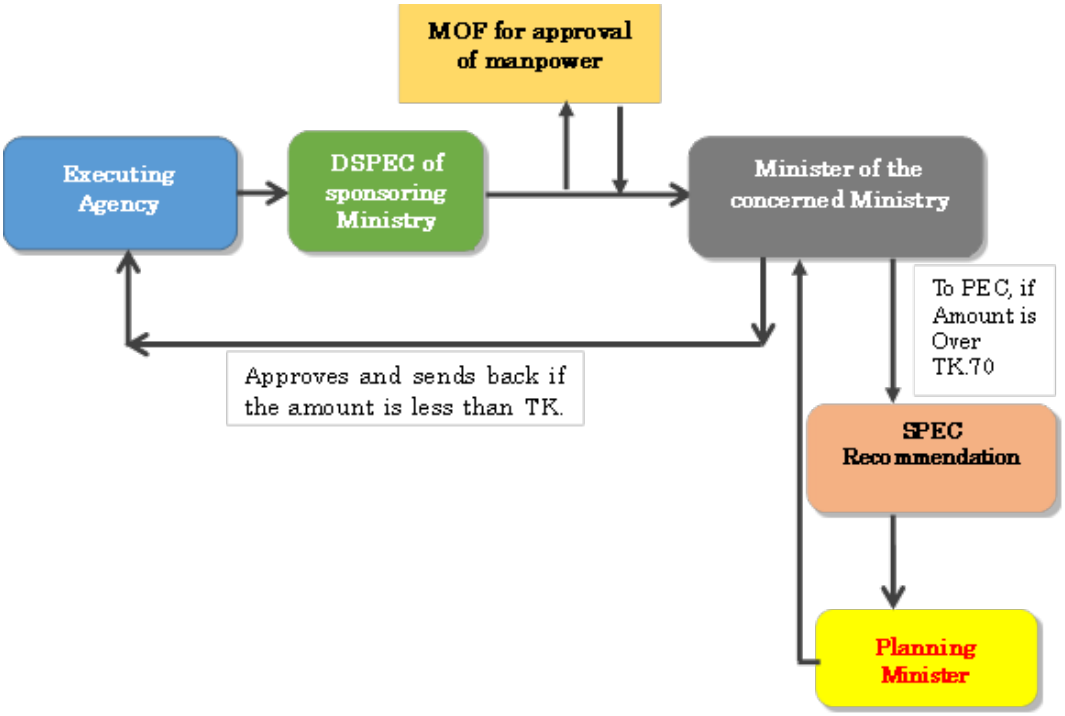
Source: JICA Study Team

2) Approval authority for Technical Assistance Project Proposal (TPP)

There are some Survey/Study projects financed by Development Partners under Technical Assistance for which the approval procedure is same but the amount of the proposal is a little different. It is shown as follows;

I In the case after the Technical Assistance proposal is finalized, the sponsoring Ministry approves Survey/Study project Proposals up to Tk 70.00 (seventy) million. Moreover, the project proposal will be examined by a committee named Departmental Special Project Evolution Committee (DSPEC) also chaired by the concerned Secretary, but with different committee composition.

II If the amount is more, it will be sent to the Planning Commission for approval of the Planning Minister. The composition of the committee will be different and named as Special Project Evolution Committee (SPEC) which will be chaired by Member of the concerned Division of the Planning Commission.




Source: JICA Study Team

**Figure 5.3 Flow Diagram of Approval Process 2**

The composition of DSPEC and SPEC along their respective members is shown in Table 5.7 and Table 5.8.

**Table 5.7 Composition of Departmental Special Project Evaluation Committee (DSPEC)**

| | | |
|---|---|---|
| 01 | Secretary of the concerned Ministry/Division | Chairperson |
| 02 | Representative of the concerned Wing/Sector/Division of the Planning Commission. | Member |
| 03 | Representative of the General Economic Division of the Planning Commission. | Member |
| 04 | Representative of the Planning Wing/Branch of the sponsoring Ministry/Division | Member |
| 05 | Representative of the Programming Division of the Planning Commission. | Member |
| 06 | Representative of the Finance Division | Member |
| 07 | Representative of the Economic Relation Division | Member |
| 08 | Representative of the Ministry of Establishment | Member |
| 09 | Representative of the concerned Sector of the IMED | Member |
| 10 | Representative of the Ministry of Science and Information & communication Technology | Member |
| 11 | Representative of the National Board of Revenue | Member |
| 12 | Head of the concerned Executing Agency | Member |

Source: JICA Study Team

**Table 5.8 Composition of Special Project Evaluation Committee (SPEC)**

| | | |
|---|---|---|
| 01 | Member of the concerned Division of the Planning Commission | Chairperson |
| 02 | Division Chief of the Sector/Division of the Planning Commission | Member |
| 03 | Representative of the General Economic Division of the Planning Commission. | Member |
| 04 | Representative of the concerned sponsoring Ministry/Division | Member |
| 05 | Representative of the Programming Division of the Planning Commission. | Member |
| 06 | Representative of the Finance Division | Member |
| 07 | Representative of the Economic Relation Division | Member |
| 08 | Representative of the Ministry of Establishment | Member |
| 09 | Representative of the concerned Sector of the IMED | Member |
| 10 | Representative of the Ministry of Science and Information & communication Technology | Member |
| 11 | Representative of the National Board of Revenue | Member |
| 12 | Head of the concerned Executing Agency | Member |

Source: JICA Study Team

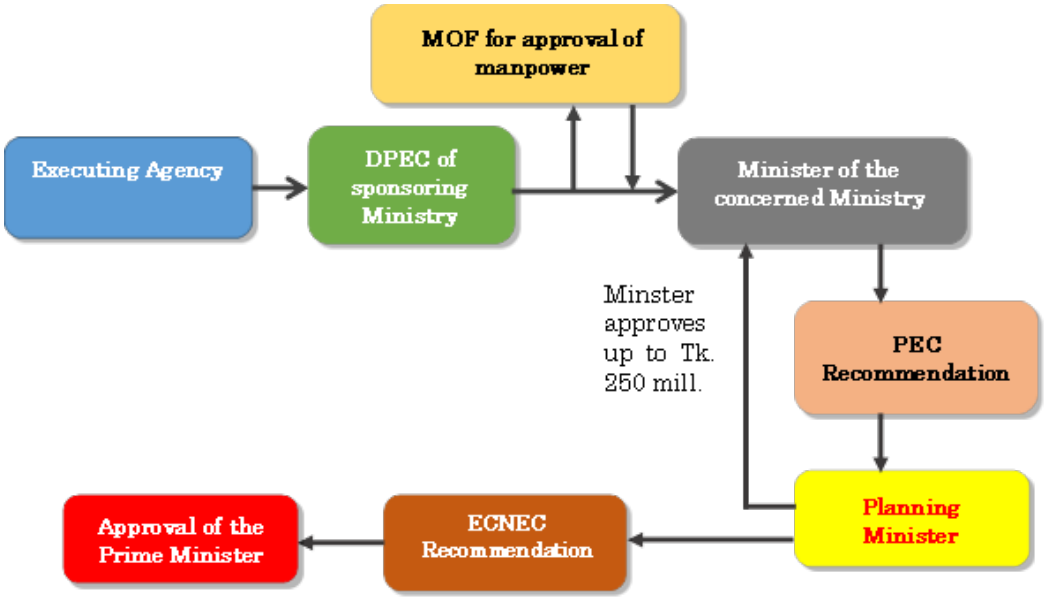
3) Approval authority for Development Project Proposal (DPP)

Prepare Development Project Proforma/Proposal (DPP) and send it to the line Ministry authenticated by the head of the agency.

The DPP was examined by the Ministry's concerned officials and was discussed in the meeting of the DPEC. After the recommendation of DPEC, the procedure of manpower approval was completed and was sent to the Planning Commission with authentication of the Minister of the sponsoring Ministry.

I If the budget is less than Tk. 250.00 million, the approval of the Planning Minister will be obtained after the recommendation of the PEC.

II If the budget is over Tk. 250.00 million, the approval of the Economic Council chaired by the Prime Minister will be obtained after the recommendation of the PEC.




Source: JICA Study Team

**Figure 5.4 Flow Diagram of Approval Process 3**

The Executive Committee of the National Economic Council (ECNEC) is the highest body for approval of any development project over Tk. 250.00 millions. The ECNEC Wing is in charge of coordinating meetings and monitoring the decisions taken at the meetings. ECNEC Wing is headed by a Joint Chief, with 2 Deputy Chiefs and 2 Assistant Secretaries.

The composition of NEC and ECNEC along their respective members is shown in Table 5.9.

**Table 5.9 Composition of NEC and ECNEC**

| | | |
|---|---|---|
| 01. | Prime Minister | Chairperson |
| 02. | Minister, Ministry of Finance | Alternate Chairman |
| 03. | Minister, Ministry of Planning | Member |
| 04. | Minster, Ministry of Agriculture | Member |
| 05. | Minister, Ministry of Labour and Employment | Member |
| 06. | Minister, Ministry of Water Resources | Member |
| 07. | Minister, Ministry of Commerce | Member |
| 08. | Minister, Ministry of Communication. | Member |
| 09. | Minister, Ministry of Shipping | Member |
| 10. | Minister/State minister of the concerned Ministry | Member |
| Supporting Officials | | |
| 01 | Cabinet Secretary | |
| 02 | Principal Secretary / Secretary, Prime Minister's Office | |
| 03 | Secretary, Economic Relations Division | |
| 04 | Secretary, Finance Division | |
| 05 | Secretary, Planning Division | |
| 06 | Secretary, IMED | |
| 07 | Member, General Economics Division, Planning Commission | |
| 08 | Member, Programming, Planning Commission | |
| 09 | Secretary, Concerned Ministry/Division | |

Source: JICA Study Team

## 5.3 Summary of Issues To Urban Transport Administration In DHAKA

(1) Summary of Past Studies Findings

The summary of the findings and recommendations of previous report and current improvement related to organizations and institutions of the Road Transport Sector is stated in Table 5.10.

**Table 5.10 Summary of Previous Studies Findings**

| Findings | Study Title | Recommendation | Current Improvement |
|---|---|---|---|
| Lack of skilled and experienced technical manpower in most of the transport related agencies. | BRT(ADB)<br>SISCETRA<br>STP | 1. Institutional development and capacity enhancement with approved new organogram;<br>2. Recruitment and placement of experienced and skilled manpower. | 1. Most of the agencies proposed new organogram;<br>2. Recruitment rules for new proposed posts have not yet been prepared. |
| Formation of a Government owned company for construction, operation and maintenance of MRT/BRT. | SISCETRA<br>IBA<br>DHUTS | 1. To prepare legislative documents and get approval of the GOB | 1. GOB owned company named DMTC has been formed under Company Act 1994. |
| Coordination among the transport related agencies is very poor. | SISCETRA<br>IBA<br>DHUTS, STP<br>BRT(ADB) | 1. New organogram for the agencies to be approved, with a focal point on coordination. | 1. No improvement as yet (Coordination DTCA) |
| For DTCA, BRTA and RAJUK most of the higher posts are on deputation from other agencies. | STP<br>SISCETRA | 1. Career path for the department officers should not be blocked. There should be recruitment for these posts if the department officers are not qualified. | 1. No improvement as yet.<br>2. Career building opportunity of department officers not visible. |
| Awareness of the Drivers, Commuters, and Pedestrians was found to be at the bottom level and measures should be taken to increase them. | STP<br>SISCETRA<br>BRT | 1. DMP and BRTA should do more campaign, workshops, seminars etc.<br>2. Awareness on road transport may be included in primary education curriculum. | 1. BRTA and DMP's campaign, workshops, seminars etc. are insufficient. (Coordination DTCA) |
| Vehicle emission level and noise level are very high and measures should be taken to eradicate or lower them. | STP | 1. DMP and BRTA should take action to write Manuals with the help of the Department of Environment (DoE). | 1. Guideline has been prepared.<br>2. Enforcement initiative is inadequate. (Coordination DTCA) |
| DTCA do not have legislative and functional capability to coordinate with all the transport related agencies. | STP<br>SISCETRA | 1. Organogram of the DTCA should be properly rearranged with correct and adequate number of posts for executing such activities; and it should be empowered with legislative authority. | 1. Legislation has been enacted.<br>2. No action is visible as yet on Functional authority. |

Source: JICA Study Team

(2) Arising Issues from Current Observation

Summarized below are the recommendations of this study on issues that need to be addressed as revealed from the analysis and observations made of the previous studies on Transport sector and current improvements:

1) The Road Safety will be discussed with concern agencies. The improvement of urban transport system should not be ignored The DTCA should be the unitary coordination body for the Road Safety system of greater Dhaka for which it should be organizationally empowered. And the enforcement agency(BRTA and DMP) should be manned and equipped properly so that they can take action against faulty vehicles as well as organize workshops seminars on public awareness, driver's and operators awareness and most importantly on Road Safety.

2) Effective Management Information System and database system should be developed so that DTCA can provide support to other agencies which will be treated as an important tool for coordination. It should also be able to supervise, monitor and coordinate the activities of other agencies involved in transport sector with due respect to transport planning and land use planning.

3) In spite of new development projects; transport related projects are coming up without proper coordination. DTCA should be strengthened to take the lead to conduct periodic coordination meetings and provide data and information to other agencies.

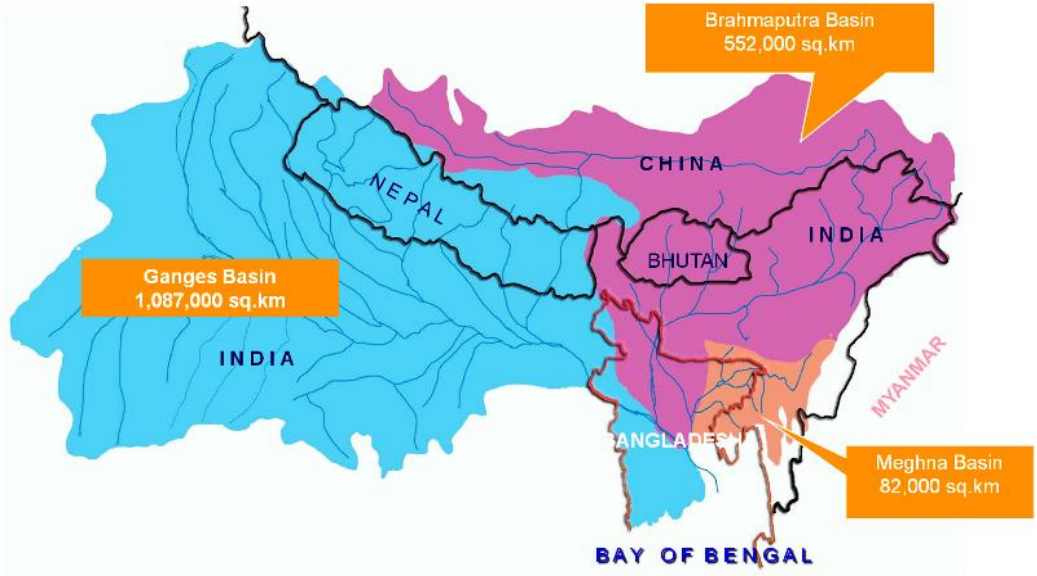
# 6. ENVIRONMENTAL CONDITION

## 6.1 Natural Environment

(1) Topography, Soils, Geological Characteristics

The People's Republic of Bangladesh is located in the delta formed by three major rivers; Ganges River, Brahmaputra River and Meghna River in confluence, and is a flat, low-lying country comprising an alluvial plain formed by tributaries and distributaries of these major rivers. Floodplains (80%), terraces (8%) and hills (12%) cover the land area. The hill zone is relatively small and mainly located in the southeast.

The three major rivers are international rivers that encompass India, Nepal, Bhutan, China and Myanmar, as well as Bangladesh in their basins, with total catchment area of about 1.721 million km$^2$. Bangladesh's territory area is about 147,000 km$^2$, covering merely about 8.5% of the total catchment area (Figure 6-1).




Source: BWDB presentation

**Figure 6.1 Major rivers flowing through Bangladesh**

With regard to the climate, Bangladesh is located at the foot of the Himalayas, in one of the regions having the highest rainfall in the world, under the influence of tropical monsoon climate. The year is distinctly divided into a dry season and a rainy season. About 70% of the yearly precipitation occurs in the rainy season from June to September.

Bangladesh has about some 310 rivers running through it, and receives inflows from the outside of the country through the three major rivers and others, and the total inflow is estimated to amount to about four times the precipitation within the country (total yearly runoff of surface water through rivers is about 1,200 billion cubic meters). Because the period during which the inflows enter across the national borders nearly coincides with the rainy season of the country, the flat, low-lying delta of Bangladesh is inevitably inundated during the rainy season.

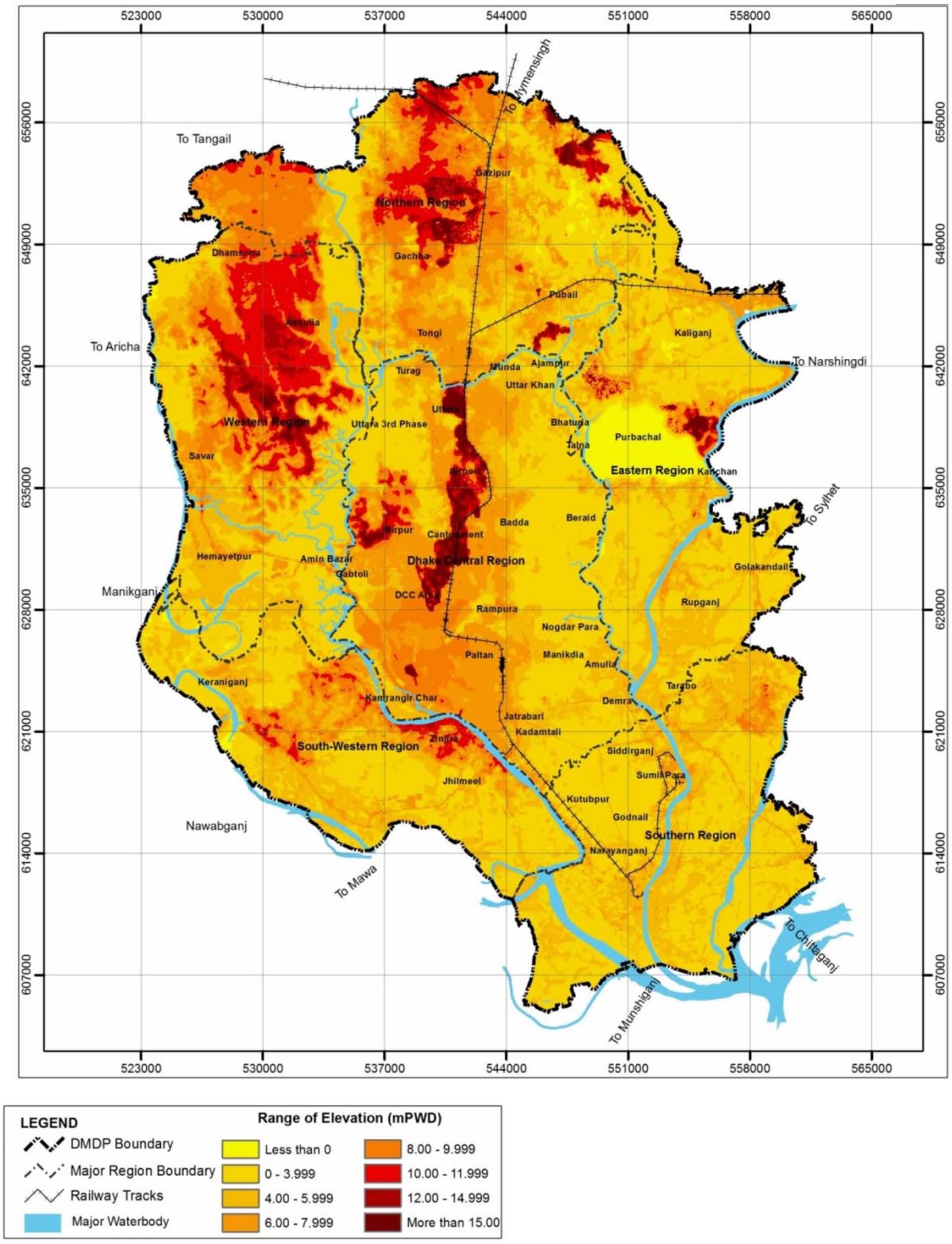
Low lying swamps and marshes located in and around the city are other major topographic features. The elevation of DCC area varies from 2 to 13 m above the mean sea level. The most of the developed areas in RAJUK area are at an elevation of 6 to 8 meters above the mean sea level (Figure 6.2). (Regional Development Planning, RAJUK, 2014)

Bengal Basin covers a vast area of the north-east part of the Indian Plate. It includes Bangladesh and part of West Bengal, Tripura and Assam of India. The Bengal Basin is bounded by the Indian Peninsular Shield on the west, on the north by the Precambrian Shillong Massif, on the east by the Arakan-Yoma Fold Systems and to the south it is open to the Bay of Bengal.

Bengal Basin consists of a large alluvial basin floored with Quaternary sediments deposited by the Ganges, Brahmaputra and Meghna rivers and their tributaries. In the active floodplain areas two major areas of Pleistocene sediments are within Bengal Basin and are known as the Barind Tract and Madhupur Tract (Source: Regional Development Planning, RAJUK, 2014

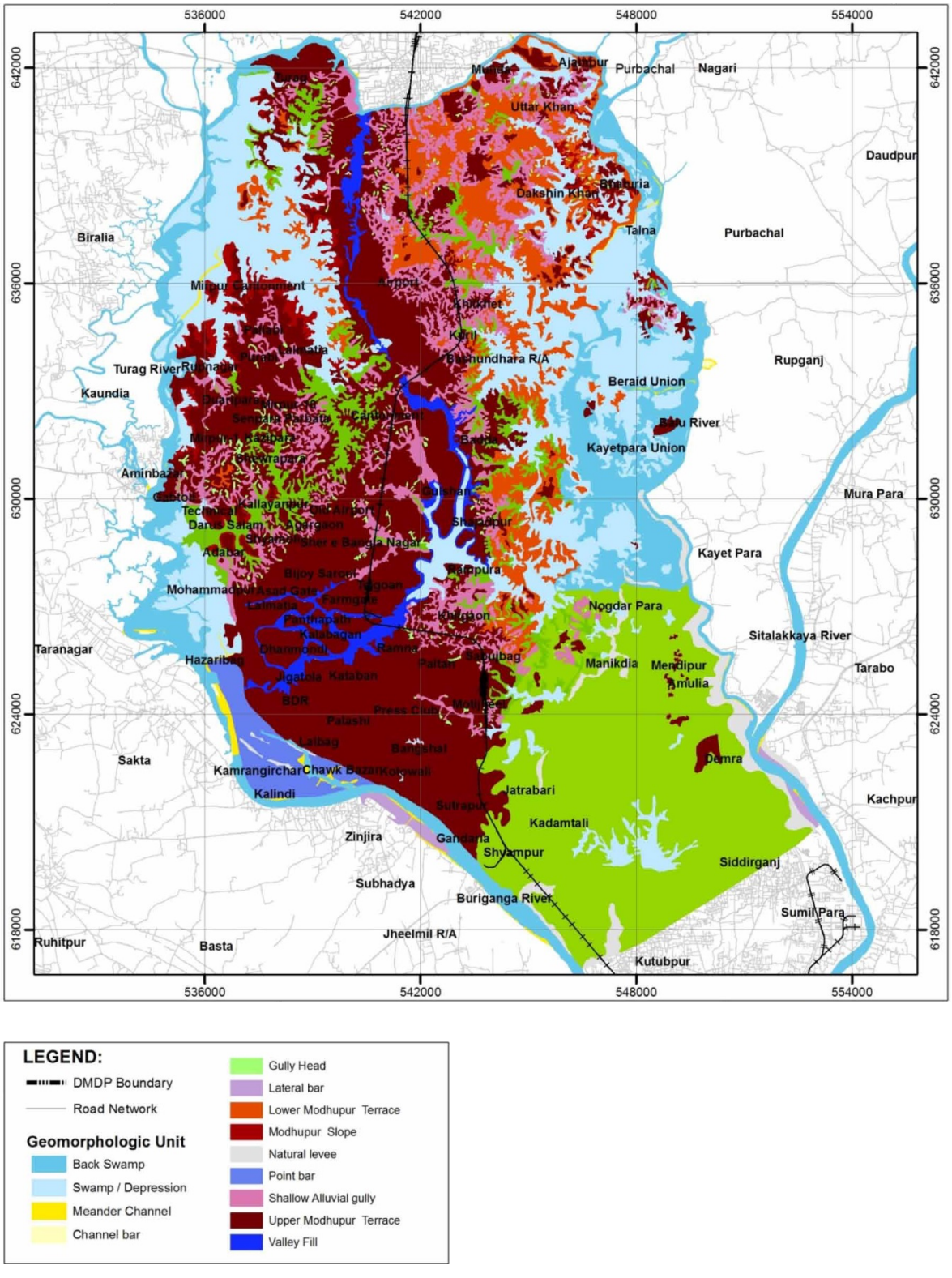
Figure 6.3).

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 north-west part and lies elongated from the middle of the north to south of the project area and these are oxidized Pleistocene sediments. In the east, south and western half of the RAJUK area are covered by the Ganges-Brahmaputra floodplain sediments. The area has been divided into 6 geological units and these are: i) Chandina Alluvium, ii) Alluvial Silt and Clay, iii) Alluvial Sand, iv) Alluvial Silt, v) Marsh Clay and Peat and vi) Madhupur Clay Residuum as shown in Figure 6.4. (Regional Development Planning, RAJUK, 2014)




Source: Regional Development Planning, RAJUK, 2014

**Figure 6.2 Digital Elevation/Terrain model of RAJUK Area**

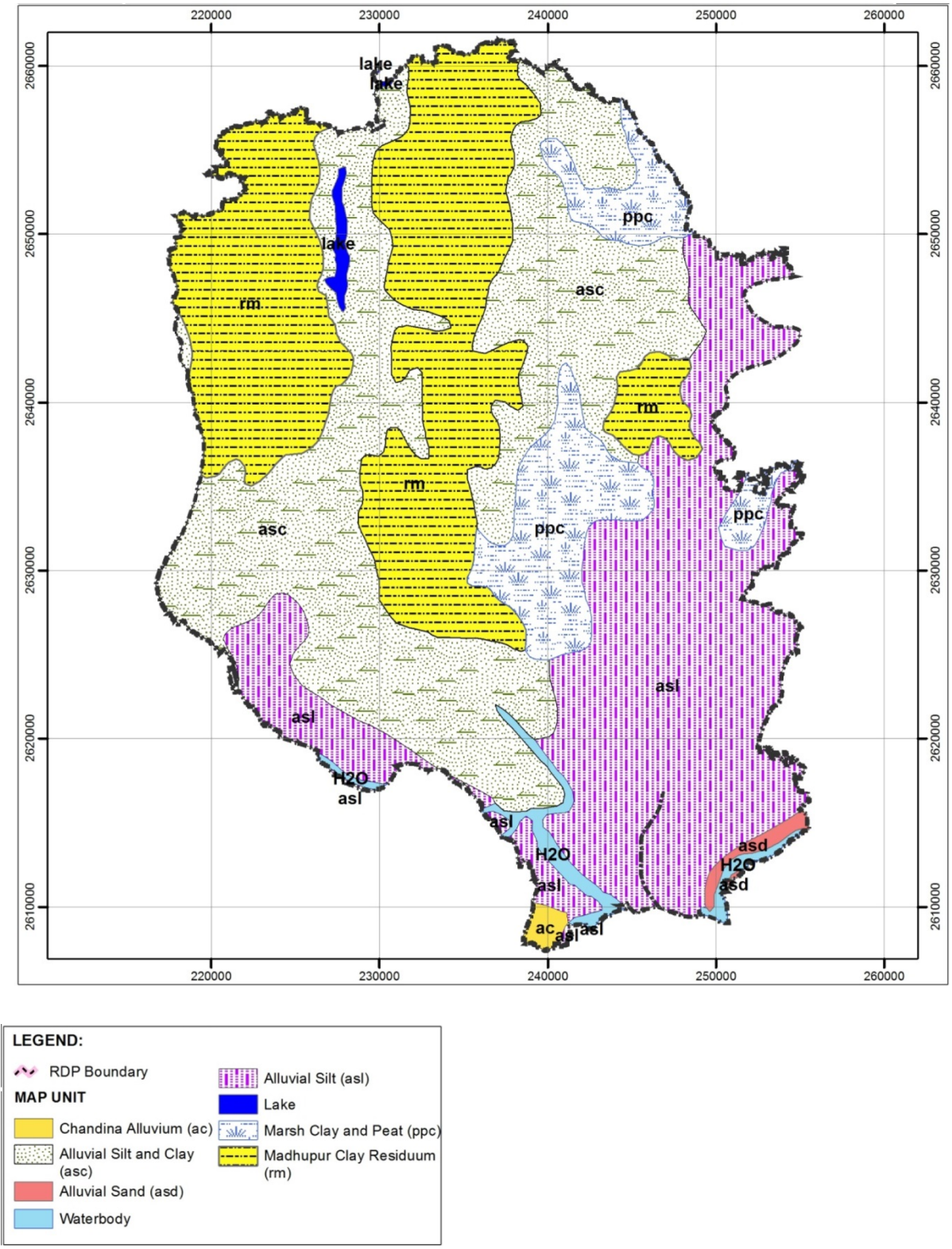






Source: Regional Development Planning, RAJUK, 2014

**Figure 6.3 Geomorphologic Situation of Dhaka Central Part of RAJUK Area**




Source: Regional Development Planning, RAJUK, 2014

**Figure 6.4 Generalized Geology of RAJUK area**

1) Soil

Dhaka district conceives greater variety of soils than any other district of Bangladesh. The soils of the RJUK area are described under the headings of the six major geomorphologic units within which the different parent material 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 is recorded the fascinating history of uplift and subsidence, erosion and deposition of changes of sea-level and in climate and vegetation and have contributed to provide the distinctive aspect 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.

Topsoil is usually a ploughed layer 5 cm to 80 cm thick. The floodplain topsoil varies in thickness from 5 cm to about 15 cm. The subsoil is the layer undisturbed by tillage. In the floodplains it ranges from 15 cm to 45 cm. The topsoil grades uniformly into the substratum which may range from loose sand to Madhupur clay (Soils Resource Development Institute).

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

2) Seismology

The National Seismic Zoning Map (Geological Survey of Bangladesh (GSB)) divides the country into three regions (Figure 6.5). The city of Dhaka falls within the medium-risk zone (zone 2). In the medium risk zone, shocks of moderate intensity are possible, with a probable maximum magnitude of 6-7 on the Richter scale. This map clarifies the seismological status of the various regions of the country.

The earthquake risk factor for this zone 2 is 0.15, while the risk factors for zone 1 and zone 3 are 0.075 and 0.25 respectively. More than 20 large earthquakes have been recorded in and around Bangladesh over the last 130 years (MPO, 1987). These earthquakes were centered in the Shillong Plateau in Assam in the Arakan Yoma Ranges and in the Indo-Burman Ranges in Myanmar (Table 6.1).

**Table 6.1 Seismic attribute over the years**

| Year | Epicenter | Magnitude |
|---|---|---|
| 1762 | Arakan Yoma | 8.4 |
| 1885 | Bengal | 7.0 |
| 1897 | Shillong | 8.7 |
| 1918 | Sreemangal, Sylhet | 7.6 |
| 1923 | NER/Tangua hanor | 7.1 |
| 1944 | NER/Hakaluki hanor | 6.0 |
| 1950 | Assam | 8.5 |
| 1967 | NER/Khowai | 5.1 |
| 1968 | NER/Khowai | 5.2 |
| 1971 | Tripura | 5.5 |

Source: NERP

A recent study by Comprehensive Disaster Management Program (CDMP) on the liquefaction susceptibility of Dhaka indicates that the city's eastern and south-western parts lie within the high to very high liquefaction susceptibility range. These parts are recently filled and developed marshy lands. Liquefaction is a physical process of ground failure that takes place during earthquake. In Dhaka, an earthquake from either Madhupur or Dauki fault might cause severe liquefaction effects to buildings, especially those developed on marshy lands on the eastern and western fringes, and even within the city in the infill areas like Begunbari and parts of Mirpur.


Source: Ministry of Power, Energy & Mineral Resources Division

**Figure 6.5 National Seismic Zoning Map of Bangladesh**

(2) Hydrological Characteristics

1) River water level

Dhaka, the capital of the People's Republic of Bangladesh, is surrounded by tributaries and branches of the three major rivers. 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 as high as 5.0 to 6.0 m in an ordinary rainy season, but are about 1.0 to 2.0 m in the dry season.

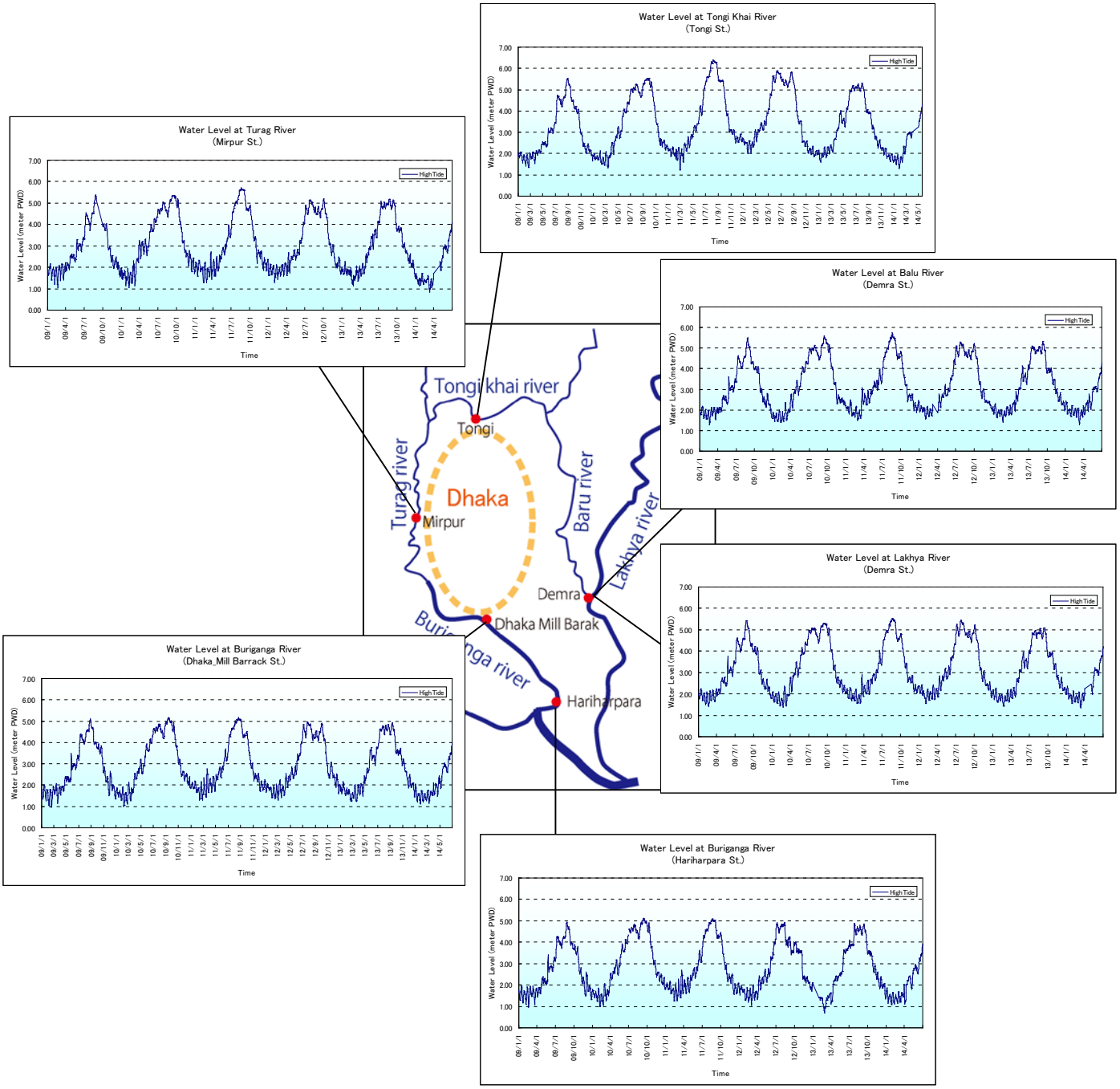



**Figure 6.6 Variations in water levels in rivers around Dhaka in recent 5 years**

2) Precipitation

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

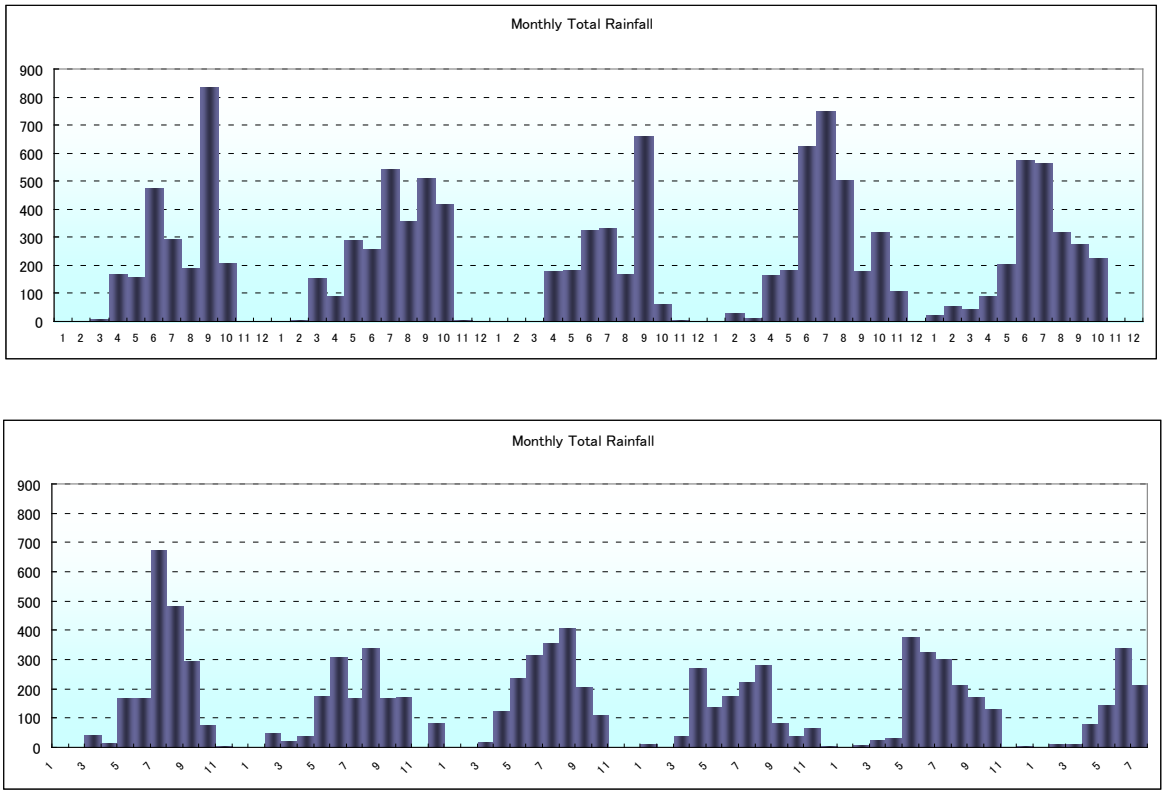
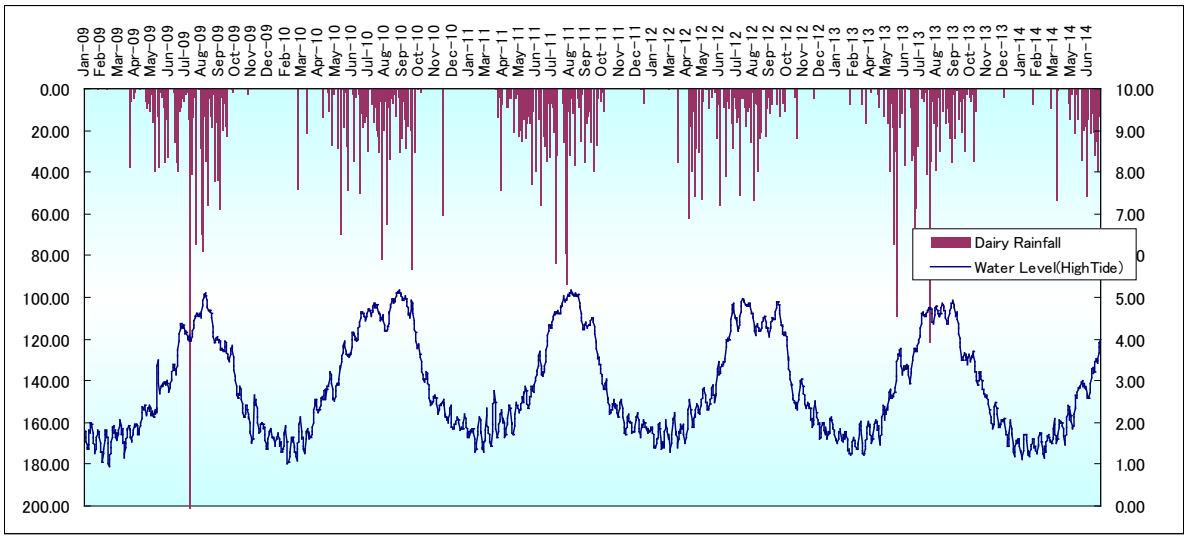



**Figure 6.7 Monthly precipitation in recent 10 years**




Source: HAZARDS_AFFECTING_BANGLADESH_forReport

**Figure 6.8 Daily precipitation in Dhaka and variations in water level in Buriganga river in recent 5 years**

3) Groundwater Table of Dhaka City

There are various reasons that are responsible for gradual declination of groundwater level in Dhaka city of which high groundwater withdrawal from the aquifer is the most crucial. In addition, rapid urbanization including construction of roads, buildings, other engineering structures, flood protection dams, and embankments are continuously hindering the natural groundwater recharges from rainfall and perennial water sources existing in and around the city (Rahman and Alam, 2005). A network of 22 lakes, canals, and small rivers facilitate the natural drainage for the floodwaters and groundwater recharge in this city. Illegal encroachment and disappearances of them also depreciated groundwater recharge over the last four decades.

In Bangladesh, the depth of water tables varies from less than a meter to more than 30m. The shallowest water table occurs in the coastal region whereas the deepest water table occurs in the

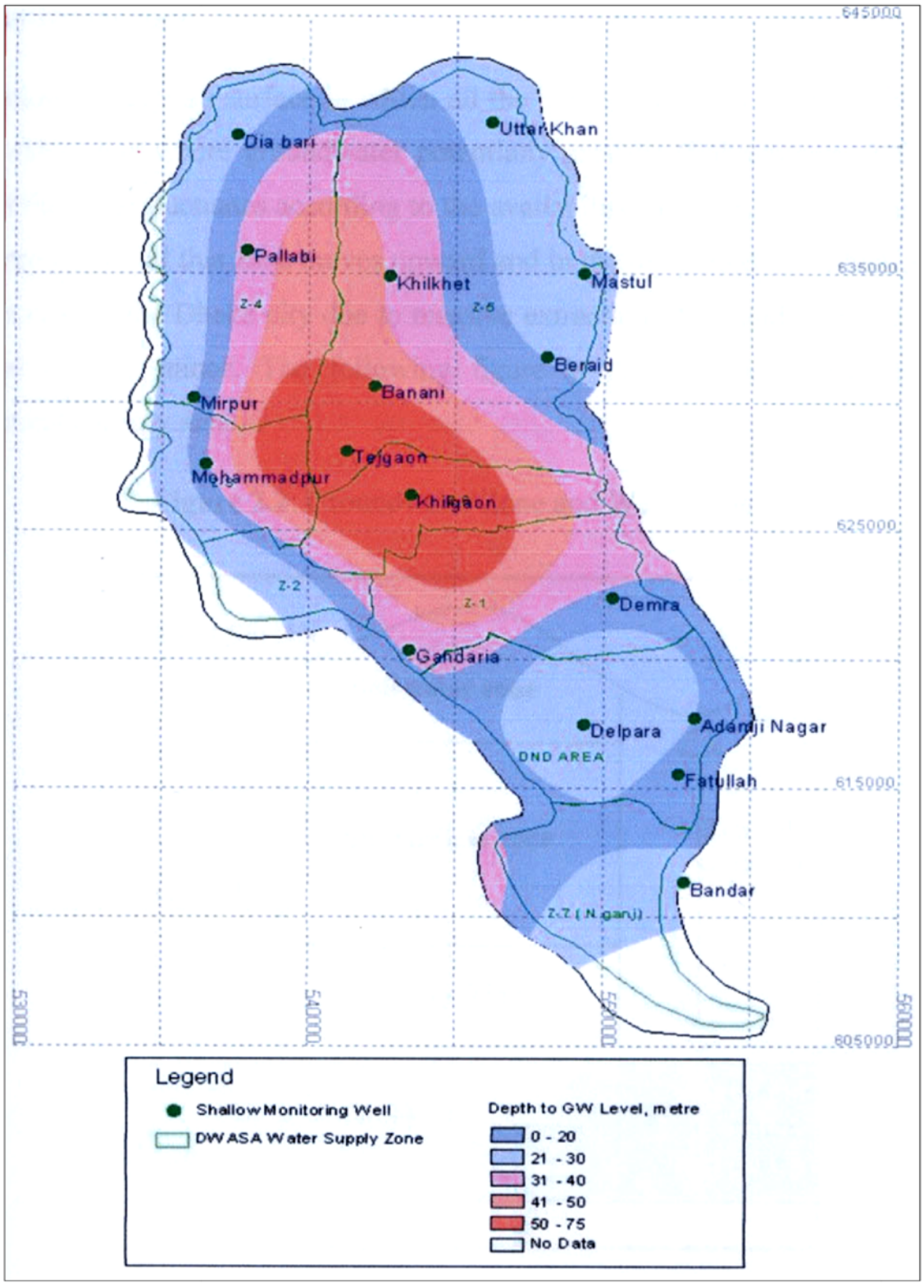
Barind Tract and Dhaka City (more than 30m from the ground surface) (Banglapedia, 2006).

The depth to the water table moves seasonally with annual recharge and discharge conditions. The amount of seasonal fluctuation varies from less than a meter to more than 10m depending on the local hydro geological conditions, amount of groundwater abstraction and natural discharge of groundwater. In recent years, there is a declining trend in the water table due to larger amount of groundwater withdrawal.

Geologically, Dhaka city is under the category of the Pleistocene terraces mostly composed of the Madhupur clay deposits. There is little variation in the surface elevation of the city. The thickness of the Madhupur clay ranges from 8 m to about 45 m with an average thickness of 10m in this city. The underlying layer is known as “Dupi Tila” composed of sand particles that are considered as the main aquifer of Dhaka city. The impermeable clay layer of variable thickness overlies the sandy layer that makes the groundwater aquifer mostly confined in nature. The total thickness of the Dupi Tila aquifer varies from 100m to about 200m with an average thickness of 140m. Some scientific studies on the groundwater of the city revealed that the aquifer piezometric level which is the natural water level of a confined aquifer of the city main aquifer, has gone down significantly in last few years due to over-withdrawal of groundwater (Akther, Ahmed and Rasheed, 2009).

4) Groundwater Depletion of Dhaka City

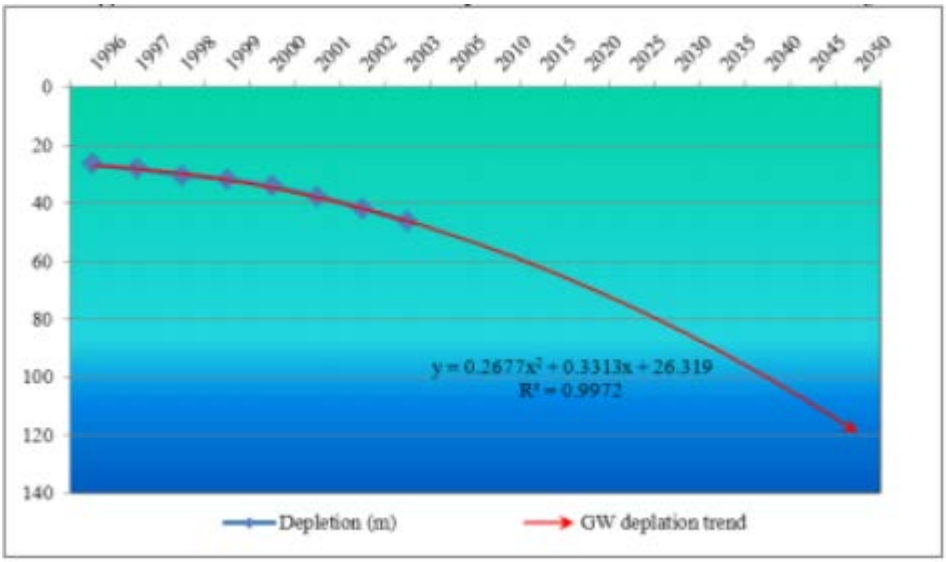
In Dhaka city, groundwater extraction started from a depth of 100 meters and in some extreme condition the well goes up to 300 meters to reach the main aquifer. The depletion rate varies from area to area as in Mirpur the groundwater level dropped 53.75 meters between 1991 and 2008 at a rate of 3.2 meter per year. While the decline was 1.1 m/y in Mohammadpur, 2.2 m/y in Sabujbagh, 0.5 m/y in Sutrapur, and 0.8 m/y in Dhaka Cantonment during the same period (The Daily Star, 2010). The city’s groundwater level has dropped about 20 meters over the last seven years at a rate of 2.81 meter per year, and from the year 2000, the rate is increasingly high.




Source: DWASA,2008

**Figure 6.9 Ground water Zoning Map of upper Dupitila Aquifer System**

Taking into account the current groundwater depletion trend at 2.81 m/y, a projection has been made for 2050 and it predicts that the groundwater table will be lowering down to 120 meters by 2050 from the existing water table (Figure 6.10). This depletion will hamper the constant water supply as many of the operating deep wells may shut down due to water unavailability. The production cost may rise at the highest peak.




Source: Dhaka City State of Environment 2005, 2011

**Figure 6.10 Groundwater Depletion Trend of Dhaka City**

(3) Wetland Characteristics

1) Function of Wetland

Dhaka city play important roles of flood control and environment protection, by performing various functions as listed below. However, wetlands have been in an irreversible course of disappearing in recent years, as poorly planned development projects are rampant, while relevant regulatory agencies remain poorly coordinated.

Functions of wetlands

A. Water retention for flood water

Mitigates the inundation damage by temporarily retaining the flood water coming from rivers.

B. Drainage of rain water from urban district

Rain water falling in Dhaka is stored in wetlands in the surrounding areas, while rain water falling in the urban district is discharged through drainage and khals into rivers.

C. Recharging of ground water

According to a survey conducted by SWMC in 2000, about 95% of water supplied to Dhaka was ground water from a depth of 1.02 m to 2.46 m during the period from 1995 to 1999. It can be seen that the lowlands play an important role of recharging the ground water.

D. Preservation of ecological system and biodiversity

A wetland, that includes diverse ecological elements such as waterbody, habitat of emergent plants and forests, makes a great contribution to the preservation of ecological system and biodiversity.

E. Contribution to local economy

Most of the wetlands are fertile floodplains, which are highly valued and utilized as rice paddies or fields to cultivate other agricultural products in the dry season. In the rainy season, the wetlands join with the neighboring rivers and provide a fishing ground. Thus the wetlands are integrated in the economy of the local residents.

F. Field of recreation activities

The vast expanse of wetlands surrounding the urban district provides an open, natural landscape and a field for recreation activities.

**Figure 6.11 Wetland (Rupgonj)**

2) Wetland Loss

Map in Figure 6.12 shows that the main wetlands of Dhaka have been squeezed substantially over the years. Analysis revealed that area covered by wetlands in the city significantly reduced over the period 1960 to 2008 (Islam 2010). In 1960, the area of the open water body was about 2,952 ha, which became about 1,991 ha in the year 2008. The amount of the open water body reduction is 961 ha. There has been a yearly wetland loss of 5.67% from 1999 to 2003 as against 1.23 % from 1989 to 1999. The wetlands in the south-western corner retreat towards the Turag River in between Mirpur and Mohammadpur area. Minor reduction of the wetland has been occurred in the Pallabi-Cantonment area as well where low-lying areas were filled and levelled for the urban extension.

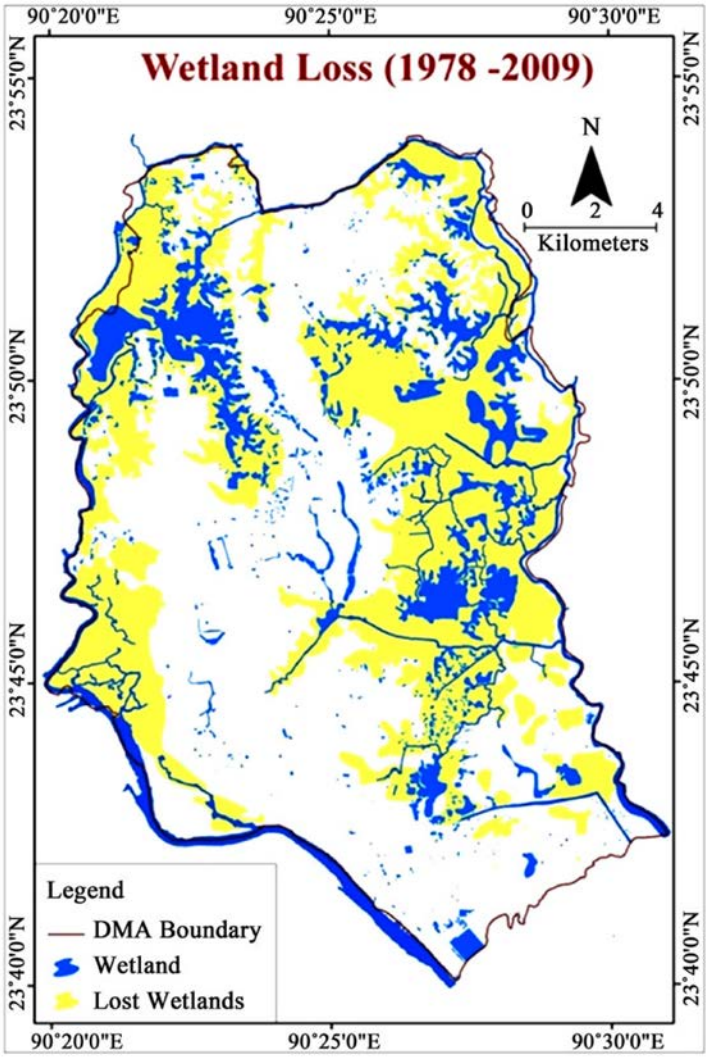
From 2005 to 2011 in just six years, the wetlands adjacent to Dhaka shrank from 5.85 $km^2$ to 3.95 $km^2$ when local water bodies and lowlands were converted to commercial, industrial and residential zones. If the current trend continues, experts said, by the year 2037 all wetland of Dhaka will disappear, posing a serious threat to the city's existence. (BCAS, Abu Syed, 2012)

The rainy seasons in Dhaka are getting shorter but more intense. The wetlands serve as flood basins for the city - they help the rainwater to run off. With the depletion of the wetlands, the city’s drainage systems are no longer able to function properly, resulting in frequent water-loggings. (CGEC, Ataur Rahman, 2012)

Not only for preventing drainage congestion and water logging but also for sustainable development, as well as for various environmental benefits all the remaining wetlands in and around Dhaka City must be preserved. Wetlands ecosystems help regulate climate change by storing and capturing carbon. Wetland play important role as carbon sinks to mitigate the effects of climate change.

Most of the natural drainage channels of Dhaka City disappeared or are on the way to extinction due to illegal encroachment and filling. Most of these developments do not have required approvals from appropriate authorities including the RAJUK or have obtained the same using their political influences or using unfair practices. In addition, without there being any systematic plans by RAJUK for land development and development control in such fringe areas, the intrinsic ability of these flood flow zones to retain or store excess water during periods of high rainfall is getting reduced.

It was reported by an expert from BUET that in a recent study conducted in Boro Beraid, Santarkul, Kathaldia and Dumni moujas in the city's eastern fringe areas, severe socio-economic impacts have been reported on the original residents due to the earth filling. These people now face forced displacement from their ancestral homes as well as their traditional livelihood based on agriculture. Even though they are provided compensation amounts, in the absence of any comprehensive rehabilitation policy and with the low skill sets of the displaced people, the signs of impoverishment are even more pronounced. It has even been reported that due to the unlawful modalities adopted by the land developers, 53.2% of the affected locals are forced to sell their lands due to the tactics adopted by the developers, while 25.8% were compelled to sell just because their lands were turned into enclaves within areas filled up by developers. (Regional Development Planning, RAJUK, 2014)




Source: Survey Report (RAJUK 2014)

**Figure 6.12 Wetland Loss in RAJUK between 1978 and 2009**

(4) Protected Area

1) National Park, Sanctuaries and Other Conservation Sites

Based on Bangladesh Wildlife Preservation Order 1973 Protected Areas (PAs) is classified into national parks, wildlife sanctuaries, game reserves and private game reserves. Bangladesh has 37 nationally designated protected areas (17 national parks and 17 wildlife sanctuaries). Covering approximately 266,000 ha, this covers 10.72% of Total Forest Area of the country. A part of the Sundarbans 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 February 4, 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.

Bhawal National Park

Bhawal National Park is one of the oldest national parks in Bangladesh encompassing an area of 5,022 ha. The park was established in 1982 to protect the

biological, ecological and geographic significance of the area, providing recreational facilities for the visitors. It is a moist deciduous forest known as Sal (Shorea robusta) forest, which spread over the plains of the central and northern regions of the country (FSB, 2000). The Park is situated about 40 kilometers away from Dhaka City, along the highway of Dhaka-Mymensingh. About 180.25 ha (18 %) of this core area of the park was privately owned out of which only 24.38 ha (13.5%) of land is transferred to government, i.e. Forest Department (Anon., 2002).

The Park has 220 plant species, including 43 different tree species, 19 shrubs, 3 palms, 27 grasses, 24 vines, and 104 herbs. The wildlife in the park includes 13 mammals, 9 reptiles, 5 birds and 5 amphibians.

Unfortunately illegal deforestation has stripped the area of much of this natural vegetation, in fact only 600 $km^2$ remains of what was once a magnificent forest. New trees and woodlands have been planted in an effort to help the forest recover, but it will most likely take many years before they are mature enough to support the incredible animal diversity that was once so common in this area.

**Figure 6.13 Bhawal National Park Sal (Shorea robusta) forest and Bhawal National Park Sal forest and wetland**

2) Environmentally Critical Area

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 RAUK; 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.

(5) Biodiversity

1) Ecosystems

The ecosystems of Bangladesh could be categorized into two major groups, i.e. (i) land based and (ii) aquatic. The land-based ecosystems include forest and hill

ecosystems, agro-ecosystem and homestead ecosystem; while seasonal and perennial wetlands, rivers, lakes, coastal mangroves, coastal mudflats and chars, and marine ecosystem fall into the aquatic category.

Each of the ecosystems has many sub-units with distinct characteristics as well (Table 6.2). IUCN Bangladesh in 2002 classified the country into twenty five bio-ecological zones, some of which are constituted of one or more than one type of ecosystems.

Under the RAJUK area, Moist Deciduous Forest (Sal Forest), Agro-ecosystem, Homestead Ecosystem and Wetland Ecosystem are observed.

**Table 6.2 Type of Ecosystem**

| Category | Type of Ecosystem | | Total Area ($km^2$) | % of land area |
|---|---|---|---|---|
| Land based | Forest Ecosystem | Tropical Evergreen and Semi-evergreen Hill forest | 6,700 | 4.54 |
| | | Moist Deciduous Forest (Sal Forest) | 1,200 | 0.81 |
| | Agro-ecosystem | | N.A. | N.A. |
| | Homestead Ecosystem | | 27,670 | 20 |
| Aquatic | Forest Ecosystem | Mangrove Forest | 6017 | 4.07 |
| | | Freshwater Swamp Forest | N.A. | N.A. |
| | Coastal and Marine Ecosystem | | Coast: 714 (km) | N.A. |
| | Wetland Ecosystem | | 1720.09 | 1.16 |

Source: JICA Study Team

(6) Ambient Air Quality

1) General

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 (NOx), Sulfur Dioxide ($SO_2$), Particulate Matter (PM), usually expressed as PM with diameter of 10 microns or smaller: $PM_{10}$, or $PM_{2.5}$ microns or smaller: $PM_{2.5}$, Carbon Monoxide (CO), Ozone, and Lead. The motor vehicles and traditional brick kilns contribute predominantly to the air pollution. The motor vehicles are major source of PM pollution that contributes to the risk of developing cardiovascular and respiratory diseases, as well as lung cancer. Most of the PM pollution comes from the diesel-run vehicles. Hundreds of brick kilns operate during the dry season from November to April in the low agricultural land surrounding Dhaka City and generate smoke dust including $SO_2$, NOx and hydrocarbons that contribute to worsening the ambient air and damage of public health.

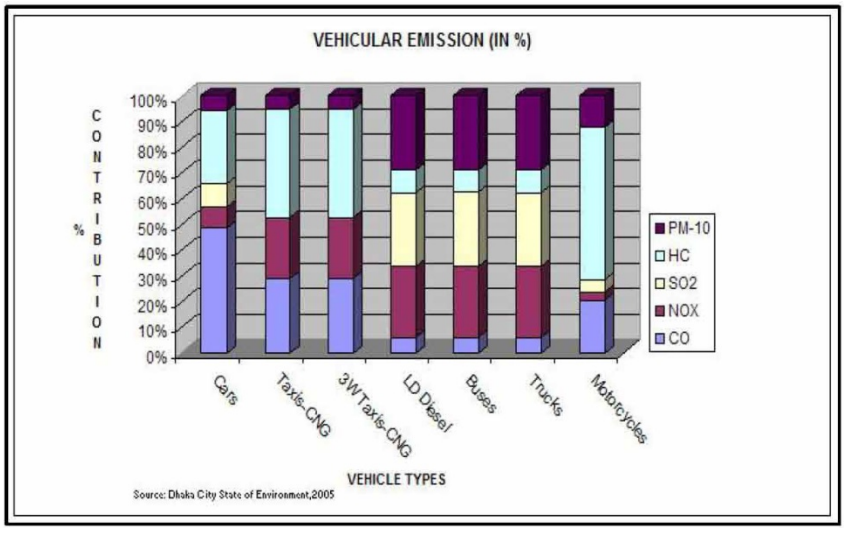
Table 6.3 represents the current air quality standards for Bangladesh.

**Table 6.3 National Ambient Air Quality Standards for Bangladesh**

| Pollutant | Unit | Averaging Period | Bangladesh Standards | WHO Guideline Values |
|---|---|---|---|---|
| CO | $mg/m^3$ | 8 hours(a) | 10 (9 ppm) | 10 |
| | $mg/m^3$ | 1 hour(a) | 40 (35 ppm) | 30 |
| Pb | $\mu g/m^3$ | Annual | 0.5 | 0.5 |
| NOx | $\mu g/m^3$ | Annual | 100 (0.053 ppm) | 40 (as $NO_2$) |
| $PM_{10}$ | $\mu g/m^3$ | Annual (b) | 50 | 20 |
| | $\mu g/m^3$ | 24 hours (c) | 150 | 50 |
| $PM_{2.5}$ | $\mu g/m^3$ | Annual | 15 | 10 |
| | $\mu g/m^3$ | 24 hours | 65 | 25 |
| $O_3$ | $\mu g/m^3$ | 1 hour (d) | 235 (0.12 ppm) | - |
| | $\mu g/m^3$ | 8 hours | 157 (0.08 ppm) | 100 |
| $SO_2$ | $\mu g/m^3$ | Annual | 80 (0.03 ppm) | - |
| | $\mu g/m^3$ | 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 $ug/m^3$.
(c) The objective is attained when the expected number of days per calendar year with a 24 hour average of 150 $\mu g/m^3$ 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).

Contribution of air pollution from different sectors is summarized below. (Dhaka Metropolitan Development Plan Strategic Environmental Assessment, 2007)




Source: Dhaka City State of Environment 2005

**Figure 6.14 Air Pollution from Vehicles in Dhaka**

Transport

Analysis of the emission inventory presented in Figure 6.14 indicates that the diesel vehicles contribute approximately 80% of the air pollution from mobile sources. The ageing fleet of diesel vehicles along with the high sulphur content in diesel is considered as prime reasons for such high levels of air pollution. CNG Taxis and 3-wheelers also contribute to the NOx load. Poor maintenance coupled with poor fuel quality, traffic congestion, poor transport infrastructure planning and lack of coordination between the agencies involved in planning and executing of land use and transport planning add to the vehicular air pollution in the city.

Solid Waste

The practice of burning of a part of the municipal solid waste collected contributes to air pollution. The existing municipal solid waste landfill sites (both temporary and permanent) are sometimes put on fire and emit fumes and gases contributing to air pollution including methane and non-methane organic compounds, for example benzene, etc.

Brick Kilns

Large number of brick kilns has been setup in the fringe areas of the city, especially in the northern parts and all along Tongi and Turag river banks. The significantly high levels of air pollution from these kilns has substantial impacts on the air quality especially during dry winter months

Industries

Industries in Tejgaon Industrial Area are a major source of industrial air pollution. Also, the Tanneries and hide dealers in Hazaribagh area, which is a predominantly residential area, discharge effluent and emit foul odour (decaying carcasses and treatment chemicals), impacting the health of workers and residents. The rolling mills in Fatullah also pollute the air in this region.

2) Air Quality Survey

CASE Project

In order to address the growing public concern over air pollution, GOB took up the Air Quality Management Project (AQMP) - a World Bank supported Learning and Innovation loan which became operational in September 2000 and closed on December 2007. As a follow-up, Clean Air and Sustainable Environment (CASE) project has been implemented with the World Bank financial support, implemented by DOE of MOEF, and carries out real-time measurements of ambient level pollutant, aiming to define the nature and severity of pollution in the cities; identify pollution trends in the country; and develop air models and emission inventories. Monthly report which summarizes the air quality data collected at the different Continuous Air Monitoring Stations (CAMS) in operation under the Department of Environment (DOE) air quality monitoring network, is prepared to present, analyze and make available of these data to the general public, stakeholders, researchers and policy makers to develop effective air pollution abatement strategies

Parameters of CASE Project

CASE project monitors the criteria pollutants such as carbon monoxide (CO), nitrogen dioxide ($NO_2$), ozone ($O_3$), sulfur dioxide ($SO_2$), $PM_{10}$ and $PM_{2.5}$. Monitoring is performed to demonstrate attainment or non-attainment of national ambient air quality standards to assess the trends of air pollution levels.

Monitoring Stations of CASE Project

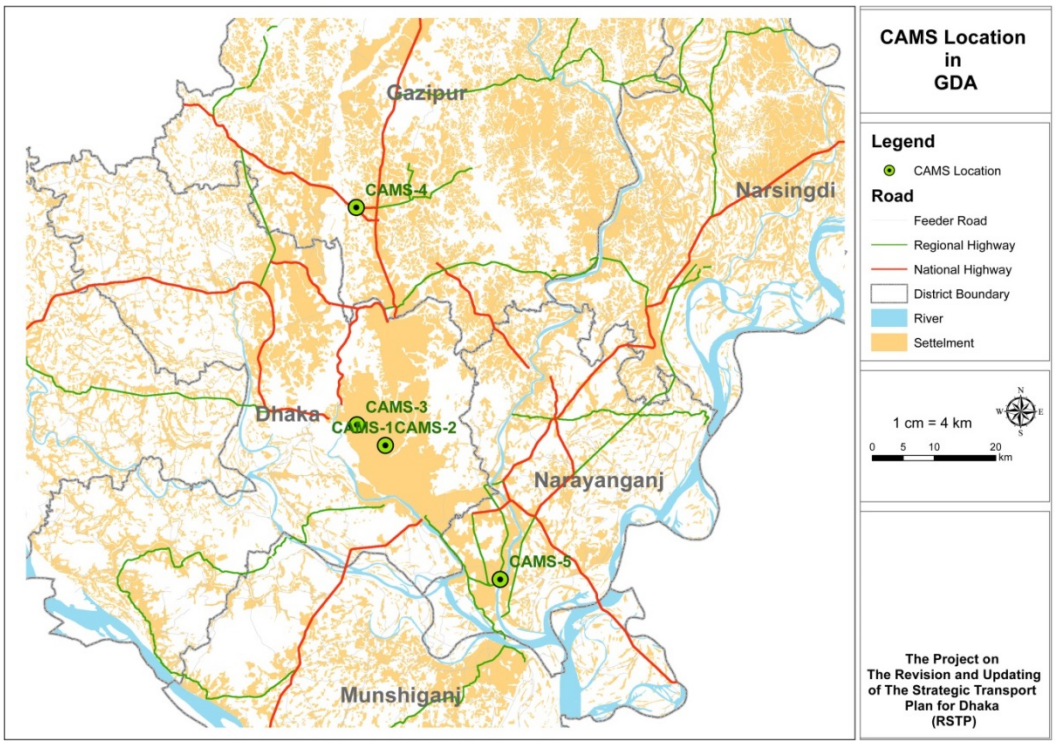
The data has been collected from the Air Quality monitoring Network stations under DoE. Out of the five CAMS (Continuous air quality monitoring station) obtained from previously implemented AQMP, three CAMS (BARC-Dhaka, Chittagong and Rajshahi) were continuously operated, although some of the analyzers need comprehensive repair/maintenance. Under CASE Project, the data of 8 major cities (Namely, Dhaka, Narayanganj, Gazipur, Chittagong, Rajshahi, Khulna, Barisal and Sylhet) of Bangladesh are obtained.

The ambient air quality monitoring network of Bangladesh consists of eleven (11) fixed CAMS. In RAJUK area, there are 5 CAMS as described in the table below.

**Table 6.4 Description of Monitoring Network**

| City | ID | Location | Lat/Lon | Monitoring Capacity |
|---|---|---|---|---|
| Dhaka | CAMS-1 | Sangshad Bhaban, Sher-e-Bangla Nagar | 23.76N 90.39E | $PM_{10}$, $PM_{2.5}$, CO, $SO_2$, $NO_X$, $O_3$, and HC concentrations with meteorological parameters. |
| | CAMS-2 | Firmgate | 23.76N 90.39E | $PM_{10}$, $PM_{2.5}$, CO, $SO_2$, $NO_X$, $O_3$, and HC with meteorological parameters. |
| | CAMS-3 | Darus-Salam | 23.78N 90.36E | $PM_{10}$, $PM_{2.5}$, CO, $SO_2$, $NO_X$, and $O_3$ with meteorological parameters. |
| Gazipur | CAMS-4 | Gazipur | 23.99N 90.42E | $PM_{10}$, $PM_{2.5}$, CO, $SO_2$, $NO_X$, and $O_3$ with meteorological parameters. |
| Narayanganj | CAMS-5 | Narayanganj | 23.63N 90.51E | $PM_{10}$, $PM_{2.5}$, CO, $SO_2$, $NO_X$, and $O_3$ with meteorological parameters. |

Source: CASE Project




Source: JICA Study Team

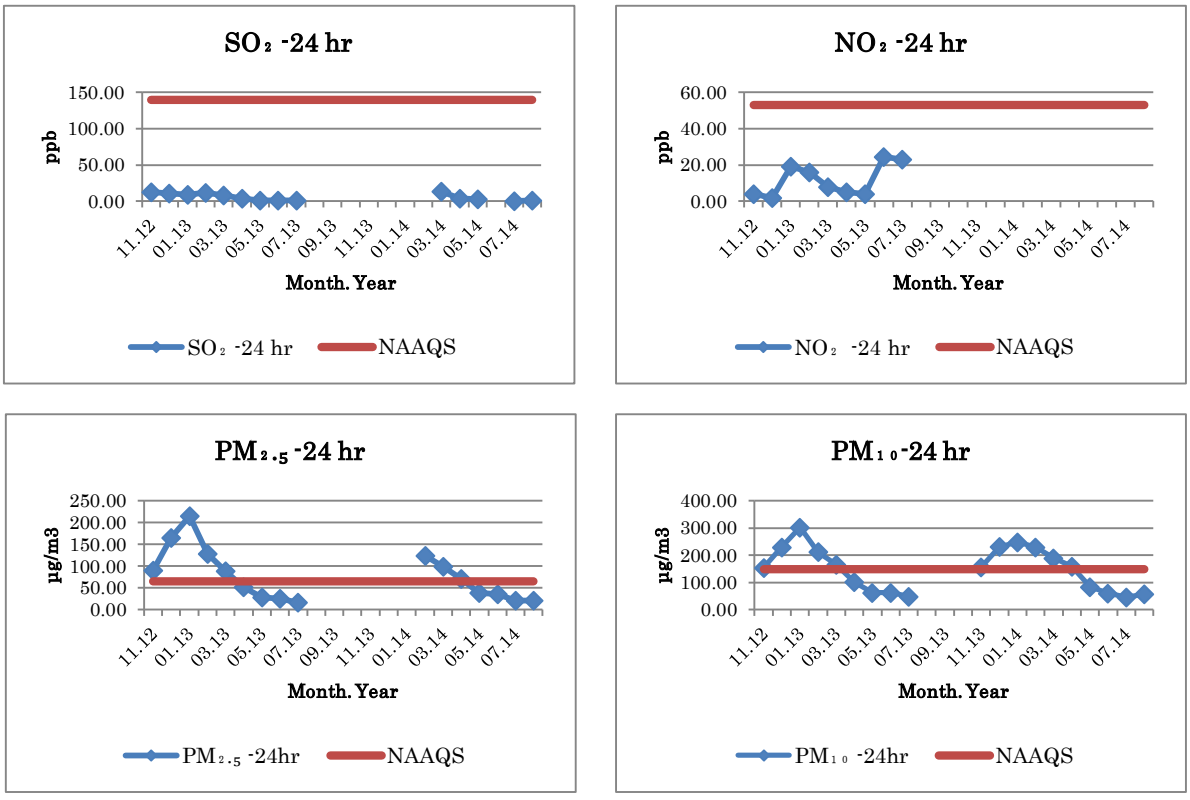
**Figure 6.15 CAMS location**

Summary of Data

Following five figures show the monthly average of air pollutants from November 2012 to August 2014 captured at 3 CAMS under the RAJUK area.

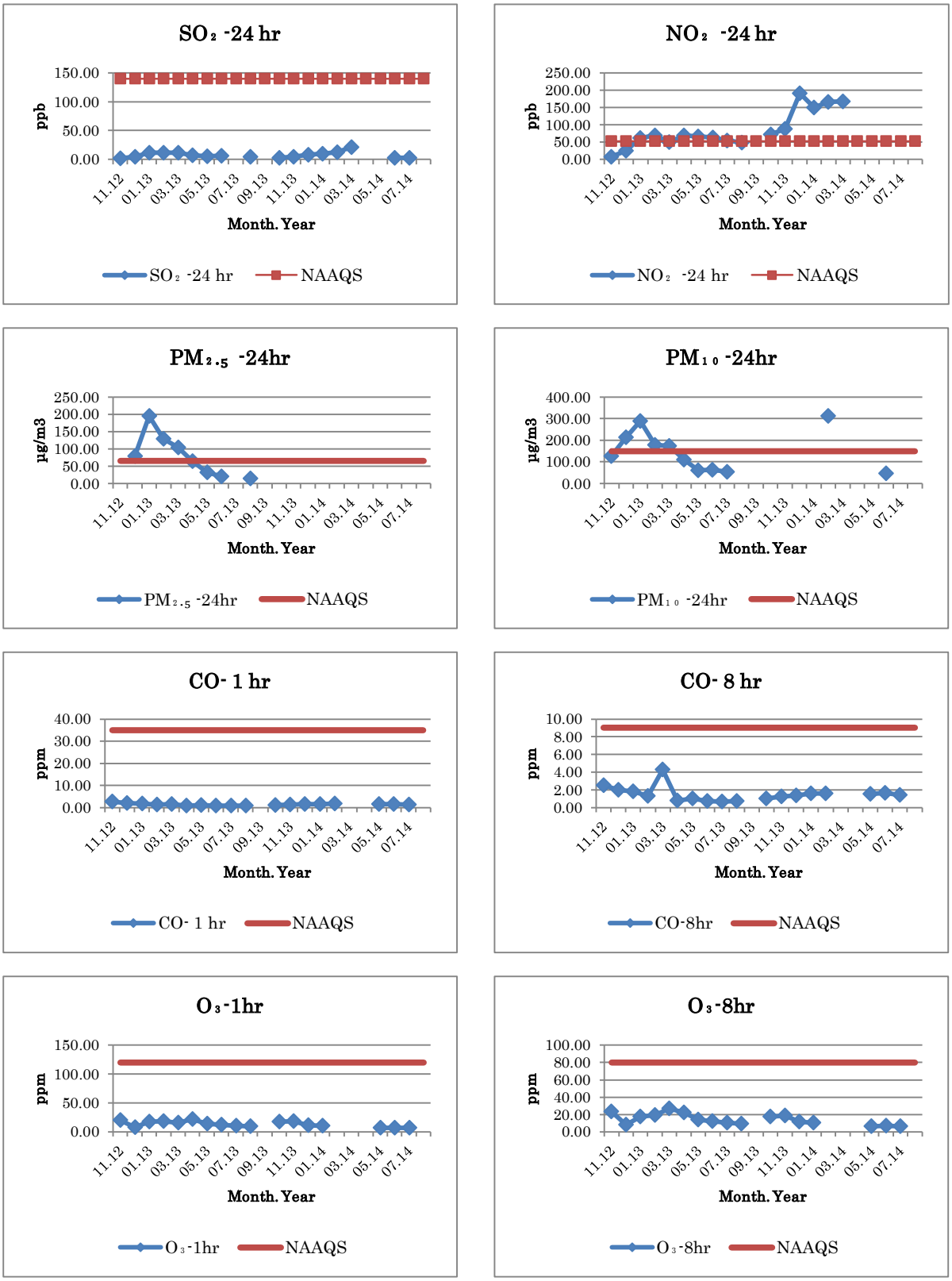
The most serious pollutant from the health point of view in Dhaka is Particulate Matter (PM). Usually in the dry seasons the pollution level reached highest peak and gradually decreases during wet season. The 24-hour average for both $PM_{10}$ and $PM_{2.5}$ concentrations were found noncompliance with the national standards during the dry season, i.e., from November to May.

The gaseous pollutants except NOx measured at different CAMS did not exceeded limit values of the national air quality standards. Since NOx have only annual standard, so for this pollutant daily 24-hours average concentration levels were compared with the annual average. Maximum 24 hours NOx concentration at some stations found exceeded the annual average of standard value during the dry season.



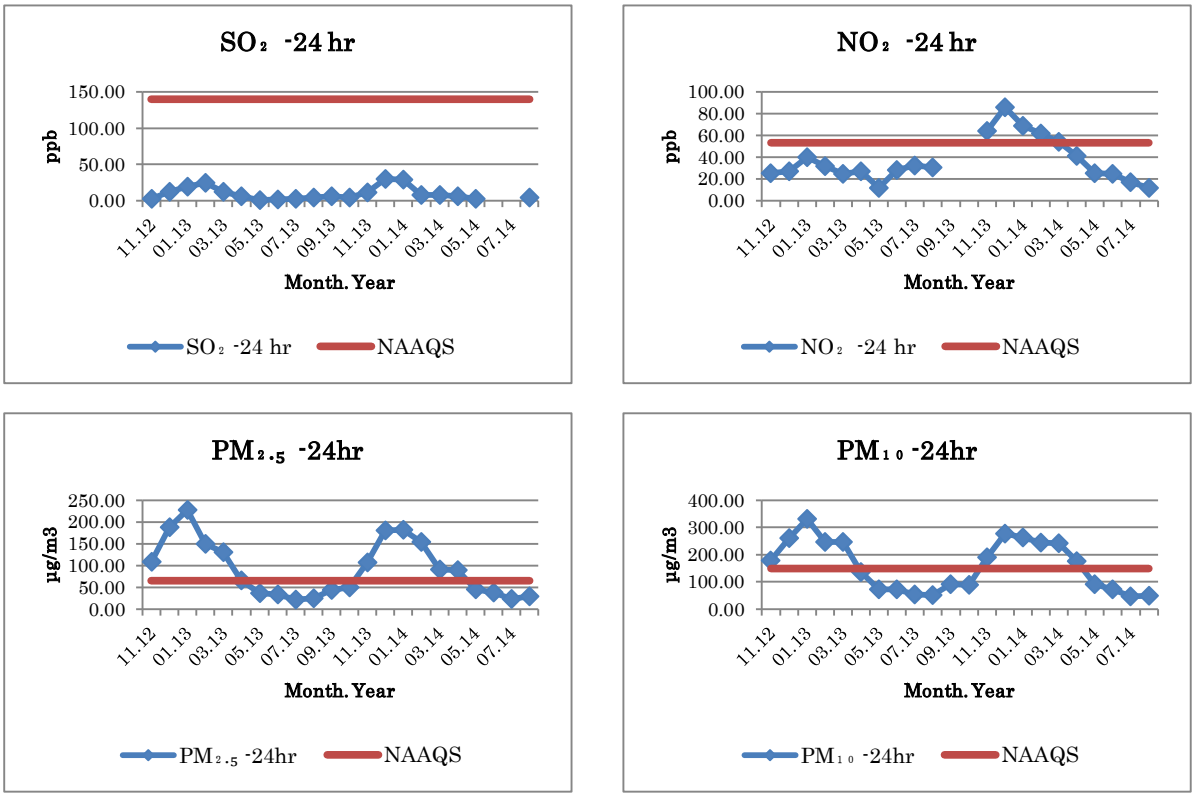

Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.16 Ambient Air Quality Data measured at CAMS-1 from Nov.2012 to Aug.2014**



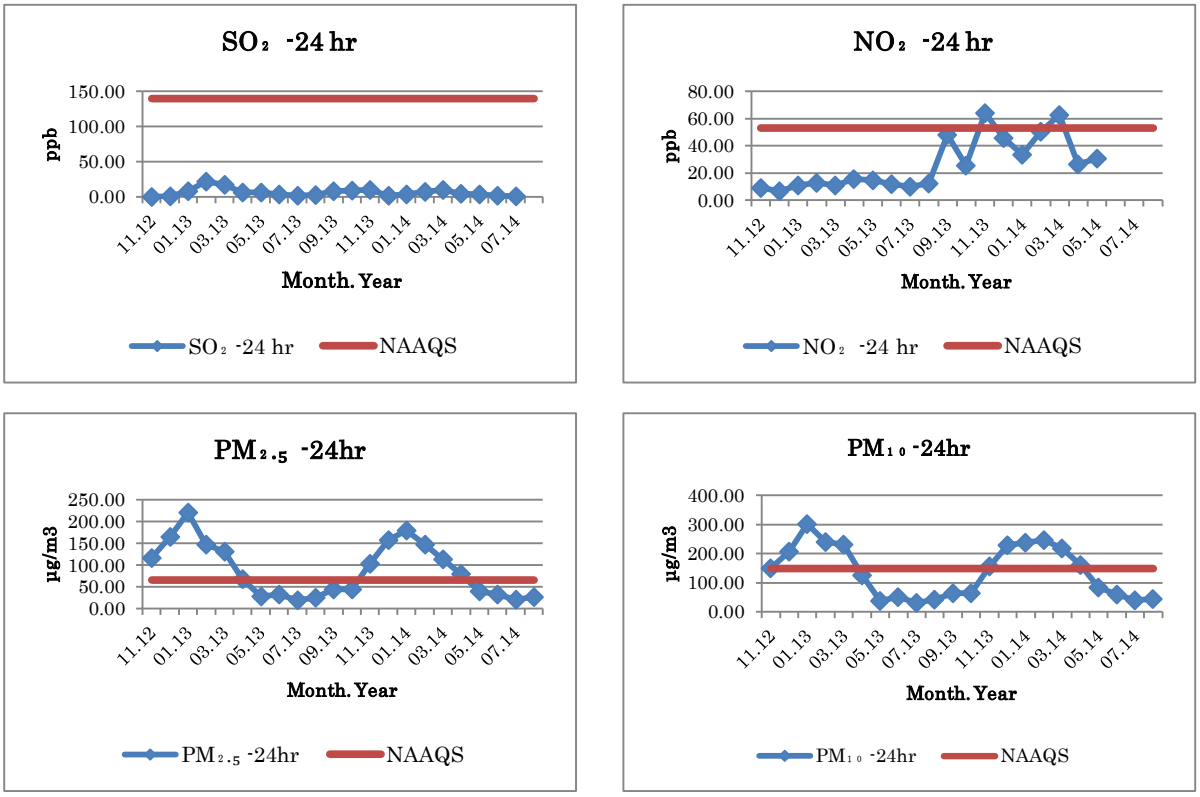

Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.17 Ambient Air Quality Data measured at CAMS-2 from Nov. 2012 to Aug. 2014**



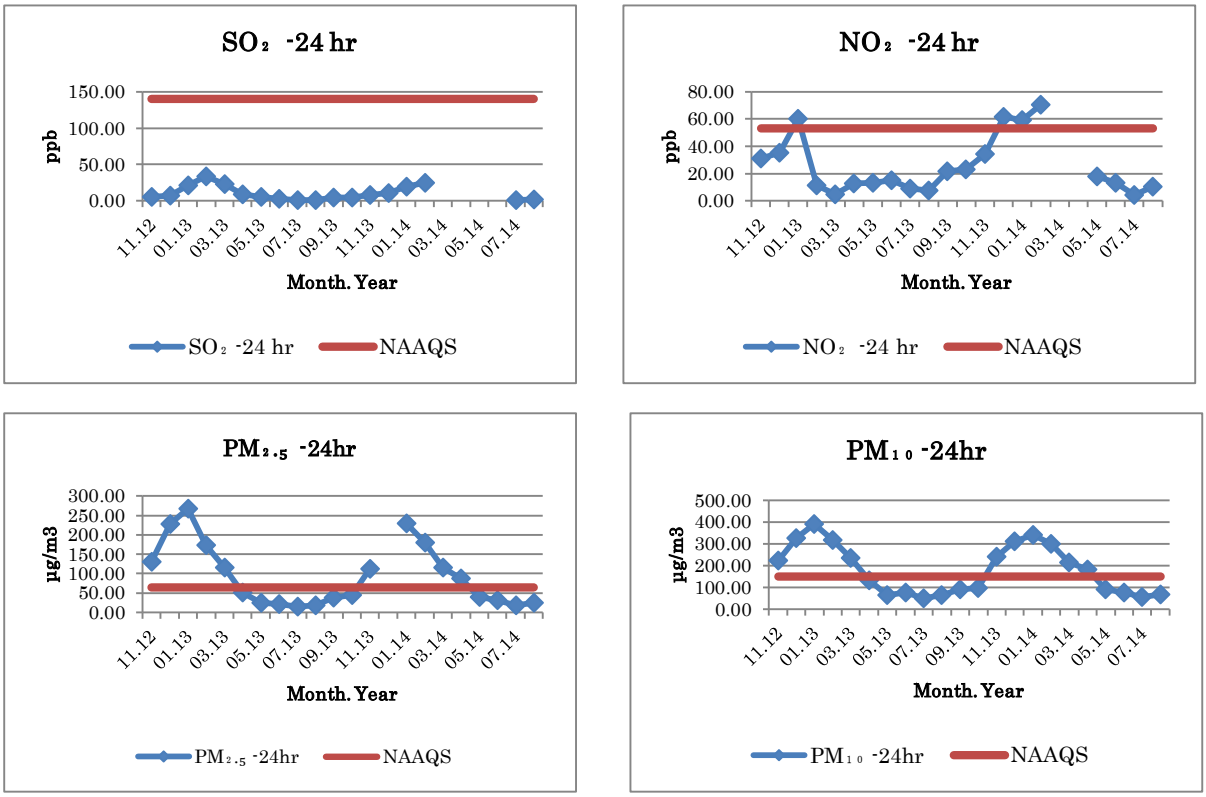

Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.18 Ambient Air Quality Data measured at CAMS-3 from Nov. 2012 to Aug.2014**




Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.19 Ambient Air Quality Data measured at CAMS-4 from Nov. 2012 to Aug. 2014**



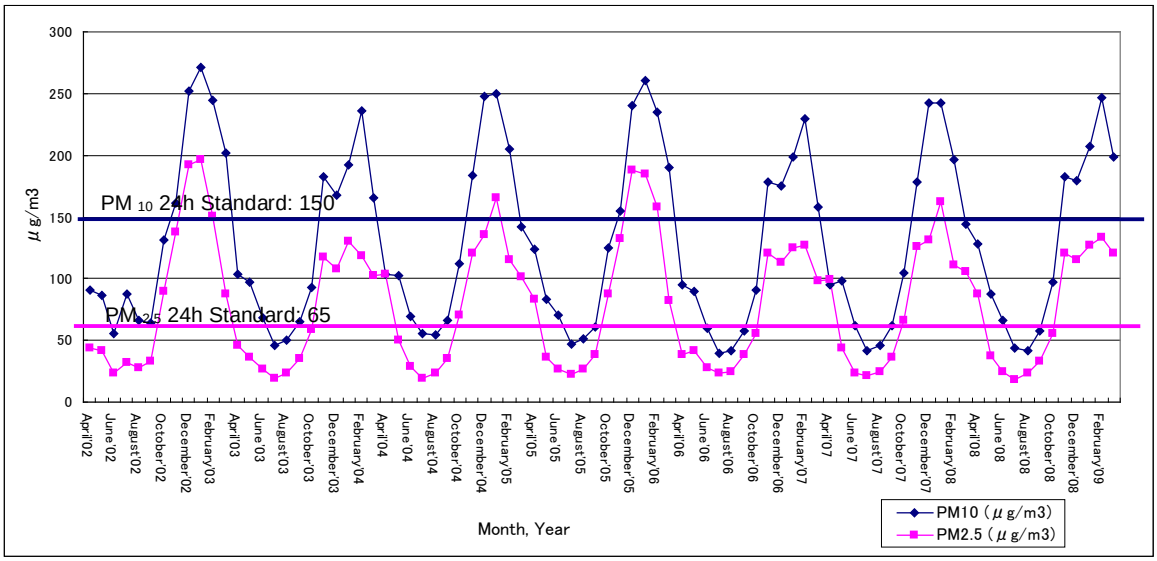

Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.20 Ambient Air Quality Data measured at CAMS-5 from Nov. 2012 to Aug.2014**

Air Quality Management Project (AQMP)

In 2002, a continuous air quality monitoring station (CAMS) was established at the premises of the national Parliament Building, the Jatiyo Sangsad, located at the heart of the capital city, Dhaka, under the World Bank- financed Air Quality Management Project (AQMP).

Plotting the average concentrations by month from 2002 to shows a consistent trend in the seasonal variation of PM concentrations (Figure 6.21). In 2002 to 2007, the highest concentrations of $PM_{10}$ and $PM_{2.5}$ occur in January. High concentrations of PM generally occur from November to February when the country experiences mild winters. On the other hand, concentrations are generally lower from May to September, when most rainfall is received.




Source: Department of Environment

**Figure 6.21 Monthly Average Level of $PM_{10}$ and $PM_{2.5}$ in Dhaka**

3) Ambient Air Quality Measurement

There are 5 CAMS under the RAJUK area: 3 CAMS in the central Dhaka and one each at Gazipur and Narayanganj. The study team will carry out the actual field measurement of ambient air quality in the fringe areas, such as Purbachal, Jheelmil and Savar, during the dry month.

(7) Noise Environment

1) General

Level of noise in Dhaka City is now a major concern for the general people because it has exceeded the tolerance level. According to WHO survey at 45 locations of Dhaka City, most of the traffic points and many of the industrial, residential, commercial, silent and mixed areas are suffering noises exceeding the standard limits of Bangladesh. WHO found noise levels of 70 dB in Dhaka Medical College, 75 dB in Shakhari Patti, 90 dB in English Road, 88 dB in RAJUK avenue and 85 dB in Tejgaon, though the standard limit for those area are 50, 55, 60, 70 and 75 dB(A) respectively.

The noise standards are presented in Table 6.5 together with WHO guidelines.

**Table 6.5 Noise Standards of Bangladesh and WHO Guideline**

| Category of areas | Bangladesh Noise Standards*1 (Equivalent sound level in dBA) | | Guidelines for Community Noise (WHO, 1999) | |
|---|---|---|---|---|
| | Day (6:00-21:00) | Night (21:00-6:00) | Day (7:00-22:00) | Night (22:00-7:00) |
| Silent zone | 45 | 35 | - | - |
| Residential area | 50 | 40 | 55 | 45 |
| Mixed area | 60 | 50 | - | - |
| Commercial area | 70 | 60 | 70 | 70 |
| Industrial area | 75 | 70 | 70 | 70 |

Source: JICA Study Team
Note: 1) Standards for Sound, Environment Conservation Rules,1997

These are mainly due to vehicular horns and movement, loudspeakers from processions and meetings, high volume of audio players from roadside small business enterprises and others.

Noise exposure, in fact, causes an extreme threat to human health, especially for elderly people and children. Moreover, the traffic personnel, rickshaw pullers, open vehicle drivers, road side workers, small scale business enterprise workers etc. are exposed for long-term noise pollution which might cause severe mental and physical health problems.

2) Noise Pollution

To prevent noise pollution, the Government of Bangladesh enacted Noise Pollution (Control) Rules in 2006. However, the actual situation has not been improved, as the data collected by several different researches suggests. The examples of noise pollution in Dhaka City are presented in Table 6.6 and Table 6.7.

**Table 6.6 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.

**Table 6.7 Noise Levels in Selected Areas of Dhaka**

| Area | Noise level (dBA) |
|---|---|
| Sayedabad Bus Terminal | 106 |
| Bangla Motor | 106 |
| Sonargaon Hotel | 104 |
| Farmgate | 104 |
| Mohakhali Crossing | 103 |
| Maghbazar | 103 |
| Mowchak | 103 |
| Gabtuli | 102 |
| Jatrabari | 100 |
| Tejgaon Industrial Area | 97 |
| Mirpur-1 | 97 |
| Kakrail | 92 |
| Gulistan | 90 |
| Sapla Chattar Motijheel | 89 |
| Sadarghat | 87 |
| Mirpur-10 | 86 |
| BIRDEM Hospital | 81 |
| Dhanmondi Residential Area | 78 |
| Gulshan Residential Area | 70 |
| Banani and Baridhara Residential Area | 68 |

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

Under the JICA Preparatory Survey on Dhaka Urban Transport Network Development (DHUTS) Phase II, noise surveys were conducted at five locations along the proposed MRT Line 6 in October, 2010. The most of the project site run through mix and commercial area. The surveyed noise levels far exceeded the Bangladesh Standards at all locations and times.

**Table 6.8 Result of Noise Survey in the Project Site**

| No. | Location | Noise Level (Equivalent sound level in dBA) | |
|---|---|---|---|
| | | Day (6:00-21:00) | Night (21:00-6:00) |
| 1 | Pallabi Near to Police Station, Mirpur | 83 | 78 |
| 2 | South Side of Farmgate on ground level, Farmgate | 90 | 85 |
| 3 | South Side of Farmgate on foot over bridge (7m above ground), Farmgate | 89 | 85 |
| 4 | South Side of Bangla Academy along Sir Sayed Road | 76 | 68 |
| 5 | South Side of Banga Bhaban along Folder Street | 91 | 89 |

Source: DHUTS, Phase II, Environmental Impact Assessment Study (Draft).

3) Noise Measurement

The regular monitoring of noise levels in the RAJUK area has not been conducted by DOE or relevant agencies of the local governments. The noise data are available in the only limited urbanized area in Dhaka City.

The acoustic environment of rural areas is expected to be silent due to low noise level and the homestead gardens also acts as the noise barrier to the receivers (settlers). However, there are no measurement data.

Therefore, the study team will carry out the actual field measurement of noise levels in the fringe areas of Dhaka City, such as Gazipur, Jheelmil and Savar.

## 6.2 Social Environment

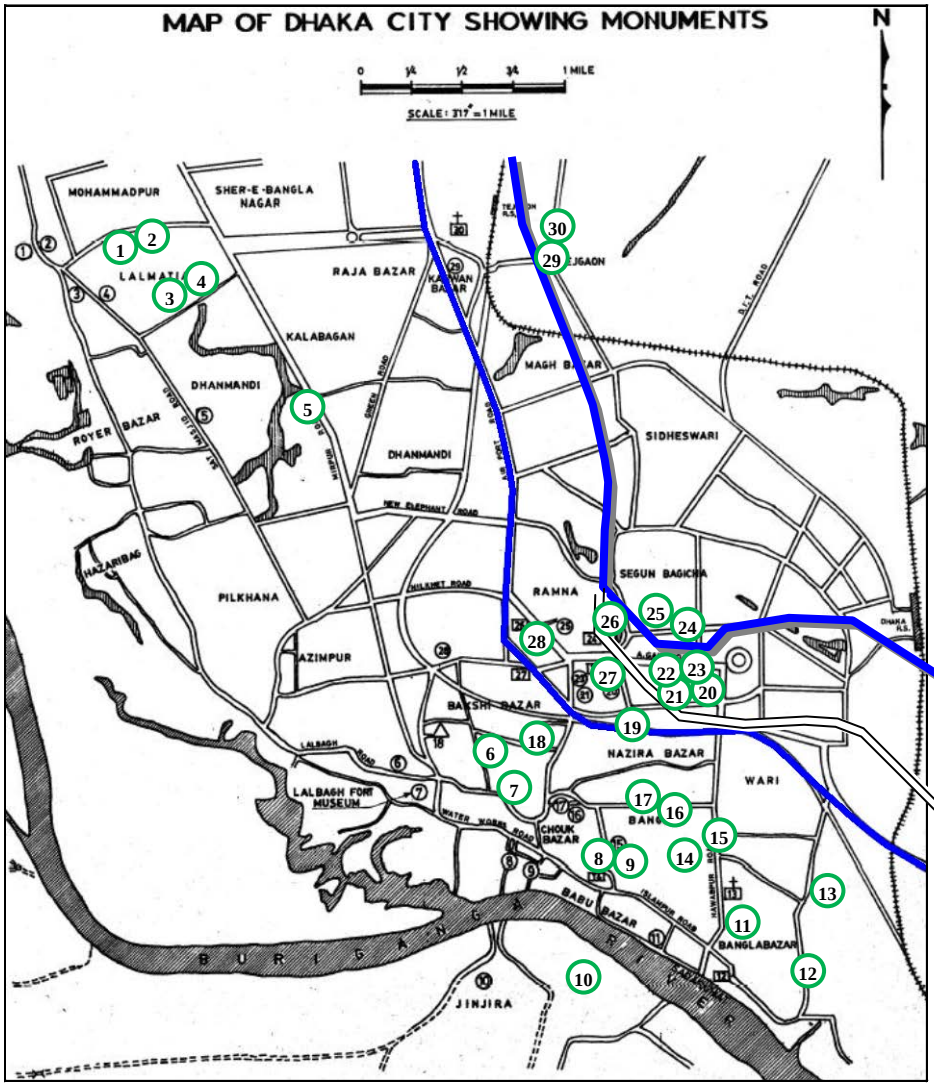
(1) Historical and Cultural Resources

The historic areas, buildings, monuments or other features or buildings and structures of recognized architectural significance contribute to the cultural, social, economic, political, artistic or architectural heritage. The following 74 archeological sites in RAJUK area are to be protected as per existing law (Table 6.9). Some of the prominent archeological sites in Dhaka City are plotted on the map in Figure 6.22.

**Table 6.9 List of Protected Archaeological Sites in Greater Dhaka**

| No. | District | Thana/Upazila | Name of Archaeological Sites |
|---|---|---|---|
| 1 | Dhaka | Mohammadpur | Sat Gumbad Mosque |
| 2 | Dhaka | Mohammadpur | Tomb near Sat Gumbad Mosque |
| 3 | Dhaka | Lalbagh | Khan Mohammad Mridha Mosque |
| 4 | Dhaka | Lalbagh | Lalbagh Fort |
| 5 | Dhaka | Lalbagh | Gate way of the South East corner of Lalbagh Fort |
| 6 | Dhaka | Lalbagh | Lalbagh Fort Mosque |
| 7 | Dhaka | Lalbagh | Audience & Hammam of Lalbagh Fort |
| 8 | Dhaka | Lalbagh | Tomb of Pari Bibi |
| 9 | Dhaka | Kotwali | Tomb of Nawab Nusrat Jang |
| 10 | Dhaka | Kotwali | Tomb of Nawab Shamsud Daulah |
| 11 | Dhaka | Kotwali | Tomb of Nawab Quamarul Daulah |
| 12 | Dhaka | Kotwali | Tomb of Nawab Gaziuddin Haider |
| 13 | Dhaka | Kotwali | Chhoto Katra |
| 14 | Dhaka | Kotwali | Bara Katra |
| 15 | Dhaka | Kotwali | Tomb of Bibi Champa |
| 16 | Dhaka | Kotwali | Nawabbari Gateway near Ahsan Manzil |
| 17 | Dhaka | Kotwali | North Brook Hall |
| 18 | Dhaka | Kotwali | Ruplal House |
| 19 | Dhaka | Ramna | Haji Khawaja Shahbaz Mosque |
| 20 | Dhaka | Ramna | Tomb of Haji Khawja Shahbaz |
| 21 | Dhaka | Ramna | Musa Khan Mosque |
| 22 | Dhaka | Ramna | Nimtali Deury |
| 23 | Dhaka | Sutrapur | Jamindar Bari |
| 24 | Dhaka | Sutrapur | Shankhanidhi House |
| 25 | Dhaka | Sutrapur | Shankhanidhi Dance House |
| 26 | Dhaka | Sutrapur | Bhajahari Lodge |
| 27 | Dhaka | Sutrapur | Radha Krishna Temple |
| 28 | Dhaka | Narinda, Sutrapur | Tomb of Colombo Sahib |
| 29 | Dhaka | Narinda, Sutrapur | Tomb of Reverend Joseph Paget |
| 30 | Dhaka | Sutrapur | Rose Garden |
| 31 | Dhaka | Dhanmondi | Old Eidgah at Dhanmondi |
| 32 | Dhaka | Badda | Ancient Portion of Beraid Bhuyanpara Jame Mosque |
| 33 | Dhaka | Savar | Building of Raja Harish Chandra |
| 34 | Dhaka | Savar | Buruj of Raja Harish Chandra |
| 35 | Dhaka | Savar | Rajashan Mound |
| 36 | Dhaka | Savar | Sree Sree Kanailal Ziu Bigraha Mandir (Kanailal Akhra) |
| 37 | Dhaka | Savar | Chhoto Bangla Mandir |
| 38 | Dhaka | Savar | Shorovuz Mohaprovu Biggraha Mandir |
| 39 | Dhaka | Savar | Boro Mandir |
| 40 | Dhaka | Savar | Gopaler Akhra |
| 41 | Dhaka | Savar | Kashimpur Jaminderbari |
| 42 | Dhaka | Savar | National Mausoleum |
| 43 | Dhaka | Nawabganj | Temple of Khelaram Data |
| 44 | Dhaka | Keraniganj | Jinjira Palace and Gate |
| 45 | Gazipur | Kaliakoir | Borai Bari Archaeological Site |
| 46 | Narayanganj | Sonargaon | Goaldi Mosque |
| 48 | Narayanganj | Sonargaon | Panam City |
| 49 | Narayanganj | Sonargaon | Choto Sardar Bari |
| 50 | Narayanganj | Sonargaon | Mausoleum of Ghiyasuddin Azam Shah |
| 51 | Narayanganj | Sonargaon | Panam Bridge |
| 52 | Narayanganj | Sonargaon | Taksal Poddar Bari |
| 53 | Narayanganj | Sonargaon | Mozumpur Mosque |
| 54 | Narayanganj | Bandar | Khandakar Mosque |
| 55 | Narayanganj | Bandar | Tomb of Haji Baba Saleh |
| 56 | Narayanganj | Bandar | Sonakanda Fort |
| 57 | Narayanganj | Bandar | Gazir Mound |
| 58 | Narayanganj | Rupganj | Math, Chandi Mandap, Pati Mandir |
| 59 | Narayanganj | Rupganj | Murapara Rajbari |
| 60 | Narayanganj | Sadar | Hajiganj Fort |
| 61 | Narayanganj | Sadar | Tomb of Bibi Maryam |
| 62 | Narayanganj | Sadar | Dewan Bazar College Mosque |
| 63 | Narayanganj | Fatullah | Pagla Bridge |
| 64 | Manikganj | Saturia | Baliati Palace |
| 65 | Manikganj | Harirampur | Machain Shahi Jami Mosque |
| 66 | Manikganj | Shibalaya | Teota Zamindar Bari Dol |
| 67 | Munshiganj | Tungibari | Sonarong Temple |
| 68 | Munshiganj | Tungibari | Baba Adam Mosque |
| 69 | Munshiganj | Tungibari | Mirkadim Bridge |
| 70 | Munshiganj | Sadar | Idrakpur Fort |
| 71 | Munshiganj | Rampal | Tank of Harish Chandra |
| 72 | Narsingdi | Palash | Parulia Shahi Mosque |
| 73 | Narsingdi | Belabo | Asam Rajar Gar (Botashwar) |
| 74 | Narsingdi | Belabo | Paritakto Vita (Wari) |

Source: Department of Archaeology, Bangladesh




Source: Department of Archaeology, Bangladesh

**Figure 6.22 Location of Archeological and Historical Monuments and Religious sites**

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

(2) Housing, Slum, and Open land

1) Housing

Housing Shortage

Government's lone effort in terms of resources, capabilities and initiatives are not adequate to meet the housing need of such a growing population. As a result the gap between the increasing housing needs (due to rapid urbanization) and supply became wider. According to Bangladesh Bureau of Statistics 2011, total housing units in RDP area was 3.12 million compared to the total number of households of 3.35 million exhibiting a housing shortage of 0.24 million. (Regional Development Planning, RAJUK, 2014)

Housing Type and Condition

In Bangladesh housing are categorized in mainly following 4 type by the materials used for construction.

- Pucca: Strong houses of flats and bungalows. They are made up of wood, bricks, cement, iron rods and steel. Such houses are called permanent houses.
- Semi- Pucca: Walls are made partially of bricks, floors are cemented and roofs of corrugated iron sheets.
- Kutcha: Made up of wood, mud, straw and dry leaves. It is temporary house which people live at one place for a very short time. They build houses that can be moved from one place to another.
- Jhupri: made of jute sticks, tree leaves jute sacks etc.

The Table below shows the Housing type and tenancy of houses and accessibility to Infrastructure service under RAJUK area. It shows that the urban area of Dhaka city, Gazipur and Narayanganj, more than 50 % live in rented permanent housing, whereas rural area majority live in temporary housing. In terms of urban infrastructure, sanitation infrastructure are mostly covered in Dhaka and Gazipur, however the rest of RAJUK area need further development. Electricity supply are covered in Dhaka and Gazipur, however the rest of RAJUK area are hardly supplied.

**Table 6.10 Housing Type and Tenancy**

| Administrative Unit | Number of Households | Housing Type | | | | Tenancy of House | | |
|---|---|---|---|---|---|---|---|---|
| | | Pucka | Semi-pucka | Kutcha | Jhupri | Owned | Rented | Rent free |
| Dhaka Zila | 2,639,630 | 1,203,667 | 965,371 | 419,468 | 51,124 | 710,009 | 1,849,318 | 80,303 |
| | | 45.6% | 36.6% | 15.9% | 1.9% | 26.9% | 70.1% | 3.0% |
| Gazipur Zila | 809,761 | 93,828 | 349,855 | 354,614 | 11,464 | 417,366 | 375,540 | 16,855 |
| | | 11.6% | 43.2% | 43.8% | 1.4% | 51.5% | 46.4% | 2.1% |
| Manikganj Zila | 323,741 | 9,734 | 32,306 | 275,374 | 6,327 | 302,665 | 12,595 | 8,481 |
| | | 3.0% | 10.0% | 85.1% | 2.0% | 93.5% | 3.9% | 2.6% |
| Munshiganj Zila | 310,664 | 24,602 | 37,992 | 241,743 | 6,327 | 254,380 | 40,527 | 15,757 |
| | | 7.9% | 12.2% | 77.8% | 2.0% | 81.9% | 13.0% | 5.1% |
| Narayanganj Zila | 663,088 | 137,218 | 222,634 | 295,270 | 7,966 | 349,372 | 294,743 | 18,973 |
| | | 20.7% | 33.6% | 44.5% | 1.2% | 52.7% | 44.5% | 2.9% |
| Narsingdi Zila | 473,937 | 33,926 | 106,537 | 328,917 | 4,557 | 409,618 | 54,476 | 9,843 |
| | | 7.2% | 22.5% | 69.4% | 1.0% | 86.4% | 11.5% | 2.1% |
| TOTAL | 5,220,821 | 1,502,975 | 1,714,695 | 1,915,386 | 87,765 | 2,443,410 | 2,627,199 | 150,212 |
| | | 28.8% | 32.8% | 36.7% | 1.7% | 46.8% | 50.3% | 2.9% |

Source: JICA Study Team

**Table 6.11 Accessibility to Infrastructure Services**

| Administrative Unit | Number of households | Toilet Facility | | | | Source of Drinking Water | | | Percentage of Electricity Connection |
|---|---|---|---|---|---|---|---|---|---|
| | | Sanitary (With Water Seal) | Sanitary (No Water Seal) | Non-Sanitary | None | Tap | Tube-well | Others | |
| Dhaka Zila | 2,639,630 | 1,370,203 | 1,097,484 | 161,935 | 10,008 | 1,752,969 | 842,709 | 43,952 | 2,560,764 |
| | | 51.9% | 41.6% | 6.1% | 0.4% | 66.4% | 31.9% | 1.7% | 97.0% |
| Gazipur Zila | 809,761 | 237,756 | 422,083 | 133,437 | 16,485 | 296,714 | 492,993 | 20,054 | 679,844 |
| | | 29.4% | 52.1% | 16.5% | 2.0% | 36.6% | 60.9% | 2.5% | 84.0% |
| Manikganj Zila | 323,741 | 61,123 | 173,694 | 82,346 | 6,578 | 170,561 | 302,665 | 12,595 | 8,481 |
| | | 18.9% | 53.7 | 25.4% | 2.0% | 52.7% | 93.5% | 3.9% | 2.6% |
| Munshiganj Zila | 310,664 | 73,547 | 180,482 | 51,477 | 5,158 | 279,763 | 254,380 | 40,527 | 15,757 |
| | | 23.7% | 58.1% | 16.6% | 1.7% | 90.1% | 81.9% | 13.0% | 5.1% |
| Narayanganj Zila | 663,088 | 158,427 | 359,473 | 133,937 | 11,251 | 631,604 | 349,372 | 294,743 | 18,973 |
| | | 23.9% | 54.2 | 20.2% | 1.7% | 95.3% | 52.7% | 44.5% | 2.9% |
| Narsingdi Zila | 473,937 | 95,895 | 193,694 | 144,297 | 40,051 | 345,183 | 409,618 | 54,476 | 9,843 |
| | | 20.2% | 40.9% | 30.4% | 8.5% | 72.8% | 86.4% | 11.5% | 2.1% |
| Total | 5,220,821 | 1,996,951 | 2,426,910 | 707,429 | 89,531 | 3,476,794 | 2,651,737 | 466,347 | 3,293,662 |
| | | 38.2% | 46.5% | 13.6% | 1.7% | 66.6% | 50.8% | 8.9% | 63.1% |

Source: JICA Study Team

Affordability

The affordability issue is another serious aspect of housing problems. Naturally, the private developers are focusing on providing somewhat luxurious housing for the higher income classes. The problem of acute housing needs of the lower income households thus becomes the task of the government and public sector in Bangladesh.

2) Slum

The lack of proper housing infrastructure for various sections of the urban society is a crucial problem in Dhaka. With a rapid influx of population from the rural areas into Dhaka, the ability of the city to provide proper housing infrastructure to the migrant workers is under severe stress. Therefore due to the high land prices and the unavailability of housing infrastructure for low income groups, the migrants take shelter in one of the slums within Dhaka, preferably close to their place of work. Many parts of the city have witnessed intensification of slums. The number of slums in Dhaka has increased from 1125 in 1998 to 4,966 slum clusters in 2005 (Centre for Urban Studies, 2006). These slums are very densely populated with an average of 0.2 million people per $km^2$. Some of the slums are considered to be illegal and often evicted by government agencies from time to time without any proper rehabilitation. In addition, many of the slums have developed gradually mostly in marginal areas of the city, and in many cases in low lying areas adjoining rivers and drainage khals or by filling up wetlands. Therefore, they are vulnerable to flooding and associated flood risks.

Infrastructure services

Even though approximately 30% of the Dhaka's population lives in slums, access to urban services are poor. Amongst the poorest people in the slums, only 9% of households have a sewer line, and 27% obtain water through piped supply. Only 2% of the identified slums are within 100 meters of a public toilet. Only 7% of slums have

a public health clinic and 26% have a government school. It is pertinent to add that the slums themselves led to further environmental degradation through discharge of untreated household waste and sewage into the surrounding water bodies. (Dhaka Metropolitan Development Plan Strategic Environmental Assessment, WB, 2007)

The slum dwellers are also more prone to various vector borne diseases because of the lack of good quality drinking water and proper sanitation facilities.

Economical activities

Most of the slum dwellers work as readymade garment industry workers, rickshaw pullers, household helps, rag pickers, etc., and make an important contribution to Dhaka's economic growth by contributing labour to business or by providing necessary urban services. The income level of slum dwellers varies between US$17–50 per month (for men) and US$4-2,118 (for women). (Dhaka Metropolitan Development Plan Strategic Environmental Assessment, WB, 2007)

(3) Public Open Space and Landscape

Role of open spaces that are located within or beyond the city boundary is enormous for social, economical, ecological as well as aesthetic purpose of the urban population. As a direct effect of the unplanned urbanization and lack of development control, Dhaka has very little open space in form of park, gardens etc. Due to the diversity and complexity of management of open spaces, the total open spaces are not calculated from reliable sources. Within the RDP area (1610 $km^2$) open spaces under recreational category is 987.15 acres (i.e.0.248% area), whereas in DAP (1528 $km^2$) open spaces of all category, including vacant and unused land, is 6962.54 acres (i.e.1.84% area). (Regional Development Planning, RAJUK, 2014)

Under DCC, there are parks of 185 acres, and the total area of newly developed parks is only 79.0285 acres. However importantly, some of the areas demarcated for parks have been illegally occupied by encroachers having political influence to set up temporary markets, bus stops, slums, etc. This in spite of the fact that Bangladesh Open Spaces and Wetland Protection Act 2000 does not allow parks open spaces and wetland to be converted for any other uses.

Considering the nature of the land and the type of use, all the public open spaces within built-up areas of Dhaka City can be ordered under the following four categories. The locations are presented in the map of Figure 6.23 to Figure 6.25.

1) Urban Parks

These are large open spaces in metropolitan scale, used purely for the recreational purpose and to have ecological balance. They are basically the open spaces like Ramna Park, Chandrima Udayan, Osmani Udayan, Suhrawardy Udayan etc. in Dhaka which are maintained by PWD (occupying from 50- 80 acres of land).

2) Urban Recreational Areas

Open spaces developed and assigned for more or less organized out-door recreational facilities both at metropolitan and the community level. These are either large areas like Stadiums, Swimming pools and Tennis Complex at metropolitan scale of Dhaka, or intermediate sized areas like Armanitola Play Field at local scale in residential areas (usually 2-9 acres). Besides, relatively small size open spaces are used at local level as Children's Park with play equipment (usually less than an acre).

3) Urban Development Open Spaces

Open spaces which shape, control and site urban development. These include urban plazas/parks of various sizes in commercial and institutional areas of Dhaka. They are mainly intermediate to small sized green areas with pavements; like Pantha Kunja, Anowara Udayan, Gulistan Park etc. (usually 2- 8 acres). Some of these areas have historic, cultural or political importance like Bahadur Shah Park, Central Shaheed Minar, and Muktangan Park etc.

4) Functional Open Spaces

Some open spaces are very much functional in nature, like Eidgah, Nursery, and Car Parks. However, the trend of open markets, like Chawk of Old Dhaka is not in use. Even so, many road side areas act as open markets in Dhaka. Moreover, some of the open spaces have multi-use like local Children's Park cum Road-side green buffers; e.g. Pantha Kunja; or like Urban Plaza cum Historic Monument e.g. Central Shaheed Minar.

Besides, other two type of public open space are also available, which some of them are covered under protected areas mentioned earlier.

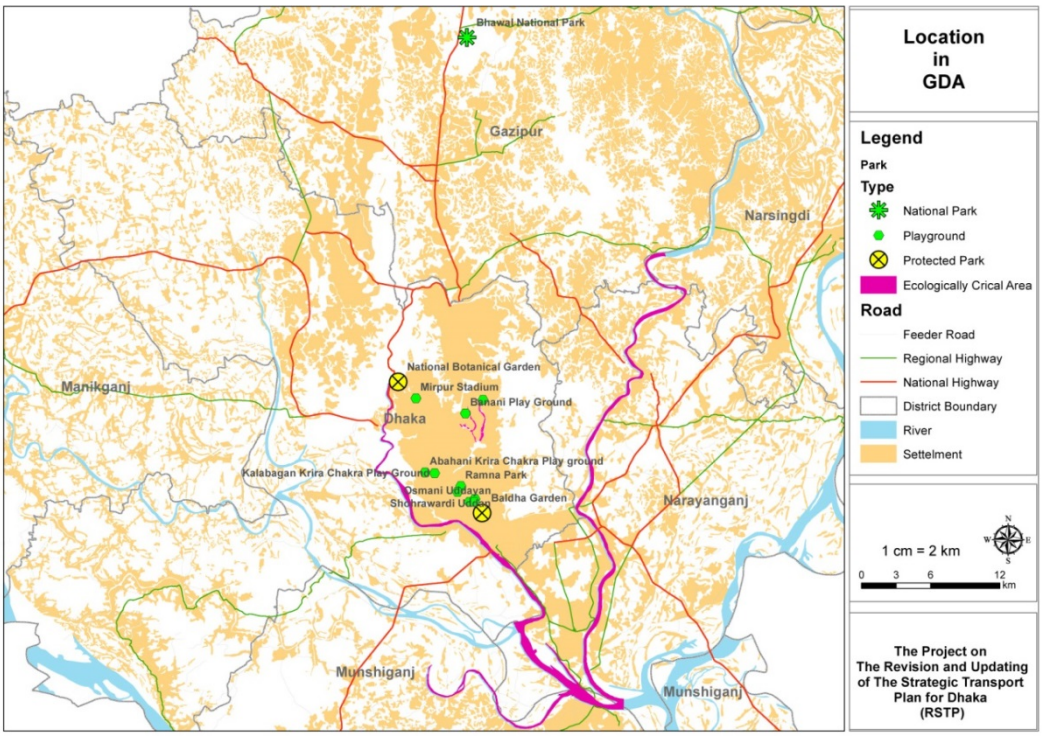
5) Urban Forests / Natural Park

Forest areas include National Park, botanical garden, urban forest, roadside forestry and orchard garden etc. Bhawalgarh forest including the Safari park is the largest forest area and included in the forest land use category. Forest in Dampara mouza of Biralia union also belongs to this group. These are fairly big open areas as picnic spots or naturally pleasant sites in the form of Natural Park from suburban areas in the periphery of the city.

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

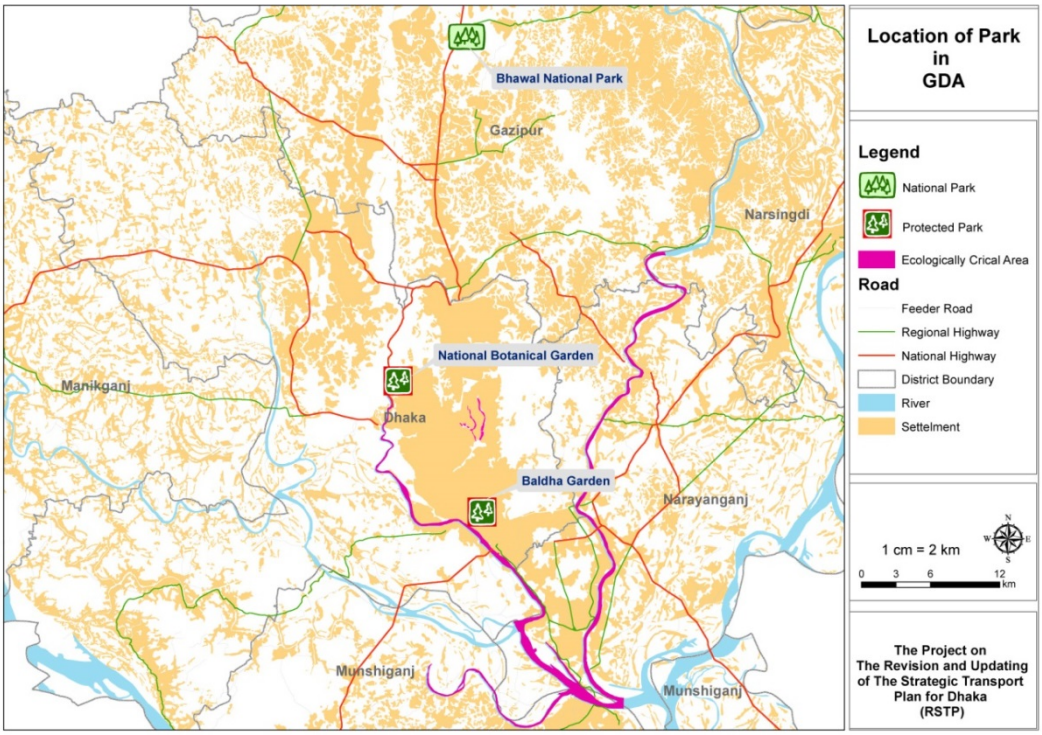
6) Protected area

Special areas of scenic and other natural values facilitated for public recreational use.



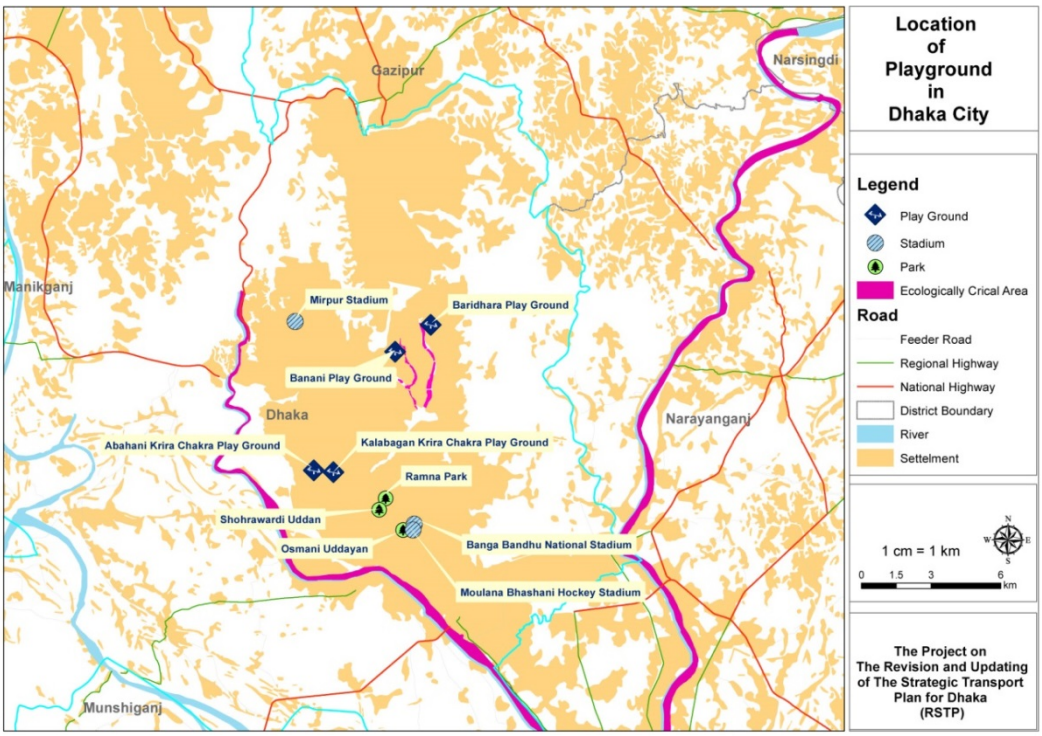

Source: JICA Study Team

**Figure 6.23 Location of Public Open spaces in Greater Dhaka Area (GDA)**




Source: JICA Study Team

**Figure 6.24 Location of National park and Botanic Gardens in GDA**




Source: JICA Study Team

**Figure 6.25 Location of Playground in Dhaka City**

(4) Water bodies

RAJUK area is covered by a network of natural water body including river, canal and pond. Water body has an immense importance for environmental concern as mentioned earlier, but also for active and passive recreation of people. Indeed, the water bodies of Dhaka had immense quality in addition to drainage purpose. Landscape of these areas is very important to uphold its role in hydrological as well as ecological and economical context of Dhaka.

1) Rivers and banks

Most of the rivers around RAJUK area are distributaries of Brahmaputra, Jamuna and Meghna River. Generally, these rivers flow from north to south direction. The remarkable rivers are Bangsi, Turag, Tongikhal, Buriganga, Dhaleshwari, Kaliganga, Gazikhal, Banar, Balu, Shitalakshya, Lohajang, Bhubaneshwari, Ichamati, Malik Bader Khal, Gajahatar Khal, Ilshamari etc. Although most of the rivers have lost their individuality, till now they play important roles for Dhaka city. Among these rivers Buriganga, Bangshi, Turag, Balu and Shitalakshya are just beside the city and carry most of the runoff of RDP area.

Historically, the natural landscape of rivers and their banks were essentially rich in scenic beauty and sparkling environment. When the embankment of Buriganga, named as Buckland, was constructed it used to be a recreational promenade of Dhaka. Due to intense pressure of urbanization most of the banks of these rivers are now eroded, being encroached and the water has also become polluted. Thus the resources have become blight of the city and in most cases the city faces back to these resourceful areas due to their present condition.

2) Khals

Khal are the important elements of Dhaka's wetlands for their immense role in drainage of the city. These Khals used to be connecting channels of rivers surrounded by the greater Dhaka district. It is estimated that there are approximately 40 natural canals/khals, total about 145 km that works as the natural drainage system Dhaka city. Out of these 40 canals, 26 canals are under jurisdiction of Dhaka WASA, a major part for which is under threat of encroachment and filling. These khals drain 80% storm water of the city to the surrounding rivers (Khan 2006). The major khal systems are as follows (Chowdhury et al.1998b):

- Degun-Ibrahimur-Kallyanpur khal system that drains to Turag River;
- Dhanmondi-Paribagh-Gulshan-Banani-Mohakhali-Begunbari khal system that drains to Balu River;
- Segunbagicha-Gerani-Dholai khal system that drains to Balu and Buriganga river

3) Retention ponds

A number of low-lying areas are identified as retention ponds. In fact, a retention pond has drainage facilities leading to another location. They are more or less kept for flood control when large amount of rain create flash flooding in the city. They need to be designed to hold a set amount of water temporarily and slowly draining to another location. To ensure their greater role for drainage of the city, such areas need to be protected from encroachment as they act as natural water collection areas for surface run off.

Major Retention Areas of Dhaka City and Characteristics of Rivers around Dhaka City is shown in Table 6.12.

**Table 6.12 Major Retention area of Dhaka City**

| Name | Length (m) | Avg. Depth (m) | Area ($Km^2$) | Volume ($m^3$) |
|---|---|---|---|---|
| Dhanmondi Lake | 2,400 | 2.5 | 0.176 | 440,000 |
| Ramna Lake | 400 | 4.5 | 0.02 | 90,000 |
| Crescent Lake | 650 | 2.5 | 0.016 | 40,000 |
| Gulshan Lake | 3,800 | 2.5 | 0.48 | 1,200,000 |
| Hateer Jheel | 3,000 | 2 | 1.078 | 2,160,000 |

Source: Regional Development Planning, RAJUK 2014

## 6.3 Natural Disaster and Flooding

(1) Flood and Inundation Characteristics

Basic mechanism of inundation occurring in Dhaka is such that rising water levels in the three major rivers cause back flows in the tributaries, which in turn make it difficult to drain the surface water, thus resulting in inundation in the wetlands and in the surrounding areas in the hinterland.

A major inundation (called banna in Bengali) that causes damages to human lives, properties, agriculture, etc. is caused when discharges through the three major rivers increase and river water of rising level flows into the city through portions of lower elevation, thus inundating an extended area.

In recent years, major inundations occurred in 1988 and in 1998, bringing about significant damages. During these inundations, water level in Buringanga River in the western part of Dhaka exceeded 7.0 m.

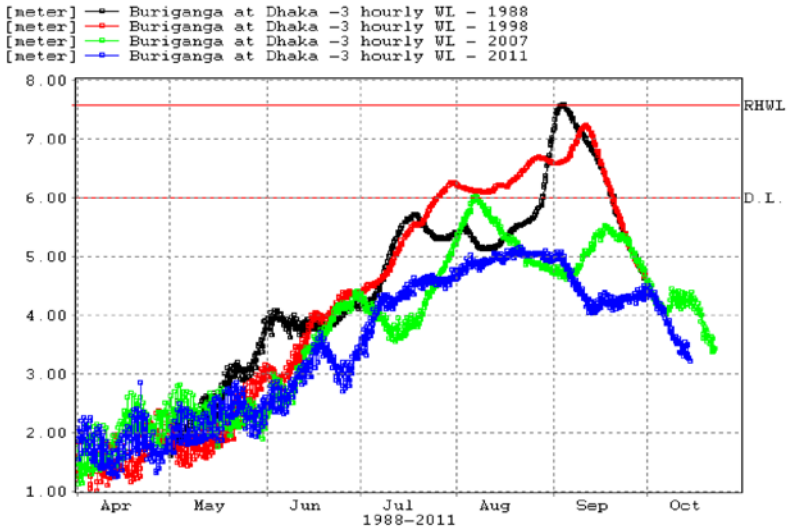



Figure 3. 6 : Comparison of Hydrograph on Buriganga at Dhaka(Milbarak)

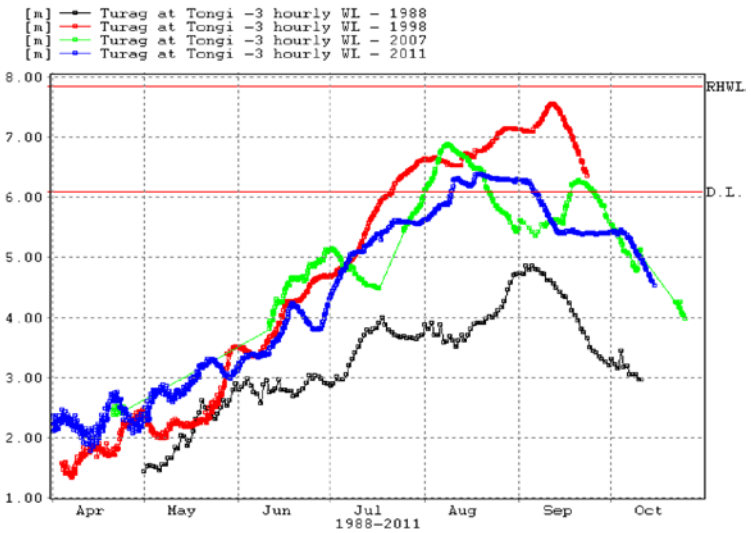



Figure 3. 7 : Comparison of Hydrograph on Tongi Khal at Tongi

Source: Annual Flood Report 2011, FFWC, BWDB

**Figure 6.26 Water levels in rivers around Dhaka during major inundations in recent years**

Dhaka city has been built on the 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 level and flowing river water.

Inundation by river water in Dhaka is characterized by the very slow process of flood water to recede, resulting in an elongated period of inundation. Typical duration of inundation in the last 50 years is from 15 to 45 days, during which the residents continue to suffer direct and indirect consequences.

Another form of inundation that affects Dhaka is the inundation by inside water. In case water levels in rivers rise when there has been a torrential rain in Dhaka, inundation damage by inside water occurs because the flood water cannot be drained into rivers. Flood water of inundation caused by inside water is usually shallow, and there is no risk of many lives to be lost. Halcrow (2006) postulates that an inundation due to drainage failure that causes properties damage is brought about by a deluge having probability of occurring once in ten years.

A recent case of inundation by inside water is one that affected a large part of the urban Dhaka in 2004.

This inundation occurred when rising water levels in the rivers caused Balu River in the eastern Dhaka to overflow thus inundating the lowland areas of the city. In the western Dhaka, overflow from Turag River flooded the inside land through culverts and opened regulators.

The inundation damage by inside water was caused by an intense rainfall in Dhaka when the regulator was closed so as to protect the urban Dhaka from the flooding river water.

Daily rainfall recorded in Dhaka on September 14 when the inundation occurred was 341 mm. This means that such an amount of rainfall occurred in one day, that exceeded the mean monthly precipitation of 284 mm recorded in rainy seasons (June to September) of recent 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 urbanized area in the western Dhaka to be waterlogged by the inside water.

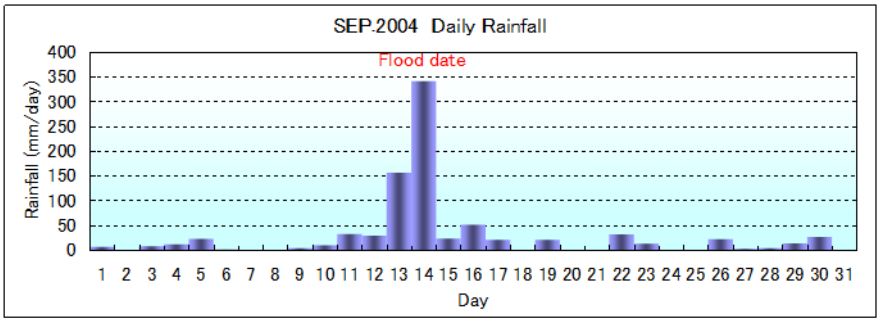
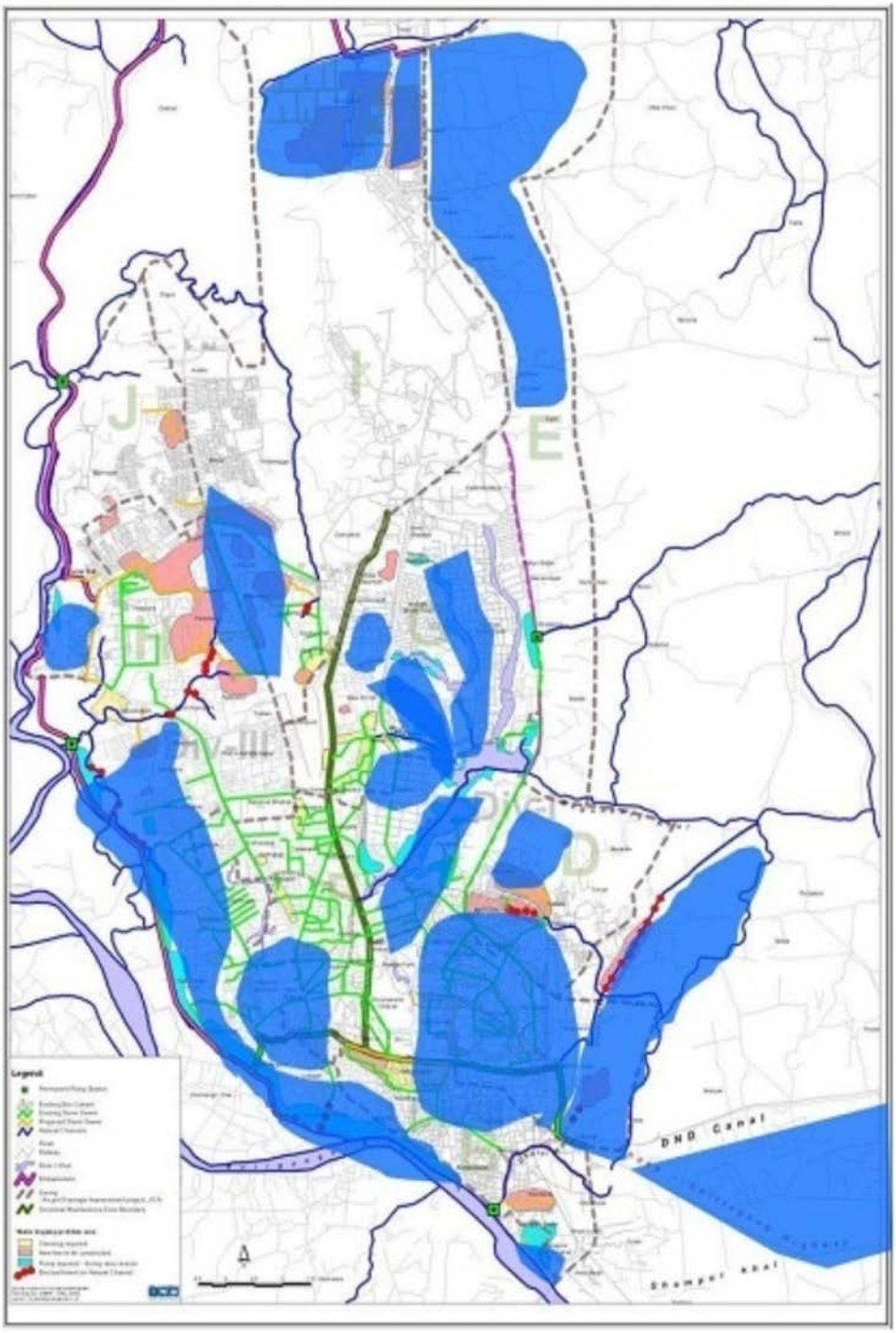



**Figure 6.27 Daily rainfall in September 2004**




Source: Survey Report (RAJUK 2014)

**Figure 6.28 The inundation map of Greater Dhaka, 2004**

There were water channels, natural drainages and lowland areas in and around Dhaka in the past, contributing to the retention and discharge of rain water. However, rapid sprawl of the urban district 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 carried out in disregard of the topography, coupled with the failure of timely building storm water drainages and negligence of maintenance services, has been aggravating the problem of rain water remaining in the urban district.

Rain water remaining over an extended period of time not only causes inconvenience to the residents' lives, traffic and other activities, but also causes environmental and hygienic problems such as odor and health hazard due to fouled storm water.

Source: Survey Report (RAJUK 2014)

**Figure 6.29 Water logging condition (Purba Jurain of Dhaka city)**

**Figure 6.30 Left: Street without drainage Right: Drainage clogged with garbage**

(2) Flood control policy of Dhaka City

Flood control policy of Dhaka City was established as part of FAP in1990s, with the basic idea of preventing inundation by river water by building embankment and draining rain water from urban area by pumping. The flood control policy is intended to prepared for disasters having probability of occurring once in one hundred years. Construction of the storm water drainage system in the city, on the other hand, is planned to cope with events having probability of occurring once in 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 $m^3/s$) are under construction. In the existing urban district, there are retarding basins such as Gulshan Lake and a new retarding basin has been built in Tejgaon district, to provide functions of receiving and retaining drained rain water.

With regard to the embankment and the pump stations on the eastern edge, revision and F/S of the plan have been completed, but the prospect of commencing the construction has not been obtained. At present, DIT Road serves as a flood protection line, functioning as an embankment that prevents overflows from rivers running in the east from infiltrating the city (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 of them have pumping stations built alongside.

In the central part of the city, a project is now being implemented to construct a multipurpose waterfront that 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. The trend toward nuclear families also makes it increasingly difficult to meet the demands for housing 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 the eastern part of Dhaka because it is a lowland with elevation of 5 to 6 m. However, demands for housing development in this district have been growing because the district is located near the existing urban district.

The most challenging about the housing development in the eastern part of Dhaka is the need for flood control measures. As described above, a project to construct embankment, reservoirs to keep inside water and pumping stations has been put into place in the eastern Dhaka under the revised Eastern Bypass Study (2006). The following problems have been pointed out for this project.

1) Setting the embankment crown height

In the past inundations, water levels in the three major rivers rose to 15 m or higher, and those in Buriganga River and Balu River surrounding Dhaka rose to almost 8 m. Since the ground height in eastern Dhaka is about 5 to 6 m, it is feared that building the embankment with crown height of 8 m would lead to increased flooding energy in the event of dyke break, resulting in significant damages.

2) Timing of embankment construction

If building of embankment lags behind the urban development works, risk of inundation damage increases. If building of embankment in the downstream proceeds ahead of building of embankment in the upstream, overflow from the upstream would be prevented by the downstream embankment from returning to the river, so as to be retained in the inside over an extended period of time.

3) Protection against bank erosion

The embankment should be protected with revetment installed over the height range of the varying water level. River sand will be used as the embankment material, when the actual conditions surrounding the project are considered. If this is the case, the surface behind the revetment must be installed with a soil draw-out prevention material, to prevent the sand behind the revetment from being drawn out giving rise to the danger of collapsing revetment and fragile embankment.

4) Drainage of inside water

Building an embankment makes is difficult to drain the inside water. To drain inside water, it is necessary to install pumps, sluice gates and other facilities. It is also required to establish well-defined rules for operating these facilities, and a reliable system must be put in place that is capable of ensuring correct operation and management of the facilities.

5) Loss of wetlands

The eastern Dhaka has wetlands scattered therein that are valuable not only for their flood control functions as buffer and water retention in case of river overflow, but also for their contribution to the preservation of diversity in the natural environment. Water in the wetlands comes mainly from the overflow from rivers, ground water and rain water. Construction of embankment would stop the harmless, ordinary flooding (barsha) from occurring, thus causing the wetlands to diminish and weakening their functions, with the supply of water and fishes from rivers interrupted.

(4) Development in eastern district by landfill

First Dhaka Eastern Bypass study was undertaken in 1998 under World Bank TA. The study was updated in June 2006 with a new name of “Updating/Upgrading the Feasibility Study of Dhaka Integrated Flood Control Embankment cum Eastern Bypass Road Multipurpose Project”.

The main objective of the project is to provide flood protection for the eastern part of Dhaka in order to mitigate damage and loss as a result of flooding by the Balu River and from internal flood water. The project will also deliver transport benefits, but they are secondary to those of flood defense. All the proposals under this project refer to Figure 8.3-11 as below. Total project cost at constant 2005 prices and excluding physical contingencies was estimated at BDT 19.0 billion (US$233 million) in the report.

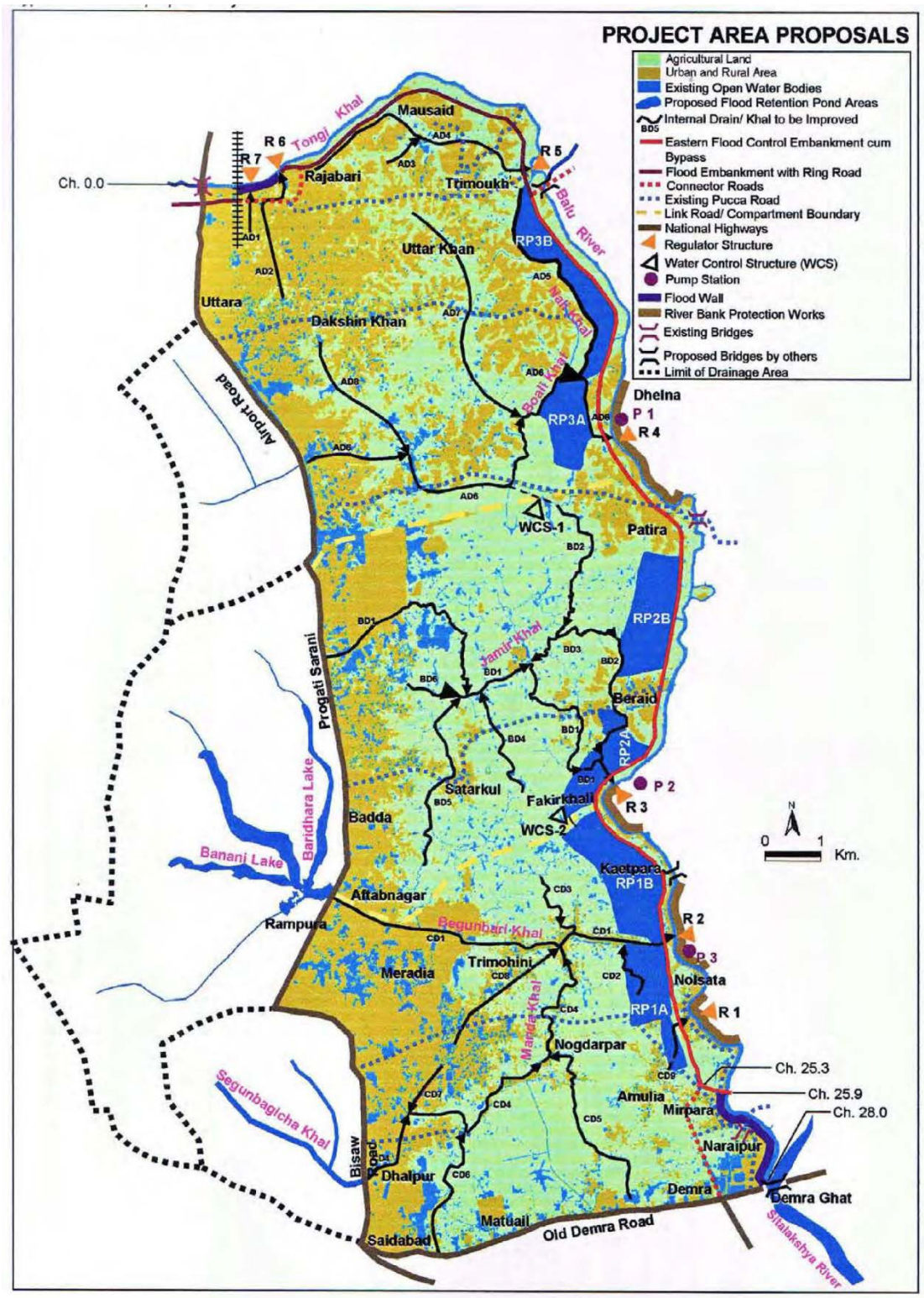



**Figure 6.31 Proposals for Eastern Area from Updating/Upgrading the Feasibility Study of Dhaka Integrated Flood Control Embankment cum Eastern Bypass Road Multipurpose Project**

The purpose of flood control may also be achieved by raising the ground level, instead of embankment. There are following merits in raising the ground level compared to the construction of embankment:

- Since the development works effectively serve as flood control works at the same time, there is no possibility of flood damage to increase in the developed area due to the time lag with the implementation of flood control measures.
- Even if an inundation does occur, it is caused by spill that has far less flooding energy than a dyke break has.
- Drainage of rain water from the developed area is made easier.
- It is made possible to clearly distinguish the housing areas to be protected from inundation damage and the farmlands to be utilized as before (present use of farmlands can be continued).

Raising the ground level involves the following problems:

- A vast amount of land reclamation material would be needed to raise the ground level to a height free from inundation (about 10 m), as the current ground level is 5 to 6 m in the eastern Dhaka.
- If there is a weak soil layer underneath the reclaimed land, the ground may subside due to the weight of landfill.
- Most probably, river sand will be used as the reclamation material, similarly in the case of embankment (In fact, river sand is used in the development works currently in process). This gives rise to the fear of liquefaction in the event of an earthquake, as the river sand has high water permeability.
- Protection against erosion must be implemented in portions of the reclaimed land that would make contact with the river water or flood water.
- Reclaimed lands must be connected with each other by a traffic network (it will be required to build traffic system (mainly roads) at a raised height (surface height of the reclaimed land)).
- Haphazard development works may generate areas of poor drainage around the reclaimed lands.

# 7. FINANCIAL STRUCTURES AND BUDGETING

This chapter provides an overview of financial structures and budgeting in Bangladesh based on government documents to provide legal framework, general ideas of basic structures and processes including the Constitution of Bangladesh (1972), General Financial Rules and Planning Commission documents. In addition to the basic structure and current status of the national budgeting system, local and urban authorities, state-owned enterprises and the private sector are reviewed. Finally, the chapter discusses financial capacity of the Government for investment in the transport sector on the basis of the current situation.

## 7.1 Legal Framework, Basic Structure and Process of the National Budget

(1) Legal Framework for National Budget System

The Constitution of the People's Republic of Bangladesh 1972 (the Constitution) and The General Financial Rules (1998) are major legal documents in relation to government finance and budget.

Regarding the Constitution, Legislative and Financial Procedures in Chapter II of Part V defines the basic legal framework for the Government budgeting process. Articles 80-92 of Chapter II outline the requirements of budgetary procedures (Table 7.1).

**Table 7.1 Contents of Articles80-92 to Regulate Budgetary Process**

| Article | Contents |
|---|---|
| Article 80 | Legislative procedure |
| Article 81 | Money Bills |
| Article 82 | Recommendation for financial measures; |
| Article 83 | No taxation except by or under Act of Parliament; |
| Article 84 | Consolidated Fund and Public Account of the Republic<br>(1) All revenues received by the Government, all loans raised by the Government, and all moneys received by it in repayment of any loan, shall form part of one fund to be known as the Consolidated Fund<br>(2) All other public moneys received by or on behalf of the Government shall be credited to the Public Account of the Republic |
| Article 85 | Regulation of public moneys |
| Article 86 | Moneys payable to public account of republic; |
| Article 87 | Annual financial statement<br>(1) there shall be laid before Parliament in respect of each financial year, a statement of the estimated receipts and expenditure of the Government for that year, in this Part referred to as the annual financial statement.<br>(2) The annual financial statement shall show separately-(a) the sums required to meet expenditure charged by or under this Constitution upon the Consolidated Fund; and (b) the sums required to meet other expenditure proposed to be made from the Consolidated Fund; and shall distinguish expenditure on revenue account from other expenditure; |
| Article 88 | Charges on consolidated fund |
| Article 89 | Procedure relating to annual financial statement |
| Article 90 | Appropriation Act |
| Article 91 | Supplementary and excess grants |
| Article 92 | Votes on account, votes of credit, etc. |

Source: JICA Study Team made based on the Constitution of the People's Republic of Bangladesh 1972

The General Financial Rules stipulates the basic financial rules, and in particular Chapter 5 – Budget, Grants and Appropriation defines procedures for preparation and submission

of budget estimates. The Rules provides that under Article 87 of the Constitution, a statement of the estimated receipts and expenditure of the Government for each financial year has to be laid before the Parliament. In addition, it states that the Constitution refers to this statement as “the Annual Financial Statement”, and in common it is called “the Budget”.

Compilation of General Financial Rules was first published during the British rule. Through revisions of the Compilation of Financial Rules, the present General Financial Rules was approved by the President in 1998. With the publication of the approved General Financial Rules, the two sets of rules which were in operation i.e., the Compilation of General Financial Rules and Bangladesh Financial Rules became inoperative and shall have no effect. All departments and Government functionaries henceforth currently follow the revised version of the General Financial Rules 1998. Departmental authorities observe these rules, supplemented by the special orders and instructions, if any, contained in their departmental regulations. The rules contain compilation of previous rules in addition to the Account Code and Treasury Rules.

The contents related to non-development (revenue) budget and development budget preparation of the rules under Chapter 5 are summarized below

1) Non-development Budget

General procedure of preparation and submission of budget estimate is as follows:

a. The Finance Division prepares the Budget and for this purpose other Ministries/Divisions/Departments are required to furnish materials on which the estimates are to be based;

b. The Budget Monitoring and Resource Committee in the Finance Division headed by the Finance Minister monitors the budget on the basis of review of progress of revenue collection, inflow of foreign assistance, expenditure trend against the budget and all other pertinent issues;

c. Dates of submission of budget estimates is given in appendix 3 of the rules;

d. Estimates of revenue, receipts and revision;

e. Preparation of estimates of expenditure;

f. Estimates of new expenditure, new civil works and proposed for new civil works and its schedule; and

g. Discussion with administrative ministries

2) Development Budget

General procedure of preparation and submission of budget estimate is stated as follows.

a. Every year the Planning Commission issues guidelines for preparation of the proposed and revised Annual Development Programme (ADP).

b. A Programming Committee constituted in the Planning Commission with participation of Finance Division, Economic Relations Division and Implementation, Monitoring and Evaluation Division examines development proposals, fixes their priorities and determines the allocations to be provided in the ADP.

c. After the ADP is finalized, particulars of each development project included in the Programme, showing the Revenue and Capital components and receipts, if any, are furnished to the Finance Division for incorporation in the Budget.

d. The Finance Division then classify the allocation for the project/scheme according to the Classification Chart.

The following table summarizes the legal framework.

**Table 7.2 Legal Framework of National Budget System**

| Laws and Regulations | Year | Contents/Activities |
|---|---|---|
| The Constitution of the People's Republic of Bangladesh | 1972 | Articles 80-92 in Chapter II of Part V refer to legislative and financial procedures. The contents are as below.<br>• Article 84 defines the Consolidated Fund and the Public Account of the Republic<br>• A statement of the estimated receipts and expenditure in respect of each financial year shall be prepared (Article 87)<br>• Annual financial statement shall show as the sums required to meet expenditure charged by or under this Constitution upon the Consolidated Fund (Article 87)<br>• Annual financial statement shall show as the sums required to meet other expenditure proposed to be made from the Consolidated Fund (Article 87) |
| The General Financial Rules | 1998 | Chapter 5 of the General Financial Rules refers to non-development budget and development budget and the contents are as below:<br>• The Finance Division of the Ministry of Finance is responsible for budget preparation<br>• All Ministries/Divisions/Departments are required to furnish materials on which the estimates<br>• The Budget Monitoring and Resource Committee in the Finance Division headed by the Finance Minister monitors the budget<br>• The Rules refers to dateline and times schedule for budget preparation<br>• The Planning Commission is responsible for issuing guidelines for preparation of the proposed and revised Annual Development Programme (ADP).<br>• A Programming Committee constituted in the Planning Commission with participation of Finance Division examines the ADP |

Source: JICA Study Team

(2) Basic Structure of Budget

The central government financial statements (Finance Accounts) consists of two parts – (i) the Consolidated Fund, which shows receipts and payments of government money as authorized by the Constitution and each year's Appropriation Act, and (ii) the Public Account, a group funds that receive and pay 'other money'. The Consolidated fund includes all revenues, proceeds of loan and loan repayment to the Government. All other public money received by Government credited to the Public Account.

The budgetary measure essentially governs the aggregate management of Government's revenue and expenditure. Within the broad premise of the fiscal policy, the Government has to (a) prepare estimate of revenue collection (b) prepare expenditure plans and (c) identify the probable sources for financing the budget deficit. 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. The rest comes from different non-tax revenues such as fees, charges and tolls. These financial documents are annually published together with supporting statements of actual

expenditures compared with budget authorizations, variances and explanations of variances (the Appropriation Accounts).

The budget and accounts for the Consolidated Fund are divided into 'Development Budget' and 'Revenue Budget'. Broadly, Development Budget contains all those expenditures that are supported both by domestic resources and foreign aid/loans. These include capital construction, incremental operating and maintenance expenditures, and technical assistance. The Revenue Budget contains government revenues from taxes, aid and loans, recurrent expenditures insofar as they are not in the Development Budget (typically the staff costs), interest on development loans and some 'non-development' capital expenditures such as administrative buildings.

Administratively, the Finance Division of the Ministry of Finance has overall responsibility for the orchestration of the Revenue and Development Budget preparation process. The Budget Wing of Finance Division has responsibility for collation and examination of Ministerial Revenue Budget submissions and for their summarization and passes through Parliament to final publication. The Development Wing is also responsible for the Development Budget process but the Planning Commission is mainly responsible for preparation of the Annual Development Programme (ADP) which after preparation is converted into the Development Budget by the Development Wing. All processes end in the presentation of the Budget in the Parliament by the Finance Minister and its enactment.

(3) Development Budget Allocation Process among Sub-sectors

Although the Government of Bangladesh introduced Medium Term Budget Framework (MTBF) in the FY 2007-08, the traditional resource allocation process still exists in the country. The majority of the ministries have introduced the new MTBF system and receive allocations based on it. Some other ministries still now continue to follow the previous system. Figure 7.1 presents the traditional process, and Figures 7.2 and 7.3 show the process of MTBF budget allocation and approval.

1) Traditional Budget Allocation Process

The Programming Committee headed by the Member (Programming), Planning Commission prepares the Annual Development Programme (ADP) under the traditional arrangement based on the projection of potential resources from government revenue, external assistance and internal borrowing. The members of the Programming Committee are representatives of the sector divisions of the Planning Commission, line ministries/divisions and executing agencies responsible for reviewing and recommending proposals for inclusion of new projects in the ADP. The following are basic process of budget allocation.

a. The Resource Committee headed by Finance Minister estimates resources available for ADP. The Programming Committee also reviews ADP implementation, resource availability and sectorial priorities to allocate/reallocate resources under the ADP.

b. National Economic Council (NEC), headed by the Prime Minister approves medium and long-term development plans including ADP, Revised Annual Development Programme (RADP) and carries out periodic review of ADP implementation; while Executive Committee for NEC (ECNEC), also chaired by the Prime Minister and Minister in charge of Finance and Planning, as the alternative Chairperson, approves all public sector investment projects having a total cost exceeding Tk. 250 million and reviews and approves important economic policies of the Government.

c. The Programming Division in Planning Commission makes ADP allocations to the sectors/sub-sectors. The allocation is communicated to the line ministries through sector Divisions of the Planning Commission for preparation of proposal for use of the allocation.

d. The Programming Division provides general guideline for preparation of proposals consistent with national goals and international commitments. The guidelines reflect priorities and strategies enunciated in time bound national development plans (such as the Five Year Plan), the Poverty Reduction Strategy (PRS), the Millennium Development Goals (MDGs), and periodic policy and strategy pronouncements of the Government. Line ministries; has the tendency to deviate from the guidelines primarily under the influence of subjective non-economic considerations.

e. The Programming Committee reviews the ADP proposals received from the line ministries, against the allocations indicated by the Programming Division, paying attention to new projects and the performance of on-going projects.

f. After its review the committee decides upon the inclusion of new projects and allocations to ongoing projects. Some of the major criterion use in deciding the level of final allocation includes, among others.

g. The sector divisions of the Planning Commission then finalize the ADP proposals by making specific allocations to each project.

h. The Programming Division takes the draft sector/sub-sectors program, reviews them and consolidates them into a draft ADP.

i. The draft ADP is submitted to NEC for approval and finally the Programming Division publishes the ADP, which is incorporated into the national budget by the Finance Division.

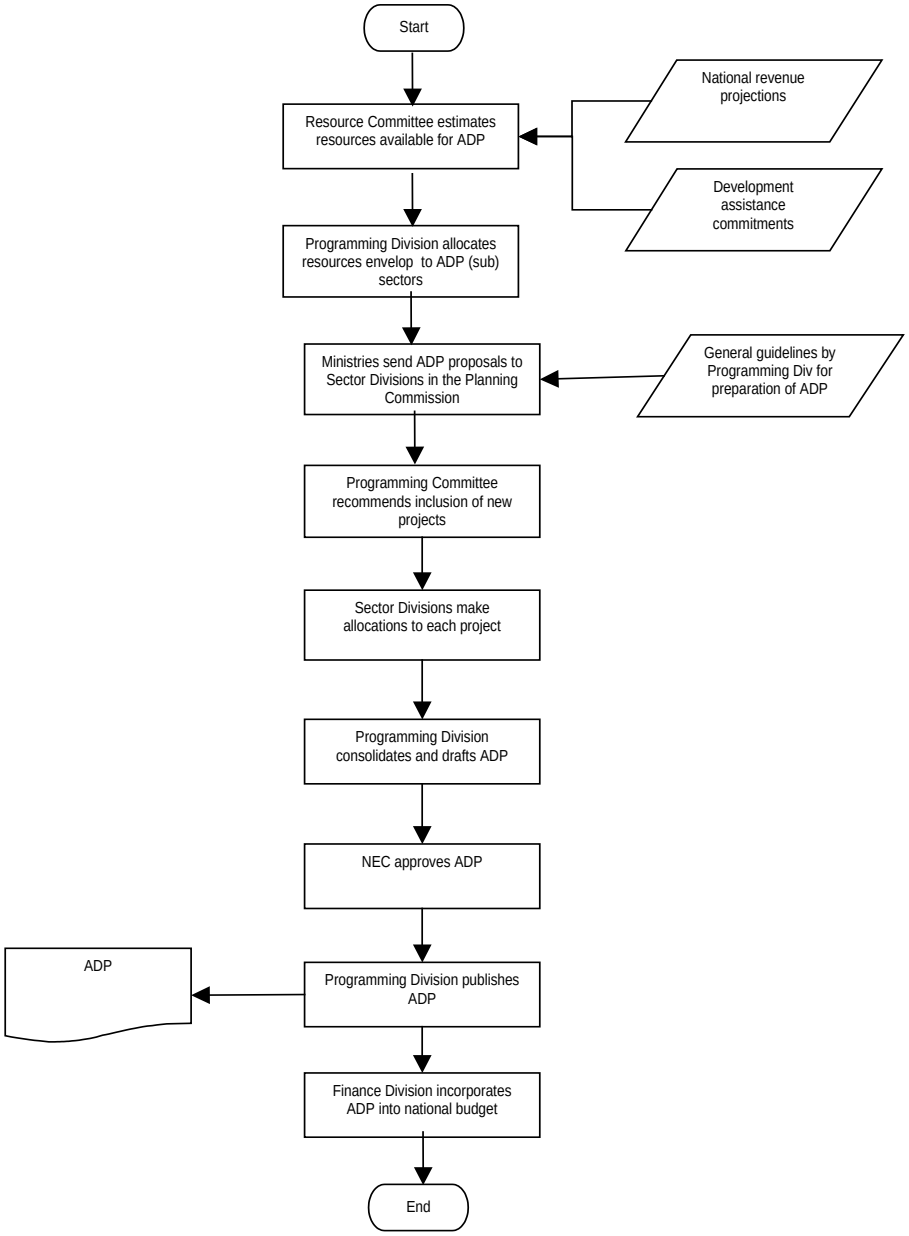



**Figure 7.1 The Traditional Process of Development Budget Allocation in Bangladesh**

2) Medium Term Budget Planning and Approval:

The Medium Term Budget Framework (MTBF), a new budgeting approach which is generally known as Medium Term Expenditure Framework (MTEF) is a multi-year approach to budgeting that sets a medium term framework for government receipts and expenditures. The MTBF links the spending plans of government to its policy objectives and requires a reliable estimates of resources available for expenditure, as government spending plans must respect a reasonable view of what government receipts (both revenue and foreign assistance) are likely to be over the medium term. Under MTBF system, line ministries are provided with greater responsibility for resource allocation decisions and resource use. The MTBF requires decision

makers to balance what is affordable in aggregate against the policy priority of the country. The MTBF consists of a top-down resource envelop, a bottom-up estimation of the current and medium term cost of existing policy and, ultimately the matching of' these costs with available resources.

This is policy-based budget providing an overall medium-term macro/fiscal resource framework and expenditure policies, and the issuance of Cabinet-approved expenditure ceilings at the beginning of the budget preparation process as shown in Figure 7.2 and Figure 7.3.

Other improvements include merger of development and non-development budget in one envelop. Improvements in the use of forward estimates and the linking of the bottom-up planning and budgeting with the top-down resource framework will be required in order to make the budget an effective tool for government policy.

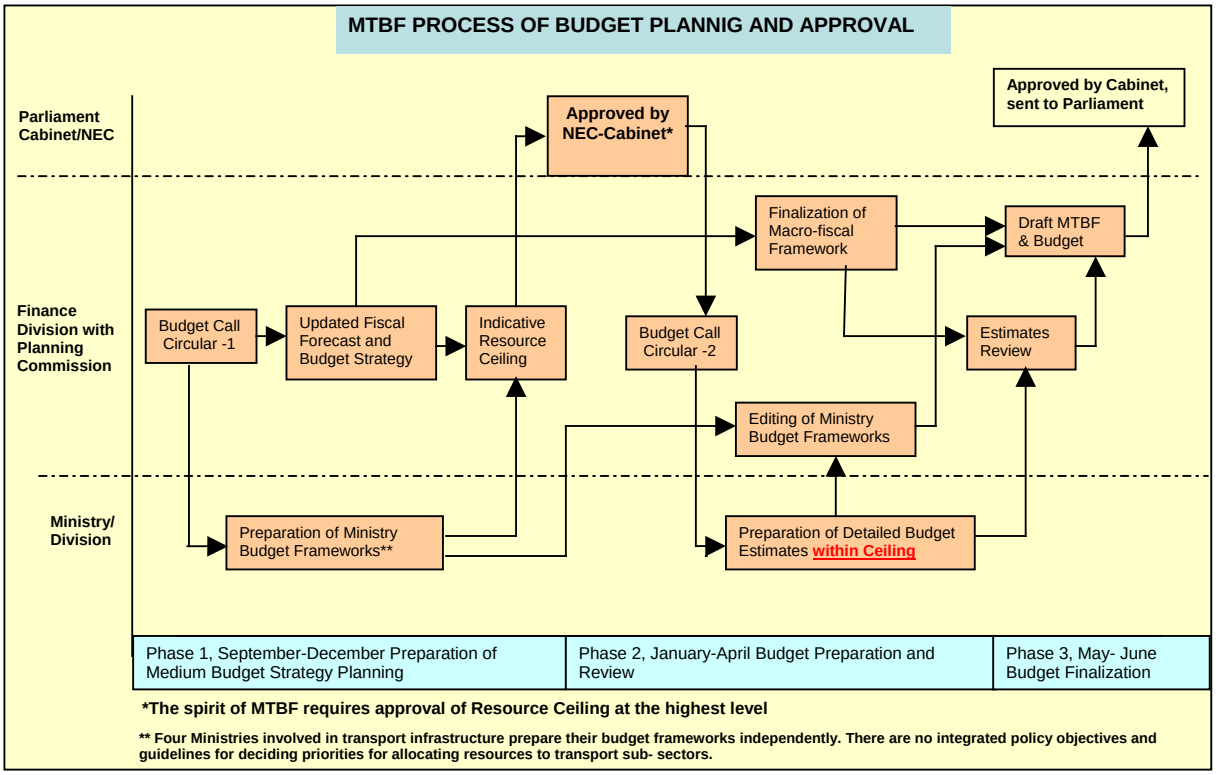



**Figure 7.2 Medium Term Budget Planning and Approval**

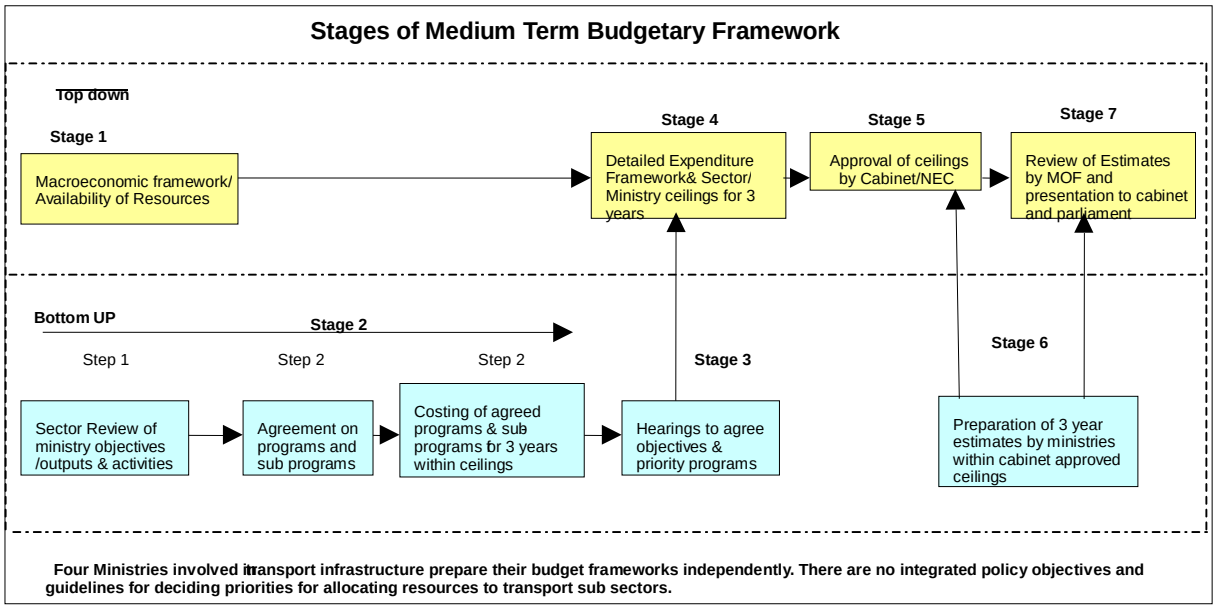



**Figure 7.3 Stages of Medium Term Budgetary Framework**

(4) Administrative Authorities of Development Budget

The Ministry of Finance mainly is responsible to prepare and place the development budget before the Parliament and three divisions of the ministry along with other key agencies are involved. The divisions and key agencies are stated as below:

A. Ministry of Finance

- Development Wing of Finance Division
- Economic Relations Divisions
- Internal Resources Division (National Board of Revenue)

B. Other key agencies

- Planning Commission under Ministry of Planning
- National Economic Council (NEC)
- Administrative Ministries/Divisions//Departments

The Development Wing of Finance Division prepares the Development Budget along with Planning Commission and for this purpose other Ministries/Divisions/Departments are required to furnish materials on which the estimates are to be based. Most of the Ministries/Divisions/ Departments depend for these materials on local offices that collect the revenue or incur expenditures.

Planning Commission under Ministry of Planning issues guidelines for preparation of the proposed and revised estimates for Annual Development Program (ADP). A Programming Committee constituted in the Programming Division of the Planning Commission is mainly in charge of preparation of development programmes and determination of allocations in ADP.

**Table 7.3 Administrative Authorities of Development Budgeting**

| Administrative Authorities | | Responsibility |
|---|---|---|
| Ministry of Finance | Development Wing of Finance Division | • Development Wing of Finance Division has overall authority to prepare development budget, its allocation and control |
| | Economic Relations Division (ERD) | • ERD leads as the focal point of the Government for interfacing with the development partners as well as for co-ordination of all external assistance inflows into the country<br>• It assesses the needs of external assistance, devises strategy for negotiations and mobilizing foreign assistance, formalizes and enables aid mobilization through signing of loans and grant agreements, determines and executes external economic policy. |
| | Internal Resources Division (IRD) | • IRD is responsible for domestic resource mobilization for the country through NBR<br>• National Board of Revenue (NBR) under IRD is responsible for formulation and continuous reappraisal of tax policies and tax laws in the country<br>• Under the overall control of IRD, NBR administers the excise, VAT, customs and income tax |
| Ministry of Planning | Planning Commission (Programming Division) | • Preparation of development programmes<br>• Determination of the sizes of the Annual Development Programmes (ADP) and sectorial allocations/ proportions.<br>• Formulation of ADP and revision of ADP. |
| National Economic Council (NEC) | | • Approving the development programmes |
| Administrative Ministries/ Divisions/ Departments | | • Preparation of base documents for proposed projects and administrative procedures |

Source: JICA Study Team

(5) Procedure of Development Fund Release

Development budget has several components depending on the type of project and nature of financing. The development project may have expenditure in foreign currency for import of equipment and services (either financed from government's own resources or from donor sources). There are several other items financed in local currency by the government from its cash resources or reimbursable project aid from donors, to meet local expenditures of the project.

On the basis of ADP allocation, fund is released in four installments. Extra allocations are released in additional installments. At the beginning of the year (within 15th July) the Administrative Ministry/Division issues break up order with the approval of the competent authority, in accordance with the provision of approved DPP/TAPP. In respect of unapproved/revised projects, which are not very common these days, the concurrence of Finance Division and Planning Commission is necessary for issuing break up order and any change in revenue or capital allocation. If there is any discrepancy between the proposed break up order and the DPP/TAPP allocation, the concurrence of Finance Division and Planning Commission is required to be obtained. In case of any change in the original allocation, revised break up order is necessary in accordance with the revised allocation.

The release proposal is required to be accompanied by the implementation plan and the statement showing the budget allocation, fund released so far, actual expenditure and reimbursement. Copies of all release orders issued from the Administrative Ministry/Division are required to be sent to relevant section of the Development Wing of Finance Division. Fund release without depositing the DSL dues in cash requires the prior approval of Finance Ministry.

Custom Duty (CD) and Value Added Tax (VAT) are required to be paid on imported equipment which is allocated from government resources and are paid following standard procedures. CD&VAT amount cannot be spent for other purposes. The exact amount of CD&VAT is assessed by the custom on arrival of the equipment at the port and based on custom classification of equipment/components, types etc.

**Procedures for release of Reimbursable Project Aid**: The Administrative Ministry/Division is authorized to release up to two quarters during July-December period on the basis of budget allocation. During January-June period of the relevant financial year funds for any quarter including third and fourth quarters can be released with the concurrence of Finance Division. Release of fund at one installment (First-Fourth) will require the concurrence of Planning Commission and Finance Division. Subject to the payment of DSL installment in cash, the same procedure is applicable in respect of autonomous/semi-autonomous bodies. Release of fourth quarter before the finalization of revised ADP will require the concurrence of Planning Commission and Finance Division.

**Procedures for release of Reimbursable Project Aid (Special Accounts) - SAFE Account (Special Account in Foreign Exchange)**: In accordance with the proposal of the Administrative Ministry/Division, Finance Division issues authorization order according to budget allocation at the beginning of the financial year in favor of the commercial bank. On receiving the authorization, Bangladesh Bank will transfer money to the Project Account in four installments. After adjustment of the fund released in previous quarter, the fund for next quarter will be released. The same procedure will be applicable in respect of the autonomous/semiautonomous bodies, and also for Unapproved/Revised Unapproved Projects. The following Figure 7.4 describes the follow diagram of development projects fund released procedures.

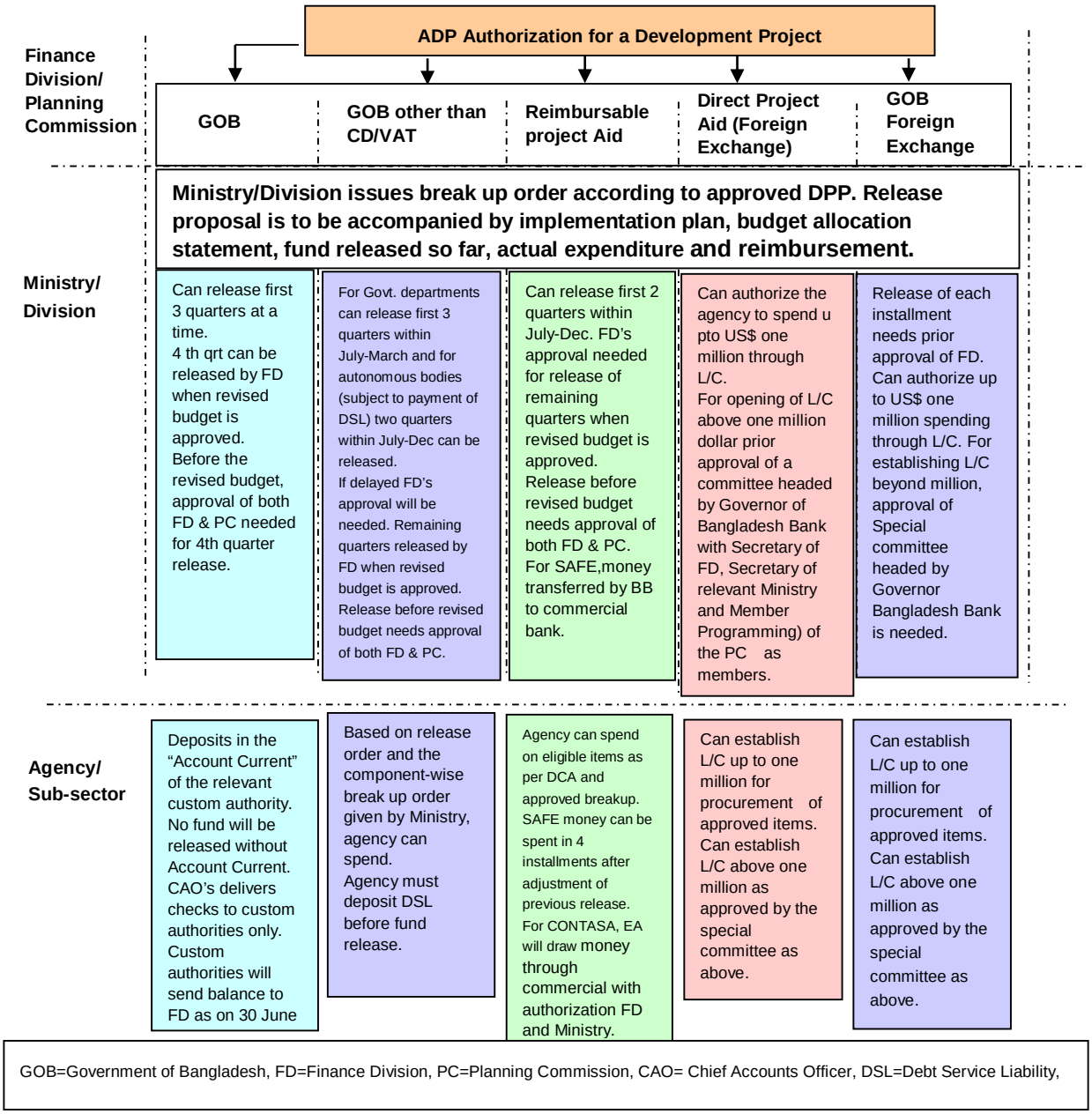



**Figure 7.4 Development Fund Release Flow Chart**

(6) Institutional Structure of Public Accounting and Auditing

Part VIII of The Constitution of Bangladesh 1972– The Comptroller and Auditor-General provides the basic legal institutional structure of keeping the Government Accounts. Articles 127-132 under the Part VIII stipulate basic matters on the comptroller and auditor-general. The following table summarize the contents.

**Table 7.4 Contents of PART VIII-The Comptroller and Auditor-General-**

| Article | Contents |
|---|---|
| Article 127 | establishment of office of Auditor-General |
| Article 128 | Functions of Auditor-General which are:<br>-The public accounts of the Republic and of all courts of law and all authorities and officers of the Government shall be audited and reported on by the Auditor-General and for that purpose he or any person authorized by him in that behalf shall have access to all records, books, vouchers, documents, cash, stamps, securities, stores or other government property in the possession of any person in the service of the Republic.<br>-Without prejudice to the provisions of clause (1), if it is prescribed by law in the case of anybody corporate directly established by law, the accounts of that body corporate shall be audited and reported on by such person as may be so prescribed.<br>-Parliament may by law require the Auditor-General to exercise such functions, in addition to those specified in clause (1), as such law may prescribe, and until provision is made by law under this clause the President may, by order, make such provision.<br>-The Auditor-General, in the exercise of this function under clause (1), shall not be subject to the direction or control of any other person or authority. |
| Article 129 | Term of office of Auditor-General which are:<br>-The Auditor-General shall, subject to the provisions of this article, hold office for five years from the date on which he entered upon his office, or until he attains the age of sixty five years, whichever is earlier.<br>-The Auditor-General shall not be removed from his office except in like manner and on the like ground as a judge of the 84 Supreme Court.<br>-The Auditor-General may resign his office by writing under his hand addressed to the President.<br>-On ceasing to hold office the Auditor-General shall not be eligible for further office in the service of the Republic. |
| Article 130 | Acting Auditor-General |
| Article 131 | Form and manner of keeping public accounts which are the public accounts of the Republic shall be kept in such form and in such manner as the Auditor-General may, with the approval of the President, prescribe. |
| Article 132 | Reports of Auditor-General are to be laid before Parliament:<br>The reports of the Auditor-General relating to the Reports of public accounts of the Republic shall be submitted to the President, who shall cause them to be laid before Parliament. |

The Constitution of the Republic has made the Comptroller and Auditor General is responsible, with the approval of the President, for the form and manner of keeping Government Accounts. In addition, the Comptroller and Auditor General (Additional Functions) Act, 1974 gives certain specific accounting tasks which are preparation of the Annual Financial Account and the Annual Appropriation Accounts. Though the Comptroller and Auditor General is responsible for the form and manner of keeping Government Accounts, however, the Finance Division, Ministry of Finance, has the ultimate financial administration and expenditures control in practice. The following diagram below Figure 7.5 summarizes the existing institutions dealing with financial administration.

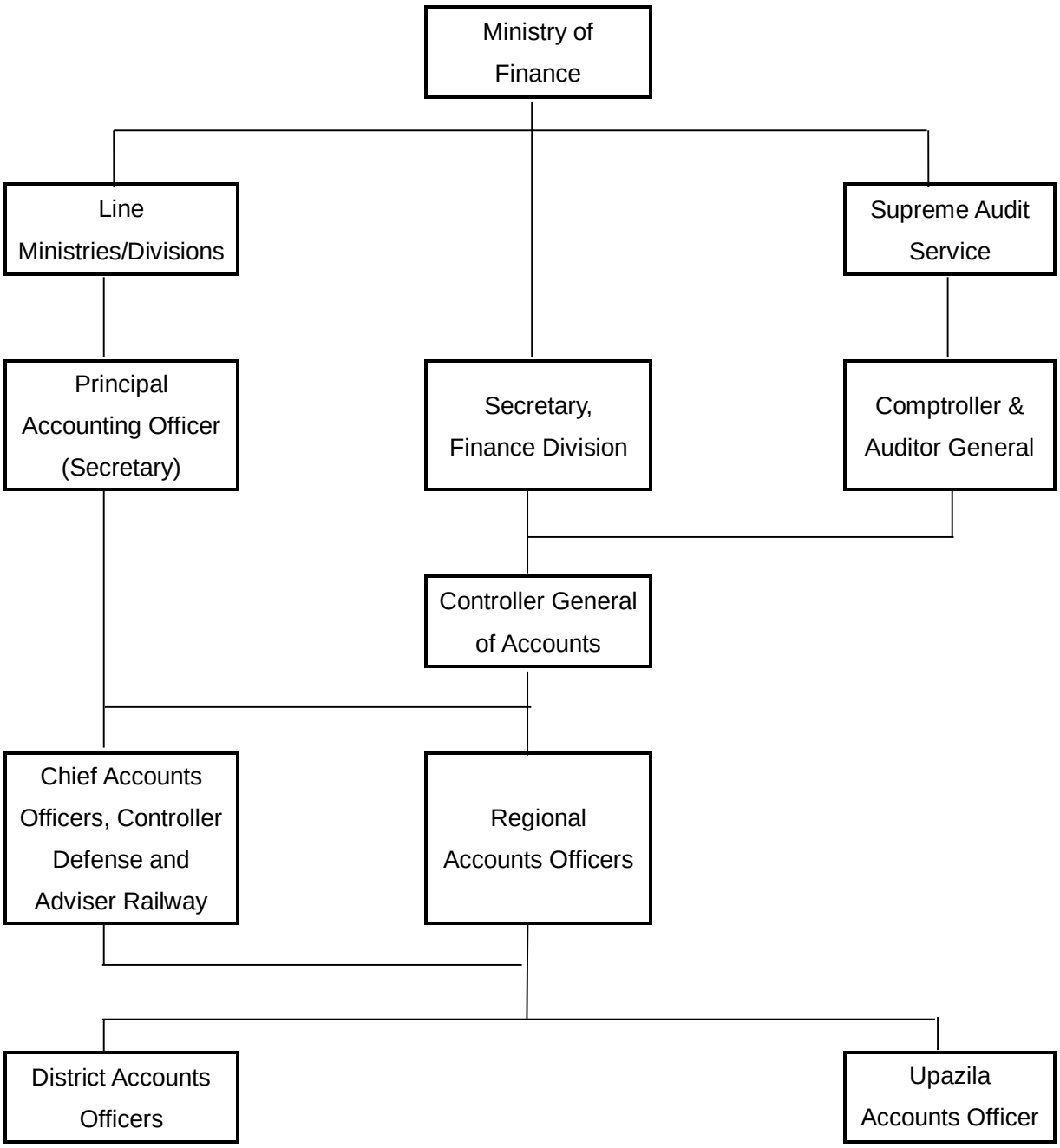



**Figure 7.5 Existing Institutional Structure of Financial Administration**

From the above discussions, it is worthwhile to mention here about accounting and auditing functions. The Constitution, Acts of Parliament, Rules and Regulations contained in different publications of the Government together with instructions issued from time to time provide the framework for financial administration including budgeting, accounting and certain audit functions. The Ministry of Finance presents the budget to the Parliament but the Comptroller and Auditor General prepares and submits the finance accounts, the appropriation accounts and audit reports each year to the President, who lays them before Parliament. These are dealt with on behalf of Parliament through standing committees. These include the Public Accounts Committee, the Estimates Committee and the Public Undertakings Committee.

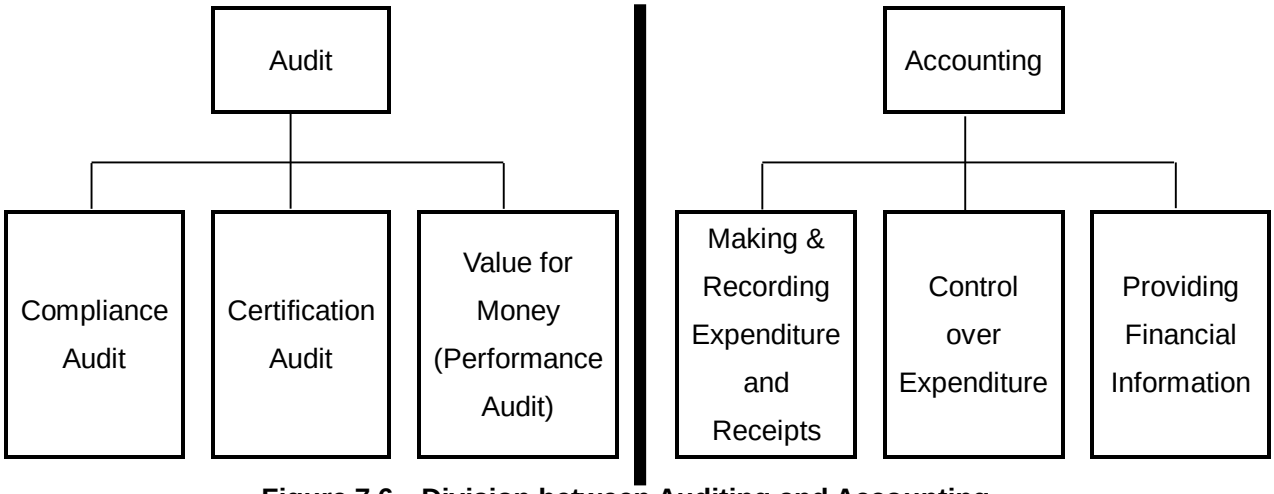



**Figure 7.6 Division between Auditing and Accounting**

**Accounting Monitoring and Controlling:**

The process of control and evaluation is built in the system in the forms of rules and procedures for performing the task. Annual financial accounts are submitted to the Controller General of Accounts for incorporation in the Finance Accounts of the Republic. At the end of the fiscal year appropriation account relating to expenditure brought to the account during the financial year providing comparison between final grant and expenditure is prepared. Consolidated financial report (appropriation account + financial accounts) of the Republic as prepared by Comptroller & Auditor General is placed before the Parliament. C&AG is mandated by the Constitution to carry out independent audit of the accounts all of sectors/ sub-sectors of the government and to report on them to the Parliament.

**Internal Control:**

Internal control refers to the Government's or department's whole system of controls, financial and otherwise, established in order to provide reasonable assurance of efficient and effective public services, reliable financial information and reporting and compliance with applicable laws and regulations. The internal audit is part of its internal control system. It is an independent and objective appraisal service within an organization and aims to help line ministries improve their risk management, control and governance. As a key element in the framework of internal control there is an audit committee is to provide support to the Public Accounting Officer by acting as an interface with the Auditor General and the internal auditors. Their dealings with the auditors enable them to assess the degree of assurance that the Public Accounting Officer can obtain from the audit process.

**External Control:**

A broad range of external controls exists to oversee and discipline the operations, financial and otherwise, of service departments/ministries. These controls are broadly exercised by the central ministries like the Ministry of Finance, Office of the Auditor-General and the Parliamentary Committees. The broadening of such control optimizes the quality and effectiveness of public spending by way of minimizing the potential risk of wastage, irregularities and leakage in the use of public resources. In dealing with the external audit, the audit committee is expected to consider the Auditor General's audit report for the Ministry; review action taken in response to audit findings and assemble the Ministry's case for matters reported to Public Accounts Committee. As a part of external control, the Ministry of Finance provides guidance on financial

management issues regulates financial management across ministries/ sectors/ sub-sectors and regulates internal control across government of Bangladesh.

**Independent External Audit:**

The Constitution of the Republic provides authority to the Comptroller and Auditor General of Bangladesh to audit the accounts of government agencies, public bodies and public companies and to report to Parliament. The office of the Comptroller and Auditor General assists the Parliament in ensuring accountability and transparency of the Government in the use of public resources. With the independence guaranteed by the constitution, the Comptroller and Auditor General carries out:

- Independent (external) audit in order to fulfill its role as a watchdog agency;
- Evaluation of the effectiveness of internal control and internal audit functions;
- Performance or value for money audits to enhance accountability,
- Reporting, as necessary to Standing Committee on Public Accounts (PAC)/ Committee on Public Undertakings (PUC);
- Reporting to ministries on the effectiveness or otherwise of internal audit;
- Following up audit reports to ensure that effective action has been taken.

## 7.2 Current Status of National Budget

This section provides an overview of current status of national revenue and expenditure and its average growth which is one of the influential factor for the determination of future economic development of the country. Moreover, the section describes the development expenditure by sectors and trend.

(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. The tax receipts consists 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. In FY2004-2005, Revenue-GDP ratio was 10.6% which kept the same rate up to the FY2006-2007 (10.5%). The ratio has been slowly growing to 12.9% in FY2010-2011. In FY2012-13, total revenue collection stood at 12.2 percent of GDP as shown in Table 7.4.

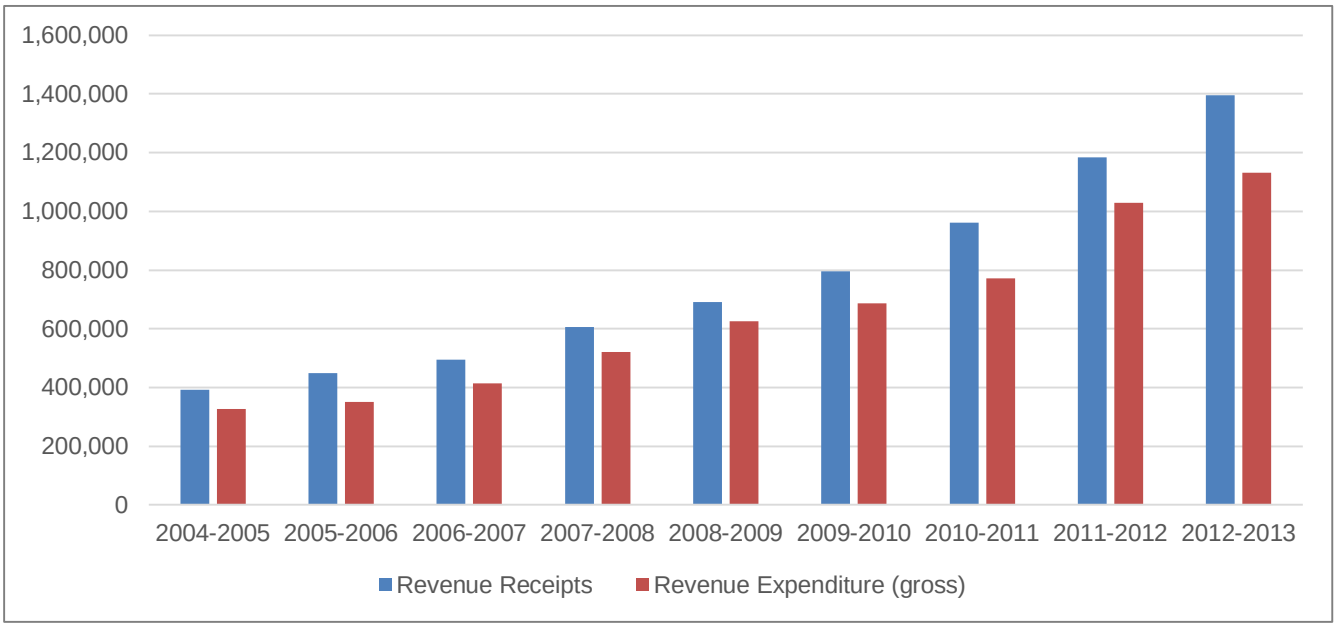
The public expenditure includes non-development expenditure and development expenditure. Non-development expenditure is relating to “Revenue Budget” and development expenditure relating to “Development Budget”. Revenue expenditure mainly consists of consumption expenditure (salaries, wages & services), transfer payment (interest payment, grant to local bodies, city corporations and autonomous bodies) and subsidies and pension payment. While development expenditure is expenditure for agriculture, flood control, industry, infrastructure and other service development. In FY2004-2005, development expenditure ratio to total expenditure was 36.4 percent and the ratio is decreasing by the following years (Table 7.5). In FY2011-2012, the share of development expenditure was 25.3 percent which represents non-development is increasing instead of development budget. Therefore, it could be mentioned in here that such low development expenditure in the field of the transport infrastructure causes recent chronic transport congestion and conflict.

**Table 7.4 Recent Trend of Consolidated Receipts and Expenditures**

Million BDT

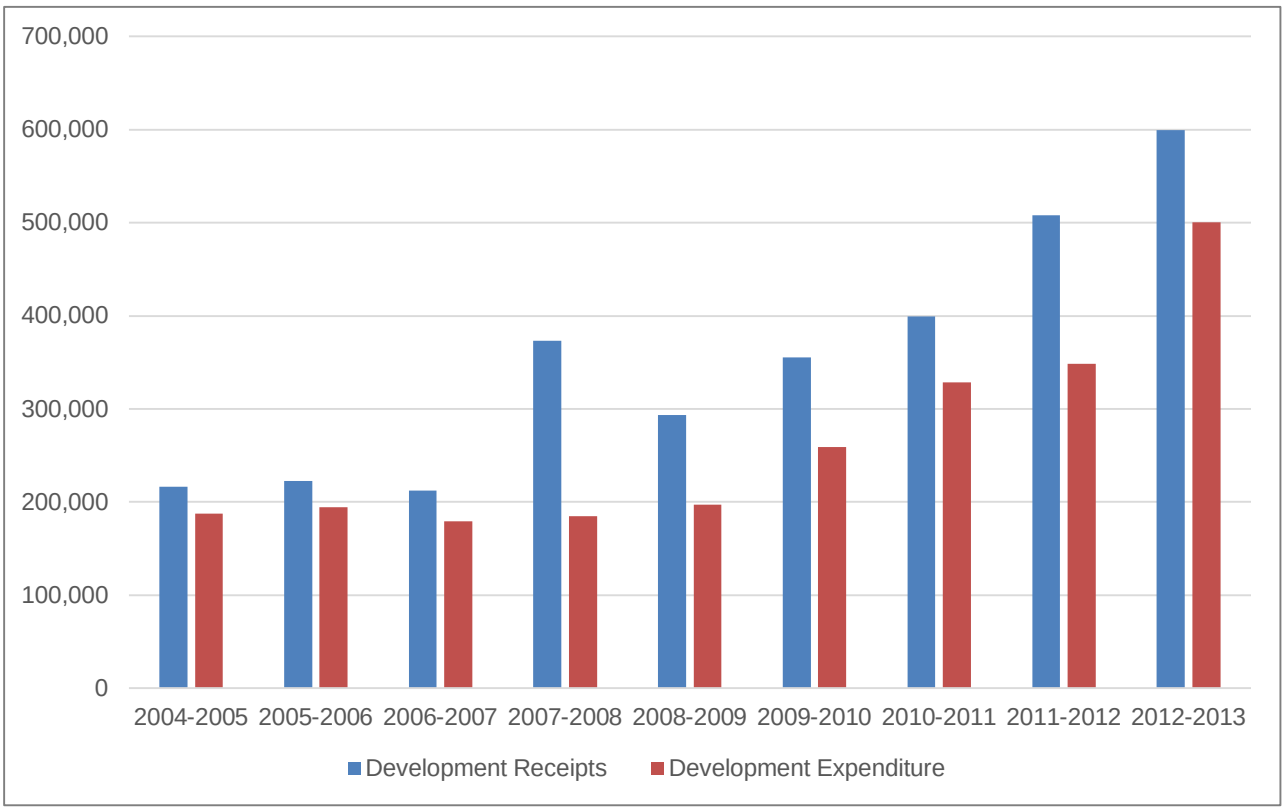
| Heads | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 | 2009-2010 | 2010-2011 | 2011-2012 | 2012-2013 | AAGR 2004-2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| Revenue Receipts | 392,000 | 448,680 | 494,720 | 605,390 | 691,800 | 794,840 | 961,877 | 1,183,850 | 1,396,702 | 17.21 |
| Development Receipts | 216,110 | 222,320 | 212,290 | 373,350 | 293,420 | 355,590 | 399,610 | 508,310 | 599,260 | 13.60 |
| Total Receipts | 608,110 | 671,000 | 707,010 | 978,740 | 985,220 | 1,150,430 | 1,351,487 | 1,692,160 | 1,995,962 | 16.02 |
| Revenue Expenditure (gross) | 327,736 | 351,544 | 413,551 | 521,923 | 626,760 | 687,110 | 771,030 | 1,029,030 | 1,131,330 | 16.75 |
| Development Expenditure | 187,260 | 194,720 | 179,280 | 185,060 | 197,000 | 259,170 | 328,550 | 348,500 | 500,353 | 13.07 |
| Total Expenditure | 514,996 | 546,264 | 592,831 | 706,983 | 823,760 | 946,280 | 1,099,580 | 1,377,530 | 1,631,683 | 15.51 |
| GDP at current producer's price | 3,707,070 | 4,157,279 | 4,724,769 | 5,458,224 | 6,147,952 | 6,943,243 | 7,967,040 | 9,147,842 | 11,412,612 | 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 | 10.6% | 10.8% | 10.5% | 11.1% | 11.3% | 11.5% | 12.1% | 12.9% | 12.2% | |
| % of total receipts to GDP | 16.4% | 16.1% | 15.0% | 17.9% | 16.0% | 16.6% | 17.0% | 18.5% | 17.50% | |
| % of Development Expenditure to Total Expenditure | 36.4% | 35.6% | 30.2% | 26.2% | 23.9% | 27.4% | 29.9% | 25.3% | 30.70% | |

Source: Statistical Yearbook of Bangladesh-2012




Source: Statistical Yearbook of Bangladesh-2013

**Figure 7.7 Recent Trend of Receipts and Expenditures in "Revenue Budget"**




Source: Statistical Yearbook of Bangladesh-2013

**Figure 7.8 Recent Trend of Receipts and Expenditures in "Development Budget"**

(2) Current Status of Revenue Budget

The National Board of Revenue (NBR) under Internal Resources Division (IRD) of the Ministry of Finance is the central authority for tax administration and policy formulation in Bangladesh. The Government has been taking various measures to increase direct and indirect taxes such as: (a) steps for raising direct tax are increasing tax exemption limit, increase in tax coverage and investment ceiling; (b) steps for indirect tax are five-tier supplementary duty rates readjust to eight-tier, duty imposed on finished goods and luxury items and impose duty on tobacco items; (c) steps for VAT are simplification of VAT system and increase in VAT coverage; and (d) imposing of supplementary tax.

In consideration of national revenue, Bangladesh has one of the lowest levels of tax revenues in the world though the revenue collection is increasing many folds in the recent years. Bangladesh remains heavily dependent on trade-based taxes. To increase the domestic resource mobilization as well as development budget, there will need policy options for: (i) broadening the tax base, (ii) reducing tax exemptions, (iii) improving tax administration, (iv) tightening billing and collection in the delivery of public services. As for national expenditure, Bangladesh has one of the lowest levels of government spending in the world. Such low level of expenditures results from the fact that the Government has not been able to mobilize large volumes of resources domestically with the government own tax. As a result, budget financing remains heavily reliant on domestic borrowing.

Table 7.5 and Figure 7.9 shows the recent trend of 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 FY2004-2005 to FY 2011-2012.

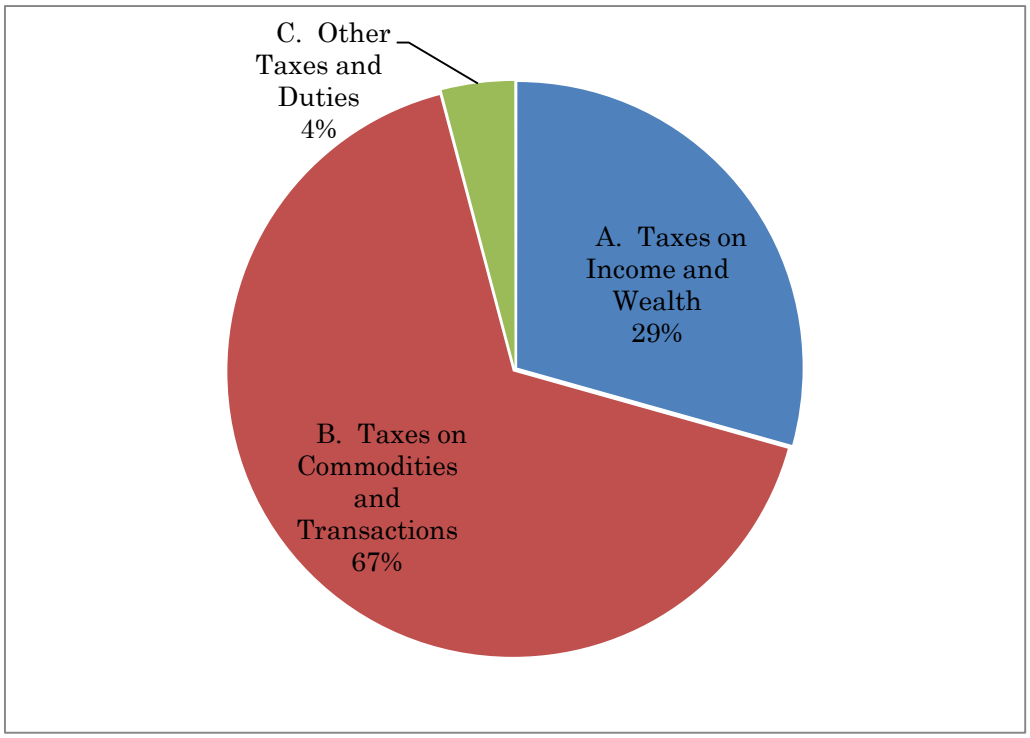


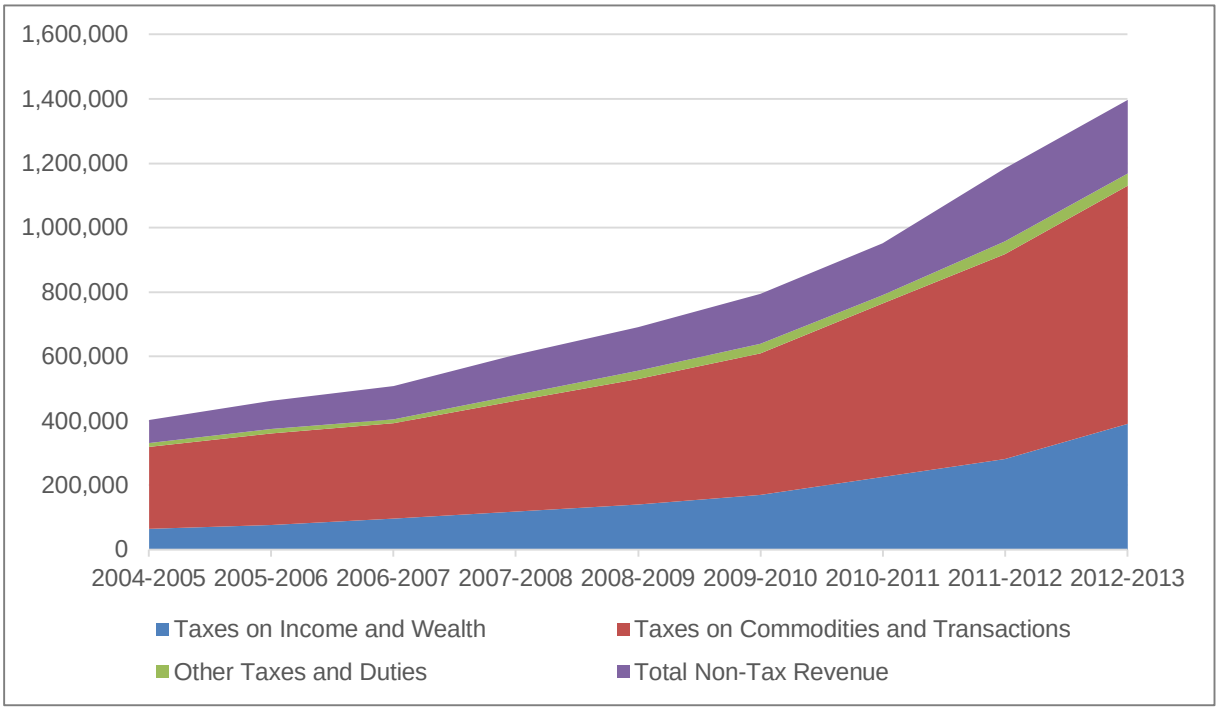

**Figure 7.9 Breakdown of the National Revenue Component (2011-2012)**

**Table 7.5 Recent Trend of the Government Revenue Budget**

Million BDT

| Heads | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 | 2009-2010 | 2010-2011 | 2011-2012 | 2012-2013 | AAGR 2004-2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Total Tax Revenue | 319,500 | 361,750 | 392,470 | 480,120 | 555,256 | 639,660 | 790,524 | 957,850 | 1,163,242 | 17.53% |
| A. Taxes on Income and Wealth | 64,430 | 76,750 | 96,389 | 118,375 | 139,466 | 169,521 | 226,304 | 281,307 | 390,970 | 25.28% |
| B. Taxes on Commodities and Transactions | 255,070 | 285,000 | 296,081 | 344,990 | 391,420 | 440,760 | 539,310 | 637,130 | 739,112 | 14.22% |
| C. Other Taxes and Duties | 11,520 | 13,100 | 12,581 | 16,755 | 24,370 | 29,279 | 24,910 | 39,413 | 38,160 | 16.15% |
| 2. Total Non-Tax Revenue | 72,500 | 86,930 | 102,250 | 125,270 | 136,544 | 155,280 | 161,353 | 226,000 | 228,460 | 15.43% |
| Total Revenue Receipts | 392,000 | 448,680 | 494,720 | 605,390 | 691,800 | 794,840 | 951,877 | 1,183,850 | 1,396,702 | 17.21% |
| GDP | 3,707,070 | 4,157,279 | 4,724,769 | 5,458,224 | 6,147,952 | 6,943,243 | 7,967,040 | 9,147,842 | 11,412,612 | 15.09% |
| % to GDP | 10.6% | 10.8% | 10.5% | 11.1% | 11.3% | 11.4% | 11.9% | 12.9% | 12.24% | |

Source: Statistical Yearbook of Bangladesh-2013




Source: Statistical Yearbook of Bangladesh-2013

**Figure 7.10 Breakdown of the National Revenue Component**

(3) Current Status of Development Budget

Public sector plays crucial role of making economic growth to increase public expenditures in infrastructure as well as health and human resource development which has direct impact on poverty reduction. It is found the Table 7.6 and Figure 7.11 that the transport sector is one of the major recipients of public sector allocations. Though the development expenditure in FY 2010-2012 was BDT 38,471 million in the transport, but it is increased in BDT 52,642 million in the FY2011-2012 because of some mega projects such as Padma Bridge and railway sector investment. It could be assumed that the expenditure will grow more for the future mega projects such as construction metro rail in Dhaka city, Eastern Bangladesh Bridge Improvement and railway investment.

**Table 7.6 Development Expenditure by each Sector**

Million BDT

| Heads | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 | 2009-2010 | 2010-2011 | 2011-2012 | 2012-2013 |
|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 5,883 | 6,117 | 5,679 | 5,863 | 12,352 | 16,389 | 20,934 | 19,800 | 26,962 |
| Industry | 4,812 | 5,004 | 4,579 | 4,725 | 4,125 | 4,428 | 3,518 | 4,471 | 17,137 |
| Flood Control & Water Resources | 9,050 | 9,410 | 8,898 | 9,184 | 8,057 | 10,768 | 11,553 | 12,800 | 15,934 |
| Rural Institution | 24,478 | 25,454 | 23,445 | 24,198 | 32,765 | 36,267 | 44,734 | 42,730 | 67,714 |
| Power & Natural Resources | 38,934 | 40,485 | 37,265 | 38,465 | 25,096 | 33,352 | 69,028 | 67,548 | 104,978 |
| **Transport** | **30,754** | **21,980** | **29,462** | **30,409** | **19,970** | **35,265** | **38,471** | **52,642** | 82,081 |
| Communication | 10,748 | 11,177 | 10,225 | 10,554 | 1,840 | 3,808 | 2,618 | 7,454 | 6,861 |
| Education & Training | 20,283 | 21,092 | 19,258 | 19,879 | 32,206 | 41,548 | 48,792 | 52,130 | 65,345 |
| Health | 13,418 | 13,946 | 12,718 | 13,128 | 21,107 | 27,110 | 28,652 | 30,270 | 35,088 |
| Population Control & Family Planning | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Physical Planning & Housing | 22,932 | 23,845 | 22,022 | 22,737 | 30,594 | 38,743 | 43,204 | 50,930 | 58,440 |
| Others | 5,968 | 6,210 | 5,729 | 5,918 | 8,888 | 11,492 | 17,046 | 7,719 | 19,823 |
| % of Transport to Total | | | | | | | | | |
| Total | 187,260 | 184,720 | 179,280 | 185,060 | 197,000 | 259,170 | 328,550 | 348,494 | 500,363 |

Source: Statistical Yearbook of Bangladesh-2013

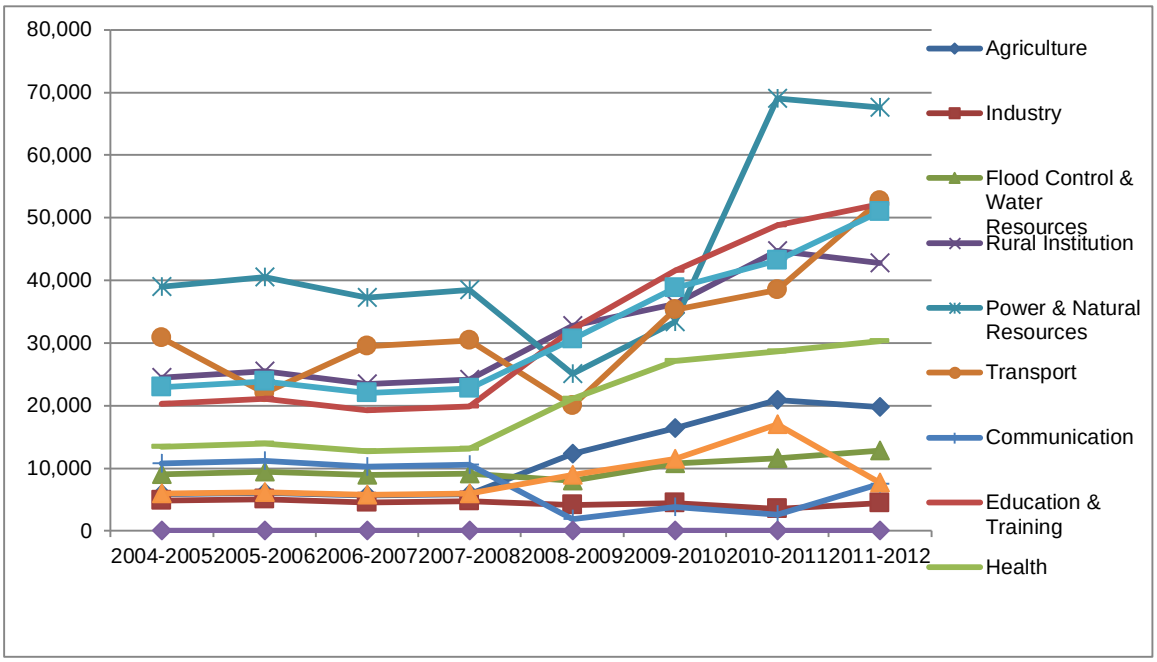



**Figure 7.11 Development Expenditure by each Sector**

## 7.3 Local and Urban Authorities

This section provides an overview of current institutional framework for local and urban development authorities, authorities for urban services, local administrative structures, financial management of local authorities and authorities for management of Dhaka Metropolitan areas.

(1) Local Administrative Structure

Local governments are the basic administrative and political units in Bangladesh. Two types of local government institutions exist in Bangladesh which are the urban local government and rural local government. The urban local governments are divided into two types. In the divisional town level, the City Corporation functions whereas

Pourashava (Municipality) functions in other towns. At the local level, Pourashava is the basic planning and development authority. Through the Pourashava Bill 2009, the Pourashava authorities were empowered to prepare Master Plan, implement development schemes and exercise building control. A Pourashava consists of a Mayor, Councilors whose number is fixed by the government and women Councilors of reserved seats. The Mayor and Councilors of a Pourashava are elected by direct election on the basis of adult franchise. The Pourashava (Municipal) Act, 2009 has given the Pourashavas wide responsibilities, but the administrative, financial and technical capabilities of the Pourashava are not adequate to meet the challenges associated with rapid urbanization in the country.

A City Corporation has seven departments including the secretariat, but Dhaka City Corporation has 16 departments. The departments in all City Corporations except for Dhaka City Corporation are Secretariat, Engineering, Health, Education, Revenue, Conservancy and Accounts. In contrast, the departments in Dhaka City Corporation are Secretariat, Accounts, Chief Executive Officers (CEO) office, Conservancy, Engineering, Establishment, State, Health, Information Technology, Internal Audit, Law, Public Relation, Revenue, Slum Development, Social Welfare, Transport and Urban Planning.

A Union Parishad is the lowest rural Local Government Institutions in Bangladesh. The Local Government (Union Parishad) Act 2010 provides the legal framework for the Unions Parishad. Section 47 of the Union Parishads Act provides the overall functions of Union Parishad namely: (a) administration and establishment issues; (b) maintaining law and order; (c) services for public welfare; and (d) planning and implementing local economic and social development.

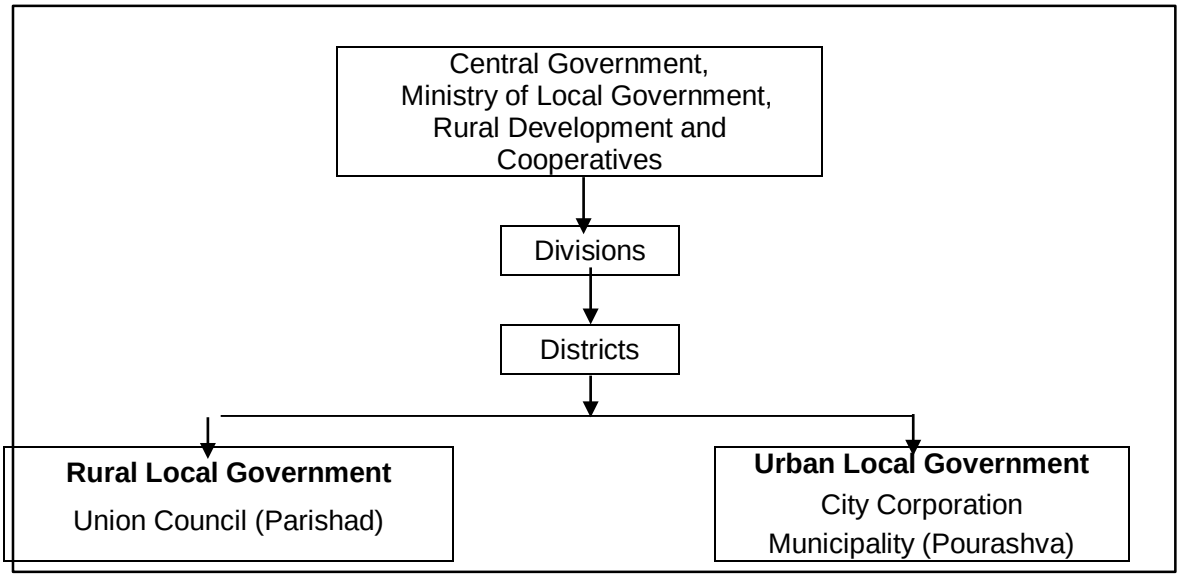



**Figure 7.12 Local Administrative Structure**

**Special Purpose Authorities**: There are also some special purpose agencies that provide special services to the city dwellers. These are Water Supply and Sewerage Authority, Electricity Supply Authority, Road Transport Authority, etc. These are water and sewerage authorities i.e. DWASA and CWASA which are working in two metropolitan cities of Dhaka and Chittagong respectively. The other agencies involved in the development activities of Dhaka Metropolitan Area, e.g. Dhaka Transport Coordination Authority (DTCA) which is mainly responsible for planning and development of transportation facilities within the metropolitan. DTCA is under the Ministry of Road Transport and Bridges.

**Other Development Authorities:** Pourashava were originally created for planning and management of urban areas. Later on separate planning and development organizations were created for the cities of Dhaka (RAJUK), Chittagong (CDA), Khulna (KDA) and Rajshahi (RDA) which are under the Ministry of Housing and Public Works. The development authorities in these cities are authorized to undertake local urban planning as well as infrastructure and site development activities for housing, commercial and industrial use. The authorities are also empowered to exert development control functions. The effectiveness of these authorities, however, is generally limited by such factors as inadequate management and financial system, multiplicity of institutions with urban development function within their jurisdictions, uncoordinated development, lack of integration with other agencies, inadequate manpower, and lack of public participation.

(2) Local Government Financial System

Municipal councils (in cities and municipalities) and union councils are legislative bodies corresponding to Parliament at the central level. Elected Mayors or Chairman head them. Each Municipal Council and the Ministry of Local Government nominate and appoint an Executive Committee for day-to-day administration. The Executive Committee is headed by a Chief Executive Officer (CEO) and is accountable to the Council. Below the Executive Committee there are departments, divided functionally. The Union Council organization is very simple, which a Secretary, an Assessor, and a Tax Collector, headed by an elected Chairman.

Each city corporation is governed by its own ordinance, while all municipalities are under the Pourashava Ordinance and union councils are under the Local Government Ordinance. These laws impose a similar framework for budget preparation. Budgets have to be submitted to the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C) for approval. Accounts of receipts and expenditure are to be kept in the prescribed manner and form, and an Annual Statement of Accounts is to be prepared and sent to the Government by 31 December. All Local Government Institutions (LGIs) are subject to audit by the C&AG. He sends his report to the Government, and a copy to the LGI which “shall forthwith remedy any defects or irregularities and report to the Government the action taken by it”.

As in central government, the budget is divided into a Revenue budget and a Development budget. The budget timetable, procedure and forms are set by the MLGRD&C. LGIs are legally required to balance their budgets. Revenue budgets go through Budget/Accounts Section, the CEO, the Council and the MLGRD&C. Development budgets start with proposal for projects in each ward. The Chairman/Mayor forwards proposals to Engineering Section for feasibility study and cost estimation. Project estimates are consolidated into the Development budget, which follows the same path of approvals as the Revenue budget.

(3) Current Status of Agencies Involved and Local Finance in Dhaka Metropolitan Administration

There are many organizations involved in the development process and providing services to the Dhaka Metropolitan areas. Apart from local authorities, the national authorities are providing different services to the Dhaka areas which are Urban Development Department (UDD), National Housing Authority (NHA) and Public Works Department (PWD) under Ministry of Housing and Public Works (MOHPW), the Department of Public Health Engineering (DPHE) and Local Government Engineering Department (LGED) under Ministry of Local Government, Rural Development and Cooperatives (LGRD&C), Department of Environment (DOE) under Ministry of Environment and Forest (MOEF), Roads and Highways Department (RHD) and Bangladesh Road Transport Authority (BRTA), Bangladesh Road Transport Corporation

(BRTC) and Bangladesh Bridge Authority (BBA) under Ministry of Road Transport and Bridges. There are also special purpose agencies that provide special services to Dhaka City dwellers which are Dhaka Water Supply and Sewerage Authority (DWASA) under LGRD&C, Dhaka Electric Supply Company Limited (DESA) and Dhaka Power Distribution Company Limited (DPDC) under Ministry of Power, Energy and Mineral Resources (MOPEMR).

Moreover, there are three local level agencies are directly involved for the development of Dhaka Metropolitan areas and its services. One of them, Rajdhani Unnayan Kartipakha (RAJUK) is authorized to undertake local urban planning as well as infrastructure and site development activities for housing, commercial and industrial use. The authority is also empowered to exert development control functions. Dhaka Transport Coordination Authority (DTCA) under Ministry of Road Transport and Bridges is involved mainly for planning and development of transportation facilities. Moreover, Dhaka City Corporations (DCCs) is responsible for overall maintenance of public assets and day-to-day services for the city.

Drastic changes in the physical, economic and social structure in the Dhaka areas resulting from rapid urbanization has been posing serious challenges for sustainable urban development. Dhaka city is now afflicted with innumerable problems ranging from law and order situation to deteriorating environmental conditions. Poor city management and low efficiency are exacerbating the problems. The quantity of solid waste generated at present varies between 3000 to 3500 tons per day. DCC is capable of collecting only 50% of this waste, leaving the remaining half unattended. A part of this waste either remains in the streets or on nearly open ground. Some of the waste flows to the open drains and blocks the normal drainage flow. As a result, water logging sometimes disrupts the normal city life for days during monsoon. The serious health hazard posed by this situation is of major concern. The situation with respect to water supply is also quite unsatisfactory. The Dhaka Water and Sewerage Authority (DWASA) is capable only in an average of 80% of water supply. Only a limited segment of the population is enjoying adequate supply of water while for the rest of the population the water supply is quite inadequate.

Dhaka city traffic has reached nightmare proportions, often causing huge delays in covering small distances with associated productivity losses. Extreme traffic congestion on urban roads is a major challenge for big as well as intermediate urban centers in Bangladesh. Rapid urbanization in Bangladesh during the last few decades increased transport demand quite significantly leading to manifold increase in the number of motorized and non-motorized vehicles on the streets. The increase in the number of vehicles without concomitant expansion of road facilities has led to severe congestion on roads and deterioration in urban environment. The situation further deteriorated due to insufficient public transport facilities and weak management of traffic. Non-existence of transport planning and inefficient traffic engineering result in low quality traffic management. Moreover buses are in short supply and there is no metro rail (presently study for detail design) system to handle day-to-day commuter traffic in the city.

The followings show the local fiancé in Dhaka Metropolitan area.

**Table 7.7 Dhaka City Corporation (DCC) Revenue Receipts**

Million BDT

| Heads | 2005-2006 | 2009-2010 | 2010-2011 |
|---|---|---|---|
| Revenue Receipts | | | |
| Tax Revenue & other charges | 2101.9 | 3474.0 | 4481.5 |
| Yearend balance | 1015.9 | 1460.5 | 1388.0 |
| Other Receipts | | | |
| Government Grants & others | 765.0 | 338.8 | 407.5 |
| Foreign aided projects & others | 2477.7 | 2971.8 | 6610.0 |
| Total | 7376.4 | 9705.6 | 14350.0 |

Source: Budget, Dhaka City Corporation
Note: Presently, Dhaka City Corporation bifurcated into (a) Dhaka North City Corporation and (b) Dhaka South City Corporation since 2011-2012 Financial Year.

**Table 7.8 Dhaka City Corporation (DCC) Expenditure**

Million BDT

| Heads | 2005-2006 | 2009-2010 | 2010-2011 |
|---|---|---|---|
| Non-Development Expenditures | | | |
| Revenue Expenditure | 2080.7 | 3064.5 | 3470.0 |
| Other Expenditure | 240.0 | 212.5 | 190.0 |
| Sub-total | 2320.7 | 3277.0 | 3660.0 |
| Development Expenditure | | | |
| GOB Fund | 2458.0 | 2906.8 | 3480.0 |
| Foreign aided projects & others | 2477.7 | 2971.8 | 6610.0 |
| Sub-total | 5025.7 | 5878.6 | 1009.0.0 |
| Total | 7346.4 | 9155.6 | 13750.0 |

Source: Budget, Dhaka City Corporation
Note: Presently, Dhaka City Corporation bifurcated into (a) Dhaka North City Corporation and (b) Dhaka South City Corporation since 2011-2012 Financial Year.

It is found from the above revenue receipts and development budget for the mega city like Dhaka, a major constraint is the lack of adequate funding as well as domestic resource mobilization. It could be assumed that the domestic resource mobilization is the prime issues for Dhaka city, though even with best city governance unless new sources of funding are found it will be difficult to meet the demand and development needs of the urban sector. Presently, much of the financing comes from the Government's own budget; property taxes and user charges for urban services are very limited. So, Dhaka city needs to emphasize resource mobilization through much better implementation of the property tax and stronger cost recovery of key urban services. Therefore, there will need policies include steps to improve land and property valuation, better tax collection through improvements in property tax administration, and setting prices for urban services with due regards to cost.

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## 7.4 State-Owned Enterprises (SOEs)

(1) Outline of SOEs

State-Owned Enterprises (SOEs) are governed according to their respective status. Legally they are autonomous bodies, but the respective ministries appoint their boards of directors and in practice SOEs are highly regulated by their ministries. All personnel, investment, borrowing, dividend, pricing and major procurement decisions have to be cleared with the ministry. The Ministry of Finance (Monitoring Cell) approves budget.

SOEs are quasi-fiscal entities, legally separate from the Government. However, they have a number of fiscal effects. They receive equity injections, loans and subsidies from the Government; they repay loans, and pay interest, taxes and dividends. There are also major effects on macroeconomic balances that are off the budget. Supplier credit is guaranteed by the Bangladesh Bank on a counter guarantee by the Ministry of Finance. Where a corporation cannot meet its debt service liability, it borrows further from the commercial banks. Since 1995, all offers of supplier credit have to be cleared by a committee including the Finance Secretary, Planning Secretary and Bangladesh Bank Governor.

SOEs have very limited operational autonomy, although they carry out commercial activities. In practice, they are suffering from considerable bureaucratic and political interference. Most have excessive staff but lack adequate professionally trained staffs with technical and managerial skills. SOEs' weak economic performance is due to several factors in particular; (i) weak governance and accountability, leading to considerable investment misallocations, operational inefficiencies, over employment and inadequate revenue collection, (ii) inappropriate administered prices, many SOE products have been priced significantly above world market or competitive price level, (iii) insufficient disengagement of the public sector in commercial activities. SOEs remain a drain on public resources

**Departmental Enterprises e.g. Bangladesh Railway (BR):** As Bangladesh Railway is an enterprise; earning revenues that are relate to their expenditures, they produce commercial accounts on an accrual basis. However, as they have remained as government departments, consolidation of their accounts with the rest of the government requires parallel cash accounts or conversion of their accrual accounts back onto a cash basis. The budget of the Bangladesh Railway has been part of the Government budget since 1985. It has been making large losses.

(2) National Budget for SOEs

SOEs are subject to a similar planning and budgeting framework to central Government ministries. Each corporation prepares its estimates in January, together with its revised estimates for the current year. All projects have to be approved by the Planning Commission and included in the Annual Development Plan (ADP). Projects that a SOE is proposing to finance itself are also included in the ADP, but only after the Monitoring Cell (Ministry of Finance) has certified to the Planning Commission that the SOE will have the necessary funds after paying its liabilities (debt service liability, customs, etc.). The Revenue and Development budgets are submitted through the respective administrative ministries to the Monitoring Cell, which scrutinizes revenue budgets, ensures that they allow for operating and maintenance expenditures arising in projects taken over by the Government, negotiates targets and gives final approval during the March/May period. However, total expenditures, has been increasing in every financial year on account of increased subsidy and transfers to the SOEs sector.

(3) Key Issues on SOEs' Financial Management

Public sector of Bangladesh, however, extends far beyond the central government, comprising a large State-Owned Enterprise (SOE) sector and a dominant public financial sector. SOEs that operate in traditional utilities, infrastructure and the manufacturing sector account for more than 20 percent of public sector employment. In addition to being a drain on public resources through a range of subsidies and contingent liabilities, they also exert considerable influence on the economy through the supply of vital inputs and services and their pricing policies.

Appointments of board members and chief executive are the most important decisions affecting public enterprise performance. The present quality of directors and top executives is very mixed. These personnel should appoint strictly on their qualifications, experience and track record in business. The procedure in India is for the Minister to make each appointment from a short list of candidates prepared from a central database of qualified personnel. This may be considered for adoption in Bangladesh.

**Table 7.9 Net Profit/Loss of selected State-Owned Enterprises**

Unit: Million BDT

| Name Enterprises | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-013 |
|---|---|---|---|---|---|---|---|---|---|
| Bangladesh Inland Water Transport Corporation (BIWTC) | 265.0 | 271.3 | 277.1 | 284.3 | 261.8 | 282.7 | 226.5 | 139.2 | 471.4 |
| Bangladesh Inland Water Transport Authority (BIWTA) | (190.1) | (173.1) | (206.3) | (135.9) | 44.7 | (76.1) | (15.7) | 144.4 | 196.9 |
| Bangladesh Road Transport Corporation (BRTC) | (353.1) | (389.2) | (359.2) | (373.3) | (308.6) | (246.0) | (620.6) | (746.6) | (542.8) |
| Bangladesh Bridge Authority (BBA) | 1432.8 | 1620.0 | 1553.1 | 1849.7 | 1835.3 | 978.6 | 1165.1 | 684.0 | (181.2) |
| Dhaka WASA | 39.1 | 284.2 | 63.5 | 127.5 | 14.7 | 95.0 | 85.3 | 203.0 | 98.2 |
| Bangladesh Power Development Board (BPDC) | (6,183.0) | (9,380.9) | (9,040.9) | (9,932.4) | (8,286.1) | (7,357.6) | (45,870.1) | (63,598.6) | (50261.1) |
| RAJUK | 488.7 | 549.7 | 706.0 | 561.9 | 832.8 | 2,020.5 | 1,341.6 | 1,568.8 | 1528.1 |
| Total of Bangladesh | (26,816.1) | (35,735.3) | (22,758.9) | (9,9828.5) | (32,828.8) | (27,765.5) | (9,1914.7) | (94,148.0) | (26260.5) |

Source: Bangladesh Economic Review (2014)

## 7.5 Government Budget for Transport Sector Development

(1) Public Investment in the Transport Sector

Public sector involvement in the transport sector of Bangladesh consists of ownership and operation of nine state-owned enterprises (SOEs). Except for the two sea ports, the SOEs have poor financial performance. The poor financial performance of the SOEs and their weak capital structure created a huge financial liability on the government. However, the situation has been improving in recent years. To address the problem, the government has been pursuing the two-pronged policy of privatization and restructuring of public sector transport SOEs for achieving improved administrative, management and operational performances.

The government recognizes the importance of substantially upgrading the transport infrastructure while also improving transport services. In recognition of this, it has been giving priority to transport in budget allocations, improving the performance of public

transport entities through policy and institutional reforms, and encouraging the private sector in both building infrastructure through PPP and in providing transport services.

**Table 7.10 Transport Sector Investment in Sixth Five Year Plan**

| Financial Year | Plan Investment (Million BDT) |
|---|---|
| 2010-2011 | 53,700.0 |
| 2011-2012 | 71,530.0 |
| 2012-2013 | 81,470.0 |
| 2013-2014 | 96,700.0 |
| 2014-2015 | 111,720.0 |
| % of total allocation | 15.7 |

(2) Roads and Highways

The Roads and Highways Department (RHD) is a major public sector agency directly responsible for planning, design, construction, improvement and maintenance of primary and secondary road network in the country, which include National and Regional Highways and Zila Roads. RHD is also responsible for the operation, and maintenance of a ferry system in the country. However, gradual replacement of ferry system with bridges is a broad dimension of RHD. The Government is fully aware about the importance and role of road and road transport. As such, it has been making substantial investments in building physical infrastructure including road network because of its paramount need as a pre-requisite for socio-economic development of the country. Table 7.11 shows the Government budget and donor agencies involvement to improve the RHD's road networks.

**Table 7.11 RHD Allocation and Expenditure during FY 2004-05 to FY 2013-14**

Crore BDT

| Financial Year | Allocation | | | Expenditure | | | Annual expenditure in overall percent |
|---|---|---|---|---|---|---|---|
| | Development Budget | Revenue Budget (Maintenance) | Total | Development Budget | Revenue Budget (Maintenance) | Total | |
| 2004-05 | 2361.31 (PA 657.09) | 866.86 | 3228.17 (PA 657.09) | 2206.00 (PA 586.02) | 866.86 | 3072.86 (PA 586.02) | 95.19% |
| 2005-06 | 1989.87 (PA 558.47) | 861.55 | 2851.42 (PA 558.47) | 1801.36 (PA 468.16) | 822.81 | 2624.17 (PA 468.16) | 92.03% |
| 2006-07 | 2245.44 (PA 659.80) | 437.98 | 2683.42 (PA 659.80) | 1745.32 (PA 468.47) | 437.22 | 2182.54 (PA 468.47) | 81.33% |
| 2007-08 | 1852.29 (PA 423.86) | 627.37 | 2479.66 (PA 423.86) | 1526.83 (PA 293.25) | 627.37 | 2149.95 (PA 293.25) | 86.70% |
| 2008-09 | 1399.28 (PA 543.65) | 717.51 | 2116.79 (PA543.65) | 1213.13 (PA 409.52) | 530.10 | 1743.23 (PA 409.52) | 82.35% |
| 2009-10 | 2308.21 (PA 597.87) | 610.00 | 2918.21 (PA597.87) | 1966.57 (PA 430.75) | 606.52 | 2573.09 (PA 430.75) | 88.17% |
| 2010-11 | 2063.61 (PA 492.36) | 667.80 | 2731.41 (PA 492.36) | 1842.59 (PA 303.72) | 658.97 | 2501.56 (PA 303.72) | 91.58% |
| 2011-12 | 2440.51 (PA 359.79) | 704.90 | 3145.41 (PA 359.79) | 2317.14 (PA 248.60) | 701.78 | 3018.92 (PA 303.72) | 95.98% |
| 2012-13 | 3382.87 (PA 363.86) | 1135.61 | 4518.48 (PA 363.86) | 3370.03 (PA 353.72) | 1135.61 | 4505.64 (PA 353.72) | 99.72% |
| 2013-14 | 3465.04 (PA 473.66) | 1239.64 | 4704.68 (PA 473.66) | 3454.06 (PA 465.16) | 1237.68 | 4691.74 (PA 465.16) | 99.72% |

Source: Planning Cell, Roads and Highways Department (RHD)
PA=Project Aid

(3) Railways

Historically the railway enjoyed a monopoly as a carrier and used to carry most of the principal commodities in the country such as cement, coal, fertilizer, raw jute, stone, food grain, sugar cane etc. With gradual emergence of road transport, railway started losing its modal share and overtime it declined to 4% in the recent years. Presently, BR is a SOE losing agency. However, Bangladesh Railway (BR) has planned to undertake many projects about 149 within next 10 years. With the implementation of the on-going as well as new projects BR will be able to regain its market share and be self-sustainable and create other business opportunities. Tables 7.12 and 7.13 show the operating expenses and operating income of Bangladesh Railway.

**Table 7.12 Operating Expenses of Bangladesh Railway**

Million BDT

| Heads | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 |
|---|---|---|---|---|---|---|---|---|---|
| General Administration | 1129.5 | 2645.5 | 1385.6 | 1370.6 | 1514.4 | 1725.4 | 2345.3 | 1990.3 | 1997.3 |
| Repairs and Maintenance | 2451.1 | 2718.2 | 3152.5 | 3995.5 | 3976.2 | 4339.5 | 4529.2 | 4827.5 | 4896.3 |
| Operating Staff | 1034.0 | 617.0 | 978.3 | 604.3 | 713.5 | 809.3 | 832.4 | 767.5 | 702.9 |
| Operating Fuel | 920.7 | 1208.0 | 1609.3 | 1870.2 | 2214.3 | 2058.0 | 2104.0 | 2561.0 | 2979.4 |
| Operating other than Staff & Fuel | 462.6 | 962.2 | 554.3 | 1084.5 | 1025.4 | 988.8 | 1272.8 | 1265.5 | 1208.4 |
| Miscellaneous | 942.8 | 1450.4 | 1651.2 | 1960.0 | 2283.4 | 2650.8 | 3834.2 | 4259.1 | 3939.2 |
| Total | 6950.8 | 9601.7 | 9331.2 | 10885.4 | 11727.4 | 12572.0 | 14918.1 | 15671.1 | 15623.8 |

Source: Information Book, Bangladesh Railway, 2013

**Table 7.13 Net Operating Income**

Million BDT

| Heads | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 |
|---|---|---|---|---|---|---|---|---|---|
| Public Service Obligation Compensation | 860.0 | 860.0 | 860.0 | 860.0 | 860.0 | 860.0 | 860.0 | 860.0 | 860.0 |
| Welfare Gain | 133.2 | 210.1 | 164.8 | 266.1 | 265.7 | 208.5 | 315.2 | 369.9 | 390.6 |
| Total Operating Revenue | 5449.4 | 5512.8 | 5552.4 | 6742.5 | 7379.2 | 6731.6 | 7470.7 | 7264.2 | 9293.3 |
| Total Operating Expenses | 6950.8 | 9601.7 | 9331.2 | 10885.4 | 11727.4 | 12572. | 14918.1 | 15671.1 | 15623.8 |
| Net Operating Income | (1501.4) | (4088.8) | (3778.8) | (4142.9) | (4348.2) | (5840.4) | (7447.4) | (8406.9) | (-) 6330.4 |

Source: Information Book, Bangladesh Railway, 2013

(4) Rural Roads

Local Government Engineering Department (LGED) is major public sector agency directly responsible for design, construction, improvement and maintenance of Upazila, Union and Village roads along with other activities. The other activities of LGED are: (a) rural development and institution; (b) physical planning, water supply and housing; and (c) agriculture. The LGED made significant contribution towards rapid expansion of the rural transport network resulting in rapid growth of transportation services. The following table shows the expenditure during the FY 2009-10 to 2012-2013.

**Table 7.14 Expenditure during FY 2009-10 to 2012-2013 under LGED**

Million BDT

| Financial Year | Sector | GOB | Project Aid | Total |
|---|---|---|---|---|
| 2009-2010 | Rural Development & Institution | 18,840 | 10399 | 29240 |
| | Physical Planning, Water Supply and Housing | 2,284 | 4686 | 6970 |
| | Agriculture | 296 | 437 | 734 |
| | Transport | 14,21 | 0 | 1421 |
| | **Total** | **22842** | **15524** | **38366** |
| 2010-2011 | Rural Development & Institution | 21817 | 9233 | 31050 |
| | Physical Planning, Water Supply and Housing | 1513 | 2713 | 4227 |
| | Agriculture | 402 | 429 | 831 |
| | Transport | 2424 | 0 | 2424 |
| | **Total** | **26158** | **12376** | **38534** |
| 2011-2012 | Rural Development & Institution | 24395 | 8254 | 32649 |
| | Physical Planning, Water Supply and Housing | 2381 | 3757 | 6139 |
| | Agriculture | 202 | 896 | 1098 |
| | Transport | 2241 | 0 | 2241 |
| | **Total** | **29220** | **12908** | **42129** |
| 2012-2013 | Rural Development & Institution | 35028 | 10638 | 45666 |
| | Physical Planning, Water Supply and Housing | 2987 | 4385 | 7370 |
| | Agriculture | 363 | 1290 | 1653 |
| | Transport | 2008 | 0 | 2008 |
| | **Total** | **40387** | **16312** | **56699** |

Source :Project Monitoring and Evaluation Unit, LGED, 2014

## 7.6 Financial Resources

The financial resources for development expenditure consist of domestic resources and foreign assistance. As shown about 64% of development expenditure is the domestic assistance which is increasing yearly. Presently, the share of project assistance is 31% and non-project assistance only 4% which is combined as foreign assistance. The Figure 7.12 and Table 7.15 show the financial resources and historical trend of financing for development expenditures.

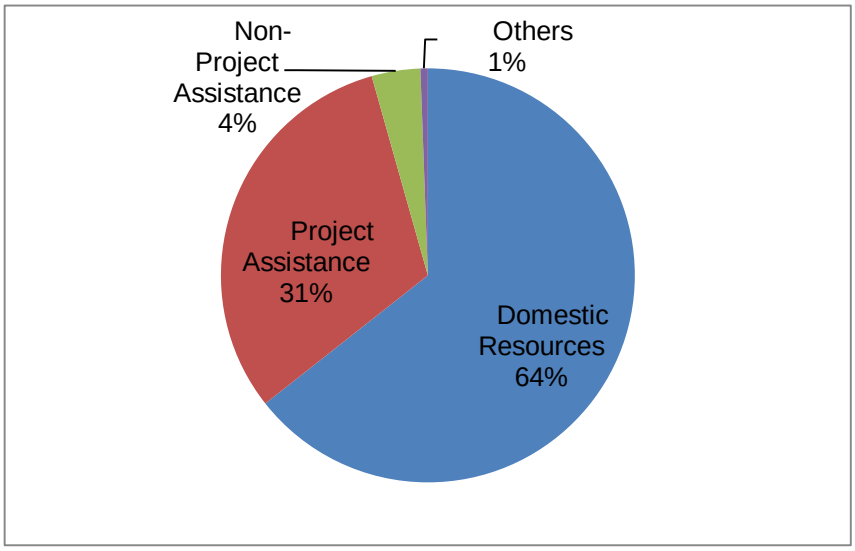



**Figure 7.12 Share of financial Resource**

**Table 7.15 Historical Trend of Financing for Development Expenditures**

| Heads | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 | AAGR 2004-13 |
|---|---|---|---|---|---|---|---|---|---|---|
| Development Expenditure | 205,000 | 215,000 | 216,000 | 225,000 | 290,000 | 285,000 | 358,800 | 456,510 | 601,370 | 14.40% |
| Domestic Resources | 152,110 | 182,030 | 174,390 | 167,100 | 165,150 | 280,960 | 429,010 | 426,900 | 736,580 | 21.80% |
| Foreign Assistance | 115,410 | 114,320 | 111,960 | 174,120 | 151,440 | 182,340 | 151,440 | 236,230 | 264,420 | 10.92% |
| Project Assistance | 66,200 | 74,750 | 85,290 | 94,990 | 111,900 | 124,800 | 134,300 | 207,200 | 239,730 | 17.45% |
| Non-Project Assistance | 45,570 | 35,170 | 22,730 | 72,800 | 35,400 | 55,320 | 13,500 | 25,200 | 20,600 | -9.45% |
| Others | 3,640 | 4,400 | 3,940 | 6,330 | 4,140 | 2,220 | 3,640 | 3,830 | 4,190 | 1.77% |
| Total Resources | 267,520 | 296,350 | 286,350 | 341,220 | 316,590 | 463,300 | 580,450 | 738,930 | 1,001,000 | 17.93% |
| Balance | (-)62,520 | (-)81,350 | (-) 70,350 | (-)116,220 | (-)26,590 | (-)178,300 | (-)221,650 | (-)221,650 | (-)399,630 | |

Source: Statistical Yearbook of Bangladesh-2013

## 7.7 Private Sector Participation

(1) National Policy and Current Status of PPP in Bangladesh

The Government of Bangladesh has adopted the Bangladesh Private Sector Infrastructure Guidelines (PSIG) on October 2004 by a notification of the Cabinet Division. PSIG establishes procedures to identify, procure and implement Private Infrastructure Projects and establishes institutional arrangements to monitor and expedite implementation of these projects at national level. For promotion and efficient processing of Private Infrastructure Projects in Bangladesh, a national Private Infrastructure Committee (PICOM) was also set up under the Prime Minister's Office on October 2005 headed by the Principal Secretary of the Government.

In addition, the Finance Division of the Ministry of Finance published the "Invigorating Investment Initiative through Public Private Partnership" in 2009 and based on the position paper the "Policy and Strategy Paper for PPP" was announced in 2010 which decided to establish a PPP Office under the Prime Minister's Office and a PPP unit under the Finance Division. The process of PPP project implementation was clarified in the paper and in accordance with the framework, 42 projects are listed as of 2015 June.

However, the private sector involvement in transport infrastructure has been very limited so far, although there is great potential for the same, particularly in major highways. On those highways, where traffic and potential toll income are high, the private sector could be invited to invest on Build –Operate- Transfer (BOT) basis. In such cases, Government may have to assume the role of acquiring land, and possibly fund part of the equity. In these cases, concession periods could be of the order of 25 to 30 years, with provision for three yearly tariff reviews. However, where traffic levels do not warrant BOT involvement, the Government could consider the annuity concept where the private sector could invest in improving a highway on an existing right of way (ROW), and recoup its investment from annual Government payments.

(2) PPP Projects in Transport Sector

Development and maintenance of the transport infrastructure in the country is essentially the responsibility of the public sector. However, in view of resource constraints, Bangladesh needs an active involvement of the private sector to enhance access to capital as well as to bring in efficiencies in service operation. Currently the involvement of the private sector is limited mainly to providing services in some of the sub-sectors such as road, inland water and shipping. They have also very limited participation in civil aviation and rail services. Absence of regulatory institutions, an appropriate legal framework, inadequacy of capable and educated transport providers, and bureaucratic procedures and practices are some of the factors that inhibit private sector involvement. The following Table 7.16 shows the PPP Projects and their status in below.

**Table 7.16 PPP Project in Transport Sector**

| Transport Organizations | Project Name | Estimated Costs USD in million | Status |
|---|---|---|---|
| RHD | Dhaka-Chittagong Expressway | 9121.0 | Solicited Project |
| RHD | Upgrading of Joydevpur-Debogram-Bhulta-Madanpur Road into 4 lane | 140.0 | Solicited Project |
| RHD | Upgrading of Hemayetpur-Singair-Manikganj Road into 4 lane | 84.0 | Solicited Project |
| RHD | Upgrading of Jatrabari-Sultana Kamal Bridge-Tarabo Road into 4 lane | 54.0 | Solicited Project |
| MPA | 2 Jetties at Mongla Port through PPP | 50.0 | Negotiation |
| BBA | Dhaka Elevated Expressway | 1,088 | Agreement signed with Concessionaire |
| DCC | Gulistan – Jatrabari Flyover | | Partially operating |

Note: Solicited Project means approved by the Government

# 8. REVIEW OF PREVIOUS AND ON-GOING TRANSPORT PLANS

## 8.1 Introduction

In Dhaka, there are several urban transport master plan. The Greater Dhaka Metropolitan Area Integrated Transportation Study (DITS), the 1st urban transport master plan was prepared in 1994 by an initiation of the Government of Bangladesh (GOP) with the assistance from UNDP.

And 2nd urban transport master plan is the Dhaka Urban Transport Project (DUTP). This project was one of the first World Bank projects aimed at easing the complex transport problems facing Bangladesh's capital. The World Bank's aim was to help the Government of Bangladesh develop, refine, and implement appropriate strategies for managing road traffic and services in Dhaka. It also aimed to assist in the preparation of an urban transport policy and a 20-year strategic transport plan for the Dhaka Metropolitan Area (DMA). The project closed on June 30, 2005. The DUTP included five (5) studies and projects, namely physical improvement projects in urban infrastructure, STP as long term transport strategic plan, and two (2) feasibility studies for Dhaka Eastern Bypass Project and Jatrabari Flyover Project.

In this chapter, recently-implemented urban transport master plan projects, STP and DHUTS are reviewed and important three on-going projects, MRT Line 6, BRT Line3 and Dhaka Elevated Expressway are reviewed also.

## 8.2 Strategic Transport Plan (STP)

(1) Overall

Strategic Transport Plan (STP) was prepared in 2004 by Dhaka Transport Coordination Board (DTCB) under the Ministry of Communication with assistance from the World Bank. The STP laid out a 20-year (long-term) transport plan for the greater Dhaka area and its transport strategy underscored a balance between public transport and private mode of transport and anticipated future demand forecast. The plan is divided into four periods, of 5 years each, beginning in 2005 and ending in 2024.

Urban development scenario in STP was selected "Growth Pole Scenario" with the concept of satellite sub-urban cores. These sub-urban cores would be build up with not only housing but also working space and connected with CBD by UMRTs.

(2) Proposed Projects

1) Strategic Road Networks Proposals

STP has suggested a number of important transport components, such as a number of strategic road links, some Expressway, the Mass Rapid Transit (MRT) System and a Circular Water-way for Dhaka. Many of the STP roads were derived from DMDP as indicated earlier. Besides those a number of new arterial roads were also recommended by STP. Table-2.3 contains a list of those roads, which are expected to serve Dhaka City. Many of the STP road links when fully completed will become major arterial road network of Dhaka and facilitate smooth traffic movement along east-west and north-south directions.

2) Mass Rapid Transit (BRT and MRT)

STP recommended 3 Bus Rapid Transit (BRT) lines and 3 Metro Rail (MRT) lines. Due to shorter lead-in time for design, financing and the construction, it was proposed that the BRT lines move ahead in the early years whilst the Metro system.

3) Elevated Expressways

STP recommended 3 - elevated expressways which are as follows:

a) Gulistan-Jatrabari Flyover: This project was developed and proposed by Dhaka City Corporation (DCC) to be implemented as a PPP project (BOT basis). It will be a 10 km. dual 2-3 lane expressway. The project work is currently in progress and assumed to be completed by mid-2013.

b) The Elevated Expressway: A 20 km elevated expressway proposed by Roads & Highways Department (RHD), was to be developed in 2-phases. Under Phase-I, Gulistan to Mohakhali portion of the flyover was proposed to be built and in Phase-II, from Mohakhali flyover to the north was proposed to be built. It would be dual 3-lane expressway.

c) Mogh Bazar-Mouchak Flyover: This is a project being developed by Local Government Engineering Department (LGED) with financing from the Kuwait Fund. STP suggested that this connection be provided at locations, somewhere in the area of Paribagh and Bangla Motors before plans are finalized for project.

4) Major Interchange Development Potential

With the development of new mass rapid system, the following intersecting nodes will become viable for major new commercial and residential developments.

- Airport Road / Kamal Attaturk - Intersection of Line 3, 4 & 5.
- Tejgaon - Intersection of Lines 4, 5 & 6.
- Saidabad Bus Terminal - Served by Lines 1, 2, 4 & 6.
- Proposed Projects by phase

(3) Project Phases

STP recommended phasing of the projects as follows:

1) Phase 1 (2005-2009)

- Design and construction of six road projects primarily to establish the east-west connection and the plan to join the city through the Dhaka by-pass. These 6 projects are: i) Zia Colony to Mirpur, ii) Panthapath to Rampura, iii) Tejgaon Airport Tunnel, iv) Merul Badda to Golakandail, v) Tongi to Ghorashal and vi) Malibag to Janapath.
- Planning, design, financing and preparatory work of three expressways in readiness for the implementation of Phase 1 and Phase 2.
- Planning, design and construction of an extensive Traffic Management system to re-capture lost capacity on major routes.
- Preliminary engineering on 12 road projects for inclusion in Phase 2.
- A comprehensive survey and inventory of the existing bus operations.
- Implementation of Traffic Management measure on major routes to incorporate the first BRT lines.
- Production of Design Guidelines for the mass rapid transit systems including both BRT and Metro systems.
- Implementing around 30 km of the BRT line. As suggested these lines are Line 1 from Uttara to Saidabad and Line 2 from Gabtoli to Saidabad.

2) Phase 2 (2010-2014)

- Design and construction of 12 road projects creating a major advance in the city's

infrastructure.

- Completion of three major elevated expressway projects following agreements on PPP arrangements and financing.
- Preliminary engineering on 16 road projects scheduled for Phase 3A.
- Continued development of the BRT network and opening of 16km Line 3.
- Final design and financing plans for the first Metro Line – No.5.
- Complete rationalization of regular bus services to complement the mass rapid transit system.

3) Phase 3A (2015-2019)

- Design and construction of 16 road projects aimed at opening up the eastern and western fringe areas.
- Preliminary engineering on 17 road projects scheduled for Phase 3B.
- Final design and financing plans for the second and third Metro Lines – No. 4 and 6.
- Completion of construction on Metro Line No. 5.

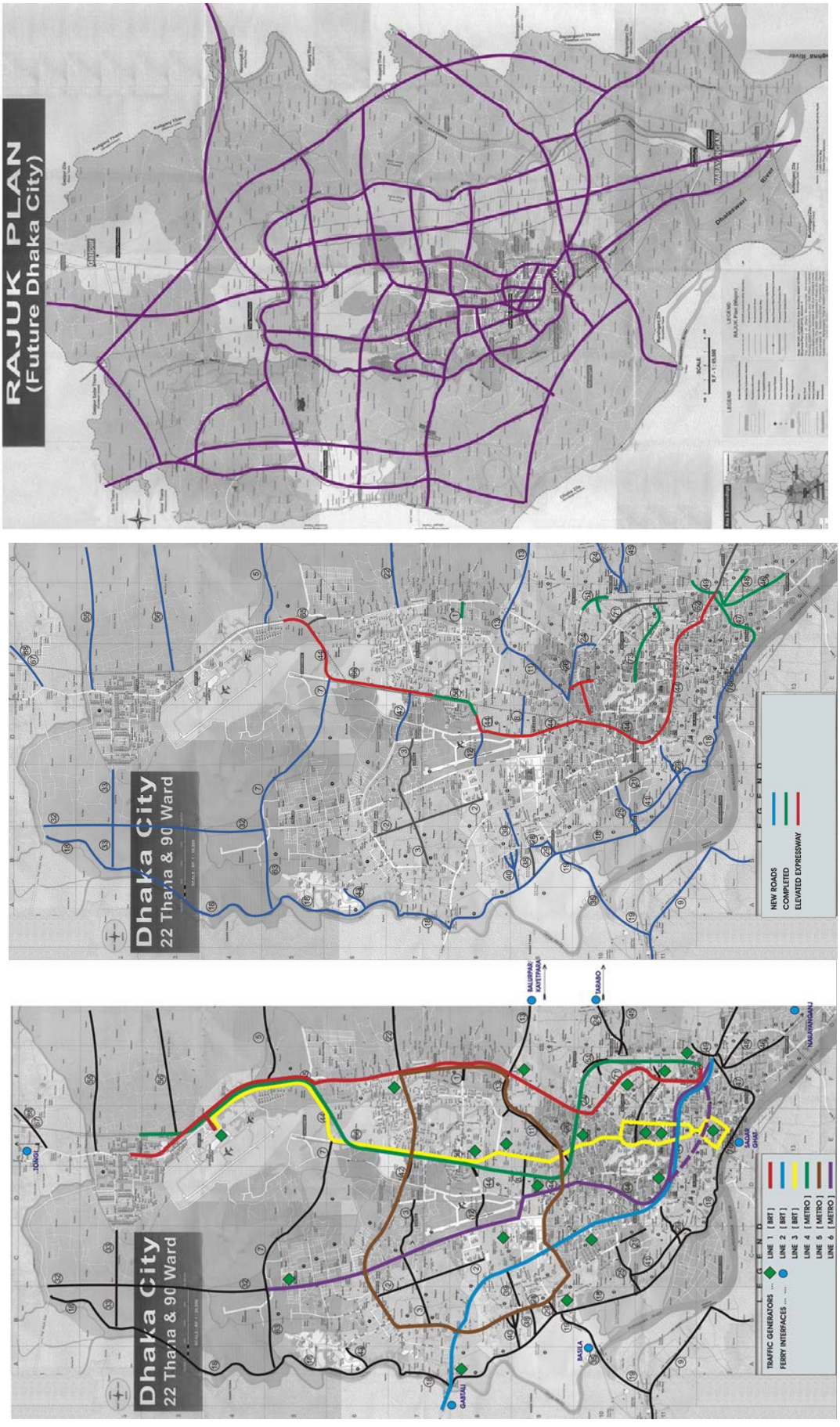
4) Phase 3B (2020-2024)

- Design and construction of 17 road projects aimed at completing the city highway network.
- Completion of the construction for the Metro Lines No. 4 and 6.

(4) Review of STP

Population growth and urbanization of GDA are changed rapidly more than predicted figures of STP. And Growth Pole Scenario which proposed in STP hasn't happened. And more existing Dhaka faced the phase 2 and will move to the next phase, Phase 3A. But only one BRT line and one MRT line are only one BRT line (BRT Line 3) is still in design stage, construction from Gzipure to International airport is expected to start in late 2014, and bus operation will start in mid of 2015. And MRT Line 6 is at the detail design stages and will start operate in 2019. On the other hand, construction of flyovers proposed and un-proposed in STP have been constructed without other transport infrastructures and traffic congestion beyond the flyover is still congested.

Not only socio-economic environment but also urban transport environment are quite different with supposed environments in STP. So JICA RSTP study team will revise and update the STP based on new environments.




Highway System

Roads Package

Mass Rapid Transit Network

Source: The strategic transport plan for DHAKA

**Figure 8.1 Proposed Transport System in STP**

## 8.3 Dhaka Urban Transport Network Development Study (DHUTS), 2010

(1) Overall

Dhaka Urban Transport Network Development Study (DHUTS) was conducted in 2010 by JICA to formulate the urban transport network in Dhaka up to 2025. DHUTS showed the strategy and implementation plans including the public transportation development plan, the road network development plan, the traffic management plan and the institutional development.

The urban transport development policies of DHUTS are:

- Introduction of mass transit system based on hierarchy of public transport system presently.
- Developing an intermodal public transport system consisting of MRT that is proposed to introduce to Dhaka and bus and para-transit systems requires the efficient integration and interconnection of the different public transport elements.
- Transport cost of public bus is comparatively cheaper than the other modes for low-income peoples.
- Mass rapid transit railway (MRT) system in order to solve traffic congestion in the Central Business District (CBD) need to be developed to promote new urban development to accommodate increasing population and to promote appropriate urban development.

(2) Proposed Projects in DHUTS

1) Public Transport Development Plan

The four key policies for public transport development plan were recommended by DHUTS. These included the introduction of mass transit system based on hierarchy of public transport system, building an integrated public transport system, public transport for low income sectors, and a public transport system that promotes urban development. In addition, the Mass Rapid Transit system (MRT) plan was recommended in order to accommodate future population increases. A total of eight MRT lines will be constructed by 2050 according to DHUTS. MRT Line 6 was especially recommended as the most urgent project.

2) Road Network Development Plan

DHUTS showed the road network development plan which included the improvement of existing road networks, improvement of missing links, the development of grid type road networks, provision of urban expressway networks, and improvement of inner ring roads. The recommended road network development plan based on above policies is shown in the figure below.

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

a) To improve based on hierarchical and functional road network.
b) To improve the primary road network to link between CBD of Dhaka and urban cores, satellite communities and division centers.
c) To improve the missing link within the urbanized area in order to prepare efficient road network.
d) To develop the grid type road network for newly development areas taking into consideration the geographic feature of the Eastern Fringe Area,
e) To construct the Urban Expressway to make backbone road network in the center of Dhaka.

f) To improve Inner Ring Road to serve traffic from Dhaka to regional centers in RAJUK area but also in Bangladesh.

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

a) To develop the road network taking into consideration hierarchy and road functions,

b) To development as concept of ring and radial road network.

3) Traffic Management Plan

The traffic management plan included improvement of bottleneck intersections, improvement of parking systems, improvement of traffic safety facilities, improvement of traffic signal control, introduction of ITS system, traffic safety education and Institutional coordination.

4) Institutional Development

DHUTS recommended the establishment of the Dhaka Mass Transit Authority (DMTA). The DMTA is expected to assume the functions of the Dhaka Transport Coordination Board and to determine public transport projects including MRT and BRT systems. The establishment of the MRT operating company (DMTC) was also recommended.

(3) High Priority Projects proposed in DHUTS

a) Public Transport Projects

- MRT Line 6 Project
- BRT Line 3 Project

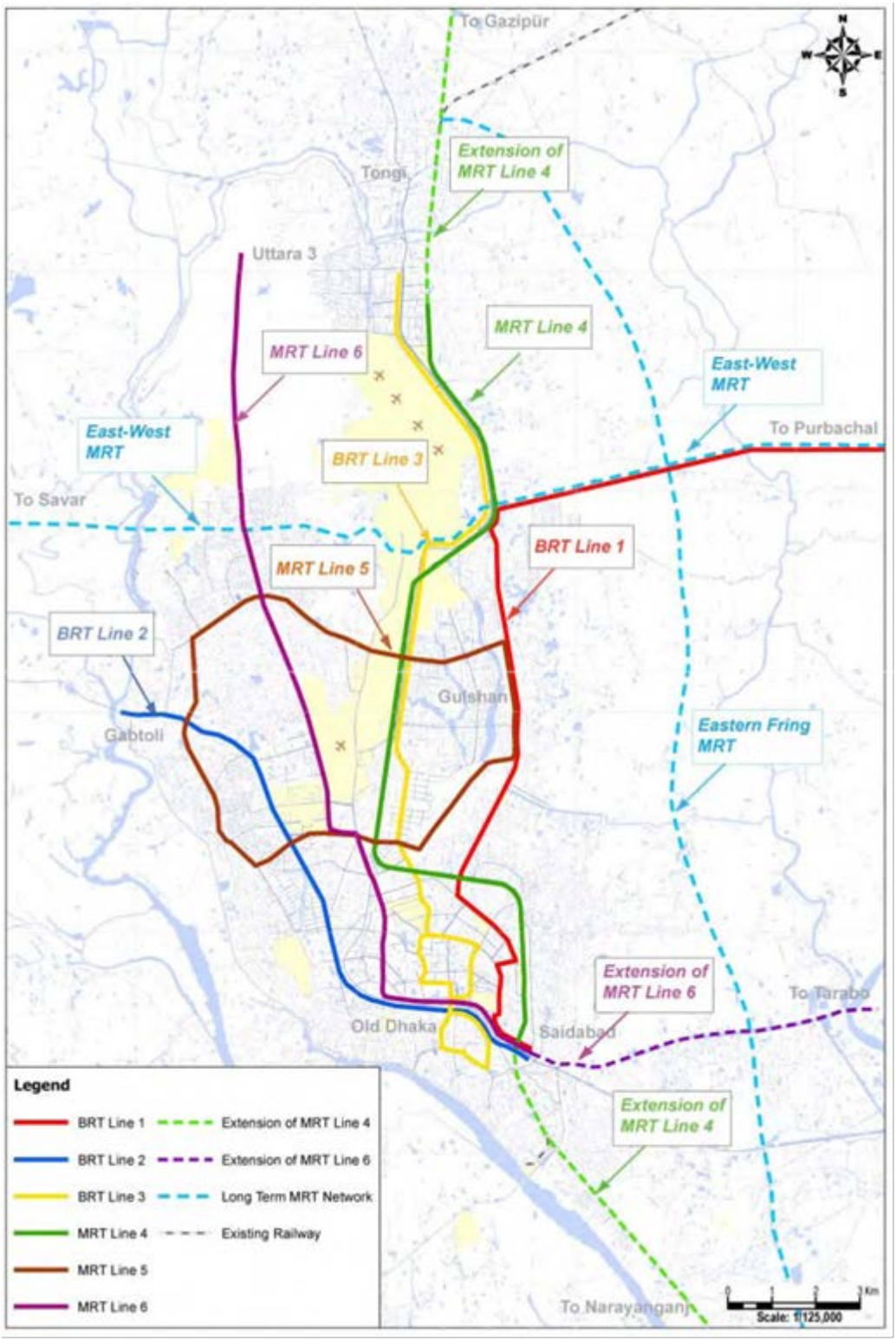
b) Road Projects

- Eastern fringe road project
- Southern section of middle ring road
- Flyover projects

c) Traffic Management

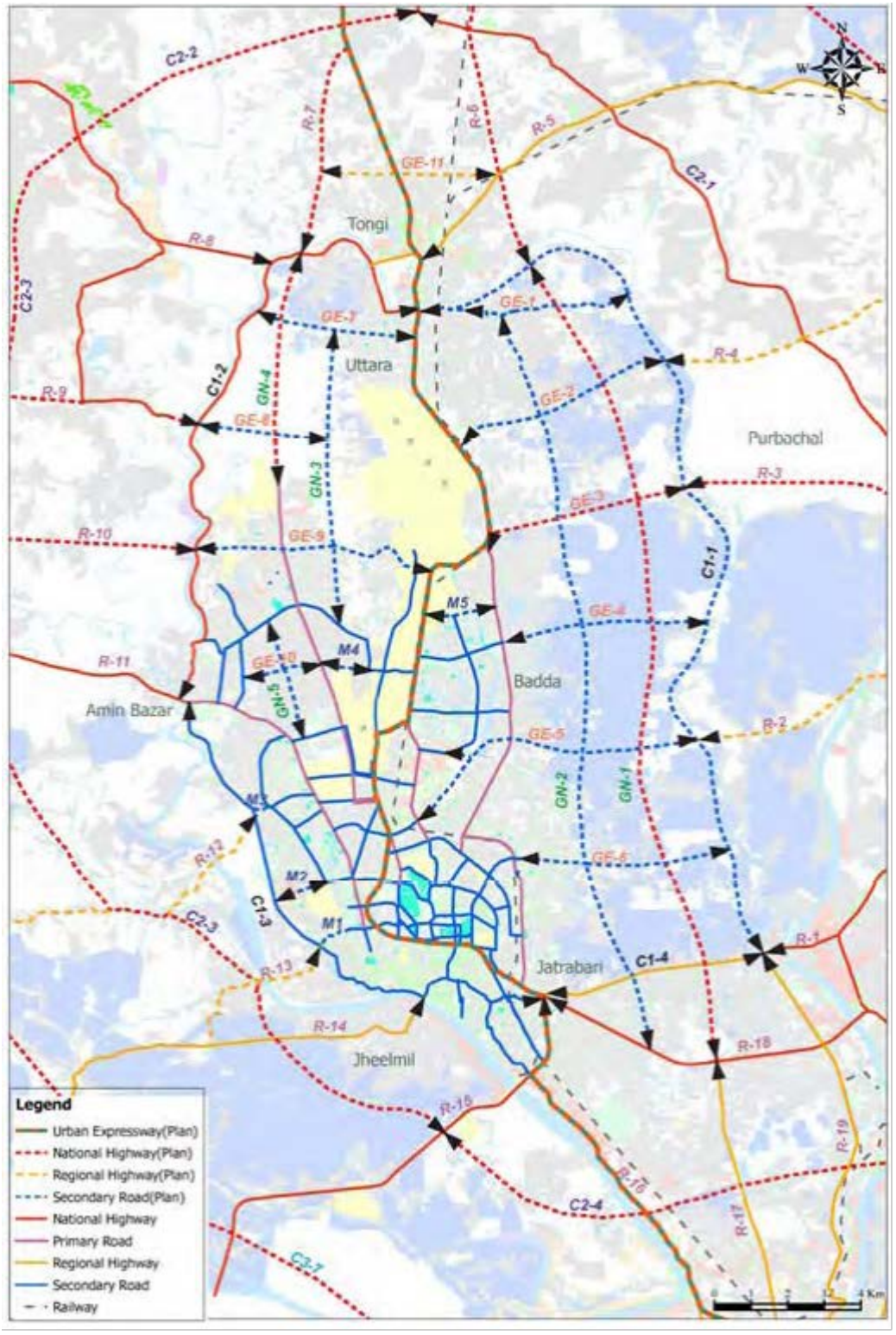
- Comprehensive traffic management project

d) Organizational development for DMTA and DMTC




Source: Dhaka Urban Transport Network Development Study, JICA

**Figure 8.2 Mass Rapid Transit Plan by DHUTS**




Source: Dhaka Urban Transport Network Development Study, JICA

**Figure 8.3 Network Plan by DHUTS**

## 8.4 MRT line 6

(1) Background

Japan International Cooperation Agency (JICA) conducted the Dhaka Urban Transportation Network Development Study (DHUTS) Phase 1 from March 2009 with the DTCA as its counterpart agency. The study's objectives were to conceptualize basic urban development scenarios for the DMA up to 2025 and to select priority projects that would be integrated into the scenarios. That study recommended the prioritization of constructing an MRT Line 6. As a result, JICA conducted the feasibility study on MRT Line 6 under DHUTS Phase 2. Following this study, the GOB and JICA concluded the loan agreement on the "Dhaka Mass Rapid Transit Development Project" on February 2013 which was the blueprint for the construction of an MRT Line 6.

(2) Existing Situation

DMTC (Dhaka Mass Transit Company) was established under the Ministry of Road Transport and Bridges as the MRT Company in 2013. And since September 2014, General Consultant has been implementing the design works and preparing tender documents for MRT line 6. And at the same time, Institutional Development Consultant (IDC) for the Dhaka MRT Line 6 has started.

(3) Schedule

There are eight kind of bid, six packages for civil works and one package for system and one package for locomotive.

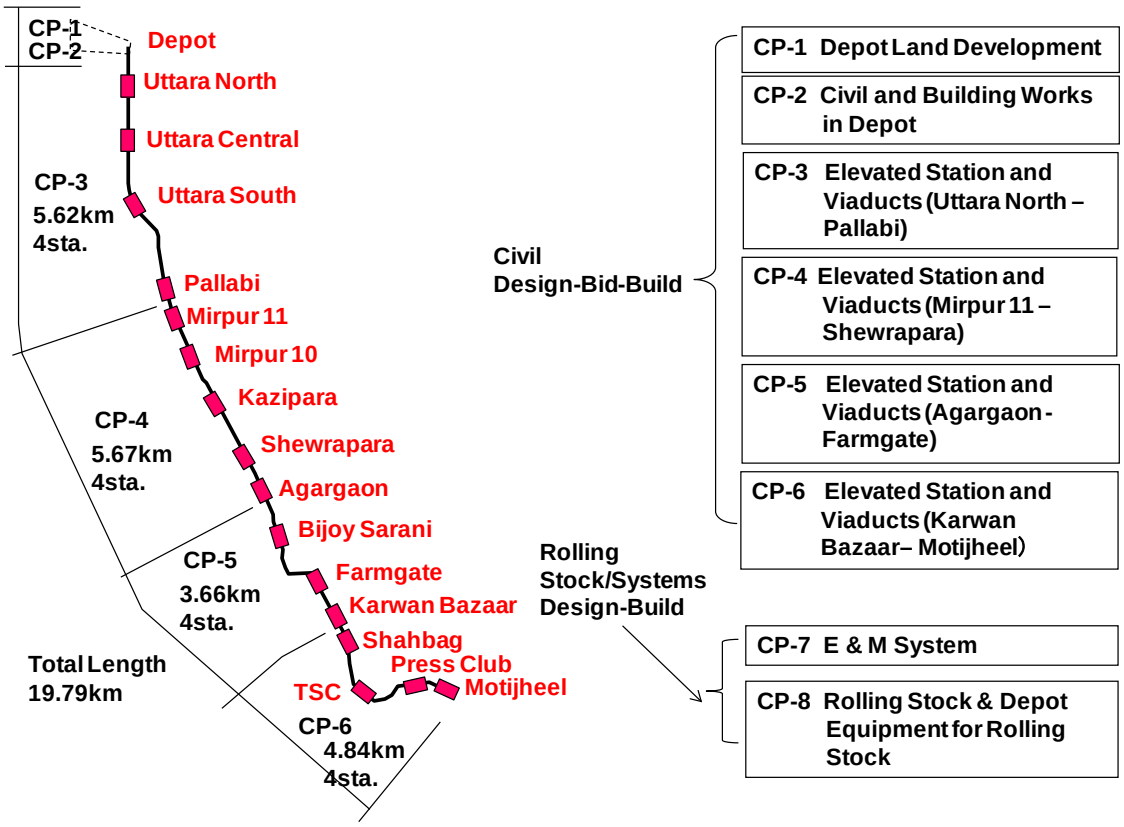



**Figure 8.4 MRT Line6 Alignment**

DMTC hopes to open the MRT Line 6 immediately. And the project schedule was made tightly to implement the trial operation of MRT Line 6 within 2019. Civil Design Bid, CP-1: Depot Land Development will be start from January 2015.

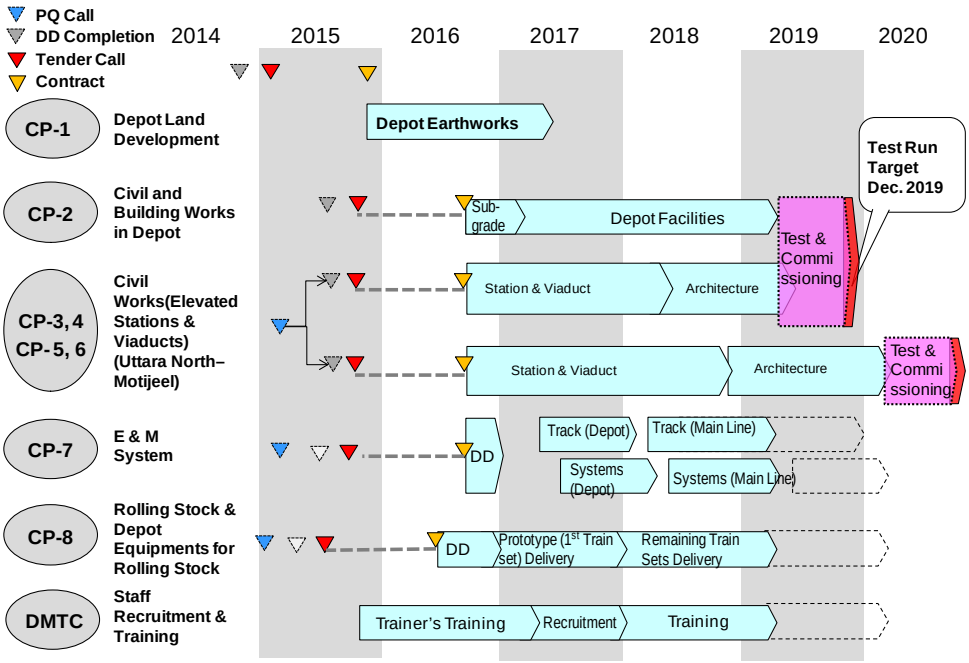



**Figure 8.5 Schedule**

## 8.5 BRT line 3

(1) Overall

Dhaka Transport Coordination Authority (DTCA) continues to make satisfactory progress in the implementation of this component. The Bus Rapid Transit (BRT) Feasibility Study has been completed, and the ongoing Detailed Design Study is providing key inputs for the preparation of Dhaka BRT project.

(2) Demand Estimation in Feasibility Study

In that report, scenarios have been defined combining the future public network and the forecasted mobility by bus for each time horizon. Public network includes the conventional and mass transit network and is built on the road network. They are as follows:

- Current situation
- Scenario 0: public network 2009 and bus mobility matrix 2016
- Scenario 1: public network 2016 and bus mobility matrix 2016
- Scenario 2: public network 2016 and bus mobility matrix 2020
- Scenario 3: public network 2020 and bus mobility matrix 2020
- Scenario 4: public network 2020 and bus mobility matrix 2030
- Scenario 5: public network 2030 and bus mobility matrix 2030

The corridor exploitation has been designed considering that the Northern section of the BRT corridor (Gazipur-Airport) would be already in operational. Therefore, BRT L3 busway would stretch from Gazipur to Keraniganj. With these hypotheses, results show that 54% of the demand of BRT L3 routes in 2016 travel from/to the Gazipur-Airport section from/to the corridor under study. The percentage of inner trips along the corridor varies over time, from 46% in 2016 to 82% in 2020 and 59% in 2030.

Demand varies slightly per direction, with more passengers in northbound routes (11% to 22% more).

**Table 8.1 Alternate demand capacity estimation**

| Scenario | Total Number of Passengers (pax/day) | Passenger Demand per Direction | |
|---|---|---|---|
| | | North -South | South - North |
| Scenario 1 | 667,966 | 315,239 | 352,727 |
| Scenario 2 | 781,867 | 368,928 | 412,939 |
| Scenario 3 | 1,034,109 | 479,746 | 554,362 |
| Scenario 4 | 1,457,981 | 667,466 | 780,516 |
| Scenario 5 | 1,293,842 | 581,780 | 712,062 |

Source: ALG, BRT and Corridor Restricting Implementation Study and Preliminary Design Work for the Uttra-Mohakahali-Ramna-Sadar Ghat Corridor in Dhaka, 2013

(3) Project Cost

Capital investment cost is estimated around USD 207.7 million, including initial investment cost USD 175m and rolling stock (USD 208m inclusive). The following table recapitulates the initial investment items:

**Table 8.2 Capital investment cost**

| **Items** | **Investment** |
|---|---|
| - Civil Works | 116,238,616 (67%) |
| - ITS + Equipment | 11,175,813 (6%) |
| - Project Planning + Design | 12,741,443 (7%) |
| - Resettlement Plan | 11,830,165 (7%) |
| - Land Acquisition | 18,532,246 (11%) |
| - Environmental Management Plan | 4,160,000 (2%) |
| **Sub Total** | **174,678,283 (100%)** |
| - Rolling Stock | 32,975,005 |
| **Total** | **207,653,288** |

Source: ALG, BRT and Corridor Restricting Implementation Study and Preliminary Design Work for the Uttra-Mohakahali-Ramna-Sadar Ghat Corridor in Dhaka, 2013

(4) Greater Dhaka Sustainable Urban Transport Project (BRT Gazipur-Airport)

At government request, the PPTA consultants analyzed 6 main corridors in Greater Dhaka's fringes and recommended a corridor in the northern part of Dhaka's metropolitan area as the one with the best potential to organize urban development and support a mass-transit infrastructure. BRT was then recommended as the best mass-transit mode for the selected corridors, with 20% of its length located within DCC area, and 80% located within Tongi and Gazipur Pourashava Area (TGPA)

To remove the congestion, a dedicated bus lane with adequate number of lanes according to traffic volume will be constructed at the center of the road where high capacity articulated buses will ply. There will be 2+2 elevated section of length 4.5 km along with 8 lanes Tongi Bridge with ramp at Abdullahpur. Besides footpath will also be constructed on the two sides of road for easy movement of pedestrians specially garments workers. All these measures will make mass transportation efficient reducing congestion considerably. Access roads will be developed to remove congestion and efficient traffic flow in the adjacent areas. Adequate parking of private vehicle, taxi, CNG (auto-rickshaw) will be provided in main BRT stations for easy transfer of passengers.

Total Investment Cost will be BDT 20,398.50 million (Note: investment cost is revising presetly) and Project Implementation Schedule will be from December 2012 to December 2016 (Note: implementation schedule also revising presently).

## 8.6 Dhaka Elevated Express Way

(1) Background

Dhaka, capital of Bangladesh is the largest and most densely populated city, with 18 million people. As the population of the city is increasing rapidly, the transport sector needs to expand to meet this rapid growth of the country. The huge number of growth in transport resulting in high levels of traffic congestion and operational difficulties. In order to minimize the acute traffic congestion, Bangladesh Bridge Authority (Government of Bangladesh) intends to deliver a project for the construction of approximately 23 km of Elevated Expressway in the northern part of Dhaka City on a Public Private Partnership (PPP) basis.

The four lane Elevated Expressway will commence at Shahjalal International Airport and run alongside New Airport Road, with the rail alignment through the Mohakhali, Tejgaon and Moghbazar to Kamalapur Railway-station and then the alignment crossing over Jatrabari before connecting to Dhaka Chittagong Highway.

Link: Palashi-Katabon-Hatirpul-Hotel Sonargaon (backside) - Moghbazar Rail Crossing.

(2) Objective

The purpose of the Expressway is to increase traffic capacity within and around the city by improving connectivity between northern part of Dhaka City with the Central, South and South-Eastern part. In addition to providing a much-needed increase in traffic capacity, the Expressway will be designed to relieve existing overloaded roads. Access and distribution to the Expressway will be designed to avoid adding congestion to existing facilities.

(3) Project Scope

Design, construction, operation and maintenance of the approximately 23 km elevated expressway including construction of culverts, toll plazas, underpass and overpass, lay byes, wayside amenities; installation of computerized toll collection system, providing adequate lights and development of service areas with all required facilities.

(4) Objectives

The main objectives of the Project is to support implementation of Dhaka Elevated Expressway PPP project on the following components:(a) Land acquisition and resettlement;(b) Relocation of existing utilities (DWASA, DPDC, BTCL, Titas gas etc.) to construct the Dhaka Elevated Expressway from Hazrat Shahjalal International Airport to Kutubkhali of Dhaka-Chittagong Highway.(c) Consultancy for feasibility study, land acquisition, Environment & Social Assessment, Financial modeling, transaction & legal advisory functions.(c) Supervision of Construction activities through Independent Engineer etc.

(5) Main route

he route of the Dhaka Elevated Expressway shall commence at Shahjalal International Airport and run alongside New Airport Road, along the rail alignment through the Mohakhali, Tejgaon and Moghbazar to Kamalapur rail station and then the Expressway shall pass through Golapbag south of the Kamalapur Stadium, east of Jatrabari and connect to Dhaka-Chittagong Highway near Kutubkhali. Elevated Link 1 Manik Mia Avenue-Holy Cross College-Tejgaon CrossingElevated Link 2 Palashi-Katabon-Hatirpul-Hotel Sonargaon (backside)-Moghbazar Rail CrossingProject Cost: 8,703 Crore

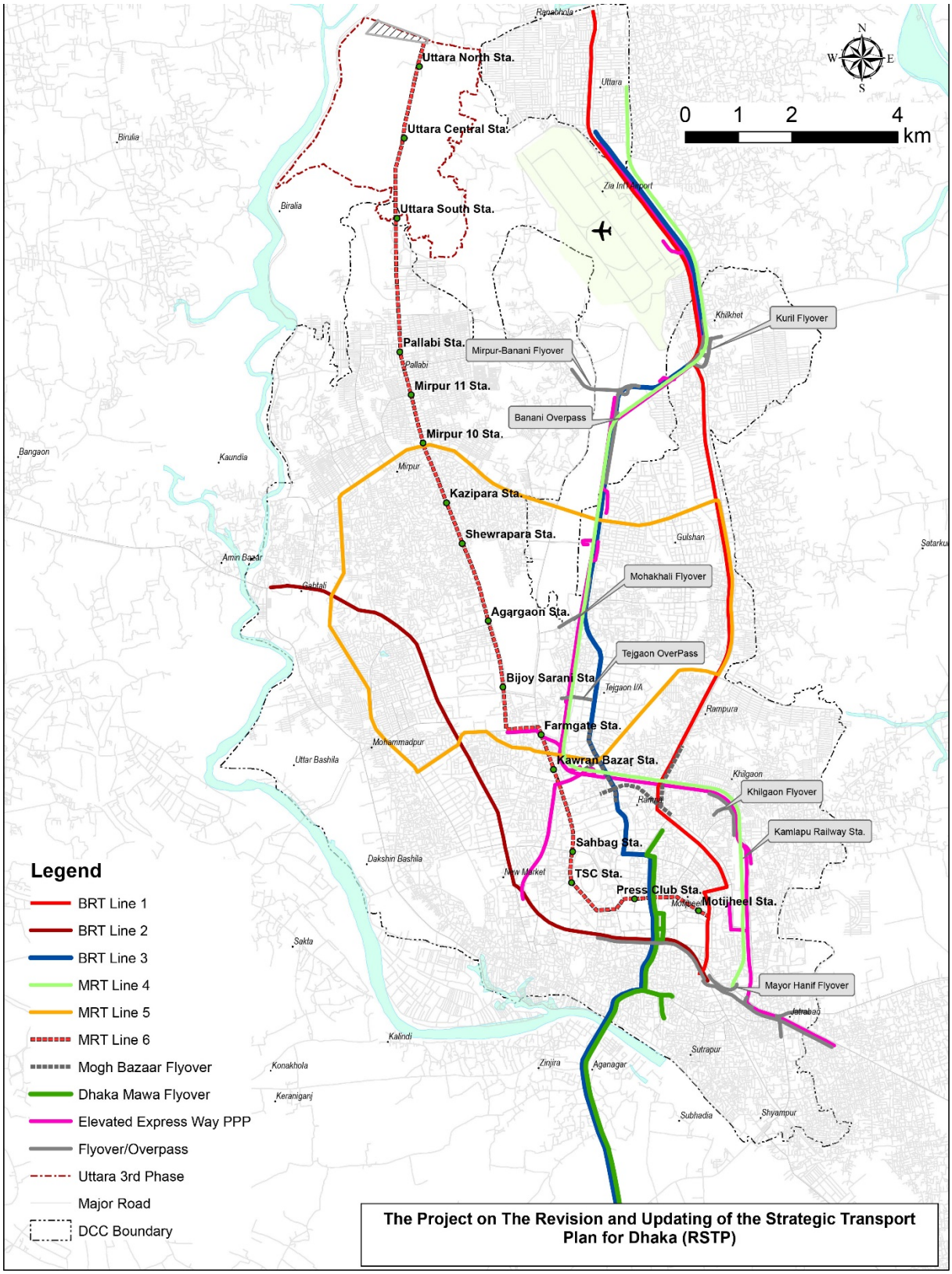



**Figure 8.6 Urban Transport Projects**

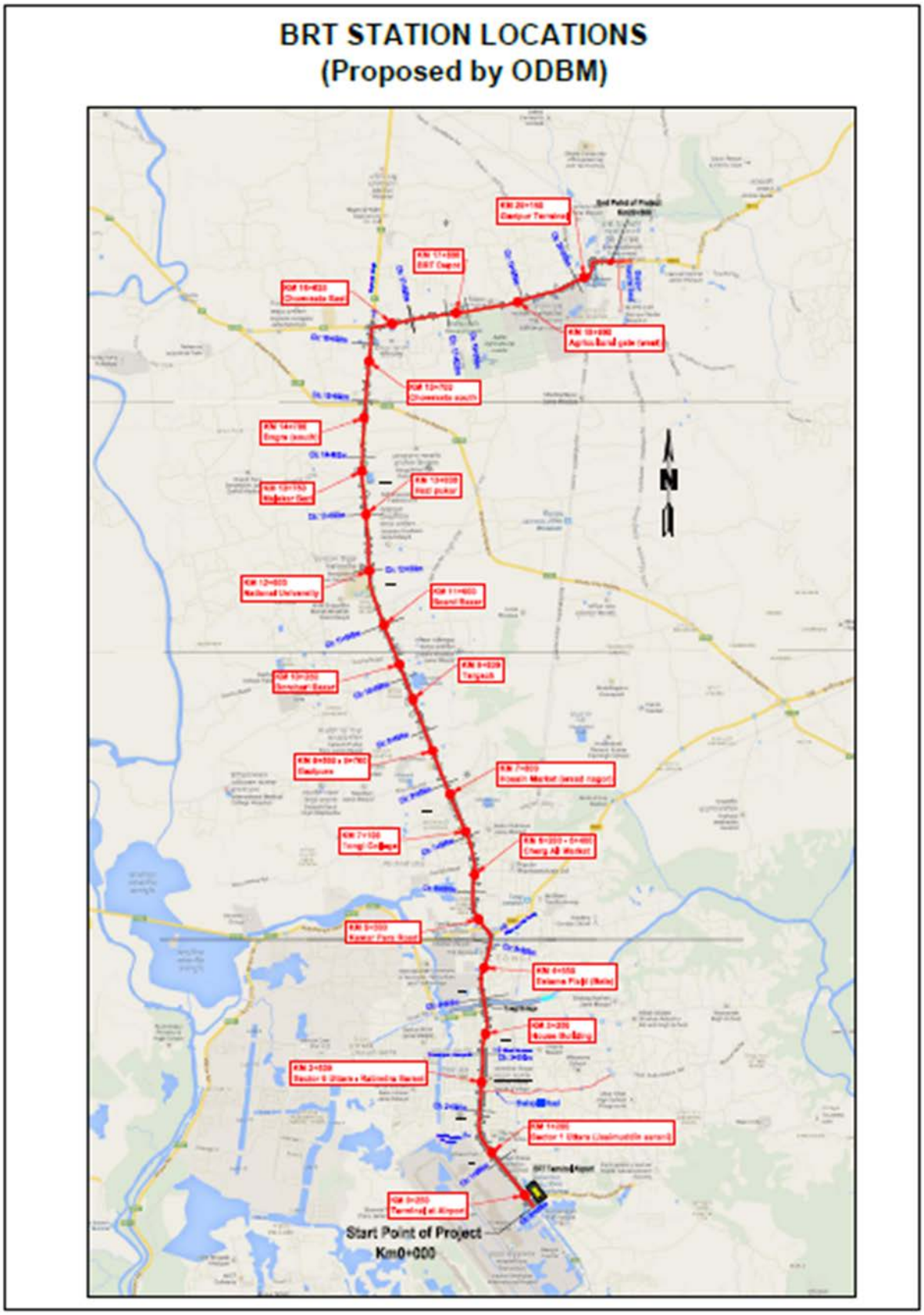



**Figure 8.7 BRT line 3 Network**

## 8.7 Review of Transport Related Studies

(1) Master Plan of Bangladesh Railway, 2014

The introduction of the Railway Master Plan contains a brief description of the main activities undertaken leading to a long term Master Plan for the Bangladesh Railway (BR). In order to develop balanced transport infrastructure in Bangladesh, the Government of Bangladesh approved the National Land Transport Policy (NLTP) in April, 2004 and is actively formulating the Integrated Multi-modal Transport Policy (IMTP) as envisaged in the NLTP as well as a revised Poverty Reduction Strategy, MDGs, Sixth Five Year Plan and Vision 2021. Both the NLTP and the IMTP place emphasis on the preparation of long-term plan for each of the transport sub-sector identifying railways as a priority. The NLTP provides different strategic options for railways such as upgrading and expansion of railway infrastructure, achieving higher quality services and operations and establishing international rail links. However, in order to survive as a viable mode, it must significantly improve its efficiency, service quality and establish better connectivity.

Moreover, in November 2004, the Ministry of Planning approved the Revised Terms of Reference (ToR) of Transport Sector Coordination (TSC) Wing of the Physical Infrastructure Division of the Planning Commission. This ToR also emphasised need for the preparation of future Railway Master Plan. To this end, TSC Wing consulted Ministry of Communications (then BR was under the Ministry of communications) and planned for preparation of a 20-year Railway Master Plan with the support of DfID's funded international consultants. Preparation of the plan commenced immediately with the followings:

- increase railway efficiency with interventions to make best use of assets;
- extend railway (infrastructure) to meet policy objectives;
- integrate railway network in a multi-modal approach;
- allow railway to play a greater role in the overall transport sector with a view to contributing to economic and social development;
- prepare railway for playing role in regional and international context;
- establish Broad Gauge throughout the country to bring uniformity in the Gauge System;
- extend its network within the capital city Dhaka by introducing metro system to reduce traffic congestion and
- modernize its loco workshops and training institute with a view to increase its operation and human capacity.

This plan sets out the infrastructure requirements to achieve these goals. The cost estimates for investment presented in this report were developed from a review of available reports, along with BR's own cost estimates. Although the plan does not present Economic Internal Rates of Return (EIRR) for the proposed investments, but provides a comprehensive discussion on the benefits of rail transport to the nation and the value of strategic investment to facilitate freight and passenger movement. In the preparation of this long-term Master Plan, the following activities were undertaken:

- A review and study of previous reports and documents of relevance;
- Comprehensive data collection on passenger and freight movement from Central Railway Building, Bangladesh Railway, Chittagong ;
- The creation of a computer based GIS mapping, and network analysis (trip assignment model) using dynamic segregation model;
- The forecasting of key parameters, and the selection of a preferred scenario for future railway networks;

- The development of transportation strategies to cater to the national and regional traffic demands;
- The formulation of a programme of works for the next 20 years;

Originally preparation of the Master Plan was overseen by a Steering Committee chaired by the Secretary, Ministry of Communications along with the following officials as members: Director General of Bangladesh Railway, Division Chief of Physical Infrastructure Division, Chief/Joint Chief of Ministry of Communications, Chairman of Chittagong Port Authority, Chairman of Mongla Port Authority, Chairman of Land Port Authority, Chairman of BIWTA, Joint Chief of ERD of Ministry of Finance, Joint Chief of Planning Wing of Ministry of Shipping, Additional Chief Engineer (Planning & Maintenance) of RHD and Deputy Chief (Eco) of the Ministry of Communications, who also served as the Member Secretary of the committee.

Lastly, Bangladesh Railway has been separated from the Ministry of Communications and now under the Ministry of Railways. As a result, this Master Plan again was reviewed by a committee headed by the Secretary, Ministry of Railways. The members of this Review Committee are Director General of Bangladesh Railway, all Additional Director Generals and General managers of Bangladesh Railway, Joint Chief of Rail Wing, Planning Commission, Joint Chief of TSC Wing, Planning Commission, Director General of IMED, Joint Secretary of ERD and Deputy Chief of Ministry of Railways. The TSC Wing of the Planning Commission coordinated the preparation of the Railway Master Plan.

(2) Road Master Plan of RHD, 2010

The Road Master Plan (RMP) has been developed in response to the direction provided by the National Land Transport Policy, which committed the Government to ‘develop a long term (20 year) Road Master Plan. The Road Master Plan for Bangladesh is intended to be the guiding document for investment in the road sector over the next twenty years. It has been compiled following a thorough diagnosis of the existing problems of the RHD road network, and the future challenges to be faced.

The recommendations include concrete actions and affordable solutions to adequately address each of the identified problem areas. It was approved by the Ministry of Communication on 2 June 2009.

(3) Annual Development Program me (ADP) 2012-2013

The principal objective of yearly ADP formulation is to raise standard of living and poverty alleviation of the people. 6th five year Plan (2011-2015) has been prepared to achieve these targets and has prioritized employment generation, nutrition, maternity health, sanitation and safe drinking water, standard education system, law and order, electricity and energy, local governance and monitoring system.

The size of ADP in the year 2012-2013 Fiscal year stands at tk 55,000 (Tk Fifty Five thousand) crore of which 61% is in local currency and 39% project assistance .The amount has been allocated to 17 sectors and different developmental assistance programs. ADP size of 2012-2013 stands at 20%more than that of 2011-12 ADP and 34% more of revised ADP.

1037 projects have been included in 2012-2013 ADP of which 1002 projects have been transferred from revised 2011-2012 ADP while new 35 projects have been added. Out of total projects, 857 projects are of investment program, 128 are of technical assistance and 52 are under JVC.

Physical Planning, water supply and housing is an important sector under ADP which deals with water supply and Drainage of large and small towns, improvement of rural

sanitation system, and improvement of infrastructure in City Corporation areas. The activities will assist to achieve the MDG and Poverty alleviation targets.

126 projects have been included this sector (114 projects under investment, 8 projects under TA and 4 projects under JVC). Total allocation for 2012-2013 stands at tk. 5290.83 crore (Tk. Five thousand Two hundred Ninety thousand and Eighty Three only) for physical Planning, Water Supply and Housing sector only.

# 9. URBAN DEVELOPMENT CONTEXT

## 9.1 Vision and Key Spatial Development Strategies

### (1) Vision of Dhaka Structure Plan

#### 1) Vison

The draft report of Dhaka Structure Plan (2016-2035) was published by RAJUK in October 2015. And in that report, “Making Dhaka A Livable, Functional & Resilient Metropolitans Respecting Local Social-Culture Fabric & Environmental Sustainability” was defined as the Vison.

The vision stands upon three pillars – **Livability, Functionality & Resilience**. It also has two conditions– respect towards a. local socio-cultural fabric & b. environmental sustainability. The pillars are forward looking in nature playing the role of driving forces for the plan. The conditions are more of restraining nature, not in limiting sense, but as guiding rails to keep the forward movement in the desired direction. Bringing a simple analogy, if the pillars are the accelerator that gives speed, the conditions are the brakes and steering wheel that guide and control that speed.

Livability here refers to a collection of qualities considered desirable by inhabitants of a locality. It is concerned mainly with the experience from an individual resident’s perspective. Consequently, enhancing livability is supposed to enhance the experience of a resident of living within a community in a positive way. Parameters that come forth while judging livability of an area may include, but not limited to, the following:

- Accessibility to services & facilities
- Affordability (housing, transportation etc.)
- Meaningful employment opportunity
- Safety & security
- Cleanliness & hygiene
- Social equity & justice
- Sense of community
- Availability of quality education & healthy facilities
- Attractiveness & adequacy public places
- Walkability
- Healthy natural environment
- Interesting cultural activities
- Opportunities for public participation

The term **Functionality** is related to the efficiency with which the components of an urban system operate. It sees the settlement from above to get the larger picture. In a way, it is the organizational or city manager’s perspective that is more concerned with large systems and their functioning than an individual’s experience of those systems. The essence of functionality are the effectiveness and efficiency of key systems like:

- Transport
- Drainage
- Social services (health & education)
- Utility/life support systems

- Economy
- Energy
- Natural environment & ecosystem
- Governance

**Resilience** is perceived here as the capability of a community to prevent catastrophic events and also the ability to recover in case the event occurs. It can be compared with the immune system of human body. Regarding the Metropolitan Region, essential components of resilience are, first, to be aware of the disaster risks that threaten everyday life of its inhabitants and, second, to create the capacity to prevent and recover from any disaster that does occur. Thus it incorporates both the preventive and curative aspects. The vision is to make the Metropolitan Region resilient to:

- Natural & anthropogenic hazards
- Economic downturn/depression
- Climate change impacts

The first condition, **respecting local socio-cultural fabric**, mainly points to being aware of and sensitive to the social and cultural background of the community in question. It also means that the usual norms and ways of life of the people have to be acknowledged and considered when judging the appropriateness of any policy decision taken in the plan. The term local here is deemed significant because the Metropolitan Region and its communities are not of uniform in nature. Therefore, the community in question would be the community that is most directly impacted by any particular policy.

The second condition of **respecting environmental sustainability** intends to make sure that while the pillars try to attain certain milestones concerning the human systems, they don't ignore other systems present in the area that together form the greater whole. The essence of this condition is understanding the inherent interdependency of human beings on many natural & ecological processes. It is the realization that disrupting the natural balance of these systems which apparently seem disconnected to the proper functioning of a city or region will ultimately hamper human systems too because of this high level of interdependency, and will eventually be self-defeating.

### 2) Long-term Planning Policy Framework of Dhaka Structure Plan

In Dhaka Structure Plan, 8 planning policies are defined as follows;

Promote a Livable City in Dhaka Metropolitan Region (DMR)

- Promote compact urban development and well connected and hierarchical networked city within DMR
- Revitalize the old Dhaka and recast and improve the land use of the underutilized areas of Dhaka Core
- Facilitate thriving economic activities by means of sustainable and inclusive planning
- Establish effective linkages promoting a vibrant regional connectivity in order to foster the development in regional centers;
- Prudently guide the developments in growth management areas within the DMR

Establish and operationalize zones and centers

- Plan all future developments focusing proposed strategic zones, urban core center, regional centers, sub-regional centers, specialized centers and community centers

- Plan for making urban Centers as attractive place for living
- Plan for options required for establishing well connectivity among inter and intra zones and centers
- Plan for establishing regional viz-a-viz national connectivity with zones and centers

Gear-up the economy in DMR

- Create employment opportunities specially for the medium and low income groups
- Plan for lifting up informal economic activities into higher productive level
- Plan and facilitate provision of essential infrastructure and services for the estimated workforce of the priority industrial locations within affordable commuting distance
- Facilitate development of ICT sector in the Dhaka Core area
- Encourage compact and clustered industrial growth
- Plan housing options close to the job locations for major industrial clusters

Provide better public facilities and preserve natural environment

- Protect flood plains for reducing flood vulnerability, absorbing heat generated by ‘urban heat island’, preserving bio-diversity, and providing breathing space
- Plan for loop closing system for integrated water management
- Introduce 3R strategy to minimize waste generation
- Plan for identifying sustainable location for public toilet
- Plan for school zoning concept to reduce travel demand
- Provision of healthcare facilities proportionate to future population

Preserve Natural Environment

- Protect places of special uses, open space and heritage value
- Create energy efficient and comprehensive risk sensitive land use planning
- Adequate options in plans to preserve and provide sufficient green areas in and around DMR
- Plan to preserve all possible natural environment in and around DMR
- Plan for reducing the level of environmental pollution
- Introduce effective ETP in all major industrial enterprises

Well connected transportation network

- Plan for improved public transport services keeping options for walking and cycling
- Plan for an integrated mass transport system (BRT/MRT) for RAJUK area keeping options for rail, road and water ways
- Plan for ring road and major roads to connect regional centers to increase the mobility
- Locate long term transport networks for passengers and freight movement
- Tackle traffic congestion introducing Advanced Technologies and keep Dhaka Metropolis moving

Affordable Housing for City Dwellers

- Plan for housing for city population in accordance with the need of the increasing population

- Locate housing close to work places in a decentralized manner
- Increase housing supply for low and middle income group of people
- Create planned and environmentally sound housing neighborhood

Putting the Plan in Practice

- Specify the responsibilities in implementing the plan in effective manner
- Plan for capacity building of concerned agencies/ individuals required for implementing the plan
- Identify mechanism for facilitating effective coordination among the agencies concerned
- Identify a sing organization/institution for looking after city development and management

### (2) Vison of RSTP

In RSTP, vision for Dhaka and strategies from a standpoint of urban transport are defined based on Dhaka Structure Plan (2016-2035). And 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 to 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 RSTP has developed a vison for Dhaka as **"Green Dhaka with Blue River and Green Urban"** that has the following concepts.

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

Relocating industrial areas in CBD to the suburbs by the developing logistic artery such as the three ring roads and bypass roads in order to reduce industrial waste.

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

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

Reducing environmental strains to coincide urban transport projects, and developing urban transport network such as the three ring roads and public transport system as the transport backbones, in order to reduce $CO_2$ emissions and promote the development of low-carbon city.

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

Realizing this vison from a viewpoint of urban transport will be done through the following main strategies: Realizing this vision from a viewpoint of urban transport, the following main strategies are essential to make it through.

Strategy 1: Develop public-transportation-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 a safe and healthy lives, engage in convenient and comfortable socio-economic activities and aspire for better incomes and livelihoods, it is therefore needed that new types of industries that will generate better jobs and employment be introduced and encouraged. This will include knowledge-based, high end technologies, high value-added urban services, expanded higher education, advanced urban agriculture and some 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 and the development of modern commercial and industrial areas, high-quality foreign or domestic investments in strategic locations are the driving for the continuous economic development of Dhaka. Furthermore, an efficiently provided and managed infrastructures, including a high-quality public transportation, will make it possible for the public to commute safely without the hassle of traffic congestions and transporting of goods will likewise be 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.

### (3) Key Spatial Development Strategies

Urban development involves a wide range of complex and interactive issues that requires comprehensive study and should be done in an integrated manner. Like in the case of transportation development that closely affects land-use pattern and vice versa. Since land-use pattern and water environment are determinant factors for the quality of living conditions, for this reason, key strategies must be set in such a way that development objectives are addressed and at the same time actions and projects of related subsectors are clearly formulated. Six core strategies were worked out to wit:

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

For large urban areas, like Dhaka, the effective way to meet transportation demand is to provide the city a high-quality public transportation system which should be developed in integration with urban development. The core network will be the mass rapid transit (MRT) and bus rapid transit (BRT) while secondary and feeder services will be by buses of different sizes and types of services. However, establishing a good public transportation system is not an easy task at all, it requires huge amount of funds as well as operation and management capacities over a long period of time. Moreover, fares that can be collected from commuters will hardly pay for the investment cost and if the system is poorly developed, it can only attract limited number of passengers. It is clearly noted based on experiences of successful cities that mass transit networks serve as the backbone of the urban structure and is integrated with urban land use and development.

A public-transportation-oriented city cannot be realized solely by introducing mass transit as a mode of transportation; it must also be associated with effectively integrated urban areas alongside with a corresponding 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 effectively articulated with mass transit. This requires a review of the existing urban master plan which is seems to be like a road-transportation-based.

(b) Adequate Role-sharing with Private Transportation: Private transportation, including cars, motorcycles, and bicycles, is also an equally important mode as the society becomes affluent and the demands are diversified. Private transportation modes are also important feeder services to mass transit systems.

(c) Long-term Commitment: A successful mass-transit-based city cannot be realized in a short time but needs long-term, consistent policy intervention and the people's good understanding and support.

Residential areas in Singapore integrated with public transportation development.

Sub-center development at a railway station in Tokyo.

**Figure 9.1 Residential Areas in Singapore and Sub-center Development in Tokyo**

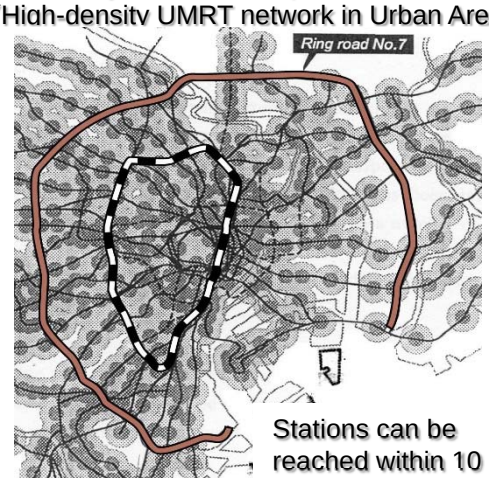
**Box 9.1 Mass Transit Development in Large Urban Areas**

**Tokyo:** Tokyo forms a large metropolitan region with a total of 20 million people and extensive socio-economic activities. Although its urban areas are congested, Tokyo functions efficiently and safely. People can travel on set schedules at reasonable costs and comfort levels largely because of the availability of an extensive metro and urban rail network. The many rail lines that densely cover the city center allow the people to reach a metro station within five to ten minutes walk. In outer areas, the rails are connected to good feeder bus services.

**Singapore:** With a population of 4 million, Singapore is admired for its strategically planned urban development which has taken place since the 1960s. More than 80% of the citizens are housed in new towns which are provided with high-quality amenity and urban services. These new towns are connected to the CBD by a modern metro system and feeder services including bus and AGT.[1)]

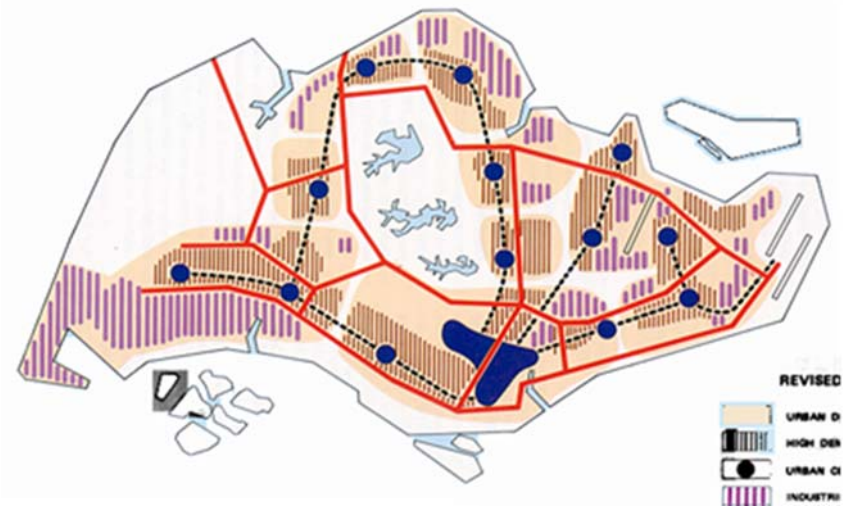
**Curitiba, Brazil:** Curitiba is always referred to as the city that has achieved great success in sustainable development based on a unique integration of land-use management and high-quality BRT.

Tokyo Public Transport Network
(High-density UMRT network in Urban Area)




Stations can be reached within 10 minutes of walking.

Curitiba Land-use Plan
(High-density land use along Busway)


Singapore Conceptual Plan
(High-density new town development integrated with UMRT and Urban Expressway)

1) Automated guideway transit is a small-capacity transportation system which is computer-operated.

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

Many parts of the existing urban areas suffer from extremely dense living environments with deteriorating buildings and poor urban services. Although in general, the people are satisfied with their current living conditions, it can be foreseen that the situation will eventually turn for the worse and the people will become unhappy as incomes increase and a higher quality of life is demanded. A doable mechanism must be developed to prepare for such possibility.

In the urban fringe, it is a growing concern that the progress of suburbanization may intensify the expansion of unplanned developments which will worsen the living conditions of existing communities. Adequate infrastructures must then be provided well ahead of the progress of such unplanned development.

Dhaka must be provided with alternative and more effective mechanisms that can promote the upgrading of existing urban areas including the following:

(a) Land Readjustment: Many cities in Japan experienced unplanned developments during their own periods of rapid urbanization. The key intervention was to reorganize the urban structure by adjusting lands, modifying the rights of various stakeholders for the common good, and securing fund sources for infrastructure development (see Box 9.2).

(b) Urban Renewal: A similar concept can be applied for the improvement of a congested urban areas without relocating the people and relying on government budget.

(c) Development of Adequate Institutional Framework and Active Involvement of the Community: Clear rules and guidelines should be established to facilitate stakeholder participation, including the affected communities, who will equitably share the roles and shoulder part of the costs of development. The government is currently encountering increasing difficulties in implementing resettlement.

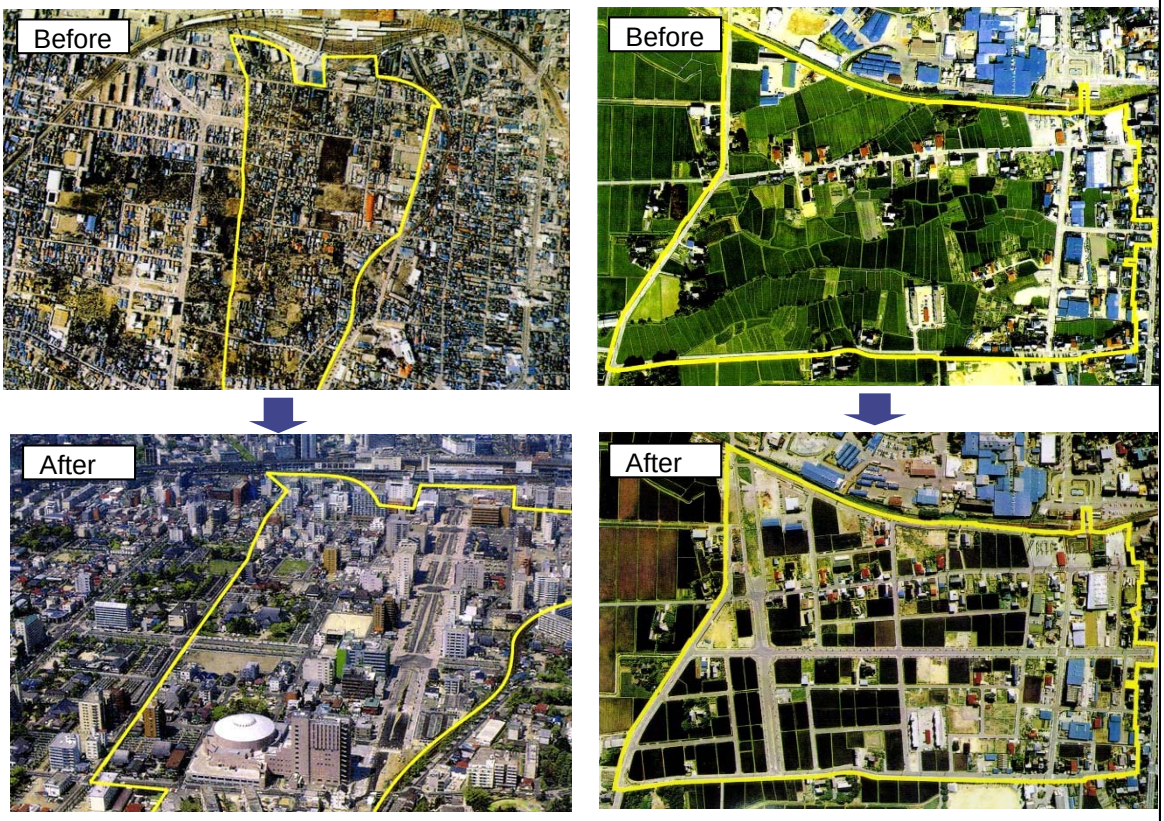
**Box 9.2 Concept of Land Readjustment**

**What is land readjustment:** Land re-adjustment is an urban planning method wherein a group of landowners (or those who hold the rights to a land) cooperate in amalgamating their lands and allowing their subdivision in accordance with the urban plan in order to construct the necessary public facilities such as roads, parks, schools, etc. In this process, the resettlement of landowners will be in the same area and not to a different location.

**Why land readjustment:** Land re-adjustment makes it possible to provide lands for infrastructure development and to regulate land use and spatial structure in a comprehensive manner.

**Where can land readjustment be applied:** In Dhaka, land readjustment can be applied both in the urban core and urban fringe. A practical area of application is where roads are planned. Necessary space for roads will be generated in a comprehensive land readjustment project, as was the experience in Japan (see photo below), where no cost for land acquisition was incurred.

**Japan's Experiences in Area Redevelopment**



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

In order for the large city to be competitive and meet the need for diverse socio-economic activities, modern and new urban centers for commercial and business purposes must be developed. This can be achieved by attracting quality investments which will apparently generate employment. Quite numbers of large cities in Asia have developed or continuously developing these types of new CBDs. One of these cities is Dhaka which has started to develop the Uttara Residential Model Town, Purbachal and many others, while similar large-scale developments are taking place in the eastern fringe area in Dhaka. A modified planning concept from residential into a more business or commercial, these areas portrays a better chance of being developed as multi-functional urban centers. Since this type of developments is more attractive to the private sector, the role of the government must be limited to that of a facilitator or a regulator while ensuring that the benefits from the development are equitably shared among stakeholders- the people, developers and the government – and that the public interest expressed in the city plan is always protected.

While the potential role of new urban center is significantly important in developing a strategic and an efficient urban structure for Dhaka, considerations must be given to the following:

(a) Mixed Use: Urban centers should provide adequate space and variety of services for different people and activities. Mixed land uses can make urban centers attractive and effective. Residential use should not dominate but should occupy an adequate portion of urban centers.

(b) Clear Role and Identity of Urban Centers: In order for urban centers to become competitive, their respective roles and identities must be made clear.

(c) Appropriate Transportation Access: Since urban centers generate and attract large traffic demand, both public and private, they must be integrated with mass transit, while ensuring the effective use of cars and motorcycles.

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

Infrastructure is the most fundamental factor that determines the efficiency and quality of urban activities. It also shapes how public funds are spent. An inferior and inadequate road network results to a worsen traffic congestion, an increase vehicle operating costs and waste of time for road users. Moreover, an incompetent traffic management reduces the efficiency of given facilities as well as traffic safety levels. While poor performance of infrastructure services including transportation, power, water supply, drainage, sanitation, etc. lowers the quality of services and will eventually add to the over-all service costs. All these inefficiencies become a burden to the city authorities as well as to the people in general.

Infrastructure development in urban areas must be planned and implemented in an integrated manner. Road development without consideration to surrounding land uses will neither contribute to an effective development of urban areas nor protect life. Unsynchronized development of utilities will cause repetitive road diggings such as inadequate collection which may reduce efficiency of drainage system and degrade sanitary conditions.

Since infrastructure development requires a large amount of public funding and is critical to sustain urban development, socio-economic activities, and living conditions, due consideration must be given to the following:

(a) Coordinated Development: Infrastructure development aims to promote the quality of socio-economic activities and living conditions. This type of infrastructure must be planned and implemented in a much more coordinated manner.

(b) Effective Operation and Maintenance: Inefficiency in operation and management of infrastructure will not only spoil socio-economic activities but also increase the cost of services, thereby increasing the burden on government and users.

(c) Private Sector Participation: In order to ensure the sustainability of infrastructure development and services, the private sector including providers and users, must fully participate in the development process and operation. This will also encourage efficiency and the provision of quality services

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

Dhaka is situated in an area that is vulnerable to various hazards such as flooding, inundation, land subsidence, river erosion, earthquake, etc. History would show that the city has in fact already suffered from a number of disasters. Densely inhabited urban areas with limited or narrow roads and no open spaces are at risk from fires that can ravage the whole areas in an instant. In such situations, response to emergencies and relief activities would also be greatly hampered. Therefore, existing urban areas must be upgraded, while future development must avoid such pitfalls to guarantee the protection of life and property.

In order to promote disaster-free urban areas and ensure safety and security of life and property as well as efficient socio-economic activities, Dhaka must consider the following:

(a) Realization of Flood-free Urban Areas: There are many negative effects due to flooding. In addition to the many negative effects due to flooding such as direct damage to life, health and property, this also creates traffic congestions, damage infrastructure and downgrade the image of the city.

(b) Disaster Preparedness and Rescue: The current structure of existing urban areas makes it difficult to provide necessary rescue operation in case of fires and emergencies. There is a need to reorganize the urban areas in this aspect.

(c) Earthquake Preparedness: Dhaka's urban areas are not free from the threat of earthquakes. There is a need for a long-term strategy to reorganize the urban structure in a way that the central function of the city will not be directly compromised in the event of earthquakes.

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

Managing large urban areas is quite difficult as challenges are so complex and interdependent that no solution can be done from one discipline alone. It is thereby required to have a wide-range, integrated and location-specific solutions which can profoundly test a city's technical and financial capacities. On the other hand, a city that is properly managed can bring immense benefits that can be enjoyed by all stakeholders. To ensure that this happens to Dhaka, the following key areas must be carefully looked into:

(a) Development of alternative implementation methods to carry out urban development (e.g. land readjustment, urban renewal, etc.).

(b) Encouragement of public-private partnerships.

(c) Involvement of stakeholders in the development process.

(d) Provision of open and business-friendly environment.

(e) Enhancement of planning and administrative capacities for urban management.

## 9.2 Urban Development Scenario

### (1) Introduction

The urbanization in Dhaka has been rapidly progressing. More people begin living and working in central areas, that lead to the increase in urban population. The economic growth and motorization brought expansion also of the urban area .RAJUK is one of the area that has 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 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.

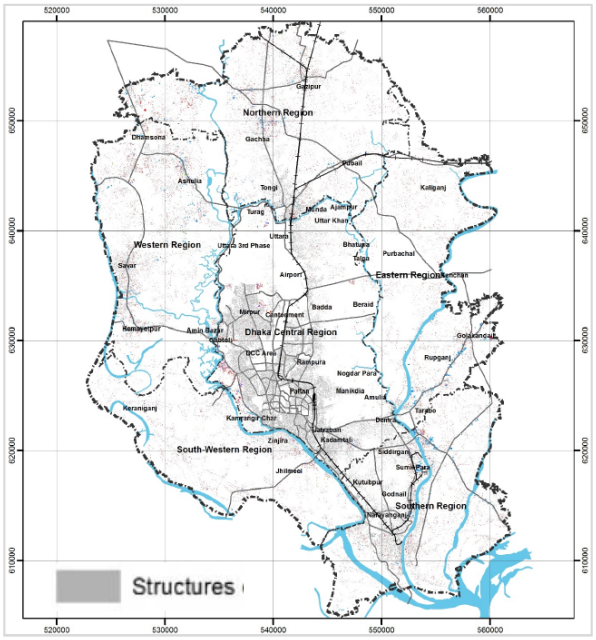
### (2) Current Urban Development Characteristics and Trends

#### 1) Overall Urban Development Direction

The urban development direction of RAJUK and Dhaka is highly affected by their physical location, particularly their topography. There are several rivers, swampland, and depressions within RAJUK that limits its urban expansion. Urbanization initially occurs in elevated areas that are not affected by flooding. This is where Dhaka City was established. When all elevated areas within and around Dhaka City have been developed, the urban development has shifted to low-lying areas, vegetated areas and wetlands.

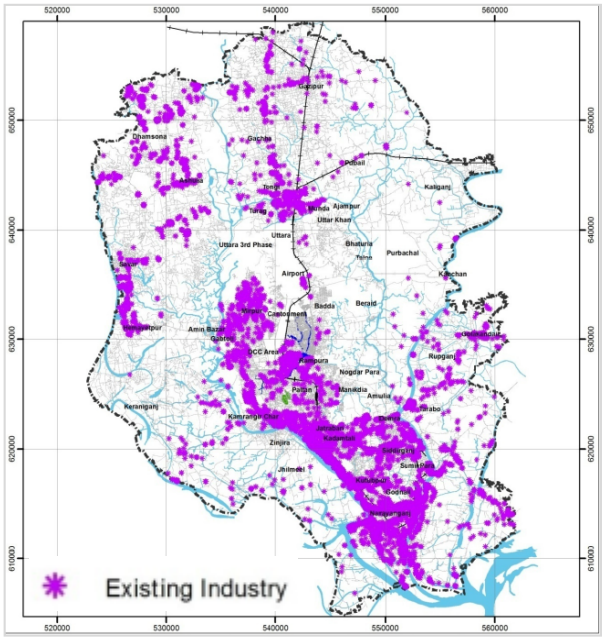
In the year 1970’s, the direction of urban expansion was northward and in lowlands, where the dominant type of land used were the cultivated areas and water bodies. As urbanization progress, many water bodies, depressions and cultivated land were developed. This phenomenon can be seen mostly in Dhaka City. In late 1970’s to early 1990’s, the urban expansion was extended further to the north, north-west and west part as an outcome of the construction of bridges over rivers. After the year 2000, more vegetated areas, wetlands, and lowland areas were converted to urban use. The construction of bridge over the Buriganga River also accelerated urban expansion in the south areas.

Although the urbanization has expanded to all directions, the development pattern of RAJUK remained highly monocentric, with Dhaka City still as the center (see Figure 10.1 and Figure 10.2).The previous plans, such as the DMDP Structure Plan of 1995-2015, and the Strategic Transport Plan of Dhaka recommended the decentralization or multi polarization of urban functions; but the situation had not changed. Though RAJUK has several satellite town developments in different areas, still they are under developed and remained in the conceptual stage.




Source: Survey Report on Preparation of Regional Development Planning for RAJUK under CRDP

**Figure 9.2 Structural Distribution in RAJUK in 2014**




Source: Survey Report on Preparation of Regional Development Planning for RAJUK under CRDP

**Figure 9.3 Industrial Distribution in RAJUKin 2014**

### 2) Housing Development

There are several ongoing and planned housing projects by RAJUK and other private developers. However, the capability to provide housing units is much lesser than the requirement due to the rapid increase of the population. As a result, there is a significant housing backlog every year that affects particularly the low-income households. RAJUK has some housing projects but they have limited resources. Meanwhile, private developers usually aim the middle to high-income households. Therefore, low-income households are forced to live in temporary structures or in slum.

Public Housing Development Projects (RAJUK)

The development of RAJUK reflects the government policies in the sense that, it is a national government agency that is empowered to control urban development, and to provide the urban master plan. The development especially in Purbachal new town, which is the largest town development in Bangladesh, is influencing the regional urbanization trend. Table 9.1 shows the current status of RAJUK development projects.

**Table 9.1 Ongoing and Planned Housing Development Projects by RAJUK (As of 2014)**

| Project Name | Area (ha) | Planned Population | Planned Population Density (person/ha) | Target Year of Completion | Status |
|---|---|---|---|---|---|
| Purbachal | 2,489 | 1,000,000 | 400 | 2015 | Ongoing |
| Uttara 3rd Phase | 813 | 600,000 | 734 | Dec. 2014 | Ongoing |
| Jhilmil Residential | 154 | 133,000 | 860 | Around 2020 | Ongoing |
| Apartment Project in Kamrangirchar | - | - | - | - | Under F/S |
| Savar Satellite Town | 906 | - | - | - | Planned |
| Gazipur Satellite Town | 1,749 | - | - | - | Planned |
| Kamurangirchar P. S. | - | - | - | - | Planned |
| East Baridhara | About 809 | - | - | - | Planned |

Source: RAJUK

Private Housing Development Projects

Private developers in the housing market of Dhaka play a very vital role due to the demand of the rapid increase in population. As of the year 2014, 77 housing projects by private developers were officially approved. However, the recent economic situation restrained the smooth implementations of the said projects; there are only 18 projects that were implemented (see Table 9.2). Most of these projects are located in the fringe areas of Dhaka's urban area and along the major roads. These private housing developments have resulted in urban sprawl.

Aside from the 18 ongoing projects, the implementation of the 59 approved housing projects was postponed due to the recent economic conditions. If these projects will be implemented at the same scale of the ongoing projects, the total land area of private housing projects will reach to 5,000ha. In addition to that, there are small projects with areas less than 4 acres each, which do not require official approval.

**Table 9.2 Ongoing Private Housing Projects in 2014**

| no | Name of the project | Project Location | Area (ha) |
|---|---|---|---|
| 1 | Ashulia Land development Limited | Dakhshin Khan | 17.4 |
| 2 | Xenovaly Properties Limited | Boro Kathalya | 40.5 |
| 3 | Bangladesh Development Company | North town , Tongi /Baagier | 129.5 |
| 4 | Bangladesh Development Company | North town , Kerano Ganji /Baagier | 404.7 |
| 5 | Bangladesh Development Company | East Town Kachpur / Madanpur | 40.5 |
| 6 | Sun Valley Residential Project | Badda, Suti Vula | 121.4 |
| 7 | Notun Dhara Housing Company | Badda, Suti Vula | 55.0 |
| 8 | Mission Energy and Property Limited | Dhaor Rana Vola | 36.4 |
| 9 | M N Housing Limited | Baunya | 35.2 |
| 10 | Hazi M Gafur Land Development Limited | Amuliya , Sunnya | 39.7 |
| 11 | AshuliaModel town Project | Ashulia, Savar | 161.9 |
| 12 | Madhumoti Model Town Residential Project | Amin Bazar Savar | 80.9 |
| 13 | Bashundhara River view | Kerani Ganja | 202.4 |
| 14 | BCS Police Officers Projects Cooperative Housing | Savar | 48.6 |
| 15 | Hamid Real Estate Limited, Prto Prangon, | Kerani Ganja | 34.4 |
| 16 | Concord Land Real Estate Limited, Rajdhani Housing Project | Matuail Demra | 43.7 |
| 17 | Tanin Kunja Housing Project Limited | Deol, DND | 12.1 |
| 18 | Vuluya Royel City Private Limited | Borua | 20.2 |
| Total | | | 1524.5 |

Source: RAJUK

Slums and Squatter Areas

Most of the informal settlements inside and around Dhaka City are situated on vacant government land and wetlands. These informal settlements comprises single-story make shift houses. The houses in slums and squatters areas have a very low quality, extremely small floor spaces and very densely located on flood-prone areas.

In the early 1960's, some areas of the city were zoned as low income- areas, but some of these were gradually transformed into a middle income areas or were mixed with the middle-income group areas. Due to the increasing prices of land and housing/apartment costs in Dhaka City, the lower-income groups have been forced to live in the outskirt of the metropolitan area.

### (3) 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 9.3 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 | a. To enhance the functionality of Dhaka as a centre of economic activities through intra-regional distribution of economic and lifestyle opportunities<br>b. To create efficient inter-and intra-urban connectivity with and within the project area<br>c. To ensure environmentally sustainable urban development<br>d. To encourage development that respects the social & cultural fabric of the city and distributes its benefits in an inclusive way |

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

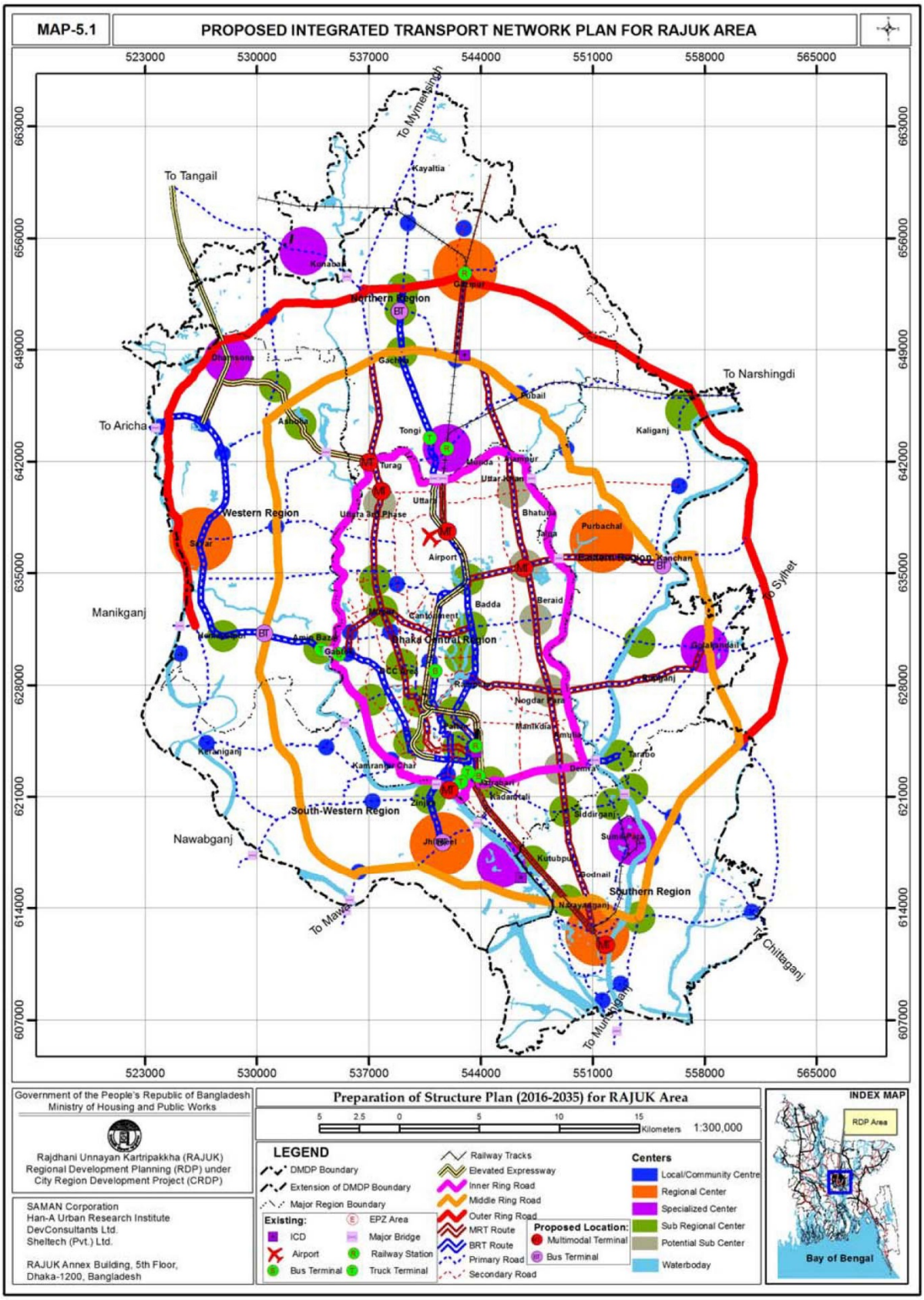
As the above objectives imply, the main theme of the spatial structure is to promote local decentralization. The decentralization of urban functions and services can release the pressure currently experienced by the city. Moreover, the required urban services will be provided nearer to living spaces. Local decentralization will be supported by establishing an urban centre hierarchy in RAJUK. 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 9.4 and Figure 9.4.

**Table 9.4 Urban Hierarchy in Regional Development Planning**

| Hierarchy | Function/Feature | Location/Area |
|---|---|---|
| Core | - Central focal point for the entire planning area<br>- 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<br>- The focal point of regional development and generally an urban administrative headquarters<br>- Provide full range of services. Wide range of economic activity and employment | Other City Corporation<br>Major Pouroshava |
| Sub-regional/ Major Centre | - Major business and shopping centre for its sub-region<br>- Supporting local employment<br>- Providing goods and services of wide range to meet the local demand | DCC Wards<br>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<br>- Supporting convenience of residents | City Corporation Wards<br>Neighbourhoods<br>Para/Mahallah |

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




Source: Preparation of Regional Development Planning for RAJUK under CRDP (Draft final Report, 2015)

**Figure 9.4 Conceptual Structure Plan for RDP Area (2016 - 2035)**

### (4) 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:

i. **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.

ii. **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.

iii. **RSTP Scenario:** This scenario is the combination of the Trend Scenario and the RDP Scenario, 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 contribute to 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) Trend Scenario

In estimating the future population and urban development pattern under the Trend Scenario, the following assumptions were made:

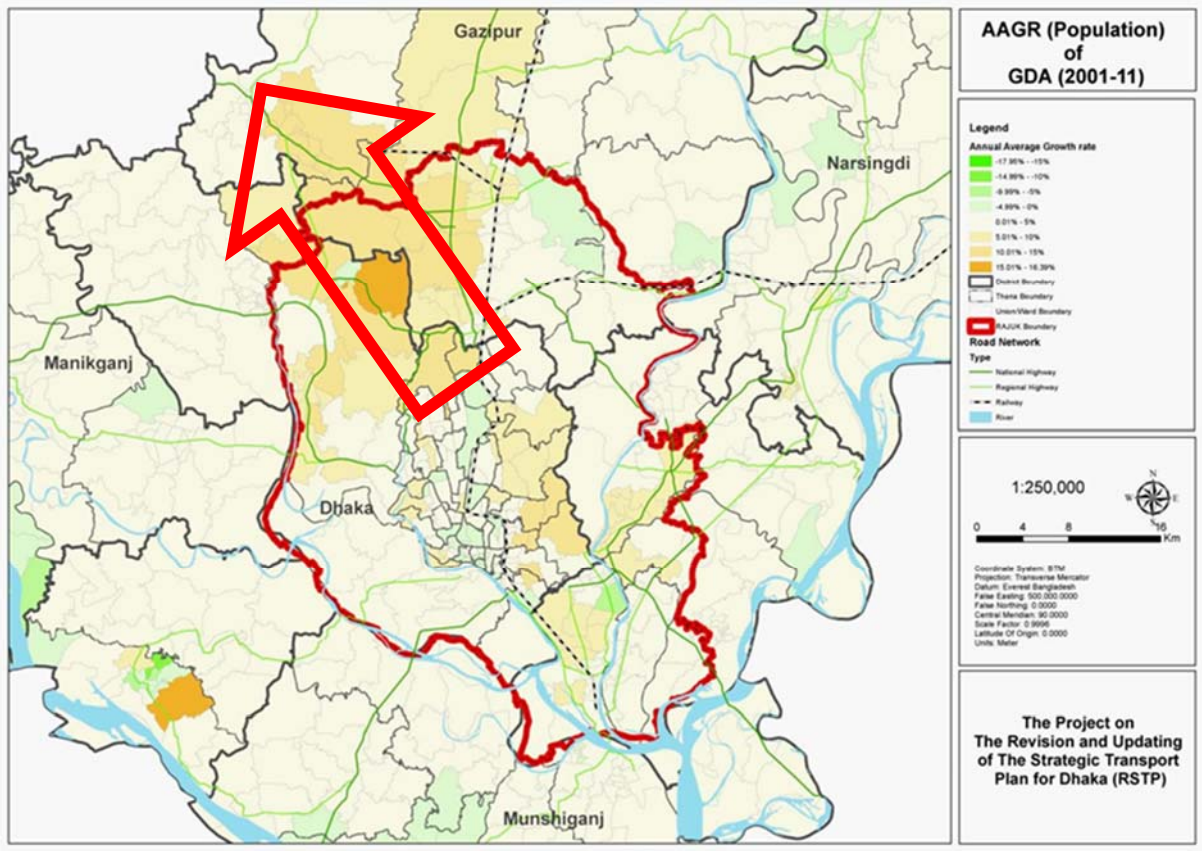
i. There would be average increase and decrease in population rates between 1991–2001 and 2001–2011;

ii. Urban infrastructure would be provided to support the above growth; and

iii. No strategic intervention to urban and transportation development would be implemented.

Under this scenario, the future population of RAJUK was estimated to be about 32.5 million. Population would increase toward the north and the west along Dhaka–Mymensingh Road and Dhaka Aricha Highway in an unplanned manner, while the growth in Dhaka City would slow down to less than 2%/year. The fastest population growth would be in the Western Region, which will also account for the highest population density at 417 persons/ha in 2030.

The main concern in this scenario would be the continuous congestion in the existing city center and the spawning of new crowded urban areas in the Northern and Western Regions as a result of urban sprawl toward less populated areas. Without an appropriate urban development direction, the situation of Dhaka City would worsen, and the disparity between Dhaka City and other areas would widen.




Source: JICA Study Team

**Figure 9.5 Trend Scenario**

**Table 9.5 Population Growth under Trend Scenario**

| Region | Area (ha) | Population (000) | | | | Density (person/ha) | | | | Population Growth (%/year) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011 (actual) | 2015 | 2025 | 2035 | 2011 | 2015 | 2025 | 2035 | 11-15 | 15-25 | 25-35 |
| Central | 30,700 | 8,841 | 9,401 | 9,223 | 5,422 | 288 | 306 | 300 | 177 | 1.55 | -0.19 | -5.17 |
| Northern | 36,300 | 1,626 | 2,395 | 6,228 | 25,891 | 45 | 66 | 172 | 713 | 10.17 | 10.03 | 15.31 |
| Eastern | 23,800 | 611 | 684 | 820 | 934 | 26 | 29 | 34 | 39 | 2.89 | 1.83 | 1.30 |
| Southern | 27,800 | 1,965 | 2,268 | 2,908 | 3,586 | 71 | 82 | 105 | 129 | 3.64 | 2.52 | 2.12 |
| South Western | 16,600 | 794 | 919 | 1,230 | 1,919 | 48 | 55 | 74 | 116 | 3.72 | 2.95 | 4.55 |
| Western | 24,600 | 1,286 | 2,173 | 6,816 | 18,407 | 52 | 88 | 277 | 748 | 14.01 | 12.11 | 10.45 |
| Total | 159,800 | 15,123 | 17,840 | 27,226 | 56,159 | 95 | 112 | 170 | 351 | 4.22 | 4.32 | 7.51 |

Source: JICA Study Team

### 3) RDP Scenario

Under the RDP Scenario, the future population was projected based on a medium growth rate which was considered as the desired case. As a result, the future population of RAJUK would reach to more than 24.5 million by 2030 and population density with 153 persons/ha. By that time, the population density of Central Region would be 408 persons/ha, although this area is already highly crowded even at present. The urban

development direction will be promoted continuously in the Central Region and expanded towards the Northern and Western Regions.

The direction of the development under the RDP Scenario follows the concept laid out by the previous plans and studies, such as the Strategic Transport Plan for Dhaka (STP), and the Preparatory Survey Report on Dhaka Urban Transport Network Development Study in Bangladesh (DHUTS). However, other concerns under this scenario are as follows:

i. Unclear regional functions in RAJUK area: It is clear that the RDP Scenario aims to promote decentralization and to develop multiple urban centers within the regions or communities and make services more accessible to people. However, the function of each region in RAJUK was not mentioned (e.g., the Central Region will function as the administrative center, etc.).

ii. Lack of relocation sites for public facilities: The RDP Scenario mentioned the importance of relocating or locating workplaces in areas close to residential areas. However, the concentration of government offices and education facilities in Dhaka City is one of the significant causes of traffic congestion in the city. This needs to be solved by relocating these facilities farther, away from residential areas.

iii. No proposal on new industrial zones: Presently, the industrial estates concentrate on Dhaka and Narayanganj which is not the ideal situation. In accordance with the urbanization, Dhaka should be the commercial and services center. Hence, relocating the industrial estates to suburban areas is inevitable.

iv. No plan for utilizing the old airport land: Many studies and research papers mentioned that the old airport is the traffic bottleneck in Dhaka. Furthermore, this area has very high value from the viewpoint of urban development. Some interventions should be included in the plan.

**Table 9.6 Population Growth under RDP Scenario**

| Region | Area (ha) | Population (000) | | | | Density (person/ha) | | | | Population Growth (%/year) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2011 (actual) | 2015 | 2025 | 2035 | 2011 | 2015 | 2025 | 2035 | 11-15 | 15-25 | 25-35 |
| Central | 30,700 | 8,841 | 9,805 | 11,754 | 13,052 | 288 | 319 | 383 | 425 | 2.62 | 1.83 | 1.05 |
| Northern | 36,300 | 1,626 | 2,086 | 3,375 | 4,843 | 45 | 57 | 93 | 133 | 6.43 | 4.93 | 3.68 |
| Eastern | 23,800 | 611 | 669 | 799 | 913 | 26 | 28 | 34 | 38 | 2.32 | 1.79 | 1.34 |
| Southern | 27,800 | 1,965 | 2,231 | 2,827 | 3,224 | 71 | 80 | 102 | 116 | 3.22 | 2.39 | 1.33 |
| South Western | 16,600 | 794 | 878 | 1,088 | 1,283 | 48 | 53 | 66 | 77 | 2.54 | 2.16 | 1.66 |
| Western | 24,600 | 1,286 | 1,639 | 2,488 | 2,990 | 52 | 67 | 101 | 122 | 6.26 | 4.26 | 1.86 |
| Total | 159,800 | 15,123 | 17,309 | 22,331 | 26,306 | 95 | 108 | 140 | 165 | 3.43 | 2.58 | 1.65 |

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

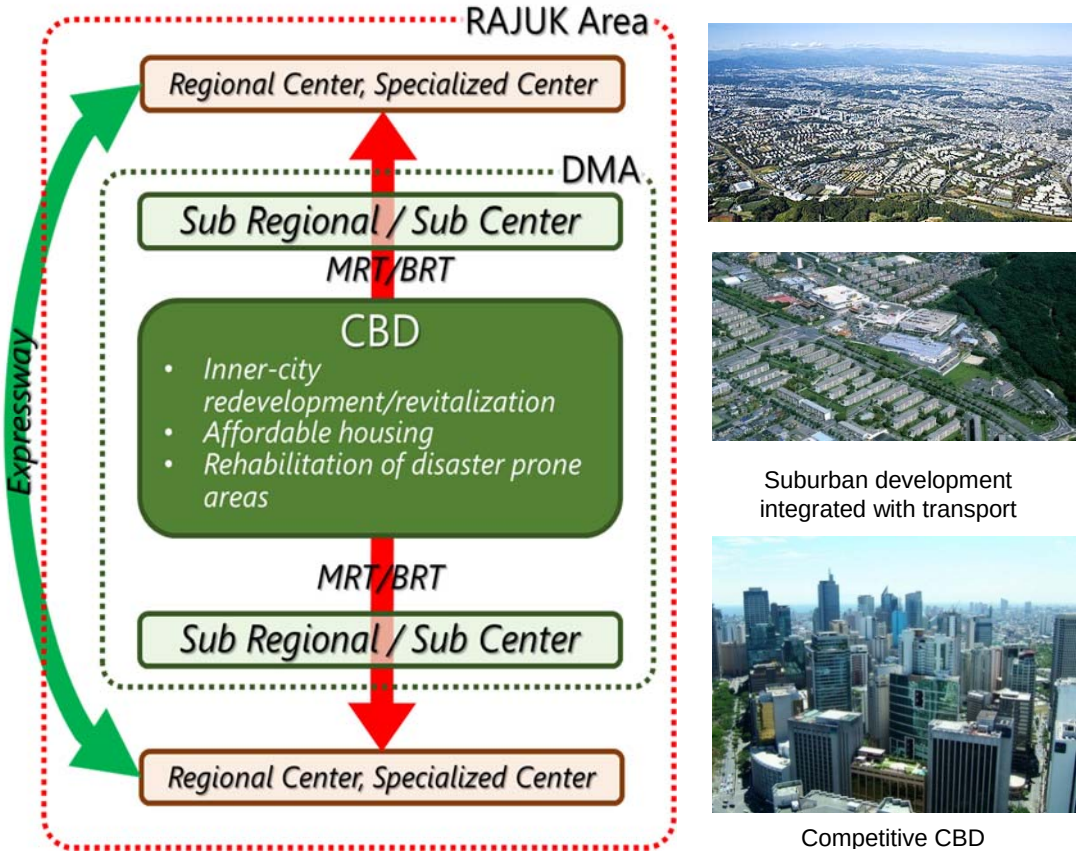
#### 4) RSTP Scenario

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 infrastructure 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 are rarely enforced. At the local levels, 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 the following figure which are connected firmly with strong transport axis. 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 with growth centers internationally.




Source: JICA Study Team

**Figure 9.6 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 above. 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 the 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 north Bangladesh.

iv **Savar (Regional Centre):** This will be the regional center in the western region, since 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 DCC area. It's larger residential areas can provide better living environment. Mass transit service will ease the commute from Jhilmill to 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, Narayanganj will be an industrial center of RAJUK.

Together with the major urban centers, the following corridors were identified as growth corridors with high development potentials, considering current urbanization trends and land conditions. Improvement of connectivity among main urban centers will accelerate the multiplication of urban functions in RAJUK.

a. East–West Corridor (Purbachal–Savar)

b. North–South Corridor (Gazipur–Narayanganj)

c. North–South Corridor (Gazipur–Jhilmil)

d. Ring Corridor

**5) 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 framework of the RDP Scenario and the Trend Scenario addressed to improve the above imperfections. The RSTP Scenario will show the strategic developments directions, which will be promoted through an efficient transport development. The following are the areas for improvement of the RSTP Scenario.

i. Population in inner core of Dhaka will decrease by decentralization;

ii. 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;

iii. 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;

iv. The western part of RAJUK will become the educational center and will be expected to generate new types of industry such as IT industry; and

v. The trend of population growth in North-west area of RAJUK will be reflected.

### (5) Urban Development Potentials in RAJUK Area

#### 1) Methodologies

The Grid analysis is a method use to analyses different geographical information relating to the designated area by grids based on the location defined by longitude and latitude. It provides easier comparison quantitatively and historically. In addition to this, it allows to calculate the scored values inside the grids. The values can be obtained not only from statistics but also from the locations and areas of geographical characteristics, natural environment, roads and railways, public facilities, cultural heritages and so on. This analysis method is applied to the process of preparation of a spatial plan and a disaster management plan by the government. Thus, this report uses this method for estimation of the future population. The size of each grid is 250m and has an area of 6.25ha. Different geographical information is added to the grids coming from the existing GIS databases which have been developed by JICA, RAJUK, etc.

#### 2) Urban Development Potentials

A transport system in metropolitan area should be planned based on urban development trend and population activities. A thorough examination of urban development scenario and future urbanized area is essential to define the framework of transport planning; this is called as “Urban Development Potential Analysis”.

This analysis applies a grid system of 250m each for data compilation and scoring by level.

Urban development potential consist various factors, however, those factors can be classified into two according to the effects to urban development as “Negative” or “Positive”.

Generally, the development of urban area is spread according to the increasing economic activities of the existing developed areas in CBD to peripheral area. Without any control factors, such areas continues to be developed as sprawled areas. One of the controlling factors of urban development is geographical or natural condition such as rivers, slopes, forests, and so on. Another controlling factor is the control of human activities by administrative and institutional methods. Therefore, these two factors are considered as “Negative Elements” in this analysis.

On the other hand, the existing developed areas have been developed by various factors. Those factors which define urban development are assessed as “Positive Elements”.

Finally, overall urban development potential will be calculated based on the following formula.

“Overall Urban Development Potential” = “Positive Elements” – “Negative Elements”

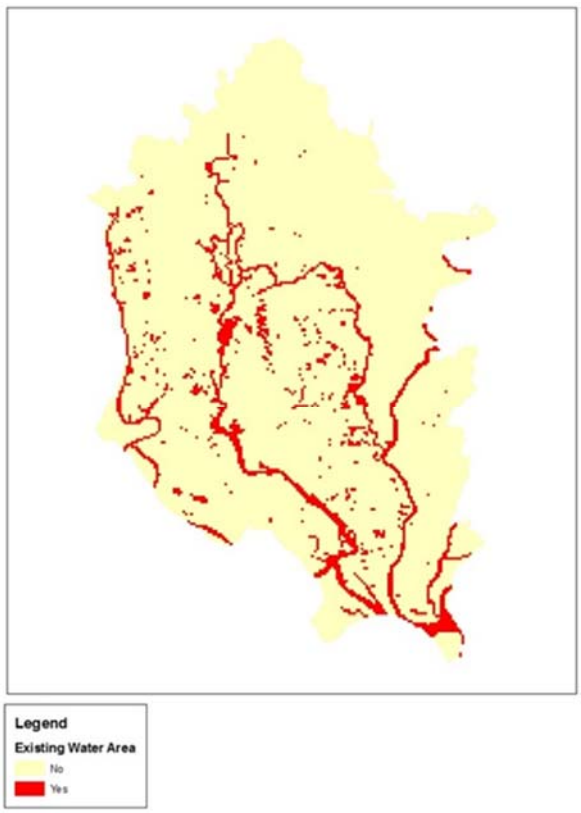
<u>Negative Elements</u>

The negative element for urban development is identified by the following factors.

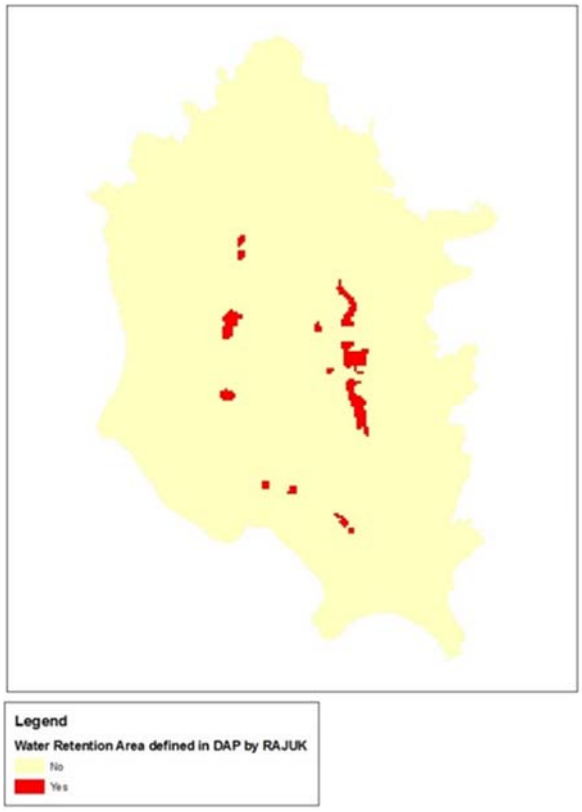
A. Water body in the existing land use map by RAJUK

B. Water Retention Area Defined in DAP by RAJUK

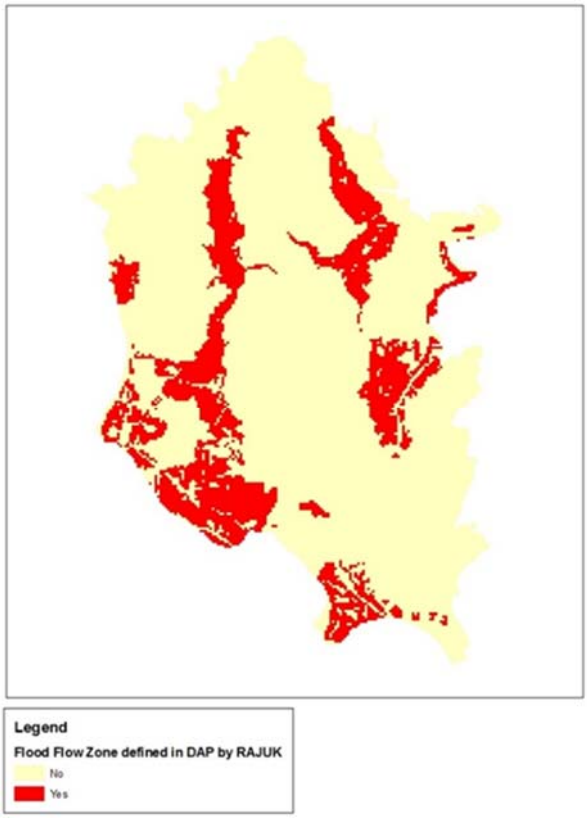
C. Flood Flow Zone Defined in DAP by RAJUK



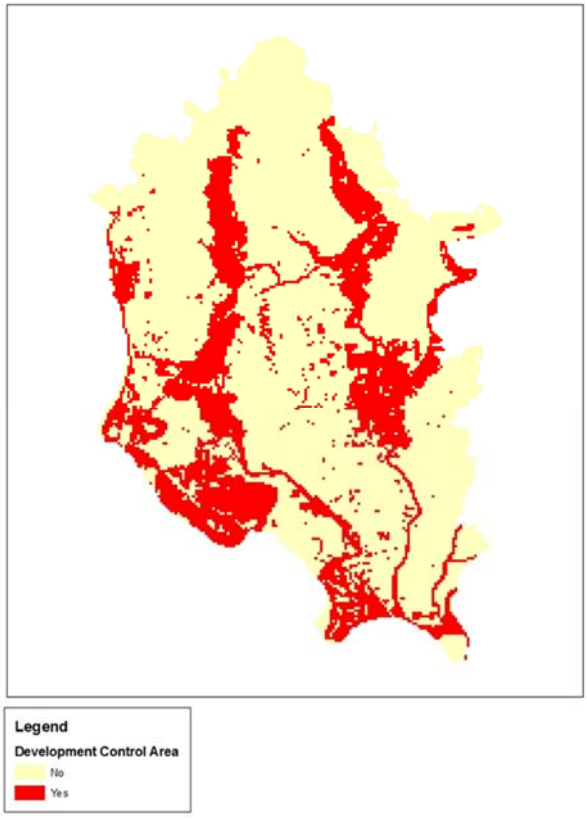

**A Waterbody from Existing Land Use**




**B Water Retention Area Defined in DAP by RAJUK**




**C Flood Flow Zone Defined in DAP by RAJUK**




**Negative (Where any of A or B or C is existing)**

Source: JICA Study Team

**Figure 9.7 Negative Elements**

Positive Elements

The positive element for urban development is identified by the following factors.

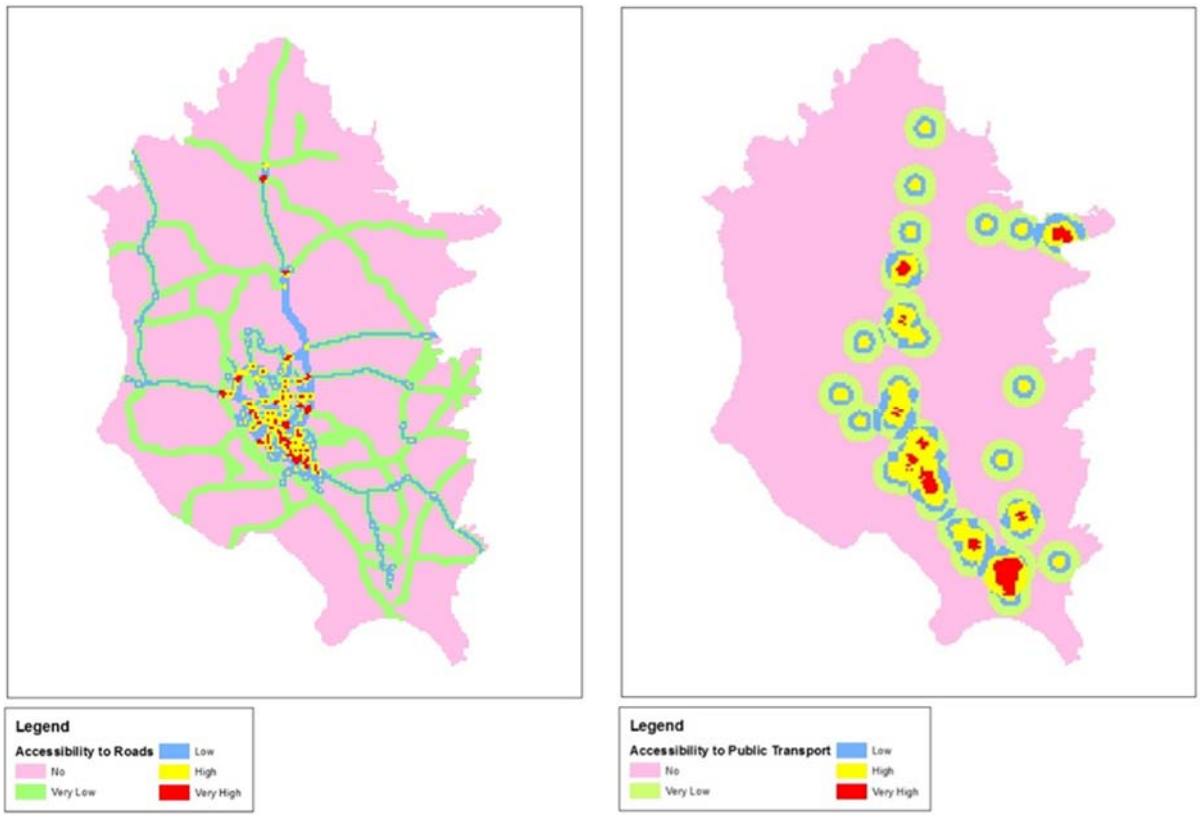
D. Accessibility to Roads

E. Accessibility to Public Transport Modes (Bus Terminal, Ferry Port, Railway Station, Airport)

F. Accessibility to Public Facilities (Administrative Facilities, Educational Facilities, Health Facilities, Religious Facilities, Security Facilities (Police Station, Fire Station))

G. Accessibility to Urban Services (Piped Water Supply, Electricity, Drainage, Sewage, Gas)

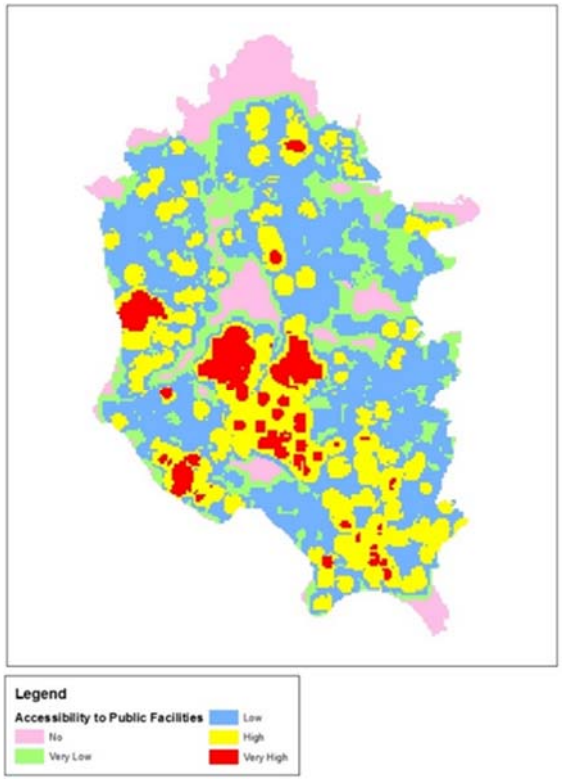
H. Accessibility to People Attraction Areas (Industrial Area, Commercial Area, Recreational Facilities)



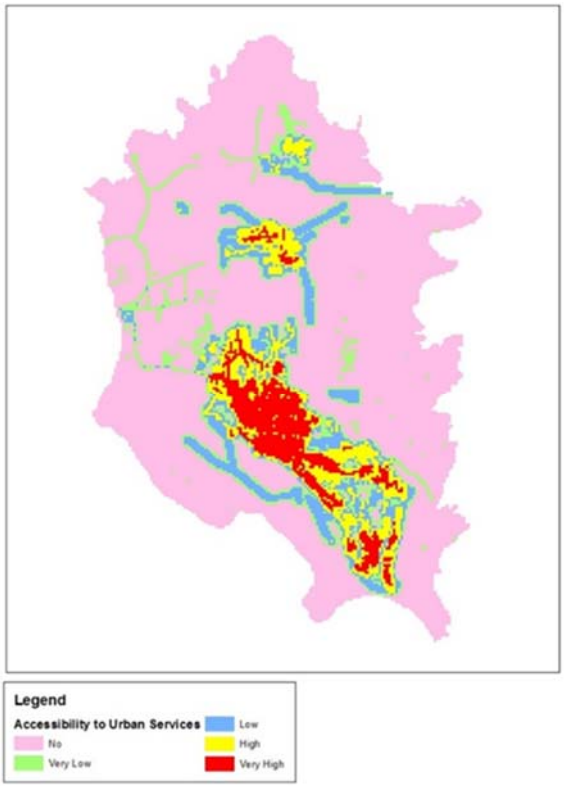

**D Accessibility to Roads** **E Accessibility to Public Transport Modes**

Source: JICA Study Team

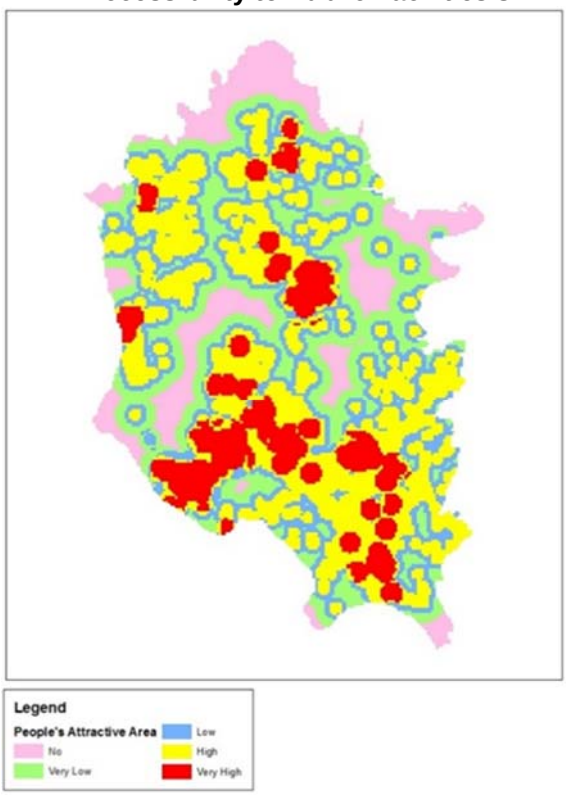
**Figure 9.8 Positive Elements (1)**



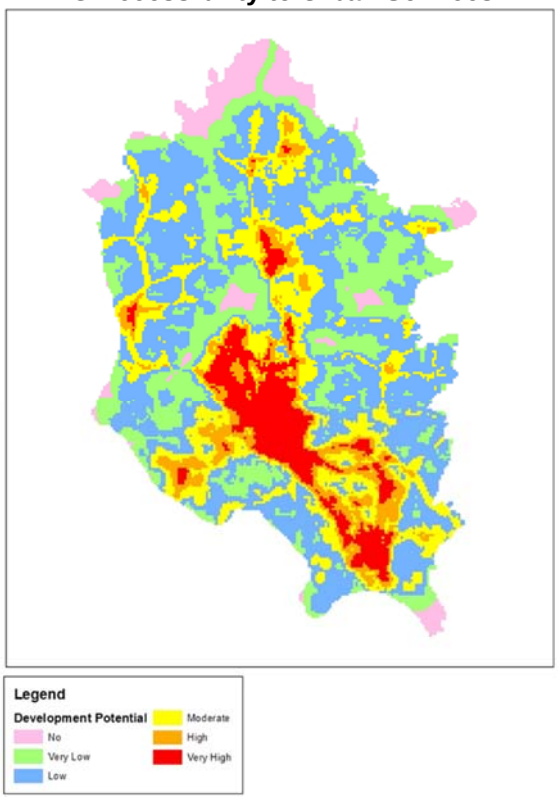

F Accessibility to Public Facilities s




G Accessibility to Urban Services



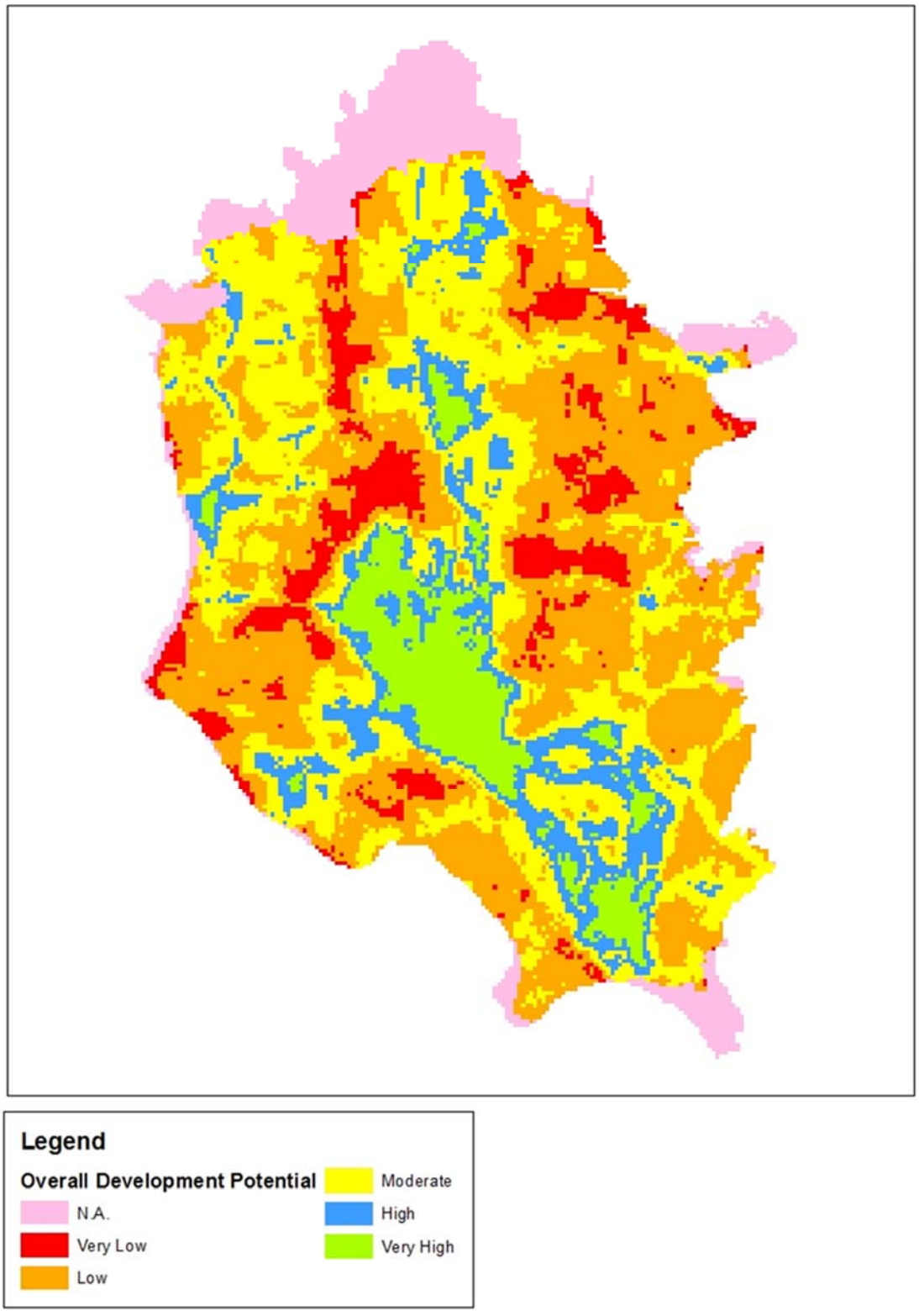

H Accessibility to People Attraction Areas




Positive Elements (Aggregation of D, E, F, G, H)

Source: JICA Study Team

**Figure 9.9 Positive Elements (2)**




**Overall Development Potential ( = Positive – Negative)**

Source: JICA Study Team

**Figure 9.10 Overall Development Potential**

### (6) Socio-Economic Framework

#### 1) Projection of Population

General

Populations increase through natural or social growth. Since data on natural growth rates in the study area are not available, the national average was used to estimate the growth rates in the study area, as shown in Table 9.7.

**Table 9.7 Natural and Social Growth of Population**

| | Population (000 persons) | | Population Growth (%/year) | | |
|---|---|---|---|---|---|
| | 2001 | 2011 | AGR | Natural | Social |
| RAJUK Area | 10,100, | 15,023 | 4.05 | 1.24 | 2.81 |
| Outside RAJUK | 8,061 | 9,381 | 1.53 | 1.24 | 0.29 |
| Total (GDA) | 18,161 | 24,404 | 3.00 | 1.24 | 1.76 |

Source: JICA Study Team

In RAJUK area, the population increase was attributed mostly to migration from other regions. The districts of Dhaka and Gazipur are the areas where most people settled in.

**Table 9.8 Ratio of People Living in their Birthplaces in 2011**

| District | Dhaka | Gazipur | Manikganj | Munishiganj | Narayanganj | Narshingdi |
|---|---|---|---|---|---|---|
| People living same region (%) | 49.2 | 59.1 | 96.3 | 91.3 | 75.8 | 92.0 |

Source: Population Census 2011

Considering the above trend, the future population was projected in three cases as follows:

**Case A:** Half of the potential land for urban development would be developed with the current gross population density (208 person/ha);

**Case B:** New town developments by RAJUK and private developers would be pursued intensively; and,

**Case C:** Considering that the population capacity of RAJUK is around 28 million, the population growth rate of RAJUK would decline sharply as it reaches the capacity. Meanwhile, areas outside RAJUK will attract immigrants more instead of RAJUK area.

Population Projection Case A

Under Case A, RAJUK area's population up to 2030 will increase at an annual growth rate of 3.03% based on UN estimates. After 2030, the UN forecasts the growth rate to decline to 0.64% due to population saturation. Areas outside of RAJUK will grow at the same pace as in 2001-2011 up to 2020. After 2020 they will grow at the same pace of the country. As a result, the population of GDA and RAJUK area will reach at 39.9 million and 27.4 million by 2035, respectively.

**Table 9.9 Future Population Case A**

| | Population (million) | | | | | | AGR (%/year) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | '15–'20 | '20–'25 | '25–'30 | '30–'35 |
| RAJUK | 14.8 | 17.3 | 20.1 | 23.3 | 27.1 | 27.4 | 3.03 | 3.03 | 3.03 | 0.64 |
| Outside | 9.6 | 10.2 | 11.1 | 11.6 | 12.1 | 12.5 | 1.60 | 0.96 | 0.79 | 0.64 |
| Total (GDA) | 24.4 | 27.6 | 31.1 | 34.9 | 39.2 | 39.9 | 2.49 | 2.31 | 2.31 | 0.64 |

Source: JICA Study Team

Population Projection Case B

Under Case B, natural population growth will be the same as the national trend. Migration will decline based on the rate of internal migration, i.e., from rural to urban, during 2004-2011 period as shown in the population census.

**Table 9.10 Rural-to-Urban Migration Rate**

| 1991 | 2004 | 2011 |
|---|---|---|
| 0.562% | 0.479% | 0.429% |

Source: Population Census 2011

As a result, the population in RAJUK area will grow rapidly until 2040, reaching 31 million by 2035. The population of GDA, reflecting the rapid growth of RAJUK area, will be 43.2million, while the population outside RAJUK area will almost be the same as the Case A population. As mentioned earlier, the population of RAJUK area will unlikely reach more than 30 million due to its capacity.

**Table 9.11 Future Population under Case B**

| | Population (million) | | | | | | AGR (%/year) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | '15–'20 | '20–'25 | '25–'30 | '30–'35 |
| RAJUK | 14.8 | 17.3 | 20.6 | 24.0 | 27.6 | 31.3 | 3.50 | 3.16 | 2.82 | 2.52 |
| Outside | 9.6 | 9.6 | 10.3 | 10.9 | 11.4 | 11.9 | 1.37 | 1.19 | 1.00 | 0.84 |
| Total (GDA) | 24.4 | 26.9 | 30.8 | 34.9 | 39.0 | 43.2 | 2.76 | 2.52 | 2.27 | 2.04 |

Source: JICA Study Team

Population Projection Case C

Under Case C, taking into account that the population of RAJUK area will hardly exceed 28 million, the population growth rate of the area will decline sharply as the area reaches its population capacity. Meanwhile, areas outside RAJUK will become alternative places and thus attract immigrants. Based on this, the migration rate of RAJUK area in 2020-2025 will drop to half of its rate during the period 2015-2020, a fourth in 2025-2030, and will be null after 2030. On the other hand, the migration rates outside RAJUK area in 2020-2025 will be double than that of 2015-2020, 1.5 times in 2025-2030, and after 2030 will be the same as that in 2015-2020. As a result, future population under Case C would be similar to Case A; however, the population of RAJUK area will grow slowly compared with Case A.

**Table 9.12 Future Population under Case C**

| | Population (million) | | | | | |
|---|---|---|---|---|---|---|
| | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 |
| RAJUK | 15.0 | 17.4 | 20.2 | 23.2 | 25.1 | 26.3 |
| Outside | 9.4 | 9.5 | 10.6 | 10.7 | 12.0 | 12.2 |
| Total (GDA) | 24.4 | 26.9 | 30.8 | 33.9 | 37.1 | 38.5 |

Source: RSTP Estimate

Population Projection for GDA

To project the population of GDA, the cohort component method was applied to population projection for GDA. In this method, the components of population change including 1) birth rate, 2) survival rate, 3) social growth and 4) male to female ratio are projected separately for each cohort (5-year group). The assumptions for the projection are as follows:

i. Birth rate and survival rate will be the same as that of the national urban area;

ii. Birth rate is set by total fertility rate (TFR) and age specific fertility rate (ASFR). The TFR will decline up to the time the target of Vision21 (TFR=1.7) is achieved. The ASFR will constantly decline with the same pace as that of the TFR;

iii. Survival rate is set by infant mortality rate and age specific death rate. Those rates are set so as to improve the conditions to enable to achieve the target of Vision 21 and will continue with the same pace from 2011- 2021;

iv. Social growth from 2001 to 2011 was estimated by cohort component method that the future social growth will continue at the same pace during the 2001-2011 periods; and Male-to-female ratio is set at 50%.

Based on the above assumptions, the future population of GDA is estimated to reach 38.9 million by 2035.

**Table 9.13 Future Population of GDA**

| | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|
| Population (mil.) | 26.0 | 29.2 | 32.4 | 35.6 | 38.9 |

Source: JICA Study Team
Note: the population is based on the unadjusted population

The adjusted population shown above is the total population of both genders, while the cohort analysis is based on unadjusted population. The other estimates were based on the adjusted population. The result is adjusted to conform to other estimates.

**Table 9.14 Future Adjusted Population of GDA**

| | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|
| Population (mil.) | 27.1 | 30.4 | 33.7 | 37.0 | 40.4 |

Source: JICA Study Team

Future Population 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 differs 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 9.15 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 9.16 Selected Future Population Framework**

(unit: million persons)

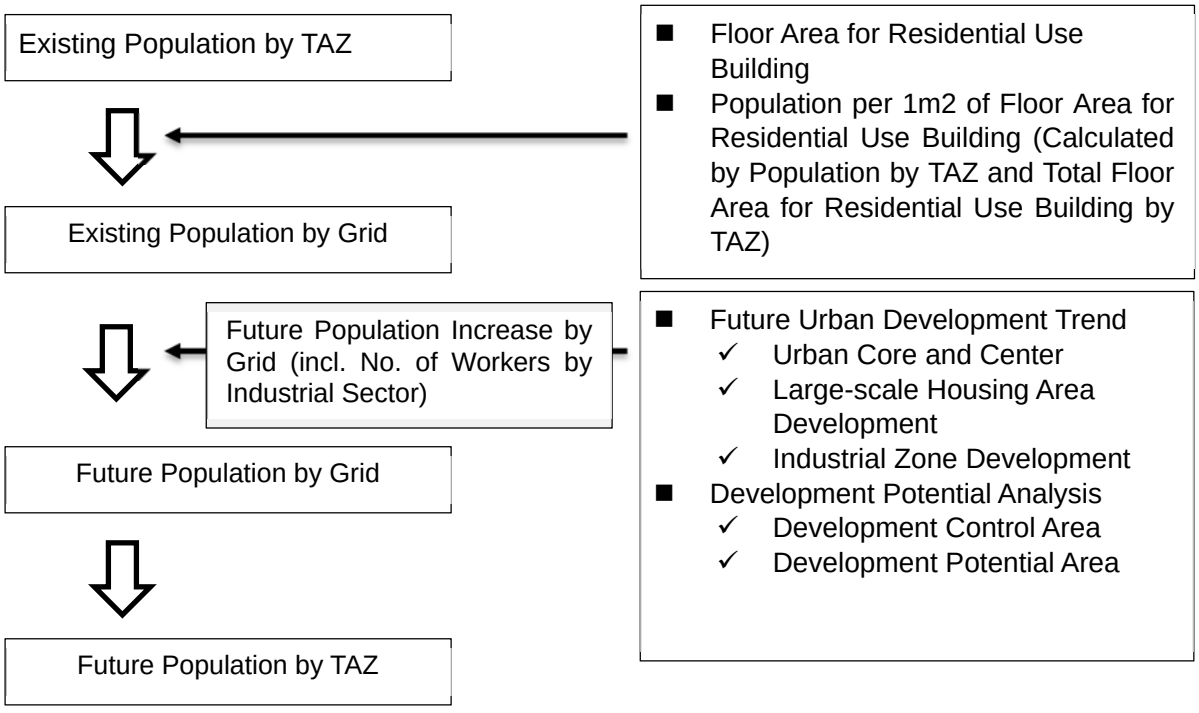
| | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|
| RAJUK Area | 20.2 | 23.2 | 25.1 | 26.3 |
| Outside Area | 10.6 | 10.7 | 12.0 | 12.2 |
| Total (GDA ) | 30.8 | 33.9 | 37.1 | 38.5 |

Source: RSTP Estimate

Methodology of Population Breakdown to Traffic Analysis Zones

The estimation of future population by TAZ based on administrative zone is not enough to express the real situation of population distribution along the proposed transport network because of the average population density in the large area zone. It is difficult to identify the station's location and its buffer zone while population is concentrated. However, a grid analysis is suitable for the analysis of future population distribution for demand forecast and for the assessment of hazards and accessibilities to urban facilities. The grid system prepared for this analysis contains the information of the geographical characteristics, the disaster hazard levels, and the accessibility to transport/public facilities and so with the urban services in the form of the scores. Moreover, an analysis of development control and potential areas can be conducted using the scores in the grids.

The work flow to calculate the future population by TAZ using this grid system is shown in Figure 9.11. At first, based on the existing population by TAZ, existing population by grid is estimated by using the floor area for residential use building and an indicator of population per 1m2 of floor area for residential use building by TAZ. Then, based on the estimated population by grid, future population by grid is estimated according to the future urban development trend and development potential analysis. Finally, the future population by grid is aggregated to future population by TAZ.



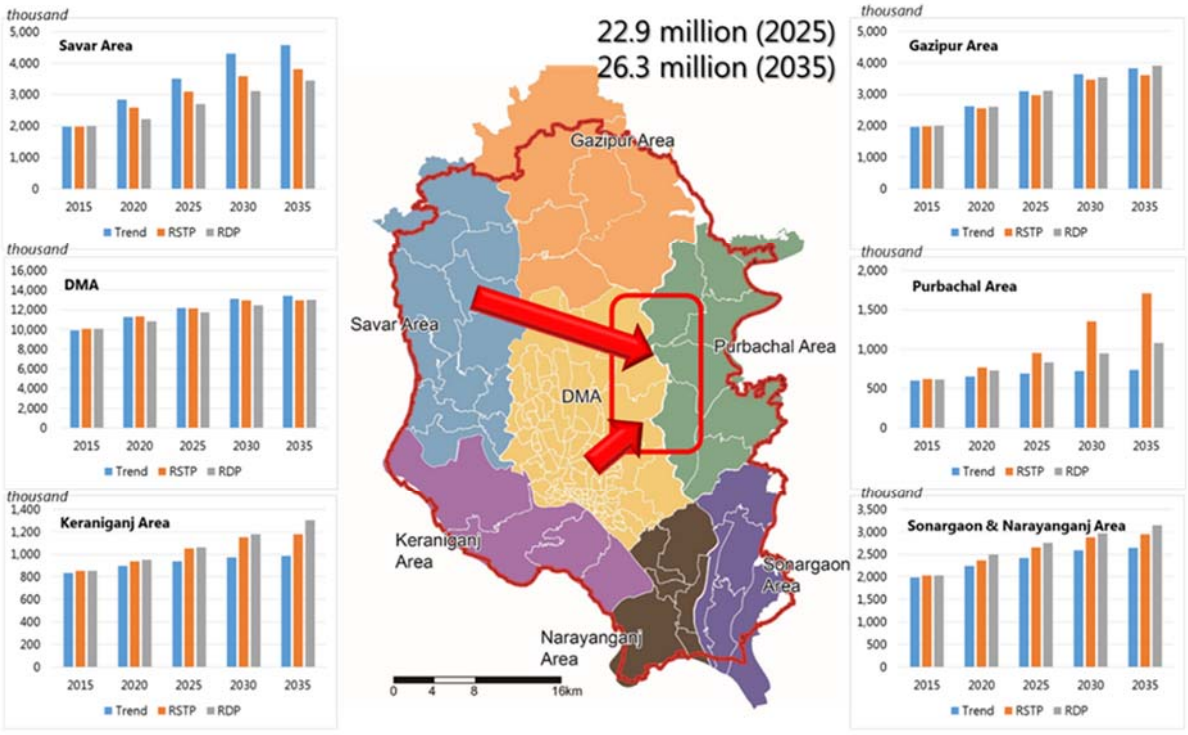

Source: JICA Study Team

**Figure 9.11 Work Flow for Calculation of Future Population by Zone**

**Table 9.17 Summary of Forecast Population**

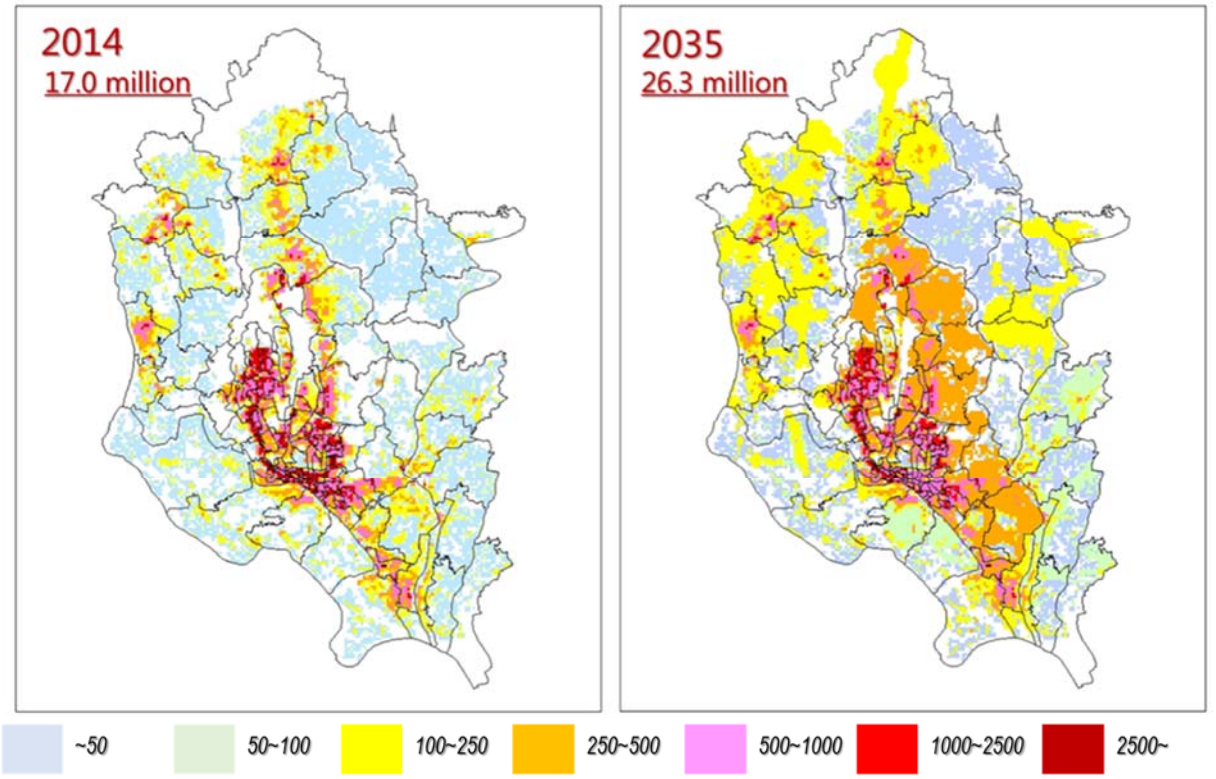
| | | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|
| DMA | Trend | 9,934 | 11,310 | 12,217 | 13,143 | 13,434 |
| | RSTP | 10,050 | 11,361 | 12,149 | 12,948 | 12,959 |
| | RDP | 10,066 | 10,834 | 11,756 | 12,461 | 13,046 |
| Gazipur | Trend | 1,969 | 2,617 | 3,100 | 3,642 | 3,824 |
| | 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




Source: JICA Study Team

**Figure 9.12 Population by Area**

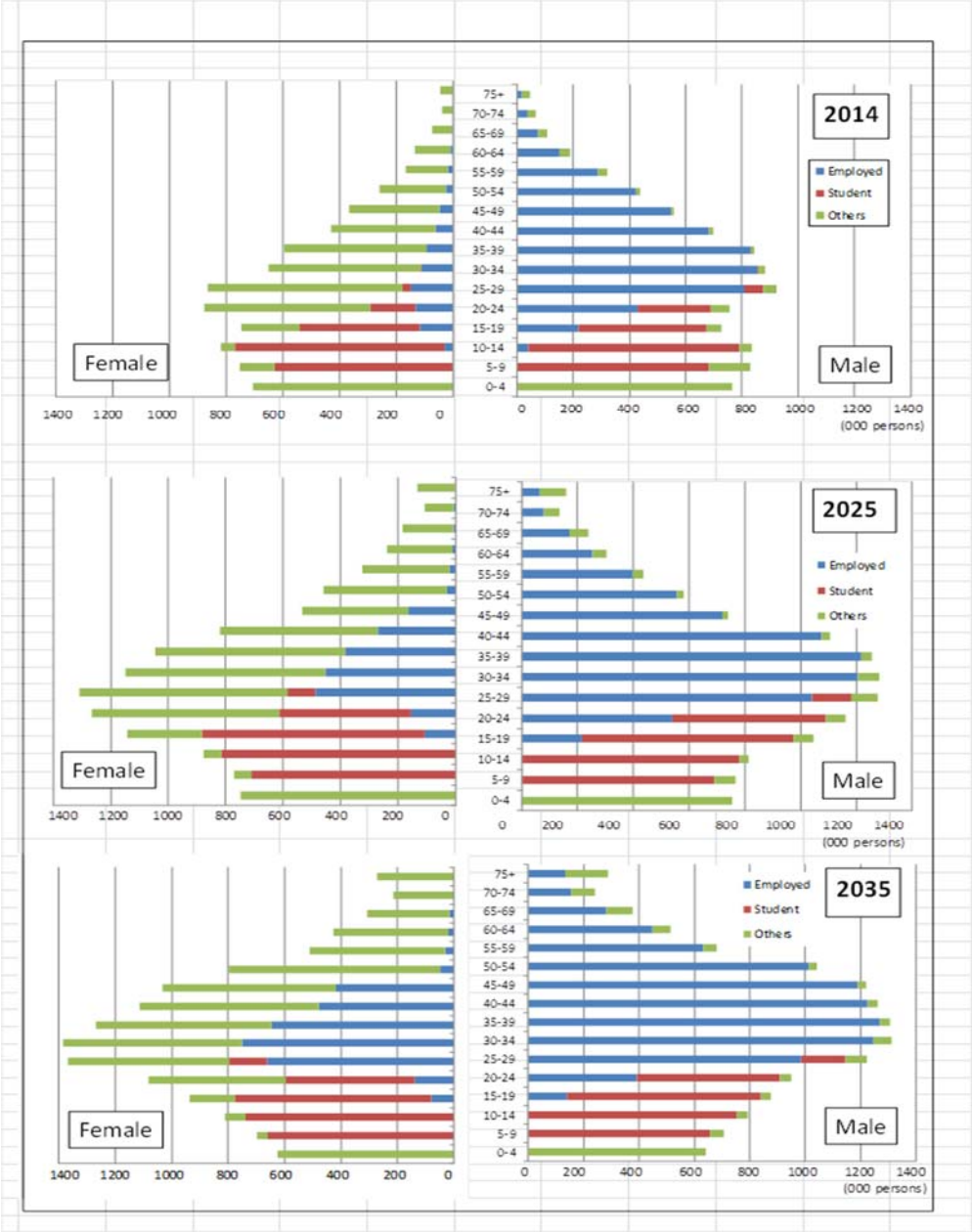



Source: JICA Study Team

**Figure 9.13 Population Density in RAJUK Area**

Population by Social and Economic Status

Population in RAJUK has been projected by sex and 5 year age group for future years. Population by socio-economic status such as employed, students, housewife, retired and unemployed were estimated taking school enrolment ratio and labor force participation rate for male and female into consideration as depicted in Figure 9.14.




Source: RSTP Estimate

**Figure 9.14 Population by Socio-Economic Status in 2014, 2025 and 2035**

These diagrams indicate the increase of school enrolment at higher education and increasing labor force participation of female population.

### 2) Employed Population by Industrial Sector

Employed population by industrial sector in 2014, 2025 and 2035 was estimated as shown in Table 9.18. In RAJUK, employed population in primary sector composed 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 9.18 Employed Population by Industrial Sector: 2014, 2025 and 2035.**

Unit: 000 persons

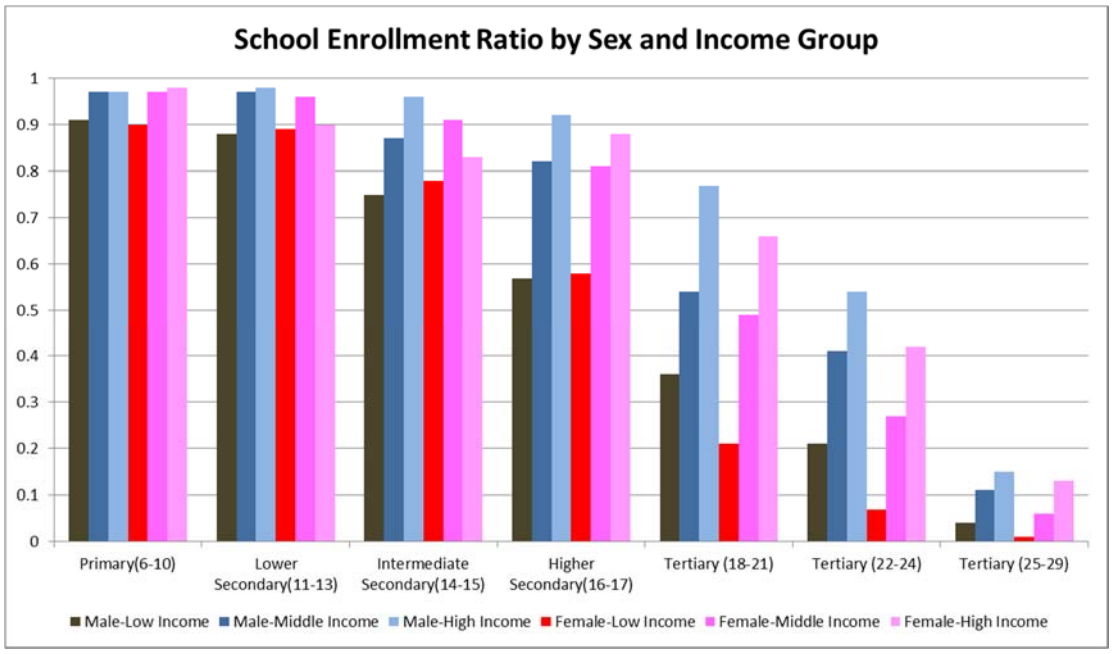
| Sector | 2014 | 2025 | 2035 |
|---|---|---|---|
| Primary | 150 | 130 | 120 |
| Secondary | 1,980 | 3,340 | 3,900 |
| Tertiary | 4,060 | 6,130 | 8,180 |
| Total | 6,190 | 9,600 | 12,200 |

Source: RSTP Estimate

### 3) Number of Students and Pupils by Grade of Education

School enrolment rates vary according to the grade of education, sex and income level as illustrated in Figure 9.15.

In RAJUK area, more than 90 percent of children go to primary school although school enrolment rate of low income group indicate lower enrolment rate. Income factor affect school enrolment when they are at higher secondary school or in tertiary education level. School enrolment of female is lower when they are in tertiary education but in secondary education level, female school enrolment rate is slightly higher than those of males.




Source: RSTP Household Interview Survey, 2014

**Figure 9.15 School Enrollment Ratio by Sex and Income Group**

Number of students and pupils has been estimated based on 5-year age group population and school enrolment rate for male and female by income group. As indicated in Table 9.19, the number of students would increase from 2015 to 2025; however, the number would decrease from 2025 to 2035 due to reduction of young generation population.

**Table 9.19 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 |

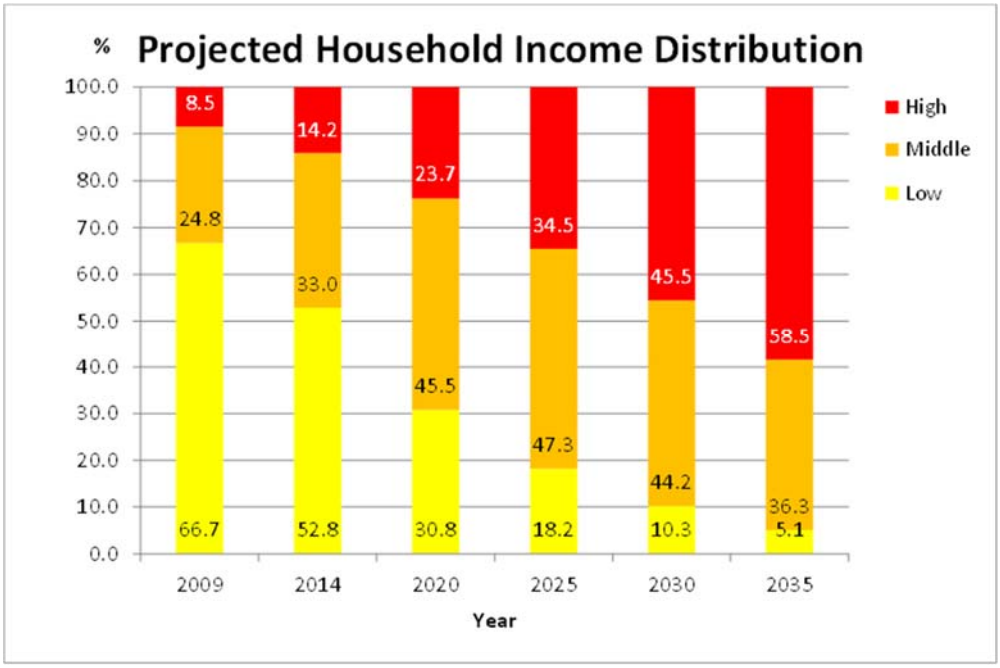
Source: RSTP Estimate

### 4) 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.

### 5) 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 as illustrated in Figure 9.20. 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 9.16 Estimated Composition of Income Groups**

### (7) Spatial Distribution of Population and Employment

#### 1) Employed Population by Industrial Sector

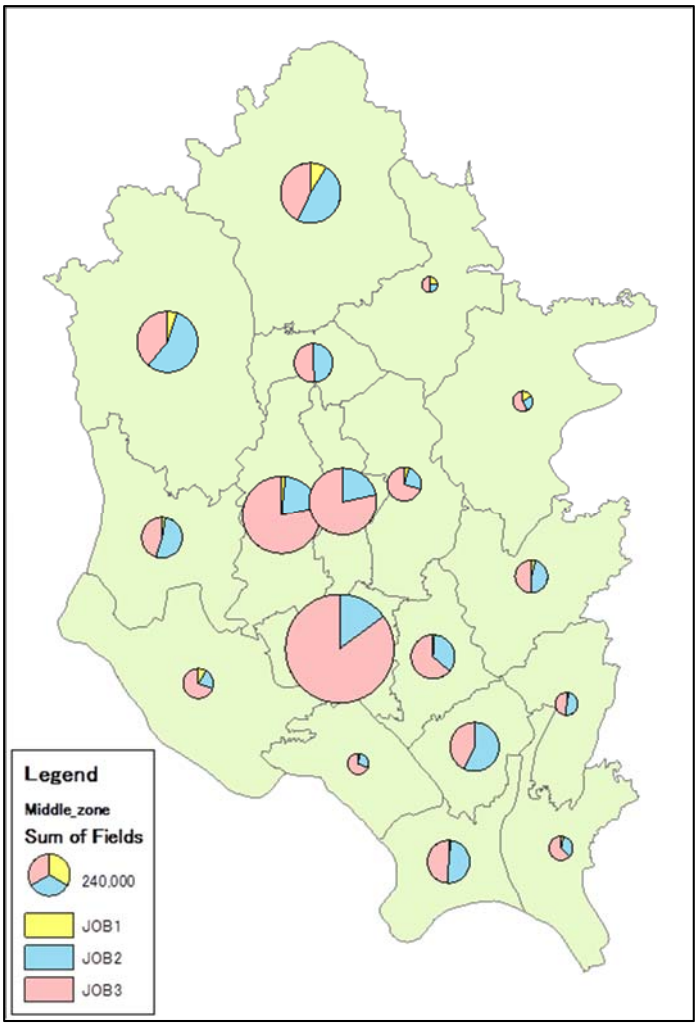
Majority of employed population belongs to tertiary sector which includes commercial industry and service industry. More than 75 percent of jobs consist of tertiary sector in urban area as depicted in Figure 9.17. Employed population in secondary industry are seen in suburban areas such as Savar, Ashulia, Gazipur and Narayanganj.

Distribution of employed population in secondary sector has been estimated as follows;

- Employed population in secondary sector has been allocated at planned specialized centers
- Manufacturing factory would be located in suburban areas along the major arterial roads such as Middle Ring Road.

Distribution of employed population in tertiary sector has been estimated as follows;

- Two thirds of service industry jobs are regarded as population-serving jobs.
- The remaining jobs in tertiary industry go for basic industry and they would work at regional centers as well and sub-regional centers as proposed in DSP.




Source: RSTP Household Interview Survey 2014

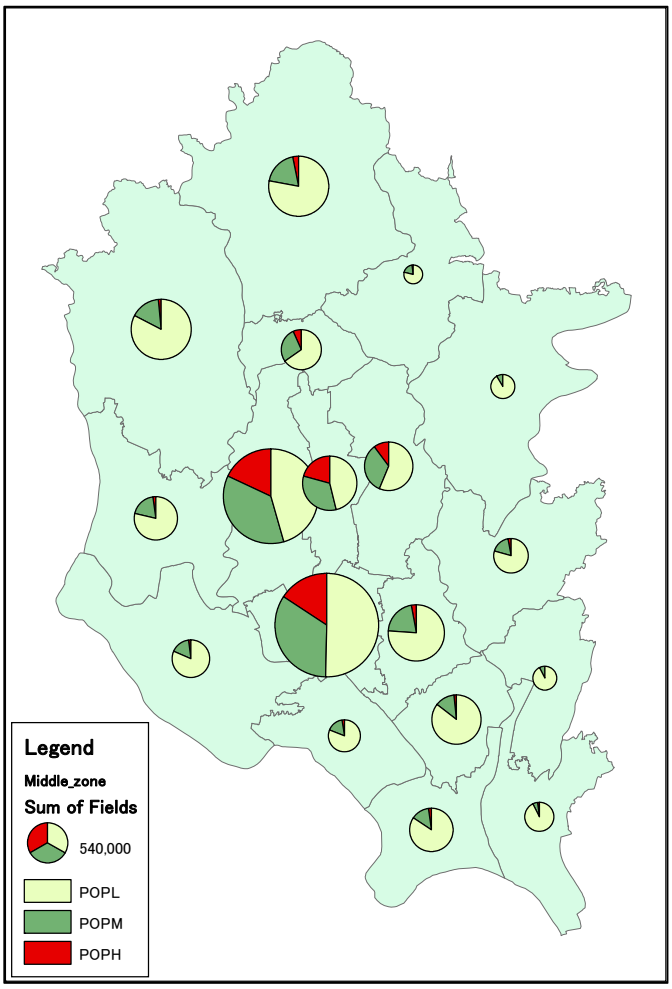
**Figure 9.17 Spatial Distribution of Employed Population by Industrial Sector 2014**

### 2) Number of Students and Pupils

The locations of primary/secondary schools in principle are close to residence; therefore, the number of pupils at primary/secondary schools is the same as those pupils at residence. The number of students at tertiary education such as universities is assumed to be the same as the present location. Some additional schools are assumed to be built in sub-regional centers.

### 3) Population Distribution by Income Level

The distribution of population by income level in 2014 is illustrated in Figure 9.18. This figure indicates that high income households are located in the central area of Dhaka. In suburban area, 80 percent of households are low income households.




Source: RSTP Household Interview Survey 2014

**Figure 9.18 Spatial Distribution of Population by Income Level 2014**

The household composition by income level has been estimated based on the present household income composition obtained from RSTP Household Interview Survey and growth of income has been estimated for the existing urban area. In the newly developed area, household income composition of the existing well-developed area has been applied.

## 9.3 Regional Structure

### (1) General

Considering the rapid urbanization of RAJUK area, the urban issues in RAJUK will not be solved within the area in the near future. Therefore, it is advisable to prepare a plan for a wider area, i.e., the Greater Dhaka Area (GDA). The same concept of developing urban centers and corridors can be applied for GDA. In RAJUK area, due to existing traffic congestion, introducing mass transit system along urban corridors is essential. On the other hand, at GDA level, developing the road network to include expressways is needed.

### (2) Possible Scenario for the Regional Structure of GDA

#### 1) Urbanization

The intensive urban developments at peripheral areas of DCC in recent years will absorb a lot of population to form a conurbation with DCC. However, it will bring various types of critical issues in urban activities as well as the urban environment simultaneously. Anyhow, RAJUK area will become almost urbanized everywhere. As Gazipur and Kaliacoir showed already, rapid urbanization happens even at the cities located more than 20km from the center of DCC in future.

a) Within a 10-km radius from the central area of DCC: The area will almost be fully developed to form a conurbation including Purbachal. At present, the population of DCC (North and South) is 7 million, and the future population of the area will be around 12－14 million.

b) 10km–20km: The area within a 20-km radius has almost the same size as RAJUK area and will be urbanized in most parts including Savar and the part of Gazipur and Narayanganj. The area from Gazipur to Narayanganj will be a conurbation.

#### 2) Polar Cities

In order to ease the urban problems derived from the intensive concentration of population and urban functions in an expanded Dhaka conurbation, there is a need to develop cities with job opportunities as well as functions for managing and servicing surrounding areas.

a) In between 10-20km radius, there are growing cities to be known not only as bedroom suburbs but also an employment centers. These cities are Narayanganj, Gazipur, and Savar; Purbachal will soon become one too. If more urban functions will be added, those cities will shoulder some of the burden concentrated in the central area as the sub-center of Dhaka agglomeration.

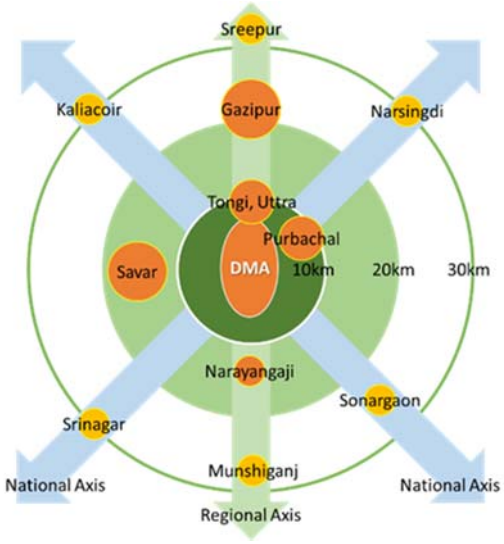
c) If properly developed, cities located around 30 km from the central area can become regional centers, sharing functions necessary to the metropolitan area.

d) Outside of RAJUK area, low-population settlements are located in every direction but are densely distributed in the north-west part of GDA. The area has also the potential for attracting factories, which will enhance urbanization through changing settlements with higher population density. Among these areas there will be the growth centers.

#### 3) Transport Axis

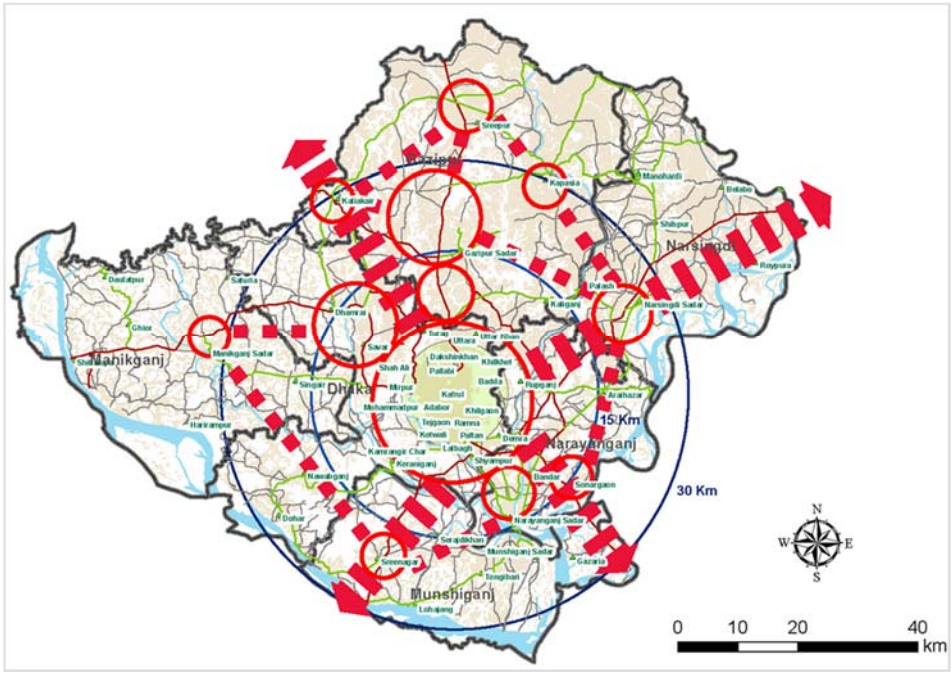
There are two major axes in the context of international and national network, i.e., Sirajganj–Comila–Chittagong and Jessore–Padma Bridge–Sylhet. These axes will support the growth of cities. In this region there is the regional axis from the north to the south passing through Gazipur and Narayanganj. At this moment the

urbanization is found along this axis, however the development potential will depend on the improvement of transport systems coping with the increasing demand. And it will be indispensable to improve regional network connecting not only connecting the central area and the suburbs but cities in GDA, especially connecting polar cities.




Source: JICA Study Team

**Figure 9.19 Future Regional Structure of GDA**



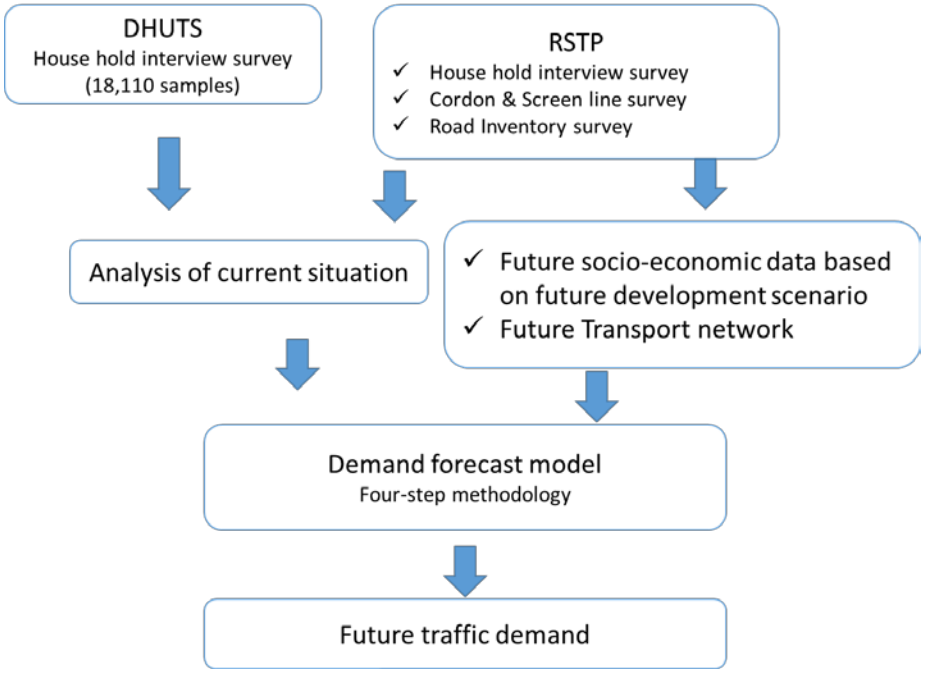

Source: JICA Study Team

**Figure 9.20 Preliminary Concept of Spatial Structure of GDA**

# 10. TRAFFIC DEMAND FORECAST

## 10.1 Methodology of Traffic Demand Forecast

The traffic demand forecast model for Dhaka was designed based on the result of the Household Interview Survey (HIS) conducted by DHUTS and the traffic survey results conducted by RSTP which includes the HIS, the Cordon and the Screen Line Survey and the Road Inventory Survey. As shown in Figure 11.1, the current traffic demand characteristics were analyzed based on the results of the aforementioned surveys and through these, the demand forecast model is developed along with the input data from the future socio-economic data based on the future development scenario and the future transport network. Consequently, future traffic demand can be formulated as an output of demand forecast model as shown in below study flow.




Source: JICA Study Team

**Figure 10.1 Flow of Traffic Demand Forecast**

## 10.2 Current Traffic Demand Characteristics

In this section, the current traffic demand characteristics will be shown based on the HISs.

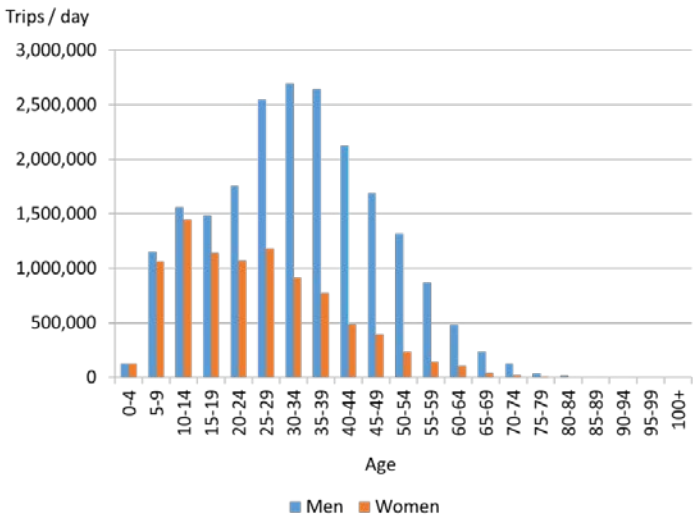
### (1) Number of Daily Trips and Trip Rate by Gender and Age Group

Table 11.1 and Figure 11.2 shows the number of daily production trips and trip rates as per gender and age group which accordingly indicates that 20.9 million trips from man and 9.1 million trips from woman are generated per day within the study area while trip rates of man and woman are 2.26 and 1.18 respectively. The main factor of the gender's rate difference, which is almost halfway is that women of Dhaka, in their own unique traits, generally prefer not to go out.

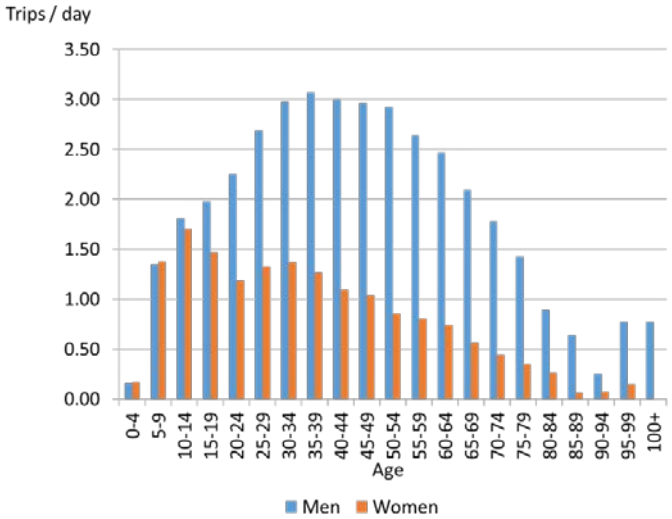
**Table 10.1 No. of Trips and Trip Rate by Gender and Age Group**

| Age | No. of Trips (trip/ day) | | Trip Rate (trip/person) | |
|---|---|---|---|---|
| | Men | Women | Men | Women |
| 0-4 | 123,792 | 122,252 | 0.16 | 0.17 |
| 5-9 | 1,152,669 | 1,060,255 | 1.35 | 1.37 |
| 10-14 | 1,562,769 | 1,441,682 | 1.81 | 1.70 |
| 15-19 | 1,483,891 | 1,140,635 | 1.98 | 1.47 |
| 20-24 | 1,756,339 | 1,066,495 | 2.25 | 1.19 |
| 25-29 | 2,546,950 | 1,179,925 | 2.69 | 1.33 |
| 30-34 | 2,695,034 | 916,641 | 2.98 | 1.37 |
| 35-39 | 2,642,783 | 776,310 | 3.07 | 1.27 |
| 40-44 | 2,122,619 | 487,580 | 3.00 | 1.09 |
| 45-49 | 1,686,280 | 395,014 | 2.97 | 1.04 |
| 50-54 | 1,315,869 | 231,498 | 2.92 | 0.86 |
| 55-59 | 867,923 | 141,419 | 2.64 | 0.81 |
| 60-64 | 482,929 | 104,353 | 2.47 | 0.74 |
| 65-69 | 234,160 | 43,710 | 2.09 | 0.57 |
| 70-74 | 125,213 | 18,980 | 1.78 | 0.44 |
| 75-79 | 39,037 | 6,945 | 1.43 | 0.35 |
| 80-84 | 10,821 | 3,513 | 0.89 | 0.26 |
| 85-89 | 3,183 | 273 | 0.64 | 0.06 |
| 90-94 | 438 | 437 | 0.25 | 0.08 |
| 95-99 | 630 | 431 | 0.77 | 0.15 |
| 100+ | 1,140 | 0 | 0.77 | 0.00 |
| Total | 20,854,469 | 9,138,347 | 2.26 | 1.18 |

Source: JICA Study Team




No. of Trips by Gender and Age Group




Trip Rate by Gender and Age Group

Source: JICA Study Team

**Figure 10.2 No. of Trips and Trip Rate by Gender and Age Group**

### (2) Number of Production Trips and Trip Rate by Household Income

The number of production trips and trip rate as per household income as shown in Table 11.2 and Figure 11.3 indicates that trip rate of high income group is higher than lower income group. These results correspond to the group's lifestyles and business activities as those with high income produces more business trips, shopping trips etc.

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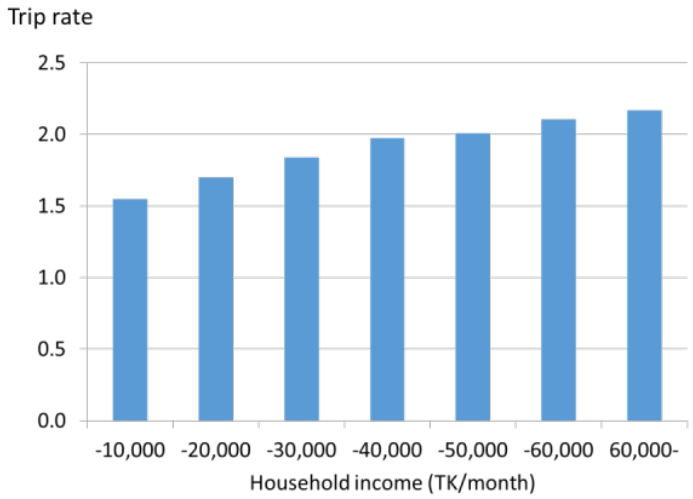
**Table 10.2 Number of Trips and Trip Rate by Household Income**

| Household Income | No. of Persons | No. of Trips | Trip Rate |
|---|---|---|---|
| -10,000 | 4,385,230 | 6,790,764 | 1.5 |
| -20,000 | 6,425,757 | 10,926,274 | 1.7 |
| -30,000 | 2,543,249 | 4,675,755 | 1.8 |
| -40,000 | 1,108,730 | 2,187,447 | 2.0 |
| -50,000 | 637,617 | 1,279,353 | 2.0 |
| -60,000 | 441,094 | 927,568 | 2.1 |
| 60,000- | 1,157,875 | 2,510,857 | 2.2 |

Source: JICA Study Team




Source: JICA Study Team

**Figure 10.3 Number of Trips and Trip Rate by Household Income**

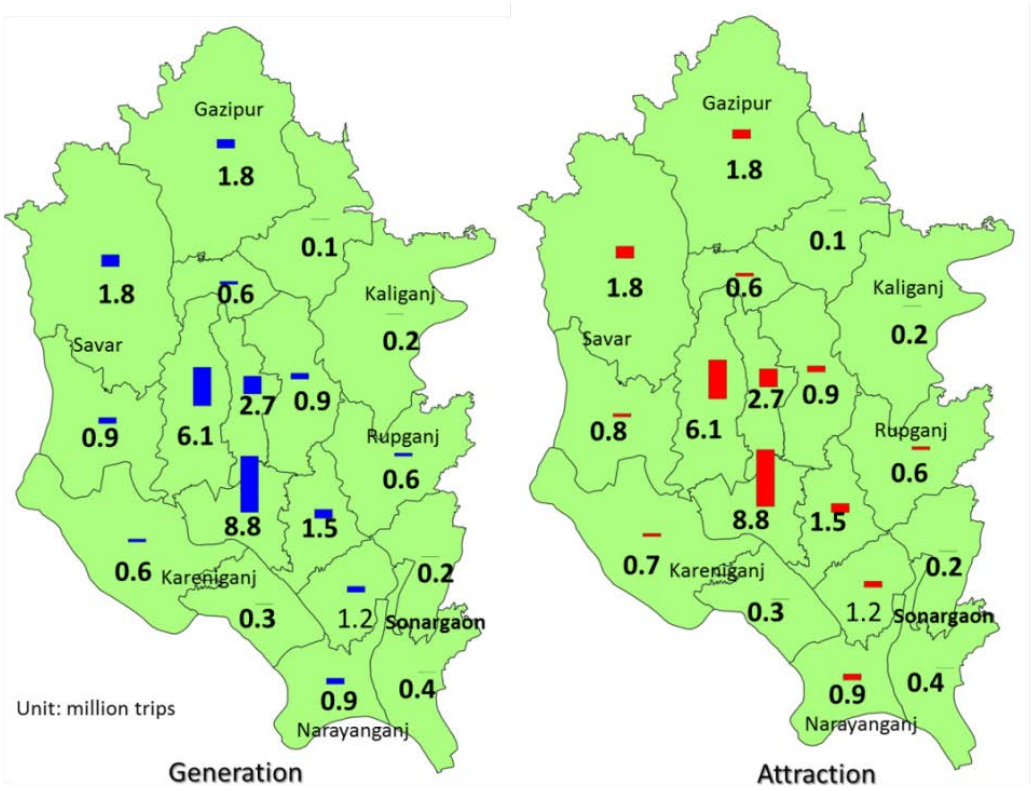
### (3) Number of Generation and Attraction Trips by Area

Number of Generation and Attraction Trips by area as shown in Table 11.3 and Figure 11.4 indicates that in Dhaka area, South Dhaka which includes Old Dhaka and West Dhaka which includes Mirpur are the busiest area with daily generation/attraction trips of 8,763,834/8,785,059 trips and 6,107,144/6,111,365 respectively. This is followed by Gulshan area with generation/attraction trips of 2,744,676/2,737,625 trips per day. While outside of DMA, Gazipur and North Savar generate and attract huge trips of 1,751,735/1,753,703 and 1,831,507/1,833,950 trips per day.

**Table 10.3 Number of Generation and Attraction Trips by Area**

| Area | | Generation (Trips/day) | Attraction (Trips/day) |
|---|---|---|---|
| 1 | South Dhaka | 8,763,834 | 8,785,059 |
| 2 | West Dhaka | 6,107,144 | 6,111,365 |
| 3 | Airport, Gulshan | 2,744,676 | 2,737,625 |
| 4 | East Dhaka | 921,062 | 895,423 |
| 5 | South East Dhaka | 1,503,671 | 1,504,896 |
| 6 | Tongi | 800,058 | 799,883 |
| 7 | Gagipur | 1,751,735 | 1,753,703 |
| 8 | East Gazipur | 128,708 | 128,902 |
| 9 | Kaliganj | 225,521 | 225,872 |
| 10 | Rupganji | 573,109 | 573,569 |
| 11 | North Sonargaon | 249,079 | 250,066 |
| 12 | South Sonargaon | 356,433 | 356,309 |
| 13 | North Narayanganj | 1,162,379 | 1,163,787 |
| 14 | South Narayanganj | 933,591 | 936,115 |
| 15 | South kareniganj | 341,589 | 341,047 |
| 16 | North Kareniganj | 632,067 | 671,125 |
| 17 | South Savar | 881,353 | 839,546 |
| 18 | North Savar | 1,831,507 | 1,833,950 |

Source: JICA Study Team




Source: JICA Study Team

**Figure 10.4 Number of Generation and Attraction Trips by Area**

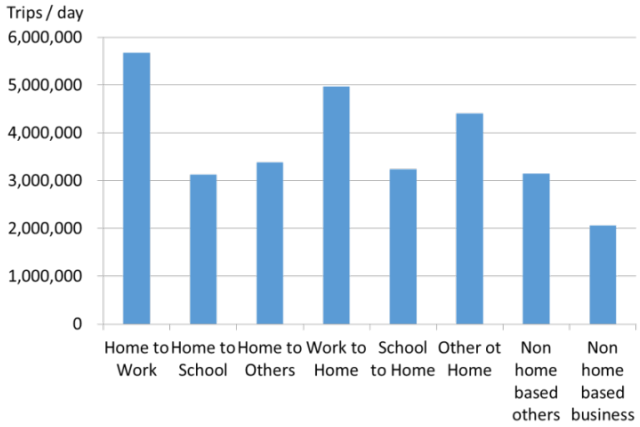
### (4) Number of Trips by Purpose by Age Group

Trips by purpose by age group as shown in Table 11.4, Figure 11.5 and Figure 11.6 indicates that purposes of “Home to Work” trip and “Work to Home” trip generate the highest trip while “Home to School” and “School to Home” trips account for the major purpose of young age groups. “Home to Work” trip and “Work to Home” trip increases by the age group of 20’s to 50’s while it decreases at age group of over 60’s as “Home to Other” trip and “Other to Home” trip increases.

**Table 10.4 Number of Trips by Purpose by Age Group**

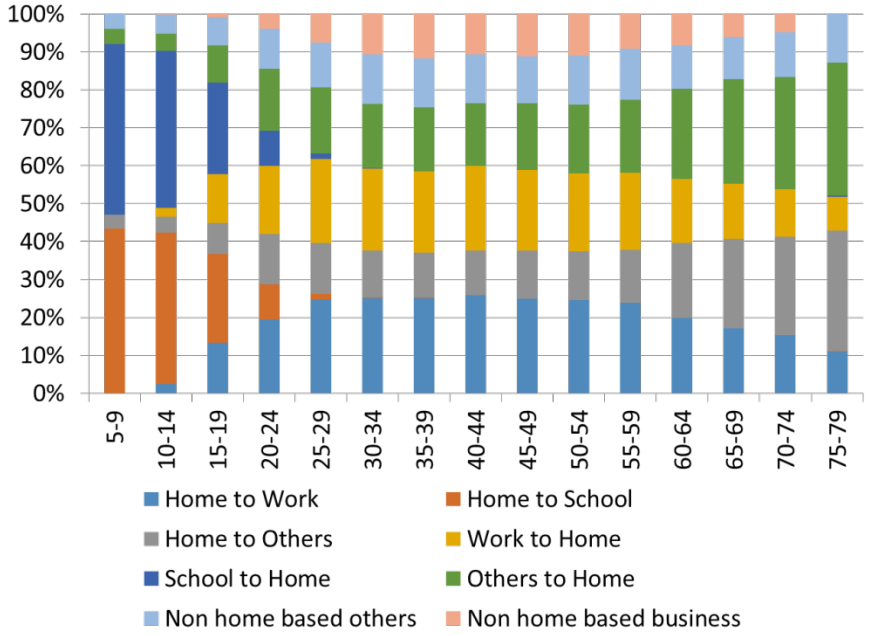
| Age | Home to Work | Home to School | Home to Others | Work to Home | School to Home | Others to Home | Non home based others | Non home based business |
|---|---|---|---|---|---|---|---|---|
| 0-4 | 3,856 | 26,194 | 83,868 | 3,008 | 27,570 | 85,730 | 11,868 | 3,950 |
| 5-9 | 634 | 960,869 | 80,127 | 714 | 997,111 | 84,343 | 88,699 | 427 |
| 10-14 | 71,180 | 1,200,826 | 124,372 | 70,392 | 1,247,638 | 134,434 | 150,215 | 5,392 |
| 15-19 | 351,657 | 611,944 | 214,826 | 336,292 | 636,945 | 253,803 | 194,561 | 24,499 |
| 20-24 | 551,217 | 261,229 | 370,305 | 509,202 | 263,460 | 458,950 | 299,521 | 108,950 |
| 25-29 | 919,760 | 53,740 | 504,181 | 824,780 | 53,631 | 649,537 | 438,417 | 282,829 |
| 30-34 | 909,218 | 6,256 | 443,815 | 780,845 | 7,184 | 608,248 | 472,280 | 383,829 |
| 35-39 | 859,751 | 2,179 | 408,358 | 729,078 | 2,436 | 573,362 | 443,759 | 400,171 |
| 40-44 | 673,917 | | 308,073 | 584,746 | | 431,295 | 333,479 | 278,689 |
| 45-49 | 517,781 | 338 | 265,845 | 440,175 | 338 | 366,966 | 256,217 | 233,634 |
| 50-54 | 380,565 | | 198,080 | 318,139 | | 281,009 | 198,420 | 171,154 |
| 55-59 | 240,488 | | 141,446 | 204,882 | | 193,805 | 136,206 | 92,515 |
| 60-64 | 116,826 | | 115,518 | 99,819 | | 139,756 | 66,212 | 49,151 |
| 65-69 | 47,684 | | 65,201 | 40,500 | | 76,711 | 30,720 | 17,055 |
| 70-74 | 21,946 | | 37,441 | 18,211 | | 42,709 | 16,906 | 6,980 |
| 75-79 | 5,026 | 116 | 14,620 | 4,078 | 116 | 16,162 | 5,864 | |
| 80-84 | 837 | 304 | 5,983 | 1,134 | 304 | 5,285 | 487 | |
| 85-89 | 368 | | 1,284 | 368 | | 1,342 | 95 | |
| 90-94 | | | 465 | | | 410 | | |
| 95-99 | | 315 | 90 | | 315 | 185 | 156 | |
| 100+ | 275 | | 295 | 275 | | 295 | | |

Source: JICA Study Team




Source: JICA Study Team

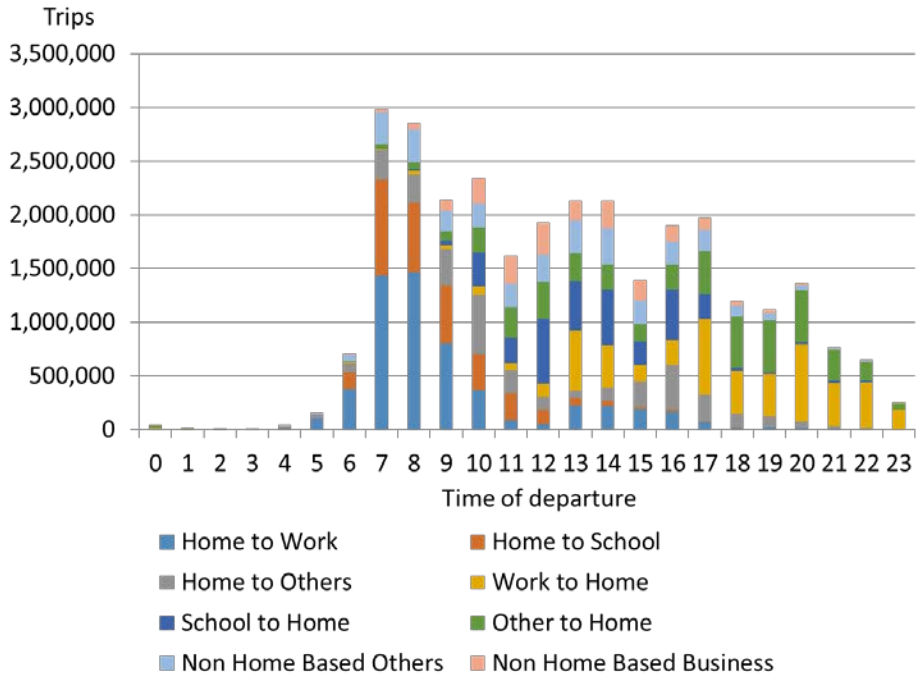
**Figure 10.5 Number of Trips by Purpose**




Source: JICA Study Team

**Figure 10.6 Rate of Trips by Purpose by Age Group**

### (5) Number of Trips by Purpose by Time of Departure




Source: JICA Study Team

**Figure 10.7 Number of Trips by Purpose by Time of Departure**

**Table 10.5 Number of Trips by Purpose by Time of Departure**

| Time | Home to Work | Home to School | Home to Others | Work to Home | School to Home | Other to Home | Non Home Based Others | Non Home Based Business |
|---|---|---|---|---|---|---|---|---|
| 0 | 286 | 0 | 371 | 18,836 | 1,072 | 15,012 | 1,390 | 221 |
| 1 | 336 | 0 | 187 | 6,292 | 466 | 2,586 | 745 | 206 |
| 2 | 491 | 0 | 0 | 2,690 | 1,453 | 619 | 0 | 0 |
| 3 | 3,184 | 0 | 733 | 0 | 0 | 193 | 317 | 393 |
| 4 | 20,438 | 986 | 10,484 | 776 | 0 | 218 | 3,142 | 188 |
| 5 | 98,848 | 6,425 | 35,217 | 834 | 0 | 2,099 | 11,223 | 1,621 |
| 6 | 377,679 | 152,719 | 88,294 | 9,651 | 126 | 9,455 | 57,865 | 9,711 |
| 7 | 1,432,432 | 890,919 | 280,029 | 12,540 | 2,551 | 43,966 | 288,639 | 33,671 |
| 8 | 1,463,657 | 645,325 | 267,719 | 37,898 | 7,333 | 64,789 | 311,800 | 55,906 |
| 9 | 799,753 | 540,158 | 343,139 | 33,415 | 45,142 | 82,458 | 197,038 | 94,038 |
| 10 | 369,405 | 330,777 | 557,005 | 79,464 | 309,495 | 235,142 | 221,644 | 235,701 |
| 11 | 88,621 | 245,421 | 217,416 | 63,384 | 246,366 | 277,935 | 213,125 | 268,810 |
| 12 | 47,474 | 132,644 | 127,084 | 120,880 | 598,885 | 346,510 | 256,736 | 299,069 |
| 13 | 227,342 | 69,213 | 65,249 | 562,527 | 457,593 | 262,735 | 303,726 | 182,921 |
| 14 | 218,268 | 49,280 | 118,784 | 401,403 | 512,790 | 237,246 | 337,150 | 256,030 |
| 15 | 188,853 | 15,586 | 244,550 | 149,163 | 220,789 | 163,755 | 221,285 | 190,580 |
| 16 | 164,779 | 13,023 | 423,127 | 229,418 | 474,427 | 235,403 | 212,201 | 148,737 |
| 17 | 68,307 | 6,460 | 248,916 | 706,140 | 235,150 | 397,205 | 195,556 | 113,877 |
| 18 | 19,377 | 4,044 | 126,022 | 393,532 | 34,905 | 475,851 | 95,847 | 50,382 |
| 19 | 20,846 | 944 | 102,848 | 392,554 | 15,468 | 479,727 | 68,549 | 36,438 |
| 20 | 18,155 | 854 | 54,210 | 720,500 | 16,933 | 482,517 | 45,251 | 20,363 |
| 21 | 9,619 | 549 | 23,238 | 398,807 | 21,452 | 288,301 | 16,725 | 9,389 |
| 22 | 6,244 | 98 | 11,253 | 426,833 | 8,166 | 179,432 | 11,211 | 4,396 |
| 23 | 1,648 | 0 | 2,962 | 176,302 | 1,531 | 60,459 | 3,565 | 2,866 |

Source: JICA Study Team

The number of trips by purpose by time of departure is shown in Figure 11.7 and table 11.5. The morning peak starts from 7 am to 9 am which is mainly occupy by “Home to Work” trip and “Home to School” trip. Whereas evening peak time is not clearly identified as “Work to Home” trip and “School to Home” trip starts from 12am and it continues up to 23pm.

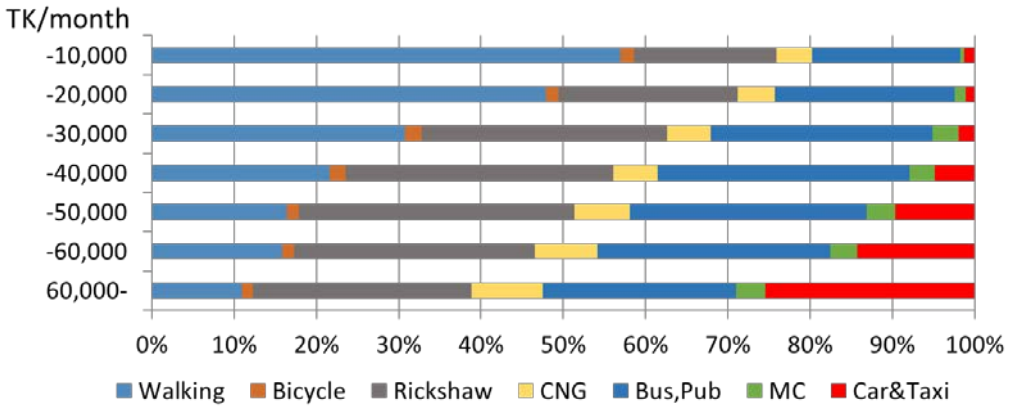
### (6) Modal Share by Household Income Group

Table 11.6 and Figure 11.8 show the number of trips and modal share by household income. For low income group, "Walking" is the major mode of travel while "Car" share increases as income increases. The share of "Bicycle" and "Motorcycle" are few in each group. Figure 11.9 shows the modal share without walking and bicycle wherein "Rickshaw" and "Bus" shares slightly declining with increasing income.

**Table 10.6 Number of Trips by Household Income Group**

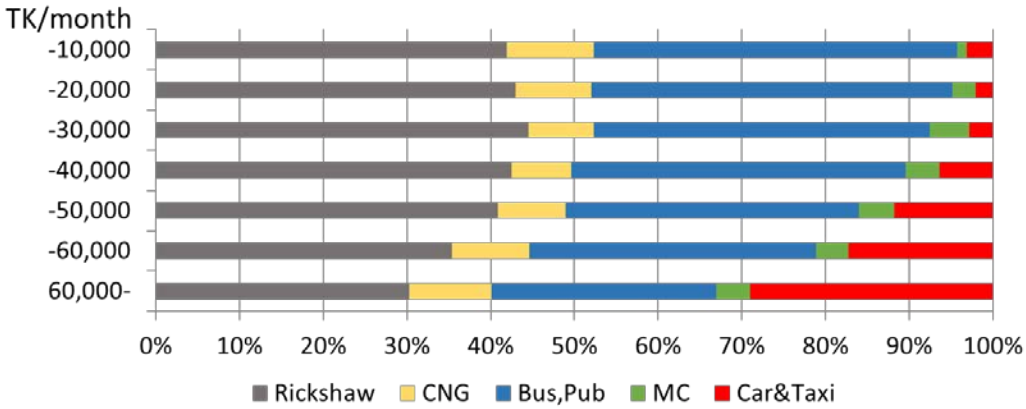
| Household Income | Walking | Bicycle | Rickshaw | CNG | Bus,Pub | MC | Car&Taxi | Truck |
|---|---|---|---|---|---|---|---|---|
| -10,000 | 3,862,950 | 109,988 | 1,179,024 | 291,634 | 1,218,638 | 31,621 | 88,169 | 8,739 |
| -20,000 | 5,225,472 | 174,795 | 2,371,689 | 496,249 | 2,383,301 | 150,475 | 114,170 | 10,122 |
| -30,000 | 1,437,480 | 93,116 | 1,398,807 | 244,804 | 1,262,478 | 147,755 | 89,422 | 1,893 |
| -40,000 | 472,057 | 43,344 | 710,566 | 119,225 | 667,818 | 67,367 | 106,409 | 661 |
| -50,000 | 209,785 | 18,857 | 428,469 | 85,463 | 368,064 | 44,239 | 123,334 | 1,141 |
| -60,000 | 147,047 | 13,032 | 271,819 | 70,879 | 262,368 | 29,648 | 132,709 | 65 |
| 60,000- | 274,736 | 33,387 | 666,329 | 217,701 | 590,079 | 88,922 | 639,439 | 267 |
| unknown | 103,376 | 6,389 | 206,206 | 33,975 | 198,399 | 14,928 | 131,424 | 101 |

Source: JICA Study Team




Source: JICA Study Team

**Figure 10.8 Modal Share by Household Income Group with Walking and Bicycle**

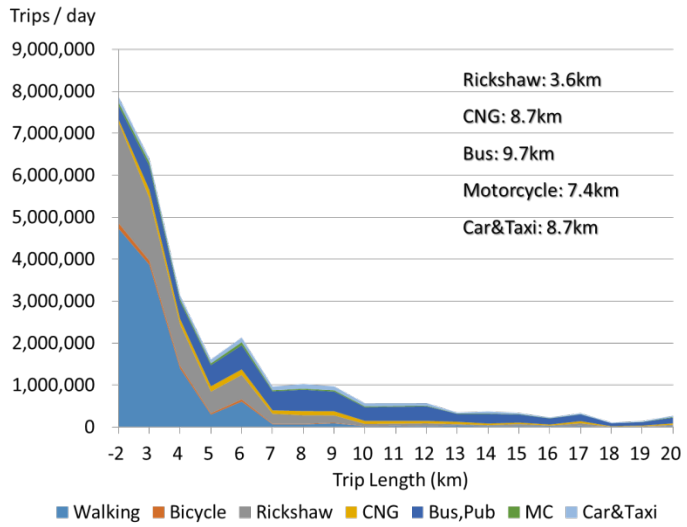



Source: JICA Study Team

**Figure 10.9 Modal Share by Household Income Group without Walking and Bicycle**

### (7) Trip Length

The number of trips by mode by trip length is shown in Figure 10.10. “Walking” and “Rickshaw” are selected for short distance travel while “Bus” is selected for long distance travel. The average trip length each mode are recorded as 3.6km for Rickshaw, 8.7km for CNG, 9.7km for Bus, 7.4km for Motorcycle and 8.7km for car & Taxi.



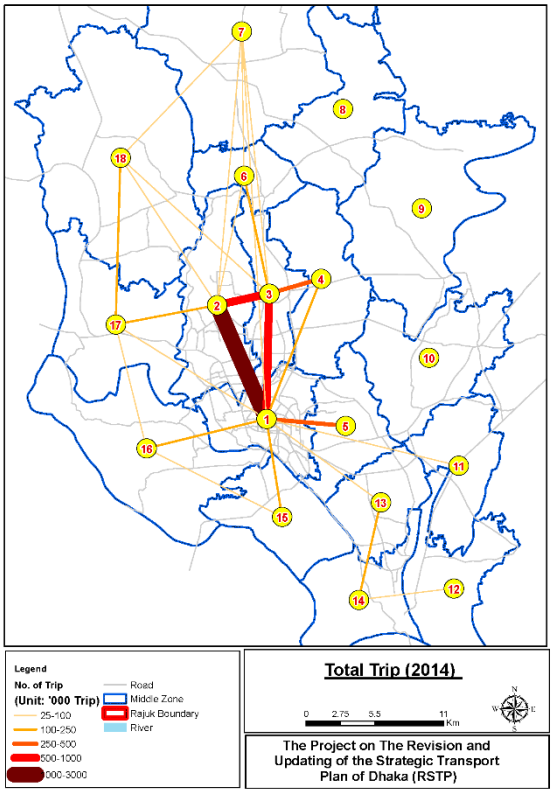

Source: JICA Study Team

**Figure 10.10 Number of Trips by Mode by Trip Length**

### (8) Desire Line and Current Road Situation

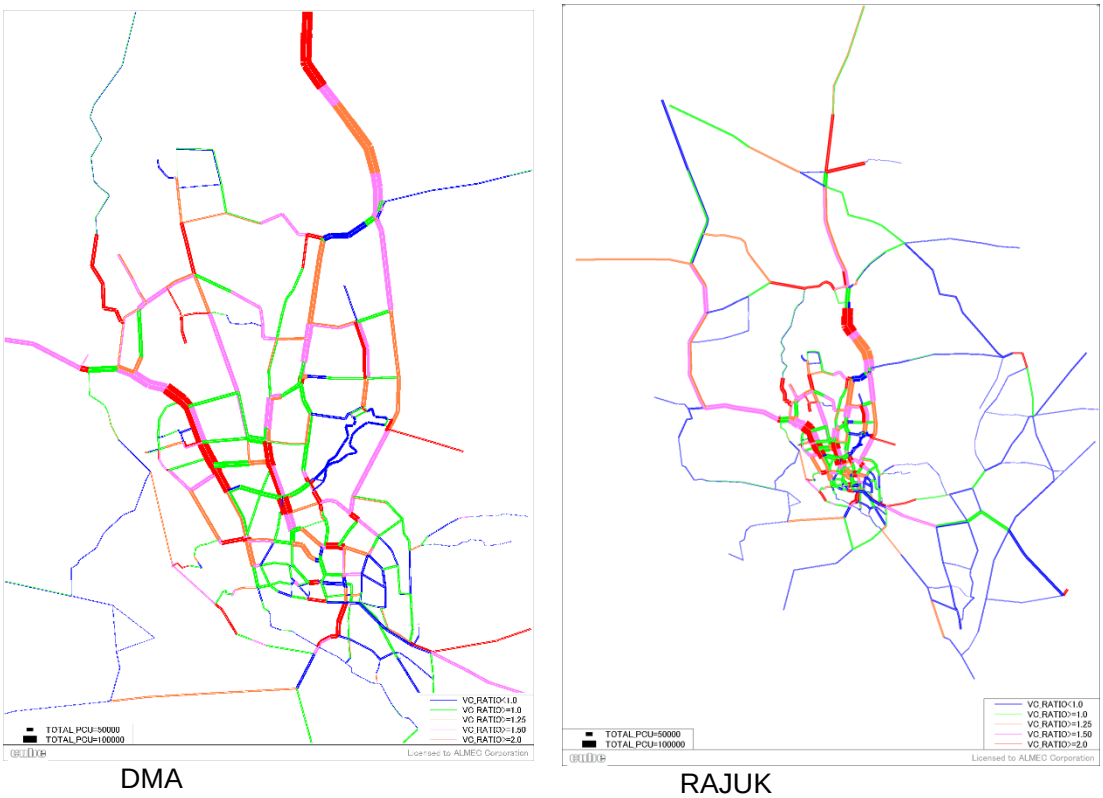
Figure 10.11 shows the desire line for all purpose. The zone numbers on the figure shows 1: South Dhaka, 2: West Dhaka, 3: Gulshan, 4: East Dhaka, 5: South East Dhaka, 6: Tongi, 7: Gazipur, 8: East Gazipur, 9: Kaliganj, 10: Rupganj, 11: North Sonargaon, 12: South Sonargaon, 13: North Narayanganj, 14: South Narayanganj, 15: South Kareniganj, 16: North Kareniganj, 17: South Savar and 18: North Savar. The busiest corridor is between South Dhaka and West Dhaka with 2.1 million trips per day. Following busy corridors are between West Dhaka and Gulshan with 0.9 million and between South Dhaka and Gulshan with 0.9 million. In the outside of DMA, the travel between South and North Savar is heavy.

Figure 10.12 shows the current road situation which was calculated from a road assignment model. The road width and color show the traffic volume and the congestion ratio. According to assignment results, most roads in DMA are congested particularly Mirpur road, New airport road and DIT road shows heavy congestion. In outside of DMA, some primary roads which connect DCC and the cities in RAJUK are congested especially Dhaka-Aricha HW and Dhaka-Bogra HW. Average congestion ratio in RAJUK during peak hour is 1.2 which means the road capacity lacks 20% to the traffic volume. The average travel speed of road transport in the morning peak is 6.4 km/h which is faster than walking speed but lower than bicycle speed.




Source: JICA Study Team

**Figure 10.11 Desire Line in 2014**




DMA RAJUK

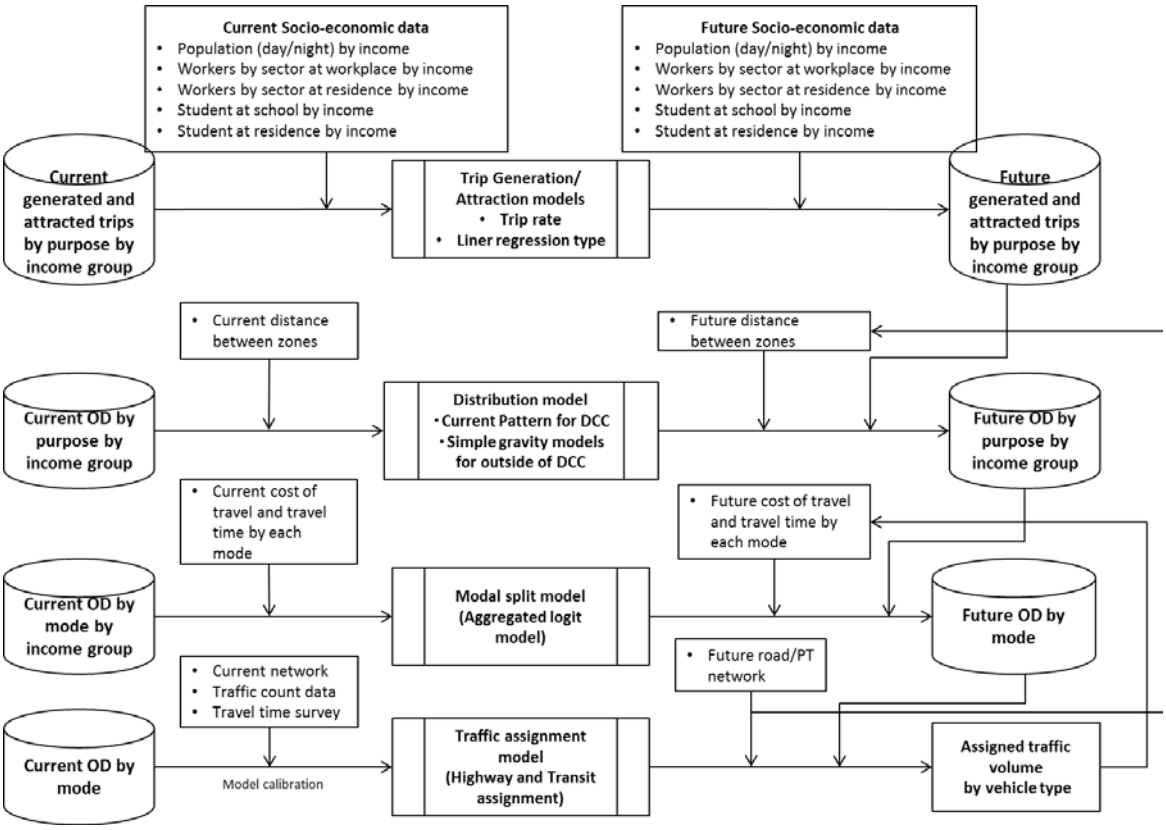
Source: JICA Study Team

**Figure 10.12 Road Situation in 2014**

## 10.3 Demand Forecast Model

### (1) Outline

The demand forecast model in Dhaka was developed based on the conventional four steps demand forecast process. The demand model was constructed separately for low household income group (less than 20,000 TK/ month), middle household income group (20,001 – 50,000 TK/ month) and high household income group (more than 50,001 TK/ month) as their traffic characteristics are different. The outline of the four steps demand forecast modelling procedures and flow of data is briefly illustrated below. The model is consisted four steps which are trip generation/ attraction step, distribution step, modal split step and traffic assignment step. These steps will be explained in the following sections.

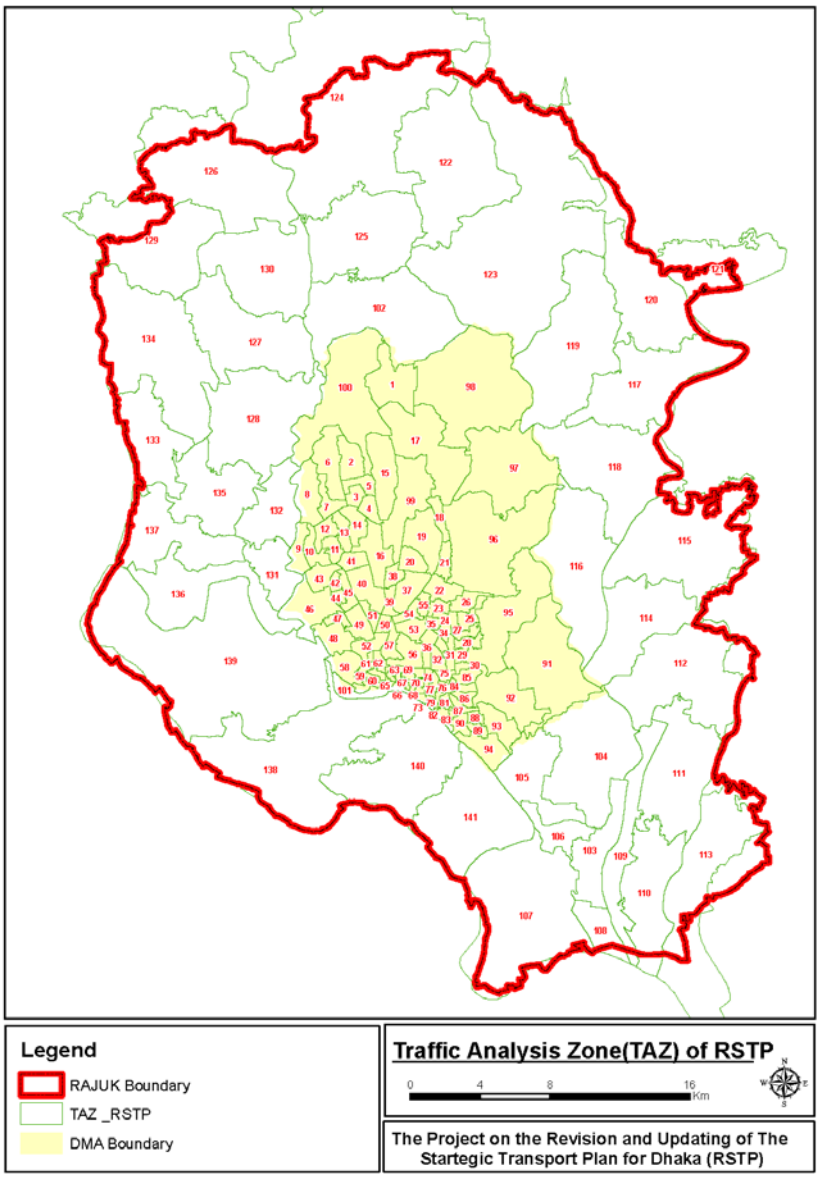



Source: JICA Study Team

**Figure 10.13 Outline of the Four Steps Demand Forecast Model**

### (2) Zone System

The study area is divided into 141 internal zones as shown in Figure 10.14. In addition, there are 49 external zones representing outside areas of RSTP study area and 5 special trip generation zones representing airport, ferry terminal and rail stations. The zone system is summarized in Table 10.7.




Source: JICA Study Team

**Figure 10.14 Zone System**

**Table 10.7 Summary of Zone System**

| Area description | | Number of zones |
|---|---|---|
| Internal zone | DCC | 90 |
| | DMA | 11 |
| | RAJUK | 40 |
| External zones | Outside of RAJUK | 49 |
| Special generator zone | Airport | 1 |
| | Ferry terminal | 1 |
| | Rail station | 3 |
| Total | | 195 |

Source: JICA Study Team

**(3) Trip Generation and Attraction Models**

The trip generation and attraction models used trip rate and liner regression techniques. The trip rates and parameters of model were estimated separately by household income group by trip purpose. As trip purpose, eight purposes were applied to modelling. These are “Home to Work”, “Home to School”, “Home to Others”, “Work to Home”, “School to Home”, “Other to Home”, “Non home based others” and “Non home based business”.

**(4) Trip Distribution Models**

The urban structure in DCC will not dramatically change as most of the land in this area has already been developed. It is therefore expected that there won’t be much change in the trip pattern in the said area. Meanwhile, trip distribution pattern of surrounding area of DCC will have a drastic change due to the rapid increase of population as a result of new urban development. Considering this scenario, a current trip pattern method was adopted for DCC and a gravity model was developed for RAJUK area excluding DCC. The current trip pattern method will also be literally applied as a current trip distribution in the future. On the other hand, the gravity model can predict trip distribution between zones by using Newton’s law of universal gravity which can be applied to new development area. The equation of the gravity model is given below. The models were designed reparatory by purpose by household income group.

$$T_{ij} = k * \frac{G_i^{\alpha} * A_j^{\beta}}{d_{ij}^{\gamma}}$$

Where, $G_i$: Total trip generation in zone i
$A_j$: Total trip attraction in zone j
$d_{ij}$: Shortest route distance between zone i and j
$\alpha, \beta, \gamma$: Parameters
k: Constant

**(5) Modal Sprit Model**

Firstly, walking and bicycle trips are excluded from all trips based on current share by distance between zones. The current share of walking and bicycle is shown in Table 11.8 that was derived and calculated from the result of HIS data.

A binary logit model was adopted as a modal sprit model. The model structure and model equation is shown below.

$$P = \frac{1}{1 + e^{k + \sum \alpha X}}$$

Where, $\alpha$: Parameter
k: Constant
x: Time difference, Cost Difference

The time and cost between zones by mode for input of the modal sprit model were calculated as below.

Time

Car, MC, CNG: From assignment results

Bus & Train: Access and waiting time for bus (10 min) + In vehicle time of bus (Considering boarding and alighting time, it was applied 80% of road assignment result) + Access time to rail station (100m / 4km/h) + Waiting time of rail (half of headway, Maximum is 30 min) + In vehicle time of rail

Rickshaw: 75% of road travel time from assignment result, however maximum speed is 6km/h

Cost

Car: Toll + Vehicle operation cost / Average occupancy

MC: Toll + Vehicle operation cost / Average occupancy

CNG: CNG fare / Average occupancy excluding driver

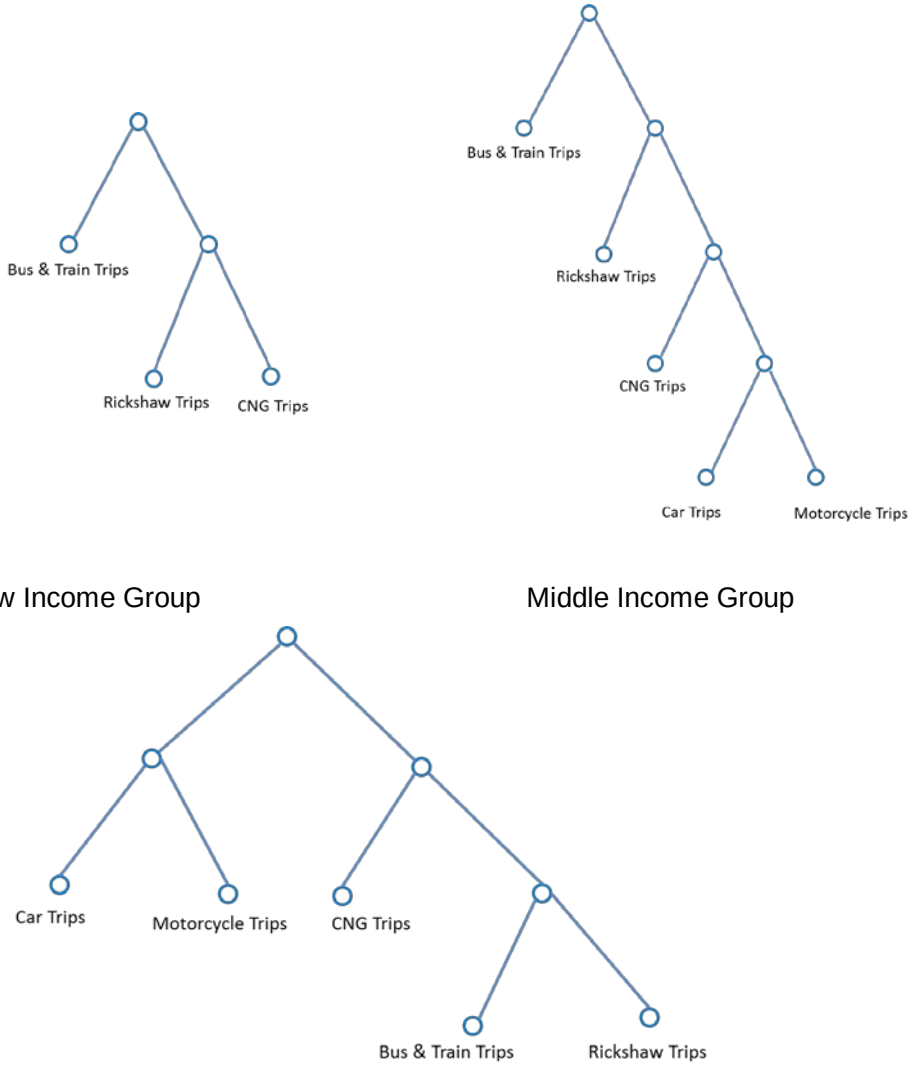
Bus & Train: Bus fare + Rail fare

Rickshaw: Rickshaw fare / Average occupancy excluding driver

**Table 10.8 Share of Walking and Bicycle by Travel Distance**

| Dist (km) | Low Income | Middle Income | High Income |
|---|---|---|---|
| >2 | 70% | 50% | 37% |
| 3 | 69% | 47% | 28% |
| 4 | 59% | 27% | 13% |
| 5 | 31% | 13% | 3% |
| 6 | 22% | 10% | 3% |
| 7 | 12% | 7% | 3% |
| 8 | 12% | 4% | 2% |
| 9 | 11% | 3% | 2% |
| 10 | 10% | 2% | 1% |
| 10< | 0% | 0% | 0% |

Source: JICA Study Team




Source: JICA Study Team

**Figure 10.15 Structure of Modal Sprit Model**

### (6) Trips from External and Special Generator Zones

Current numbers of trips from external and special generator zones were collected by the cordon survey. These were expanded up to trips on 2025 and 2035 using growth rate of GRDP.

### (7) Traffic Assignment

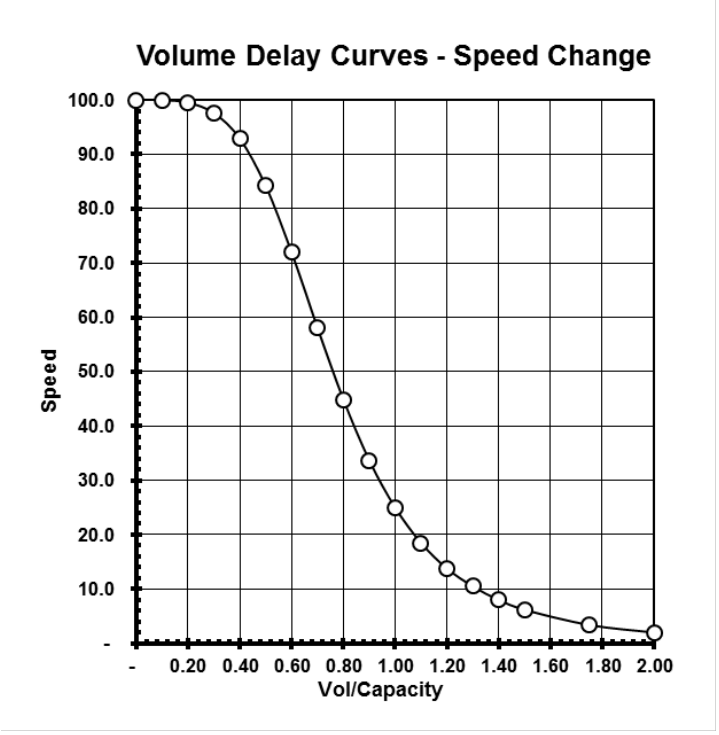
There are two traffic assignment processes namely; highway assignment for private modes including Motorcycle, CNG, Car and Truck and transit assignment process for Bus and Rail.

The highway assignment process was derived from a well-known 'equilibrium' method, where the traffic from each O/D pair is assigned iteratively to the network until no cheaper/ quicker route could be found. The shortest path building was based on the generalized cost. The equilibrium method re-calculates the new travel time based on the road capacity and assigned traffic volume after each assignment iteration. The

speed/ flow i.e., volume delay function was calibrated according to the network, and is based on the BPR function. The general form of the BPR function is described below and is graphically depicted in Figure 10.16.

BPR function $t = t_0 \left\{1 + \alpha \left(\frac{X}{C}\right)^{\beta}\right\}$

Where, t : Travel time
$t_0$ : Free flow time
X : Traffic volume
C : Road capacity
$\alpha, \beta$ : Parameter $\alpha = 3.0, \beta = 4.0$




Source: JICA Study Team

**Figure 10.16 BPR Function**

The transit assignment model assigns the public transport trips to bus & railway routes as operated. The transit assignment process is based on minimum generalized cost of travel between each origin and destination pair, and it includes: fare, access/ egress time, walk time, wait time, in vehicle time and transfer time. The output from the transit assignment model is the boarding and alighting passengers at bus stop, rail station, and line volumes.

## 10.4 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 11.9. An increase of 13 million trips in 2025 and 22 million trips in 2035 from 2014 due to population

growth, increasing in income, increasing education continuance rate 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 11.10 shows the number of production trips by area wherein South Dhaka will produce more than 10 million trips per day in 2035 while its growth rate is not significantly higher. On the other hand, the growth rate of the surrounding area of DMA is higher compare to DMA area. Meanwhile, the production trips from Kaliganj in 2035 will be eight times higher than that of 2014 while Narayanganj and North Savar will produce more than 4 million trips per day.

**Table 10.9 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

**Table 10.10 Number of Production Trips by Area**

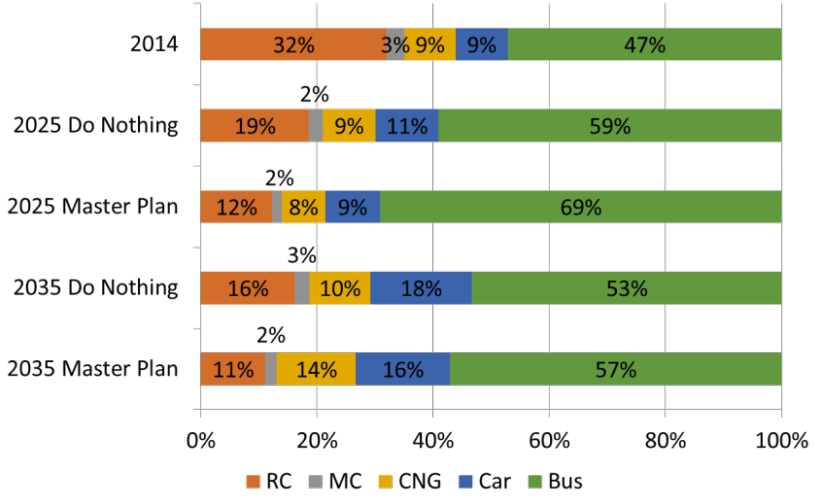
| Area | 2014 (Trips) | 2025 (Trips) | 2035 (Trips) | Growth Rate 2014-2025 | Growth Rate 2014-2035 |
|---|---|---|---|---|---|
| 1. South Dhaka | 8,764,000 | 9,614,000 | 10,092,000 | 1.10 | 1.15 |
| 2. West Dhaka | 6,107,000 | 6,861,000 | 7,788,000 | 1.12 | 1.28 |
| 3. Gulshan | 2,745,000 | 3,165,000 | 4,169,000 | 1.15 | 1.52 |
| 4. East Dhaka | 921,000 | 2,140,000 | 3,207,000 | 2.32 | 3.48 |
| 5. South East Dhaka | 1,504,000 | 2,743,000 | 3,276,000 | 1.82 | 2.18 |
| 6. Tongi | 800,000 | 1,426,000 | 1,628,000 | 1.78 | 2.04 |
| 7. Gazipur | 1,752,000 | 3,195,000 | 4,255,000 | 1.82 | 2.43 |
| 8. East Gazipur | 129,000 | 213,000 | 252,000 | 1.65 | 1.95 |
| 9. Kaliganj | 226,000 | 1,015,000 | 2,030,000 | 4.49 | 8.98 |
| 10. Rupganj | 573,000 | 916,000 | 911,000 | 1.60 | 1.59 |
| 11. North Sonargaon | 249,000 | 419,000 | 411,000 | 1.68 | 1.65 |
| 12. South Sonargaon | 356,000 | 778,000 | 750,000 | 2.19 | 2.11 |
| 13. North Narayanganj | 1,162,000 | 2,013,000 | 2,249,000 | 1.73 | 1.94 |
| 14. South Narayanganj | 934,000 | 1,393,000 | 1,722,000 | 1.49 | 1.84 |
| 15. South Kareniganj | 342,000 | 889,000 | 938,000 | 2.60 | 2.74 |
| 16. North Kareniganj | 632,000 | 899,000 | 1,118,000 | 1.42 | 1.77 |
| 17. South Savar | 881,000 | 1,680,000 | 2,022,000 | 1.91 | 2.30 |
| 18. North Savar | 1,832,000 | 3,342,000 | 4,362,000 | 1.82 | 2.38 |
| Total | 29,909,000 | 42,701,000 | 51,180,000 | 1.43 | 1.71 |

Source: JICA Study Team

### (2) Modal Share

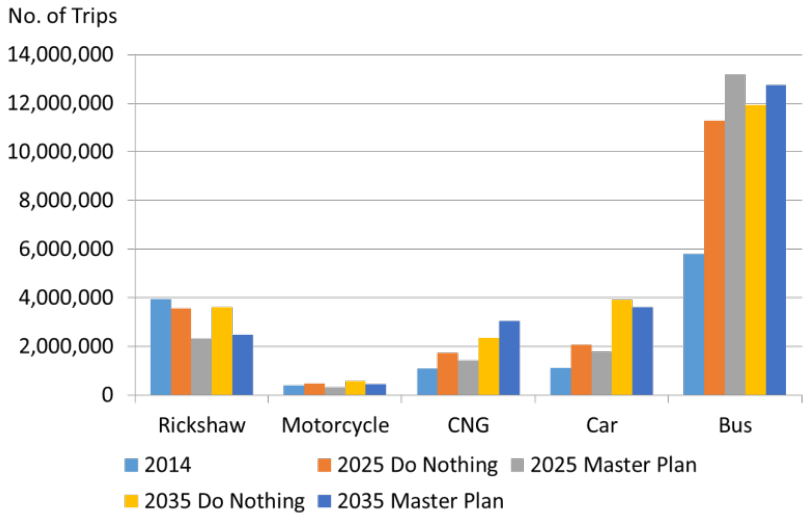
Modal share changes depending on the transport network. As shown in Figure 11.17, the rickshaw share will decrease while the bus share will increase at any given cases. As per the master plan case in 2035, the bus share can be kept 57% as highest share due to the expansion of MRT and BRT lines. Meanwhile, car share will be expected to double due to upgrading of income.

Figure 11.18 shows the number of inter trips by mode as per each cases. 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 length, walking and rickshaw trips will convert to other modes, particularly to bus trip. In here, rail trip is also included in bus trip.




Source: JICA Study Team

**Figure 10.17 Modal Share of Inter Trips in 2025 and 2035**



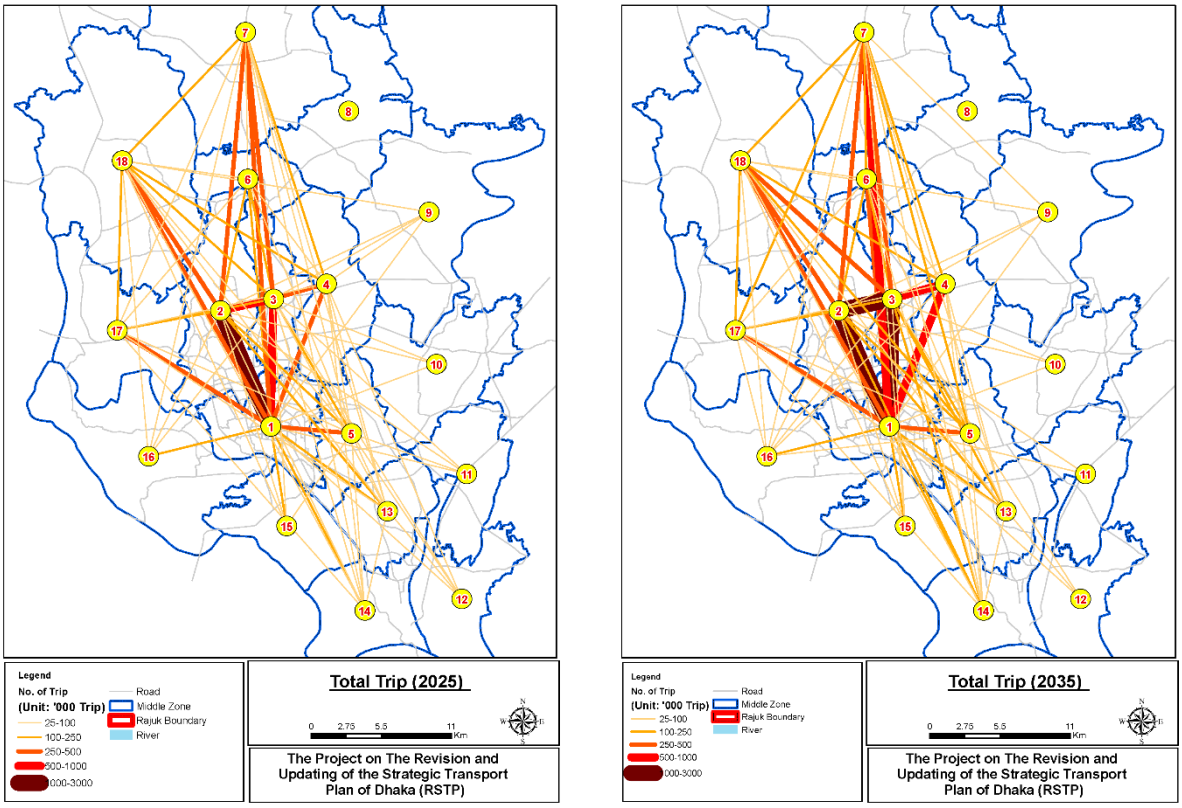

Source: JICA Study Team

**Figure 10.18 Number of Trips by Mode in 2025 and 2035 excluding Intra Trips**

### (3) Desire Line

The desire lines in 2025 and 2035 are presented in Figure 11.19. 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.



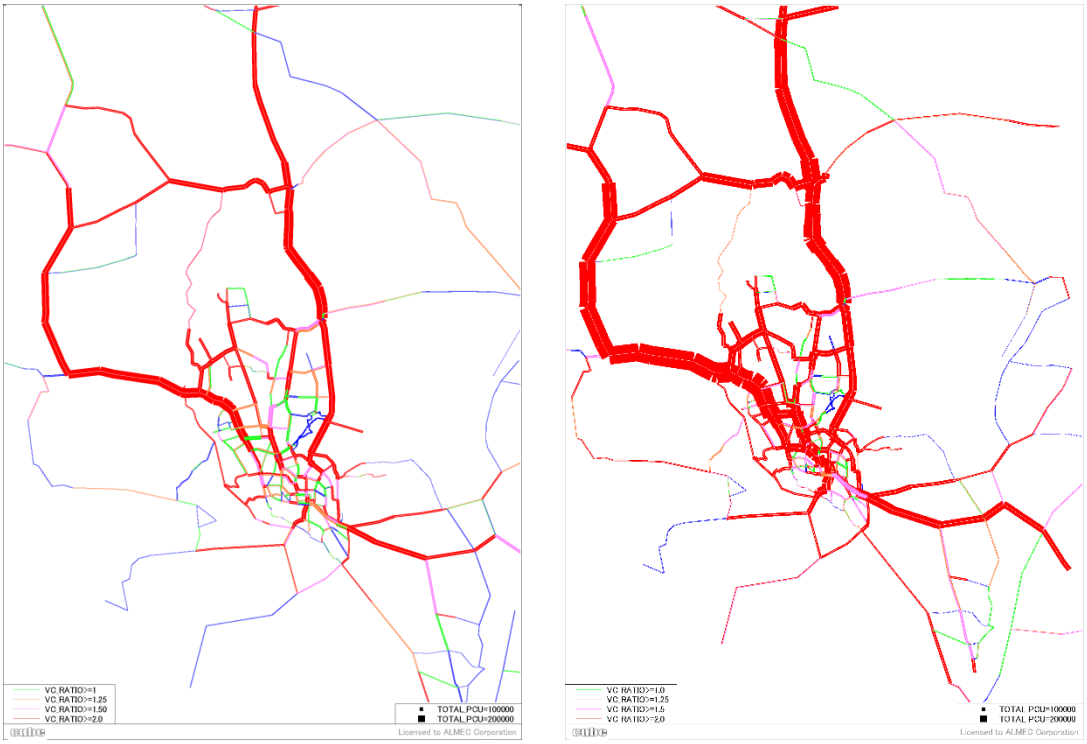

Source: JICA Study Team

**Figure 10.19 Desire Line in 2025 and 2035**

### (4) Assignment Results

Figure 11.20 shows the highway assignment results of do nothing case in 2025 and 2035. Highway assignment results of do nothing case as shown in Figure 11.20 indicates that the road transport in Dhaka by 2035 will not be worked out due to heavy traffic congestion if there won't be provisions of any roads and public transport. 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.

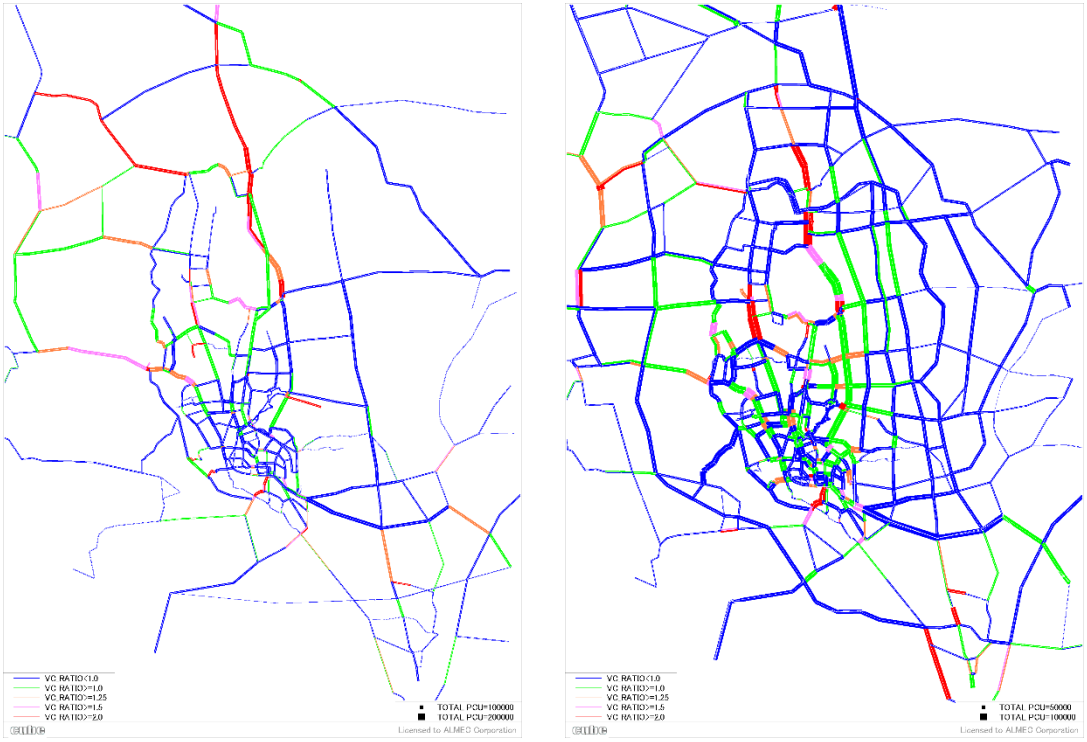
Whereas if the RSTP masterplan get implemented, the road congestion will be solved as presented in Figure 11.21. The average congestion ratio and the travel speed in 2035 will be 0.8 and 13.7 km/h. The person-hours can save 35 million hours per day compared to the do nothing case.



2025 Do Nothing Case　　2035 Do Nothing Case

Source: JICA Study Team

**Figure 10.20　Highway Assignment Results of Do Nothing Case in 2025 and 2035**



2025 Master Plan　　2035 Master Plan

Source: JICA Study Team

**Figure 10.21　Highway Assignment Results of Master Plan Case in 2025 and 2035**

The transit assignment results of master plan case in 2025 and 2035 are shown in Figure 10.22 and Table 10.11. 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 a huge passengers of 1.8 million. Highest PPHPD will be recorded by MRT6 with 45,860 persons in 2035, followed by MRT1 with 37,770 persons.


2025 Master Plan　　2035 Master Plan

Source: JICA Study Team

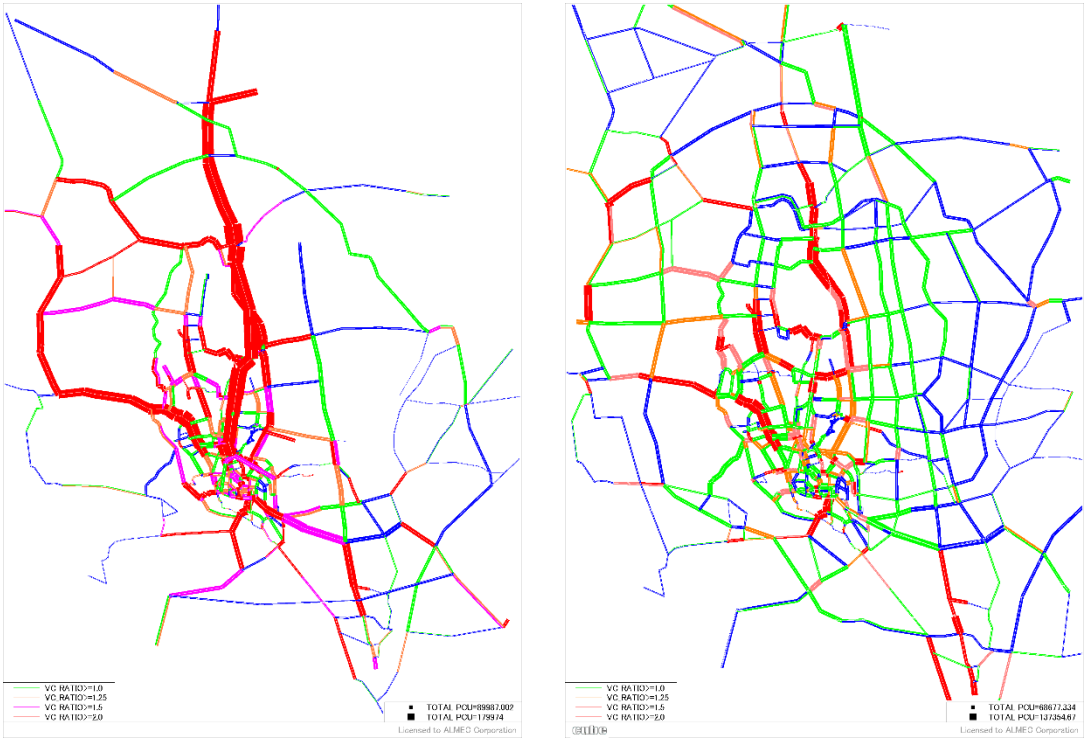
**Figure 10.22　Transit Assignment Results of Master Plan Case in 2025 and 2035**

**Table 10.11　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

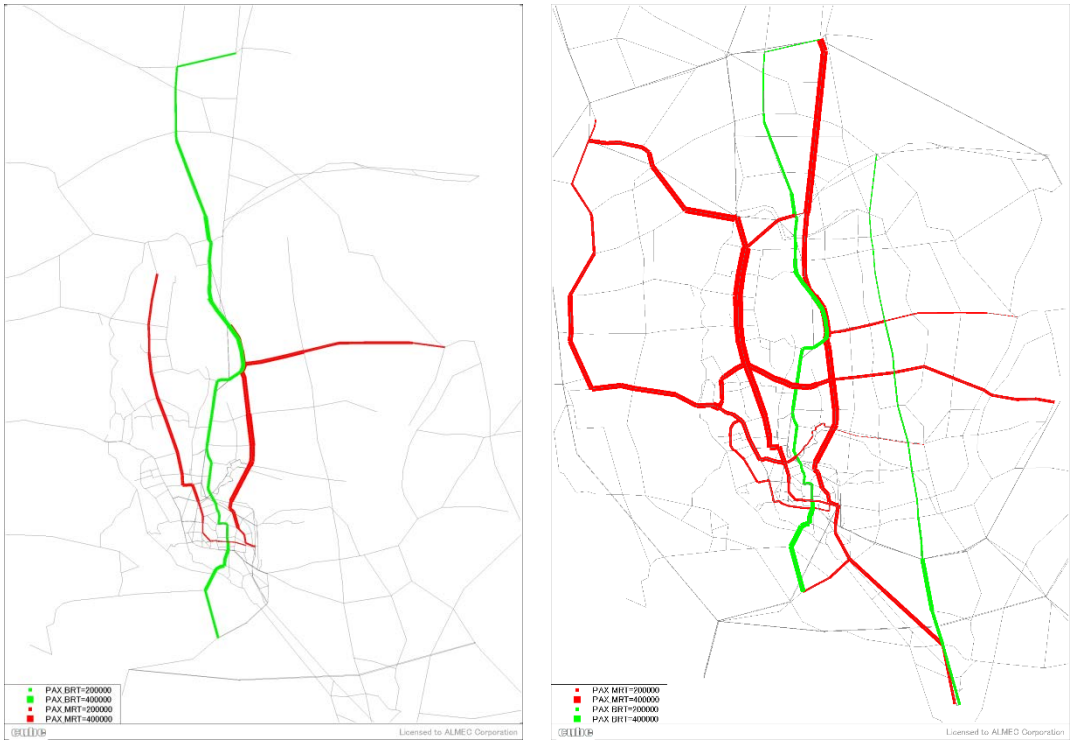
As presented in “Modal Share” section, the bus and rail share will have the highest share up to year 2035. However, it might be difficult to keep high bus share due to popularization of motorcycle. Therefore it was studied that Bus and Rail share will decline to 40% and this declined trips were converted to Motorcycle trips. The results are shown in Figure 11.23. The traffic congestion will slid to worst compared to the masterplan case due to the increasing motorcycle trip. The average congestion ratio and the average speed in 2035 will be 1.2 and 8.8 km/h. The rail user will decrease compared to the master plan case. However total daily ridership will still be estimated to 2.1 million in 2025 and 5.8 million in 2035 as shown in Figure 10.24 and Table 10.12.



2025 (Bus & Rail Share: 40%)　　2035 (Bus & Rail Share: 40%)

Source: JICA Study Team

**Figure 10.23　Highway Assignment Results in 2025 and 2035 (Bus & Rail Share: 40%)**




2025 (Bus & Rail Share: 40%) 2035 (Bus & Rail Share: 40%)

Source: JICA Study Team

**Figure 10.24 Transit Assignment Results in 2025 and 2035 (Bus & Rail Share: 40%)**

**Table 10.12 Number of Passengers of MRT and BRT in 2025 and 2035 (Bus & Rail Share: 40%)**

| Line | 2025 | | 2035 | |
|---|---|---|---|---|
| | Daily Ridership (Pax/day) | PPHPD | Daily Ridership (Pax/day) | PPHPD |
| MRT1 | 765,700 | 18,360 | 1,189,500 | 23,760 |
| MRT2 | - | - | 721,800 | 14,870 |
| BRT3 | 1,022,800 | 12,870 | 1,153,200 | 15,990 |
| MRT4 | - | - | 233,300 | 12,620 |
| MRT5 | - | - | 997,800 | 20,280 |
| MRT6 | 297,900 | 8,730 | 1,158,600 | 29,340 |
| BRT7 | - | - | 320,900 | 13,130 |
| Total | 2,086,400 | - | 5,775,100 | - |

Source: JICA Study Team

# 11. URBAN TRANSPORT NETWORK DEVELOPMENT SCENARIO

## 11.1 Overall Transport Policy

### (1) Current Urban Development Policy

City growth – in terms of population, urbanization, scale of economic activities, and household income levels – has been rapid in Dhaka. It is unlikely to slow down due to the unique position of the city as the economic engine of the entire Bangladesh. The population in RAJUK area will be 26.3 million in 2035. A large part of this growth will be accounted by in-migration, as rural population gets attracted into the city by expanded job opportunities and prospects of better lives. Household income is expected to grow by about 4 times of the current levels. As a consequence, some of the dramatic changes that will ensue are:

- **Expanding urbanization**: Although the central areas will retain their density, suburbanization will occur through a mushrooming of medium- to low-density residential areas as households with higher incomes seek larger living spaces, better environment, and car ownership. The adjoining areas will become closely intertwined with the city's social and economic activities.
- **Progressing motorization**: As economy grows, household car ownership ratio will increase inevitably. The current rate of car ownership is 3.3% and the current rate of motorcycle ownership is 9.4% in RAJUK area and those rate will increase sharply with increase in income by 2035. Coupled with the population growth and longer trip length, stress to road users will be strong due to congestion, uncomfortable commuting, long travel times and parking space scarcity.
- **Worsening living conditions for low-income groups in the central areas**: Urban redevelopment will be accelerated in the central areas for business and commercial activities, therefore exerting pressures on property values and on low-income households to relocate.

As other cities in developed and developing countries have experienced, such a scale of urban growth will entail painful adjustments on the residents of the city. Undisciplined and unregulated use of private cars should not be permitted to continue in a large city such as Dhaka.

Dhaka and its adjoining areas would continue to be the main link of Bangladesh to the global economy. The country's global competitiveness will therefore rely on the efficiency of transport system in the Dhaka urban area.

#### 1) Objectives

The city's future should be livable as well as competitive and its transport sector should support and facilitate this objective. The overall goal of urban transport is to:

"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."

Accordingly, eight specific objectives in the master plan are identified:

- Promotion of social understanding about urban transport problems and issues
- Effective management of urban growth and development
- Promotion and development of attractive public transport
- Efficient traffic control and management

- Effective management of transport demand
- Comprehensive development of transport space and environment
- Enhancement of traffic safety and reduced environmental impacts
- Strengthening of urban transport administrative and management capacities

**2) Sector Constraints**

The biggest constraint is funding. There is simply no way for Dhaka to buy itself out of its existing and emerging problems. Hence, it must turn more and more to the private sector – especially in the provision of transport services, rather than for the government to assume sole responsibilities. Even if the city has unlimited resources, it cannot continuously expand the provision of roads without destroying the fabric of the city nor overcoming ROW obstacles in an expeditious manner. Besides, as apparent from other cities, adding more roads only leads to a vicious cycle of more cars and more congestion.

Getting more commuters on public transport is a must; however, to rapid motorization, this has become a challenging issue. Unlike many developing cities which struggle against the erosion of a high share of public transport, Dhaka's public transport is fortunate to have a high modal share presently. This advantage should be maintained or strengthened even further, requiring Government involvement.

A third constraint is weak institutional capability to cope with urban and transport challenges under an uncertain and changing policy environment. One way to overcome the lack of funds is to improve government's ability to harmonize land use with transport development. This, however, entails expertise and processes that are also scarce in the public sector.

**3) On-going Initiatives**

Even before the completion of the overall master plan, some flyovers have been recently completed, and several feasibility studies and detail design works are on-going for elevated expressway, BRT Line 3, MRT Line 6, bridges and other transport infrastructures. These projects have strategic and long-term implications – not only for the master plan, but also with impacts on the city's future.

**4) Revised Policies**

With a long-term historical perspective and a deep awareness of sector constraints, the need for new policy directions becomes clear.

A key feature of this new direction is greater reliance on the private sector in the building of transport infrastructure and operation of major transport functions, which is consistent with the national policy towards a market-based economy. Bangladesh is already moving towards this end, but success will rely on creating acceptable partnership agreements to provide greater investor confidence. This will require various policy reforms and public sector practices – such as in the method of procuring infrastructure projects, price regulation, and in the operation of governmental or semi-governmental enterprises. Such reforms may need to be triggered by privatizing existing enterprises (whether profitable or not) involves in activities where the private sector can/should make a useful contribution.

Parallel to this initiative is developing commercial public sector entities that are profit-oriented and business-like in their operations. This will also allow the public sector to compete on a level playing field with the private sector and between foreign and local companies.

Commercialization of public service provision will ensure better efficiency and combined with private sector participation (PSP), will deliver more sustainable projects. For

infrastructure projects, Dhaka needs a pro-active approach; conducting feasibility studies to establish the business case for PSP, including the level of government support required in each project, and marketing these opportunities to the private sector.

For passenger transport services, the public sector also needs to increase its management role, while maintaining its regulatory role, in the delivery and outcome of transport services. This entails a more participatory approach in service delivery, taking greater responsibility and being more accountable for transport outcomes. This will require building skills and capacity in management; relying less on regulations alone to reach issues and taking a more commercial approach to managing the structures of service delivery.

This specifically includes developing 'partnering relationships' with the private sector to deliver public transport services, with sustainable business models under franchise or PPP arrangements. The public sector may take partnership risks where it is in the best position to manage such risk. Sharing risk and supporting industry with appropriate regulations will strengthen its participation and control.

Building investor trust in the regulatory framework is a key requirement and will require the public sector to set high standards of governance, eradicating conflict of interests and create a system of regulatory independence and fairness.

For city expansion, better urban controls are needed to preserve the ROW (specifically, alignment and width) for future roads, rather than just planning neat and elegant arrangement of land uses per-se. Designated ROWs will provide a clear signal to the private sector on where future growth shall be, and strategically define the future shape of the city. Tax and other incentives can be used to encourage this kind of developments outside the CBD, rather than relying on the traditional instruments of administrative controls (such as grant or denial of building permits). This new policy direction will entail, among others, the following:

(a) Adoption or promulgation by law of the future road network in undeveloped areas, in a flexible rather than rigid sense, that will allow minor changes in alignment without altering the overall network,

(b) Removing these future roads, at least the primary or major arterials, from the land market.

(c) Preparation of an integrated urban development plan with urban transport development plan for Dhaka, preferably on a GIS foundation.

Inter-city and interagency collaboration will become increasingly necessary, as the urban development spreads outside traditional city boundaries thus requiring more coordinated and integrated transport solutions.

Aside from the aforementioned three policy directions, a number of issues could also emerge to affect future policies. These are: sustainability, resettlement, and environmental issues, which all require a long-term outlook. Aside from economic and technical viability, transport projects need to be planned for sustainability (maintained, operated, and supported with funds over its life), minimum dislocation, and environmental soundness.

## 11.2 RSTP Overall Transport Development Policy

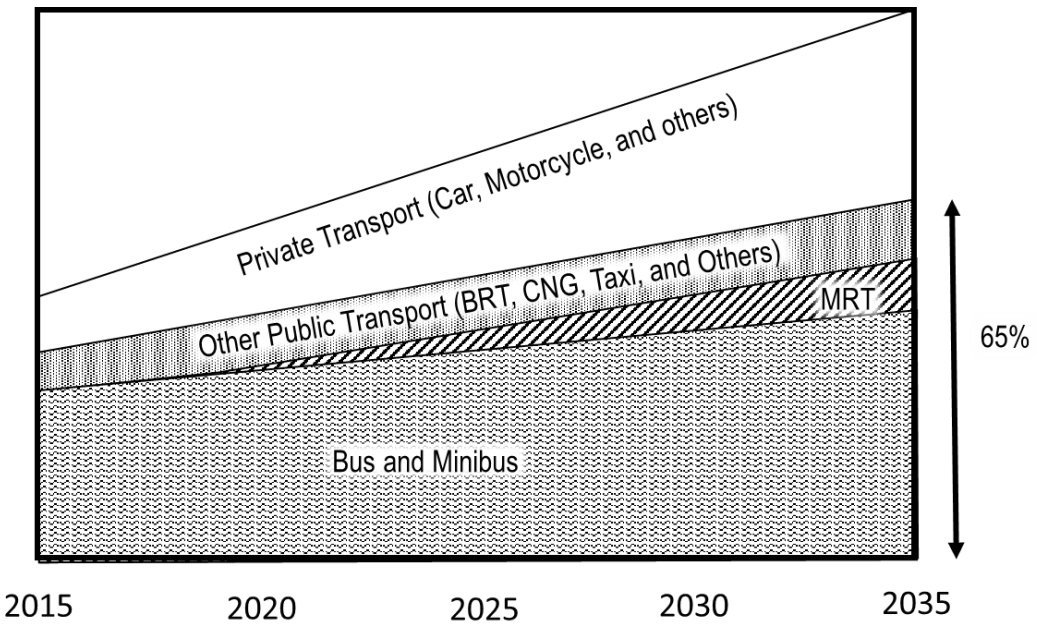
### (1) Vision and Goal

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 1.1). 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 11.1 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

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:

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

Defining a vision of the future is highly important in the study area because a fast increasing 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:

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

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:

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

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:

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)

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:

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

Transport infrastructure provides important public space for the use of traffic – 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 quality of urban areas and activities. Suggested policies are:

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

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 union government level. Suggested actions include:

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

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:

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 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 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 inter-relationship between these focuses and the identified policies is illustrated below:


Source: JICA Project Team

**Figure 11.2 Main Features and Policies of RSTP**

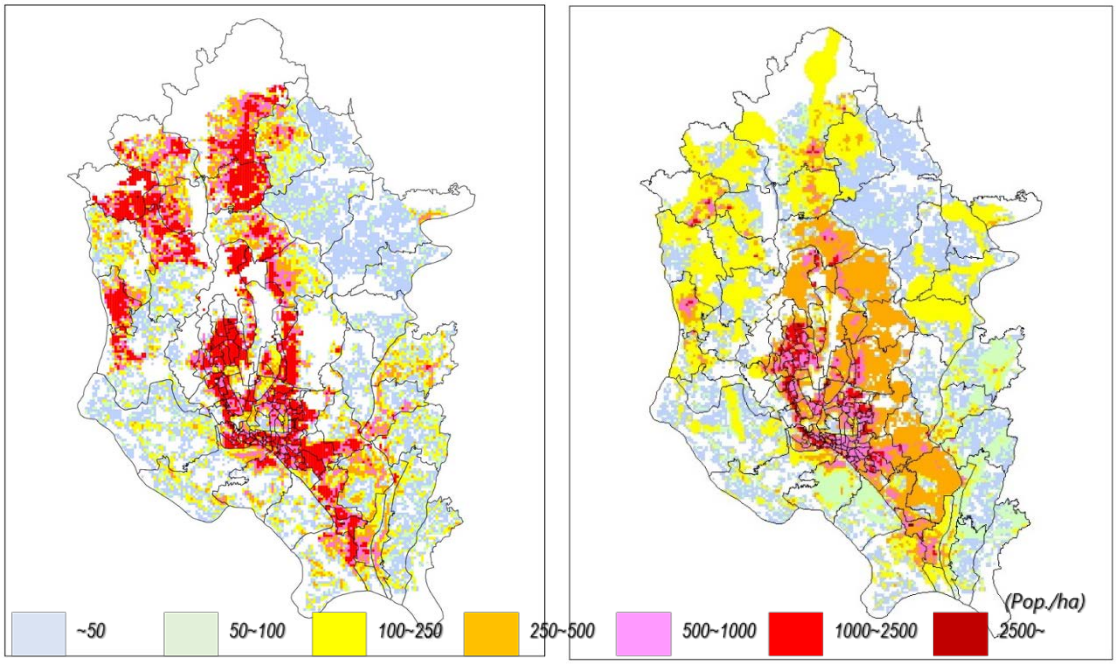
## 11.3 Land Use and Transport Integration

### (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 provinces in Bangladesh thereby creating synergy from the growth and development being experienced in both areas.




Pop. 26.3 million (2035)
**Trend Scenario**
Urban Development without any policies

Pop. 26.3 million (2035)
**RSTP Scenario**
Urban Development integrated urban transport network

Source: JICA Study Team

**Figure 11.3 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

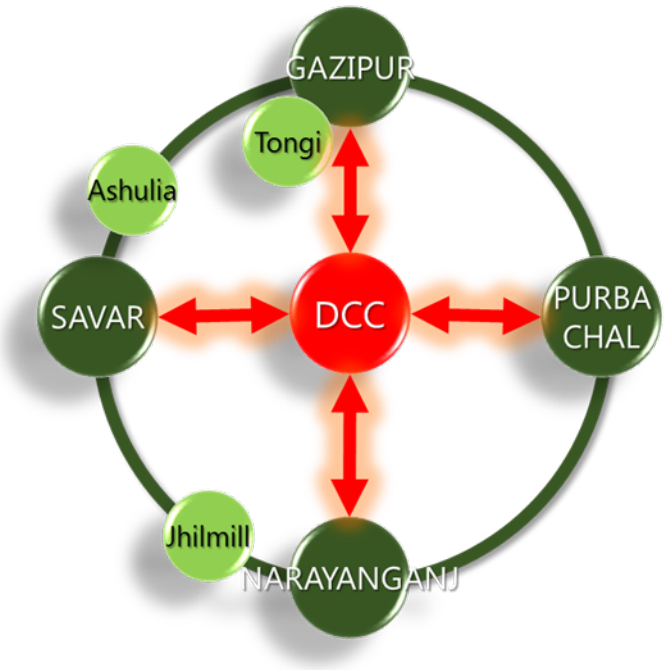
Land use and urban development must be reorganized along the mass transit corridors in a way that socio-economic activities are more effectively articulated with mass transit. This requires a review of the existing urban master plan which is rather road-transportation-based. And infrastructure development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




Source: JICA Study Team

**Figure 11.4 Integrated urban Development Concepts of RSTP**

## 11.4 Roads

### (1) Key Principles

Key principles to be considered are as follows:

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.

### (2) Network Pattern

Network patterning is known as an effective method in network planning. The road network of RSTP adopts the ring and radial patterns because of the existing road network and land-use characteristics which are suitable for the pattern.

### (3) Road Hierarchy

To develop a proper road network, a systematic and hierarchical functional classification is necessary. The hierarchical classification of functions is composed of expressways, urban primary roads, secondary roads, and tertiary roads.

(a) Urban Primary Road System: The urban primary road system services the major portions of trips entering and leaving urban areas as well as the majority of throughway travel that wants to bypass the city center. In addition, significant intra-urban travel, such as between CBDs and outlying residential areas, between major urban core communities, or between major suburban centers, is served by urban arterials. For the proposed road network, the urban primary road is divided into major arterial system and minor arterial system. The major arterial system forms a significant framework linking up with the regional primary road network, while the minor arterial system provides trunk linkages between district centers and other sub-centers.

(b) Urban Secondary Road System: The urban secondary road system interconnects with and augments the urban primary road system. It provides services to travels with moderate trip lengths at a somewhat lower level of travel mobility than primary

roads. This system also distributes travel to geographic areas that are smaller than those identified with those of higher road systems. Secondary roads must serve not only vehicular traffic but also various transportation and non-transportation activities.

(c) Urban Tertiary Road System: The urban tertiary road system aims to provide access to areas located along the roads and to serve not only vehicular traffic but also to non-motorized vehicle and pedestrian traffic, as well as roadside non transportation activities. Some urban streets that have commercial frontage serve fairly substantial volumes of traffic. However, this traffic is of terminal in nature; thus, it does not provide movement throughout the area.

## 11.5 Public Transport

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

The potential roles of 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:

a) Define clearly the role and capability of Bangladesh Railway: BR has the potential to contribute to inter-city and suburban/urban transport services. However, these two services are often contradictory in large urban areas, mainly due to the differences in the nature of their services and required operation, although the opportunity to use BR for suburban/urban services is large if it is improved in the nationwide scale.

b) Develop rapid mass transit system: A network of MRT and BRT must be developed to provide the city with a core public transport system offering high-quality services and integrating all major urban areas and activity centers.

c) Establish sustainable mechanism to develop MRT/BRT network: MRT/BRT requires a large amount of investment and a lengthy period of time before it is realized. It must be developed as a network with good coverage and in integration with efficient feeder services. Strategies for an integrated development, strategic funding, and phased development must be made clear to sustain the development of the envisioned 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, the coverage will be limited and many corridors and areas will remain that will not be served because it requires lengthy time and huge costs for construction of such system. Buses also provide important feeder services for MRT/BRT. Main planning principles should be as follows:

a) Develop an integrated and attractive bus system: Bus services must be developed as an integrated network to provide convenient services between origins and destinations, comprising various types of modes and services including BRT, express buses, air-conditioned buses, minibuses, wagons, etc. The services must also be attractive and competitive enough to encourage a shift from private transport.

b) Establish a sustainable bus operation and management system: The present dominance of buses and minibuses in Dhaka may not guarantee further successes

in the future when diversified services are required, more bus units needs to be managed and wider areas have to be covered. Besides, people demand improved services at affordable prices. Hence; sustainable bus operation and management systems must be established.

c) Provide adequate environment for private sector to invest in public transport services: An effective way to improve bus services is providing fair competition among operators. Since Dhaka needs expanded and diversified bus services, providing opportunities for new investors to offer such services in a competitive manner must be considered.

## 11.6 Traffic Management and Safety

The traffic flow in Dhaka is quite different from the traffic flow in other countries. The differences exist in vehicle composition, traffic management facilities, and traffic operation practice. As a result of such differences, traffic in Dhaka is inefficient and unsafe as evidenced by the chaotic traffic condition at many intersections and the extremely high accident rate.

### (1) Traffic Engineering Approach

With the number of vehicles in the study area which are expected to grow in the coming years, traffic congestion will become severe. Travel time is increasing due to the congestion of bottleneck points and traffic accidents have become a serious social problem. By simply constructing new roads or widening the existing roads cannot solve this problem, even if funds are available; nor can Dhaka can keep converting lands into roads. This situation needs a 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.

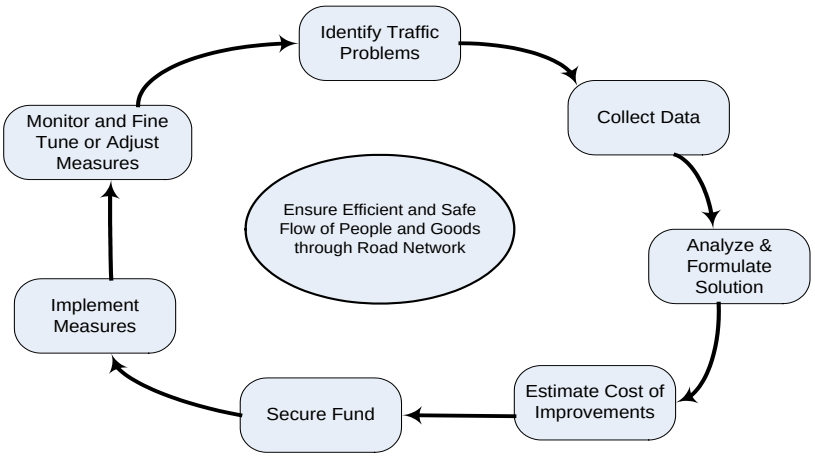
### (2) Traffic Management Process

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.

The process is shown in Figure 11.5. 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 11.1 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.




Source: JICA Study Team

**Figure 11.5 Traffic Management Process**

**Table 11.1 Classification of Traffic Management Measures**

| Area | Category | Measures |
|---|---|---|
| Intersection | Geometric Improvement | • Geometry, island, channelization, median, lane assignment<br>• Wheelchair slope |
| | Signal | • New signal<br>• Signal phase and timing updating<br>• Flasher |
| | Marking | • Stop line, pedestrian crossing, lane line, directional arrow |
| | Regulation | • Turning restriction |
| | Public transit | • Transit signal priority<br>• Exclusive bus lane at approach<br>• 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<br>• Reversible lane |
| | Demand management | • Exclusive/priority bus lane<br>• High occupancy vehicle (HOV) lane |
| | Sign | • Regulatory sign, guide sign |
| | Parking | • No parking, paid parking, free parking |
| | Public transit | • Exclusive/priority bus lane<br>• Contra-flow bus lane |
| | Others | • Street lighting |
| Area | Demand management | • Traffic cell<br>• Pedestrian mall, transit mall<br>• Road pricing<br>• Truck ban |
| | Signal | • Area traffic control (ATC) system |
| | Information | • Traffic information system<br>• Parking guidance system |
| | Regulation | • School zone |

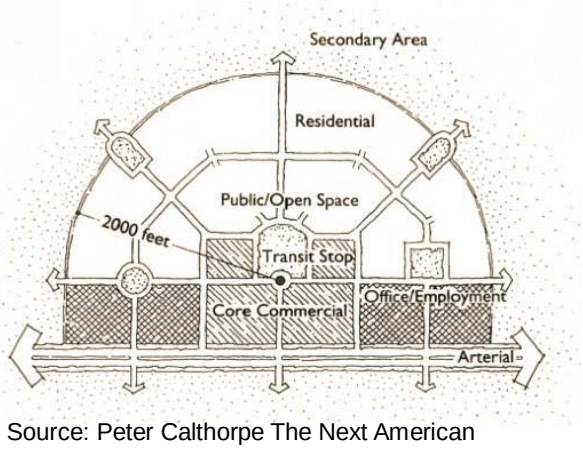
Source: JICA Study Team.

## 11.7 Concept and Importance of Transit Oriented Development (TOD)

### (1) TOD Concept and Importance

A transit-oriented development (TOD) is a compact area of mixed-use residential and commercial designed to maximize access to public transport, and also frequently encourage transit ridership. A TOD area typically is composed of a center with a transit station or stop (train station, metro station, tram stop, or bus stop), surrounded by relatively high-density development with progressively lower-density development spreading outward from the center. TODs are generally located within a radius of 400 to 800 m from a transit stop, or 600 m in average as a comfortable walking distance (around 10-minute walk).

Design principles of TOD, stated by Calthorpe, are to: (i) organize growth on a regional level to be compact and transit-supportive; (ii) place commercial, housing, jobs, parks, and civic uses within walking distance of transit stops; (iii) create pedestrian-friendly street networks that directly connect local destinations; (iv) provide a mix of housing types, densities, and costs; (v) preserve a mix of housing types, densities, and costs; (vi) preserve sensitive habitat, riparian zones, and high-quality open space; (vii) make public spaces the focus of building orientation and neighborhood activity; (viii) and encourage infill and redevelopment along transit corridors within existing neighborhoods. Figure 11.6 illustrates the spatial structure of the TOD centered by a transit stop.




Source: Peter Calthorpe The Next American Metropolis: Ecology, Community, and the American Dream", 1993

**Figure 11.6 TOD Concept**

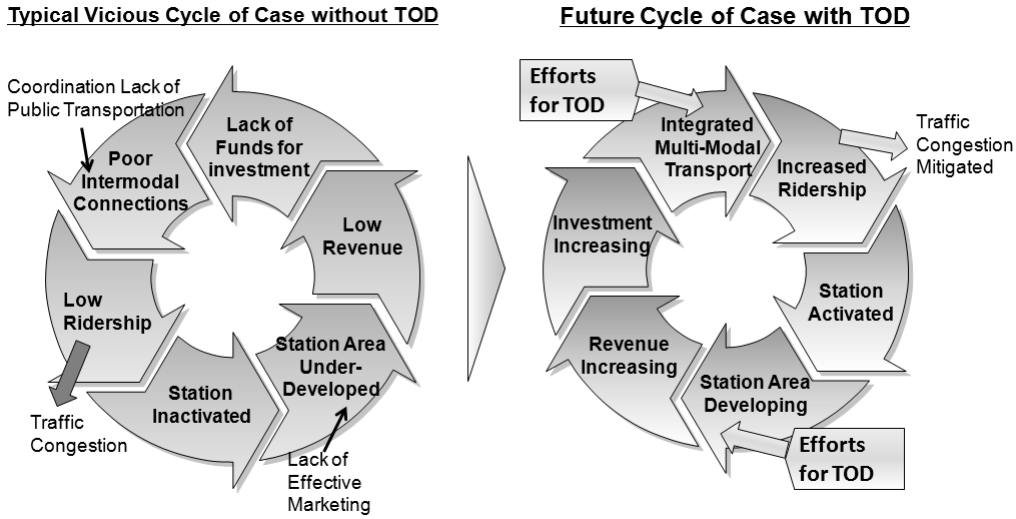
TOD was initially conceived as counter-approach to shift the society from the auto-oriented to a rather compact urban form. TOD contributes to creation of environmentally friendly society, because a shift to public transportation from private motorized transportation modes lessen energy consumption and CO2 emissions, leading to "smart growth". At the same time, a shift to public transportation also reduces space occupancy per passenger, thus, enabling more efficient urban space usage. According to NTT Data Institute of Management Consulting, a space occupancy per passenger of railway is, 1/25 that of railway, 1/2 that of bus transit, and 1/6 that of cars. In addition, railways generates 1/4 the CO2 emission compared to bus transit, and 1/9 to cars.

TOD forms urban space of high-density, multi-uses, and flow of many people, urban development projects can become financially viable with property value increase, which attracts private investors and developers while the government can gain more tax income from value capture. In addition to these, macro benefits influence areas of TOD when well planned are as follows; enjoy urban services provided near stations, good walking urban space, leading to universal designed, and comfortable urban space.

### (2) Required Function to enhance MRT/BRT Utilization

Even if the MRT/BRT network is completed, it will not function in case of no related facilities. It is essential to establish feeder service from/to station and station plaza as transfer facility in order to act railway properly. Figure 11.7 shows typical virtuous and

vicious cycle by with/without integration among transport modes. As shown in the figure, in case of poor intermodal connections, it will be vicious cycle that the number of passengers and station users decreases due to inconvenience, station area development is not proceeded due to low number of passengers, and few fund for intermodal connection function enhancement can be allocated due to low revenue. In order to stop the vicious cycle and change it to virtuous cycle, it is important to enhance connecting function between railway and the other transit modes at station.




Source: JICA Study Team

**Figure 11.7 Virtuous Cycle by with/without Integration among Transport Mode**

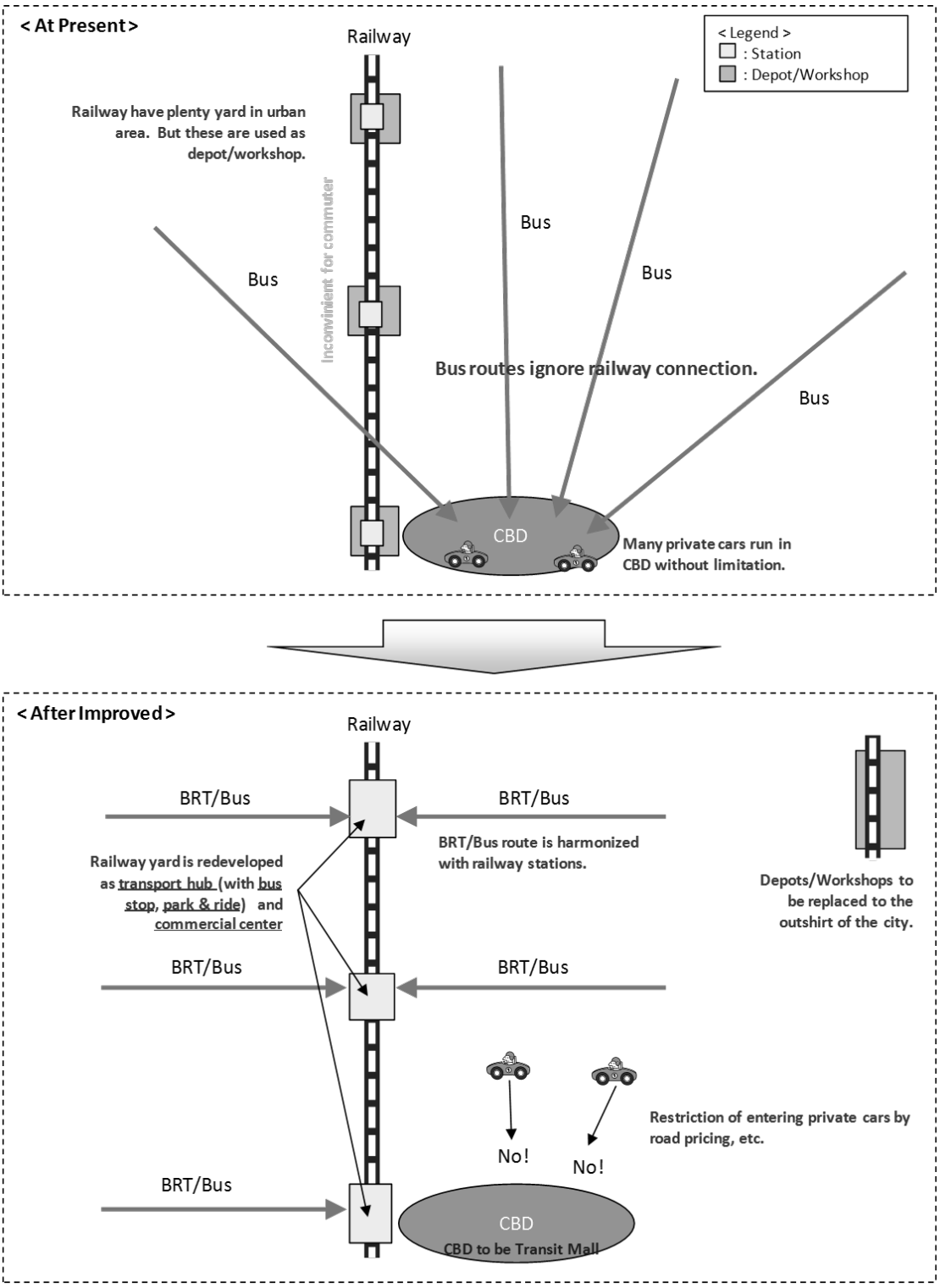
Having no MRT/BRT stations in Dhaka, here are an example of Bangladesh Railway (BR) station.

The schematic figure of the current BR line is shown as “at-present” in the figure below. It is pointed out that low network density, deteriorated infrastructure, low travel speed, low punctuality and low comfortability, etc. lead to low modal share of the current railway. These are a part of main reasons, but not all. The current railway stations are not incorporated in the current public transport network, even bus network which is usually integrated to railway networks in case of the other cities. The current bus network ignores railway stations and connect the origins and the destinations directly. Although some railway stations have potential yard for transport hub, these are currently used as depot, workshop, etc. The yard usage causes poor station access of both buses and neighboring people who can access on foot.

In order to change the situation, the following countermeasures should be conducted.

- Improvement and expansion of railway network
- Improvement of station function as transport hub (station and station plaza): to improve transfer function at railway station, and to enhance integration between railway and the other public transportation like buses, etc. (see “after improved” in the figure below)

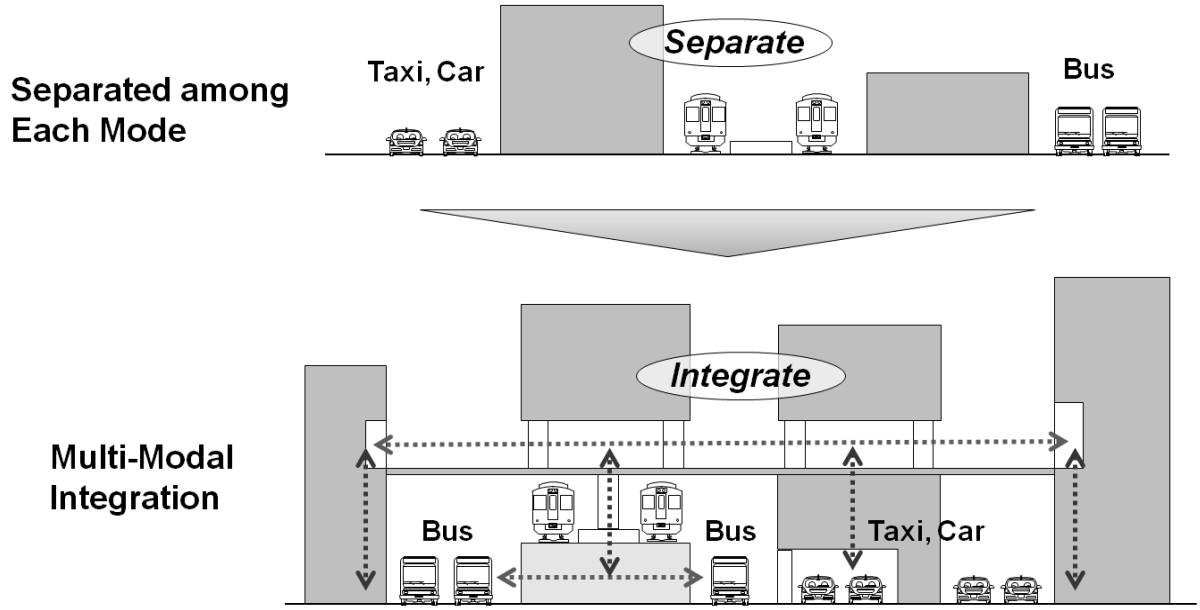
In addition, as shown as “after improved” in Figure 11.8, it is important to conduct measure for entering restriction of private car to CBD concurrently (changing CBD to transit mall), in order to realize convenience of public transport emphasizing mass transit and walking.




Source: JICA Study Team

**Figure 11.8 Schematic Image among Railway Improvement/Modernization, Railway Land Development and Integrated Multi-Modal Transport**

Image of transport hub function improvement at railway station is shown in Figure 11.9 .Integration among each transport mode would be a key of TOD because the non-Integration cause time-loss and uncomfortable transfer for passengers, and results in less-use of public transportation. The integration should be designed by combination of horizontal movement and vertical movement for passenger smooth transfer.




Source: JICA Study Team

**Figure 11.9 Schematic Image of Station Improvement for Multi-Modal Facility Integration**

Furthermore, in order to realize abovementioned “b)”, redevelopment of the current station yard is essential in middle/long-term, although small station plaza improvement with transfer function enhancement is effective in short-term. In case of MRT/BRT, TOD concepts need to be introduced to establish new stations.

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

### (1) Financial Capacity of National Government

#### 1) Overview of Current Status

Over the past years, there has been significant progress in the revenue collection. During this time, revenue collection has been increasing at the rate of 15.88 percent and this created an additional fiscal space for the Government, Therefore, the budget deficit remained stable and within the target. The foreign assistance and project assistance is increasing at the rate of 10.77 percent and 17.70 percent respectively but non-project assistance shows declining trend, which means loan assistance, is increasing in the country. On the other hand, the costs of increasing subsidies were met by borrowing from the banking system; the government burden is also increasing so as to keep SOEs in operation. However, the Government needs more financial flow to maintain transport infrastructure asset which had been constructed for the past years and to implement large projects such as sea ports, long bridges and to improve transport network including mass-rapid transit in Dhaka city.

Moreover, Bangladesh's annual development program (ADP) has been moving ahead slowly due to lack of coordination and proper policy guidelines. It is known that the reasons for the lower speed of project implementation also includes delay in preparation and approval of projects, lack of human resource and interruption in appointment of project director, consultants and the decision to present documents for procurement and difficulty in acquisition of land.

In addition, government has a practice of revising the ADP every year. Sometimes, the government changes the ADP by inclusion of new or exclusion of some listed projects in the middle of the year. The causes for revision includes delays in approval of projects, procurement related problems and shortage of fund for the projects.

In line with the urbanization strategy, it would need a more balanced growth of urban centers across the entire country through proper institutional reforms that involves the establishment of locally elected and accountable municipalities and city corporations. Property tax base needs reform to strengthen their financial autonomy along with block grants from the budget, based on principles of equity and population. Special emphasis needs to be given to improving land administration and management to arrest the spiraling urban land prices that is becoming a binding constraint to the expansion of manufacturing and modern services as well as limiting the ability to provide affordable housing.

#### 2) Budget Projection

Chapter 7.2 explains the current status of national budget which shows the revenue and expenditures that have been increasing every year. In order to determine the financing capacity for the infrastructure development, the Study Team made a projection of GDP growth and national budget below.

GDP projection

GDP projection as shown in Table 11.2, Bangladesh has been showing the stable GDP growth performance, around 6% per year in the past ten years. Many organizations made a projection of future GDP growth based on the different projections, the study team estimated the GDP growth in the future. The following tables show projected GDP growth rate by each organization.

**Table 11.2 Short-term GDP Growth Projection by International Organizations**

| | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| IMF | 6.4% | 6.8% | 7% | 7% | 7% |
| WB | 6.3% | 6.7% | 6.7% | - | - |
| ADB | 6.1% | 6.4% | - | - | - |

Source: IMF World Economic Outlook, WB Global Economic Prospect and Asian Development Bank Outlook2015

**Table 11.3 Long-term GDP Growth Projections by Research Institute and Companies**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BEF | 2015-2020 | 2020-2025 | 2025-2030 | 2030-2035 | 2035-2040 | 2040-2045 | 2045-2050 |
| | 8.7% | 9.4% | 9.3% | 8.4% | 7.7% | 6.5% | 6% |
| PWC | 2014 - 2020 | 2020 - 2030 | | 2030 - 2040 | | 2040 - 2050 | |
| | 6.51% | 5.14% | | 5.24% | | 4.58% | |

Source: “Vision 2030: What Lies Ahead for Bangladesh in Post MDGs World?” Dr. Mustafa K. Mujeri, June 2014 and PWC World in 2050, Feb. 2015

The range of the projected GDP growth rate is from 6.1% to 8.7% in 2015-2020. In the long run, PWC projected the lowest rate of 5.14% in 2020-2030,5.24% in 2030-2040 and 4.58 in 2040-2050. On the other hand, BIDS’s projection shows much higher growth rate, particularly it projected over 9% between 2020 and 2030.

The economic growth of Bangladesh is estimated on the assumption that labor force and capital stock will increase and the government will ensure sound macroeconomic policies and stable macro environment .However, political turmoil sometimes stops economic activities and political unrest is one of the critical factors which affect the national economic growth in Bangladesh. Actually, ADB and WB lower the GDP growth projection due to the hartal in 2014-2015.

World Economic Outlook by IMF projects GDP growth rate for emerging economy as (2015 and 2020); “Emerging market and developing economies” 4.26% and 5.27%. India receives the highest projection rate among the BRICs countries as 7.46% in 2015 and 7.75% in 2020 (refer to the Table 12.4). Even the majority of the emerging countries that follow BRICs countries called such as “Next Eleven” or “VISTA” receive the projection rate below 6%.

The Perspective Plan of Bangladesh 2010 – 2021 has GDP growth projection with 8.0% in 2015 and 10.0% in 2021 based on the 6.1% growth rate in 2010. This plan is made by the Planning Commission therefore the official document of the GOB. However, it is made in 2012 and considering the change in the global economy thereafter, it is safe to say, the projection is too challenging under the current situation.

**Table 11.4 GDP Growth Rate Projection for emerging Countries**

Unit: annual percent change

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Emerging market and developing economies | 5.16% | 5.00% | 4.59% | 4.26% | 4.74% | 5.03% | 5.11% | 5.24% | 5.27% |
| BRICs Countries | | | | | | | | | |
| - Brazil | 5.16% | 5.00% | 4.59% | 4.26% | 4.74% | 5.03% | 5.11% | 5.24% | 5.27% |
| - Russia | 3.40% | 1.30% | 0.62% | -3.83% | -1.10% | 1.00% | 1.50% | 1.50% | 1.50% |
| - India | 5.08% | 6.90% | 7.17% | 7.46% | 7.47% | 7.55% | 7.65% | 7.70% | 7.75% |
| - China | 7.76% | 7.75% | 7.36% | 6.76% | 6.30% | 6.00% | 6.10% | 6.33% | 6.33% |
| Next Eleven Countries | | | | | | | | | |
| - Bangladesh | 6.26% | 6.07% | 6.11% | 6.31% | 6.76% | 7.00% | 7.00% | 7.00% | 6.74% |
| - Egypt | 2.22% | 2.10% | 2.16% | 4.04% | 4.26% | 4.48% | 4.68% | 4.96% | 5.03% |
| - Indonesia | 6.03% | 5.58% | 5.03% | 5.20% | 5.50% | 5.80% | 6.00% | 6.00% | 6.00% |
| - Iran | -6.61% | -1.91% | 2.97% | 0.56% | 1.29% | 1.55% | 1.76% | 2.00% | 2.11% |
| - South Korea | 2.29% | 2.97% | 3.32% | 3.28% | 3.46% | 3.67% | 3.69% | 3.69% | 3.68% |
| - Pakistan | 3.84% | 3.70% | 4.14% | 4.30% | 4.70% | 4.82% | 5.00% | 5.00% | 5.00% |
| - Turkey | 2.13% | 4.12% | 2.90% | 3.15% | 3.60% | 3.59% | 3.55% | 3.49% | 3.49% |
| - Mexico | 4.01% | 1.39% | 2.13% | 3.00% | 3.32% | 3.52% | 3.76% | 3.76% | 3.77% |
| - Nigeria | 4.28% | 5.39% | 6.31% | 4.75% | 4.95% | 5.25% | 5.52% | 5.77% | 5.95% |
| VISTA Countries | | | | | | | | | |
| - South Africa | 2.22% | 2.21% | 1.53% | 2.00% | 2.10% | 2.40% | 2.70% | 2.80% | 2.80% |
| - Argentina | 0.80% | 2.89% | 0.47% | -0.31% | 0.12% | 0.26% | 0.35% | 0.40% | 0.45% |

Source: IMF World Economic Outlook Database April 2015

Based on the above projection range, 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 11.5 GDP Growth Projections**

Unit: Billion Taka

| | 2014-15 | 2016 | 2017 | 2018 | 2019 | 2020 | 2030 | 2050 | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 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 | Budget Speech 2015 and JST |
| GDP deflator index | 200 | 214 | 229 | 245 | 262 | 279 | 455 | 996 | JST estimate based on IMF data |
| 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.

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 11.6 Revenue and Expenditure Projections (Case 1)**

Unit: Billion TDB

| | 2014-15 | 2016 | 2017 | 2018 | 2019 | 2020 | 2030 | 2050 | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| GDP growth rate | 6.1% | 6.5% | 6.8% | 6.8% | 6.8% | 6.9% | 6.7% | 6.0% | JST estimate |
| nominal GDP | 13,395 | 14,342 | 15,356 | 16,442 | 17,605 | 18,763 | 30,768 | 68,230 | Budget Speech 2015 and JST |
| GDP deflator index | 200 | 214 | 229 | 245 | 262 | 279 | 455 | 996 | JST estimate based on IMF WEO |
| 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% | Budget speech 2015 |
| 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% | Budget speech 2015 |
| Infrastructure among ADP | 295 | 430 | 461 | 493 | 528 | 563 | 923 | 2,047 | |
| % of GDP | 2.2% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | Target value of seventh 5year plan |

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 11.7 Revenue and Expenditure Projections (Case 2)**

Unit: Billion TDB

| | 2014-15 | 2016 | 2017 | 2018 | 2019 | 2020 | 2030 | 2050 | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| GDP growth rate | 6.1% | 6.5% | 6.8% | 6.8% | 6.8% | 6.9% | 6.7% | 6.0% | JST estimate |
| nominal GDP | 13,395 | 14,342 | 15,356 | 16,442 | 17,605 | 18,763 | 30,768 | 68,230 | Budget Speech 2015 and JST |
| GDP deflator index | 200 | 214 | 229 | 245 | 262 | 279 | 455 | 996 | JST estimate based on IMF WEO |
| 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% | |
| 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% | Budget speech 2015 |
| 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% | Budget speech 2015 |
| Infra of ADP | 295 | 574 | 614 | 658 | 704 | 751 | 1,231 | 2,729 | |
| % of GDP | 2.2% | 4% | 4% | 4% | 4% | 4% | 4% | 4% | Target value of seventh 5year plan |

Source: JICA Study Team

### 3) 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 TBD. In the case of optimistic scenario, it will reach 328 billion TDB in 2020.

**Table 11.8 Projected Budget for Transport Sector**

Unit: Billion TDB

| | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 2030 | 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

## (2) Financial Capacity of Dhaka Metropolitan Administration

The urban local authority, Dhaka City Corporation (DCC) is responsible for the preparation of their respective annual budgets. By law, they are required to solicit participation of the citizens in the budget preparation process. Normally, the personnel of the corporation in the finance or accounts department prepare the draft budget which is then presented to the Mayor. Generally the budget is prepared along a set structure with some nominal adjustments such as; a certain percentage change in each approved head which is shown in the Table 11.9. It is found from same tables that the DCC is seriously weak in financial strength. It is not able to raise enough property or holding taxes and incapable of innovating new sources for revenue earning.

**Table 11.9 Debt service liabilities of Dhaka City Corporation (DCC)**

Million BDT

| | |
|---|---|
| Total Principal due on June 2012 | 1342.1 |
| Total Interest due on June 2012 | 1781.7 |
| Total Due on June 2012 | 2123.8 |

Source: Bangladesh Economic Review (2012)

## (3) Key Issues and Recommendation

(a) Drastic changes in the physical, economic and social structure in the Dhaka areas resulting from rapid urbanization has been posing serious challenges for sustainable urban development. On the other hand, the resource mobilization is not matching with the need for developing urban facilities including transportation services.

(b) There is a scope to increase property tax in Dhaka city and it is necessary to examine the possibility.

(c) In order to promote economic development in the country especially in Dhaka, it is necessary to increase investment in the Dhaka city infrastructures such as water supply, road and footpath maintenance, construction of new transport network and also in mass-rapid transit.

(d) At this moment, the ratio of revenue to GDP is very low compared with other developing countries such as Cambodia, Vietnam, Philippines, Nepal and Sri Lanka and so on. Therefore, the total budget allocated to transport sector is not sufficient to meet the demand. Government's efforts to increase tax revenue and other kind of revenues are essential as well as seeking new financing sources such as private involvement.

(e) The Government has a keen interest to attract the private sector involvement in transport infrastructure, and adoption of private sector infrastructure policies and guidelines. The Government needs to consider more practical approach to attract private sector finances in infrastructure projects, such as measures of financial risk reductions and particularly in the roads and highways as well as urban transport mainly in Dhaka city.

# 12. FORMULATION OF THE URBAN TRANSPORT MASTER PLAN

## 12.1 Development of the RSTP Urban Transportation Master Plan

### (1) Methodology

The development of the RSTP Urban Transportation Master Plan adopted the following methodology (see Figure 12.1):

(i) Elaborate the master plan network through a screen line analysis by comparing the network capacity and future demand.

(ii) Identify necessary projects to meet future demand at the same time avoiding excessive capacity.

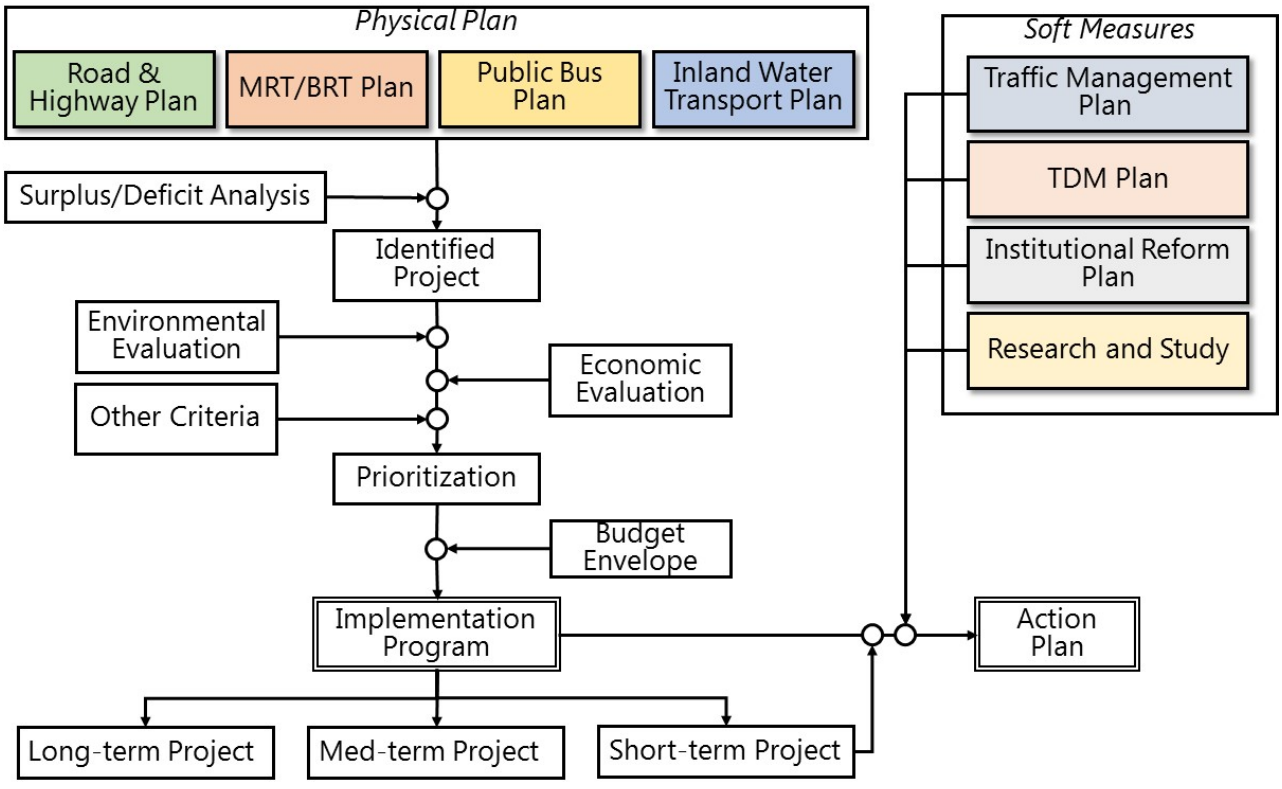
(iii) Conducts economic evaluation of each project to give priority on projects with higher economic return.

(iv) Conduct preliminary environmental assessment of every project and consider countermeasures against environmental problems, if any.

(v) Make a final prioritization of all physical projects by examining their respective characteristics from different perspectives.

(vi) Classify the projects into three categories, namely short-, medium- and long-term projects, by considering the financial constraints.

(vii) Prepare an action plan for short-term projects together with “soft” measures.




Source: RSTP Study Team

**Figure 12.1 Development Procedure for the Master Plan**

### (2) Output of the Transportation Network 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.

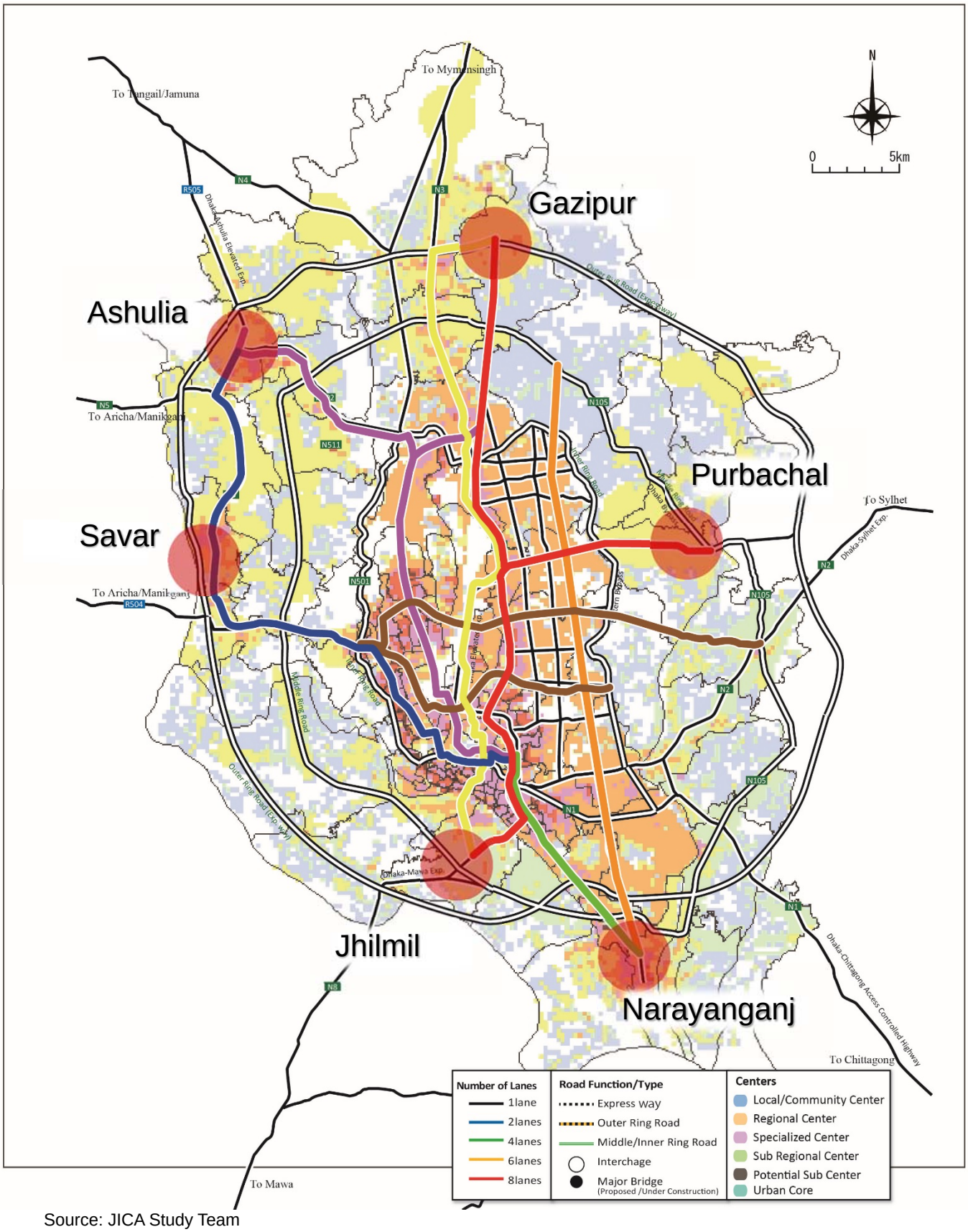
iii. RSTP retains the basic concept of STP.

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.




Source: JICA Study Team

**Figure 12.2 RSTP, Urban Transport Master Plan**

## 12.2 Road Network Development Plan

### (1) Study Procedure

Road network development plan in 2035 was proposed through the study procedure illustrated in Source: JICA Study Team

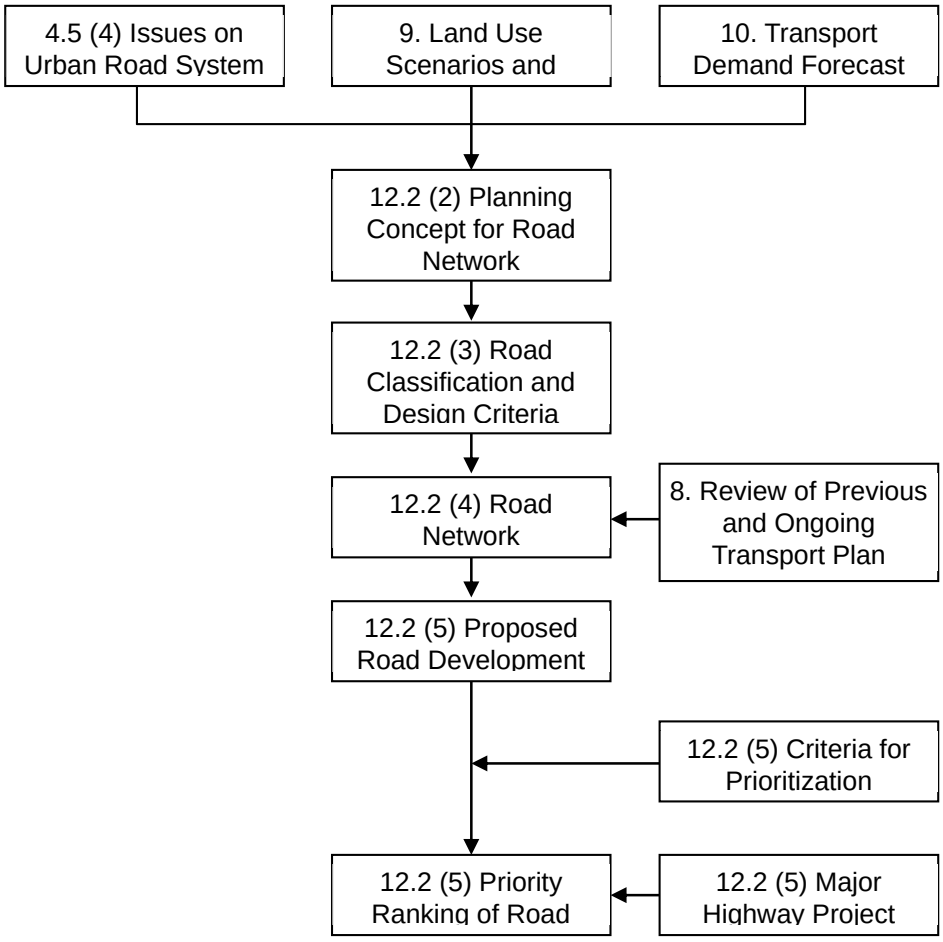



Figure 12.3.

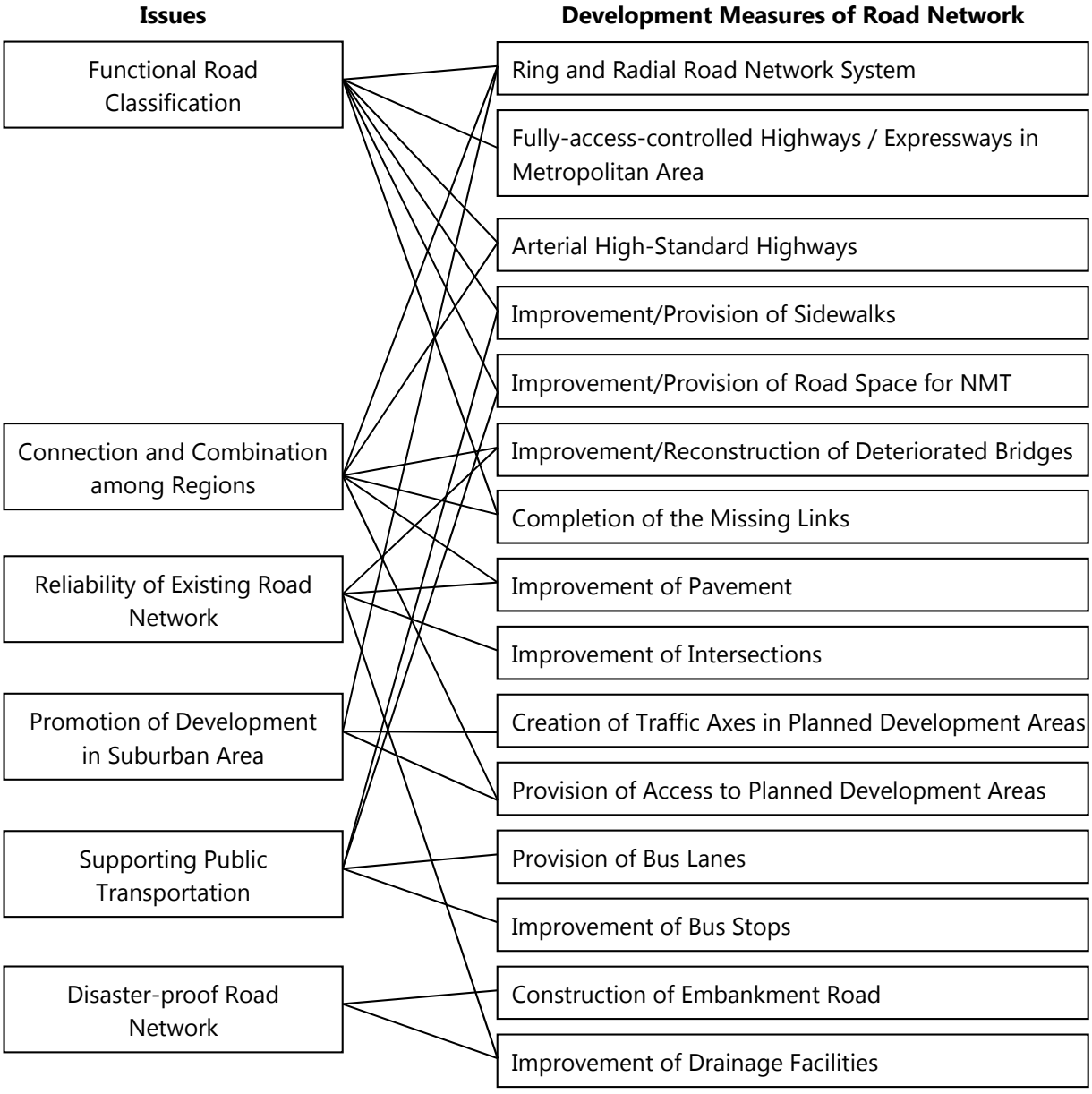
Source: JICA Study Team

**Figure 12.3 Study Procedure**

### (2) Planning Concept for Road Network Development

#### 1) Issues and Development Measures of Road Network

Based on the issues on existing road system (Chapter 4), future land use scenarios (Chapter 10), and future traffic demand forecast (Chapter 10), the development measures of road network are prepared as shown in Figure 12.4.




Source: JICA Study Team

**Figure 12.4 Issues and Development Measures of Road Network**

### 2) 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.

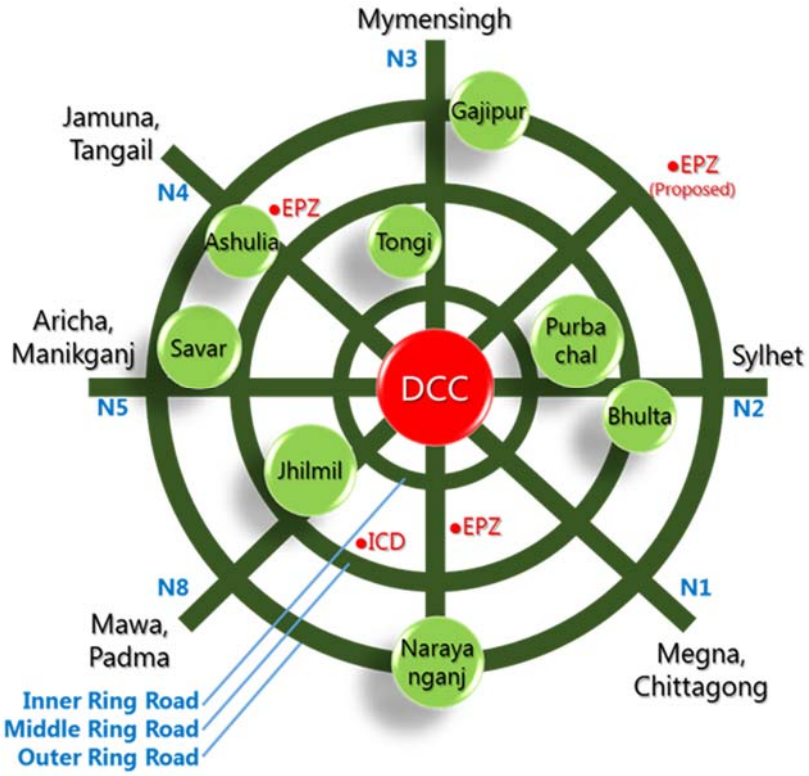
These measures will contribute in the reduction of commuting time and will alleviate traffic congestion while at the same time creating a balanced urban environment. A key measure is the development of ring and radial road network.

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 12.5 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.

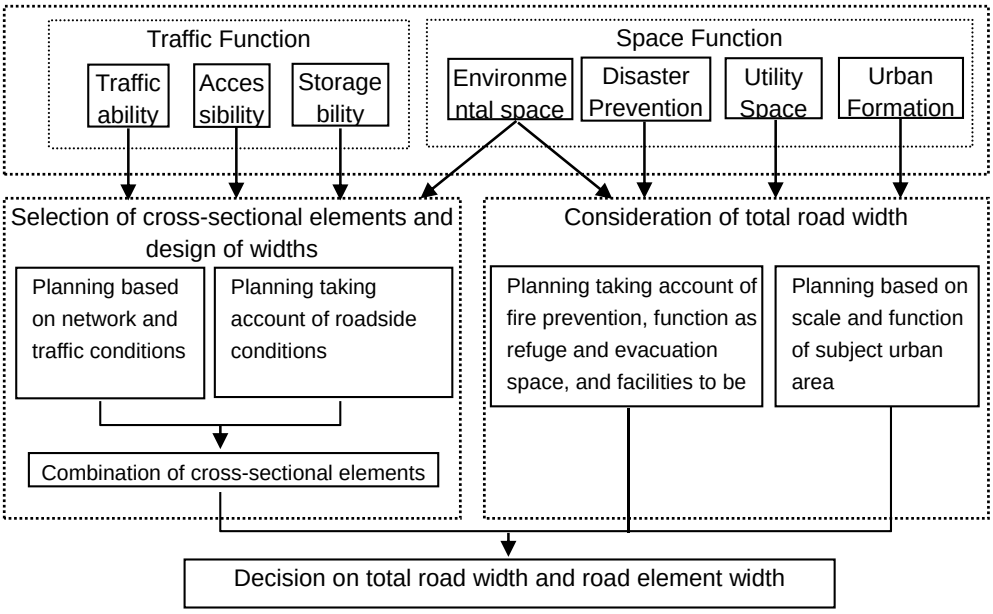



Source: JICA Study Team

**Figure 12.5 3 Rings and 8 Radials Road Network System in RAJUK Area**

### (3) Road Classification and Design Criteria

Due consideration to road function is essential in cross-section planning because urban roads facilitate traffic and provide space for varied purpose. Especially, the space function of medians, shoulders, sidewalks, and service roadways was taken into account in harmony with the relevant urban land uses.




Source: JICA Study Team

**Figure 12.6 Concept of Cross-section Planning based on Road functions**

Functional road classification is important to formulate an efficient and effective road network which is therefore proposed by taking into consideration below mentioned road design manuals and guidelines. Following the road classification, the Study Team proposes the road design policies for road structures and traffic management measures and their typical cross section as mention in Table 12.1, Figure 12.7 and Figure 12.8, respectively.

a) Road design manual, Road and Highway Department, Ministry of Communication, Bangladesh

b) Road design manual, Ministry of Local Government, Bangladesh

c) Road design manual, RAJUK, Ministry of Housing and Public Works

d) A Policy on Geometric Design of Highway and Streets, the American Association of State Highway and Transport Officials (AASHTO), Washington DC.

e) Highway Capacity Manual, Fourth Edition, Transport Research Board, National Research Council (NRC), Washington DC.

f) Guide for Design of Pavement Structure, AASHTO

g) Road Structure Guidelines, Japan Association of Road

**Table 12.1 Road Function of Future Road Network by Road Classifications**

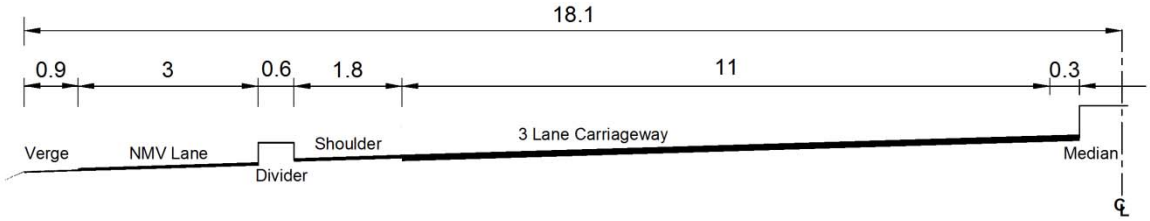
| Item | Road Classification | | | |
|---|---|---|---|---|
| | **Expressway** | **Primary Road** | **Secondary Road** | **Collector Road** |
| Access Control | Full-access controlled | Limited-access controlled | Non-access controlled | Non-access controlled |
| Structure | Embankment/ Viaduct | At-grade (Flyover) | At-grade | At-grade |
| Design Speed (km/h) | 100, 80, 60 | 80, 60 | 50, 40 | 40, 30 |
| Number of Lanes | 4-8 | 4-8 | 2-4 | 2-4 |
| Pedestrian Facility | N/A | Dual Sidewalk | Dual Sidewalk | If required |
| Bus Lanes | N/A | Possible | Possible | N/A |
| Rickshaw | Prohibited | Prohibited | Possible | Possible |

Source: JICA Study Team

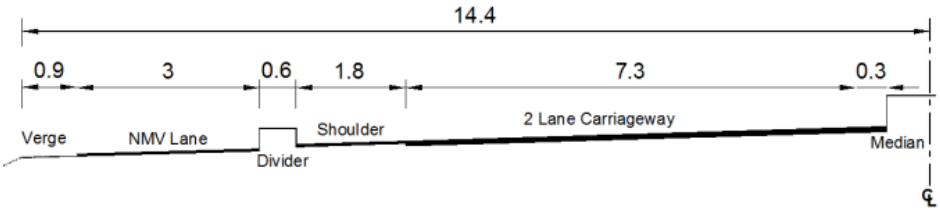
The choice of cross-section is crucial in obtaining a cost-effective solution in meeting traffic demands. Most of the roads in Bangladesh are built on embankments and every extra meter of crest width will add considerably to the cost. Therefore, the width of the carriageway and shoulder should be the minimum, just necessary to carry the traffic volume efficiently and safely.

Figure 13.7 and Figure 13.8 illustrate the typical cross sections mainly quoted from “Geometric Design Standards for Roads and Railways Division, RHD 2000”. In the feasibility study or designing phase of each project, it is required to carefully consider each component of the cross section such as carriageway and shoulder width, the necessity of NMV lanes and sidewalks, and bus bays/ stopping places by taking the circumstances of the project area into account. One of the particular characteristics of Bangladesh roads is the large number of NMVs and pedestrians. Failure to provide proper NMV lanes will significantly reduce the traffic capacity of the road, particularly on heavily-trafficked sections. In most situations, pedestrians can share the paved shoulder, however, on sections where there are huge number of pedestrians, shoulders must have enough width and smooth surface or it is necessary to provide a separate footway.

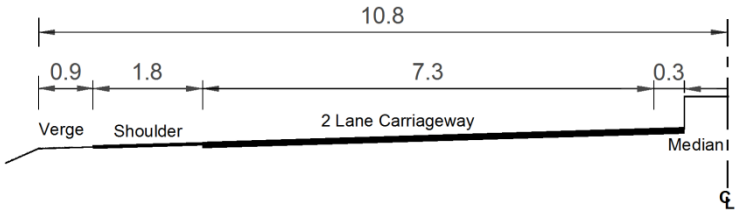
・ Type 1: Dual 3 lane with NMV lanes [Primary Road]



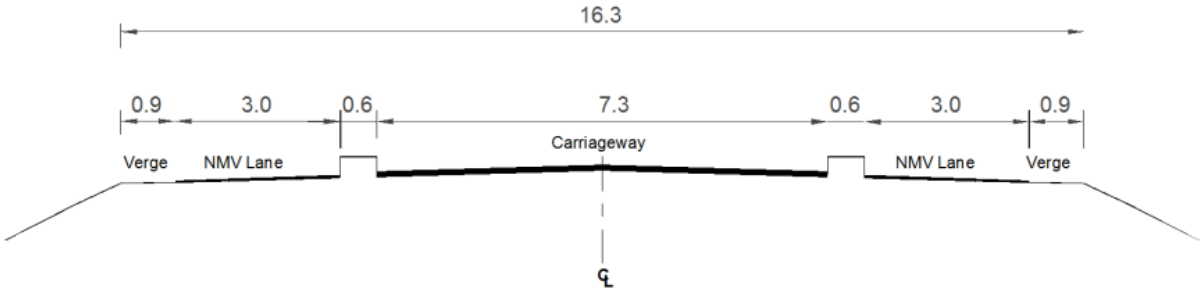

・ Type 2a: Dual 2 lane with NMV lanes [Primary/Secondary Road]




・ Type 2: Dual 2 lane carriageway [Secondary Road]



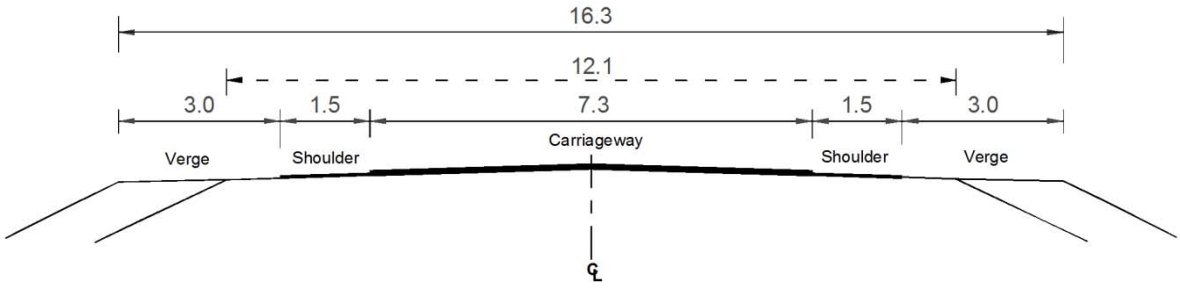

・ Type 3a: 7.3m carriageway with NMV lanes [Secondary Road]



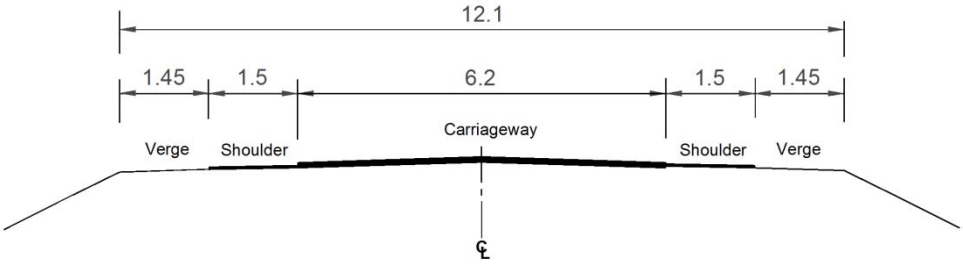

Note: NMV lanes can be replaced with service lanes
Source: Geometric Design Standards for Roads and Highway Department, RHD, 2000

**Figure 12.7 Typical Cross Section (1)**

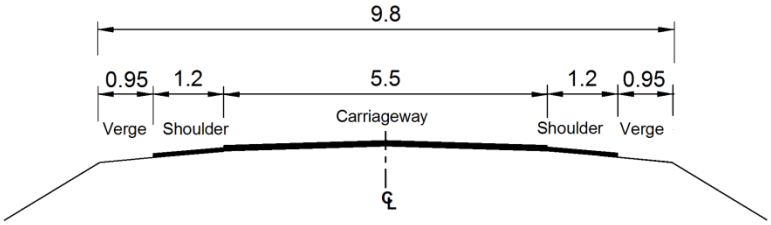
・ Type 3: 7.3m carriageway [Secondary Road]




・ Type 4: 6.2m carriageway with 1.5m shoulders [Secondary/Collector Road]




・ Type 5: 5.5m carriageway [Collector Road]




Note: NMV lanes can be replaced with service lanes

Note: verges can be omitted or replaced with sidewalks in urban area

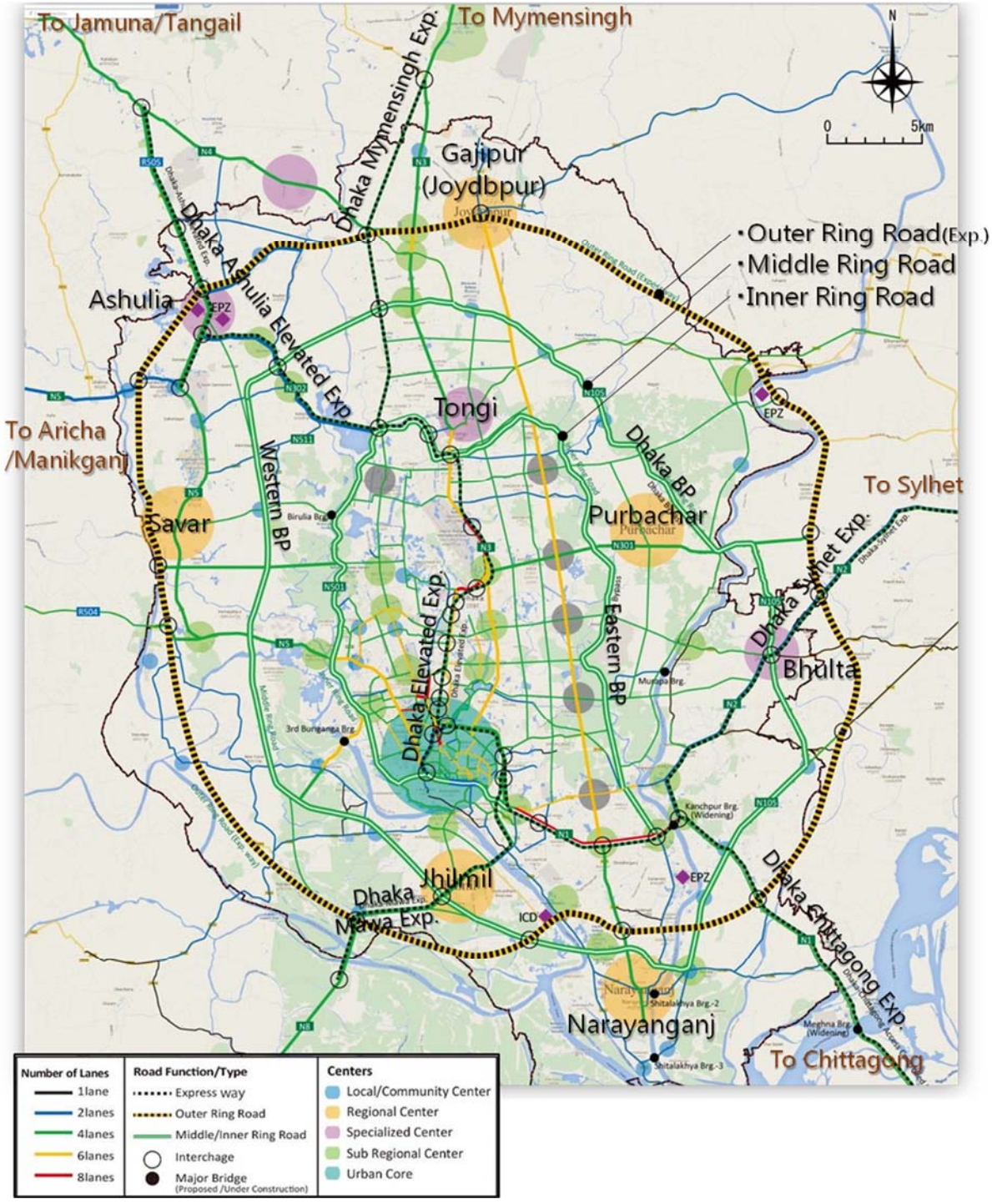
Source: Geometric Design Standards for Roads and Highway Department, RHD, 2000

**Figure 12.8 Typical Cross Section (2)**

### (4) Road Network Development Plan

#### 1) Proposed Road Network in RAJUK area

Figure 12.9 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.

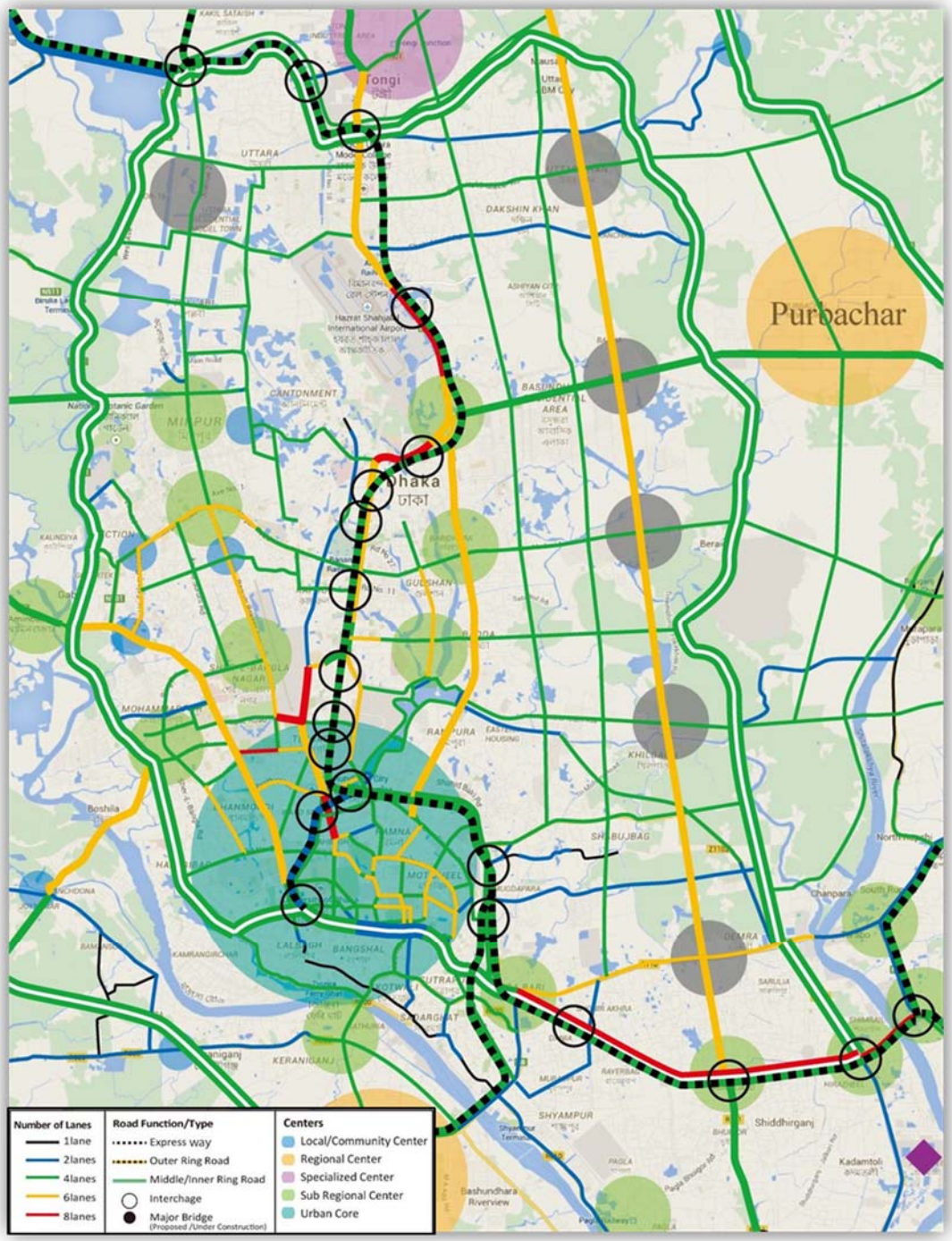



Source: JICA Study Team

**Figure 12.9 Proposed Road Network in RAJUK area**

### 2) Proposed Road Network in DMA

Figure 12.10 illustrates the enlarged figure of DMA in Figure 12.9. DMA will be surrounded by the Inner Ring Road, mainly built on the embankment of Trug River and Balu River. New traffic axles placed into a ladder form are proposed to properly promote the development of the Eastern fringe area.




Source: JICA Study Team

**Figure 12.10 Proposed Road Network in DMA**

### (5) Proposed Road Development Projects

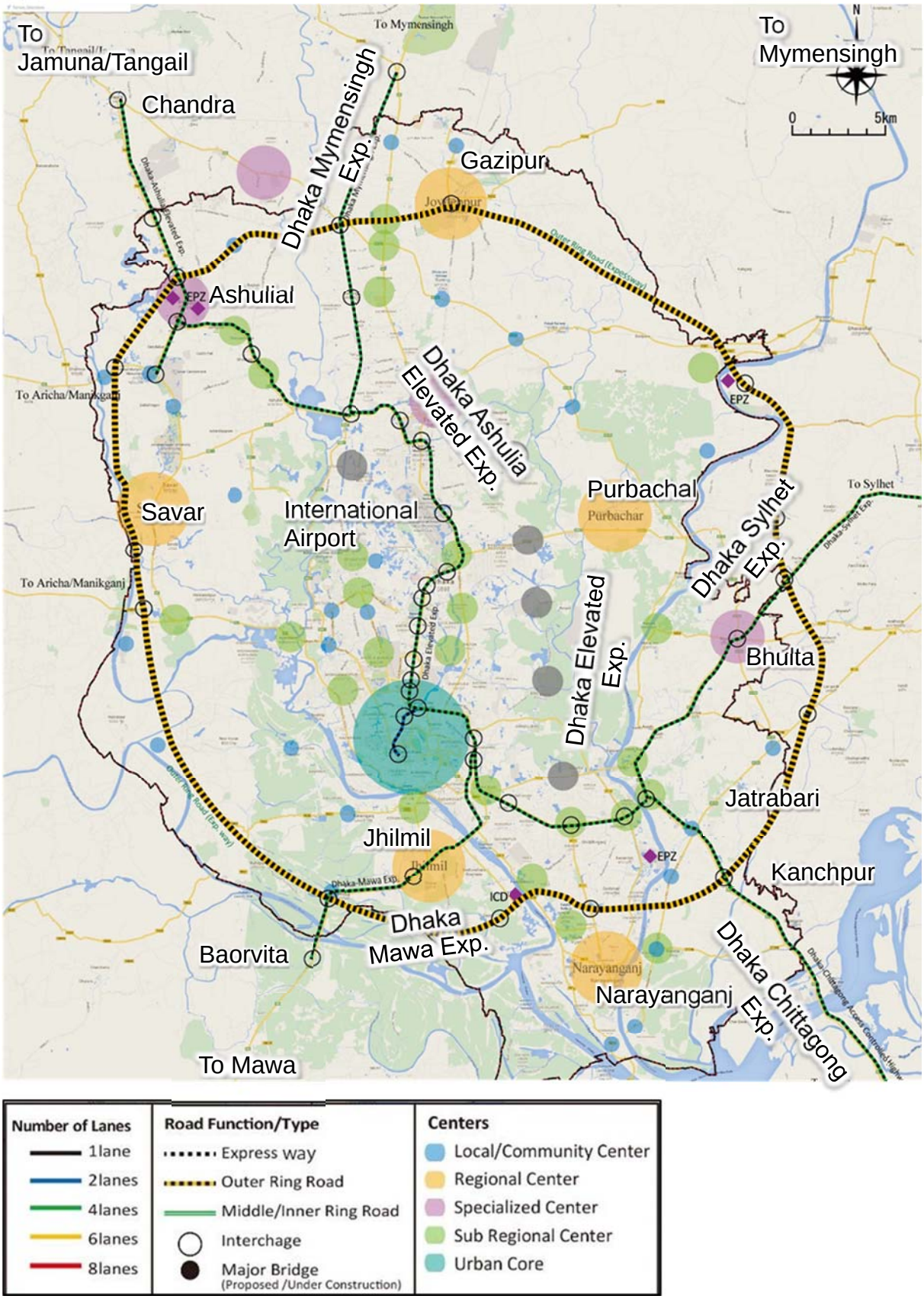
#### 1) Proposed Road Project List and Preliminary Cost

Table 12.2 shows the summary of proposed road development projects. The detailed road projects are described and listed up in Figure 12.13, Figure 12.14, Table 12.3, Table 12.4 and Table 12.6.

**Table 12.2 Proposed Road Development Projects (Summary)**

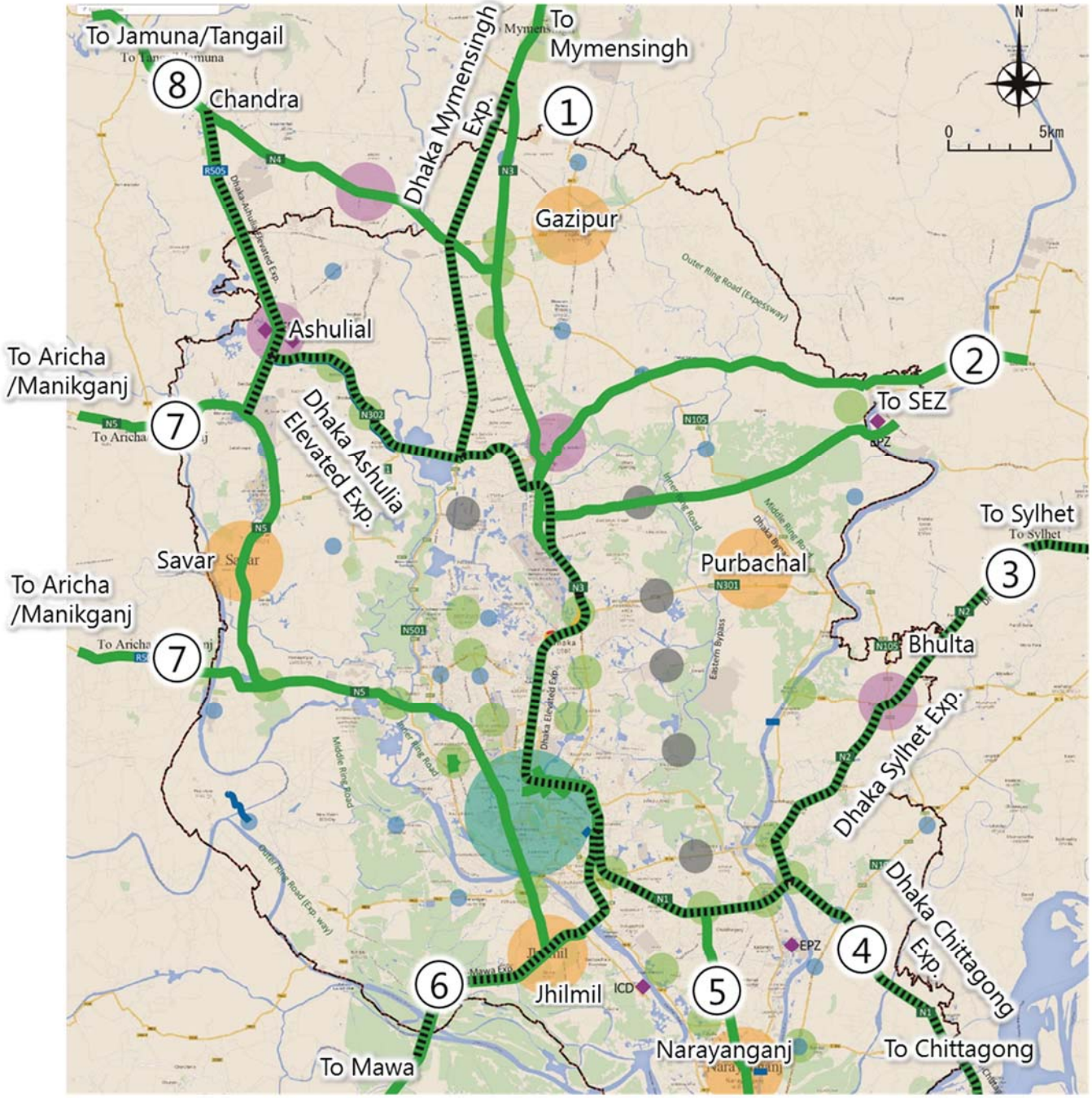
| Project Components | Length (km) | | | | Project Cost (BDT, Crore) |
|---|---|---|---|---|---|
| | Total | New Road | Wid-ening | Com-pleted | |
| 1. Expressway | 126 | *126* | *0* | *0* | 31,042 |
| 1.1 Dhaka Elevated Expressway | 20 | *20* | *0* | *0* | 8,940 |
| 1.2 Dhaka Ashulia Elevated Expressway | 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 |
| 2. 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 |
| 3. Primary Roads | 290 | *65* | *225* | *0* | 10,984 |
| 4. Secondary Roads | 471 | *185* | *286* | *0* | 18,962 |
| Total | 1,198 | *585* | *609* | *4* | 96,324 |

Note 1: Expressway excludes Outer Ring Road.
Note 2: 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



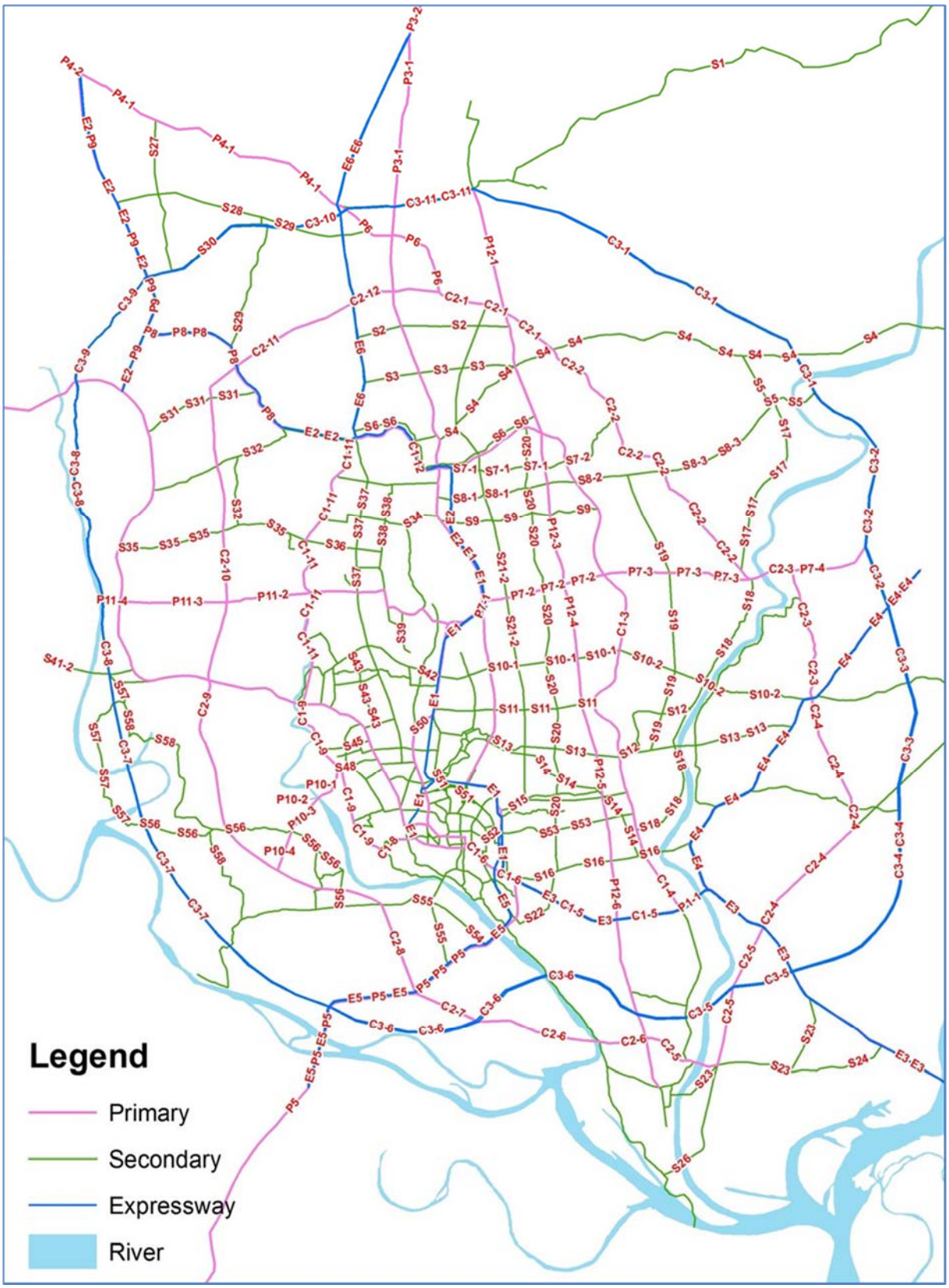

Source: JICA Study Team

**Figure 12.11 Proposed Expressway and Outer Ring Road**



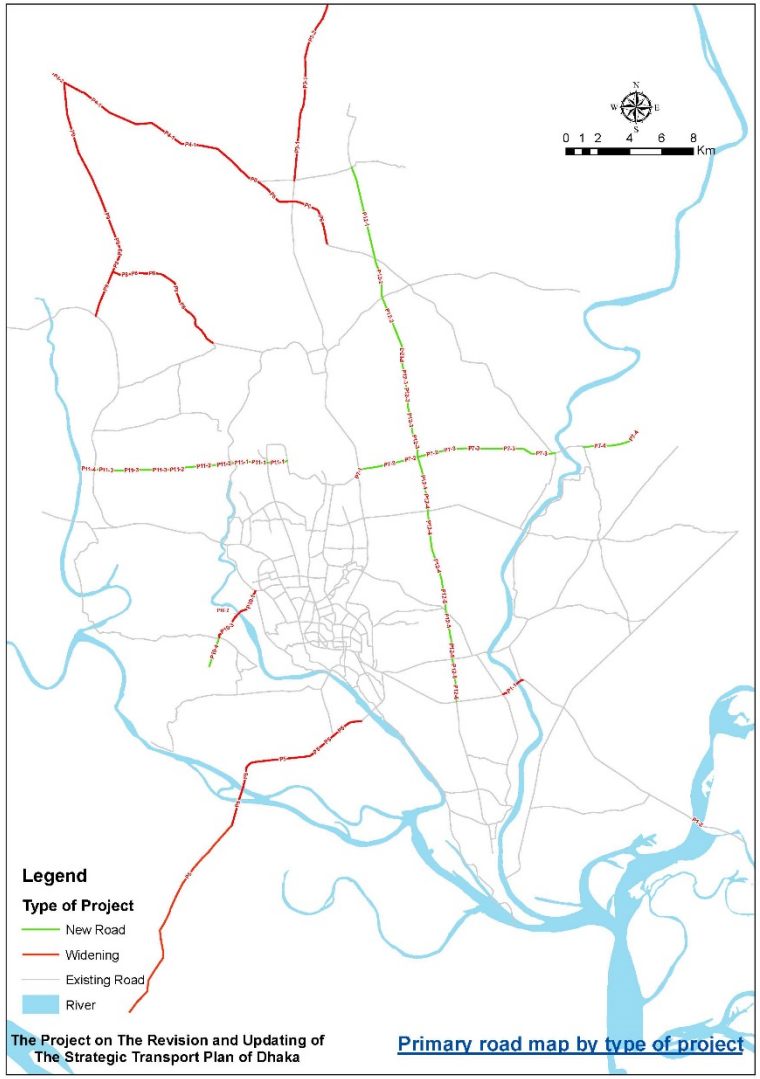

Source: JICA Study Team

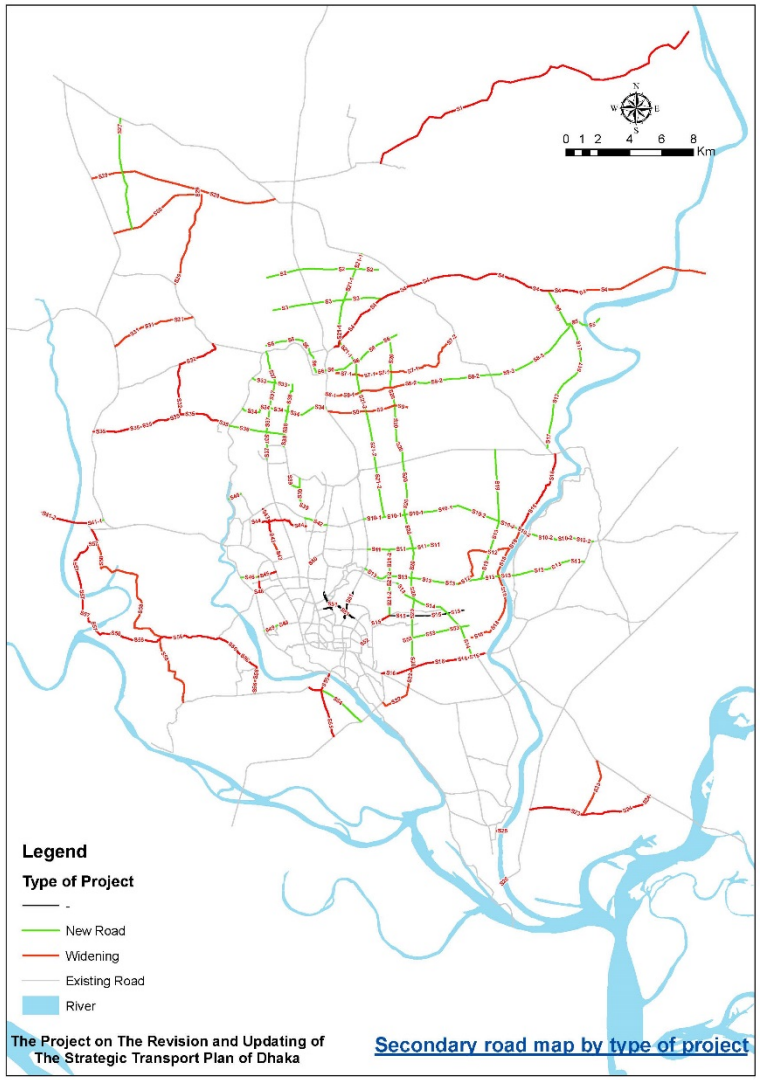
**Figure 12.12 proposed 8 Radial Roads**




Source: JICA Study Team

**Figure 12.13 Location of Proposed Road Development Projects**




Source: JICA Study Team

**Figure 12.14 Project Type of Primary Road and Secondary Road**

## Table 12.3 Proposed Road Development Projects (1)

| Sl. No. | Description | Main Area | Road Category | Type of Project | Lane Number (Existing) | Lane Number (Proposed) | Length (km) | Road Specification | Project Cost (Tk. Crore) | 2035 Traffic Flow (pcu/day per both directions) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C1-1 | Inner Ring Road / Dhaka Eastern BP (N3 to Termukh Rayerdia Link Rd.) | DMA | Primary Road | New Road | 0 | 4 | 7.4 | Limited-access Highway | 2,029 | 63,900 | B |
| C1-2 | Inner Ring Road / Dhaka Eastern BP (Termukh Rayerdia Link Rd. to N301) | DMA | Primary Road | New Road | 0 | 4 | 5.8 | Limited-access Highway | 1,590 | 58,700 | C |
| C1-3 | Inner Ring Road / Dhaka Eastern BP (N301 to R201) | DMA | Primary Road | New Road | 0 | 4 | 14.5 | Limited-access Highway | 3,976 | 54,800 | C |
| C1-4 | Inner Ring Road / R110 (R201 to N1) | DMA | Primary Road | Widening | 2 | 4 | 3.0 | Limited-access Highway | 83 | 42,500 | C |
| C1-5 | Inner Ring Road / N1 (R110 to Toll Gate) / Jatrabari - Khanchpur bridge (widening of polder road to 8 lane) | DMA | Primary Road | Widening | 4 | 8 | 8.5 | Limited-access Highway | 396 | 107,600 | A |
| C1-6 | Inner Ring Road / Jatrabari-Gulistan FO (Toll Gate to Chankhar Pul Bus Stop) | DCC | Primary Road | Completed | 4 | 4 | 4.0 | Controlled Access Highway (Toll Road) | - | 66,700 | B |
| C1-7 | Inner Ring Road / Zahir Raihan Rd. (Chankhar Pul Bus Stop to Eden Girls College) | DCC | Primary Road | Widening | 1 | 4 | 1.2 | Type 2a | 170 | 47,300 | C |
| C1-8 | Inner Ring Road (Rasulpur Bridge (Embankment) - Peelkhana road - Azimpur Old | DCC | Primary Road | New Road | 0 | 4 | 1.5 | Type 2a | 252 | 88,600 | B |
| C1-9 | Inner Ring Road / Circular Road over embankment (Rasulpur Brg. to N5) | DCC | Primary Road | Widening | 2 | 4 | 8.2 | Limited-access Highway | 811 | 67,400 | B |
| C1-10 | Inner Ring Road / Circular Road over embankment (N5 to N501/Diabari Bot Tola :Flyover) | DCC | Primary Road | New Road | 0 | 4 | 1.8 | Limited-access Highway | 302 | 41,900 | C |
| C1-11 | Inner Ring Road / N501:Circular Road over embankment (Diabari Bot Tola to N302) | DCC | Primary Road | Widening | 2 | 4 | 11.9 | Limited-access Highway | 1,177 | 95,300 | A |
| C1-12 | Inner Ring Road / N302:Circular Road over embankment (N302 to N3) | DCC | Primary Road | Widening | 2 | 4 | 5.4 | Limited-access Highway | 534 | 50,600 | C |
| C2-1 | Middle Ring Road (Near Dhirashrom Rd. to R301) / N105:Dhaka BP | RAJUK | Primary Road | Widening | 2 | 4 | 5.9 | Limited-access Highway | 186 | 44,900 | C |
| C2-2 | Middle Ring Road / N105:Dhaka BP (R301 to N301) | RAJUK | Primary Road | Widening | 2 | 4 | 14.9 | Limited-access Highway | 469 | 64,600 | B |
| C2-3 | Middle Ring Road / N105:Dhaka BP (N301 to N2) | RAJUK | Primary Road | Widening | 2 | 4 | 8.1 | Limited-access Highway | 253 | 40,300 | C |
| C2-4 | Middle Ring Road / N105:Dhaka BP (N2 to N1) | RAJUK | Primary Road | Widening | 2 | 4 | 12.6 | Limited-access Highway | 397 | 43,800 | C |
| C2-5 | Middle Ring Road (N1 to R111) | RAJUK | Primary Road | Widening /New Bridge | 1 | 4 | 10.5 | Limited-access Highway | 877 | 44,000 | C |
| C2-6 | Middle Ring Road (R111 to Zazira IC) | RAJUK | Primary Road | Widening /New Bridge | 1 | 4 | 7.9 | Limited-access Highway | 836 | 56,800 | C |
| C2-7 | Middle Ring Road (Zazira IC to N8) | RAJUK | Primary Road | New Road | 0 | 4 | 3.1 | Limited-access Highway | 67 | 54,600 | C |
| C2-8 | Middle Ring Road (N8 to 3rd Briganga Brg. access Rd.) | RAJUK | Primary Road | New Road | 0 | 4 | 9.4 | Limited-access Highway | 204 | 55,700 | C |
| C2-9 | Middle Ring Road (3rd Briganga Brg. access Rd. to N5) | RAJUK | Primary Road | New Road | 0 | 4 | 10.2 | Limited-access Highway | 222 | 55,400 | C |
| C2-10 | Middle Ring Road (N5 to N302) | RAJUK | Primary Road | New Road | 0 | 4 | 15.1 | Limited-access Highway | 329 | 64,000 | B |
| C2-11 | Middle Ring Road (N302 to Dhaka-Mymensingh Exp.) | RAJUK | Primary Road | New Road | 0 | 4 | 6.2 | Limited-access Highway | 135 | 41,900 | C |
| C2-12 | Middle Ring Road (Dhaka-Mymensingh Exp. to Near Dhirashrom Rd.) | RAJUK | Primary Road | New Road | 0 | 4 | 4.1 | Limited-access Highway | 89 | 36,700 | C |
| C3-1 | Outer Ring Road (R310 to R301) | RAJUK | Expressway | New Road | 0 | 6 | 18.9 | Expressway (Toll Road) | 2,023 | 82,900 | B |
| C3-2 | Outer Ring Road (R301 to N2) | Outside RAJUK | Expressway | New Road | 0 | 6 | 11.4 | Expressway (Toll Road) | 1,288 | 72,700 | B |
| C3-3 | Outer Ring Road (N2 to R114) | Outside RAJUK | Expressway | New Road | 0 | 6 | 8.4 | Expressway (Toll Road) | 1,136 | 33,200 | C |
| C3-4 | Outer Ring Road (R114 to N1) | Outside RAJUK | Expressway | New Road | 0 | 6 | 11.3 | Expressway (Toll Road) | 1,283 | 33,100 | C |
| C3-5 | Outer Ring Road (N1 to R111) | RAJUK | Expressway | New Road | 0 | 6 | 7.7 | Expressway (Toll Road) | 1,988 | 62,600 | B |
| C3-6 | Outer Ring Road (R111 to N8) | RAJUK | Expressway | New Road | 0 | 6 | 15.8 | Expressway (Toll Road) | 2,399 | 29,800 | D |
| C3-7 | Outer Ring Road (N8 to R504) | RAJUK | Expressway | New Road | 0 | 6 | 19.3 | Expressway (Toll Road) | 1,688 | 87,300 | B |
| C3-8 | Outer Ring Road (R504 to N5) | RAJUK | Expressway | New Road | 0 | 6 | 13.8 | Expressway (Toll Road) | 1,410 | 97,300 | A |
| C3-9 | Outer Ring Road (N5 to R505) | RAJUK | Expressway | New Road | 0 | 6 | 6.0 | Expressway (Toll Road) | 1,014 | 67,900 | B |
| C3-10 | Outer Ring Road (R505 to N4/N105) | RAJUK | Expressway | New Road | 0 | 6 | 9.8 | Expressway (Toll Road) | 3,505 | 33,900 | C |
| C3-11 | Outer Ring Road (N4/N105 to R310) | RAJUK | Expressway | New Road | 0 | 6 | 6.2 | Expressway (Toll Road) | 2,217 | 78,100 | B |

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000

Source: JICA Study Team

## Table 12.4 Proposed Road Development Projects (2)

| Sl. No. | Description | Main Area | Road Category | Type of Project | Lane Number (Existing) | Lane Number (Proposed) | Length (km) | Road Specification | Project Cost (Tk. Crore) | 2035 Traffic Flow (pcu/day per both directions) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| E1 | Dhaka Elevated Expressway | DCC | Expressway | New Road | 0 | 4 | 19.7 | Expressway (Toll Road) | 8,940 | 96,500 | A |
| E2 | Dhaka - Ashulia Elevated Expressway | RAJUK | Expressway | New Road | 0 | 4 | 38.2 | Expressway (Toll Road) | 13,654 | 83,500 | B |
| E3 | Dhaka - Chittagong Access Controlled Highway (Kutubkhali - Outer Ring Road) | RAJUK | Expressway | New Road | 0 | 4 | 15.6 | Expressway (Toll Road) | 1,501 | 63,000 | B |
| E4 | Dhaka - Sylhet Expressway (N1 - Outer Ring Road) | RAJUK | Expressway | New Road | 0 | 8 | 15.7 | Expressway (Toll Road) | 795 | 47,600 | C |
| E5 | Dhaka - Mawa Expressway | RAJUK | Expressway | New Road | 0 | 4 | 17.7 | Expressway (Toll Road) | 5,169 | 76,000 | B |
| E6 | Dhaka - Mymensingh Expressway | RAJUK | Expressway | New Road | 0 | 4 | 19.4 | Expressway (Toll Road) | 983 | 83,100 | B |
| P1-1 | N1 / 2nd Kanchpur Bridge and rehabilitation of existing Bridge | DMA | Primary Road | Widening (Bridge) | 4 | 8 | 0.4 | Bridge | - | 84,000 | B |
| P1-2 | N1 / 2nd Meghna Bridge and rehabilitation of existing Bridge | Outside RAJUK | Primary Road | Widening (Bridge) | 2 | 6 | 0.9 | Bridge | - | Unknown | |
| P1-3 | N1 / 2nd Gomoti Bridge and rehabilitation of existing Bridge | Outside RAJUK | Primary Road | Widening (Bridge) | 2 | 6 | 1.4 | Bridge | - | Unknown | |
| P2 | N2 / 4-Lane Flyover at Bhulta – Sylhet National Highway | RAJUK | Primary Road | Grade Separation | 0 | 4 | - | Grade Separation | - | Unknown | |
| P3 | N3 / Improvement of Joydevpur – Mymensingh Highway | Outside RAJUK | Primary Road | Widening | 2 | 4 | 87.2 | Type 2a | 1,951 | 74,800 | B |
| P4-1 | N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC | Outside RAJUK | Primary Road | Widening | 2 | 4 | 13.7 | Type 2a | 657 | 67,800 | B |
| P4-2 | N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC | Outside RAJUK | Primary Road | Widening | 2 | 4 | 56.3 | Type 2a | 2,698 | Unknown | |
| P5 | N8 / Improvement into 4-lanes from 1st Buriganga Bridge to Padma Bridge Mawa link | Outside RAJUK | Primary Road | Widening | 2 | 4 | 25.8 | Type 2a | 359 | 72,200 | B |
| P6 | N105 / Upgrading of Dhaka Bypass to 4 Lane (Joydevpur – Debogram – Bhulta – Madanpur) | RAJUK | Primary Road | Widening | 2 | 4 | 7.0 | Type 2a | 219 | 59,400 | C |
| P7-1 | Kuril Flyover | DCC | Primary Road | Grade Separation | 0 | 4 | 3.1 | Grade Separation | 303 | 96,200 | A |
| P7-2 | N301 / From Airport Road near Khilkhet to First Balu Bridge (Isapura) via Baruna | DMA | Primary Road | New Road | 0 | 4 | 6.5 | Under Construction | 270 | 67,900 | B |
| P7-3 | N301 / From first Balu Bridge near Tek Noadda to Sitalakhya River near Kanchan | RAJUK | Primary Road | New Road | 0 | 4 | 6.0 | Under Construction | 250 | 9,300 | D |
| P7-4 | N301 / Extension from Dhaka BP to Outer Ring Road | Outside RAJUK | Primary Road | New Road | 0 | 4 | 3.8 | Type 2a | 83 | 10,800 | D |
| P8 | N302 / Ashulia to Aricha Road (C & B More) | RAJUK | Primary Road | Improvement | 2 | 2 | 8.8 | Type 2 | 13 | 30,400 | C |
| P9 | R505 / Nabinagar - EPZ - Chandra road improvement | RAJUK | Primary Road | Widening | 2 | 4 | 16.0 | Type 2a | 131 | 43,400 | C |
| P10-1 | Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (East side) | DCC | Primary Road | Widening | 2 | 4 | 1.6 | Type 2a | 121 | 85,200 | B |
| P10-2 | Construction of Buriganga 3rd bridge near Basila | DCC | Primary Road | Widening (Bridge) | 2 | 4 | 0.7 | Type 2a | 710 | 85,200 | B |
| P10-3 | Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (West side) | RAJUK | Primary Road | Widening | 2 | 4 | 2.0 | Type 2a | 28 | 85,200 | B |
| P10-4 | Extension of Buriganga 3rd Bridge access roads to Middle Ring Road | RAJUK | Primary Road | New Road | 0 | 4 | 1.9 | Type 2a | 41 | 34,800 | C |
| P11-1 | Mirpur to Outer Ring Road (Kalshi Road to West embankment) | DCC | Primary Road | New Road | 0 | 4 | 3.4 | Type 2a | 571 | 56,200 | C |
| P11-2 | Mirpur to Outer Ring Road (West embankment to Middle Ring Road) | RAJUK | Primary Road | New Road | 0 | 4 | 3.9 | Type 2a | 85 | 64,800 | B |
| P11-3 | Mirpur to Outer Ring Road (Middle Ring Road to N5) | RAJUK | Primary Road | New Road | 0 | 4 | 4.9 | Type 2a | 107 | 49,000 | C |
| P11-4 | Mirpur to Outer Ring Road (N5 to Outer Ring Road) | RAJUK | Primary Road | New Road | 0 | 4 | 0.7 | Type 2a | 16 | 64,600 | B |
| P12-1 | Joydebpur - Narayanganj Highway (Joyedbupur to N105/Dhaka BP) | RAJUK | Primary Road | New Road | 0 | 6 | 5.9 | Type 1 | 174 | 73,800 | B |
| P12-2 | Joydebpur - Narayanganj Highway (N105/Dhaka BP to Inner Ring Road) | RAJUK | Primary Road | New Road | 0 | 6 | 5.8 | Type 1 | 171 | 63,500 | B |
| P12-3 | Joydebpur - Narayanganj Highway (Inner Ring Road to N301) | DMA | Primary Road | New Road | 0 | 6 | 7.1 | Type 1 | 634 | 63,600 | B |
| P12-4 | Joydebpur - Narayanganj Highway (N301 to Khilgaon) | DMA | Primary Road | New Road | 0 | 6 | 8.0 | Type 1 | 715 | 55,600 | C |
| P12-5 | Joydebpur - Narayanganj Highway (Khilgaon to R110) | DMA | Primary Road | New Road | 0 | 6 | 4.9 | Type 1 | 437 | 49,100 | C |
| P12-6 | Joydebpur - Narayanganj Highway (R110 to N1) | DMA | Primary Road | New Road | 0 | 6 | 2.7 | Type 1 | 242 | 36,500 | C |

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000

Source: JICA Study Team

## Table 12.5 Proposed Road Development Projects (3)

| Sl. No. | Description | Main Area | Road Category | Type of Project | Lane Number (Existing) | Lane Number (Proposed) | Length (km) | Road Specification | Project Cost (Tk. Crore) | 2035 Traffic Flow (pcu/day per both directions) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1 | Gazipur – Azmatpur – Itakhola Road (revised) | Outside RAJUK | Secondary Road | Widening | 1 | 2 | 41.0 | Type 4 | 300 | Unknown | |
| S2 | Gacha - Jiraitali Road | RAJUK | Secondary Road | Widening/New Road | 1 | 2 | 7.0 | Type 4 | 39 | 45,600 | C |
| S3 | Sataish - Karamtola Road | RAJUK | Secondary Road | Widening/New Road | 1 | 2 | 6.9 | Type 4 | 38 | 45,800 | C |
| S4 | 4-lanes road from S.A.M. (Shahid Ahsanullah Master) Flyover to Kaliganj Bypass along the railway line | RAJUK | Secondary Road | Widening | 2 | 4 | 25.0 | Type 2 | 252 | 25,800 | D |
| S5 | New EPZ Link Road (R301 to New EPZ) | RAJUK | Secondary Road | New Road | 0 | 4 | 4.7 | Type 2 | 86 | 43,400 | C |
| S6 | Tongi Embankment (Dhaka - Mymensing Exp. to Joydebpur - Narayanganj Hwy.) | RAJUK | Secondary Road | New Road | 0 | 4 | 10.4 | Type 2 | 191 | 52,800 | C |
| S7-1 | Improvement of Abdullahpur – Teromukh – Ulukhola Road (Uttara Sector-8 to Balu river embankment) | DMA | Secondary Road | Widening | 1 | 2 | 5.5 | Type 4 | 68 | 23,600 | D |
| S7-2 | Improvement of Abdullahpur – Teromukh – Ulukhola Road (Balu river embankment to Dhaka BP) | RAJUK | Secondary Road | Widening | 1 | 2 | 3.6 | Type 4 | 20 | 17,500 | D |
| S8-1 | Azampur - Kaliganj Road (N3 to Joyedbupur - Narayanganj Hwy.) | DMA | Secondary Road | Widening | 1 | 4 | 5.2 | Type 2 | 165 | 61,000 | B |
| S8-2 | Azampur - Kaliganj Road (Joyedbupur - Narayanganj Hwy. to Dhaka BP) | RAJUK | Secondary Road | New Road | 0 | 4 | 5.4 | Type 2 | 99 | 53,400 | C |
| S8-3 | Azampur - Kaliganj Road (Dhaka BP to New EPZ Link Road) | RAJUK | Secondary Road | New Road | 0 | 4 | 6.3 | Type 2 | 115 | 20,000 | D |
| S9 | Uttara Sector-4 - Dakhinkhan - Khordi | DMA | Secondary Road | Widening | 1 | 2 | 7.4 | Type 4 | 91 | Unknown | |
| S10-1 | Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj) | DMA | Secondary Road | New Road | 0 | 4 | 6.0 | Type 2 | 886 | 85,200 | B |
| S10-2 | Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj) | RAJUK | Secondary Road | New Road | 0 | 4 | 9.0 | Type 2 | 3,752 | 23,700 | D |
| S11 | Badda - Baru river Embankment Road | DMA | Secondary Road | New Road | 0 | 4 | 4.5 | Type 2 | 170 | 68,700 | B |
| S12 | Majhina – Koetpara – Trimohini connecting Road | RAJUK | Secondary Road | Widening | 1 | 2 | 5.3 | Type 4 | 53 | 17,300 | D |
| S13 | Badda - Golakandial Road (Merul Badda - Babur Jaiga - Balirpar - Parain - | DMA | Secondary Road | New Road | 0 | 4 | 14.2 | Type 2 | 536 | 72,600 | B |
| S14 | Rampura - Demra Road | DMA | Secondary Road | New Road | 0 | 4 | 10.0 | Type 2 | 141 | 34,900 | C |
| S15-1 | Bashaboo Jame Mosque to Trimohini Ghdaraghat via Shekker Jaiga Bridge | DMA | Secondary Road | Widening | 1 | 4 | 6.3 | Type2 | 156 | 51,600 | C |
| S15-2 | Construction of bridge over Balu river at Keodata | DMA | Secondary Road | New Bridge | 0 | 4 | 0.04 | Bridge | 13 | Unknown | |
| S16 | Jatrabari crossing to Demra Ghat (Tarabo bridge) road | DMA | Secondary Road | Widening | 2 | 6 | 7.5 | Type 2 | 331 | 76,600 | B |
| S17 | New EPZ Link Road to Dhaka BP | RAJUK | Secondary Road | New Road | 0 | 4 | 8.6 | Type 2 | 157 | 31,700 | C |
| S18 | Dhaka BP - Demra Road along Shitalakhya River | RAJUK | Secondary Road | Widening | 1 | 4 | 13.9 | Type 2 | 230 | 37,900 | C |
| S19 | S8 (Azampur - Kaliganj Road) to S13 (Badda - Golakandial Road) | RAJUK | Secondary Road | New Road | 0 | 4 | 13.2 | Type 2 | 241 | 52,600 | C |
| S20 | Uttara ABM city - Matuali Road | DMA | Secondary Road | New Road | 0 | 4 | 20.7 | Type 2 | 781 | 68,500 | B |
| S21-1 | Dhirasram - Basabo Road (Dhaka BP to Inner Ring Road) | RAJUK | Secondary Road | New Road | 0 | 4 | 7.5 | Type 2 | 138 | 67,400 | B |
| S21-2 | Dhirasram - Basabo Road (Inner Ring Road to Basabo Madertek Road) | DMA | Secondary Road | New Road | 0 | 4 | 16.0 | Type 2 | 604 | 70,800 | B |
| S22 | Improvement of Matuail (Mridhabari) – Shayampur (Dhaka – Narayanganj) Road | DMA | Secondary Road | Widening | 1 | 2 | 3.5 | Type 4 | 43 | 27,800 | D |
| S23 | Improvement of Langolbandh – Kaikertek – Nabiganj Road | RAJUK | Secondary Road | Widening | 1 | 2 | 9.6 | Type 4 | 53 | 22,000 | D |
| S24 | Improvement of Sonargaon Museum link Road along with Baidderbazar–Sonargaon –Mograpara-Kaikertek–Road | RAJUK | Secondary Road | Widening | 1 | 2 | 4.6 | Type 4 | 25 | 21,400 | D |
| S25 | 2nd Shitalakkhya Bridge at Narayanganj | RAJUK | Secondary Road | New Bridge | 0 | 2 | 0.3 | Bridge | 107 | Unknown | |
| S26 | 3rd Shitalakkhya Bridge at Narayanganj Bandar Upazila | RAJUK | Secondary Road | New Bridge | 0 | 2 | 1.3 | Bridge | 458 | 22,900 | D |

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000
Source: JICA Study Team

## Table 12.6 Proposed Road Development Projects (4)

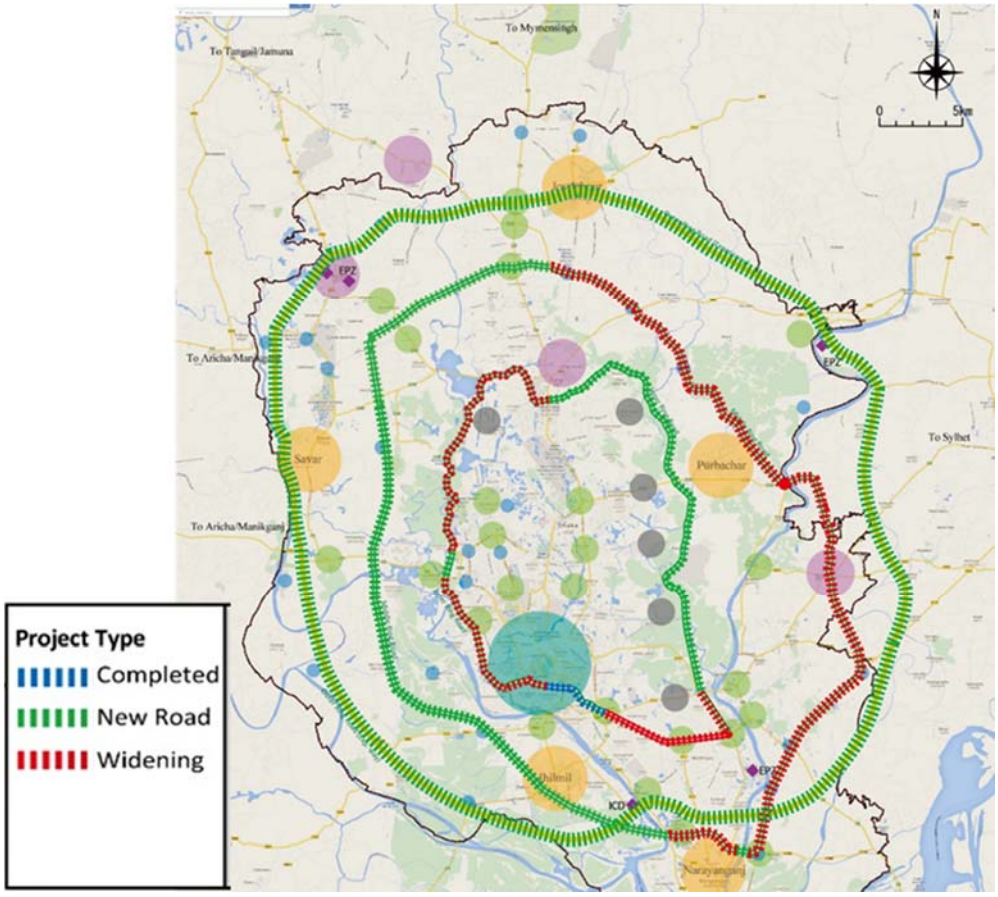
| Sl. No. | Description | Main Area | Road Category | Type of Project | Lane Number (Existing) | Lane Number (Proposed) | Length (km) | Road Specification | Project Cost (Tk. Crore) | 2035 Traffic Flow (pcu/day per both directions) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S27 | Baipay1 - Mouchak Road | RAJUK | Secondary Road | Widening/New Rd | 1 | 2 | 7.1 | Type 4 | 39 | 30,000 | C |
| S28 | Improvement of Zirani Kashimpur Road | RAJUK | Secondary Road | Widening | 1 | 2 | 6.8 | Type 4 | 38 | 26,000 | D |
| S29 | Naojora (Kodda) – Kashimpur – Narsinghapur Road | RAJUK | Secondary Road | Widening | 1 | 2 | 11.7 | Type 4 | 64 | 25,200 | D |
| S30 | Sreepur - Kashimpur Road | RAJUK | Secondary Road | Widening | 1 | 2 | 6.1 | Type 4 | 34 | 17,100 | D |
| S31 | Dewan Idris Sarak | RAJUK | Secondary Road | Widening | 1 | 2 | 5.4 | Type 4 | 30 | 60,100 | B |
| S32 | Berulia (Dhour) - Ashulia - EPZ road | RAJUK | Secondary Road | Improvement | 2 | 2 | 6.1 | Type 3 | 34 | 25,500 | D |
| S33 | Uttara Sector-10 to West Embankment road to the West | DCC | Secondary Road | New Road | 0 | 4 | 3.0 | Type 2 | 382 | 58,500 | C |
| S34 | Uttara Sector-3 to West Embankment road to the West | DCC | Secondary Road | New Road | 0 | 4 | 5.8 | Type 2 | 738 | 50,900 | C |
| S35 | West Embankment(Birulia Bridge) to Savar | RAJUK | Secondary Road | Widening | 1 | 4 | 9.0 | Type 2 | 149 | 61,700 | B |
| S36 | Pallabi to west Embankment via North Rupnagar | DCC | Secondary Road | New Road | 0 | 4 | 3.5 | Type 2 | 445 | 46,100 | C |
| S37 | Pallabi (Mirpur) to Uttara 3rd Phase | DCC | Secondary Road | New Road | 0 | 4 | 6.5 | Type 2 | 827 | 55,400 | C |
| S38 | Pallabi (Mirpur) to Uttara Sector 11 | DCC | Secondary Road | New Road | 0 | 4 | 4.0 | Type 2 | 509 | 58,600 | C |
| S39 | Mirpur Road to Matikata Road | DCC | Secondary Road | New Road | 0 | 4 | 3.2 | Type 2 | 408 | 15,700 | D |
| S40 | Mirpur Zoo to Embankment (Berry Bund) to the west | DCC | Secondary Road | New Road | 0 | 2 | 1.0 | Type 3 | 95 | Unknown | |
| S41-1 | Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane | RAJUK | Secondary Road | New Road | 0 | 4 | 1.1 | Type 2 | 77 | 15,900 | D |
| S41-2 | Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane | Outside RAJUK | Secondary Road | Widening | 1 | 4 | 30.9 | Type 2 | 2,150 | 15,900 | D |
| S42 | Mirpur-14 (Sagorika) to Airport Road (Banani Railway Station) along the fringe of | DCC | Secondary Road | New Road | 0 | 4 | 1.6 | Type 2 | 204 | 52,700 | C |
| S43 | Argagaon Road (Bangladesh Betar) to Mirpur Section 2 through Senpara Parbata | DCC | Secondary Road | Widening | 2 | 4 | 3.6 | Type 2 | 212 | 41,400 | C |
| S44 | Bangla College to Kafrul intersecting Rokeya Sharoni | DCC | Secondary Road | Widening | 1 | 4 | 3.7 | Type 2 | 787 | 8,400 | D |
| S45 | Mohammadpur Krishi Market to Mirpur Road (Sohrawardy Hospital) | DCC | Secondary Road | Widening | 1 | 2 | 1.2 | Type 4 | 51 | 14,200 | D |
| S46 | Krishi Market & Baitul Aman (Y Junction) to Embankment to the west | DCC | Secondary Road | New Road | 0 | 2 | 1.5 | Type 4 | 107 | 21,700 | D |
| S47 | Mohammadpur Shia Mosque (near Japan Garden City) - Mohammadpur Bus Stand (Widening) | DCC | Secondary Road | Widening | 1 | 4 | 0.6 | Type 2 | 61 | 25,800 | D |
| S48 | Mohammadpur Bus Stand Embankment Berry Bandh) - upgradation | DCC | Secondary Road | Widening | 1 | 4 | 0.7 | Type 2 | 51 | 60,800 | B |
| S49 | Zikatala - Hazaribagh (Sikder Medical College) road | DCC | Secondary Road | New Road | 0 | 4 | 1.6 | Type 2 | 204 | 22,100 | D |
| S50 | Flyover and underpasses at Jahangir gate area | DCC | Secondary Road | Grade Separation | 0 | 4 | 0.6 | Grade Separation | 441 | 44,500 | C |
| S51 | Mogbazar and Mouchak Flyover | DCC | Secondary Road | Grade Separation | 0 | 4 | 5.8 | Grade Separation | - | 58,400 | C |
| S52 | Motijheel Shapla Chattar to Kamlapur Railway Station (Widening) | DCC | Secondary Road | Widening | 1 | 2 | 0.5 | Type 3 | 22 | Unknown | |
| S53 | Bashabo Kadamtola Road up to Manikdi | DMA | Secondary Road | New Road | 0 | 4 | 4.2 | Type 2 | 159 | 25,400 | D |
| S54 | Road connecting Buriganga 1st and 2nd bridges via Subhadia & Zinjira (South of | RAJUK | Secondary Road | New Road | 0 | 4 | 3.5 | Type 2 | 64 | 17,900 | D |
| S55 | Improvement of Z.K.D (Zinzira-Keraniganj-Dohar) Link Road into 4-lanes from 2nd Buriganga Bridge approach to Mawa link | RAJUK | Secondary Road | Widening | 2 | 4 | 4.9 | Type 2 | 50 | 56,300 | C |
| S56 | Konakhola to Hazratpur | RAJUK | Secondary Road | Widening | 1 | 2 | 12.7 | Type 4 | 70 | 31,300 | C |
| S57 | Hazratpur to Hemayetpur | RAJUK | Secondary Road | Widening | 1 | 2 | 8.3 | Type 4 | 46 | 14,400 | D |
| S58 | Improvement of Keraniganj (Konakhola) – Kholamura – Hazratpur – Itabhata – Mirpur (Hemayetpur) Road | RAJUK | Secondary Road | Widening | 1 | 2 | 14.5 | Type 4 | 80 | 14,700 | D |

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000
Source: JICA Study Team

### 2) Current Construction Status of Ring Roads

Three kind of ring roads are proposed in 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.

The table below outlines the current status of those three ring roads.




Source: JICA Study Team

**Figure 12.15 Current Constriction Status of the Three Ring Roads**

**Table 12.7 Current Constriction Status of the Three Ring Roads**

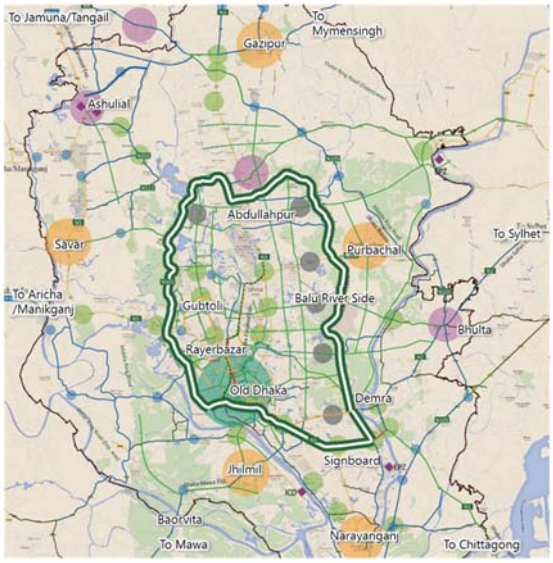
| | Inner Ring Road | Middle Ring Road | Outer Ring Road |
|---|---|---|---|
| Completed | 4.0 *(5.5%)* | 0.0 | 0.0 |
| Widening/ Improvement | 38.2 *(52.2%)* | 59.9 *(55.5%)* | 0.0 |
| New Road | 31.0 *(42.3%)* | 48.1 *(44.5%)* | 129.0 *(100.0%)* |
| Total | 73.2 *(100.0%)* | 108.0 *(100.0%)* | 129.0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

Source: JICA Study Team

**Inner Ring Road (73.2km)**

Locations;

- Teromukh
- Abdullahpur
- Gubtoli
- Rayerbazar
- Babu Bazar
- Sadarghat
- Fatullah
- Chashara
- Signboard (Dhaka-Chittgong Road)
- Shimrail
- Demra
- Balu River side ( Eastern Bypass)




**Middle Ring Road (108.0km)**

Locations;

- Autpura
- Dhaka Bypass
- Bhulta
- Kanchpur
- Narayanganj
- Jhilmil
- Western Bypass


**Outer Ring Road (129.0km)**

Locations;

- Hemayetpur
- Kalakandi
- Madanpur
- Danga
- Bypail
- Gazipur


Source: JICA Study Team

**Figure 12.16 Location of the Three Ring Roads**

### 3) Prioritization of Proposed Road Project

The proposed road projects are prioritized on the basis of assessment from the following aspects.

a) Current status of the project
b) Urgency (Degree and scale of problems)
c) Building a missing link
d) Composing rings and radials road system
e) Providing main traffic axis in development area
f) Contributing to proper formation in urban area
g) Compatibility with relevant development plans
h) Traffic demand
i) Project cost

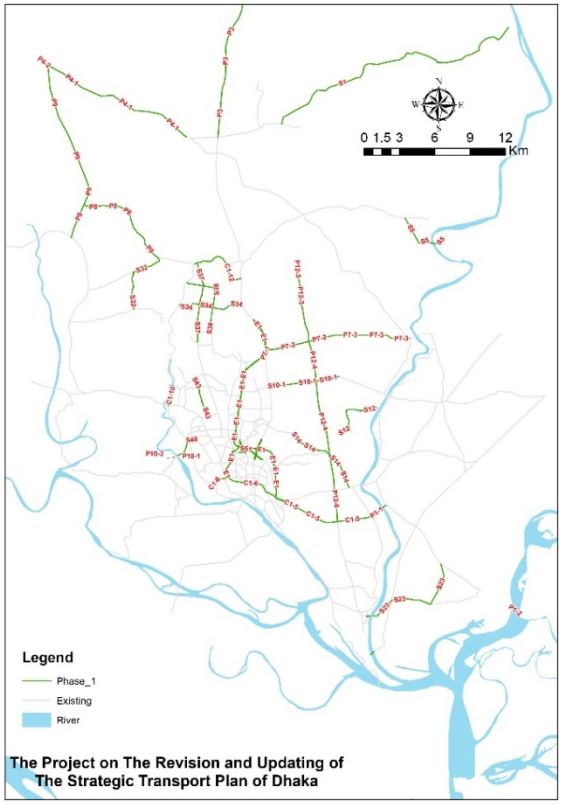
Each road project is given the priority in the following terms and summarized in Table 12.8. Details are described and listed up in Table 12.9 to Table 12.12

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

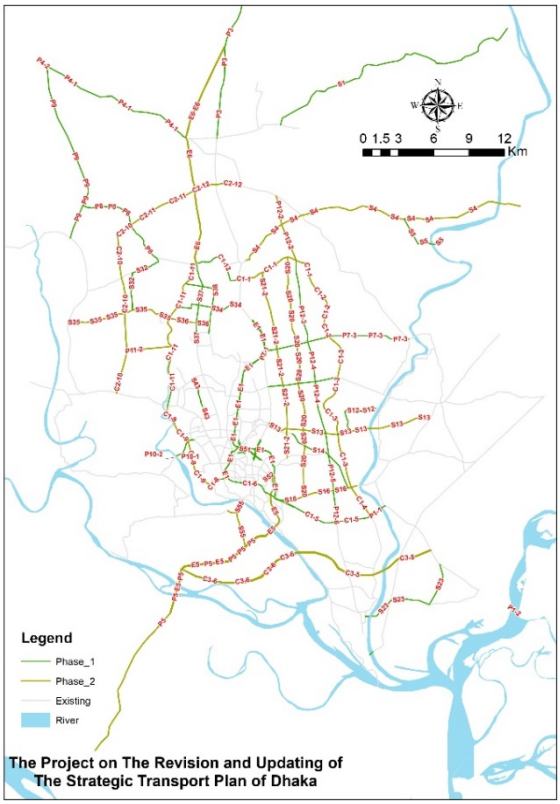
**Table 12.8 Prioritization of Proposed Road Projects (Summary)**

| 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%) |

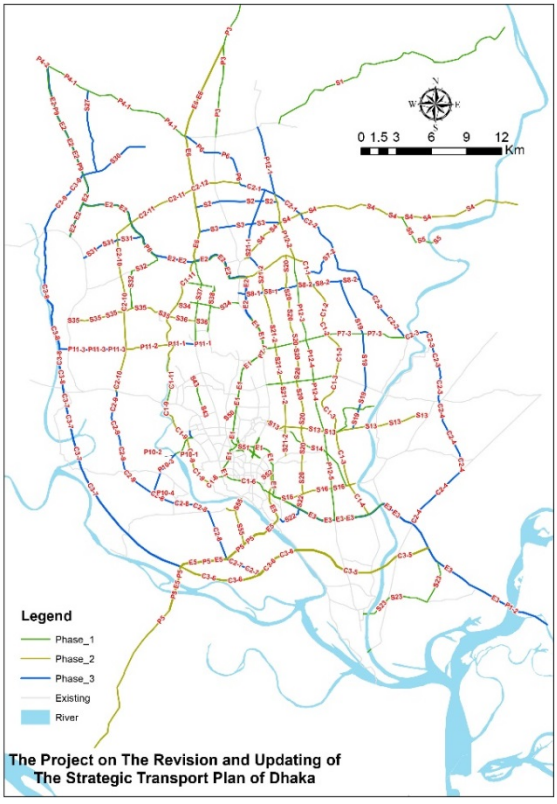
Note 2: Project costs are given from the relevant organization or estimated based on the average unit price obtained from several reports of the feasibility study on projects in RAJUK area by JICA Study team.
Source: JICA Study Team



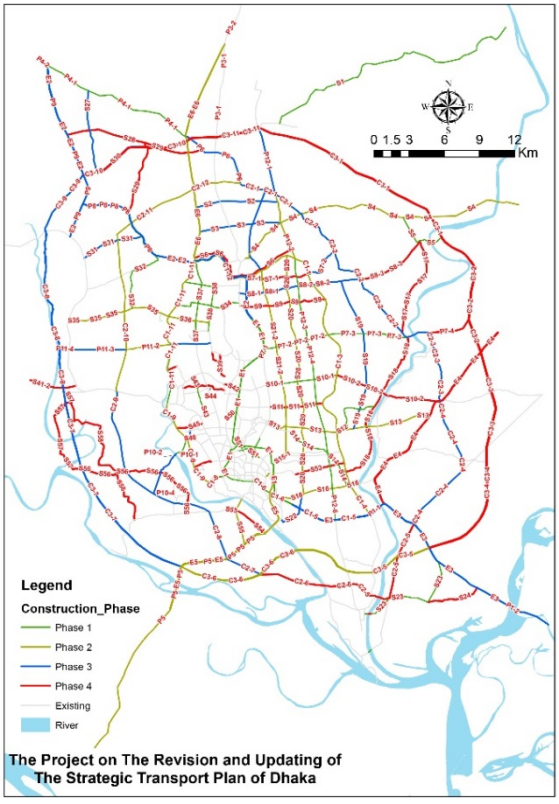

Phase 1 (2016 – 2020)




Phase 1 + 2 (2016 – 2025)




Phase 1 + 2 + 3 (2016 – 2030)




Phase 1+ 2 + 3 + 4 (2016 – 2035)

**Figure 12.17 Investment Schedule for Urban Roads**

**Table 12.9 Prioritization of Proposed Road Projects (1)**

| Sl. No. | Description | Project Cost (Tk. Crore) | 2035 Traffic Flow (pcu/day per both directions) | | Ongoing Project | Urgency | Missing Link | Rings & Radials Roads | Provision of Traffic Axis | Urban Formation | Relevant Development Plan | Traffic Demand | Construction Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1-1 | Inner Ring Road / Dhaka Eastern BP (N3 to Termukh Rayerdia Link Rd.) | 2,029 | 63,900 | B | | | | ● | | | | ● | Phase 2 |
| C1-2 | Inner Ring Road / Dhaka Eastern BP (Termukh Rayerdia Link Rd. to N301) | 1,590 | 58,700 | C | | ●Disaster Prevention | | ● | | | | | Phase 2 |
| C1-3 | Inner Ring Road / Dhaka Eastern BP (N301 to R201) | 3,976 | 54,800 | C | | ●Disaster Prevention | | ● | | | | | Phase 2 |
| C1-4 | Inner Ring Road / R110 (R201 to N1) | 83 | 42,500 | C | | | | ● | | | | | Phase 2 |
| C1-5 | Inner Ring Road / N1 (R110 to Toll Gate) / Jatrabari - Khanchpur bridge (widening of polder road to 8 lane) | 396 | 107,600 | A | ● | | | ● | | | | ● | Phase 1 |
| C1-6 | Inner Ring Road / Jatrabari-Gulistan FO (Toll Gate to Chankhar Pul Bus Stop) | - | 66,700 | B | | | | ● | | | | ● | |
| C1-7 | Inner Ring Road / Zahir Raihan Rd. (Chankhar Pul Bus Stop to Eden Girls College) | 170 | 47,300 | C | | ●Bottleneck | | ● | | | | | Phase 1 |
| C1-8 | Inner Ring Road (Rasulpur Bridge (Embankment) - Peelkhana road - Azimpur Old | 252 | 88,600 | B | | | ● | ● | | | | ● | Phase 1 |
| C1-9 | Inner Ring Road / Circular Road over embankment (Rasulpur Brg. to N5) | 811 | 67,400 | B | | | | ● | | | | ● | Phase 2 |
| C1-10 | Inner Ring Road / Circular Road over embankment (N5 to N501/Diabari Bot Tola :Flyover) | 302 | 41,900 | C | | ●Bottleneck | ● | ● | | | | | Phase 1 |
| C1-11 | Inner Ring Road / N501:Circular Road over embankment (Diabari Bot Tola to N302) | 1,177 | 95,300 | A | | | | ● | | | | ● | Phase 2 |
| C1-12 | Inner Ring Road / N302:Circular Road over embankment (N302 to N3) | 534 | 50,600 | C | | ●Bottleneck | | ● | | | | | Phase 1 |
| C2-1 | Middle Ring Road (Near Dhirashrom Rd. to R301) / N105:Dhaka BP | 186 | 44,900 | C | | | | ● | | | | | Phase 3 |
| C2-2 | Middle Ring Road / N105:Dhaka BP (R301 to N301) | 469 | 64,600 | B | | | | ● | | | | ● | Phase 3 |
| C2-3 | Middle Ring Road / N105:Dhaka BP (N301 to N2) | 253 | 40,300 | C | | | | ● | | | | | Phase 3 |
| C2-4 | Middle Ring Road / N105:Dhaka BP (N2 to N1) | 397 | 43,800 | C | | | | ● | | | | | Phase 3 |
| C2-5 | Middle Ring Road (N1 to R111) | 877 | 44,000 | C | | | | ● | | | | | Phase 4 |
| C2-6 | Middle Ring Road (R111 to Zazira IC) | 836 | 56,800 | C | | | | ● | | | | | Phase 4 |
| C2-7 | Middle Ring Road (Zazira IC to N8) | 67 | 54,600 | C | | | | ● | | | | | Phase 3 |
| C2-8 | Middle Ring Road (N8 to 3rd Briganga Brg. access Rd.) | 204 | 55,700 | C | | | | ● | | | | | Phase 3 |
| C2-9 | Middle Ring Road (3rd Briganga Brg. access Rd. to N5) | 222 | 55,400 | C | | | | ● | | | | | Phase 3 |
| C2-10 | Middle Ring Road (N5 to N302) | 329 | 64,000 | B | | | | ● | ● | | | ● | Phase 2 |
| C2-11 | Middle Ring Road (N302 to Dhaka-Mymensingh Exp.) | 135 | 41,900 | C | | | | ● | ● | | | | Phase 2 |
| C2-12 | Middle Ring Road (Dhaka-Mymensingh Exp. to Near Dhirashrom Rd.) | 89 | 36,700 | C | | | | ● | ● | | | | Phase 2 |
| C3-1 | Outer Ring Road (R310 to R301) | 2,023 | 82,900 | B | | | | ● | | | | ● | Phase 4 |
| C3-2 | Outer Ring Road (R301 to N2) | 1,288 | 72,700 | B | | | | ● | | | | ● | Phase 4 |
| C3-3 | Outer Ring Road (N2 to R114) | 1,136 | 33,200 | C | | | | ● | | | | | Phase 4 |
| C3-4 | Outer Ring Road (R114 to N1) | 1,283 | 33,100 | C | | | | ● | | | | | Phase 4 |
| C3-5 | Outer Ring Road (N1 to R111) | 1,988 | 62,600 | B | | | | ● | ● | | ●Padma | ● | Phase 2 |
| C3-6 | Outer Ring Road (R111 to N8) | 2,399 | 29,800 | D | | | | ● | ● | | ●Padma | | Phase 2 |
| C3-7 | Outer Ring Road (N8 to R504) | 1,688 | 87,300 | B | | | | ● | | | | ● | Phase 3 |
| C3-8 | Outer Ring Road (R504 to N5) | 1,410 | 97,300 | A | | | | ● | | | | ● | Phase 3 |
| C3-9 | Outer Ring Road (N5 to R505) | 1,014 | 67,900 | B | | | | ● | | | | ● | Phase 3 |
| C3-10 | Outer Ring Road (R505 to N4/N105) | 3,505 | 33,900 | C | | | | ● | | | | | Phase 4 |
| C3-11 | Outer Ring Road (N4/N105 to R310) | 2,217 | 78,100 | B | | | | ● | | | | ● | Phase 4 |

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000

Source: JICA Study Team

## Table 12.10 Prioritization of Proposed Road Projects (2)

| Sl. No. | Description | Project Cost (Tk. Crore) | 2035 Traffic Flow (pcu/day per both directions) | | Ongoing Project | Urgency | Missing Link | Rings & Radials Roads | Provision of Traffic Axis | Urban Formation | Relevant Development Plan | Traffic Demand | Construction Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E1 | Dhaka Elevated Expressway | 8,940 | 96,500 | A | | | | | ● | | | ● | Phase 1 |
| E2 | Dhaka - Ashulia Elevated Expressway | 13,654 | 83,500 | B | | | | ● | | | | ● | Phase 3 |
| E3 | Dhaka - Chittagong Access Controlled Highway (Kutubkhali - Outer Ring Road) | 1,501 | 63,000 | B | | | | | | | | ● | Phase 3 |
| E4 | Dhaka - Sylhet Expressway (N1 - Outer Ring Road) | 795 | 47,600 | C | | | | ● | | | | | Phase 4 |
| E5 | Dhaka - Mawa Expressway | 5,169 | 76,000 | B | | | | ● | | | ●Padma | ● | Phase 2 |
| E6 | Dhaka - Mymensingh Expressway | 983 | 83,100 | B | | | | ● | | | | ● | Phase 2 |
| P1-1 | N1 / 2nd Kanchpur Bridge and rehabilitation of existing Bridge | - | 84,000 | B | ● | | | ● | | | | ● | Phase 1 |
| P1-2 | N1 / 2nd Meghna Bridge and rehabilitation of existing Bridge | - | Unknown | | ● | | | ● | | | | | Phase 1 |
| P1-3 | N1 / 2nd Gomoti Bridge and rehabilitation of existing Bridge | - | Unknown | | ● | | | ● | | | | | Phase 1 |
| P2 | N2 / 4-Lane Flyover at Bhulta – Sylhet National Highway | - | Unknown | | ● | ●Bottleneck | | ● | | | | | Phase 1 |
| P3 | N3 / Improvement of Joydevpur – Mymensingh Highway | 1,951 | 74,800 | B | ● | | | ● | | | | ● | Phase 1 |
| P4-1 | N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC | 657 | 67,800 | B | ● | | | ● | | | | ● | Phase 1 |
| P4-2 | N4 / 4-Lanning of Joydevpur-Chandra-Tangail Road (National Road -4) under SASEC | 2,698 | Unknown | | ● | | | ● | | | | | Phase 1 |
| P5 | N8 / Improvement into 4-lanes from 1st Buriganga Bridge to Padma Bridge Mawa link | 359 | 72,200 | B | | | | ● | | | ●Padma | | Phase 2 |
| P6 | N105 / Upgrading of Dhaka Bypass to 4 Lane (Joydevpur – Debogram – Bhulta – Madanpur) | 219 | 59,400 | C | | | | | | | | ● | Phase 3 |
| P7-1 | Kuril Flyover | 303 | 96,200 | A | ● | | | | ● | | ●Purbachar | ● | Phase 1 |
| P7-2 | N301 / From Airport Road near Khilkhet to First Balu Bridge (Isapura) via Baruna | 270 | 67,900 | B | ● | | | | ● | | ●Purbachar | ● | Phase 1 |
| P7-3 | N301 / From first Balu Bridge near Tek Noadda to Sitalakhya River near Kanchan | 250 | 9,300 | D | ● | | | ● | ● | | ●Purbachar | | Phase 1 |
| P7-4 | N301 / Extension from Dhaka BP to Outer Ring Road | 83 | 10,800 | D | | | | ● | | | | | Phase 4 |
| P8 | N302 / Ashulia to Aricha Road (C & B More) | 13 | 30,400 | C | | | | ● | | | ●DAEE | | Phase 1 |
| P9 | R505 / Nabinagar - EPZ - Chandra road improvement | 131 | 43,400 | C | ● | | | ● | | | | | Phase 1 |
| P10-1 | Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (East side) | 121 | 85,200 | B | ● | | | ● | | | | ● | Phase 1 |
| P10-2 | Construction of Buriganga 3rd bridge near Basila | 710 | 85,200 | B | | | | ● | | | | ● | Phase 3 |
| P10-3 | Connecting roads to Keraniganj, Nawabgonj & Dohar from Buriganga 3rd Bridge (West side) | 28 | 85,200 | B | | | | ● | | | | ● | Phase 3 |
| P10-4 | Extension of Buriganga 3rd Bridge access roads to Middle Ring Road | 41 | 34,800 | C | | | | ● | | | | | Phase 3 |
| P11-1 | Mirpur to Outer Ring Road (Kalshi Road to West embankment) | 571 | 56,200 | C | | | | | | ● | | | Phase 3 |
| P11-2 | Mirpur to Outer Ring Road (West embankment to Middle Ring Road) | 85 | 64,800 | B | | | | ● | | | | | Phase 2 |
| P11-3 | Mirpur to Outer Ring Road (Middle Ring Road to N5) | 107 | 49,000 | C | | | | ● | | | | | Phase 3 |
| P11-4 | Mirpur to Outer Ring Road (N5 to Outer Ring Road) | 16 | 64,600 | B | | | | ● | | | | ● | Phase 3 |
| P12-1 | Joydebpur - Narayanganj Highway (Joyedbupur to N105/Dhaka BP) | 174 | 73,800 | B | | | | ● | | | | ● | Phase 3 |
| P12-2 | Joydebpur - Narayanganj Highway (N105/Dhaka BP to Inner Ring Road) | 171 | 63,500 | B | | | | ● | | | | ● | Phase 2 |
| P12-3 | Joydebpur - Narayanganj Highway (Inner Ring Road to N301) | 634 | 63,600 | B | | | | | ● | | ●BRT | ● | Phase 1 |
| P12-4 | Joydebpur - Narayanganj Highway (N301 to Khilgaon) | 715 | 55,600 | C | | | | | ● | | ●BRT | | Phase 1 |
| P12-5 | Joydebpur - Narayanganj Highway (Khilgaon to R110) | 437 | 49,100 | C | | | | | ● | | ●BRT | | Phase 1 |
| P12-6 | Joydebpur - Narayanganj Highway (R110 to N1) | 242 | 36,500 | C | | | | | ● | | ●BRT | | Phase 1 |

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000

Source: JICA Study Team

## Table 12.11 Prioritization of Proposed Road Projects (3)

| Sl. No. | Description | Project Cost (Tk. Crore) | 2035 Traffic Flow (pcu/day per both directions) | | Ongoing Project | Urgency | Missing Link | Rings & Radials Roads | Provision of Traffic Axis | Urban Formation | Relevant Development Plan | Traffic Demand | Construction Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S1 | Gazipur – Azmatpur – Itakhola Road (revised) | 300 | Unknown | | ● | | | | | | | | Phase 1 |
| S2 | Gacha - Jiraitali Road | 39 | 45,600 | C | | | | | | ● | | | Phase 3 |
| S3 | Sataish - Karamtola Road | 38 | 45,800 | C | | | | | | ● | | | Phase 3 |
| S4 | 4-lanes road from S.A.M. (Shahid Ahsanullah Master) Flyover to Kaliganj Bypass along the railway line | 252 | 25,800 | D | | | | ● | | | ●EPZ | | Phase 2 |
| S5 | New EPZ Link Road (R301 to New EPZ) | 86 | 43,400 | C | | | | ● | | | ●EPZ | | Phase 1 |
| S6 | Tongi Embankment (Dhaka - Mymensing Exp. to Joydebpur - Narayanganj Hwy.) | 191 | 52,800 | C | | | | | | ● | | | Phase 4 |
| S7-1 | Improvement of Abdullahpur – Teromukh – Ulukhola Road (Uttara Sector-8 to Balu river embankment) | 68 | 23,600 | D | | | | | | ● | | | Phase 4 |
| S7-2 | Improvement of Abdullahpur – Teromukh – Ulukhola Road (Balu river embankment to Dhaka BP) | 20 | 17,500 | D | | | | | | ● | | | Phase 3 |
| S8-1 | Azampur - Kaliganj Road (N3 to Joyedbupur - Narayanganj Hwy.) | 165 | 61,000 | B | | | | | | ● | | ● | Phase 3 |
| S8-2 | Azampur - Kaliganj Road (Joyedbupur - Narayanganj Hwy. to Dhaka BP) | 99 | 53,400 | C | | | | ● | | ● | | | Phase 3 |
| S8-3 | Azampur - Kaliganj Road (Dhaka BP to New EPZ Link Road) | 115 | 20,000 | D | | | | ● | | ● | | | Phase 4 |
| S9 | Uttara Sector-4 - Dakhinkhan - Khordi | 91 | Unknown | | | | | | | ● | | | Phase 4 |
| S10-1 | Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj) | 886 | 85,200 | B | ● | | | | | ● | | ● | Phase 1 |
| S10-2 | Progati Sarani (Baridhara - Beraid - Balu River - Murapara) to Bhulta (Nawabganj) | 3,752 | 23,700 | D | | | | | | ● | | | Phase 4 |
| S11 | Badda - Baru river Embankment Road | 170 | 68,700 | B | | | | | | | | ● | Phase 4 |
| S12 | Majhina – Koetpara – Trimohini connecting Road | 53 | 17,300 | D | ● | | | | | | | | Phase 1 |
| S13 | Badda - Golakandial Road (Merul Badda - Babur Jaiga - Balirpar - Parain - | 536 | 72,600 | B | | | | | | ● | | ● | Phase 2 |
| S14 | Rampura - Demra Road | 141 | 34,900 | C | ● | | | | | ● | | | Phase 1 |
| S15-1 | Bashaboo Jame Mosque to Trimohini Ghdaraghat via Shekker Jaiga Bridge | 156 | 51,600 | C | | | | | | ● | | | Phase 4 |
| S15-2 | Construction of bridge over Balu river at Keodata | 13 | Unknown | | ● | | | | | ● | | | Phase 1 |
| S16 | Jatrabari crossing to Demra Ghat (Tarabo bridge) road | 331 | 76,600 | B | | | | | | | | ● | Phase 2 |
| S17 | New EPZ Link Road to Dhaka BP | 157 | 31,700 | C | | | | | | ● | | | Phase 4 |
| S18 | Dhaka BP - Demra Road along Shitalakhya River | 230 | 37,900 | C | | | | | | ● | | | Phase 4 |
| S19 | S8 (Azampur - Kaliganj Road) to S13 (Badda - Golakandial Road) | 241 | 52,600 | C | | | | | | ● | | | Phase 3 |
| S20 | Uttara ABM city - Matuali Road | 781 | 68,500 | B | | | | | | ● | | ● | Phase 2 |
| S21-1 | Dhirasram - Basabo Road (Dhaka BP to Inner Ring Road) | 138 | 67,400 | B | | | | | | ● | | ● | Phase 3 |
| S21-2 | Dhirasram - Basabo Road (Inner Ring Road to Basabo Madertek Road) | 604 | 70,800 | B | | | | | | ● | | ● | Phase 2 |
| S22 | Improvement of Matuail (Mridhabari) – Shayampur (Dhaka – Narayanganj) Road | 43 | 27,800 | D | | | | | | ● | | | Phase 3 |
| S23 | Improvement of Langolbandh – Kaikertek – Nabiganj Road | 53 | 22,000 | D | ● | | | | | | | | Phase 1 |
| S24 | Improvement of Sonargaon Museum link Road along with Baidderbazar–Sonargaon –Mograpara-Kaikertek–Road | 25 | 21,400 | D | | | | | | ● | | | Phase 4 |
| S25 | 2nd Shitalakkhya Bridge at Narayanganj | 107 | Unknown | | | | ● | | | | | | Phase 4 |
| S26 | 3rd Shitalakkhya Bridge at Narayanganj Bandar Upazila | 458 | 22,900 | D | ● | | | | | | | | Phase 1 |

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000

Source: JICA Study Team

## Table 12.12 Prioritization of Proposed Road Projects (4)

| Sl. No. | Description | Project Cost (Tk. Crore) | 2035 Traffic Flow (pcu/day per both directions) | | Ongoing Project | Urgency | Missing Link | Rings & Radials Roads | Provision of Traffic Axis | Urban Formation | Relevant Development Plan | Traffic Demand | Construction Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S27 | Baipayl - Mouchak Road | 39 | 30,000 | C | | | | | | ● | | | Phase 3 |
| S28 | Improvement of Zirani Kashimpur Road | 38 | 26,000 | D | | | | | | ● | | | Phase 4 |
| S29 | Naojora (Kodda) – Kashimpur – Narsinghapur Road | 64 | 25,200 | D | | | | | | ● | | | Phase 4 |
| S30 | Sreepur - Kashimpur Road | 34 | 17,100 | D | | | | | | ● | | | Phase 3 |
| S31 | Dewan Idris Sarak | 30 | 60,100 | B | | | | | | ● | | ● | Phase 3 |
| S32 | Berulia (Dhour) - Ashulia - EPZ road | 34 | 25,500 | D | ● | | | | | | | | Phase 1 |
| S33 | Uttara Sector-10 to West Embankment road to the West | 382 | 58,500 | C | | | | | | | ●Uttra III | | Phase 1 |
| S34 | Uttara Sector-3 to West Embankment road to the West | 738 | 50,900 | C | | | | | | | ●Uttra III | | Phase 1 |
| S35 | West Embankment(Birulia Bridge) to Savar | 149 | 61,700 | B | | | | | | ● | | ● | Phase 2 |
| S36 | Pallabi to west Embankment via North Rupnagar | 445 | 46,100 | C | | | | | | ● | | | Phase 2 |
| S37 | Pallabi (Mirpur) to Uttara 3rd Phase | 827 | 55,400 | C | ● | | | | | | ●MRT 6 | | Phase 1 |
| S38 | Pallabi (Mirpur) to Uttara Sector 11 | 509 | 58,600 | C | | | | | | | ●Uttra III | | Phase 1 |
| S39 | Mirpur Road to Matikata Road | 408 | 15,700 | D | | | | | | ● | | | Phase 4 |
| S40 | Mirpur Zoo to Embankment (Berry Bund) to the west | 95 | Unknown | | | | ● | | | | | | Phase 4 |
| S41-1 | Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane | 77 | 15,900 | D | | | | ● | | | | | Phase 4 |
| S41-2 | Upgrading of Hemayetpur – Singair – Manikganj Road into 4-lane | 2,150 | 15,900 | D | | | | ● | | | | | Phase 4 |
| S42 | Mirpur-14 (Sagorika) to Airport Road (Banani Railway Station) along the fringe of | 204 | 52,700 | C | | | ● | | | | | | Phase 4 |
| S43 | Argagaon Road (Bangladesh Betar) to Mirpur Section 2 through Senpara Parbata | 212 | 41,400 | C | ● | | | | | ● | | | Phase 1 |
| S44 | Bangla College to Kafrul intersecting Rokeya Sharoni | 787 | 8,400 | D | | | | | | ● | | | Phase 4 |
| S45 | Mohammadpur Krishi Market to Mirpur Road (Sohrawardy Hospital) | 51 | 14,200 | D | | | | | | ● | | | Phase 4 |
| S46 | Krishi Market & Baitul Aman (Y Junction) to Embankment to the west | 107 | 21,700 | D | | | | | | ● | | | Phase 4 |
| S47 | Mohammadpur Shia Mosque (near Japan Garden City) - Mohammadpur Bus Stand (Widening) | 61 | 25,800 | D | | | | | | ● | | | Phase 3 |
| S48 | Mohammadpur Bus Stand Embankment Berry Bandh) - upgradation | 51 | 60,800 | B | ● | | | | | | | ● | Phase 1 |
| S49 | Zikatala - Hazaribagh (Sikder Medical College) road | 204 | 22,100 | D | | | | | | ● | | | Phase 4 |
| S50 | Flyover and underpasses at Jahangir gate area | 441 | 44,500 | C | | ●Bottleneck | | | | | | | Phase 3 |
| S51 | Mogbazar and Mouchak Flyover | - | 58,400 | C | ● | | | | | | | | Phase 1 |
| S52 | Motijheel Shapla Chattar to Kamlapur Railway Station (Widening) | 22 | Unknown | | | | | | | | ●BRT | | Phase 2 |
| S53 | Bashabo Kadamtola Road up to Manikdi | 159 | 25,400 | D | | | | | | ● | | | Phase 4 |
| S54 | Road connecting Buriganga 1st and 2nd bridges via Subhadia & Zinjira (South of | 64 | 17,900 | D | | | | | | ● | | | Phase 4 |
| S55 | Improvement of Z.K.D (Zinzira-Keraniganj-Dohar) Link Road into 4-lanes from 2nd Buriganga Bridge approach to Mawa link | 50 | 56,300 | C | | | | | | | ●Padma /Jhilmil | | Phase 2 |
| S56 | Konakhola to Hazratpur | 70 | 31,300 | C | | | | | | ● | | | Phase 4 |
| S57 | Hazratpur to Hemayetpur | 46 | 14,400 | D | | | | | | ● | | | Phase 4 |
| S58 | Improvement of Keraniganj (Konakhola) – Kholamura – Hazratpur – Itabhata – Mirpur (Hemayetpur) Road | 80 | 14,700 | D | | | | | | ● | | | Phase 4 |

Note: A>=90,000, B>=60,000, C>=30,000, D<30,000
Source: JICA Study Team

### (6) Major Highway Project

#### 1) Dhaka Elevated Expressway (E1)

Progress: Contract signed

Total Estimated Cost: Tk. 89,400 million

Main Route: Hazrat Shahjalal International Airport – Kuril – Mohakhali – Tejgaon - Moghbazar- Kamlapur – Saidabad – Jatrabari - Dhaka Chittagong Highway (near Kutubkhali)

#### 2) Dhaka – Ashulia Elevated Expressway (E2)

Progress: RFQ Process is ongoing.

Total Estimated Cost: Tk. 136,540 million

Main Route: Hazrat Shahjalal International Airport – Ashulia – EPZ – Chandra – connecting Savar Martyrs Monument.

#### 3) Kanchpur – Bhulta – Bhairab – Ashuganj – Sarail (N2) Road Improvement into 4-lane Expressway (E4)

Progress: PPP Cell, RHD has sent the proposal to obtain NOC (No Objection Certificate) from DTCA

Total Estimated Cost: Tk. 42,606 million

Main Route: Kanchpur – Bhulta – Bhairab – Ashuganj – Sarail (N2)

#### 4) Upgrading of Dhaka Bypass to 4 lane, Middle Ring Road (P6, C1-C4)

Progress: Detailed Feasibility has been completed

Total Estimated Cost: Tk. 15,242 million

Main Route: Joydevpur – Debogram – Bhulta – Madanpur

#### 5) Hemayetpur – Singair – Manikganj 4 Lane road (S41)

Progress: Detailed Feasibility is ongoin

Total Estimated Cost: Tk. 22,270 million

Main Route: Hemayetpur – Singair – Manikganj

#### 6) Construction of Flyover and Underpass at Jahangir gate area (S50)

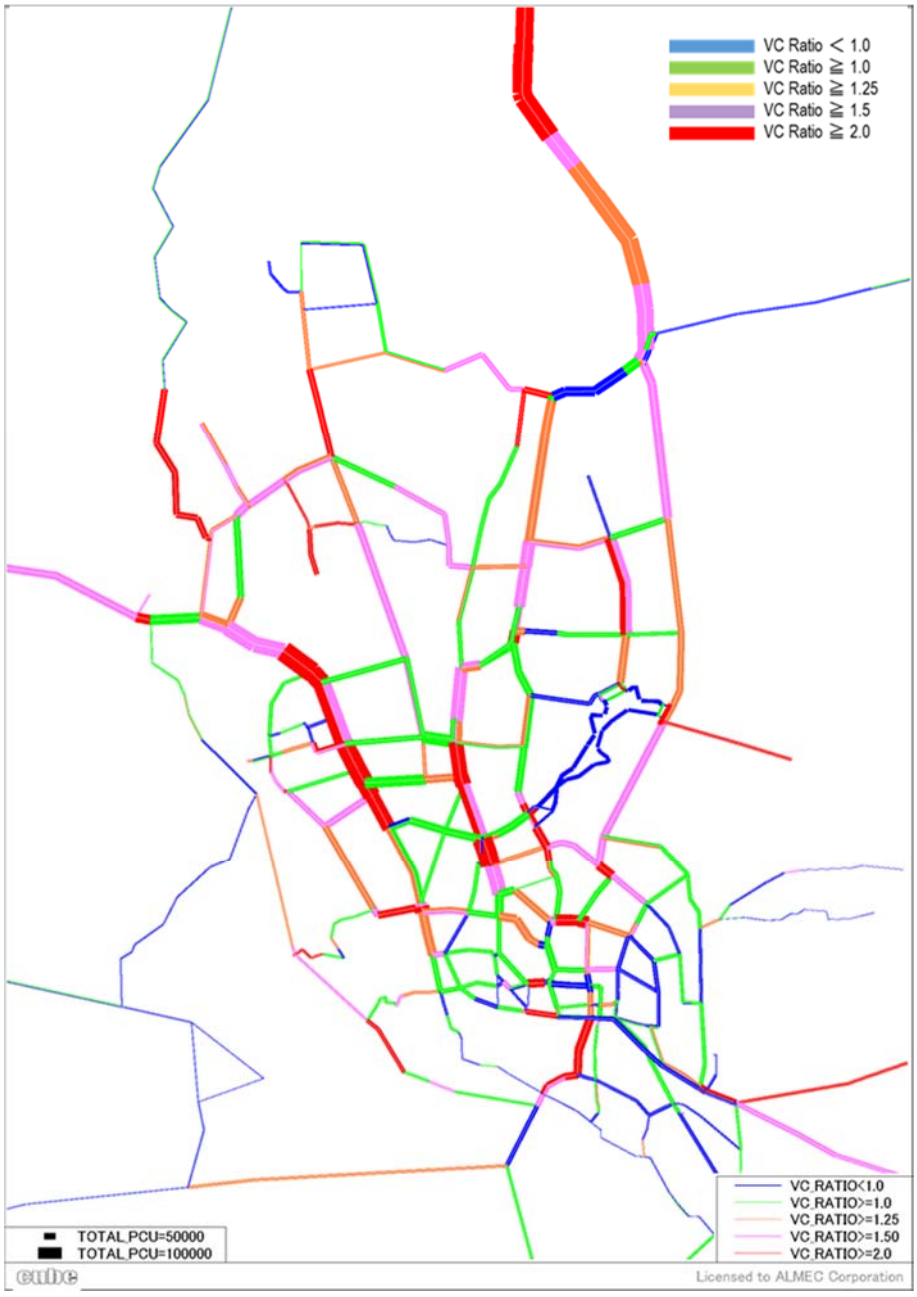
Progress: PDPP has been sent to the Planning Commission

Total Estimated Cost: Tk. 4,406 million

Main Route: Mohakhali flyover – Shahinbag – Kazi Nazrul Islam Avenue – Agargaon connecting link road

### (7) 2014 and 2035 Road Network Performance

The road network performance under the current situation is summarized as follows. The average travel speed is 6.4 km/h in RAJUK area while 6.1 km/h in DMA and V/C (volume-to-capacity ratio) is 1.2. In RAJUK area alone, excluding DMA, average travel speed is 6.8 km/h which is a little bit faster than in DMA.



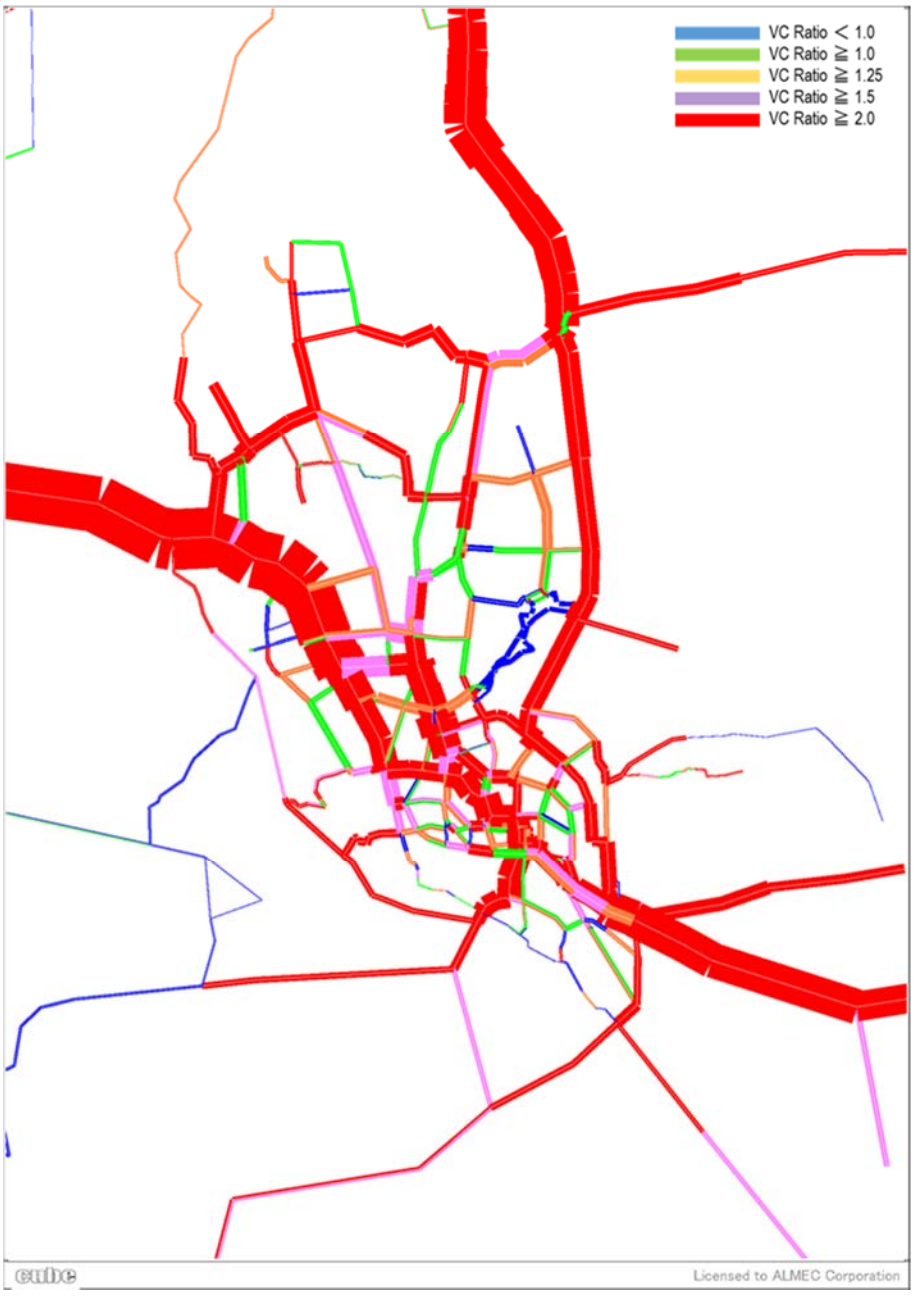

Source: JICA Study Team

**Figure 12.18 Current Road Network Performance (2014)**

And in “Do-nothing Case”, the traffic is expected to worsen at an average travel speed of 4.7 km/h in RAJUK area and 5.0 km/h in DMA while V/C will be 3.7.

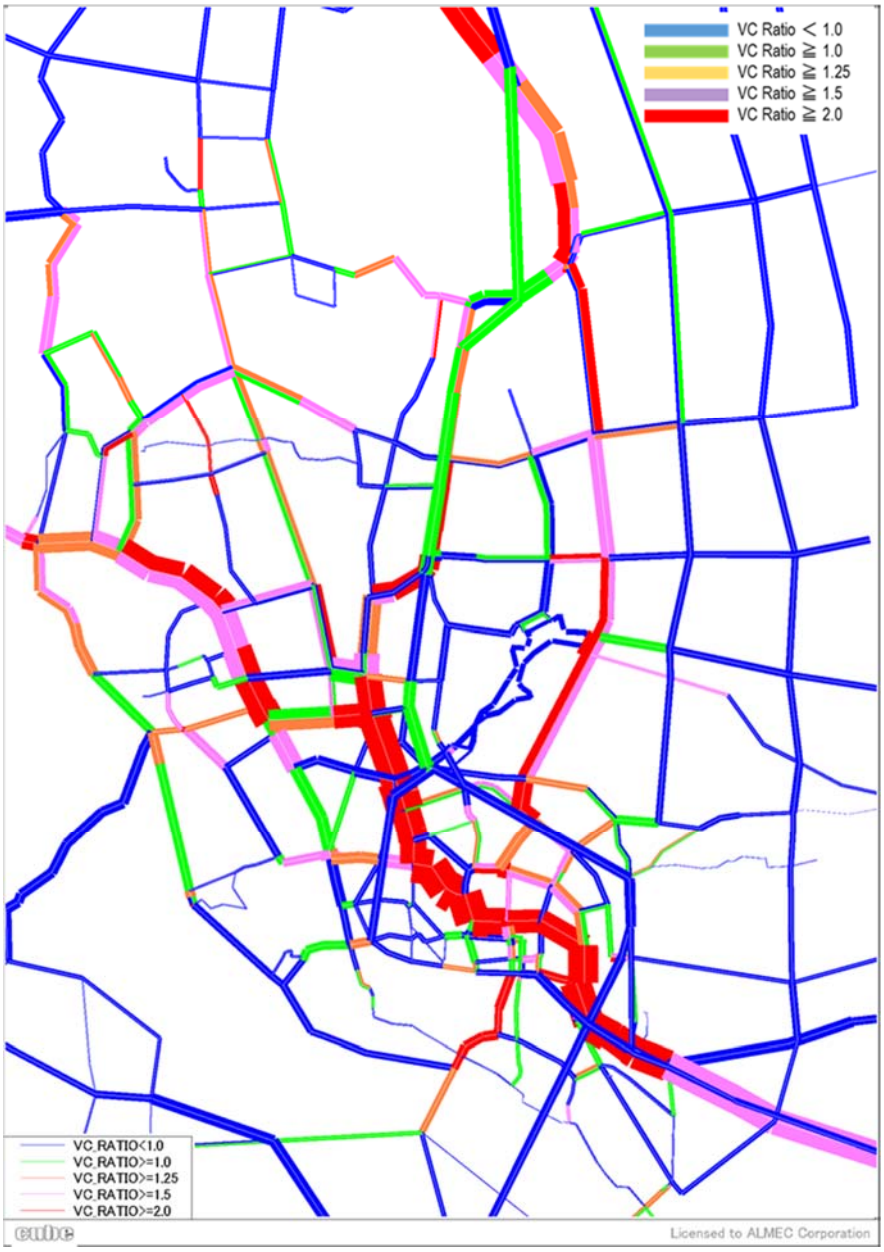
RSTP travel demand model runs were carried out considering the entire proposed roads and highways network. The entire network was tested for its operational

performance until 2035 and it showed an acceptable and sustainable level of service in the Study Area. The 2035 and 2030 road traffic volumes and resulting average speed are depicted as shown in Figure 12.20 and Table 12.13.




Source: JICA Study Team

**Figure 12.19 Current Road Network Performance (2035)**




Source: JICA Study Team

**Figure 12.20 Proposed Road Network Performance (2035)**

**Table 12.13 Road Network Performance**

| | 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 |

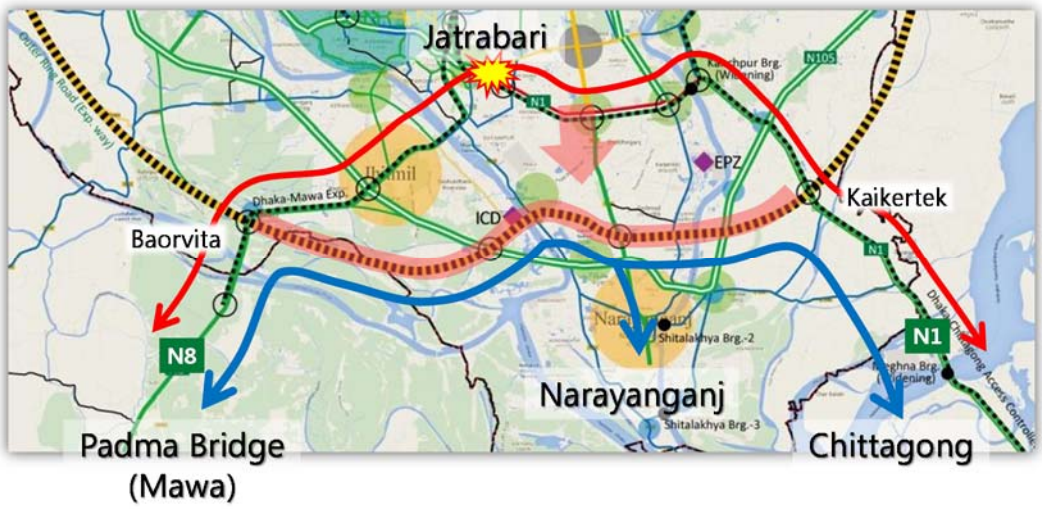
Source: JICA Study Team

### (8) The High Priority Project

#### 1) Southern Part of the Outer Ring Road

The Padma Multipurpose Bridge will be opened 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 the traffic congestion and after the opening of Padma Bridge, traffic situation will come to worst. Therefore, southern part of the middle or outer ring road should be constructed as soon as possible.




Source: JICA Study Team

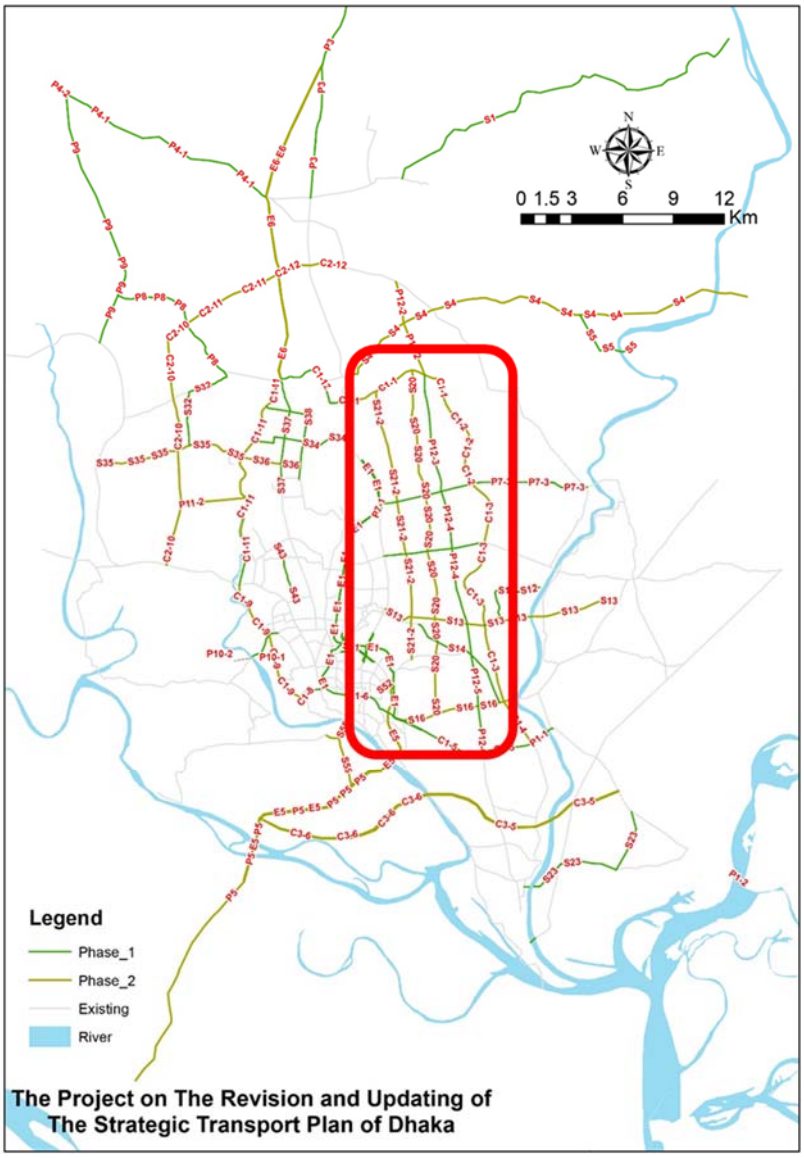
**Figure 12.21 The High Priority Project**

#### 2) Road Network in the Eastern Fringe Area

In RSTP, road network development in the Eastern Fringe Area is listed as the short- and mid- term project for promoting the designed urban development and reducing congestions of DIT road during the construction period of MRT Line 1.

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. On the other hand, at the east-north area of RAJUK area including Gazipur, Ashulia and Savar where social infrastructures had already been developed, housing land has been further along in development without any control. 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.

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 netowrks need to be constructed in the eastern fringe area as the bypass road.




Source; JICA Study Team

**Figure 12.22 Proposed Road Network in the Eastern Fringe Area**

## 12.3 Public Transportation Plan

### (1) Planning Considerations

The Study surveys analysis showed 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 huge amount of funds 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 an 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) Components of the Public Transportation System

The recommended structure of the public transportation system in Dhaka is shown in Figure 13.17. The system will have four basic components, namely:

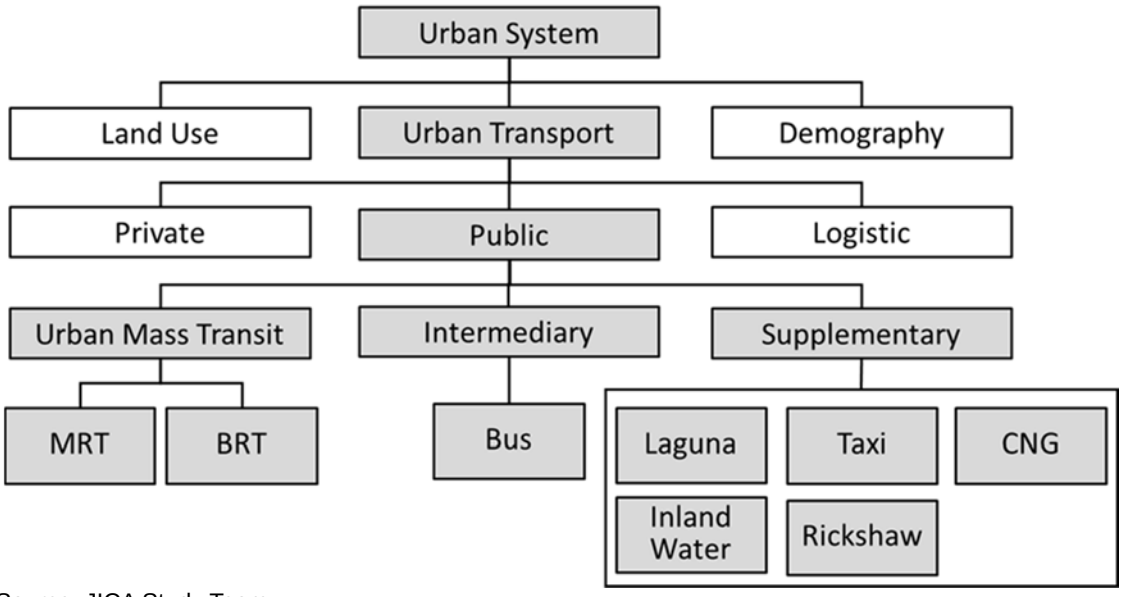
a) A high-capacity public transport network composed of both BRT and MRT in a dedicated guideway (with partly at-grade, elevated or underground alignments).

b) An intermediate bus network composed of primary and secondary (feeder), bus routes using existing road infrastructures.

c) A supplementary system made up of small vehicles and operated basically by the private sector.

d) A network of multimodal interchange stations strategically located at all major public transportation intersections around CBD and its suburbs.

These four hierarchal components of the proposed public transportation system for Dhaka are described in this section of the report.




Source: JICA Study Team

**Figure 12.23 Components of the Proposed Public Transportation System for Dhaka**

### (3) Urban Mass Transit System

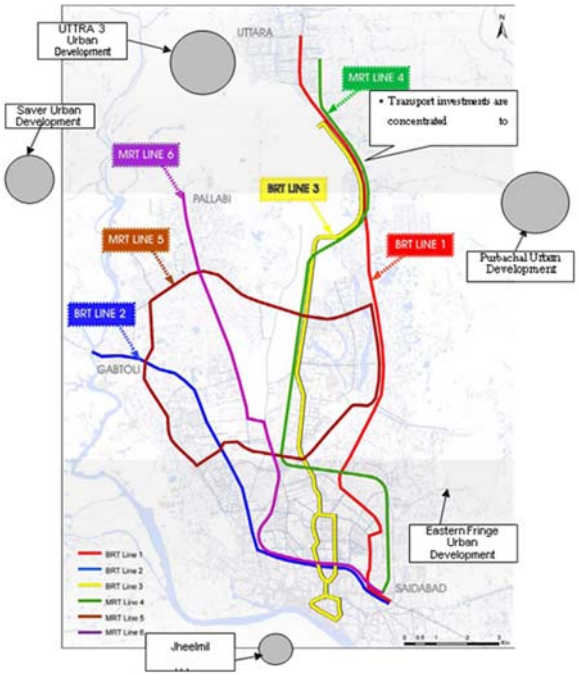
Based on the two previously identified projects and the passenger demand forecasts, the conceptual master plan for the MRT/BRT system has consolidated the number of previously proposed lines into three BRT lines and three MRT lines as described briefly below and a more detailed discussion in succeeding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

#### 1) Overall Network in STP

In the STP plan, there are two major problems or issues that can be pointed out. The first issue is that, three transport investment plans proposed by STP are just concentrated to Airport Avenue namely BRT Line 3, MRT Line 4 and Urban Expressway. Although there is a large amount of traffic demand within the Airport Road, but this seems to be too much transport investment concentrated in one area. The other is that, the public transport services are not provided for new urban communities such as Purbachal, UTTARA Phase 3, Savar, Jheelmil and Eastern Fringe area where it is expected to accommodate over 5 million from 2010 toward 2050. However, the STP has not considered any transport system covering these areas.

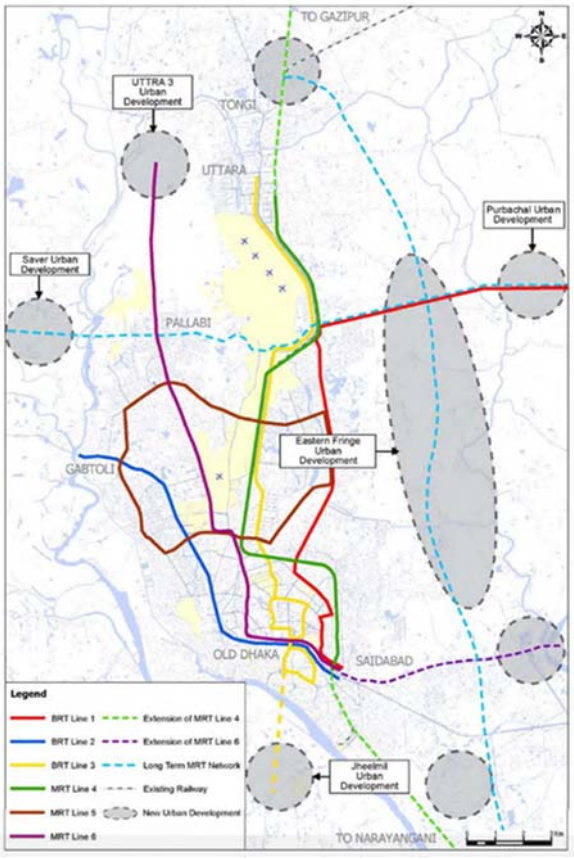
#### 2) Overall Network in DHUTS

The future urban structure of making multi-core mega region in Greater Dhaka Area toward 2050 is proposed and presented in DHUTS. This structure plan proposed the three (3) development axles with mass transit corridors, namely a) Existing North-South Development Corridor, i.e., Tongi – Mirpur – City Center – Nayangaji, b) East-West Development Corridor, i.e., Purbachal – Uttra –Savar, c) Eastern Fringe Development Corridor. Based on the above-mentioned urban structure and major issues of the STP Plan, the future MTS network plan toward 2050 is proposed in Figure 13.18. The proposed MRT development plan is eight (8) lines, of which five (5) lines are proposed for MRT system and the remaining three (3) lines are BRT Line.




Source: STP

**Figure 12.24 Public Transport Network Proposed by STP**



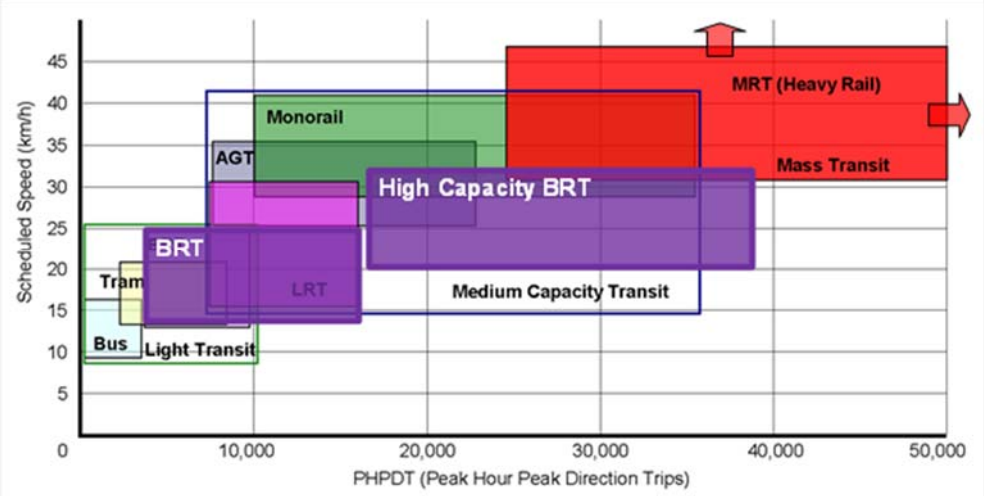

Source: DHUTS

**Figure 12.25 Public Transport Network Proposed by DHUTS**

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

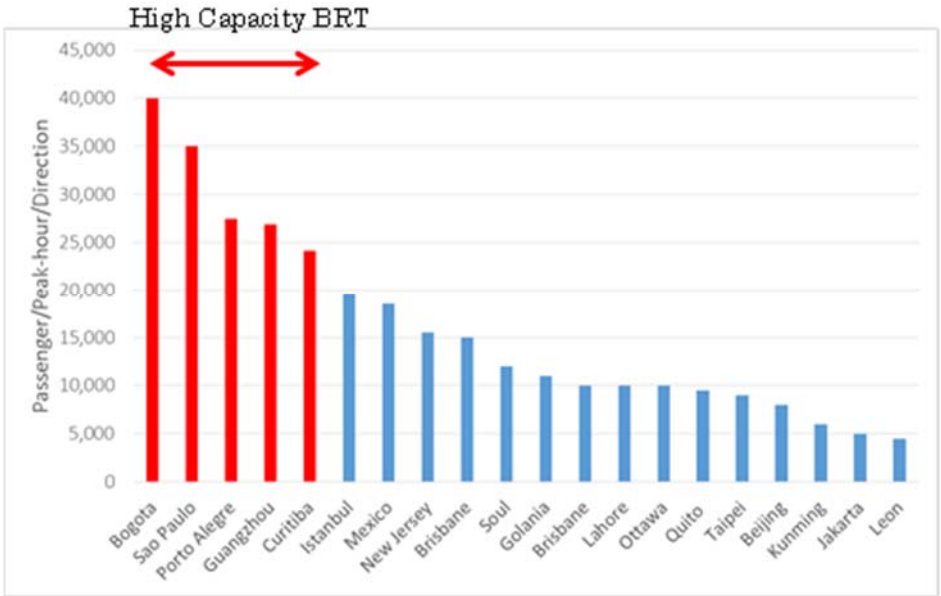
The keys of public transport to function are speed and capacity. BRT can carry 10,000 to about 16,000 PPHPD (passengers per hour per direction). But high capacity BRT operating in Curitiba, Sao Paulo, Bogota and others can carry more than 20,000 PPHPD. MRT, on the other hand, can accommodate 25,000-50,000 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. And after ten years traffic demand in the study area has grown along with rising economy. After few years, traffic demand will overtake capacity of BRT network services.




Source: JICA study Team

**Figure 12.26 Capacity of Urban Public Transports**

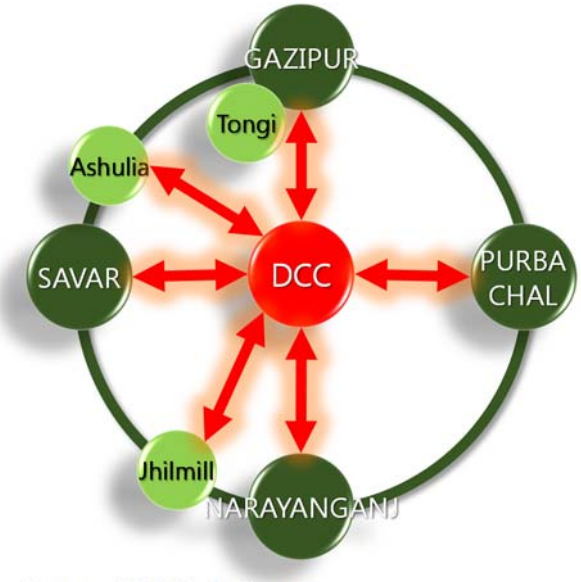



Source: Modified by JUCA Study Team based on “Bus Rapid Transit Systems – a comparative assessment”, David A. Hensher, and Thomas F. Golob, University of Sydney

**Figure 12.27 Actual Peak Ridership of Various BRT Systems**

#### 4) 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 12.28. And in RSTP, high capacity public transport system, like MRT or BRT will be proposed in each corridors.




Source: JICA Study Team

(1) CBD – Tongi, Gazipur Corridor

(2) CBD – Purbachal Corridor

(3) CBD – Narayanganj Corridor

(4) CBD – Jhimil Corridor

(5) CBD – Savar Corridor

(6) CBD- Ashulia Corridor

**Figure 12.28 Transport Corridors in RAJUK Area**

i. **CBD – Tongi, Gazipur Corridor (N3):** Gazipur area is a rapidly expanding towns in the north of Dhaka. This corridor is the main gateway to the north serving the northern suburbs of RAJUK area and beyond to Maymensingh.

ii. **CBD – Purbachal Corridor:** Purbachal is the biggest Planned township in Bangladesh. This new town area comprise of about 6150 acres land located in between the Shitalakhya and the Balu River at Rupgonj thana of Narayangonj district and at Kaligonj Thana of Gazipur district, in the north-eastern side of Dhaka. The Township will be linked with 8(eight) lane wide expressway from the Airport Road/Progati swarani crossing with the distance of only 6.8 km.

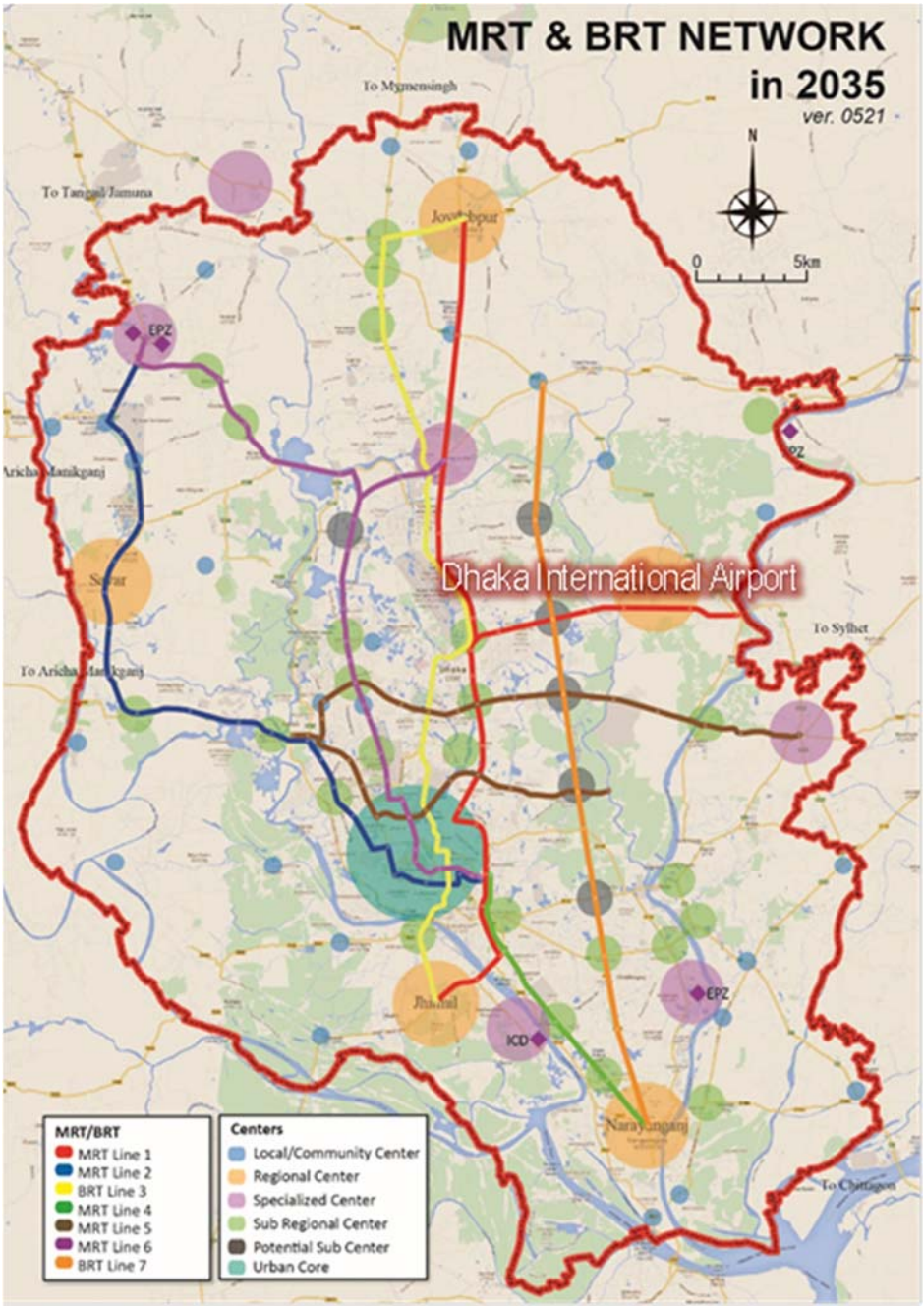
iii. **CBD – Narayanganj Corridor:** Narayanganj is a center of business and industry, particularly trading and processing plants of jute and the textile sector of the country. This corridor comprises of a four-lane road and BR single-track rail line is on the transport corridor with several stations and grade crossings.

iv. **CBD – Jhilmil Corridor:** Jhilmil new town project is located at Keranigonj across the Burigonga River. The Project area comprises of 381.11 acres of land. There will be about 1,740 residential plots and 9,500 apartments for lower and middle income groups with available necessary infrastructure and urban services. This transport corridor will play as an important logistic corridor after the opening of the Padma Bridge.

v. **CBD – Savar Corridor:** Savar is a new center of industry, specifically jute trade and processing plants and considered to be the textile center. There is a major bus terminal, Gabtoli Bus Terminal on Dhaka – Aricha Highway and this area is one of the most congested area in Dhaka.

vi. **CBD- Ashulia Corridor:** Ashulia is a suburban area near Dhaka with nearby areas like Savar and Tongi. Environmentalists and some NGOs in Bangladesh have expressed concern over the rapid urbanization of Ashulia especially in the context of the ongoing real estate development projects and happens to be the most affected city around Dhaka area. Believe it or not only a few places are left for new industries as most of the places are now owned by a garment factory or any land developer.

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 12.29 and Table 12.14. 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 12.29 MRT/BRT Network in 2035**

**Table 12.14 Summary of MRT/BRT System Plan**

| | Section | Proposed System | Length (km) | notes |
|---|---|---|---|---|
| Line 1 | Gazipur - Airport - Kamalapur - Jhimill Pulbachar - Khilkhet | MRT | 52 | |
| Line 2 | Ashulia - Savar - Gabtali - Dhaka Unv. – DSCC - Kamalapur | MRT | 40 | |
| Line 3 | Gazipur – International Airport - Jhimill | BRT | 42 | On-going |
| 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 Phase 3 – Pallabi – Tejigaon –Motijheel - Kamalapur | MRT | 41.8 | On-going |
| Line 7 | Eastern Fringe Area | BRT | 36 | |

Source: JICA Study Team

MRT Line 1

From the passenger demand forecasts for this line, it has been identified that this one has the highest passenger demands with nearly 1.9 million passengers per day and 37,770 PPHPD in 2035.

This 52-kilometer-long MRT line will serve the northern and southern suburbs of Dhaka via CBD including International Airport and Kamalapur Station and as well serve the Purbachal new town.

The alignment of northern part will generally follow the existing railway line but will be grade-separated. And southern part will run along the DIT road to Kamalapur station.

There are 8 multimodal stations including major interchange facilities at Airport, Natun Bazar (MRT Line 5), and Kamalapur Station.

Depot/workshop and stabling area will be located at the eastern part of Purbachal Newtown.

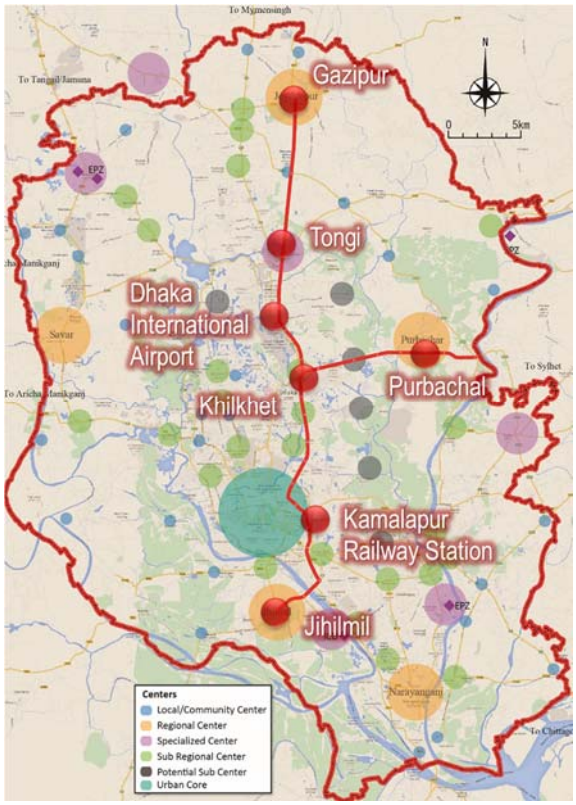



**Figure 12.30 Proposed MRT Line1**

Until the MRT Line 1 is operational in 2025, the short term corridor passenger demand will be served by the existing and new bus networks or possibly a new primary or priority bus route along the eastern corridor (Purbachal – Kulil).

MRT Line 2

This line has been identified to have the higher passenger demands with nearly 1.1 million passengers per day and 23,020 PPHPD in 2035 as per the passenger demand forecasts.

This 40-kilometer-long MRT line will serve the western suburbs of Dhaka via CBD including Gabtoli Bus Terminal and Kamalapur Station.

There are 3 multimodal stations including major interchange facilities at the station of Circular Waterway (Gabtoli) and Kamalapur Station.

Depot/workshop and stabling area will be situated at the eastern part of Savar or Ashulia.

Until the MRT Line 2 is operational in 2035, the short term corridor passenger demand will be served by the existing and new bus networks or possibly a new primary or priority bus route along the western corridor.

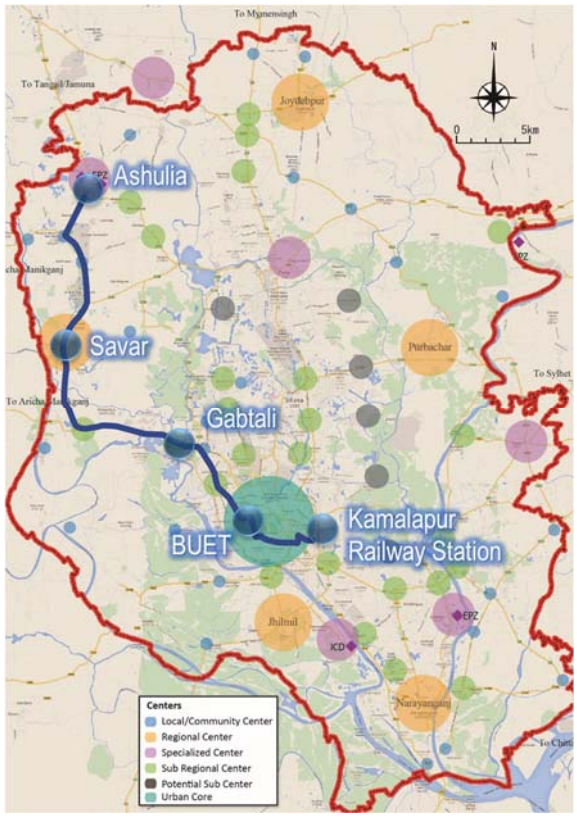



**Figure 12.31 Proposed MRT Line2**

MRT Line 4

Passenger demand forecasts showed that this line has low passenger demand with nearly 0.3 million passengers per day and 17,930 PPHPD in 2035.

This 16-kilometer-long MRT line will serve the southern suburbs of Dhaka from Kamalapur station to Narayanganj.

The alignment will generally follow the existing railway line.

There are 2 multimodal stations including major interchange facilities at Kamalapur Station.

Bangladesh Railway has the double Tracking and Commuter Service Project of this same alignment and if BR implements the Commuter Service, MRT Line 4 need not to be implemented.

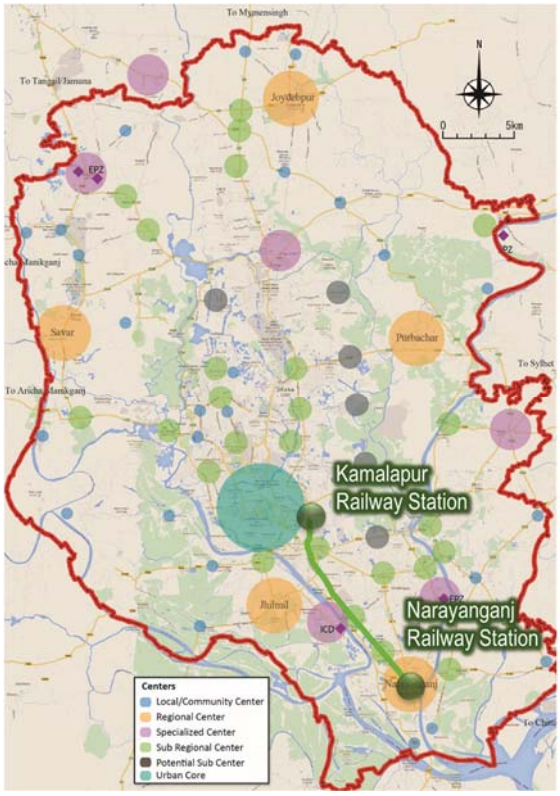



**Figure 12.32 Proposed MRT Line4**

MRT Line 5

In order to provide a high-capacity, high-speed and frequent public transport system to the city for trips which do not commence or end in the CBD and which will be served by the radial MRT Line 1, MRT Line 2, BRT Line 3, MRT Line 6 and BRT Line 7, the Study Team has identified the need for a circumferential MRT Line 5 that would provide a "bypass" public transportation service for the city's suburban areas and provide good connectivity between suburban zones.

This line has been forecasted to have a high passenger demands with nearly 1.5 million passengers per day and 28,340 PPHPD in 2035 as per the passenger demand forecasts.

This 35-kilometer-long MRT line will serve the eastern and western suburbs of Dhaka crossing the cantonment area.

There are 9 multimodal stations including major interchange facilities at the station of Circular Waterway (Gabtoli and others).

Depot/workshop and stabling area will be located at the eastern part of RAJUK area.

The MRT Line 5 is scheduled to open by 2035. However, Dhaka's corridor running through east to west needs to be developed to reduce traffic congestion. Thus, in the early stages, northern or southern part of this line needs to be developed to serve the east-west corridor demands.

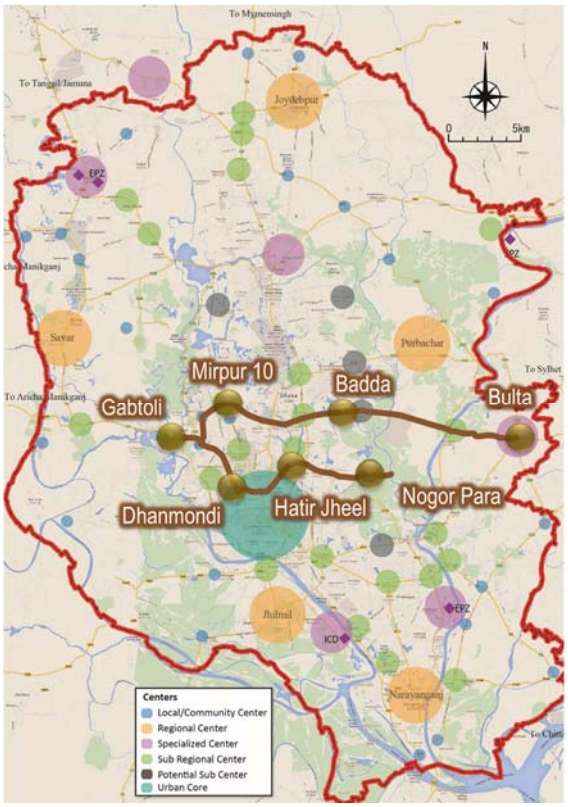



**Figure 12.33 Proposed MRT Line5**

MRT Line 6 (Extension)

This line has been forecasted as one with the highest passenger demands with nearly 1.9 million passengers per day and 45,860 PPHPD in 2035 according to the passenger demand forecasts.

The current phase of this line will serve from Uttara Phase 3 to Bangladesh Bank until 2025 and in 2035 this 41-kilometer-long MRT line will serve the northwestern suburbs of Dhaka via Mirpur to Kamalapur Station.

The extension phase from Bangladesh Bank to Kamalapur Station is located in

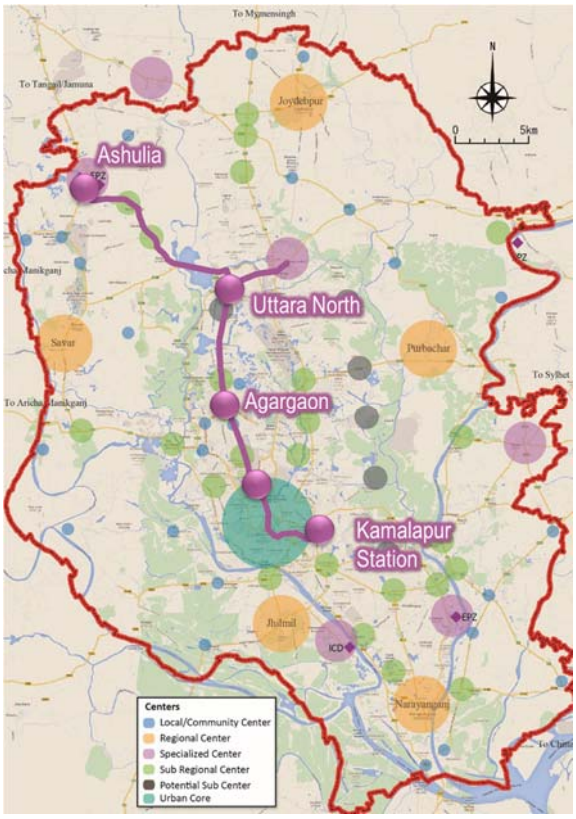



**Figure 12.34 Proposed MRT Line6**

built-up area and therefore land acquisition has to be implemented by land re-adjustment project, re-development project or urban renewal project.

There are 6 multimodal stations including major interchange facilities at the station of Circular Waterway (Ashulia), Mirupur, and Kamalapur Station.

Depot/workshop and stabling area is located at the Uttara Newtown.

BRT Line 7

This line has been identified from the passenger demand forecasts to have a high passenger demands with nearly 0.5 million passengers per day and 22,330 PPHPD in 2035.

This 36-kilometer-long MRT line will serve the eastern fringe area and the alignment of northern part will generally follow the existing railway line but will be grade-separated.

There are 4 multimodal stations. Depot/workshop and stabling area will be located at the eastern part of RAJUK area.

The role and function of this BRT line is to support the eastern fringe area development. Meanwhile, this corridor passenger demand will be served by public bus networks while the demand is less than BRT's demand. And ROW for future BRT needs to be ensured before urban development in the eastern fringe area.

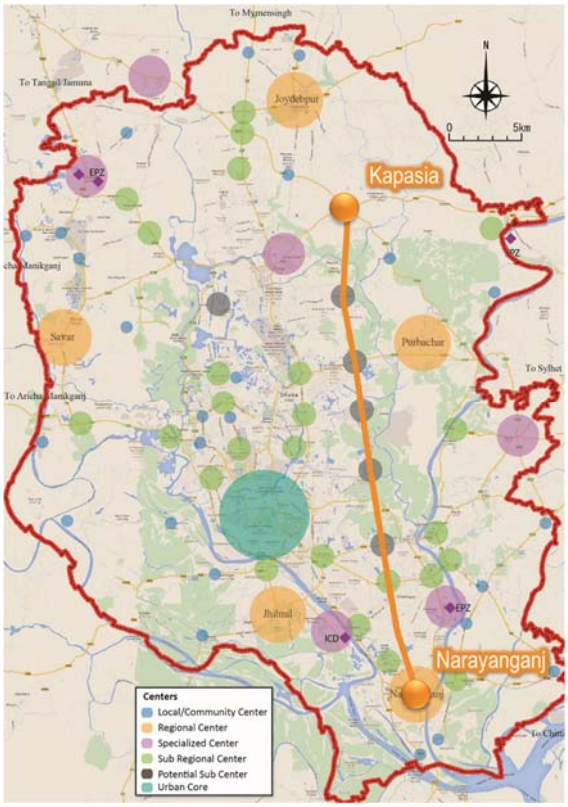



**Figure 12.35 Proposed BRT Line7**

### 5) Transportation Hubs or Multimodal Stations

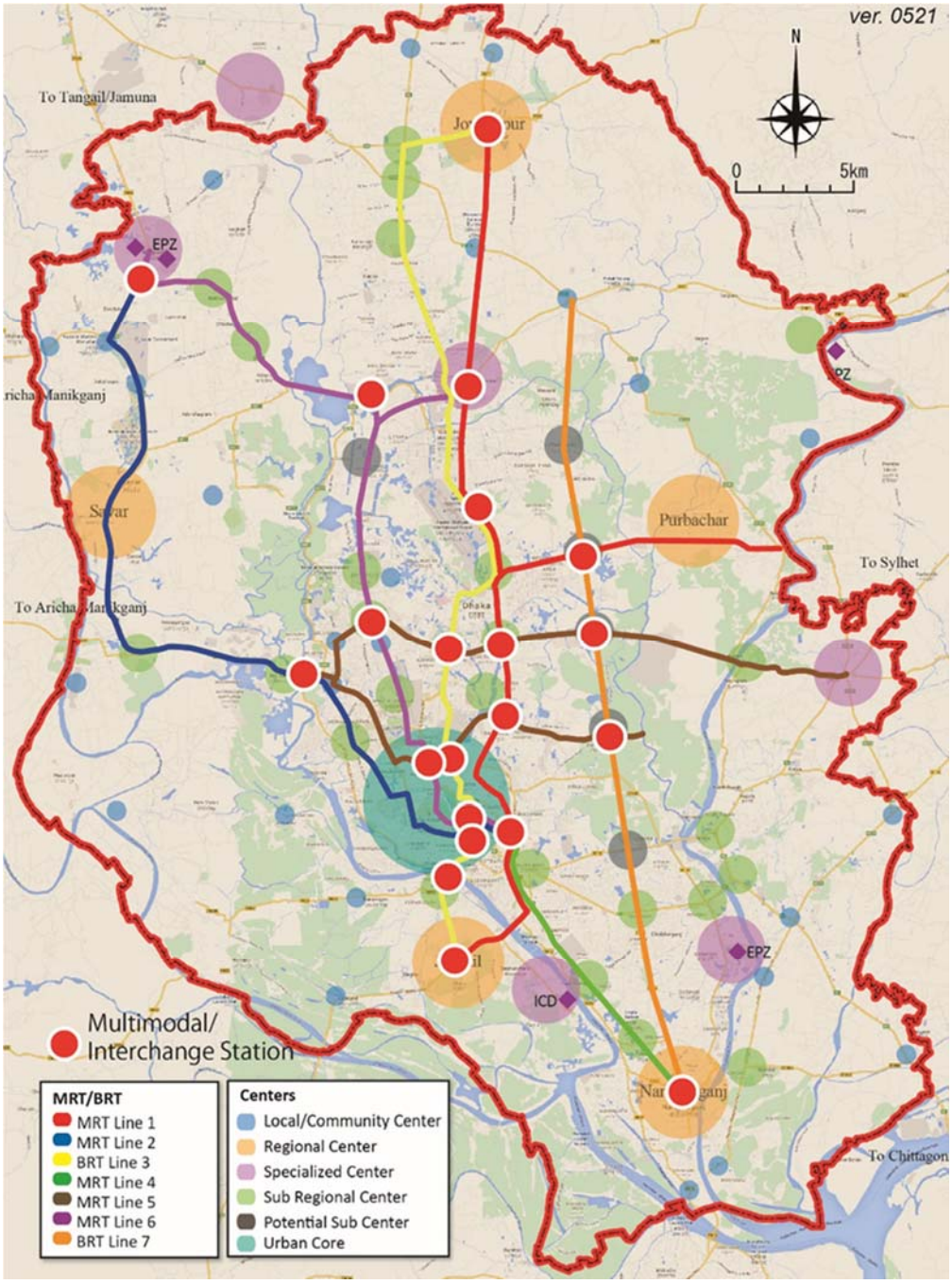
Based on the proposed MRT and BRT network, the Study Team has identified 21 transportation hubs or multimodal stations throughout Dhaka and its suburbs as indicated in Figure 13.29.

The primary existing multimodal transportation interchanges include: Dhaka International Airport, Kamalapur Station, Mohakhali bus Terminal, Jatra Bari Bus Terminal, Gabtoli Bus Terminal, Gabtoli Circular Waterway Station, and Shdarghat Boat Terminal. In addition, there are other locations where interchange facilities between transportation modes can be developed in RAJUK area. Other potential transportation hubs that can be developed at major interchanges between the various urban transit systems have been identified.

In the master plan, the size of each multimodal will be dependent on the results of the patronage demand forecasts for the final urban transit network and the facilities to be provided at each multimodal site. These facilities will include drop-off and pick-up points for rickshaws, taxis, cars, and motorcycles, circular waterway, as well as parking and bus interchanges with primary and feeder bus systems. At each of these sites, facilities will be provided to allow the smooth transfer of passengers from one transportation

mode to another, together with other passenger facilities and possibly residential, commercial, and retail development opportunities.

In addition to the multimodal connections to other MRT and BRT lines, facilities at stations will also be coordinated with existing and proposed bus interchanges along the route.




Source: JICA Study Team

**Figure 12.36 Multimodal and Interchange Station**

**Table 12.15 Multimodal Connections**

| | Urban Mass Rapid Transit (UMRT) | | | | | | | | Bus | | | | | Pickup | | Parking | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MRT 1 | MRT 2 | BRT 3 | MRT 4 | MRT 5 | MRT 6 | BRT 7 | BR | Provincial | Bus | Feeder | Waterway | Airport | Taxi & RS | Car & MC | Car | MC |
| MRT/BRT | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| BR | * | * | | * | * | * | * | | * | * | * | | * | * | * | * | * |
| Bus | * | * | * | * | * | * | * | * | * | * | * | * | * | | | | |
| Waterway | * | * | * | | * | * | | | | * | * | * | | * | * | * | * |
| Airport | | | * | | | * | | * | | * | | | | * | * | * | * |

Source: JICA Study Team
RS: Rickshaw, MC: Motorcycle

### 6) MRT/BRT Development Cost

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

**Table 12.16 Estimated Development Cost of MRT/BRT lines**

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

| | | At-Grade | Elevated | Under Ground | Total | Cost |
|---|---|---|---|---|---|---|
| MRT Line 1 | 2025 | 0 | 20.6 | 6.0 | 26.6 | BDT 219,848 (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 291,460 (USD 3,748) |
| MRT Line 4 | 2035 | 0 | 16.0 | 0 | 16.0 | BDT 135,029 (USD 1,736) |
| MRT Line 5 | 2035 | 0 | 24.9 | 9.1 | 35.0 | BDT 332,437 (USD 4,275) |
| MRT Line 6 *(extension)* | 2035 | 0 | 21.8 | 0 | 41.8 | BDT 162,456 (USD 2,089) |
| BRT Line 7 | 2035 | 36.0 | 0 | 0 | 36.0 | BDT 19,987 (USD 257) |

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

### 7) Railway System Requirements

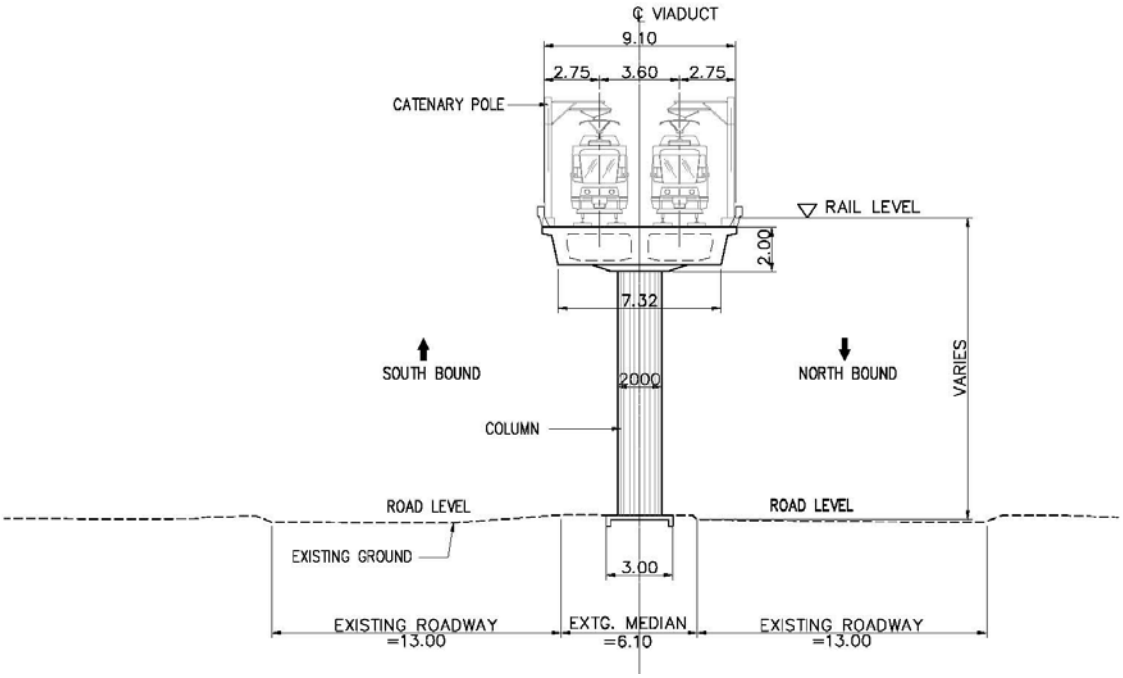
The JICA Study Team recommends adopting the same system standards in order to maintain compatibility between MRT Line 6 and proposed MRT Line 1. Major technical design features are shown in Table 12.17 below.

General Designs are shown in Figure 12.37 (Elevated Structure (Viaduct)), Figure 12.38 (Construction Gauge) and Figure 12.39 (Rolling Stock Gauge).

**Table 12.17 Major Design Features**

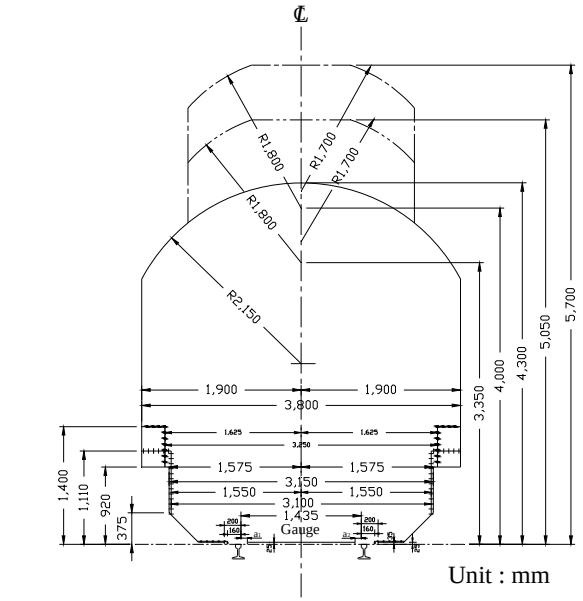
| | |
|---|---|
| （General） | |
| Rail Gauge | Standard Gauge ；1,435 mm |
| Rolling Stock & Construction Gauges | As shown below |
| In case of Fire | No-stopping between stations, No evacuation path, but provide path for maintenance work |
| Earthquake | Seismic design |
| （Alignment） | |
| Minimum Radius | R=600m、(In depot and where not avoidable R=200m) |
| Minimum Radius along platform | Straight（Not avoidable stations R=600m） |
| Distance between two track centerlines | 3.6 m（main track）approach track from/to depot 3.4m |
| Vertical gradient | Between stations；i=3.5% (not avoidable i=4.0%)<br>Station；i=0.0%（not avoidable i=1.0%） |
| (Structure) | |
| Viaduct | PC Box Girders |
| Underground | TBM |
| （track） | |
| Rail | UIC 54kg (main track), UIC 50kg (loop line & depot)、CRW |
| Fastening system | Round Bar Steel |
| Turnout | No.10（main track）, No.8 or No.10（loop line & depot) |
| （elevated station） | |
| Platform | Lateral type、Train length＋5 m x 2、 |
| Design | Universal Design, Barrier Free |
| Structures | 1st Floor Concourse and station operation rooms、3rd F Train runs |
| (underground station) | |
| Platform | Island type train length +5m x 2 |
| Design | Universal design, barrier free |
| Structure | Soil cover 2m, -1st floor concourse, and station operation rooms, mechanical rooms, toilets, -2nd floor platform; |
| Platform Screen Door | Full height |
| Disaster Prevention | Japanese MLIT notification |
| Construction | Cut & Cover |
| （Electrical Power Supply） | |
| Traction Power | DC 1,500 V |
| Power Supply | Overhead Catenary |
| （Signaling） | |
| Block System | Moving Block (CBTC) |
| （Rolling Stock） | |
| Body | Mild Stainless Steel or Aluminum. |
| Brake | Re-energize、air and electrical |
| Motor control | VVVF |
| Design speed | 100km/hr |

Source: JICA Study Team




Source: JICA Study Team

**Figure 12.37 General Design of Elevated Structure (Viaduct)**




Basic structure gauge

Structure gauge for those other than overhead contact lines, their suspension equipment, and insulated reinforcing materials on railway tracks operated with DC electric power supplied through contact lines.

Structure gauge required for those other than overhead contact lines, their suspension equipment and insulated reinforcing materials in tunnels, bridges, over bridges, and platform roofing as wellas the sections before and after those structures on railway tracks operated with DC electric power supplied through overhead contact lines.

Structure gauge for platform

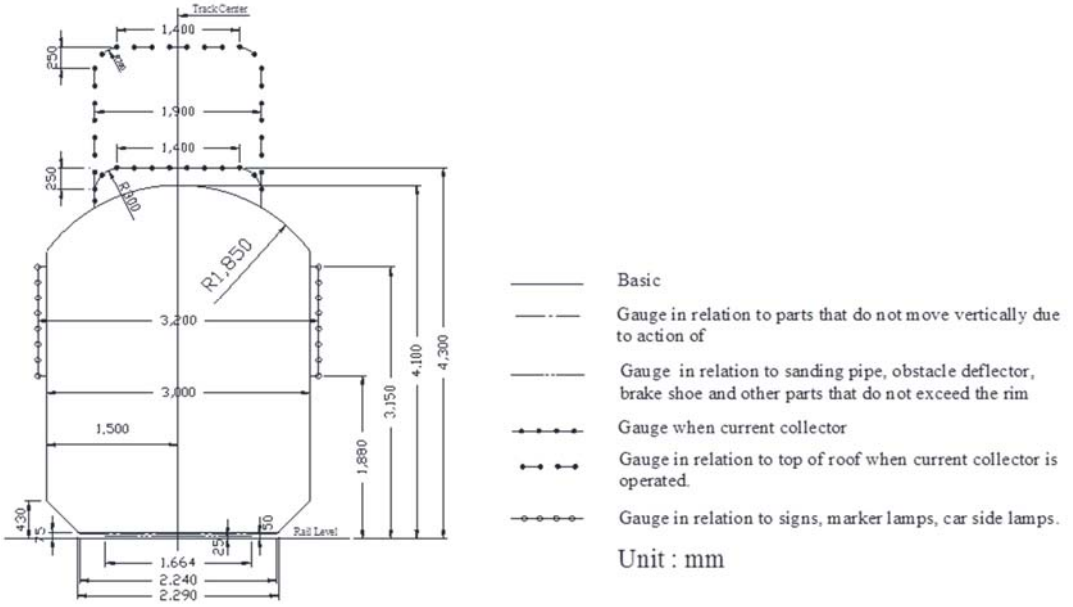
Structure gauge for signals, markers, signs, and special tunnels and bridges

Structure gauge for run-over type turnouts

Structure gauge for shunt and crossing

Source: General Consultants for MRT Line 6

**Figure 12.38 Construction Gauge**




Source: General Consultants for MRT Line 6

**Figure 12.39 Rolling Stock Gauge**

## 12.4 Bus Transport System

### (1) General

At present, bus system is the main transport mode in Dhaka and based on the demand forecast, this will still be in the future as 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 any connectivity between MRT/BRT and bus network, bus services shouldn't pose a potential obstruction to MRT operation in addition to a 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 is a priority bus network, wherein buses are given precedence over other modes – public and private.

### (2) Bus Route Network

#### 1) Primary Bus Route Network

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. This consists of bus routes providing a medium capacity and acceptable levels of line speeds. As much as possible, the primary route network will use the priority infrastructure described above. After the completion of MRT/BRT system, the primary bus route network will be modified so that passengers can be channeled to the MRT/BRT system. The primary bus network will then be connected to multimodal stations although it will not necessarily be a feeder network and will be operated by standard and articulated buses.

The purpose is to create an integrated network where public transportation mobility is secured–-not just for one or two corridors but as part of an integrated public transportation network for Dhaka which will augment the proposed high capacity MRT/BRT network on major public transportation corridors. In this infrastructure, different route network configurations can then be applied to meet particular passenger demands in specific sections of the network.

#### 2) Secondary Bus Route Network

The secondary bus network will consist of feeder and local routes providing dense coverage and accessibility. This network won't normally use the bus priority infrastructure but will operate in streets with mixed traffic and will be operated with standard and smaller buses. Accordingly, commercial speeds and performance levels will be lower.

### (3) Priority Bus Implementation

The method to achieve a bus priority network differs, depending on specific characteristics of routes. The preferred solution would be to provide a two-way busway in the center of the road, physically separated from other modes of traffic. Though this may be possible in some sections, elsewhere route specific options will have to be identified and implemented.

In addition to physical separation, time separation can be applied with buses being given priority at traffic lights. This can be done in several ways. Signaling can be influenced by priority buses, hence; if a bus is behind the schedule, it can get a green light. Also, streets can be designed in such a way that buses come in the first line when traffic light changes.

Another possible approach to secure mobility for buses could be to link the bus priority infrastructure network to a road pricing scheme especially designed for Dhaka. Since a conventional area level system based on entrance fees (Singapore, London) may be unpopular in a city like Dhaka, road pricing could instead be implemented on the street level. Motorcycles and cars would pay a monthly or annual fee for the privilege of using designated parts of a street network during peak hours. Traffic management and policing measures should be added, for example, decreasing green light times for crossing traffic at some intersections and the rigorous enforcement of traffic regulations.

**Leicester (England)** introduced a 4.5km bus priority lane over a 6km route in 1997, under the objective of promoting bus transit with high quality service to and from the city center.

- Continuous inbound bus lane (towards the city center);
- Outbound bus lane provided at critical locations;
- Red paint applied on bus lanes;
- Minor junction improvements;
- Park & Ride facility;
- Taxies and bicycles allowed to use bus lane;
- $2.2 million project cost.

**Results:** Morning peak hour vehicle traffic into the city experienced a reduction of 17%. Bus trip time was cut from 23 minutes to 18 minutes. The reduced peak hour vehicle traffic and faster and reliable bus travel are the successful outcomes of the project.

**Kunming (China)** opened China's first bus exclusive lane in 1999 over a 5km route in the city center.

- Exclusive bus lanes in the middle of carriageway;
- Bus stations located after intersections and designed to accommodate six buses;
- General traffic lanes narrowed down to 2.8-3m;
- Truck ban (daytime);
- Intersection improvements;
- $900,000 project cost and 3-month roadway space reconfiguration.

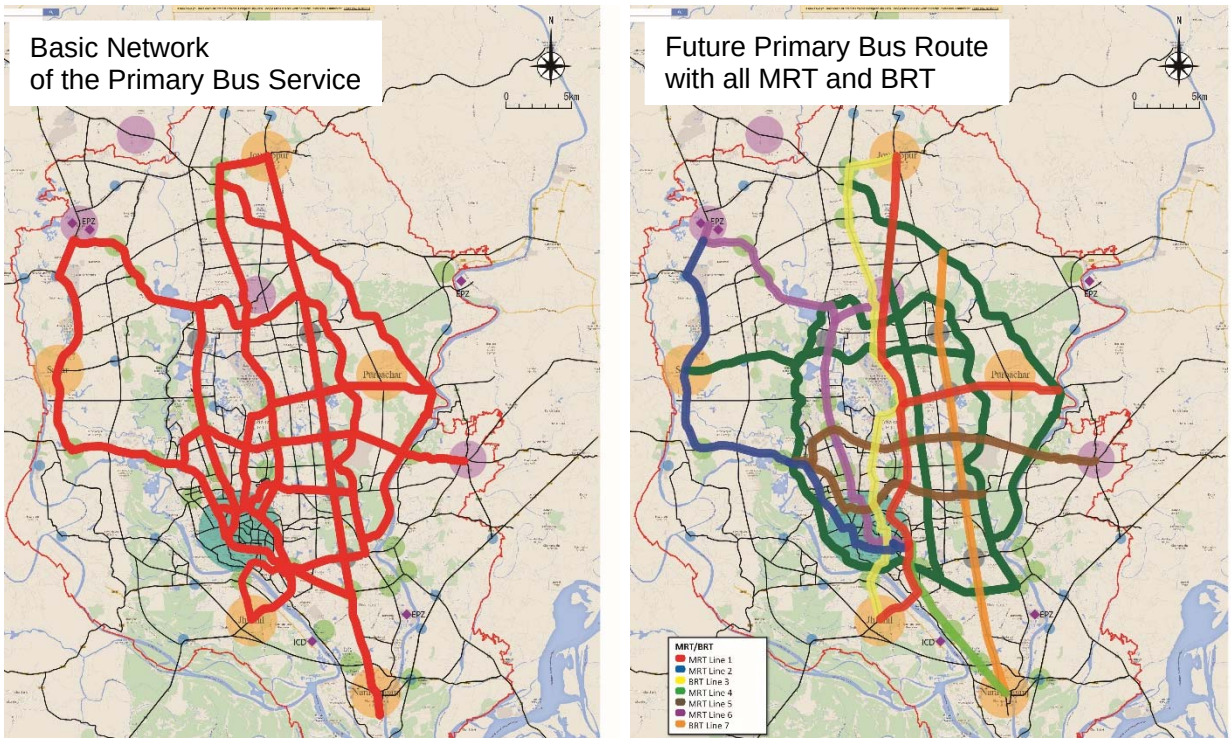
**Results:** Both bus travel time and ridership experienced significant improvements. Peak hour bus operating speed increased from 10km/hr to 15km/hr and ridership grew 21% over 2 years. The public is highly supportive of bus priority and as a result the second 10km bus lanes opened in 2002.


Source: JICA Study Team

**Figure 12.40 Example of Bus Priority Lanes**

### (4) Phased Primary Bus Route Network

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 start service in some corridor, the primary bus service will stop in the same corridor. And when the whole shape of the MRT/BRT network will be modeled, the primary bus routes need to be modified as the connection between each MRT/BRT lines.




Source: JICA Study Team

**Figure 12.41 Primary Bus Route Network (draft)**

### (5) 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.

#### 1) Phase I: Improvement/expansion of inter-city bus terminal at present locations (2016~)

An improvement/expansion plan of three bus terminals at their present respective locations already exists. An improvement/expansion work will be conducted as soon as possible in this phase.

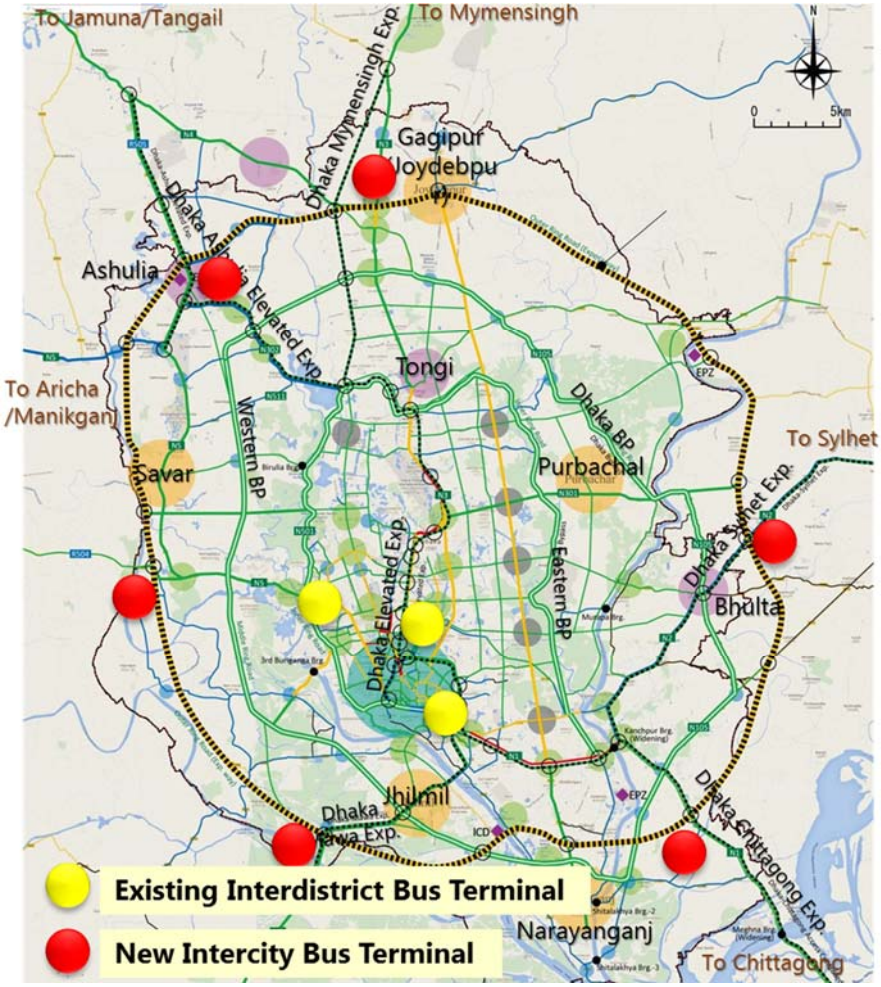
#### 2) Phase II: Study/planning on relocation of inter-city bus terminal (2020 ~)

Study on finding suitable land/area along highways or ring roads and planning for three bus terminals at a new location will be implemented.

#### 3) Phase III: Construction of interprovincial bus terminal

Three bus terminals (Gabtoli, Mohakali, and Saidabad) will be constructed.

The critical factor is the presence of many interprovincial bus operators who do not use bus terminals and collect passengers by themselves. This activity should be strictly controlled. It is also recommended that an advisory committee which will consist of BRTA and DTCA, district and provincial governments, representative of residents, and bus operators should be convened. Project cost will be 300 million USD.




Source: JICA Study Team

**Figure 12.42 Locations of the Proposed New Bus Terminals**

### (6) 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 are 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 operators 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" has been implemented in 2004 and the follow up study is currently conducted. Outputs of this WB project is very important and useful which needs DTCA's continuous revision and modification.

### (7) 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 12.18 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.<br>Consultants, local consultants, staff, office, etc. | 1 |
| Infrastructure Development | Construction of bus lanes.<br>Signal priority scheme.<br>Bus stops and interchange bus terminals. | 10<br>10<br>10 |
| Depot Development | Buildings and equipment for 10 bus depots.<br>Technical and management assistance. | 10<br>3 |
| Institutional Development | Establishment of a Public Transportation Authority, technical assistance, equipment. | 2 |
| Bus Termials Development | Replacemand and redevelopment of current three bus termians. | 300 |
| Bus System Modernization | Replacement buses, new bus stop developmnt and others | 300 |
| Subsidies | | 6 per year |
| Total Cost | | + 646 |

Source: JICA Study Team

## 12.5 Traffic Management and Traffic Safety

### (1) General

Traffic management is the fundamental action to maximize capacities and use of available infrastructure in the most efficient and effective manner. Increase in road traffic demand lessens the existing road infrastructures capacity, decreases traffic safety, increases air pollution, hampers smooth and comfortable movement and spoils the city's image.

There are various measures of traffic management. These involve the so called 3Es, i.e., engineering, education and enforcement. Engineering measures include signalling, 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. One of the effective ways in 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.

### (2) 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.

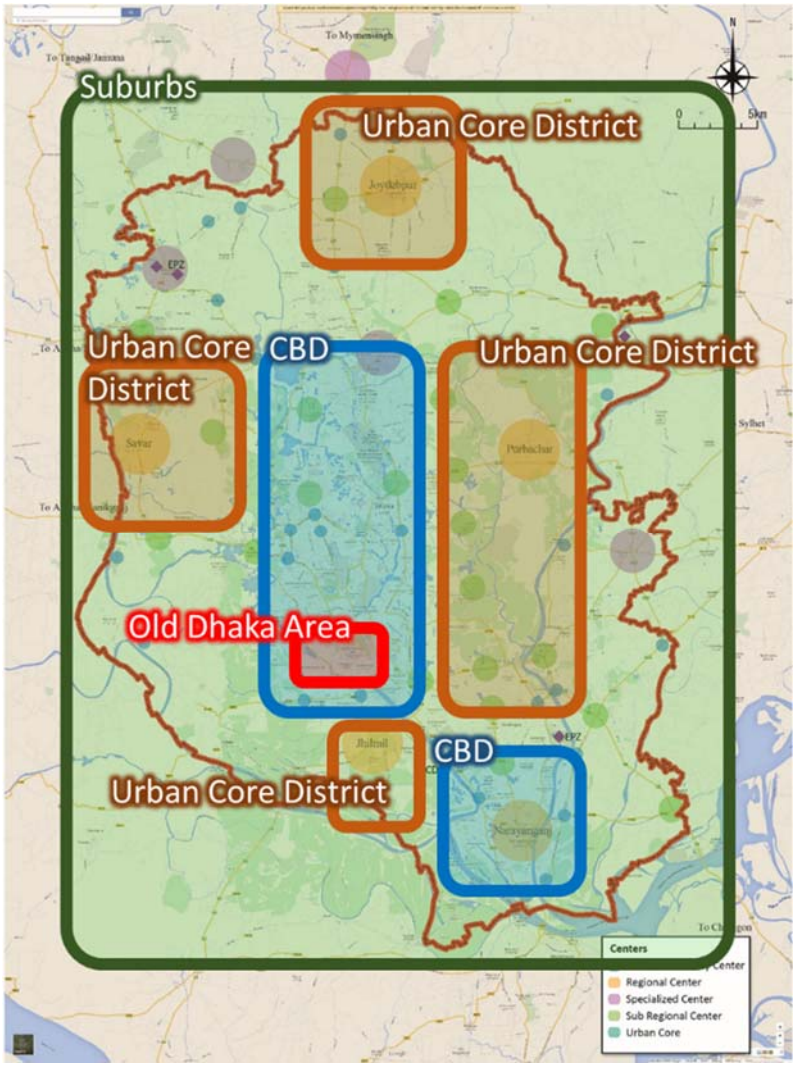
### (3) Short-term Traffic Management Orientation

The most urgent business is to put more basic measures into traffic management which will manage and maximize existing resources. This will include control of traffic and vehicles, improvement of safety standards, formulation of parking policy and strengthening of enforcement and human resources.

**Table 12.19 Traffic Management Improvement Directions by Area**

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

Source: JICA Study Team




Source: JICA Study Team

**Figure 12.43 Traffic Management Improvement Directions**

**Table 12.20 Short-term Traffic Management Policies**

| Short-term Policy | Action (Measure) | Remark |
|---|---|---|
| Control of Motorization Growth | ・Garage registration for car owners. | ・Development of the detail roles and regulations |
| | ・Designated district for TDM. | ・TDM for CBD |
| | ・Traffic control ex. one way, no entry, etc. | |
| | ・Increase of tax on vehicle ownership and operation (gasoline). | |
| | ・Enhancement of public transportation system | ・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. | ・Parking control on the sidewalk |
| | ・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). | ・Provision of the hard median and one-way system for narrow streets |
| | ・Promotion of comprehensive traffic control and management measures. | ・Corridor or area comprehensive traffic management system |
| Enhancement of the Traffic Safety Measures | ・Elimination of accident black spots. | ・Not only engineering improvement, also should coordinate with enforcement and education program |
| | ・Strengthening of traffic enforcement | |
| | ・Improvement of traffic education systems. | |
| | ・Improvement of emergency medical services. | |
| | ・Development of comprehensive traffic safety program. | ・3Es or 4Es comprehensive approach (Engineering, Education, Enforcement and Emergency) |
| Development of Efficient Parking Systems | ・Development of roadside parking plan. | ・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) |
| | ・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. | |
| Capacity Development | ・Traffic Police | ・Capacity for the planning and implementation for the comprehensive traffic management and safety, including institutional capability |
| | ・Traffic inspectors | |
| | ・Traffic engineers | |
| | ・Traffic Safety Committee | |
| | ・Improvement of the design standard, roles and regulations. | |

Source: JICA Study Team

### (4) Traffic Management Program for Narrow Road of Dhaka

As part of the Dhaka Urban Transport Project (DUTP) a Road Referencing Database of the Road Network of DCC, was prepared in 2002. The preparation of the database included the classification of 1,286 kilometers of survey roads into five categories, based upon a functional hierarchy as follows:

a. Primary Roads: Inter-zonal roads; access control; full restriction of non-motorized traffic and grade separation at major intersections.

b. Secondary Roads: Intra-zonal roads; access control; segregation of motorized and nonnotarized traffic. And total road

c. Connector Roads: Intra-zonal roads; full frontage access; partial segregation of motorized and non-motorized traffic; and segregation of opposing traffic flow.

d. Local Roads: Full frontage access; no segregation of traffic; and provision for the possibility of using some traffic calming measures.

e. Narrow Roads: Short segments providing access to small areas; predominantly for nonnotarized traffic and pedestrians; and bituminous, brick paved, and earthen surface. And the width of the other narrow road is defined to be less than 4.75m.

**Table 12.21 Road Length b Type**

| Type of Road | Length (Km) | Composition (%) |
|---|---|---|
| Primary | 61.45 | 4.78 |
| Secondary | 108.20 | 8.41 |
| Connector | 221.35 | 17.21 |
| Local | 573.75 | 44.61 |
| Narrow | 321.27 | 24.98 |
| Total | 1,286.02 | 100.00 |

Source: Road Maintenance Management System (RMMS) of RHD

The narrow road is barely wide enough for vehicles to pass each other and so this road needs to be restricted movement to a one-way route. If the width is less than 3 m, this narrow road should be a pedestrian road.

### (5) Parking Management Policy

Parking demands in Dhaka may not be necessarily provided by the public sector alone but rather mostly by the private sector. In this context, a parking development policy must be formulated that clearly defines the roles of the public and private sectors. The basic rule is that parking facilities should be provided by the buildings or institutions from which the parking demand is generated. More specifically, the recommended basic parking policy can be stated as:

i. Exclusive parking must be provided by concerned buildings or institutions.

ii. Buildings of certain type and size must have adequate parking facility.

iii. Public parking is limited to short-term parking for the public.

Based on this policy, vehicles used for commuting to work places and schools must be provided by the respective institutions. Likewise, office buildings and commercial establishments that generate large parking demand must have adequate parking facility. Vehicle owners must also have their own parking places at home or in their respective bases.

If this principle is strictly followed, the demand for short-term parking would be less than 20% of the total parking demand since “to work”, “to school” and “to home” trips covers more than 80% of the total trips. However, in reality, parking facilities cannot be

developed in a short period of time and a shortage of parking supply will result in illegal, on-road parking. As for the short-term parking supply shortages, it is therefore necessary for public parking to address the issue.

The role of the public sector is to develop the following types of parking facilities:

i. Parking areas in high parking demand places where there is an urgent need for such facilities

ii. Parking areas using part of the land for road.

iii. Parking areas to be constructed within public facilities and parking using public land.

The share of public parking will depend on the area. The suggested target share is 10 - 30% of the total short-term parking demand, with a higher share for areas where sufficient supply by the private sector cannot be expected.

On the other hand, the private sector is requested to provide parking facilities for the demand generated from their activities. The existing building code sets the parking requirement for certain types of buildings. However, the definition of the terms used in the regulation is not clearly stated. Therefore, a clearer requirement and implementation guidelines must be formulated.

It is necessary to create an environment in which parking can be financially viable as private business. For this purpose some priority measures, such as property tax reduction or low interest loan can be considered to encourage the private sector to enter into the parking business. Under present circumstances, however, constructing office buildings is much more viable than venturing into the parking business.

Other measures necessary for efficient parking management include the following:

i. Enforcement of parking bans at prohibited places.

ii. Parking in public spaces, such as on the road and on sidewalks, must be managed by authorized organizations.

iii. All public parking must be charged.

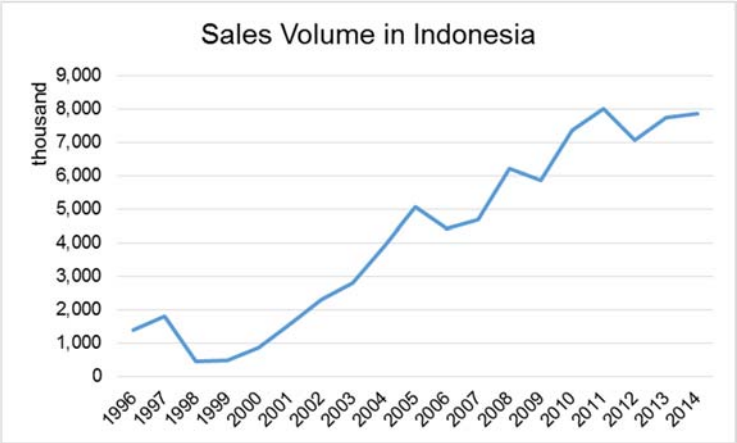
iv. Time-based parking fee system must be introduced in high parking demand areas.

v. Introduction of a parking guideline system to efficiently operate parking facilities

vi. Designation of loading/unloading zones for goods and cargo in commercial areas separate from parking spaces.

**(6) Traffic Demand Management**

In Jakarta, capital city of Indonesia, motorbike sales have posted phenomenal growth over the past decade and the sector shows no signs of abating. Last year, there were 7 million new motorcycles on Indonesian roads. And the motorbike boom has dramatically changed the ability of young Indonesians to work and learn because they no longer have to use the country's unreliable public transport system. And with the finance easily available, almost anyone can afford a motorbike or scooter.




Source: AISI (Indonesia Motorcycles Industry Association

**Figure 12.44 Number of Sales Volume of Motorbike in Indonesia**

And huge number of motorbike is a primary cause of the serious traffic jams. And modal share of public transport have greatly reduced with increased amount of motorbike.

Source: JICA Study Team

**Figure 12.45 Traffic Jams in Jakarta**

It can be easily imagined that a rapid increase of the number of car and motorbike in Dhaka will likewise result to a same or serious traffic jam as in Jakarta.

Traffic demand management (TDM) is a restrictive measure to be applied to private modes of transportation, private cars and private motorbikes. The main purpose of TDM is to encourage the use of public transportation rather than the private modes. TDM measures can be classified into two types, namely economic measures and regulatory measures. They can be applied either to the use or ownership of vehicles. The table below classifies various TDM measures.

**Table 12.22 Classification of TDM Measures**

| Restriction | Economic Measure | Regulatory Measure |
|---|---|---|
| Vehicle Ownership | • Various taxes levied upon purchase<br>• Annual registration fee<br>• Quota system | • Garage requirement<br>• Restriction by domicile |
| Vehicle Use | • Fuel price<br>• Parking fee<br>• Area license | • Area license<br>• High occupancy vehicle (HOV)<br>• Number plate control |

Source: JICA Study Team.

Area licensing is a traffic management scheme that restricts the use of private vehicles in designated areas to alleviate traffic congestion and at the same time promote the use of public transportation. The basic idea is that when an area is specified as restricted, charges are levied on vehicles entering that area during certain times of the day. The charge works as a disincentive for using private vehicles. People may choose to use other modes of transportation to avoid the charge, or change the time of travel to off-peak hours when the charge is smaller or none.

Road pricing adopts an economic rule wherein the higher the charge, the bigger the impact which results in a more traffic reduction on restricted areas. Collected charges can be used for the improvement of transportation facilities. However, this could create adverse effect on people's mobility, accessibility and social or economic activities. Thus careful study, planning and design are necessary. Table 12.23 listed the items to be considered.

It is not too early for Dhaka to study the feasibility of area licensing system since the success of the system depends not only on technical adequacy but also on social consensus as to the necessity of the system and all of these will take time to develop. An initial idea for area licensing in Dhaka is the designation of CBD as restricted area. Vehicles, including motorcycles, entering these restricted areas will be charged. As a future step, the restriction can be expanded outside of CBD. To complement the area licensing system, parking on public areas will be charged with higher parking fees.

**Table 12.23 Study Items for Area Licensing System**

| Category | Subject | Item |
|---|---|---|
| Restriction | Area | Size<br>Checkpoint<br>Public service |
| | Day and time | |
| | Targeted vehicle | Applicable type (4 wheel/2 wheel)<br>Number of vehicles affected<br>Exemption<br>Remedy for disabled |
| | Inner traffic | Restricted or not |
| | Impact on adjacent area | |
| Charge | Amount of charge | Applicable types of vehicle and amount<br>Sensitivity |
| | Fixed or flexible | By day and time |
| | Collection method | Prepaid (sticker)<br>Post paid (credit card) |
| Driver information | Guide sign | Location<br>Contents and design<br>Dynamic and static sign |
| | Media | Radio, TV, newspaper |
| Enforcement | Monitoring method | Automatic (gate and in vehicle unit)<br>CCTV camera<br>Manual surveillance |
| | Monitoring location | Boundary only<br>Gate within the area |
| | Violator | Apprehension on the spot<br>Responsibility of vehicle owner<br>Penalty and punishment<br>Recording<br>Recursive violator |
| | Countermeasure against fraud | Technology<br>Legal base |
| Operating Agency | Policy making | |
| | Systems administration | |
| | Operations monitoring | |
| | Enforcement | |
| | Logistics | |
| | Fee collection | |

Source: JICA Study Team.

### (7) Traffic Safety

#### 1) Coverage

Currently, the DMP has enhanced the enforcement of traffic regulations and has apprehended drivers violating them such as running a red light, reckless driving and others. Traffic safety facilities, including traffic signals have been improved that has helped to stop the increasing trend of number of traffic accidents and fatalities in Dhaka.

Even though the number of traffic accidents has decreased, the rate of accidents per population size and number of vehicles is still very high. It is therefore very important to enforce traffic regulations and penalize violators. But more importantly for such effort to be effective, it must be in accordance with the changes in motorization, i.e. from bicycles to motorcycles, from motorcycles to cars, and so forth.

In response to social needs, traffic safety is made as one of the components of RSTP's urban transportation subsector. In this regard, the traffic safety master plan prepared by

RSTP was based not only on the current accident situation but also on institutional conditions since traffic safety covers wide-ranging issues such as engineering, education, enforcement and emergency medical care. Consequently, the Dhaka Traffic Safety Master Plan will promote a comprehensive approach to traffic safety. Detailed programs and action plans, including a five-year safety program, will be elaborated further.

**2) Es (Engineering, Education, Enforcement, and Emergency)**

(i) Traffic Safety Facility Development

- Improve intersections.
- Install guardrails, median, street lights, and other safety facilities.
- Provide sidewalks and bicycle lanes.
- Install road traffic markings and signs.

(ii) Traffic Control and Enforcement

- Strengthen enforcement on the accident black spots.
- Provide sufficient equipment to strengthen traffic enforcement.

(iii) Traffic Safety Education

- Include practical, daily guidelines on traffic safety in school curriculum.
- Promote driver education.

(iv) Emergency Medical Care

- Develop first-aid centers.
- Promote a traffic accident insurance system.

**3) Focus Areas for the Comprehensive Traffic Safety Program**

Another significant aspect that will guarantee the success of a traffic safety program is public compliance with traffic safety regulations. Thus, it will be indispensable to have a comprehensive strategy on urban traffic safety for Dhaka which should be resolutely carried out in the long term. This strategy should include the following:

i. Strengthen safety planning and implementation capacity.

- Improve accident databases and analytical capacity.
- Develop adequate design standards.
- Establish adequate costing/funding mechanisms for safety projects/programs.

ii. Build basic social infrastructure for safety enhancement, including;

- Launch awareness campaigns on safety for the entire society including the public and private sectors, various industries and communities, on which social consensus will be built and a strong policy commitment can be established.
- Establish a mechanism on traffic safety publicity, campaign, and education.
- Strengthen enforcement and practice of basic traffic management.

iii. Develop/Improve safety measures and mechanism.

- Improve vehicle safety by strengthening safety inspection and standards.
- Improve driving and observation skills through training and testing.
- Establish an effective safety audit system.

iv. Develop Institutions including:

- Enact necessary laws and regulations on traffic safety.
- Strengthen safety organizations and their management capacities (e.g. form a

Comprehensive Traffic Safety Unit [tentative name]).

- Improve agency coordination on traffic safety.

v. Formulate a coordinated program and establish a workable mechanism at the local level.

- Provide stakeholders with a clear, long-term vision and targets (next 10 years) and specific medium-term (3 - 5 years) and short-term (1 - 3 years) action plans.
- Provide sufficient budget for the Comprehensive Traffic Safety Program.

### (8) Institutional Arrangement and Capacity Building

There are five organizations directly involve in Dhaka's traffic management. These are DNCC, DSCC, DMP, BRTA and DTCA.

Traffic management process, as earlier presented, is a cycle to be pursued repetitively. A continuous effort must be exerted to consistently improve the traffic situation as traffic demand and pattern gradually changes with time. However, the existing institutional set-up seems to have no clear defined mechanism to trigger or initiate the process. DTCA undertakes planning and design but it is not clear how such tasks are initiated. The DMP deploys policemen to intersections and enforces traffic regulation but they do not take the initiative in formulating traffic management projects. It is therefore necessary to define the tasks of each organization in the traffic management process.

Another weakness in Dhaka's traffic management is human resources. Traffic engineering and management are relatively new areas of expertise in Bangladesh and experts in these fields are quite few. Likewise, staffs of related agencies do not receive adequate training and from the viewpoint of traffic engineering, existing road facilities are not being optimized. Traffic can be more efficient and safer if knowledge on traffic engineering and management is acquired and effectively applied.

In RSTP Traffic Management Plan, training is recommended for two target groups; traffic engineers and traffic police. Different subjects will be taught to these two groups.

Traffic Management Capability Building Project: This project will be carried out to enhance the capabilities of the staff of organizations responsible for traffic management.

A team of professionals in traffic management will be invited to conduct classroom training on various aspects of traffic management including intersection geometry, traffic survey and analysis, signal design, pavement marking design, traffic sign, etc. The training period will be 24 months with the first year spent mostly on classroom training while the application of improvement measures will be carried out during the second year.

### (9) Sidewalk Space Improvement

#### 1) Overview

Sidewalks are important not only as a component of road facilities to ensure smoother traffic flow but also as space for various socio-economic activities and as an urban landscape element. Sidewalks in the center of Dhaka have provided precious space for Dhaka's urban development and have played a key role in the lives of its people.

Today, as motorization and economic development progress, sidewalks have served various purposes. They have become parking area for motorcycles and excessively encroached upon by roadside businesses. Sidewalks are no longer comfortable space for pedestrians and residents.

Ensuring a good walking environment for Dhaka is very important in many ways, to wit:

i) Urban area should be designed for walking in order for the people to enjoy the distinct atmosphere they offer. Regeneration of urban area must accompany the restoration of a good walking environment.

ii) A public transportation-based urban area, which should be the basic future policy orientation of the city, must be supported with extensive and quality walking environment to facilitate easy access to public transportation by the people.

iii) Sidewalks planted with trees and other plants enrich Dhaka's urban landscape, a characteristic that many cities in Asia have lost or been unable to maintain.

**2) Functions of Sidewalk Space**

Sidewalks have two basic functions - traffic function and space function. For traffic function, sidewalks serve as: (i) space for pedestrian traffic, (ii) access to roadside facilities, and (iii) storage space for vehicles. As for the space function, sidewalks contribute to: (i) urban formation and landscape, (ii) disaster prevention, (iii) environment improvement, and (iv) provision of space for utilities.

While roadways are largely for traffic, sidewalk functions are quite extensive and diverse that they can significantly contribute to the development of attractive urban areas.

**3) Sidewalk Improvement Measures**

Measures to improve the sidewalk include the following:

(a) Pavement
- Type of pavement: Asphalt pavement, Concrete pavement, Concrete block pavement (Inter locking block).
- Maintenance.

(b) Street Light
- Type of illumination: Necessary lux.
- Type of street light pole: Height, pitch, attachment.
- Maintenance.

(c) Planting
- Type of plant: Kind, height, life time.
- Maintenance.

(d) Signboards
- Type of signboards: Content, color, location, direction.
- Maintenance.

**Table 12.24 Sidewalk Improvement Measures**

| Measure | Strategy | Scope | Measure/Action |
|---|---|---|---|
| 1. Improvement of Environment for Road Space | • Parking control | 1. Provide sidewalks for pedestrians. | • Enforce orderly parking. |
| | | 2. Provide parking spaces for visitors.<br>3. Utilize limited road space. | • Provide parking spaces on carriageways. |
| | | 4. Utilize parking spaces efficiently.<br>5. Study parking as business. | • Introduce time-based parking systems. |
| | | 6. Improve disposal of goods. | • Provide loading and unloading spaces for goods. |
| | • Improvement of pedestrian environment | 1. Provide walkable space. | • Regulate and reduce on-street shops. |
| | | | • Regulate displays on sidewalks. |
| | | 2. Install and utilize gathering spaces. | • Install free space on carriageways. |
| 2. Improvement of Safety and Amenities for Road Users | • Traffic safety | 1. Provide safe loading and unloading area for pupils/students.<br>2. Prevent traffic accidents. | • Provide loading/ unloading space for schools. |
| | • Provision of amenities | 1. Improve landscape of roads. | • Install dust bins. |
| | | | • Clean road space. |
| | | | • Install flower beds. |
| | | | • Install information boards. |

Source: JICA Study Team

### (10) Traffic Management Measures for Rickshaws

Rickshaw is the most popular transport mode in Dhaka which people prefer for a short distance, 1-3 kilometer, travel. Actual number of rickshaw is not clear although an official 100,000 number of registered rickshaw has been recorded in Dhaka city.

Rickshaw is a functional pubic transport but it pose some problems in the aspect of urban traffic environment as follows:

- Due to rickshaw's low speed, travel speed of all transport modes in the road will consequently become low.
- Lack of willingness of the rickshaw puller to maintain line which creates disturbance to other motorized vehicles.
- No driving license is required for rickshaw driving, thus no proper traffic knowledge obtained by the rickshaw puller.
- As there is no parking space for rickshaws, in most cases, rickshaw pullers wait for the passengers at the intersection which is a common reason of traffic congestion.
- Rickshaw drivers make U-turn in the mid-block sections and create traffic congestion.

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

### (11) Intelligent Transport Systems (ITS) Development

#### 1) Rationale for ITS Development

Intelligent transportation systems (ITSs) refer to a wide range of applications of information and communication technologies (ICTs) to the transportation system. They are intended to make road traffic more efficient, safer, and user-friendly. Development of ICTs in the recent years has made it possible to realize a system which was considered as a dream before.

Development of ITSs has been active in USA and Japan, where a national ITS council has been established to formulate ITS development policy and support research and development activities. Coordinated development across the continent is underway in Europe to take advantage of the geographical nature of Europe where many vehicles travel beyond boundaries of countries.

Various ITS applications are called user services and they are grouped into several development categories. There are small differences between user services and their grouping in the countries mentioned above. The user services defined by ITS Japan are shown in Table 12.25 as example. It must be noted that user services are at different development stages; some user services, such as real-time route guidance systems, are already in commercial use, while automated highway systems are still at the research and development stage.

#### 2) User Services for Bangladesh

Although the backbone technologies that support ITS are common among countries, user services in a country must be selected and prioritized, taking the traffic and transportation characteristics and national demand into consideration.

In order to develop the ITS policy for Bangladesh, the following factors must be considered:

**Table 12.25 User Services Defined by ITS Japan**

| | Development Area | | User Service |
|---|---|---|---|
| 1 | Advances in navigation systems | 1 | Provision or route guidance traffic information |
| | | 2 | Provision of destination-related information |
| 2 | Electronic toll collection systems | 3 | Electronic toll collection |
| 3 | Assistance for safe driving | 4 | Provision of driving and road conditions information |
| | | 5 | Danger warning |
| | | 6 | Assistance for driving |
| | | 7 | Automated highway systems |
| 4 | Optimization of traffic management | 8 | Optimization of traffic flow |
| | | 9 | Provision of traffic restriction information in case of incident |
| 5 | Increasing efficiency in road management | 10 | Improvement of maintenance operation |
| | | 11 | Management of specially permitted commercial vehicles |
| | | 12 | Provision of roadway hazard information |
| 6 | Support for public transport | 13 | Provision of public transport information |
| | | 14 | Assistance for public transport operations and operations management |
| 7 | Increasing efficiency in commercial vehicle operations | 15 | Assistance for commercial vehicle operation management |
| | | 16 | Automated platooning of commercial vehicles |
| 8 | Support for pedestrians | 17 | Pedestrian route guidance |
| | | 18 | Vehicle-pedestrian accident avoidance |
| 9 | Support for emergency vehicle operations | 19 | Automated emergency notification |
| | | 20 | Route guidance for emergency vehicles and support for relief activities |
| | | 21 | Utilization of information in the advanced information and telecommunications society |

Source: ITS Japan

(i) Current status of ICT development and applications is not advanced in Bangladesh but the situation is changing rapidly so that use of ICT will become common in all aspects of the society together with the development of ICT infrastructure.

(ii) Currently, public transport modes are the dominant mode of transportation. But the number of private cars and motorcycles will grow quickly and could cause serious congestion in the near future if no actions are taken.

(iii) Substantial expansion of road network to accommodate the increased number of private vehicles and motorcycles can be neither expected nor economical in the urban core districts. The existing road network must be efficiently utilized.

(iv) To prevent undesirable growth of private cars and motorcycles, some kinds of traffic demand management measures, like area licensing system, must be implemented. At the same time, priority must be given to public transportation.

(v) In the context above, ITS development in Bangladesh must focus on user services that support the public transportation, contribute to the efficient use of the existing road network, and realize traffic demand management measures.

ITS development in Bangladesh must thus focus on the following areas:

(i) Support for public transportation.

(ii) Optimization of traffic management.

(iii) Electronic toll collection system.

More specifically, user services listed below will be given a priority.

(i) Provision of public transportation information (user service No. 13).

(ii) Assistance for public transportation operations and operations management (user service No. 14).

(iii) Provision of route guidance traffic information (user service No. 1).

(iv) Optimization of traffic flow (user service No. 8).

(v) Electronic toll collection (user service No. 3).

**3) Provision of Public Transportation Information**

If information on public transportation is easily available, it can attract more passengers. Two types of public transportation information will be given by the system; static information and dynamic information. The former includes the information regarding bus route, time table, fare, transfer, etc., while the latter refers to real-time bus operating information.

Static information is relatively easy to collect and disseminate. But timely updating must be made so as not to provide obsolete information. They can be given as brochures and posters, and through the Internet. Two versions of an Internet web site will be prepared; one for viewing by personal computers and another for web-enabled mobile phones.

Real-time bus operating information refers to the location of the buses on the route and expected travel time to a destination. In order to collect real-time information, bus operation must be monitored in real time. All buses must be equipped with a GPS (global positioning system)-based transmitter, which sends the bus location at regular intervals.

The bus location information is sent to the bus management center and processed into bus operation data. The location of the next bus by bus route will be displayed at bus stops as a service to passengers to inform them about waiting times for the next bus. If expected waiting time is too long, potential passengers can take other modes of transportation, or use the waiting time for other purposes and come back to the bus stop in time for the next bus.

**4) Assistance for Public Transportation Operations and Operations Management**

Two systems are envisioned in the user services; transit signal priority and bus operations information.

Transit signal priority is a function of a traffic signal system that offers preferential treatment to buses. It detects bus approaching a signalized intersection and adjusts the signal timing so as to minimize the delay that the bus incurs at the intersection. Thus effective running speeds of buses can be increased. The system and its mechanism are explained elsewhere in the report.

Real-time bus location data collected for the information of bus passengers are also very valuable information for bus operators. They provide bus operators with information that can help in bus scheduling, fleet management, maintenance management, staff management, and cost management. If data are effectively utilized, bus service levels can be upgraded, while the operation costs can be reduced.

**5) Provision of Route Guidance Traffic Information**

Currently, drivers in Dhaka operate their vehicle, whether it is motorcycle or passenger car, without any knowledge about traffic conditions. They choose their route based on past experiences only. Such situation is not efficient as they could face traffic congestion that could have been avoided if they knew there is congestion. Route guidance system provides real-time traffic information to drivers already on the road or have plans of doing so. The system is capable of displaying on the in-vehicle unit the suggested route to a destination, taking congestion locations into consideration. It has

been proved very useful by the fact that sales of in-vehicle units have been very vigorous. There are now more than 10 million units in use in Japan.

It must be pointed out that key to the success of any route guidance traffic information is the precise information on traffic condition in the whole area to be covered by the system. If information is not correct or old, drivers would not use the system. Area traffic control (ATC) system is a very important source of such information, as it collects traffic condition data using vehicle detectors. Thus an ATC system is a prerequisite for a real-time traffic information system to function effectively.

**6) Optimization of Traffic Flow**

Traffic flow can be managed more efficiently if intelligent traffic signals are introduced. An ATC system is the system that realizes this. It collects traffic condition data at many points in the control area and controls signals in real-time with the optimum timing to minimize delay and congestion. Signal development plan to introduce consolidated ATC system has been proposed elsewhere in the report.

**7) Electronic Toll Collection**

Electronic toll collection system can be used in two ways; toll collection at expressway and toll collection for area licensing system. For both applications, toll collection technologies have been already established and there are international standards for major system components such as DSRC (Dedicated Short Range Communication) system between vehicle and toll gate. Thus from the technological point of view, area licensing system can be introduced without much development. Study and preparation work are however required for the non-technical aspects of the system such as applicable area, amount of fee to be collected, alternative mode of transport, social acceptance, institutional set-up for operation and maintenance, etc.

### (12) Project Costs of Short-term Traffic Management and Traffic Safety Projects

Table 12.26 is the estimated project costs for the short-term projects of the traffic management and traffic safety programs.

**Table 12.26 Project Costs of short-term Traffic Management and Traffic Safety**

| Project | Project Item | Cost (million US$) |
|---|---|---|
| Signals and Associated Systems | Intersection Improvement<br>Traffic Signal System Installation and Replacement | 150 – 200 |
| Parking Management and Development | New parking slot development<br>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+<br>About 47 billion TK** |

Source: JICA Study Team

## 12.6 Transit Oriented Development (TOD)

### (1) General

Although the concept of TOD itself has been originated in USA, as counter idea against auto-centered development, Japan started its original railway-oriented development schemes which urban development integrated with railway development, even before motorization had started.

In Japan, suburban residential areas and suburban commuter railway had been developed in an integrated manner by private railway companies, which started in the 1910s. They, along with terminal station development in the central areas shaped an urban spatial structure in metropolitan areas. On the other hand, the profits accrued from such suburban development have been reinvested to the railway development, as cross-subsidy in the companies.

Dhaka is suitable to TOD due to its densely inhabited urban areas with more than 800 per hectare in the inner urbanized districts, 500 per hectare in Gulshan area and 400 per hectare in other areas compared to 86 in Paris, 62 in London, 145 in Tokyo and 370 in Hong Kong. With the increasing income and lifestyle change, there is a move towards suburban living – pushed by crammed conditions in the urban core and pulled in by modern residential complexes emerging on the outskirts of Dhaka.

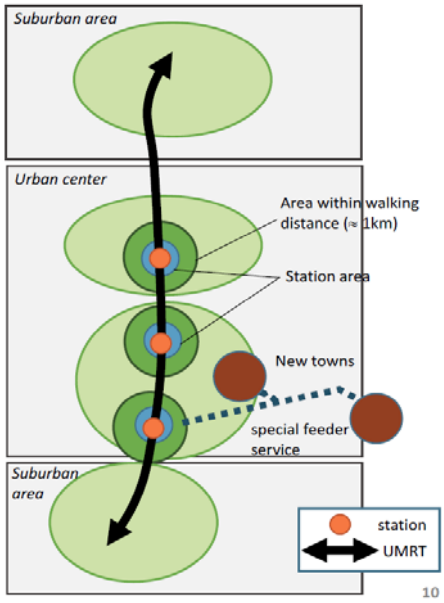



**Figure 12.46 Station Influence Area**

As envisioned in the General Plan, the challenge for Dhaka is to revitalize the CBD into well-designed areas in close proximity to good public transport and with convenient access to a mix of retail, personal services, health and recreational facilities while maintaining cultural and historical values and depopulating the district to make it less congested. Inner city infill sites can offer an ideal setting to promote TOD but require a political commitment to establish a development style enterprise that can implement land readjustment activities and redevelop around MRT/BRT stations.

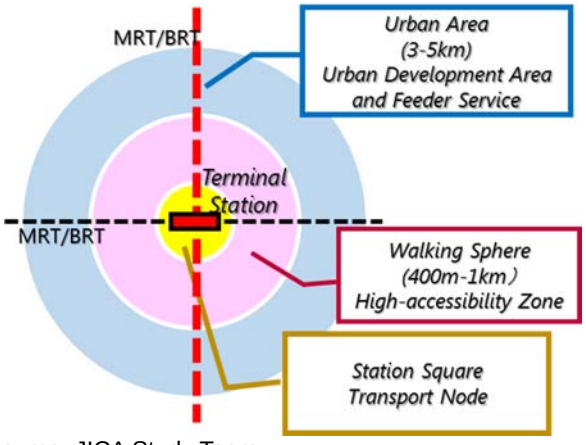
The urbanizing fringes of Dhaka offer the greatest potential for applying the TOD concept − because they are less hampered by existing land uses and ownership. These greenfields or new sites can be planned and designed with a clear transit focus. In order to succeed, these greenfield sites must be provided with high quality, fixed guideway public transport systems with regular connections to the CBD and other regional centers and other TOD nodes. This concept of urbanism seeks to bring together modern lifestyles, housing, and places of employment, retail activity and leisure time in a compact pedestrian-dominated neighborhood with linkages by transit to other points of interests in the greater Dhaka metropolitan region.

### (2) Station Influence Area

MRT Line 1 and Line 6 will give a big impact on socio-economic activities and land use along the corridors. For MRT Line 1 and Line 6 to efficiently manage the planning process, the clear definition of the influence area of the MRT Line 1 and Line 6 is

essential. And depending on the purpose and scope of activities or related projects, the station influence area of MRT Line1 and Line 6 can be described as follows:

The influence areas along Line 1 and Line 6 lie broadly on the central area of Dhaka categorized as the inner urban area (historic inner city and expanded inner city) and newly developed central urban area. Most of the stations of Line1 and Line 6 are located in the inner urban area and the others in the newly developed central urban area. The outer centers of satellite urban areas will be connected to the MRT/BRT with expanded transit, including MRT/BRT or BRT, or other.




Source: JICA Study Team

**Figure 12.47 Spatial Relation of Station Influence Area with MRT/BRT Station**

**1) Level 1 Project Influence Area: City / District:**

This influence area is spread up to a large part of existing urbanized and expanding areas of Dhaka. The role of each urban transport system should be emphasized to manage urban growth as well as related plans and projects should be coordinated in relation to the MRT/BRT development. The influence area of the project at this level refers to the areas along MRT Line 1 and Line 6 which will be directly affected.

The provision of feeder bus services and the measures to encourage usage of public transport will be important.

**2) Level 2 Project Influence Area: Area within Walking Distance**

With regards to the perspective of railway use as a part of daily life, the catchment area can be regarded as a walking distance area which will cover about 1,000 m radius of the station. It is important to consider the provision of a walkable urban environment to commercial, business and community facilities. Some other important considerations will be the development of intermodal facilities, feeder transport facilities and services, improvement of urban environment for walking, development method and roles of government agencies during the planning and development stages.

**3) Level 3 Project Influence Area: Area at and around MRT/BRT Station:**

The railway station is not only a part of the transport facility but will also be a multi-functional facility which responds to various economic and commercial needs and public service. Accordingly, this area has a large potential to satisfy the various urban functions given its strategic location and potential socio-economic activities brought about by railway users.

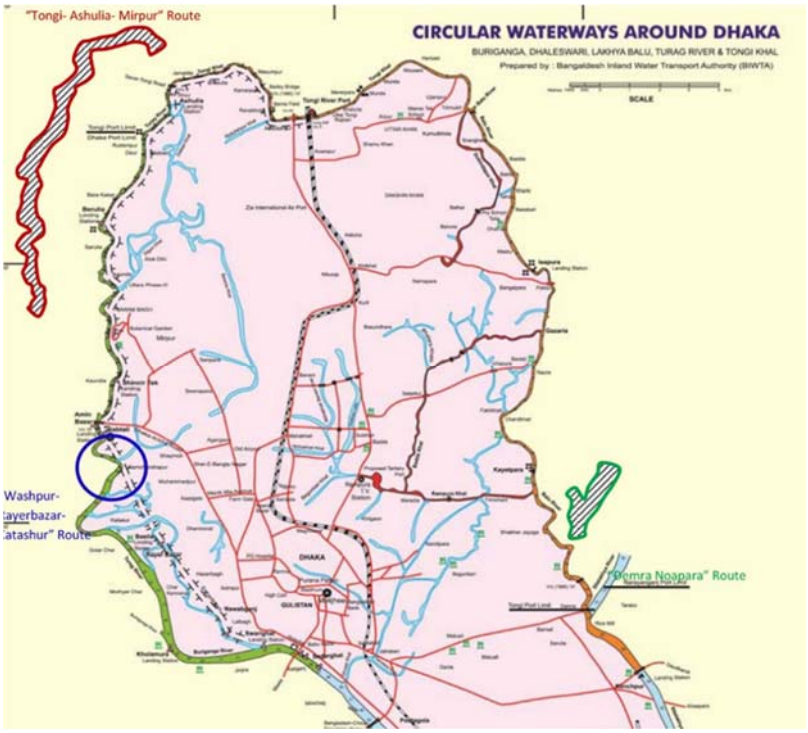
## 12.7 Inland Waterways

### (1) Circular Waterway and Canal Waterway

Dhaka is endowed with pleasant characteristics because of its numerous canals and khals crisscrossing the city, thus creating naturally attractive environmental features. Despite this fact, the city is now left with just a few navigable water bodies such as Dhanmondi, Banani and Gulshan lakes, and the Begunbari khal up to Rampura inside the city. The deteriorating situation has arisen due to the indiscriminate infill of lakes and khals dating back to partition in 1947. These lakes and the Begunbari khal do not carry any significant passengers nor cargo traffic.

However, the city is surrounded by a circular waterway system consisting of the Buriganga, the Balu, the Turag, the Tongi and the Sitalakhya rivers even though the sub-standard clearance of the railway bridge at Tongi affects the through routing of some vessels. These waterways carry a sizeable amount of freight traffic from the adjoining areas bound for Dhaka. The BIWTA under its scheme called “The Development of the Circular Waterways of Dhaka”, is improving the navigability of the rivers and is also building landing stations along the waterways. It is expected that after the improvement of the circular waterways, freight and passengers will move more conveniently through the waterway system. Under the RSTP, these landing stations will be integrated with the land transport system of the city so that the freight and passengers from the waterways can move more easily into the city.

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 1st 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.




Source: BIWTA

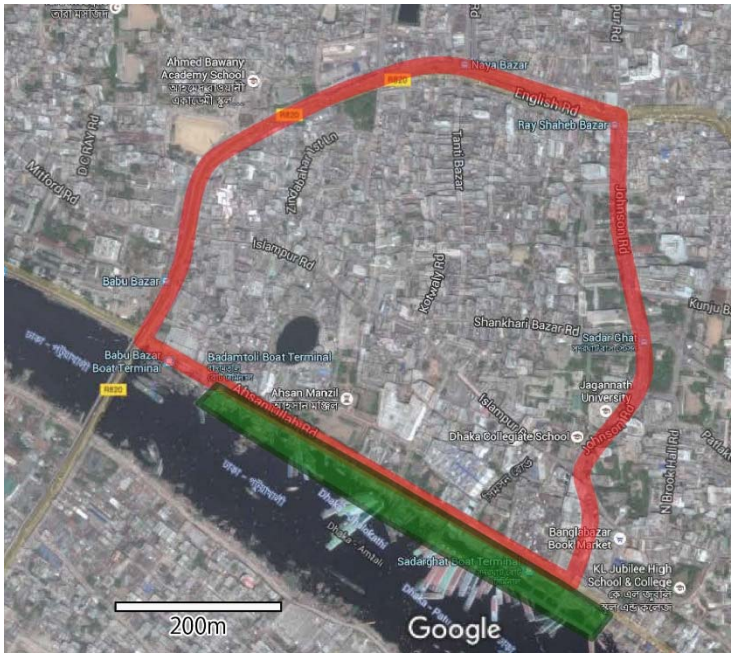
**Figure 12.48 Circular Waterways around Dhaka**

### (2) Sadarghat Boat Terminal

#### 1) Short- and Mid-term Plan

There are some boat terminals of varying size along the river in the Sadarghat area and this area is the famous trafficy area in Dhaka, because this area is located in the old Dhaka and the roads is only 1.2 lanes wide around the pass, which is very narrow. And the Sadarghat River Boat Terminal is one of the largest river ports in Bangladesh. About 300 large and small passenger river boats depart and arrive with an average of 500 passengers every hour at the terminal every day. According to the officials at the terminal, 150,000 people, in average, use the terminal for departure and arrival every day.

In the short- and mid-term, traffic management measures, one-way-system, feeder bus service, parking management and others can help relive the congested area.



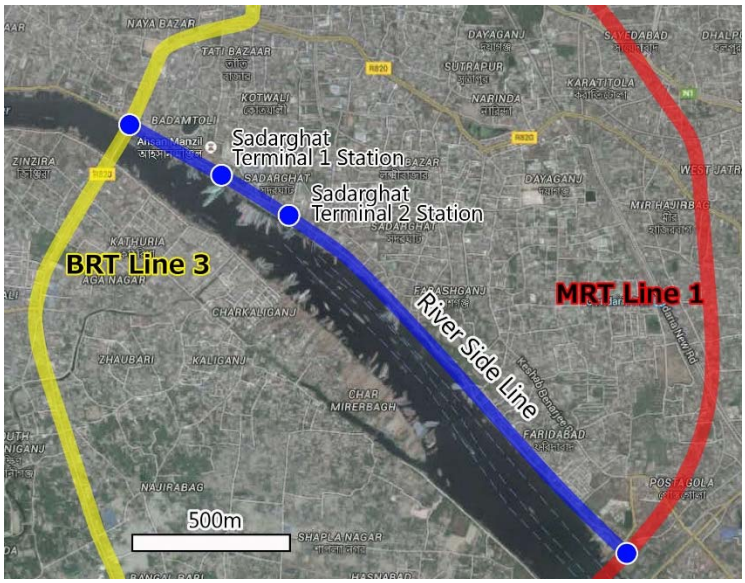

Source: JICA study Team

**Figure 12.49 Road Network Improvement**

#### 2) Long-term Plan

From the aspect of Limited developable land and future demand, monorail system or AGT (Automated guideway transit) system is most suitable transport mode in this area. This river side line is around 4 kilometer long and will serve between BRT Line 3 and MRT Line 1. And the alignment will generally follow the existing road or river side but will be grade-separated on a viaduct structure.

Current boat and ferry terminals are located like a belt along the Buriganga River, so the future Sadarghat Boat Terminals need to be improved as the airport terminal.




Source: JICA Study Team

**Figure 12.50 concept of the River Side Line**

Source: Haneda Airport Terminal Web Site

**Figure 12.51 Images of the New Sadarghat Boat Terminal**

Source: Tokyo Monorail Web Site and Tokyo Yurikamome Web Site

**Figure 12.52 River Side Line (image)**

## 12.8 Regional Transport Infrastructures

### (1) General

Considering the rapid urbanization of RAJUK area, arising urban issues within the area will be difficult to resolve in the near future. In this regard, it is advisable to prepare a plan for a wider area, i.e., the Greater Dhaka Area (GDA) where the same concept of developing urban centers and corridors can be applied. In RAJUK area, introducing mass transit system along urban corridors is essential due to its existing congested traffic condition. On the other hand, at GDA level, developing the road network to include expressways is needed.

### (2) Possible Scenario for the Regional Structure of GDA

#### 1) Urbanization

The intensive urban developments at peripheral areas of DCC in recent years will generate more population to form conurbation with DCC. Consequently, this will create various types of critical issues both in urban activities and urban environment simultaneously. Nevertheless, RAJUK area will eventually be almost urbanized. Moreover, rapid urbanization will even happens at the cities located more than 20km from the center of DCC which is already shown on areas like Gazipur and Kaliacoir.

a) Within a 10-km radius from the central area of DCC: The area will almost be fully developed to form a conurbation including Purbachal. At the present, the population of DCC (North and South) is 7 million and the future population of the area is forecasted to be around 12－14 million.

b) 10km–20km: The area within a 20-km radius has almost the same size as the Rajuk area and will be urbanized in most parts including Savar and part of Gazipur and Narayanganj. The area from Gaziour to Narayanganj will be a conurbation.

#### 2) Polar Cities

In order to ease the urban problems derived from the intensive concentration of population and urban functions in an expanded Dhaka conurbation, a need to develop cities with job opportunities is vital as well as functions for managing and servicing surrounding areas.

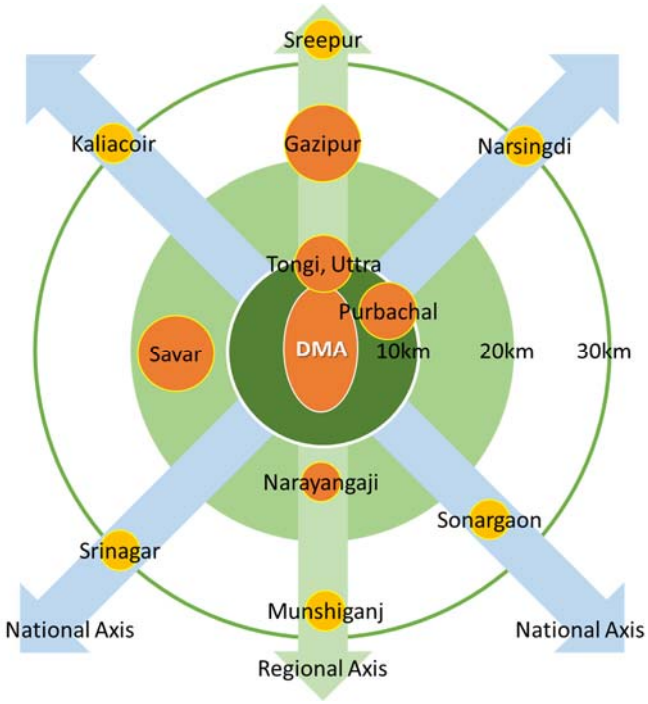
a) In between 10-20km radius, there are growing cities becoming known not only as bedroom suburbs but also employment centers. These cities are Narayanganj, Gazipur and Savar. Purbachal will eventually become one of them. If more urban functions will be added, those cities will shoulder some of the burden concentrated in the central area as the sub-center of Dhaka agglomeration.

c) If properly developed, cities located around 30 km from the central area can become regional centers that will share functions necessary to the metropolitan area.

d) Outside of Rajuk area; low-population settlements are located in every direction but densely distributed in the north-west part of GDA. The area has also the potential of attracting factories which will enhance urbanization through transforming settlements with higher population density and within these areas there will be growth centers.

### 3) Transport Axis

There are two major axes in the context of international and national network, i.e., Sirajganj–Comilla–Chittagong and Jessore–Padma Bridge–Sylet. These axes will support the growth of the cities. In this region, there is the regional axis from the north to the south passing through Gazipur and Narayanganj. At this moment the urbanization is found along this axis, however the development potential will depend on the improvement of transport systems coping with the increasing demand. Likewise, it will be indispensable to improve regional network not only connecting the central area and the suburbs but cities in GDA, especially connecting polar cities.




Source: JICA Study Team

**Figure 12.53 Future Regional Structure of GDA**

### 4) Future Road Network in GDA

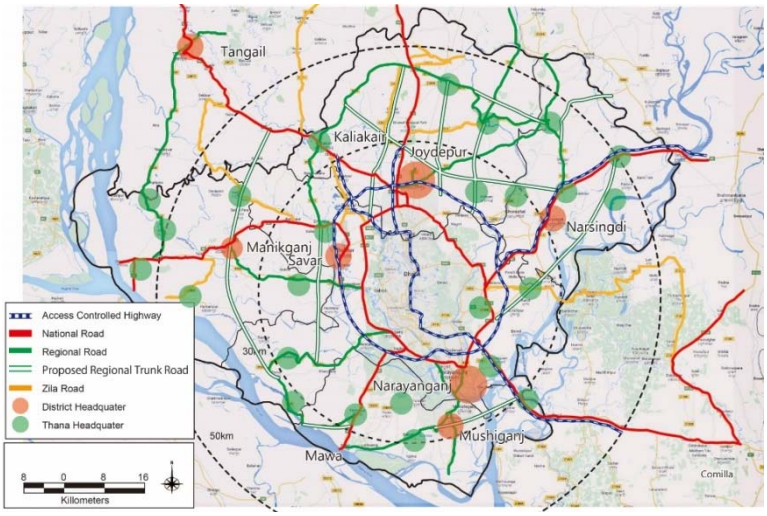
As per the data stated above, two kinds of future road network plan are proposed in RSTP as follows.

Plan A: Up-grade Current Road Network

- Future population in GDA will be 38 million in 2035
- Connectivity between regional cities
- Support for industrial activities in northern part of GDA

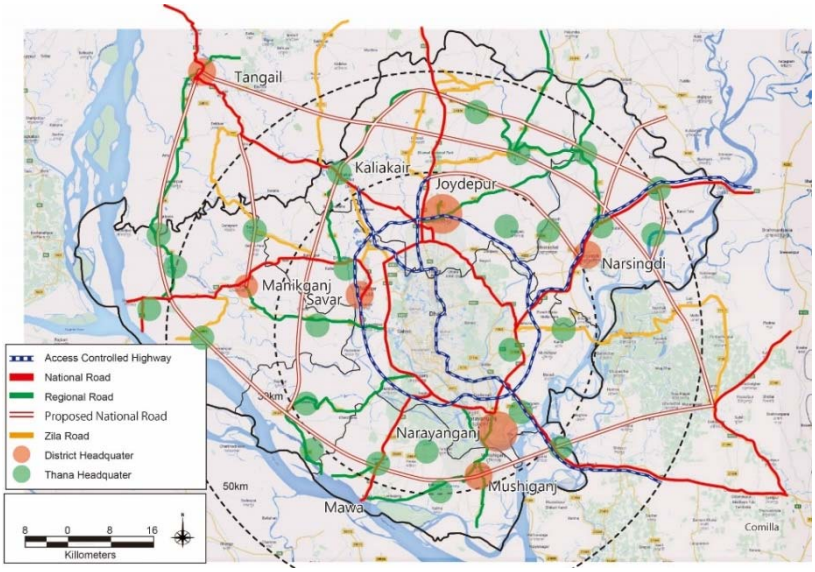
Plan B: High-Grade Road Network

- Future population in GDA will be 38 million in 2035
- Strong connectivity between regional cores by NH
- Support for industrial activities in northern part of GDA




Source: JICA Study Team

**Figure 12.54 Future Road Network in GDA (Plan A)**




Source: JICA Study Team

**Figure 12.55 Future Road Network in GDA (Plan B)**

# 13. EVALUATION OF THE MASTER PLAN

## 13.1 Approach

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.

## 13.2 RSTP 2035 Economic Evaluation of Projects

### (1) Assumptions

The study team conducted a discounted cash flow analysis in order to assess all the public transport and road projects. The economic internal rate of return (EIRR) was calculated to determine the achievability of the projects. The following presumption and standardizations were adopted for the calculation of EIRR.

- The duration of the project was assumed to be 40 years, construction period of 10 years and operating period of 30 years.
- Traffic assignment was done for the year 2025 and 2035 and the economic benefits were estimated for the two years and an estimation was done for the in between years. The economic benefits are the savings due to the reduction in vehicle operation cost (VOC) and travel time cost (TTC) which are calculated from the result of traffic assignment. After 2035, economic benefit was assumed not to change
- Social discount rate was assumed at 12%.
- Economic cost of a project was assumed to be 80% of the financial cost of project.
- Exchange rate was set as 1 TK = 0.0130 US$ on July 2015.

### (2) VOC and TTC

The unit cost of VOC and TTC were required to calculate the economic benefits. The following costs were applied as the unit of cost of VOCs. It was estimated by RHD. However the unit costs were converted to value of 2014 based on growth of GDP.

**Table 13.1 VOC**

Unit: TK / Vehicle / Km

| Car | Motorcycle | CNG | Bus | Truck |
|---|---|---|---|---|
| 15.0 | 2.0 | 3.7 | 23.0 | 21.5 |

Source: JICA study team estimated based on RHD Road User Cost Annual Report for 2004 - 2005

TTCs each mode were estimated based on household income and working/ business trip shares by using result of household interview survey. Unit TTCs was assumed to growth in line with GRDP per capita of the study area.

**Table 13.2 VOT**

Unit: TK / min / person

| Year | Car | Motorcycle | CNG | Bus | Truck |
|---|---|---|---|---|---|
| 2014 | 6.3 | 3.0 | 1.7 | 1.8 | 1.8 |
| 2025 | 8.9 | 4.2 | 2.4 | 2.5 | 2.5 |
| 2035 | 12.0 | 5.7 | 3.2 | 3.4 | 3.4 |

Source: JICA Study Team

### (3) Results of Economic Evaluation

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

**Table 13.3 Public Transportation Project Economic Evaluation Results**

| Projects | Capital Cost (US$ million) | O & M Cost in opening year (US$ million / year) | EIRR (%) |
|---|---|---|---|
| MRT1 | 4,937.6 | 78.2 | 22.1 |
| MRT2 | 2,938.3 | 92.3 | 19.4 |
| MRT4 | 1,329.1 | 37.0 | 13.2 |
| MRT5 | 3,359.8 | 80.8 | 16.1 |
| MRT6 extension | 1,671.1 | 50.8 | 33.5 |
| BRT7 | 205.3 | 32.0 | 47.9 |

Source: JICA Study Team

**Table 13.4 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

## 13.3 Financial Evaluation

### (1) Assumptions

The discounted cash flow analysis was use to determine the financial activity of the proposed MRT and BRT projects Cash inflow of the project includes fare revenue while cash outflows of the project consists of repeated costs such as operation and maintenance expenses and capital expenditures. The main assumptions are described below

- The duration of the project was assumed to be 40 years; construction period of 10 years and operating period of 30 years.
- Traffic assignment was done for the year of 2025 and 2035, and the fare revenue was estimated for the two years and an estimation was done for the in between years.After 2035, fare revenue was assumed not to change.
- Fare revenue was calculated based on the following fare settings. As for MRT fare, the fare setting of MRT6 project by JICA was applied. In addition, the fare setting of BRT3 project by WB was applied as BRT fare.
- Discount rate was assumed at 12%.

**Table 13.5 Fare Setting**

| Year | MRT | BRT |
|---|---|---|
| 2014 | 16.0 + 2.0/km TK | 7.0 + 3.2/km TK |
| 2025 | 22.6 + 2.8/km TK | 9.9 + 4.5/km TK |
| 2035 | 30.6 + 3.8/km TK | 13.4 + 6.1/km TK |

Source: JICA Study Team, MRT6 project by JICA, BRT and Corridor Restructuring Implementation Study and Preliminary Design work for the Uttara – Mohakhali – Ramna – Sadar Ghat Corridor in Dhaka by World Bank

The results of financial evaluation were shown in following table.

**Table 13.6 Public Transportation Project Economic Evaluation Results**

| Projects | Capital Cost (US$ million) | O & M Cost in opening year (US$ million / year) | FIRR (%) |
|---|---|---|---|
| MRT1 | 6,171.9 | 97.8 | 4.5 |
| MRT2 | 3,672.9 | 115.4 | 3.0 |
| MRT4 | 1,661.4 | 46.2 | 3.8 |
| MRT5 | 4,199.8 | 101.0 | 4.0 |
| MRT6 extension | 2,088.9 | 63.5 | 9.7 |
| BRT7 | 256.6 | 40.0 | 4.3 |

Source: JICA Study Team

## 13.4 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) Environmental Registration and Regulations in Bangladesh

The 1995 Environment Conservation Act (ECA) and the 1997 Environment Conservation Rules (ECR) are the legislative bases for the environmental assessment in Bangladesh. And the regulatory body responsible for enforcing the act and the rules is the Department of Environment (DOE), which is under the Ministry of Environment and Forest.

#### 1) The Bangladesh Environment Conservation Act, 1995

The said Act is considered as the basic environmental law in Bangladesh, it provides for the conservation of the environment as well as the improvement of the environmental standards and the control and reduction of environmental pollution. The provisions stated in the Act are directed to protect the environment from any harmful pollutions and damage.

The aforementioned Act is authorizing the Department of Environment (DOE) to undertake any appropriate and effective measures for the conservation, enhancement of the quality of the environment and to control, prevent and reduce pollution. This department is also the regulatory body and enforcement agency responsible for all environmental related activities. This Act includes as well as addresses the following important main issues:

- Declaration of Ecologically Critical Areas;
- Procedure for obtaining Environmental Clearance Certificates;
- Regulation with respect to vehicles emitting smoke harmful for the environment;
- Environmental regulations for development activities;
- Standards for quality of air, water, noise, and soils for different areas and for different purposes;
- Acceptable limits for discharging and emitting waste;
- Formulation of environmental guidelines to control and lessen environmental pollution, conservation and improvement of environment.

- All projects and activities under the RSTP shall comply with the provisions of this Act.

**2) The Environment Conservation Rules, 1997**

The Environment Conservation rules were issued as an enforcement law and exercises powers as granted by the 1995 Bangladesh Environment Conservation Act. The said Rules provides as well as the standards and guidelines for the following:

- Categorization of industries and development projects, including roads and bridges on the basis of actual and anticipated pollution load;
- Requirement for undertaking Initial Environmental Examination (IEE); and Environmental Impact Assessment (EIA), as well as formulating an Environmental Management Plan (EMP) according to categories of industries, development projects and activities;
- Procedure for obtaining Environmental Clearance Certificate (ECC);
- Environmental quality standards for air, surface water, groundwater, drinking water, industrial liquid waste , emissions, noise and vehicular exhausts;
- In Schedule 1, projects and activities are classified into four categories: Green, Orange A, Orange B and Red based on its location and impact on environment.

**3) EIA System and Procedure by DOE**

The EIA is conducted as a part of the process in issuing ECC in Bangladesh.

The Clearance Certificate is automatically granted to the Green categories and the Orange categories are required to submit more considerable information and plans and may be subject to further field inspection. While the Orange-B categories must undertake the Initial Environmental Examination (IEE) and prepare the Environmental Management Plan (EMP) to satisfactorily pass the standards of the Department of Environment (DOE). The Red categories should thoroughly conduct a detailed Environmental Impact Assessment (EIA) and must prepare the Environmental Management Plan (EMP).

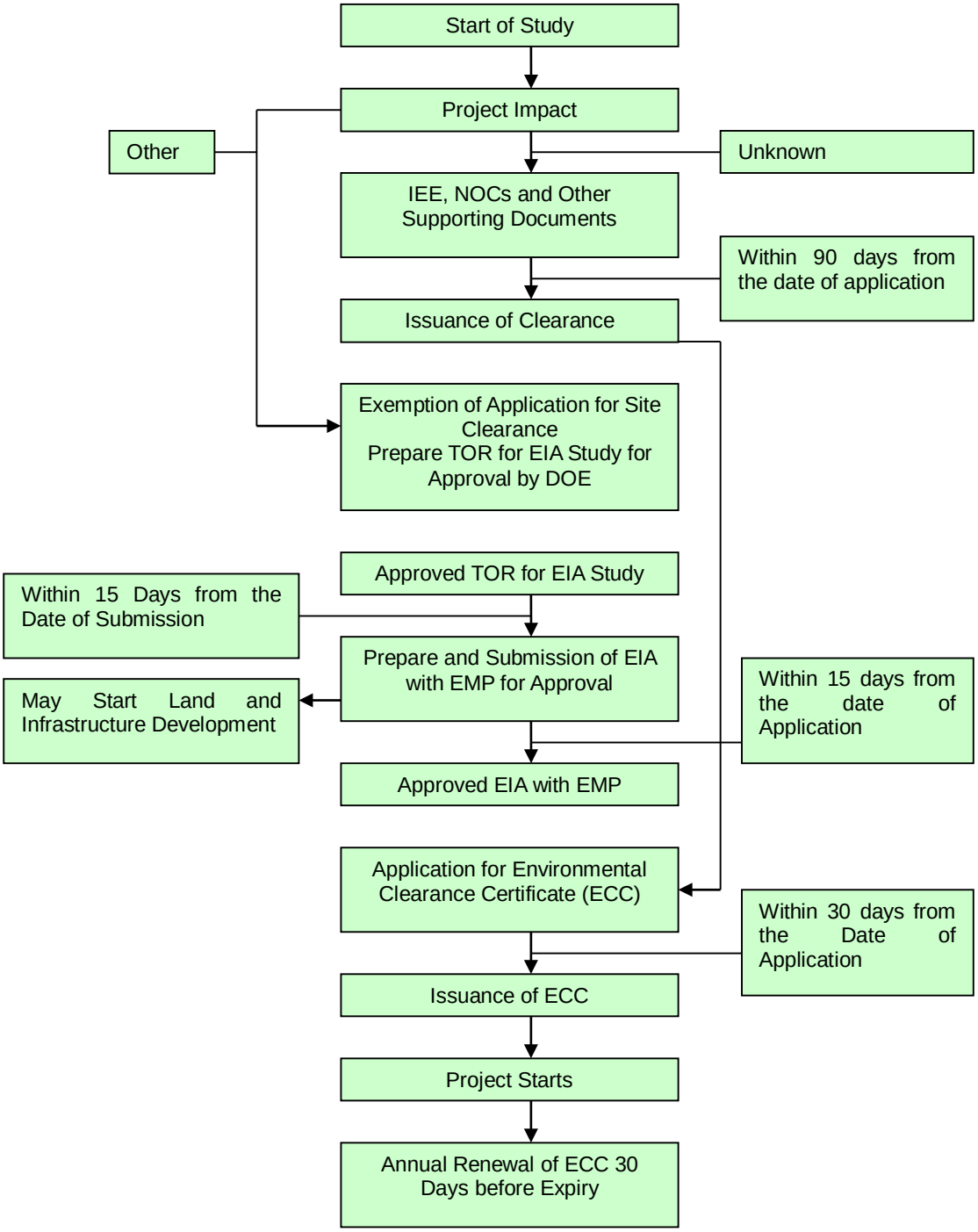
Schedule 1 of the Rules provides classification of industrial units or projects based on its location and impact on environment.

Orange-B category infrastructure projects include:

- Engineering works (up to 10 hundred thousand BDT capital.);
- Construction, reconstruction and extension of road (feeder road, local road); and,
- Construction, reconstruction and extension of bridge (length below 100 meters).

Red category infrastructure projects include:

- Engineering works (capital above10 hundred thousand BDT);
- Construction, reconstruction and expansion of road (regional, national and international); and,
- Construction, reconstruction and expansion of bridge (length100 meter and above).
- Most of the construction projects proposed of RSTP will be classified as Red categories. The procedure of EIA and ECC for Red category projects is shown in below.




Source: EIA for Padma Multipurpose Bridge, 2010

**Figure 13.1 Steps to be followed for Environmental Clearance Certificate for Red Category**

#### 4) Bangladesh Land Acquisition and Resettlement Policy and Legal Framework

Bangladesh land acquisition and resettlement policy is based on the following legislations:

a) Acquisition and Requisition of Immovable Property Ordinance of 1982 (ARIPO)

b) Cash Compensation by Law (CCL)

c) Land Acquisition Act, 1994

Under the law and act, the formal titled owners are entitled for compensations for the loss of their lands, houses, structures affected, for the loss of their crops, trees and perennials and to the sharecroppers as well, if it is applicable.

The following are the issues of the present enforcement:

- No compensation is made for the people without formal title;
- The payment of the compensation is too slow, sometimes the payment is made after the completion of the project and,
- The amount paid is too small comparing to the market value since the amount is predetermined based on the tax and so with the assets to be acquired by the project. In the past years, the people were used to report excessive small value to minimize the taxes.
- Therefore, it is a common practice in the international donors' project that:
- People with no titles are also given due compensations, equal to those people who have titles if they stayed there peacefully for a long period of time without any claim or dispute.
- Compensation is made before the relocation and start of construction; and,
- Compensation is made based on the actual market value for them to be able to purchase other alternatives.

Thus, the necessary amount of compensations shall be made to all affected people regardless of titled or non-titled, except for those speculators and professional squatters, so that they may be able to restore their lives and livelihood lost by the project. The government agency (usually the Deputy Commissioner, DC) in charge of giving legal compensation will pay the excessive small amount of compensation as specified in the law only. The project executing agency shall pay the balance of the necessary amount and the predetermined amount by the Deputy Commissioner, Therefore, the affected people have to collect the money to both the Deputy Commissioner and the project executing agency.

**5) JICA Guidelines for Environmental and Social Considerations**

The proposed projects in the urban transport development scenario under the RSTP have to follow the JICA Guidelines for the Environmental and Social Considerations (April 2010), hereinafter referred to as the "JICA Guideline". The JICA Guidelines recognizes and addresses the impacts of all the affected persons regardless of their titles, and requires for the preparation of Resettlement Action Plan (RAP) in case involuntary resettlement occurs.

i. Avoid or minimize impacts if possible;
ii. Consultation with the stakeholders, affected people or group (including informal settlers), local NGOs, etc. who have views about the projects;
iii. Payments of compensation for acquired assets at the full replacement cost;
iv. Ensure that no one is less fortunate as a result of resettlement and would maintain their at least original standard of living;
v. Resettlement assistance to affected persons, including non-titled persons; and
vi. Special attention to helpless people/groups and ethnic minorities.

There are some gaps observed between Bangladesh Policy and the JICA Guidelines. The project policy and measures to fill in the gaps should be proposed based on the gap analysis.

### (3) 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 13.7 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<br>• Forest, Agricultural land |
| | Flood Risk | • Flood Flow Zone<br>• Potential Flood Area where Elevation is less than 7.1m |
| Pollution Control | Noise and vibration | • Residential area (population density)<br>• Sensitive receptors (Schools, Hospitals, Religious facilities) |
| | Air Pollution | • Residential area (population density)<br>• Sensitive facilities (Schools, Hospitals, Religious facilities) |
| | Water pollution | • Surface water bodies (rivers, lakes, etc.) |

Source: JICA Study Team

#### 1) MRT and BRT Networks

The MRT and BRT networks of the urban development scenario in 2035 are shown in Table 13.8.

**Table 13.8 MRT and BRT Networks**

| Project | Length | Route | Description |
|---|---|---|---|
| MRT Line 1 | 52 km | • Gazipur - HSIA Airport -Badda - Kamalapur - Jhimill<br>• Pulbachar - Khilkhet | • Backbone corridor of Dhaka Metropolitan Area<br>• Connecting corridor between Purbachal and CBD |
| MRT Line 2 | 40 km | Ashulia - Savar - Gabtali - Dhaka Unv. - DSCC - Kamalapur | • Regional corridor in Savar area<br>• Connecting corridor between Savar and CBD |
| MRT Line 4 | 16 km | Kamalapur - Narayanganj | • Commuter line between Kamalapur to Narayanganj |
| MRT Line 5 | 35 km | Bulta - Badda – Mirpur Road – Gabtoli Bus Terminal – Dhanmondi – Bashundahara City –Hatir Jheel Link Road | • Main corridor of East-West connection |
| BRT Line 7 | 36 km | Purbachal - Narayanganj | • Connection corridor in Eastern Fringe Area |

Source: JICA Study Team

These MRT and BRT development projects are assessed and compared from the viewpoint of social and environmental impacts in Table 13.8.

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. Since the most alignment of the MRT networks will be built on the existing roads, the affected people that has to leave the

area by land acquisition of 25 meters width along the whole route shall be estimated through the satellite images multiplied by the 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 13.9 Comparative Analysis of MRT and BRT Networks**

| Impact Items | MRT Line1 | | MRT Line 2 | MRT Line 4 | MRT Line 5 | | BRT Line 7 |
|---|---|---|---|---|---|---|---|
| Social Environment | | | | | | | |
| Land acquisition and Involuntary Resettlement | [All Elevated]<br>In order to pass over Kuril Flyover and Moghbazar - Mouchak Link Flyover with elevated structure, a massive resettlement of affected persons due to additional ROW acquisition will be unavoidable.<br><br>[Partial Underground]<br>The tracks go partially underground in Kuril area and from Maribag to Kamulapur BR station and further Buriganga River. | | [All Elevated]<br>The route goes the narrow existing roads from Gabtali to Dhaka University. A large number of structures might be affected. The existing highway in Western Fringe area can accommodate the viaduct. | [All Elevated]<br>The elevated structure will be built within the BR ROW. There are hundreds of informal settlers and illegal vendors in BR ROW. If the BR line will be double tracked, there might be no more informal settlers. | [All Elevated]<br>The line 5 covers the center portion of Dhaka, congested area. Thus a large number of affected structures are expected. Eastern Fringe Area is not heavily populated.<br><br>[Partial Underground]<br>The tracks go partially underground at the section from Kachukhet to Notun Bazar (under cantonment), and from Dhanmondi to Bashundahara City. | | [At Grade]<br>Since there is no existing roads. The 60m width of ROW acquisition will be needed. |
| Number of Affected Households | Elevated | Underground | 1,100 | 500 | Elevated | Underground | 1,000 |
| | 500 | 100 | | | 620 | 120 | |
| Number of Affected Persons[*1] | Elevated | Underground | 5,500 | 2,500 | Elevated | Underground | 5,000 |
| | 2,500 | 500 | | | 3,100 | 600 | |
| Natural Environment | | | | | | | |
| Protected Area | The line will not go through any protected area. | | The line will not go through any protected area. | The line will not go through any protected area. | The line will not go through any protected area. | | The line will not go through any protected area. |
| Biodiversity (wetland) | Because the line will go through the existing road and BR ROW in the built-up area, wetlands will not be directly affected. There are some small swamps along the track around Tongi to Gazipur and Purbachar areas. | | The line will go through the existing road in the built-up area from Gabtali to Kamalapur. From Gabtali to Hemayetpur the highway is surrounded by wetland. The wetland might be affected during construction. | The line will go through the existing BR ROW in the built-up area. There will be no impacts on wetlands. | Because the line will go through the existing road in the built-up area, there will be no direct impacts on wetlands. The route will extend to the Eastern Fringe area, therefore, wetland and agricultural land will be reclaimed. | | Since the route will go through the wetland and agricultural land in Eastern Fringe area, a significant impact on biodiversity will be expected. |
| Flood Risk | The line will go through the existing road. The risk of | | The line will pass through the flood flow zone in the | The line will go through the existing BR ROW. The risk | The route will extend to the Eastern Fringe water | | Since the route will go through the flood flow |

| Impact Items | MRT Line1 | MRT Line 2 | MRT Line 4 | MRT Line 5 | BRT Line 7 |
|---|---|---|---|---|---|
| | flooding is low. | western side of Dhaka city. There will be a high risk of inundation. | of flooding is very low. | retention area. There will be a high risk of inundation. | zone and water retention area in Eastern Fringe, there will be a high risk of flooding. |
| Pollution Control | | | | | |
| Noise and vibration | Because the line will go through the existing road and BR ROW in the built-up area, mitigation measures to abate the noise and vibration levels should be considered especially for sensitive receptors at the elevated section. | The line will go through the existing road in the built-up area of Dhaka CBD and Savar, mitigation measures to abate the noise and vibration levels should be considered especially for sensitive receptors. | Because the line will go through the BR ROW in the built-up area, the mitigation measures to abate the noise and vibration levels should be considered especially for sensitive receptors. | The line will go through the existing road in the built-up area, mitigation measures to abate the noise and vibration levels should be considered especially for sensitive receptors at the elevated section. There might be lesser impacts in the Eastern Fringe area. | There are a few communities in the Eastern Fringe area. Noise and vibration will not cause a significant impact. |
| Air Pollution | Because the line will go through the built-up area, dust generated during construction will cause a nuisance along the route, especially for residential areas. | The line will go through the built-up area of Dhaka CBD and Savar, dust generated during construction will cause a nuisance along the route, especially for residential areas. | Because the line will go through the BR ROW in the built-up area, dust generated during construction will cause a nuisance along the route, especially for residential areas. | The line will go through the built-up area dust generated during construction will cause a nuisance along the route, especially for residential areas. There might be fewer impacts in the Eastern Fringe area. | There are a few communities in the Eastern Fringe area generated during construction will not cause a significant impact. |
| Water pollution | Since the route will not pass though the wetland, turbid water will not directly deteriorate water quality of the wetland. | Water quality of wetland will be likely to be deteriorated by suspended solids discharged from construction sites. | Since the route will not pass though the wetland, turbid water will not directly deteriorate water quality of the wetland. | Water quality of wetland in the Eastern Fringe area will be likely to be deteriorated by suspended solids discharged from construction sites. | Water quality of wetland in the Eastern Fringe area will be likely to be deteriorated by suspended solids discharged from construction sites. |
| Overall Assessment | O: The lowest number of affected households both all elevated case and partial underground case<br>O: Less impact on protected area and biodiversity<br>O: Low risk of flooding<br>X: Impact due to noise and vibration at the elevated section. | X: The largest number of affected households<br>X: Impact on biodiversity in the wetland<br>X:Risk of flooding<br>X:Impact due to noise and vibration | △: A large number of informal settlers occupy the BR ROW.<br>O: Less impact on protected area and biodiversity<br>O: Low risk of flooding<br>X: Impact due to noise and vibration | O: The second lowest number of affected households in the partial underground case.<br>X: Impact on biodiversity in the wetland<br>X:Risk of flooding<br>X:Impact due to noise and vibration | X: The second largest number of affected households<br>X: Impact on biodiversity in the wetland<br>X:Risk of flooding<br>O:Impact due to noise and vibration |

| Impact Items | MRT Line1 | MRT Line 2 | MRT Line 4 | MRT Line 5 | BRT Line 7 |
|---|---|---|---|---|---|
| | The smallest number of affected households and fewer impacts on natural environment.<br>Recommended as a priority project from the viewpoints of environmental and social considerations. | 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. | 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.<br>Fewer impacts on natural environment. | 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. | 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. |

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

## 13.5 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 Figure13.2 and Table 13.10. 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 MRRT 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.

The patronage demand forecast results also indicate that the number of boarding and alighting increases significantly when good connectivity between the four systems through multimodal interchange stations is provided in the transportation model, therefore justifying the need to rationalize the original eight rail projects into four and providing multimodal interchange stations in the MRT and BRT network.

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.


2025 2035

Source: JICA Study Team

**Figure 13.2 Estimated MRT/BRT Traffic in 2025 and 2035**

**Table 13.10 Number of MRT/BRT passengers by Line, 2025 and 2035**

| | 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 a first step, the scores are aggregated per project and are used to prioritize. Each project is evaluated by the threshold defined in the following Table 13.11.

**Table 13.11 Ranking Threshold by Evaluation Criteria**

| | Weight | Indicator | 5 | 3 | 1 |
|---|---|---|---|---|---|
| A. Demand in 2035 | 0.15 | PPHPD | X>30,000 | 30,000>X >20,000 | X<20,000 |
| B. Economic Return | 0.40 | EIRR | X>20% | 20%>X>13% | X<13% |
| C. Financial Return | 0.15 | FIRR | X>4% | 4%>X>3% | X<3% |
| D. Consistency with Urban Development Scenario | 0.15 | - | Contribute | Supportive | No Relation |
| E. Environment | 0.15 | SEC result | No impact | Some impact | Serious Impact |

Source: JICA Study Team

As the second step, 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 13.12 for MRT/BRT project proposed in RSTP.

**Table 13.12 MCA Evaluation Results of MRT/BRT projects**

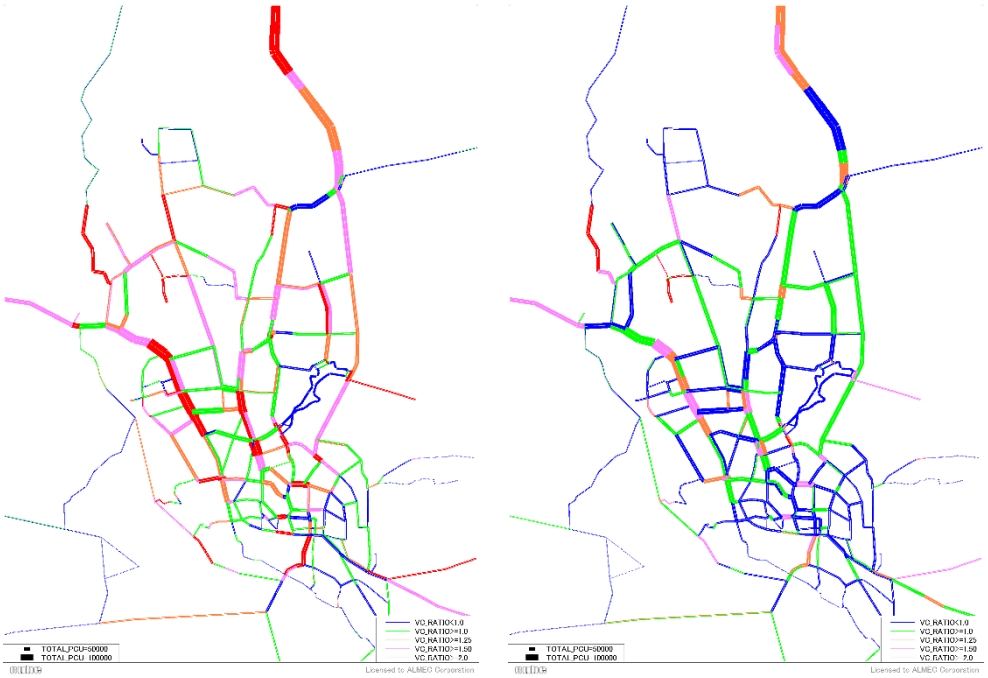
| | | MRT Line 1 | MRT Line 2 | MRT Line 4 | MRT Line 5 | BRT Line 7 |
|---|---|---|---|---|---|---|
| A. Demand in 2035 | 0.15 | 5 | 3 | 1 | 3 | 3 |
| B. Economic Return | 0.40 | 5 | 3 | 1 | 3 | 5 |
| C. Financial Return | 0.15 | 5 | 3 | 3 | 5 | 5 |
| D. Consistency with Urban Development Scenario | 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 effect of the traffic management measures are evaluated in the current traffic situation. As a result, average V/C, average speed, and total TTC become better than current situation.



Current Situation (2014)

Current Situation with Traffic Management (2014)

Source: JICA Study Team

**Figure 13.3 Traffic Assignment of current situation and traffic management situation**

**Table 13.13 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.

# 14. IMPLEMENTATION PROGRAM

## 14.1 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 were 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 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. Projects were reprioritized with reference to other essential factors of road implementation, as follows:

#### 1) Coordination with Urban Growth

The forecasted wave of urbanization by the JICA Study Team is shown in Figure 14.1. The road network and MRT/BRT network should be developed in accordance with the expected/planned urban development.

Eastern Fringe Area Development

Development of the eastern fringe area including Purbachal is the first priority policy for reducing population densities in Old Dhaka, CO2 emissions, traffic congestions, travel cost and travel time, and for promoting more comfortable living environment as mentioned in preceding sections.

So in RSTP, road network developments and MRT Line 1 Project are listed as the first priority project.

Improvement of Traffic Environment in Built-up Area

Obviously, heavy traffic congestion occurs in built-up area, but it's very difficult to construct new roads and widen the existing roads for reducing traffic congestions. So in RSTP, traffic management measures for using existing infrastructures and low investment cost are proposed as the first priority project.

#### 2) Required Antecedent Projects

Even though the project components are devised into small packages, some projects have strong relationships with others in terms of connectivity and continuity as a network. For example, an approach road should be developed together with MRT Line 1 project.

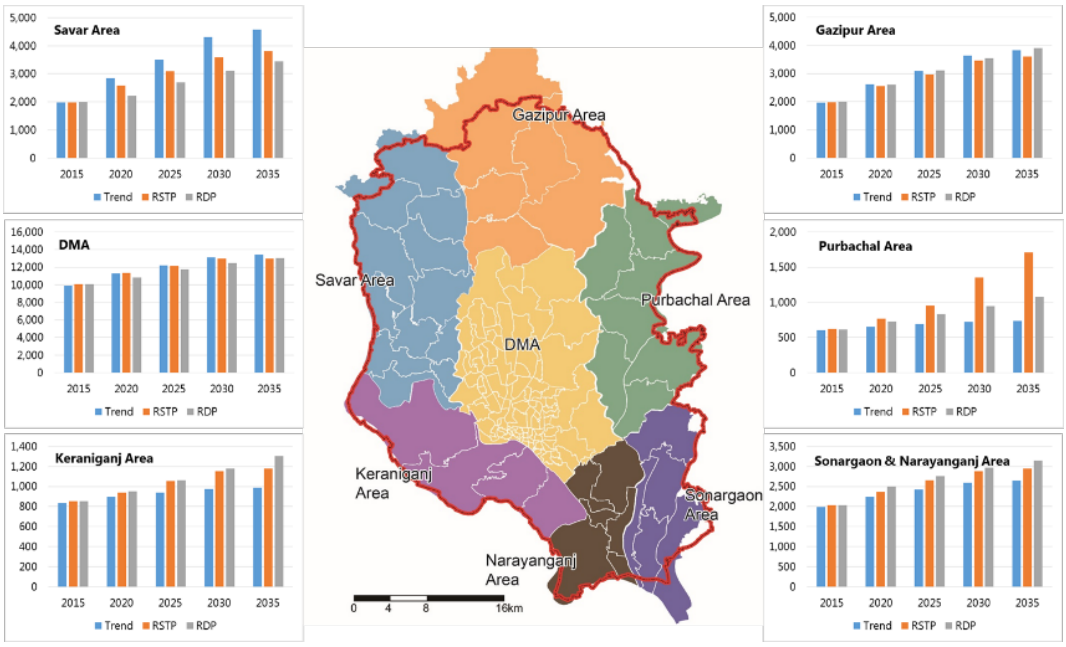
MRT Line 6

Uttara North area will be developed precipitously due to starting service of MRT Line 6. So road development in Uttara North area will be required at an early stage. And also bus network needs to be improved following the operation of MRT Line 6.

Padma Bridge

The main construction work of the Padma Bridge including piling and river training will begin in December 2015 and open by 2018.

When the Padma Bridge opens, the traffic from southwest area will increase and create massive traffic congestions at Jatrabari junction owing to its flow. So in RSTP, the southern part of outer ring road is proposed to relive the traffic bottleneck at Jatrabari junction.




Source: JICA Study Team

**Figure 14.1 Forecasted Wave of Urbanization in RAJUK Area**

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

### 1) 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 francization) & replacement of bus terminals

**2) 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;

Medium Term (~2025)

- New MRT lines development in CBD
- Implementation of TDM measures
- Arterial road and ring road development outside DMA…

Long Term (~2035)

- East-West MRT line development
- Development of new MRT lines for connection between CBD and regional centers
- Redevelopment of inter-urban roads…

.

## 14.2 Implementation Schedule and Responsible Agency

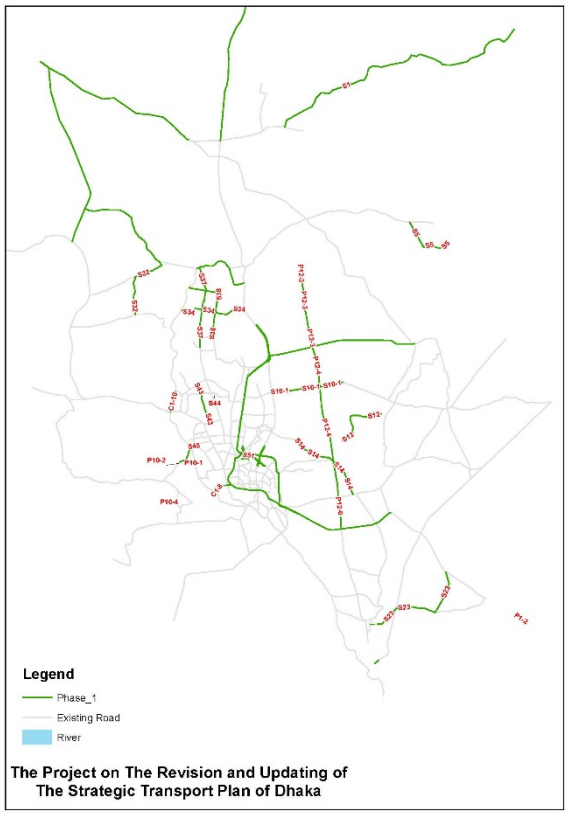
The major component of the RSTP includes the public transport system consisting of 7 MRT/BRT lines, public bus services, inland waterways and road development projects including expressways. Due to limited resources, these major projects cannot be developed at the same time; thereby a clear strategy 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 12. The implementation schedule and those responsible agencies are summarized as follows:

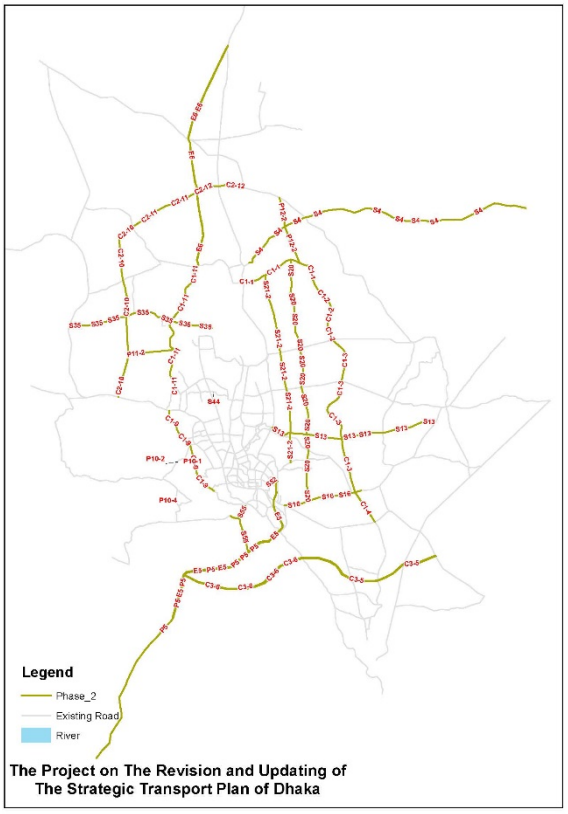
**(1) Road Development Projects**

Since there are many parts of the road projects, the scheduling of their developments compared with other projects is very important. The prioritization of the road projects was examined carefully based on the method mentioned in Chapter 12. The proposed road projects are prioritized on the basis of assessment from the following aspects:

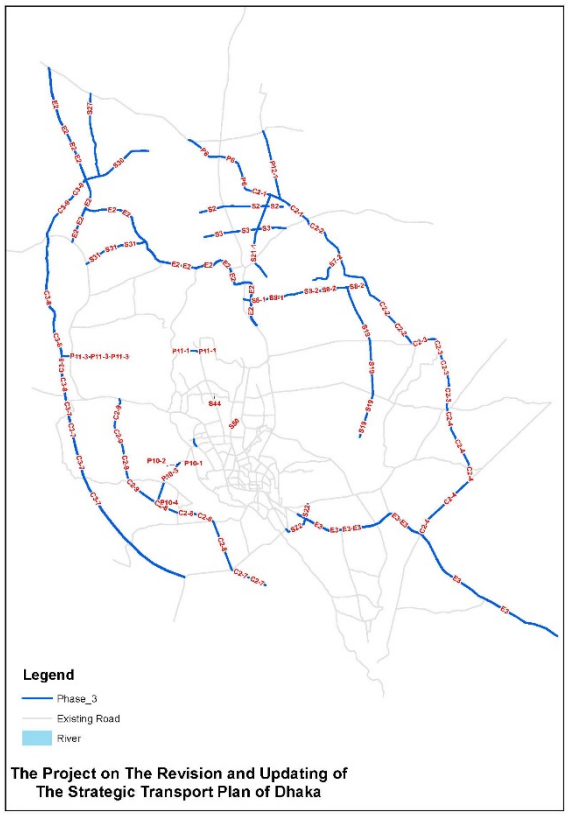
- Current status of the project
- Urgency (Degree and scale of problems)
- Building a missing link
- Composing rings and radials road system
- Providing main traffic axis in development area
- Contributing to proper formation in urban area
- Compatibility with relevant development plans
- Traffic demand
- Project cost



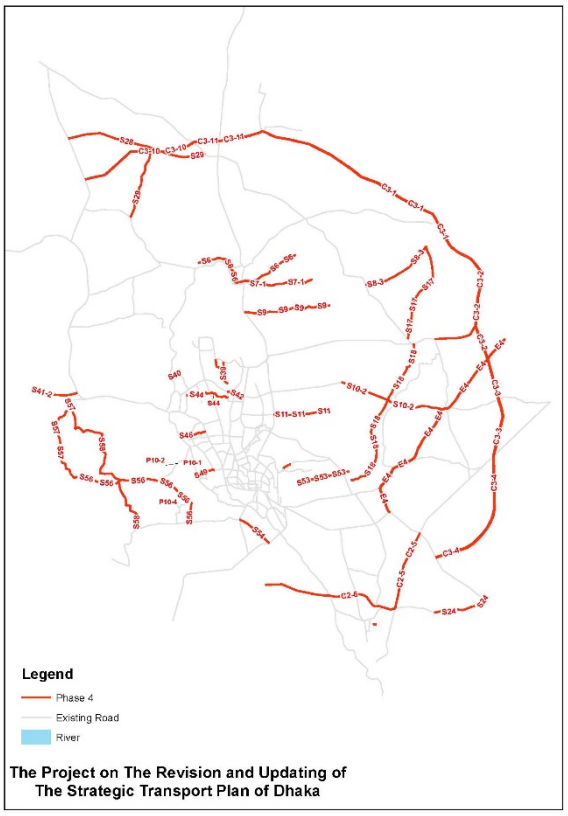

Phase 1 (2016 – 2020)




Phase 2 (2021 – 2025)




Phase 3 (2026 – 2030)




Phase 4 (2031 – 2035)

Source: JICA Study Team

**Figure 14.2 Investment Schedule for Urban Roads**

**Table 14.1 Prioritization of Proposed Road Projects (Summary)**

| Implementation Phase | Project Length | Project Cost (million USD) |
|---|---|---|
| Phase 1 (2016 to 2020) | 380 km (31.7%) | 3,041 (24.7%) |
| Phase 2 (2021 to 2025) | 274 km (22.8%) | 3,141 (25.5%) |
| Phase 3 (2026 to 2030) | 256 km (21.3%) | 3,113 (25.2%) |
| Phase 4 (2031 to 2035) | 288 km (24.1%) | 3,034 (24.6%) |
| Total | 1,198 km (100.0%) | 12,329 (100.0%) |

Note 2: 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

**Table 14.2 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 | 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

### (2) MRT/BRT Development Projects

The implementation of MRT services takes more time than that of the public bus services with the duration between seven to nine years from the beginning to completion and the start of passenger revenue 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.

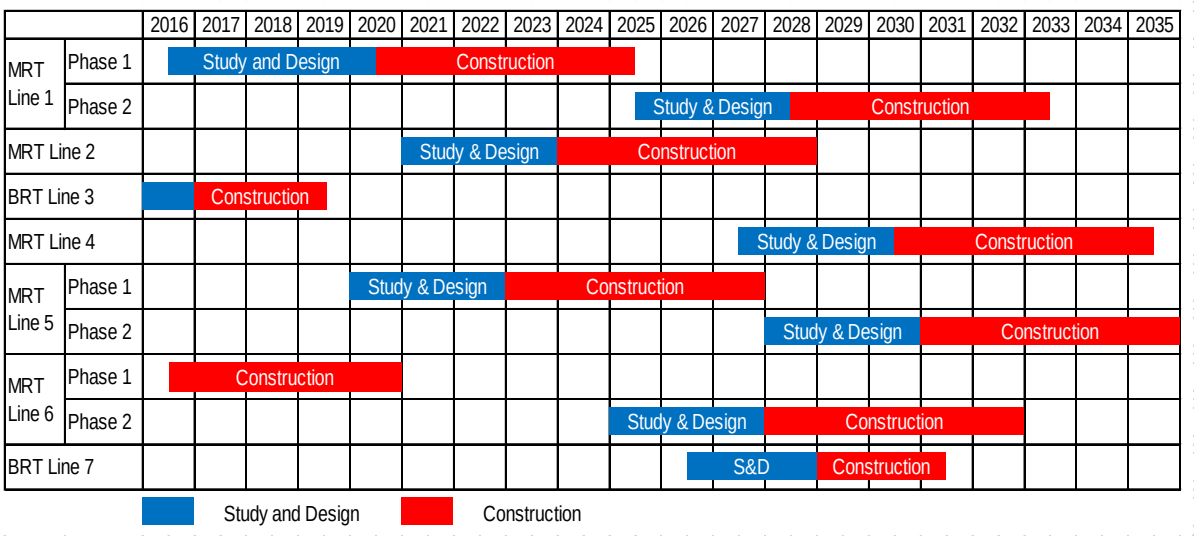
The proposed MRT system for Dhaka will comprise a combination of two types of urban transit technology depending on passenger demands and the phased development of the respective transportation corridors serving Dhaka are as follows:

1) Stage 1 (-2020): In this stage, only BRT Line 3 will be operating. An improved public bus system is to be implemented using current bus technology during the initial development stage of the network, when passenger demand forecasts cannot warrant the higher-capacity rail-based transit system. The improved public bus service would be designed to allow future expansion to a higher capacity and MRT system when passenger demand warrants it.

2) Stage 2 (-2025): In this stage, BRT Line 3 and MRT Line 6 will be operating and construction of MRT Line 1 (1st phase) will be completed. And an intermediate stage with a mixture of improved public bus services and 2 MRT/BRT services which would initially be constructed on the busiest transportation corridors with fully integrated multimodal interchange stations to provide seamless transfer of passengers between different transit modes.

3) Stage 3 (-2030): In this stage, 3 MRT Lines and 1 BRT Lines will be operating. As a nearly-completed stage, completion of the high-capacity urban public transport network with both MRT/BRT and buses.

4) Stage 4 (-2035): In this stage, all proposed MRT/BRT Lines will be operating.




Source: JICA Study Team

**Figure 14.3 Implementation Schedule of MRT/BRT Projects**

**Table 14.3 Implementation Schedule of MRT/BRT Projects**

(Unit: US& Million)

| Project | Responsible Agency | Cost | Implementation Period | | | |
|---|---|---|---|---|---|---|
| | | | Phase 1 2016-20 | Phase 2 2021-25 | Phase 3 2026-30 | Phase 4 2031-35 |
| MRT Line 1 | DMTCL | 8,694 | 283 | 2,544 | 2,934 | 2,934 |
| MRT Line 2 | DMTCL | 3,748 | 0 | 1,499 | 2,249 | 0 |
| BRT Line 3 | Dhaka BRT | 400 | 400 | 0 | 0 | 0 |
| MRT Line 4 | DMTCL | 1,736 | 0 | 0 | 174 | 1,562 |
| MRT Line 5 | DMTCL | 4,275 | 0 | 1,200 | 800 | 2,275 |
| MRT Line 6 | DMTCL | 4,089 | 2,000 | 0 | 1,253 | 836 |
| BRT Line 7 | Dhaka BRT | 257 | 0 | 0 | 206 | 51 |
| Total | | 23,199 | 2,683 | 5,244 | 7,615 | 7,658 |

Source: JICA Study Team

### (3) 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 13.

**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 Khanchpur, 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 14.4 Implementation Schedule of Traffic Management Projects**

(Unit: Million UDS)

| Project Name | Responsible Agency | Cost | Implementation Period | | | |
|---|---|---|---|---|---|---|
| | | | Phase 1 2016-20 | Phase 2 2021-25 | Phase 3 2026-30 | Phase 4 2031-35 |
| 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 |
| Total | | 1,255 | 855 | 300 | 100 | 0 |

Source: JICA Study Team

## 14.3 Investment Plan

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

In Chapter 12, 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 .And GRDP of GDA is almost 25% in Bangladesh, so urban transport development budget in GDA will be 25% of all transport sector. The following table is the projected procurable budget in 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 14.5 The Projected Budget for Transport Sector in GDA**

(Unit:million USD)

| | Phase 1 2016-20 | Phase 2 2021-25 | Phase 3 2026-30 | Phase 4 2031-35 |
|---|---|---|---|---|
| % 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 14.6.

**Table 14.6 Investment Requirement for Major Master Plan Projects**

(Unit: Million USD)

| | | | 2016-20 | 2021-25 | 2026-30 | 2031-35 |
|---|---|---|---|---|---|---|
| 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 | 2,934 | 2,934 |
| | MRT Line 2 | | 0 | 1,499 | 2,249 | 0 |
| | BRT Line 3 | | 400 | 0 | 0 | 0 |
| | MRT Line 4 | | 0 | 0 | 174 | 1,562 |
| | MRT Line 5 | | 0 | 1,200 | 800 | 2,275 |
| | MRT Line 6 | | 2,000 | 0 | 1,253 | 836 |
| | BRT Line 7 | | 0 | 0 | 206 | 51 |
| | Total | | 2,683 | 5,243 | 7,616 | 7,658 |
| 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 | 8,685 | 10,828 | 10,693 |

Source: JICA Study Team

Required investment cost for the major master plan projects is compared with the available future fund estimated in Chapter 11. As shown in the Table 14.5 and Table 14.6, 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 profit of TOD together with the effective use of unused government lands which is further discussed in the following section.

### (3) New Funding

As the overview of the financial structure and budgeting in Bangladesh addressed in chapter 7, necessary costs for all the expected projects cannot be covered by the current budgeting system. Funding sources for the road maintenance has been in the discussion.

#### 1) Traffic management

Many previous transport projects suggested the importance of the immediate implementation of the traffic management. STP report estimates that 50% of the capacity of arterial system is wasted due to the poor operation condition. Economic loss caused by the poor traffic management affected seriously the current poor traffic condition. From social and economic point of view, it cannot be helped without pointing out how many lives of the citizens were lost due to the delay of ambulance vehicles caused by the indifference of the drivers to ambulance. Many lives and traffic jams can

be solved by the implementation (education, enforcement) of proper traffic management and the authority in charge needs to take responsibility for the past failure in the implementation of traffic management. Before seeking the new resources of transportation projects, it is time for the government to take immediate actions to implement projects of traffic management such as; 1)Traffic engineering, 2)Traffic safety, 3)Traffic control, 4)Driver training and education, 5)Public awareness and 6)Enforcement.

**2) Road funds**

Road funds as a mechanism for securing dedicated funding for roads have been established for a long time. Since it is not possible to allocate sufficient funds for all road development and maintenance only from the government budget, road fund is considered as one of the main additional sources. The basic theory of the road funds is that those who benefit from having good roads will be required to pay for that benefit; It means that road users pay for the services they get from the road network.

For the road user taxes, the Ministry of Transport is not the sole government department in the determination of the tax level. In addition to transport economy, general considerations of public finance, industrial policy, trade policy etc. are often given greater weight. Road user taxes have been used for certain energy objectives, environmental policy objectives, trade and industrial concerns that includes distribution cost of goods, domestic vehicle manufacturing industry and of course transportation policy objectives. These factors generally influence decisions and the actual process of arriving at a tax rate is a political one. These complex factors are one of the difficult reasons to determine and implement the road funds.

In Bangladesh, road funds have been discussed and focused on the road maintenance objectives, while some countries use it also for the development of the road network. In Japan, a road fund was established to reconstruct the road network that was damaged by the World War II. It was a specific revenue sources for the road maintenance and development paid by the road users. However, after most of the road networks have been built in Japan, the argument of using the fund from the road user taxes for other purpose other than road development has started and the fund was abolished. It all depends on the policy of each government for which purpose the funds will be used.

Potential revenue sources discussed in the Road Fund Steering Committee in the Ministry of Communications, Government of Bangladesh in 2003 are as follows;

- Vehicle import duty
- Vehicle registration fee
- Driver Licenses
- Fitness Test Income
- Annual Road Tax
- Route Licenses
- Weighbridge Charges and Fines
- Fuel Levy
- International Transit Charges

As the conclusions of 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 14.7 Recommended Road Fund Income Domestic Sources**

| 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

Sources of the roads funds vary in countries and commonly discussed charging instruments are; fuel tax, vehicle excise duty, kilometer tax, axle tax, tolls, annual vehicle tax, etc. In case of Japan, fuel tax is divided into gasoline tax, local road tax, petroleum gas tax, diesel oil transaction tax and vehicle tax is divided into weight tax and acquisition tax.

**3) Road Pricing**

Road pricing (also road user charges) is direct charges levied for the use of roads, including road tolls, distance or time based fees, congestion charges and charges designed to discourage use of certain classes of vehicle, fuel sources or more polluting vehicles. It may be covered by the classical terms of road and bridge tolls but as the recent transportation demand management tools it is important to be addressed separately. In recent years, traffic demand management (TDM) measures to encourage a change in the traffic demand, among them, is the law for the purpose of congestion relief of the city center

These charges may be used primarily for revenue generation, usually for road infrastructure financing, or as a transportation demand management tool to reduce peak hour travel and the associated traffic congestion or other social and environmental negative externalities associated with road travel such as air pollution, greenhouse gas emissions, and visual intrusion, noise and road accidents.

In most countries toll roads, toll bridges and toll tunnels are often used primarily for revenue generation to repay long-term debt issued to finance the toll facility, or to finance capacity expansion, operations and maintenance of the facility itself, or simply as general tax funds. Road congestion pricing for entering an urban area, or pollution charges levied vehicles with higher tailpipe emissions are typical schemes implemented to price externalities. The application of congestion charges is currently limited to a small number of cities and urban roads, and the notable schemes include the Electronic Road Pricing (ERP) in Singapore, the London congestion charge, the Stockholm congestion tax, the Milan Area C, and High-occupancy toll lanes in the United States

Parking Deposit System

Road pricing is regarded as the most effective measure to solve the traffic congestion in urban area. However, the difficulty of forming a public consensus has become an obstacle to the implementation of road pricing. There is an immediate effect in terms of vehicle use suppression, and is to be effective, these can be confirmed from actual example in London, which introduced road pricing (Congestion Charge) in February 2003.

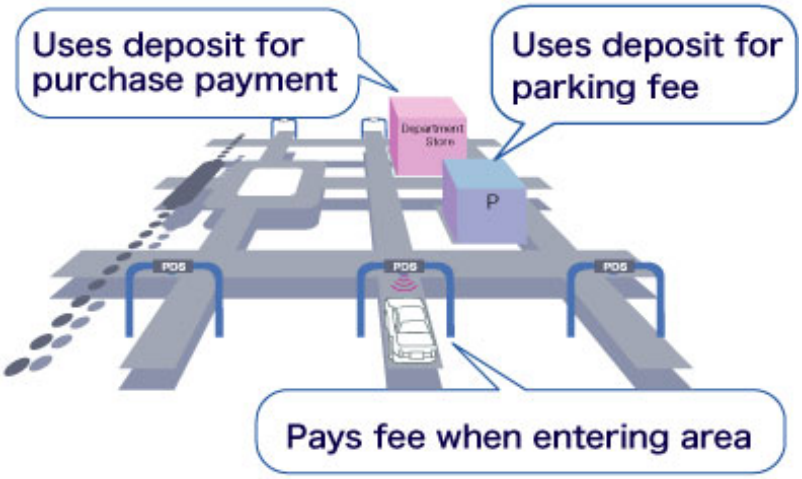
However, actual introduction of the current road pricing city is limited such as London, Singapore and Oslo. The main factor against road pricing is the low acceptability to the community (some cities such as Edinburgh rejected the proposal, and other cities like Trondheim, Norway, decided to discontinue the system after 15 years). The main

concern in the central areas is about the decline of the central business activities. According to the interview survey, visiting frequency of shoppers in the central shopping area where road pricing is introduced is clearly reduced .It has shown the need for new measures to improve the downtown visit frequency. The scheme, which has a close effect on road pricing that reduces the concerns of central commercial areas and has more social acceptance as alternatives, is under study for the introduction.

In Dhaka city, very few establishments have parking lots and most drivers leave cars on the street without paying parking fees. This is the one and big cause of the traffic congestion in the central area. Unlike most of the cities in the developed countries, majority of the car owners in Bangladesh hire car drivers is thankful to the low labor cost. This makes the parking violation crackdown difficult because the drivers remain in the vicinity of the parked car and ready to move when the traffic police appear.

The PDS is an alternative to the road pricing, which aims to improve the social acceptability, that new research is underway toward realization. While the traditional road pricing charges all vehicles flowing into the charging area, the PDM return part or the full amount of money, which is imposed upon entering the area, as the user of the parking lots. As a result, it is a system to charge only to through traffic and illegal on-street parking vehicle, which brings a significant congestion to urban area, therefore to ease the traffic congestion in the city center. It is a system that will effectively realize the congestion alleviation of urban areas while contributing to the local economy.

Considering the serious traffic congestion of Dhaka City, it is necessary to consider introduction of one scheme of the road pricing system (include PDS).




Source: Nagoya University Transport and Environment Dynamics

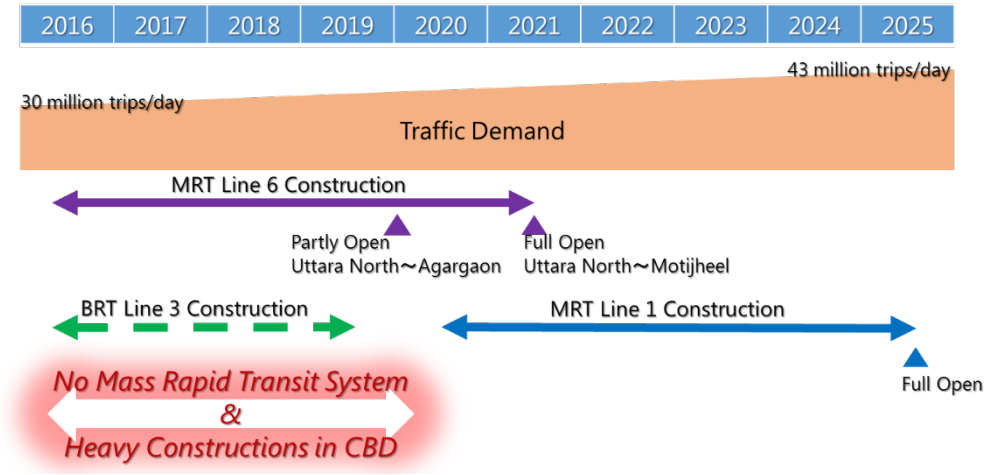
**Figure 14.4 Images of the Pricing Schemes**

## 14.4 Short-term Action Plan

### (1) General

Many urban transport projects are proposed to reduce traffic congestions, improve the traffic environment and to provide affordable services in RSTP. But enormous amounts of time and money are required. Actually, construction of MRT Line 1 will began from 2016 and construction of BRT Line 3 will began until 2019, But MRT Line 1 between Uttara North and Agargaon will be opened in 2019. So during 5 years from 2016, large-scale constructions, like a Dhaka Elevated Expressway, MRT Line 6, BRT line 3 and other flyovers will began everywhere in Dhaka, but new public transport services and new roads will not be developed.

So what the government must compare is what should be done first or later within a limited time and budget.




Source: JICA Study Team

**Figure 14.5 Shot-term Action Plan (Image)**

### (2) Approach of 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 time and money and needs 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:

Improvement of Bus Services

- Resolving the problems being encountered by the Bus Modernization Project “Dhaka Bus Network and Regulatory Reform implementation Study and Design Work”.
- Redesigning the public transport route network beyond the routes selected for the Model Bus Project, in order to widen coverage, improve commuter access, widen the types of bus service offerings, and identify new routes for operators displaced by the Model Bus scheme.
- Managing primary bus corridors within the city and the metropolitan area through traffic engineering and bus priority measures to achieve safe and efficient operating environment for general traffic and bus services as well as road conditions supportive of transit promotion.

Traffic Management and Traffic Safety

- Implementing the traffic management and traffic safety measures immediately. Because if effective measures of traffic management and traffic safety are implemented, road capacity will be increased drastically and traffic congestions will be reduced.

Road Development by Gradual Approach

- Road development for achieving systematic urban development of the Eastern Fringe Area and Systematic and Its goal is to create residential areas rich in nature so as to revitalize urban area, which have an overconcentration of population.
- Developing the southern part of outer ring road as the bypass from Padma Bridge to Chittagong to reduce the through traffic to urban area.

### (4) Short-term Action Plan

#### 1) Stepwise Bus Route Network Development

In the future, with progress of suburbanization job opportunities will be created not only in urban areas but also in sub-urban areas. And this expansion leads to the necessity of expansion of public transport service network. In RSTP, total 7 MRT/BRT lines are

proposed to connect CBD and sub-urban areas. But there is no MRT/BRT stations in some areas in sub-urban area, so affordable feeder services need to be developed t the area where there are great distances from MRT/BRT stations.

And also. Seven (7) MRT/BRT services will not be started at the same time, each line will be started in a stepwise fashion. So bus service networks needs to be developed and restructured following the development of the MRT/BRT lines.

Case of MRT Line 6

MRT Line 6 will be opened in a step by step manner until 2020. MRT line 6 will start is operation between Uttara North Station and Agargaon Station in 2019, and at the next phase the entire line will come into operation.


Source: JICA Study Team

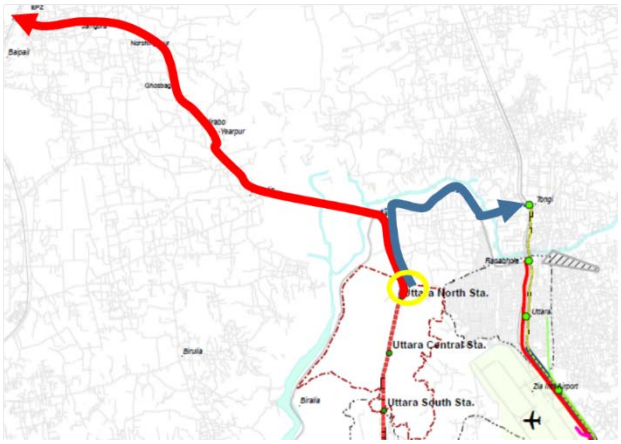
**Figure 14.6 Feeder Bus Service for MRT Line 6**

At the first phase, passengers of MRT Line 1 will suffer inconvenience to access CBD area from Uttara and Mirpur, because they need to break their journey on the way. So before when the 1st phase of MRT Line No.6 is completed, priority bus service should be provided from Agargaon Station to Motijheel/Kamalapur area.

And current bus route networks in this corridor should be restructured at the same time in order to make bus service more effective and reduce traffic congestions during construction periods of MRT Line 6.

And before extension of MRT Line 6 to the north, priority bus services should be provided from Uttara North to Ashulia/ Savar and Tongi. And Station plaza shall be developed at Uttara North station for the improvement of convenience of changing trains between MRT Line 6 and Bus.

And feeder bus services between Uttara North Station and Tongi Station will make connection between MRT Line 6 and BRT line 3 more efferent and easier.




Source: JICA Study Team

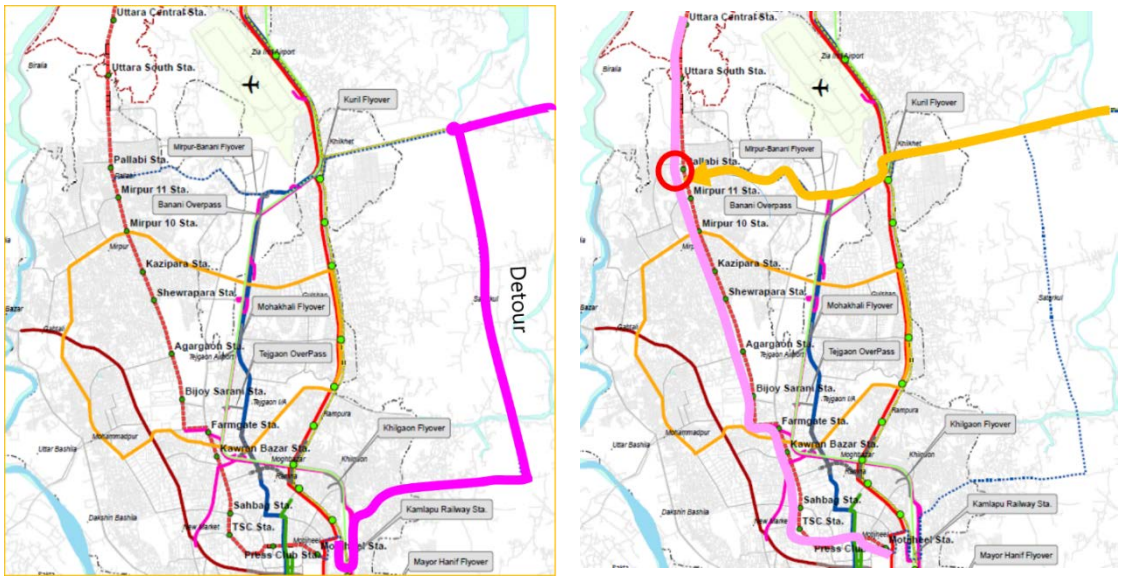
**Figure 14.7 Feeder Bus Service for MRT Line 6**

Case of MRT Line 1

In 2025, MRT Line 1 has 2 service line, one line is from Kamalapur station to Airport station, and another line is from Kamalapur Station to Purbachal Terminal Station. And at the next phase 2035, the alignment of MRT line 6 will be extended from Airport Station to Gazipur Station via Tongi, and from Kamalapur Station to Jhilmil Station.

Traffic management during the construction of MRT Line 1 should be implemented in the short-term. During the construction of MRT Line No.1, two lanes will be used for construction works on DIT Road, and reduction of lanes would lead to serious traffic congestion on the road. So it is important to manage traffic demand and to alleviate expected traffic congestion.

To avoid traffic congestion on the DIT road, bus service can be operated on new Purbachal road and extended from Kuril Intersection to Pallati station in order that passengers may transfer to MRT Line No.6 at the point.




Source: JICA Study Team

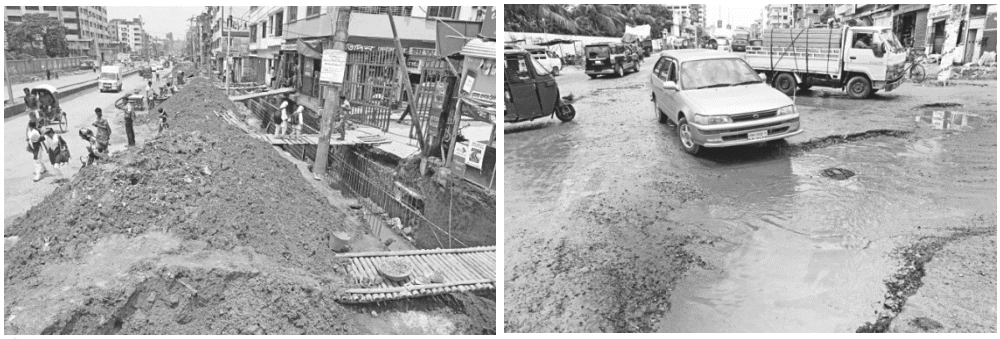
**Figure 14.8 Feeder Bus Service for MRT Line 6**

During construction period on DIT road, serious traffic congestion will be expected. A new bus route shall be provided plying on the proposed road for BRT No. 7. And priority project should be given to development of the arterial road between Gazipur and Narayanganj since this road shall provide space for detour of bus operation during construction period of MRT Line 1. New bus operation with quality service shall be provided on DIT road to replace the existing bus services.

Suspension of Rickshaw operation on DIT road shall be taken into account.

**2) Traffic Management during Construction Period**

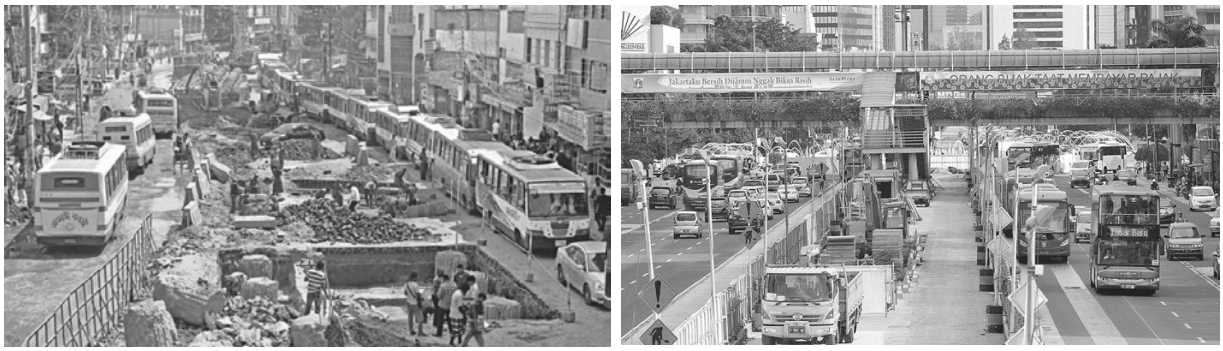
Current traffic management during construction period is very poor. The results in a lack of management, making illegally left construction materials left on the street or other paces a traffic congestion or traffic accident.



Source: Naz_toronto

**Figure 14.9 Poor Construction Management in Dhaka**

And also construction site and materials occupy unnecessary large spaces and reduce the road capacities by poor construction management. Road capacity of 2 lanes are 4,400 pcu per hour, but 1 lane's road capacity is 1,700 pcu per hour and not a half a capacity. So temporary two-lane and two-way traffic road needs to be served during the construction period.



Source: JICA Study Team

**Figure 14.10 Construction Management in Dhaka and Jakarta**

**3) Traffic Management and Safety**

As already mentioned in chapter 13, 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 the traffic management measures are evaluated in the

current traffic situation. As a result, average V/C, average speed, and total TTC become better than 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 in chapter 12, Southern part of the Outer Ring Road and road network development in the Eastern Fringe Area are proposed as 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

# 15. CONCLUSION AND RECOMMENDATIONS

## 15.1 Conclusion

RSTP proposes the overall goal of urban transport and 8 objective for achieving the overall goal as follows:

"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."

(1) Promotion of social understanding about urban transport problems and issues
(2) Effective management of urban growth and development
(3) Promotion and development of attractive public transport
(4) Efficient traffic control and management
(5) Effective management of transport demand
(6) Comprehensive development of transport space and environment
(7) Enhancement of traffic safety and reduced environmental impacts
(8) Strengthening of urban transport administrative and management capacities

The followings are conclusions and activities of each objective.

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

Transport systems play a crucial role in urban development by providing access for people to education, markets, employment, recreation, health care and other key social–economic services. Urban transport services and infrastructures are closely related with urban citizens. But many people are unconscious of the fact that traffic congestions, traffic accidents and other transport issues are caused by human error or lack of knowledge.

In the RSTP, many urban transport measures are proposed to reduce traffic congestions and improve the urban transport environment, And not only RSTP, any other transport projects and studies has been proposed many useful urban transport measures. The Government has been working on those issues for a long time, and the Government hasn't been able to get very far with those. As one of the reasons, people have a lack of understanding toward urban transport policies and measures.

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. The formulation of the most efficient plan and the intervention by the Government in the planning process will not be enough on its own to ensure successful implementation. What is needed is the political will and determination of the Government supported by the people's commitment to achieve the objective.

To achieve this objective, the following for strategies 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**

The integration of transport planning and land use planning in the context of the development of metropolitan Dhaka is critical. It is considered that the only realistic approach for the successful control of growth of development involves an active commitment to policies integrating transport and land use planning. It is essential to recognize that the size, growth and distribution of the density of activity in metropolitan Dhaka have a crucial impact on the dependence on transit. Policies for increases in density around transit nodes and along transit corridors can achieve reductions in congestion and pollution and can maximize the use of the investment in transport infrastructure. Unfortunately, the pro-active commitment to such policies and the recognition of the importance of the integration of land use and transport planning has been lacking in the Dhaka area in recent years.

To achieve this objective, the following five policies are suggested:

Activity 05: Policy coordination within metropolitan area;

Activity 06: Integration of urban development M/P and urban transport M/P;

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**

Because of its comparative advantages in terms of speed, flexibility and accessibility, road transport has emerged as the most popular mode of transport in Bangladesh. The Dhaka metropolitan area is no exception to this trend. As a result, inland water transport and the railways have been facing marginalization with respect to the carriage of passengers and goods for many years. Consequently, the approaches to transport system development followed in the past decades need to be reviewed to create a balanced and multimodal transport system in Dhaka. Although there have been a number of transport studies in recent years, no serious effort has been made to forge a functional integration of different modes of transport. However, it is well known that without effective integration of transport systems, economic benefit, convenience and comfort from transport services cannot be derived. Dhaka is one of the least motorized cities in the world with a figure of about 127 motorized vehicles per 1,000 population. As an example, saturation levels in western cities are around 500/1,000 and Bangkok as an example of an Asian city has a motorization rate of 300 per 1,000 population.

Carefully throughout measures must be adopted for the automobile society that inevitably will come rear future. 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.

To achieve this objective, the following five policies are suggested:

Activity 10: Development of a hierarchal 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 (Information and Communication Technology).

To achieve this objective, the following five policies are suggested:

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.

Traffic demand management (TDM) is a restrictive measure to be applied to private modes of transportation. The purpose of TDM is to discourage the use of private modes and encourage the use of public transportation. TDM measures can be classified into two types, namely economic measures and regulatory measures. They can be applied either to the use or ownership of vehicles.

To achieve this objective, the following five policies are suggested:

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 the use of traffic – 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 quality of urban areas and activities.

To achieve this objective, the following five policies are suggested:

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**

Traffic accidents have profound socio-economic impact as they result in traffic congestion, loss of personal productivity, and health care cost which are all borne by the society. In Dhaka, road-based traffic accidents have steadily increased. The accident rate already ranks high compared with that of other Southeast Asian cities. Immediate redressing of traffic safety problems in Dhaka could limit, if not avoid, such grave personal, social, and economic consequences.

Opportunities exist to improve traffic safety and road infrastructure. Many of the preventive measures can be undertaken at marginal costs within a short time, including road safety planning, elimination of black spots, enforcement, and education.

High priority should be given to the revival of the computerized accident database and the elimination of accident-prone locations. Accurate accident data directs attention to traffic safety and assists the formulation of remedial and preventive solutions. In eliminating accident-prone locations, common traffic engineering measures, such as use of median barriers, signalization, and geometry modification, are implemented.

It should be borne in mind that traffic safety improvement, while critical for the short term, requires long-term commitment especially in the areas of traffic police enforcement and road user education.

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 union government level.

To achieve this objective, the following five policies are suggested:

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

To achieve this objective, the following five policies are suggested:

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.

## 15.2 Recommendations

The recommendation 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 needs feasibility study 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).