Japan International Cooperation Agency (JICA)
Dhaka Transport Coordination Authority (DTCA)

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

FINAL REPORT / MainText

November 2016

ALMEC Corporation
Oriental Consultants Global, Co., Ltd.
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

EXECUTIVE SUMMARY

INTRODUCTION

General

In 2005, Strategic Transport Plan for Dhaka (STP) has been formulated as the 20-Years Urban Transportation Policy (2004-2024) by the Government of Bangladesh (GOB). STP needs to be revised and updated by the following reasons:

1. Many transport projects listed and unlisted in STP have been implemented on a first-come-first-served basis without any coordination among related agencies.
2. During 10 years, social and economic conditions around Dhaka have changed (economic level, population, urban area, urban structure…).
3. 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 MRT
4. Concept of STP change from Demand-responsive Urban Transport Development Plan to "Urban Development Policy-responsive Urban Transport Development Plan"
5. STP mentions it should be revised every five years, however, it had not been revised.

Goals and Objective

The objective of the Project is to revise and update the STP which was approved by the GOB eight years ago. And the following are the expected goals which was attained after this Project is completed:

Goal of the Proposed Plan: To revise appropriately to promote an effective and efficient urban transportation development in Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, and Narsingdi districts.

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

Outputs: To reflect short-, medium-, and long-term perspectives and a list of high-priority projects in the revised STP.

Project Area

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 (SPA)" 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.

VISION AND STRATEGIES of Revised STP

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".

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

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

B. Effective Management of Urban Growth and Development

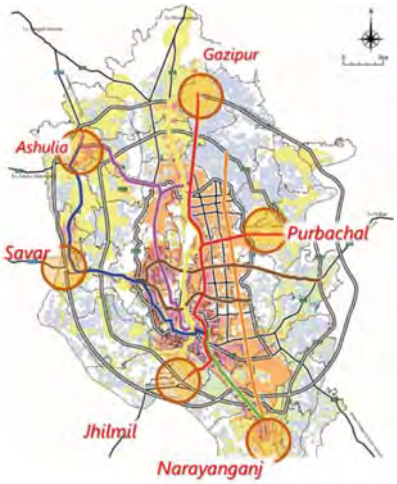


Fig 1. Development Concept

C. Promotion and Development of Attractive Public Transport
D. Efficient Traffic Control and Management
E. Effective Transport Demand Management (TDM)
F. Comprehensive Development of Transport Space and Environment
G. Enhancement of Traffic Safety
H. Strengthening of Transport Sector Administrative and Management Capacities

URBAN DEVELOPMENT SCENARIO

Population

The following are the areas for improvement of the RSTP Scenario.

- Population in inner core of Dhaka will decrease by decentralization;
- The decreased population of the inner core will be distributed in the eastern fringe and suburban areas along the selected growth corridors. For the distribution in suburban areas, new urban core areas will be emphasized which will become satellite towns and sub-CBDs of the metropolis;
- Industrial facilities in Dhaka's inner city will be relocated to suburban areas, considering the government relocation policy and urban redevelopment movements;
- 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
- The trend of population growth in North-west area of RAJUK will be reflected.

Tab 1. Population Forecast

	Area (ha)	Population (million)					
		2001	2011	2020	2025	2030	2035
RAJUK	159,800	10.0	14.8	20.2	23.2	25.1	26.3
GDA	216,117	18.2	24.4	30.8	33.9	37.1	38.5

Tab 2. Trip Forecast

Year	2014	2025	2035
Total Production Trips per Day	29,824,387	42,702,370	51,179,487

Future Traffic Demand

As projected, 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.

Modal share changes depending on the transport network. The rickshaw share will decrease while the bus share will increase at any given cases.

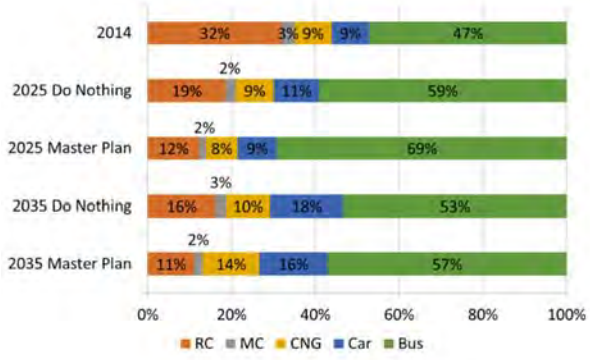


Fig 2. Modal Share

FORMULATION OF THE URBAN TRANSPORT MASTER PLAN

Concepts of urban Transport Development

- At-grade Roads: including missing links, new roads, bridges, flyovers, sidewalk and pedestrian facilities.
- Expressways: D.E.E, 3 Ring Roads, 8 Radial Roads and other expressway formed the skeleton of urban area
- MRT and BRT: 5 MRT Lines and 2 BRT Lines
- Inland Water Transport: circular waterway and channel waterways
- Bangladesh Railway: clear distinction between the role of interurban railway (BR) and MRT

- Traffic Management: includes traffic signals, traffic safety, and traffic environment and education.
- 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.

Fig 3. MRT/BRT Network

Fig 4. Road Network

Tab 3. Project Cost of Road Development

Project Components	Length (km)	Project Cost (BDT, Crore)
Expressway	126	31,042
Dhaka Elevated Exp.	20	8,940
Dhaka Ashulia Elevated Exp.	38	13,654
Dhaka Chittagong Exp.	16	1,501
Dhaka Sylhet Expressway	16	795
Dhaka Mawa Expressway	18	5,169
Dhaka Mymensingh Exp.	19	983
Ring Roads	310	35,335
Inner Ring Road	73	11,319
Middle Ring Road	108	4,065
Outer Ring Road	129	19,951
Primary Roads	290	10,984
Secondary Roads	471	18,962
Total	1,198	96,324

Tab 4. Project Cost of MRT/BRT Development

	Length (km)	Project Cost (BDT, Crore)
MRT Line 1	53	45,626
MRT Line 2	40	28,564
MRT Line 4	16	12,917
MRT Line 5	35	32,662
MRT Line 6	22	16,245
BRT Line 7	36	1,999

Tab 5. Investment Cost

	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%)	3,904	4,848	5,552	7,104
Estimated Cost	6,579	8,685	10,828	10,693

IMPLEMENTATION PROGRAM

Short-term Project (~2020)

- 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

Mid- and Long-term Project (~2035)

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

Investment Plan

According to the Strategy for Infrastructure Sector for 7th Five Year Plan, transport sector accounts for about 23% of total ADP. And estimated budget is estimated based on the current rate of revenues collection (Revenue: 14% of GDP, Tax Revenue: 11% of GDP, Development Expenditure: 6.4% of GDP, Annual Development Plan: 6.0% of GDP). And GRDP of GDA is almost 25% in Bangladesh, so urban transport development budget in GDA will be 25% of all transport sector. The table 5 is the projected procurable budget in each phase.

Short-term Action Plan

Traffic Management and Traffic Safety: Road capacity will be increased drastically and traffic congestions will be reduced by effective measures of traffic management and traffic safety. Total benefit cost of traffic management situation will be 532 million TK/ day.

Road Development by Gradual Approach: Developing the southern part of outer ring road as the bypass from Padma Bridge to Chittagong to reduce the through traffic to urban area.

Stepwise Bus Route Network Development: Redesigning bus service network integrated with MRT and BRT and Improvement and replacement of the current bus terminals

Fig 5. 3 Ring Road

Fig 6. Southern Part of the Outer Rang Road

CONCLUSION AND 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).

Our recommendations are as follows:

- DTCA to coordinate, oversee and monitor all implementation of the proposed projects in RSTP.
- Raise funding capability of the government by seeking various additional revenue sources and optimizing current revenue sources under the institutional arrangements.
- Take necessary actions as soon as possible to launch the short-term projects proposed in RSTP.
- Bus Service network needs to be modified depending on the development progress of the proposed MRT and BRT.
- The conclusion and methodology of the master plan could be handed over to the future with periodical updating (basically every 5 years).

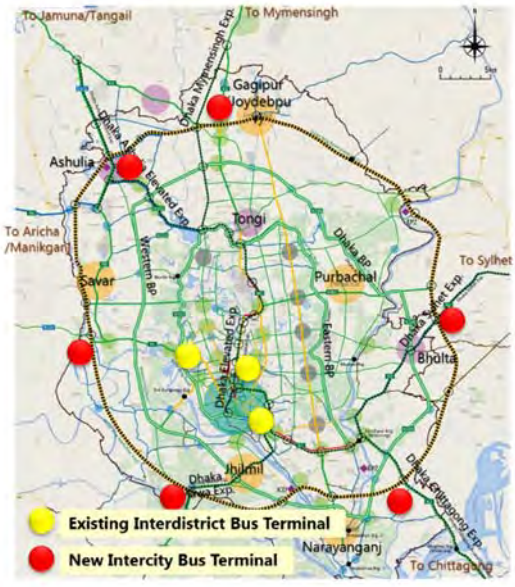


Fig 7. Replacement of Bus Terminal Plan

MAIN

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-Years 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 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 as follows:

(i) To revise and update the STP which was approved by the GOB eight years ago

(ii) To select plans and formulate a roadmap that would consist of high priority projects to solve current urban transport issues.

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

Goal of the Proposed Plan: To revise appropriately to promote an effective and efficient urban transportation development in Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, and Narsingdi districts.

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

Outputs: To reflect short, medium, and long-term perspectives and a list of high-priority projects in the revised STP.

1.3 Project Area

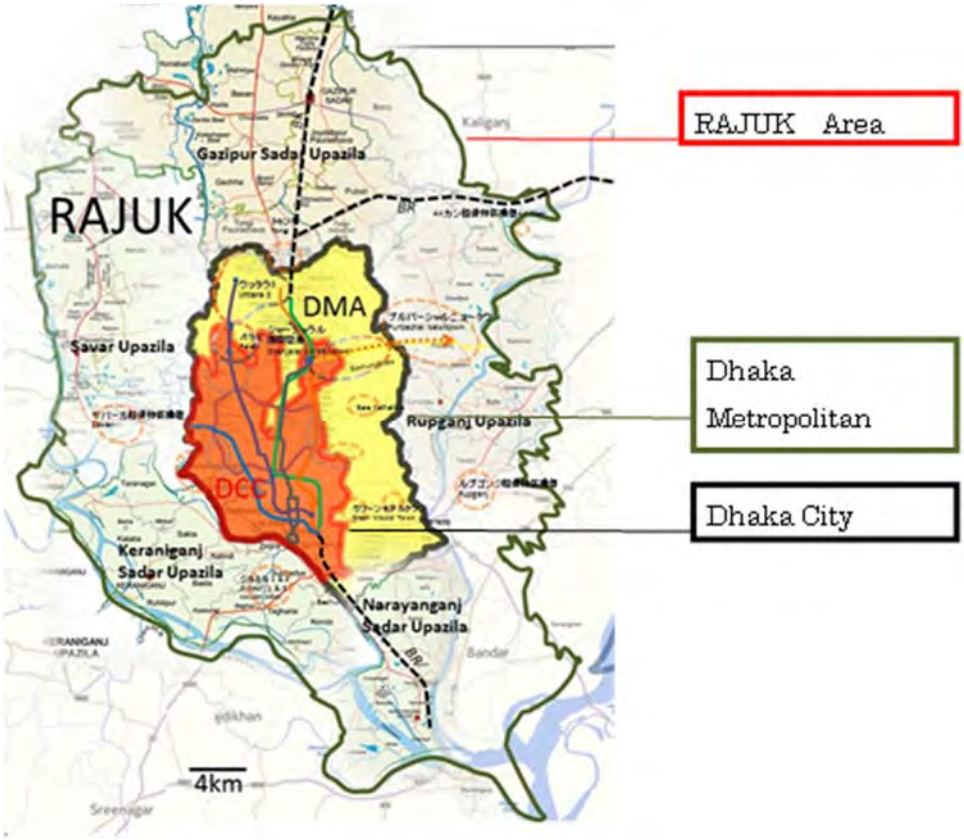
The Record of Discussions (RD) dated 10 October 2013 mentioned that the project area would be the same as that of the original STP, that is, Greater Dhaka covering Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, and Narshingdi districts. The areas to be included in the traffic survey and in transport 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 was 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 was prepared only for the area where a person travels daily. 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



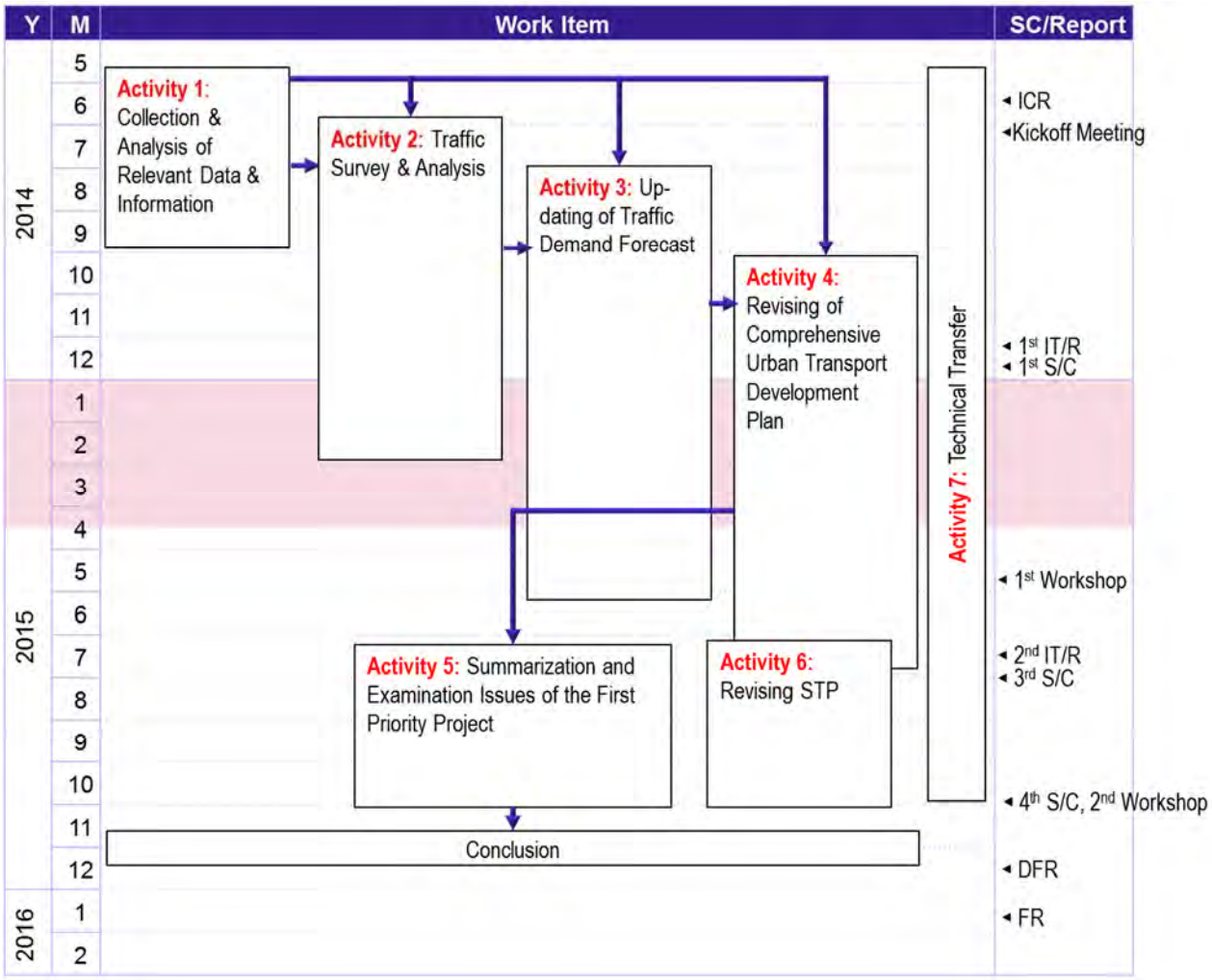
Source: JICA Study Team

Figure 1.1 Target Areas

1.4 Study Schedule and Framework

The overall framework of the Study is shown in Figure 1.2.

The final report of RSTP has been submitted to the Cabinet on March 2015, and RSTP has been approved by the Cabinet on August, 2016.



Source: JICA Study Team

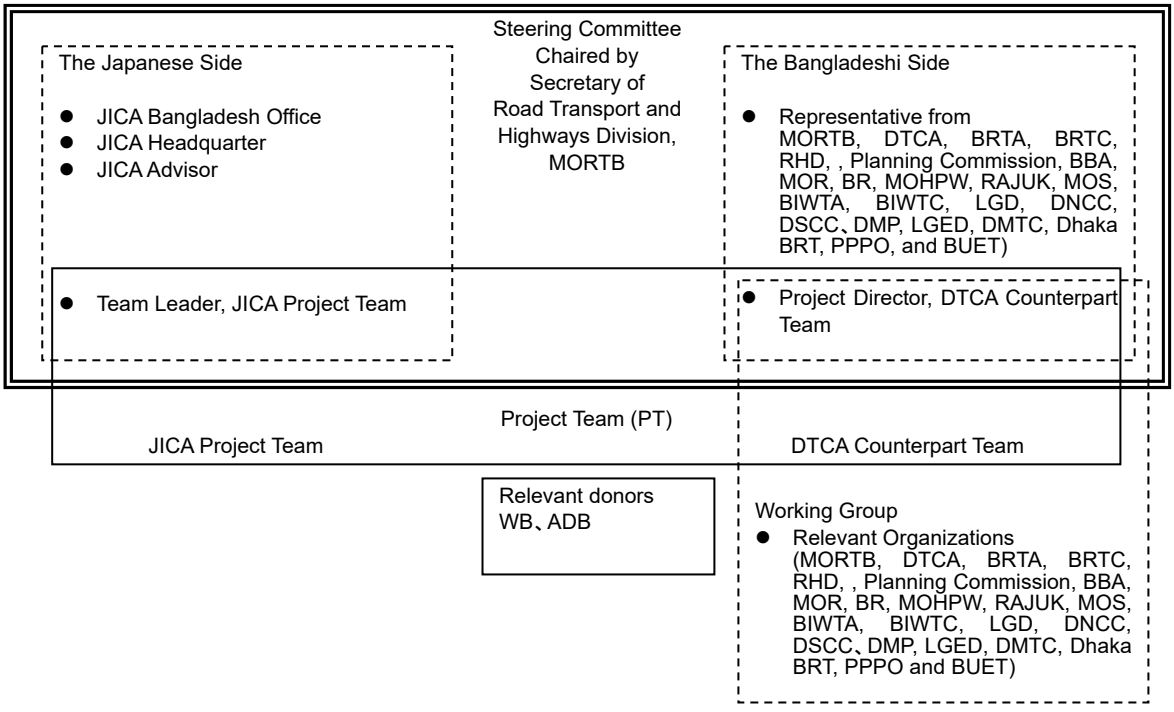
Figure 1.2 Overall Study Framework

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 1.3 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 created a Steering Committee (SC), a Project Team (PT), and a Working Group (WG). The Steering Committee was established in order to: (i) coordinate interests and resolve conflicts in related subjects and among related stakeholders and (ii) share project findings and results. SC meetings was held whenever necessary and chaired by the secretary of the MOC's Road Division (present the MORTB's Road Transport and Highways Division).

The Project Team (PT) was established mainly to implement the project, while working groups (WGs) was established in order to discuss and share information among relevant agencies. PT and WG meetings was 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 were issued depending on the agenda.



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 Engineering and 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 sq. km 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 sq. km 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 two export processing zones (EPZs) in Savar and Narayanganj. 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.

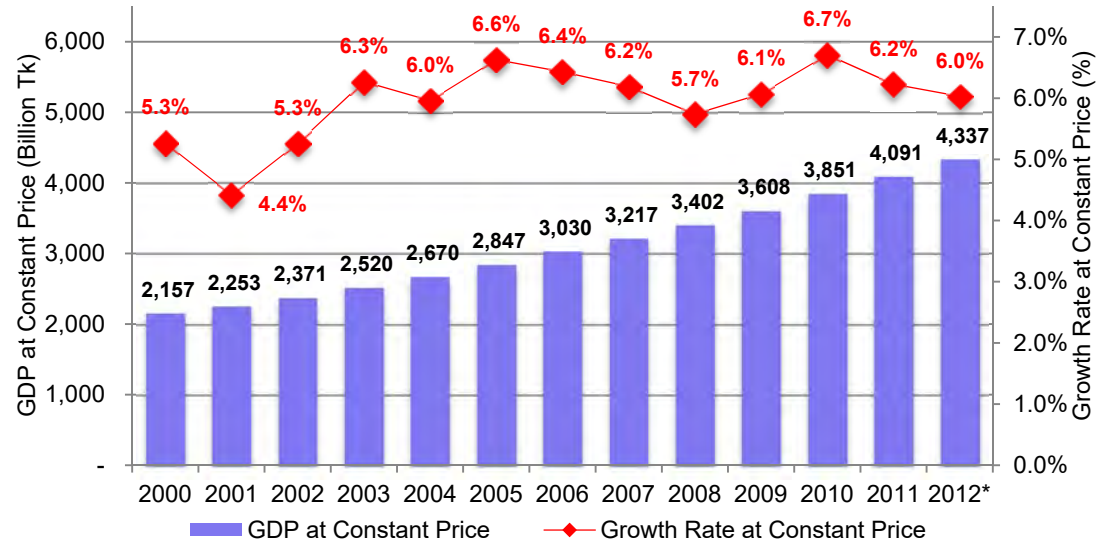
2.2 Socio Economic Conditions

(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)

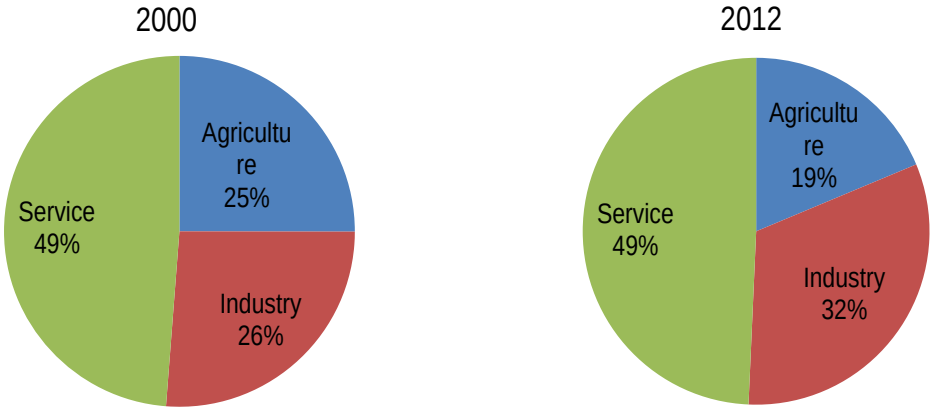
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*
GDP at Constant Price (Billion Tk)	2,157	2,253	2,371	2,520	2,670	2,847	3,030	3,217	3,402	3,608	3,851	4,091	4,337
Growth Rate (%)	5.3%	4.4%	5.3%	6.3%	6.0%	6.6%	6.4%	6.2%	5.7%	6.1%	6.7%	6.2%	6.0%
GDP per Capita at Constant Price (Tk)	16,613	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)

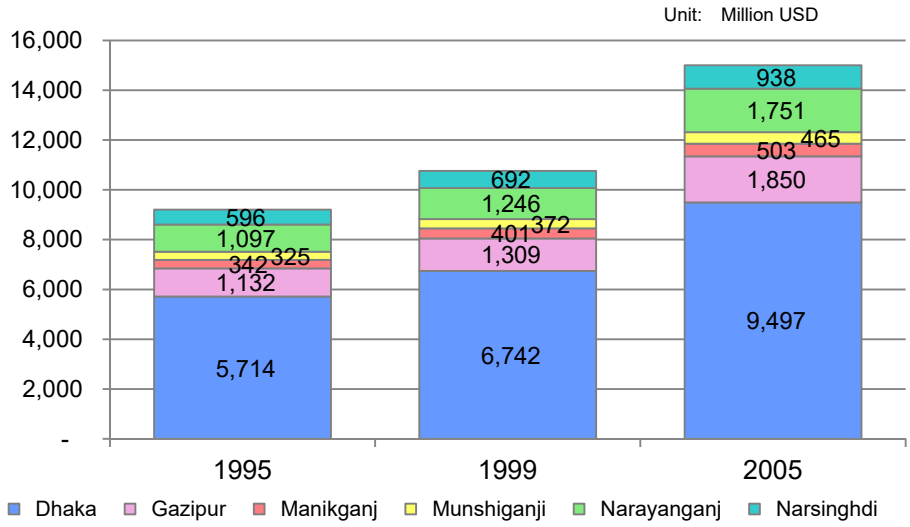
Table 2.2 GDP by Industry Sector at Constant Price of Bangladesh (2000-12)

	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

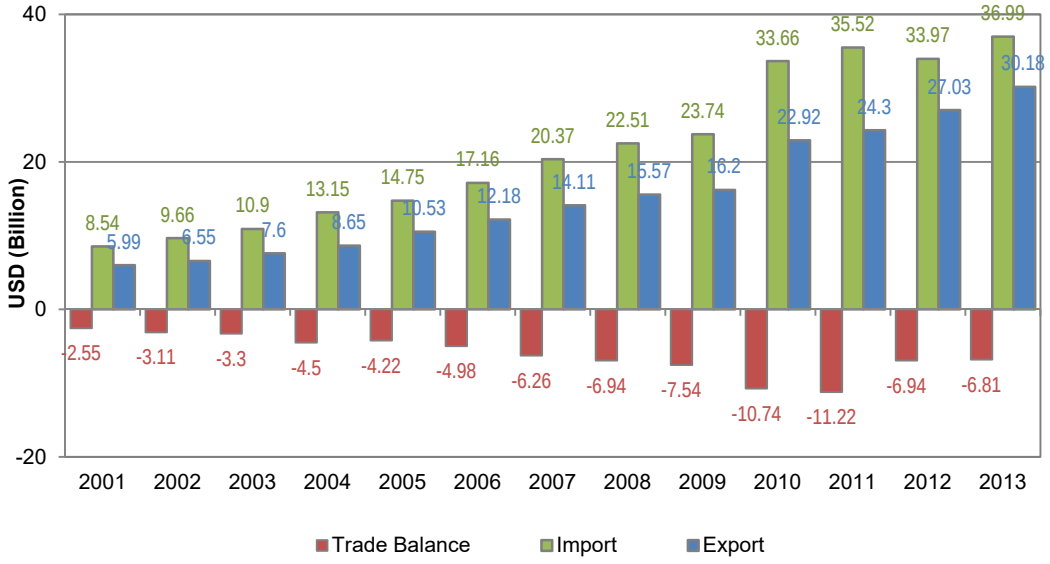
Table 2.3 GRDP in the Study Area

	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

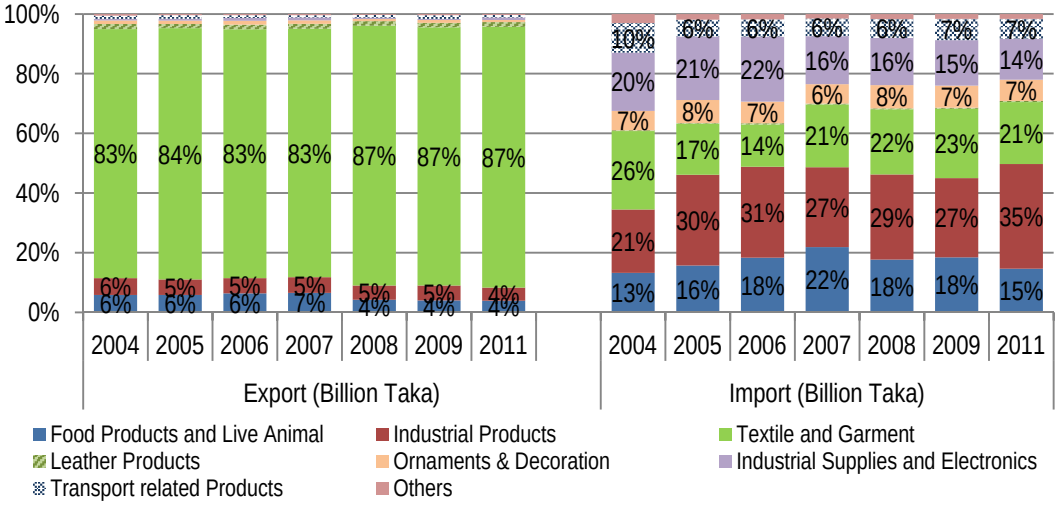
Foreign trade plays an important role in a country's economic development whereas total of Bangladesh Import and Export shows an increasing trend since 2001. In 2013, total amount of import has come closer to 37 billion USD which is 4.3 times higher than that of year 2001 while the amount of export has 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

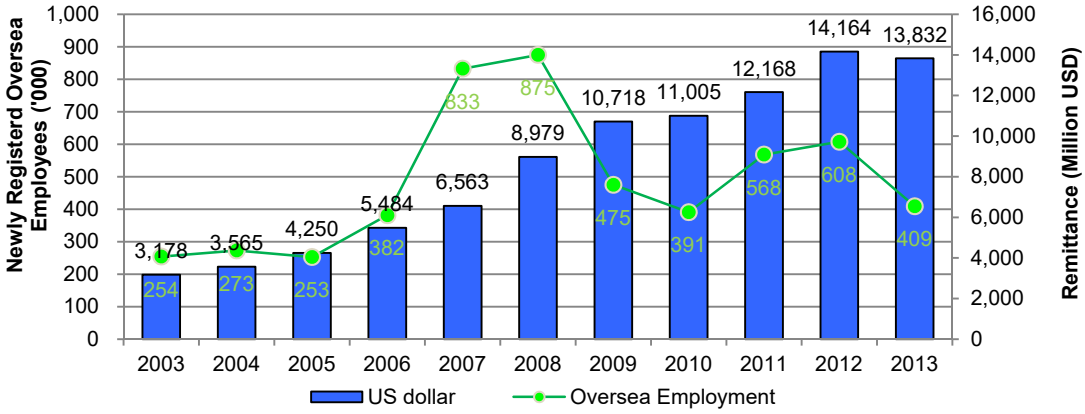
Figure 2.5 shows the breakdown of the export and import items for the past 7 years, of which, share of textile industry has increased up to almost 90% by the year 2011. This export trend has made Bangladesh the second largest RMG (Ready-made Garments) exporter in the world after China in 2013.



Source: Statistical Year Book 2012, BBS

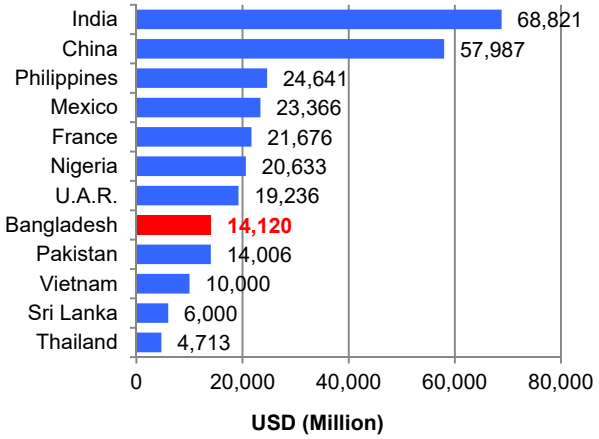
Figure 2.5 Breakdown of Export and Import Items of Bangladesh

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.



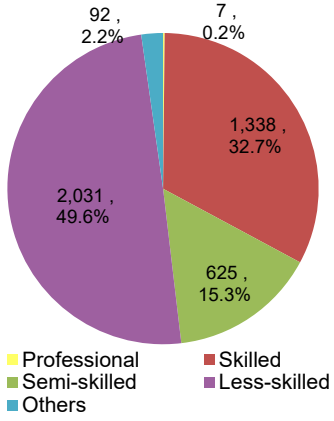
Source: Bureau of Manpower, Employment and Training, Ministry of Expatriates Welfare and Overseas Employment

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



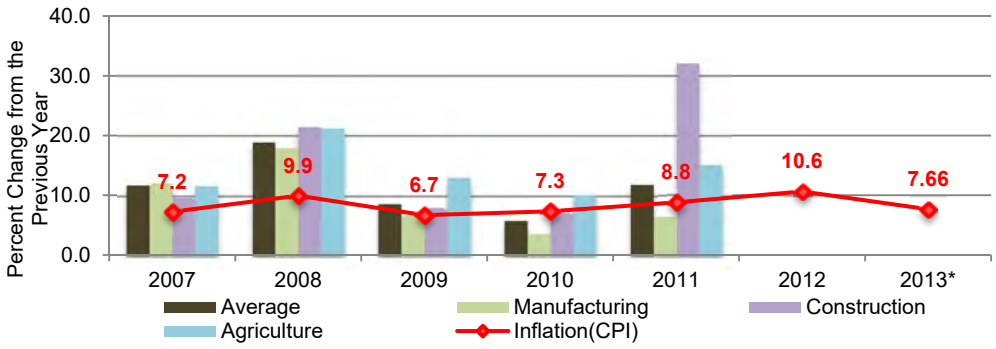
Source: Bureau of Manpower, Employment and Training, Ministry of Expatriates Welfare and Overseas Employment

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.

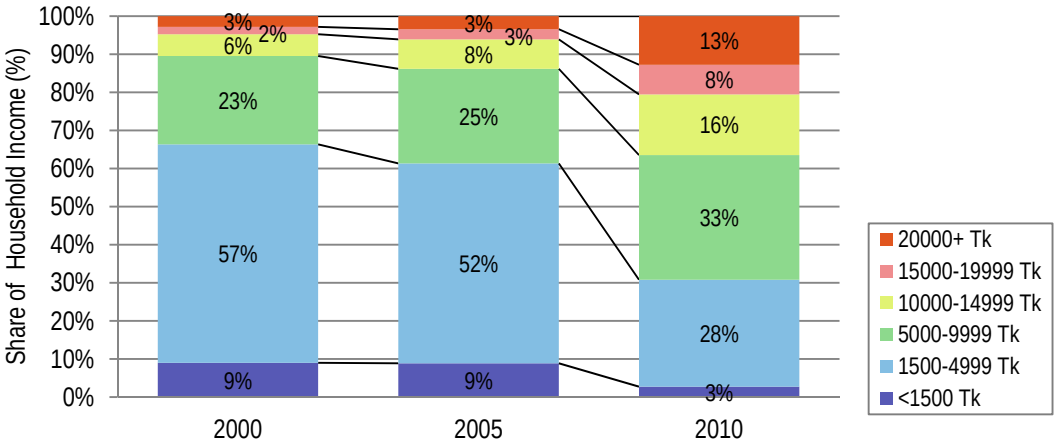


Note: * Provisional
Source: Nominal wage rate was obtained from Statistical Year book of Bangladesh 2012, and Inflation rate was obtained from National Account Statistics 2013, BBS

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

2) Distribution of Household Income and Expenditure

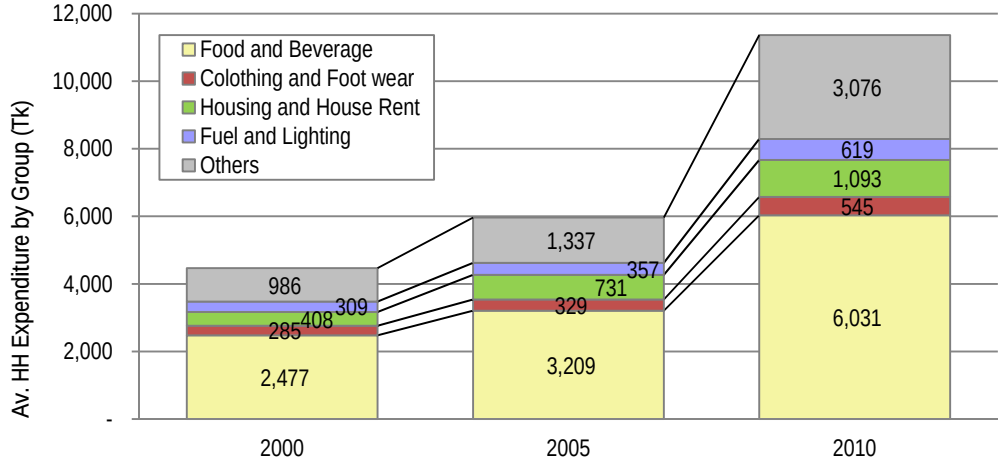
Bangladesh household income and expenditure is likewise increasing from 2000 to 2010 against economic development. As per the Household Income and Expenditure Survey, average household income was almost 12,000 Taka in 2010. As shown in Figure 2.10, share of low income households (monthly household income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



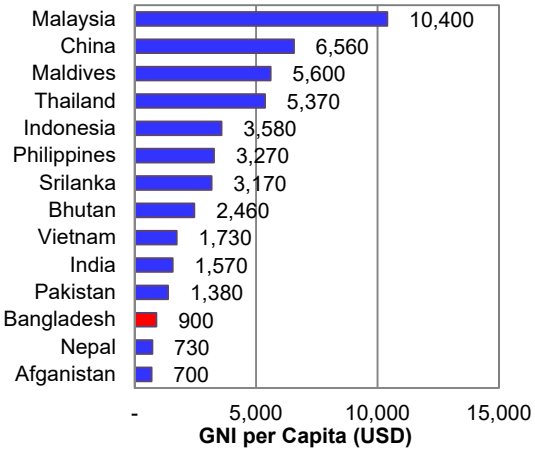
Source : Household Income and Expenditure Survey, 2010, BBS

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)

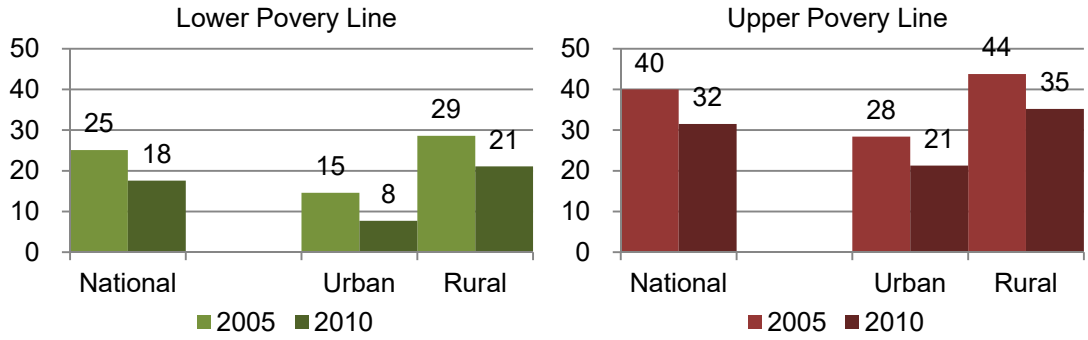
2) Population of the Poor

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%.

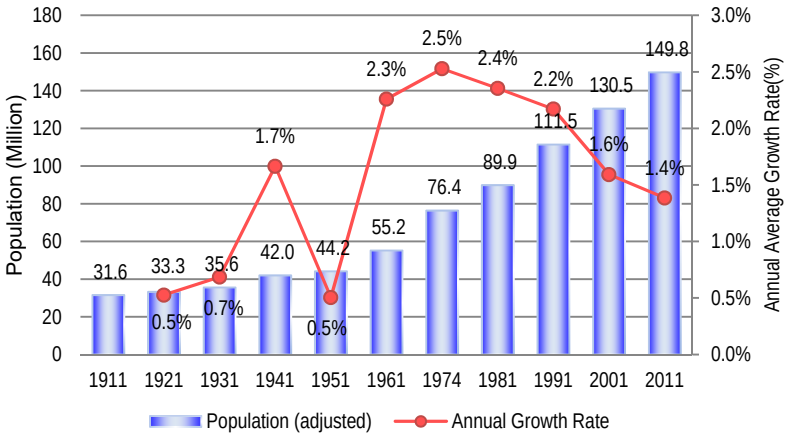
2.3 Social Characteristics and Household

(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.

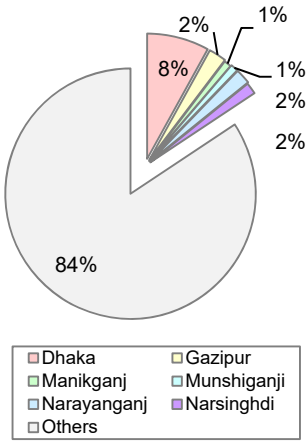
Population of GDA consists 15.7% of Bangladesh population with a population AAGR of 3.2% against a large number of social growth where only covers 5% land area of Bangladesh as shown in Table 2.4. Among the districts of GDA, population of Dhaka covers more than half of GDA population. While Gazipur and 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

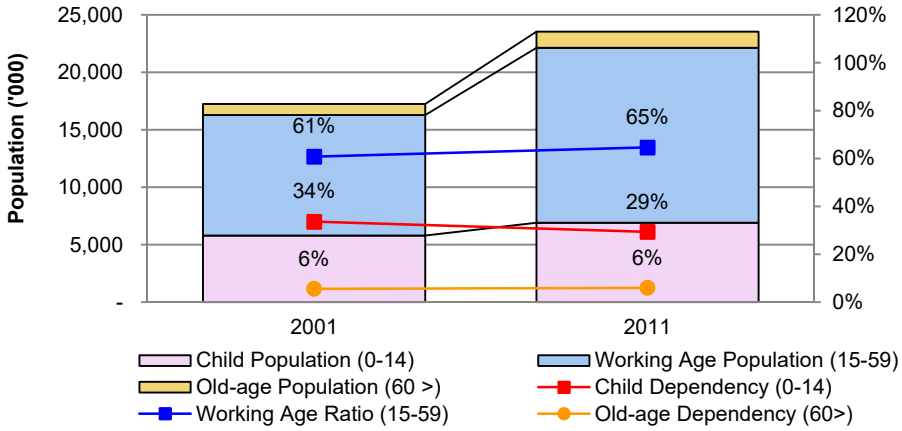
	Area (sq. km.)	Population ('000)		Population Share (%)		Growth Rate (%)	Population Density ('000 person/sq.km)	
		2001	2011	2001	2011	2001-2011	2001	2011
Bangladesh	147,570	130,523	149,772	100.0%	100.0%	1.4%	884	1,015
GDA	7,492	17,112	23,460	13.1%	15.7%	3.2%	2,284	3,131
- Dhaka	1,464	8,511	12,044	6.5%	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.



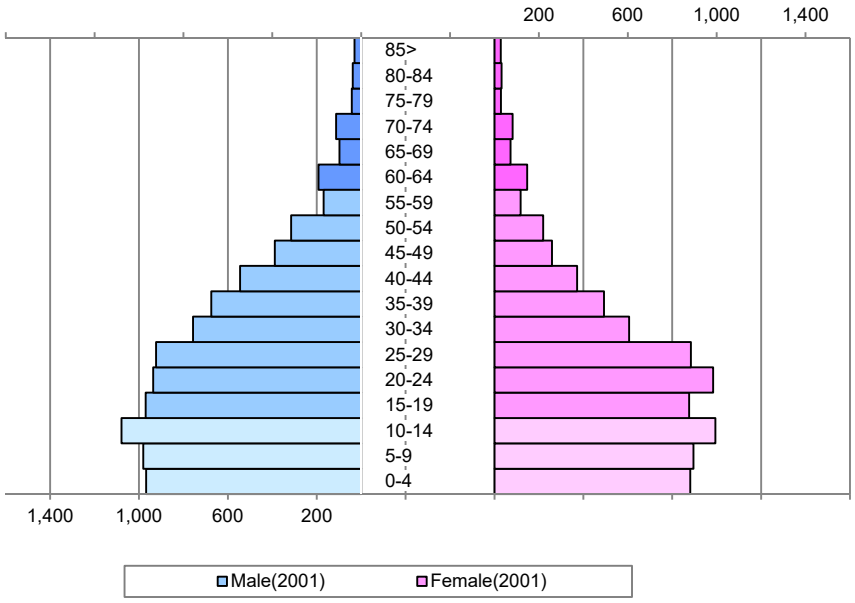
Source : Population and Housing Census 2001 and 2011, BBS

Figure 2.16 Population and Average Annual Growth Rate in GDA

Table 2.5 Population and Average Annual Growth Rate in GDA

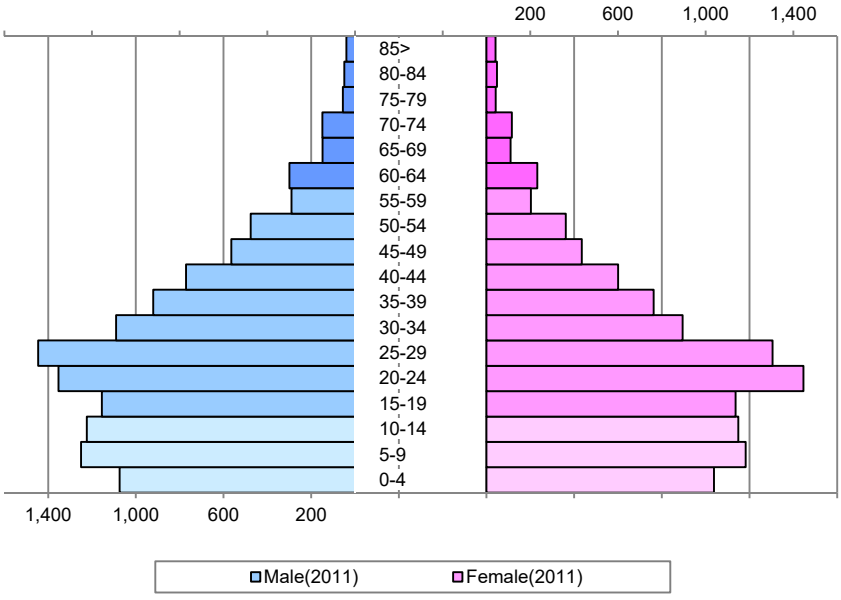
		2001	2011
Population ('000)	Child Population (0-14)	5,799	6,918
	Working Age Population (15-59)	10,490	15,213
	Old-age Population (60 >)	961	1,408
	Total	17,250	23,539
Share (%)	Child Dependency (0-14)	34%	29%
	Working Age Ratio (15-59)	61%	65%
	Old-age Dependency (60>)	6%	6%
	Total	100%	100%

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

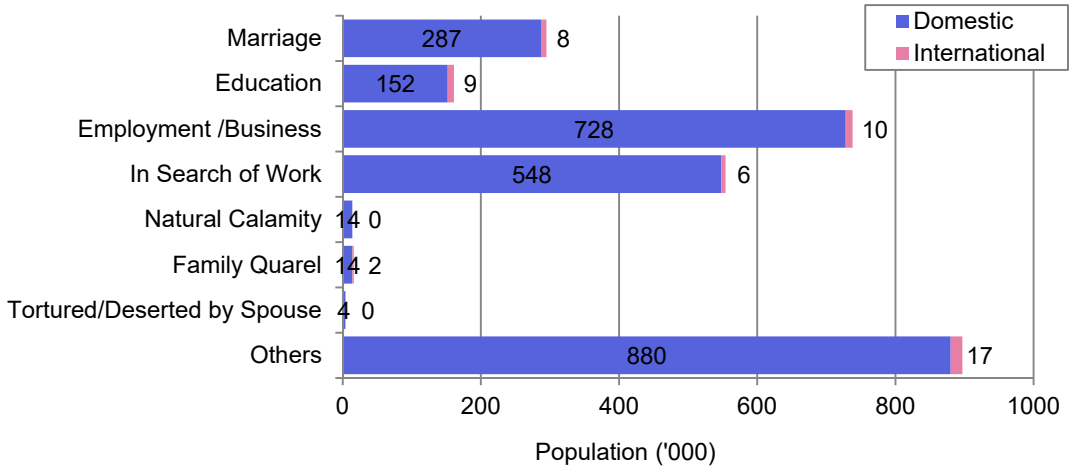


Source: Population and Housing Census 2011 , BBS

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

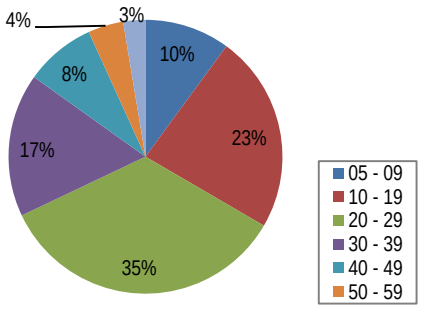
3) Characteristic of In-Migrant in GDA

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.



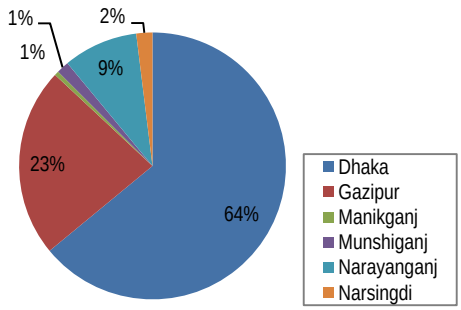
Source: Population and Housing Census 2011, BBS

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

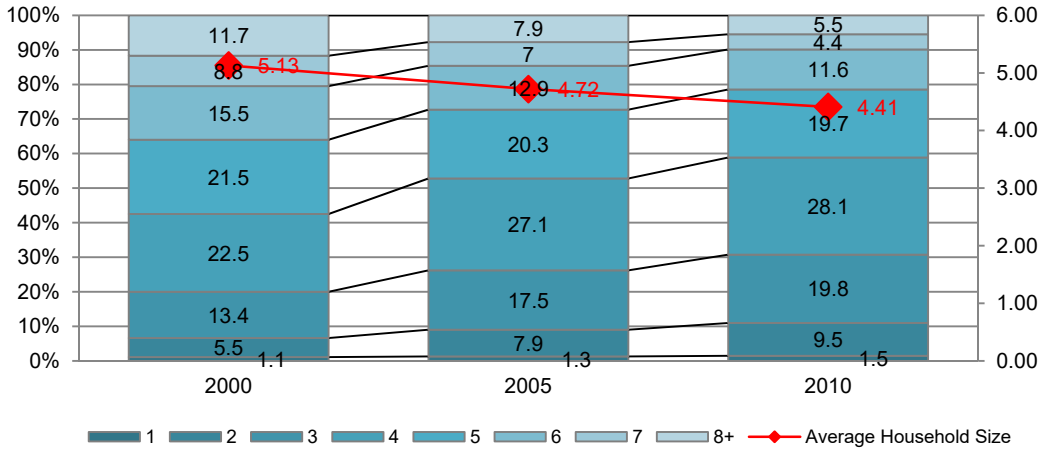
Table 2.6 Number of In-Migrants by District (Domestic/International)

	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.

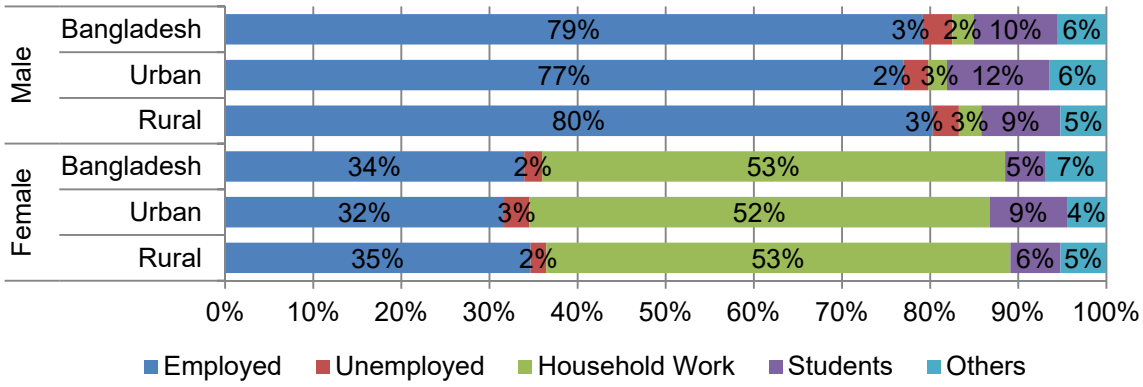
Table 2.7 Public Health Indicators of National Level

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.



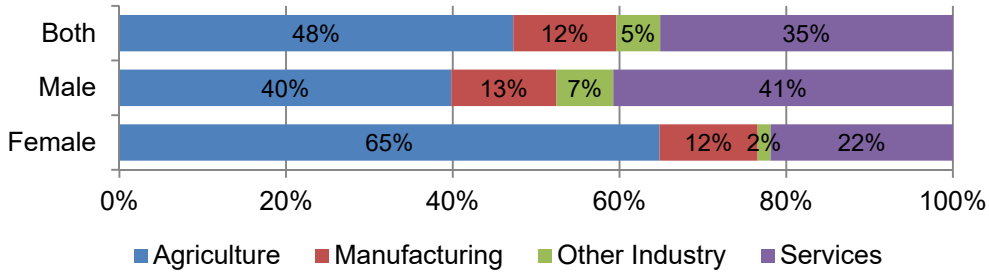
Source: Labour Force Survey Report 2010, BBS

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

(3) Employment

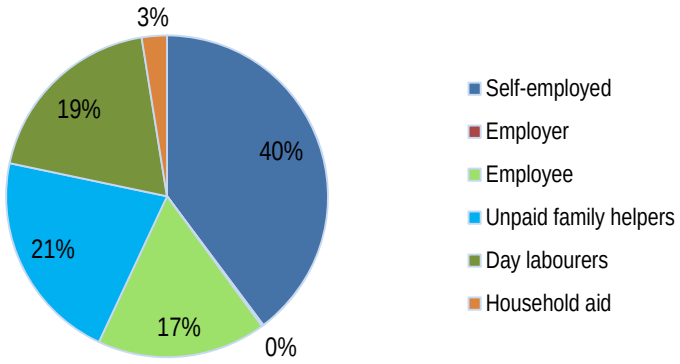
Share of employed population records are available in Labour Force Survey, however, data's available are only by major industries. The detailed records of employed population such as district wise or industrial sector wise are not available. As shown in Figure 2.24, agricultural sector covers 48% and 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



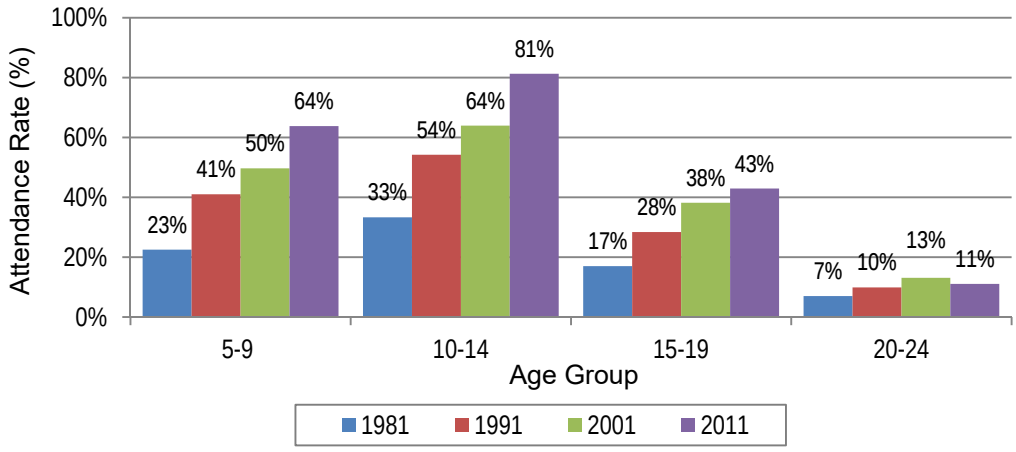
Source: Labor Force Survey Report 2010, BBS

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.

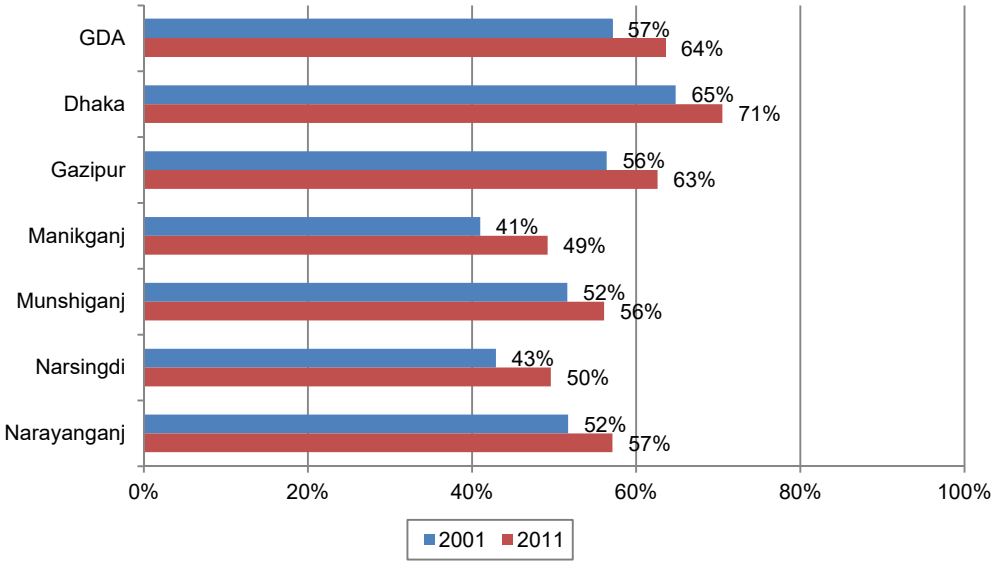


Source :Population and Housing Census 1981, 1991, 2001 and 2011, BBS

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 2.27, 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

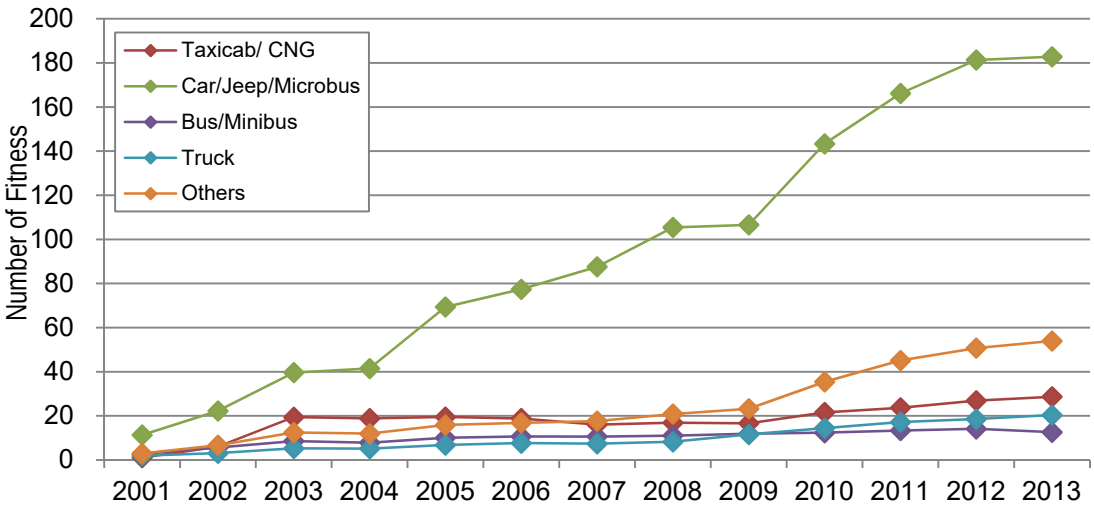
(5) Increasing of Vehicular Ownership

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

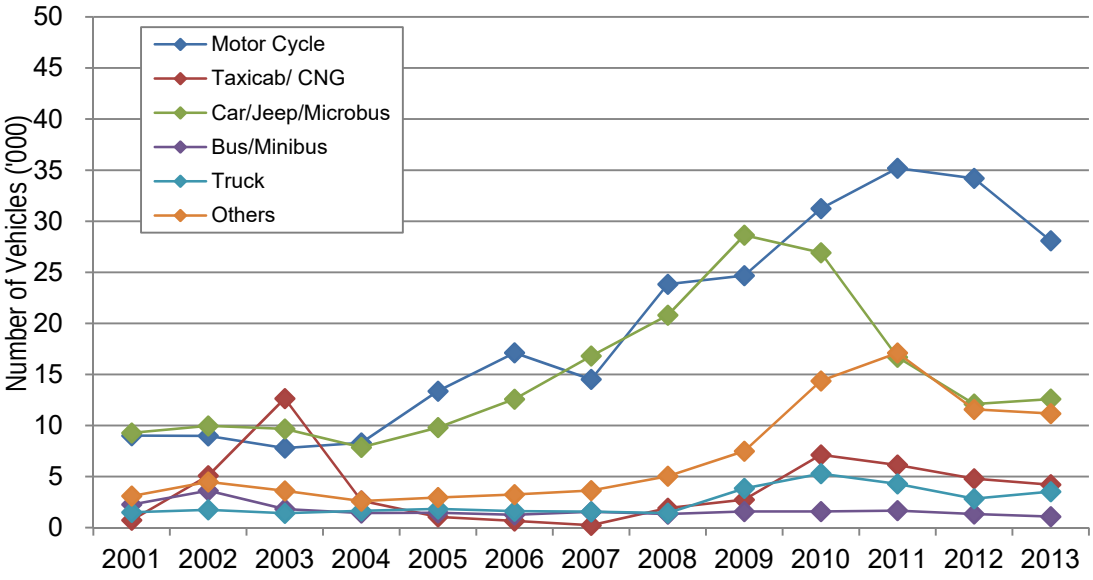
Table 2.8 Vehicle Population based on Fitness Vehicle

	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

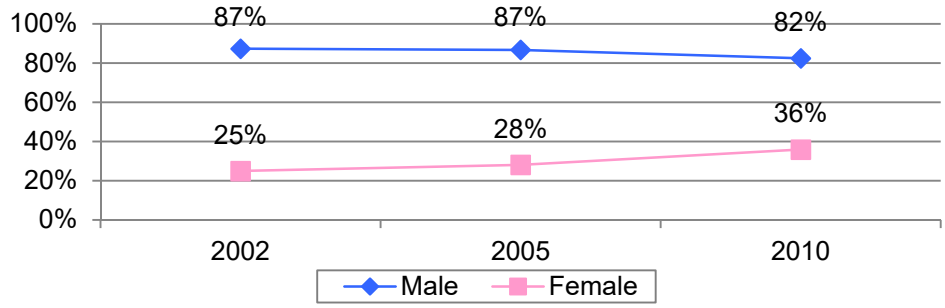
Table 2.9 Number of New Registered Vehicles from 2001 to 2013

	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)

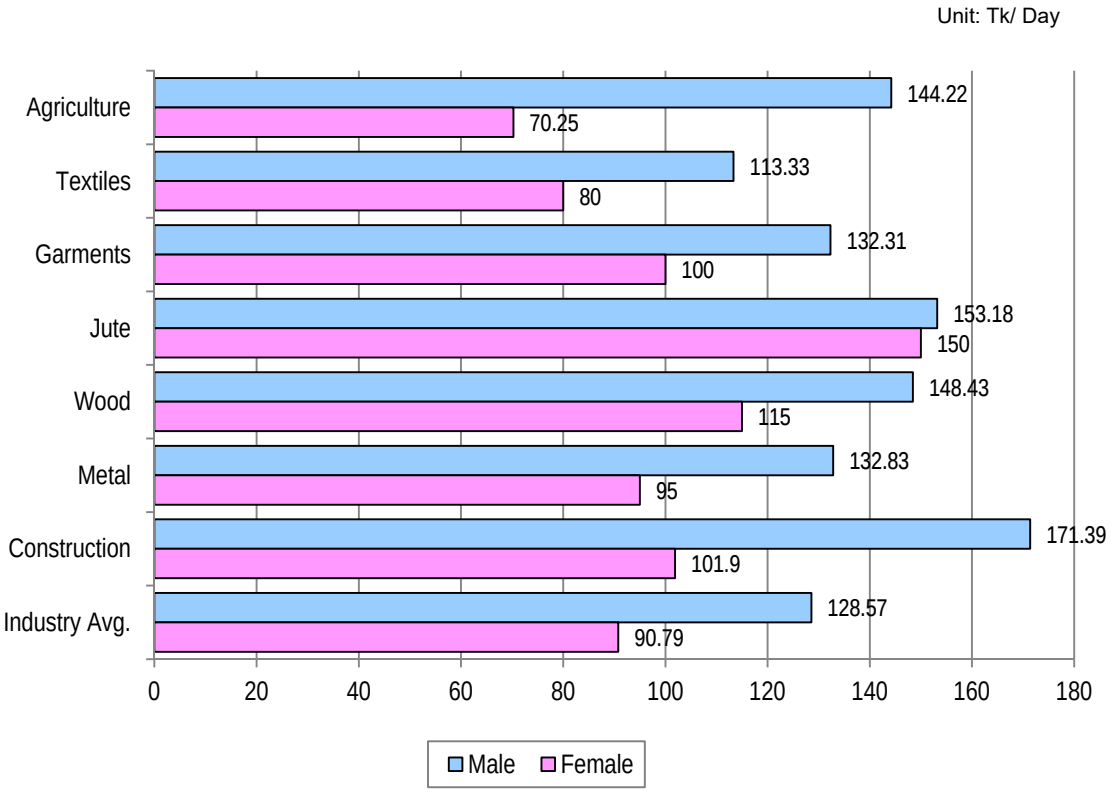
Bangladesh is concerned about the society's gender inequality and it is aiming to improve the participation rate of women in labour force of at least 40% by 2021. As shown in Figure 2.30, gradual change of women's labour force participation from 1999 to 2010 is reflected but still the percentage is quite 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 was 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 (sq.km)[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

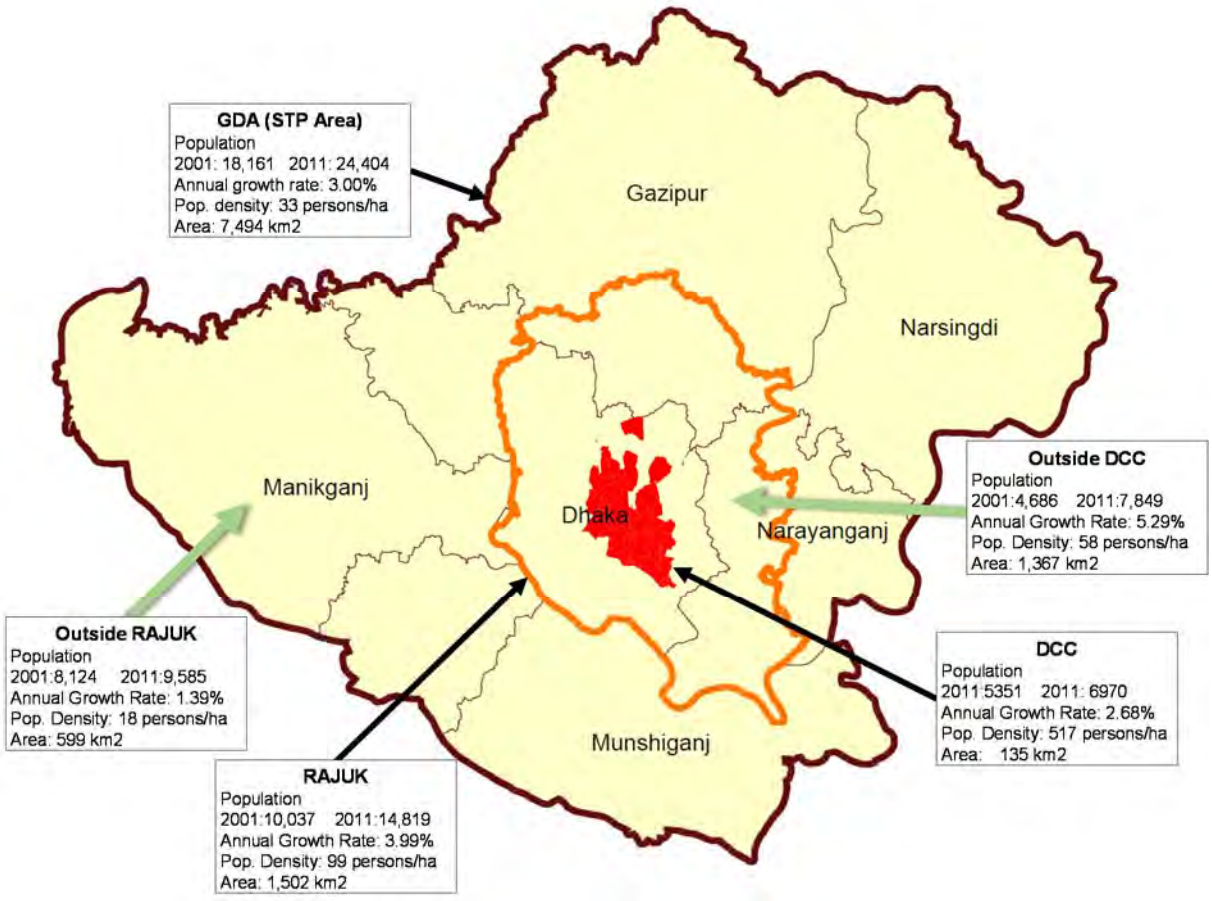
RAJUK planning area covers some parts of Dhaka and Gazipur Districts as well as Narayanganj with 20.1% of the GDA. As per population, RAJUK area has 14.9 million in 2011, and the share of its share to the GDA increased from 55.3% in 2001 to 60.7% in 2011 due to its rapid population increase (see Table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



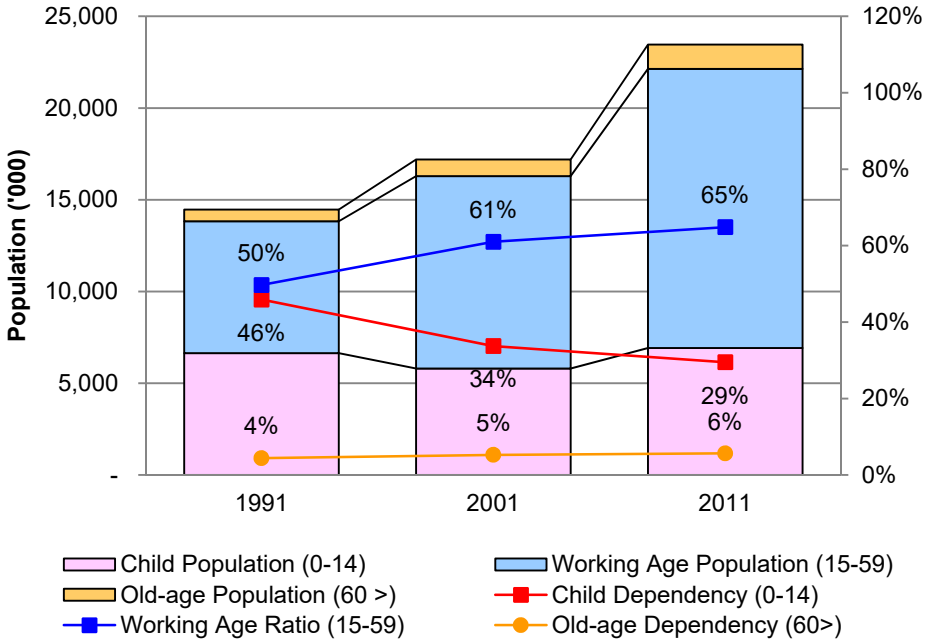
Unit of Population: thousand

Source: JICA Study Team

Figure 2.32 The Recent Population Trend by the areas

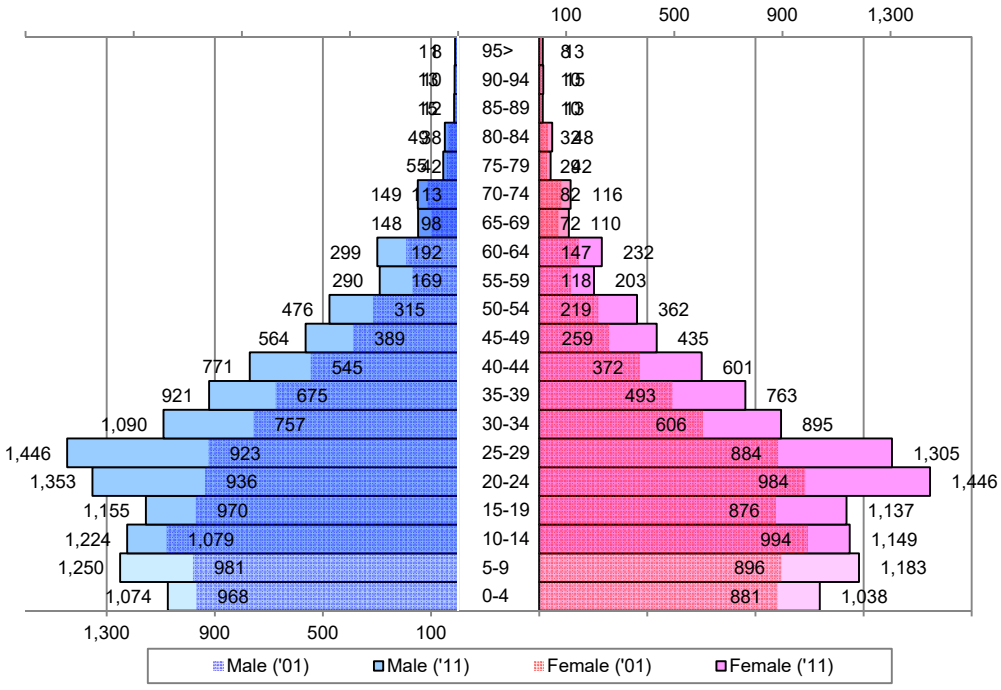
2) Population Share in the Study Area

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

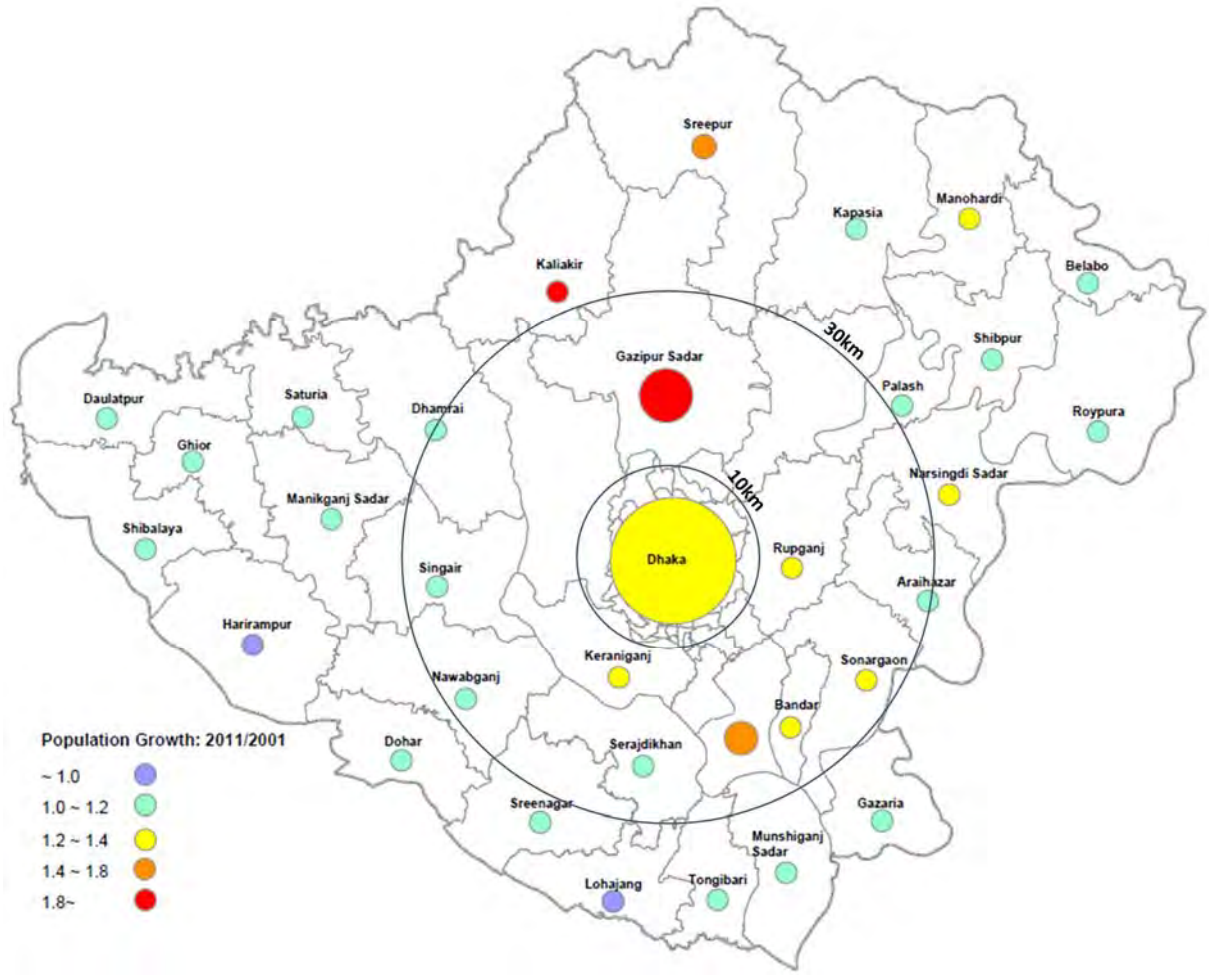
There are 29 cities (Upazila) besides Dhaka district and 26 cities outside of RAJUK area. Cities over one million of population are Gazipur Sadar, Narayanganj Sadar and Savar, which grow extremely fast. In case of outside RAJUK area, Narsingdi is the largest and Rajupura, Sreepur and Kaliakoir exceed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

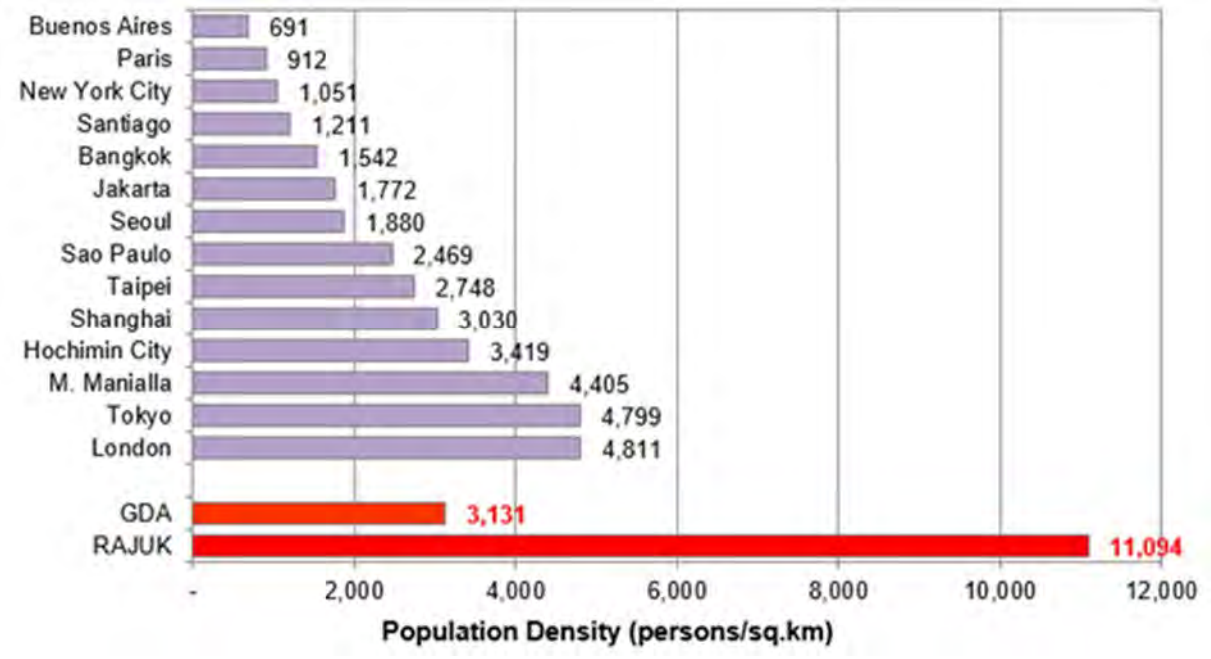


Source: JICA Study Team

Figure 2.35 Distribution of Major Cities (Upazila) in GDA

4) Population Density by Union

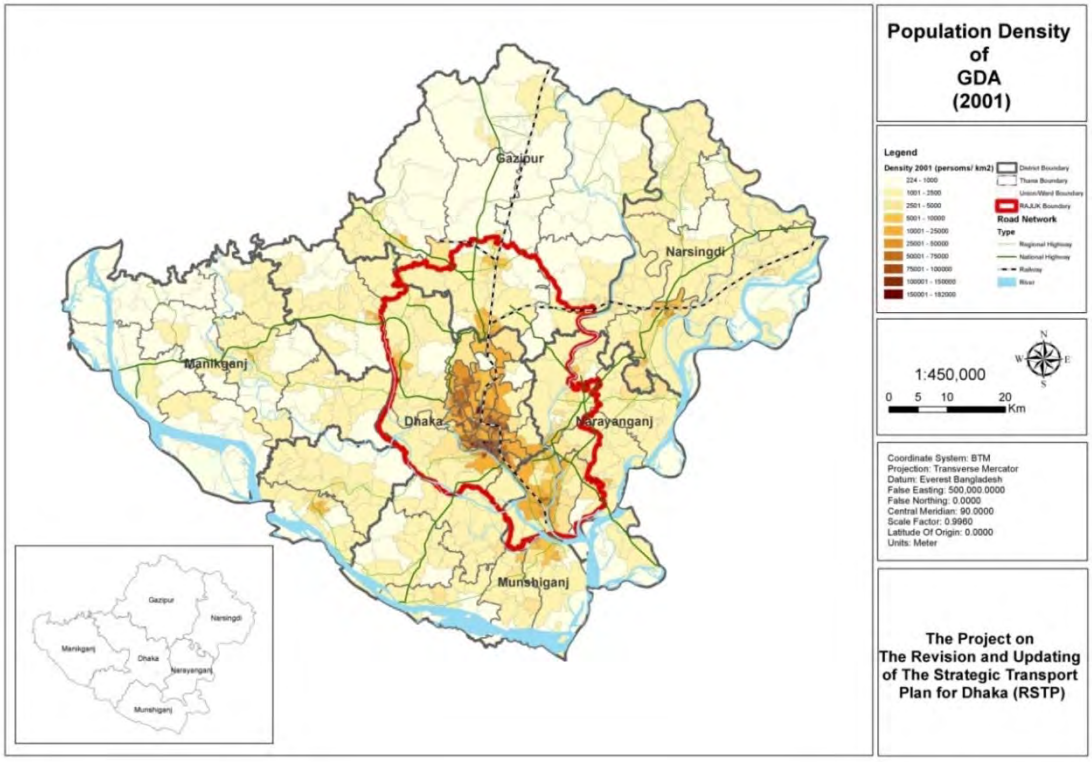
Bangladesh is ranked first among all countries with more than 10 million people. Among the densely populated cities in the world, RAJUK area is at the top with 11,094 persons/km^2.



Source: JICA Study Team compiled several data source

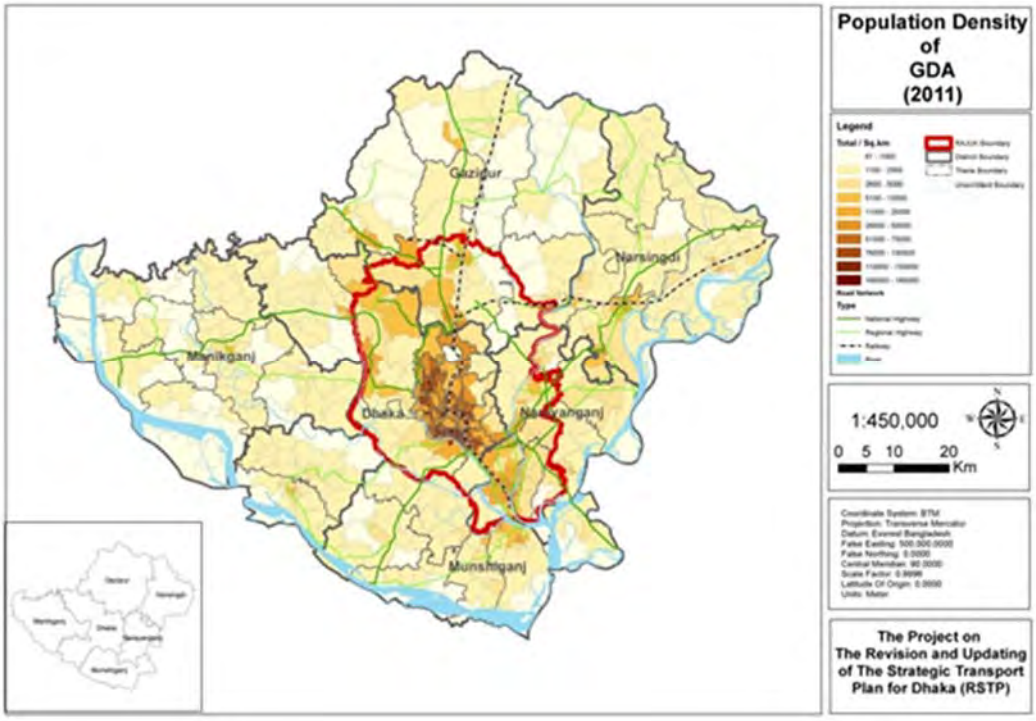
Figure 2.36 Population Density in Metropolitan Area

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

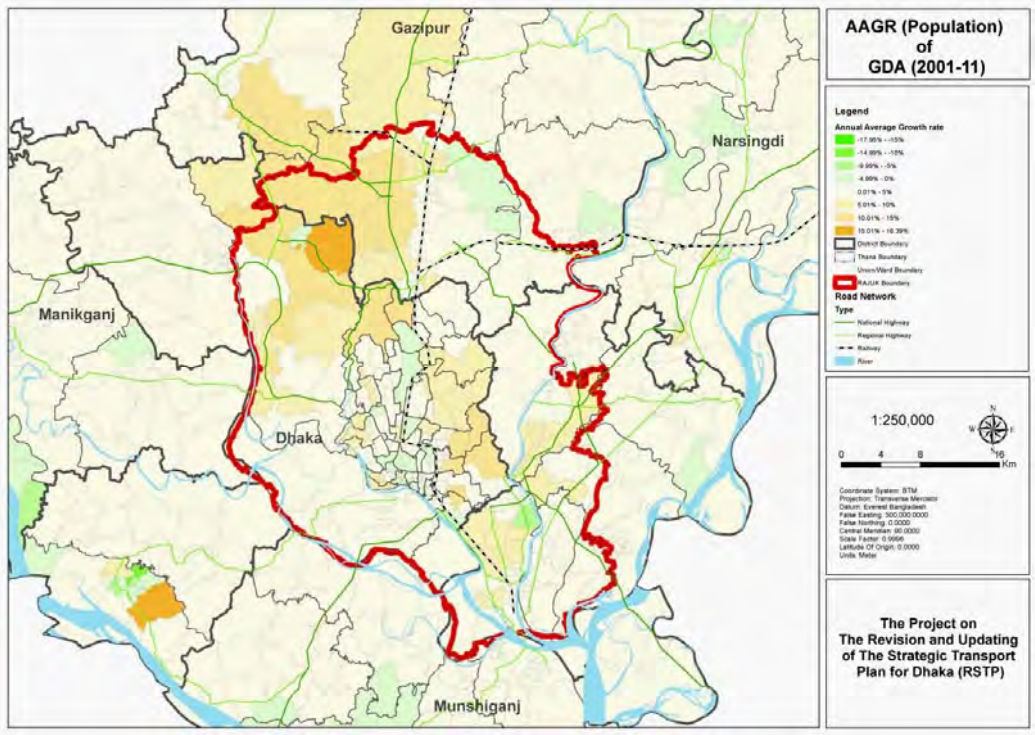
Figure 2.37 Population Density by Union in 2001



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, Shitalakshya River and Dhaleswari 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

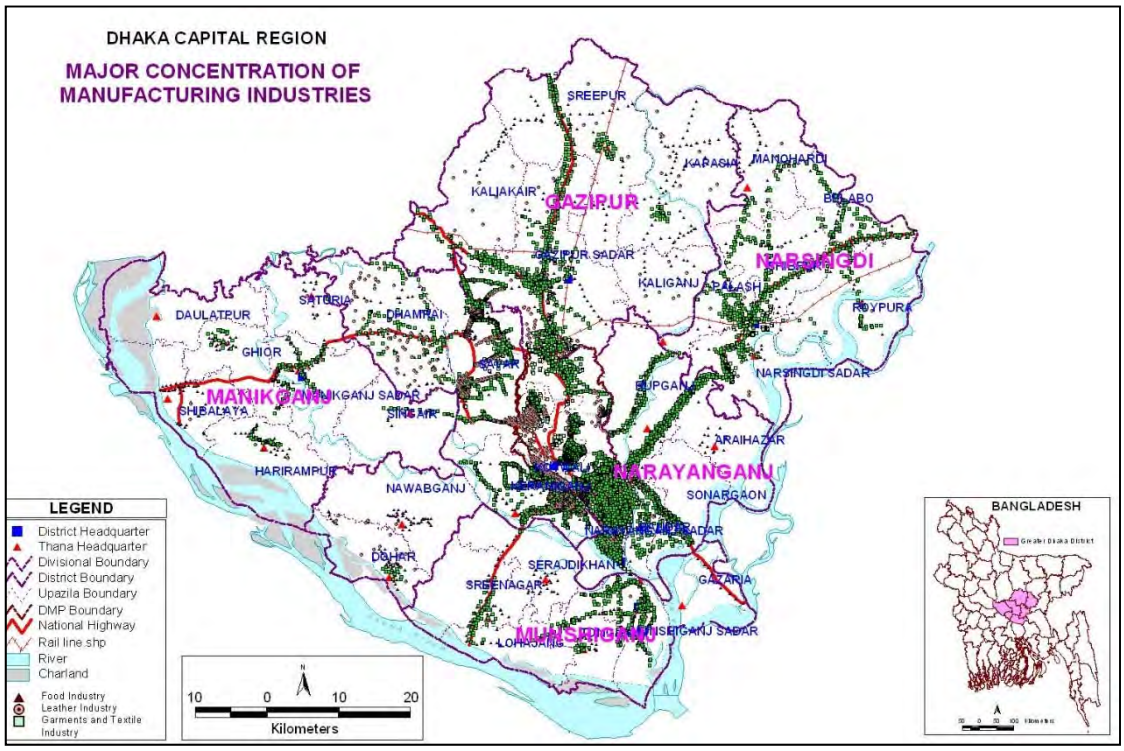
Dhaka District has an inverted doglegged shape with 146,400 ha. The urban development of the district has been concentrated on its Central Region. A big disparity is evident between the land use in Dhaka Central Region and the land uses in northwest and southwest portion of the district.

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 137,900 ha 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 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 Bengali) 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 located in Balabo area; the industrial area is located along the same corridor. Textiles 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.

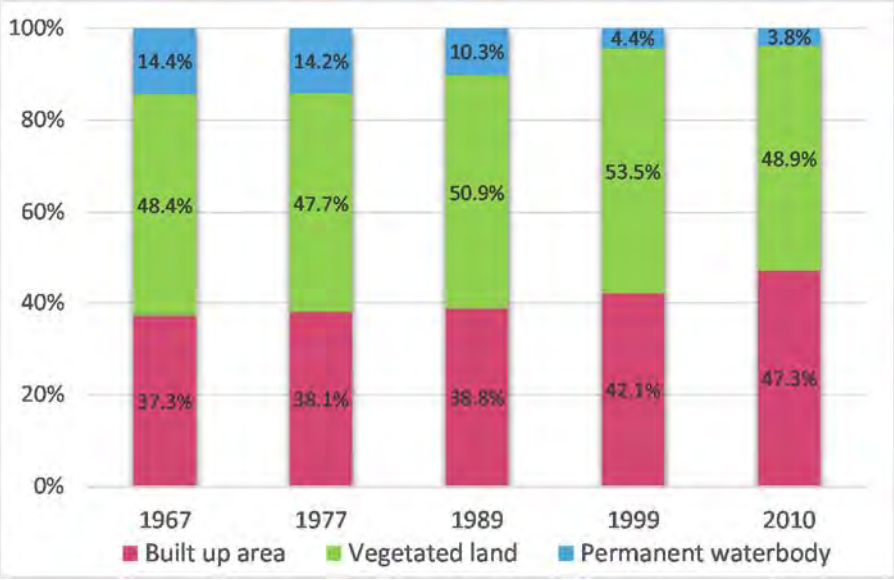
(2) RAJUK Area

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 206,868 ha in 1967 as shown in Figure 2.43. Thus, the waterbody has been converted to built-up area. The lack of growth management and planned urbanization causes extensive urban poverty, recurrent episodes of flash flooding, substantial growth of slums, and exploitation of resources and the mismanagement of limited land resources.

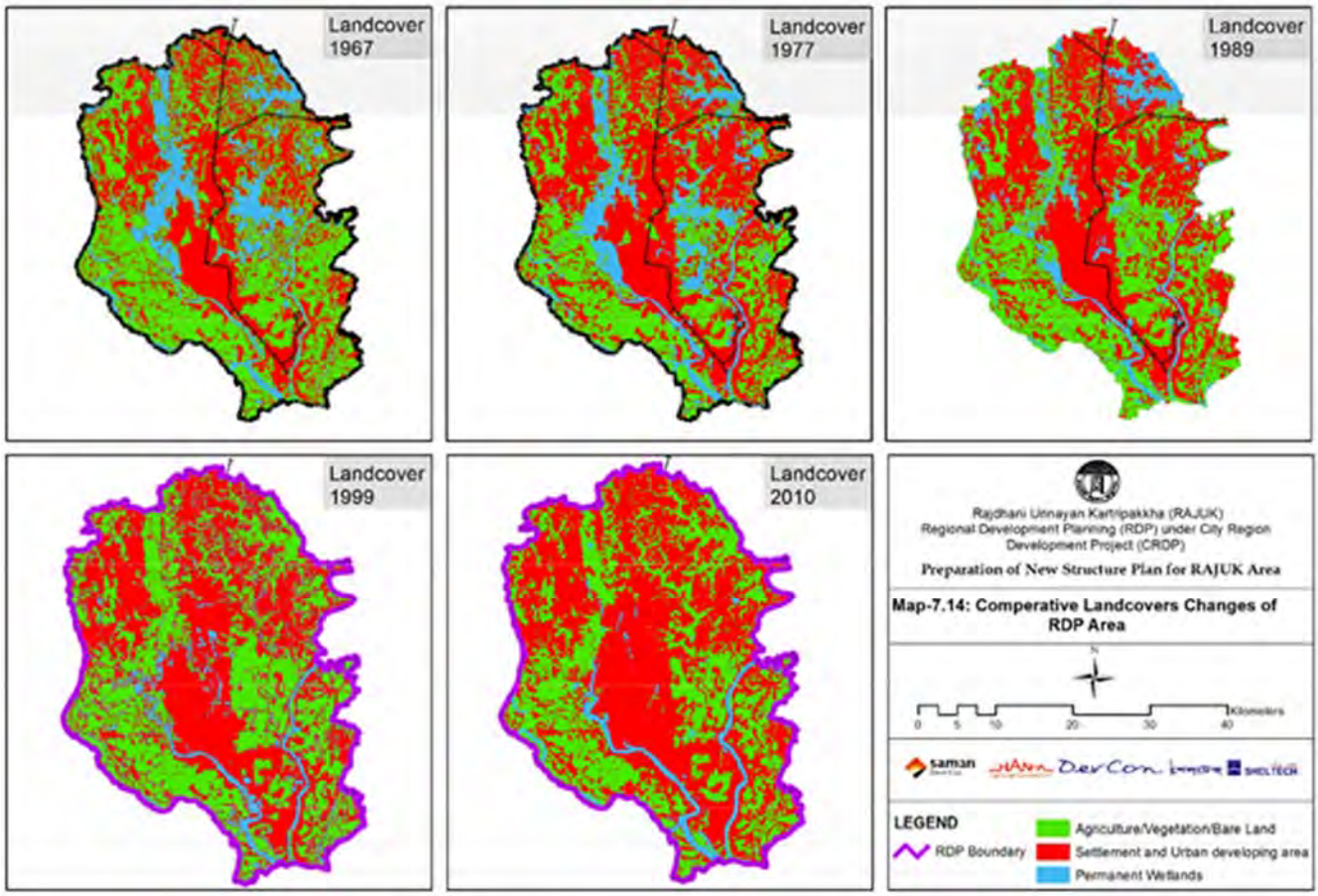
In 1967 to 1989, the built-up area had increased gradually from 53,727ha to 55,921ha with 0.2% of the annual increase rate. After that period, the urbanization has been accelerated. The built-up area increased by about 5,000 ha in the period of 1989 to 1999 and by 7,500 ha in the period of 1999 to 2010,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

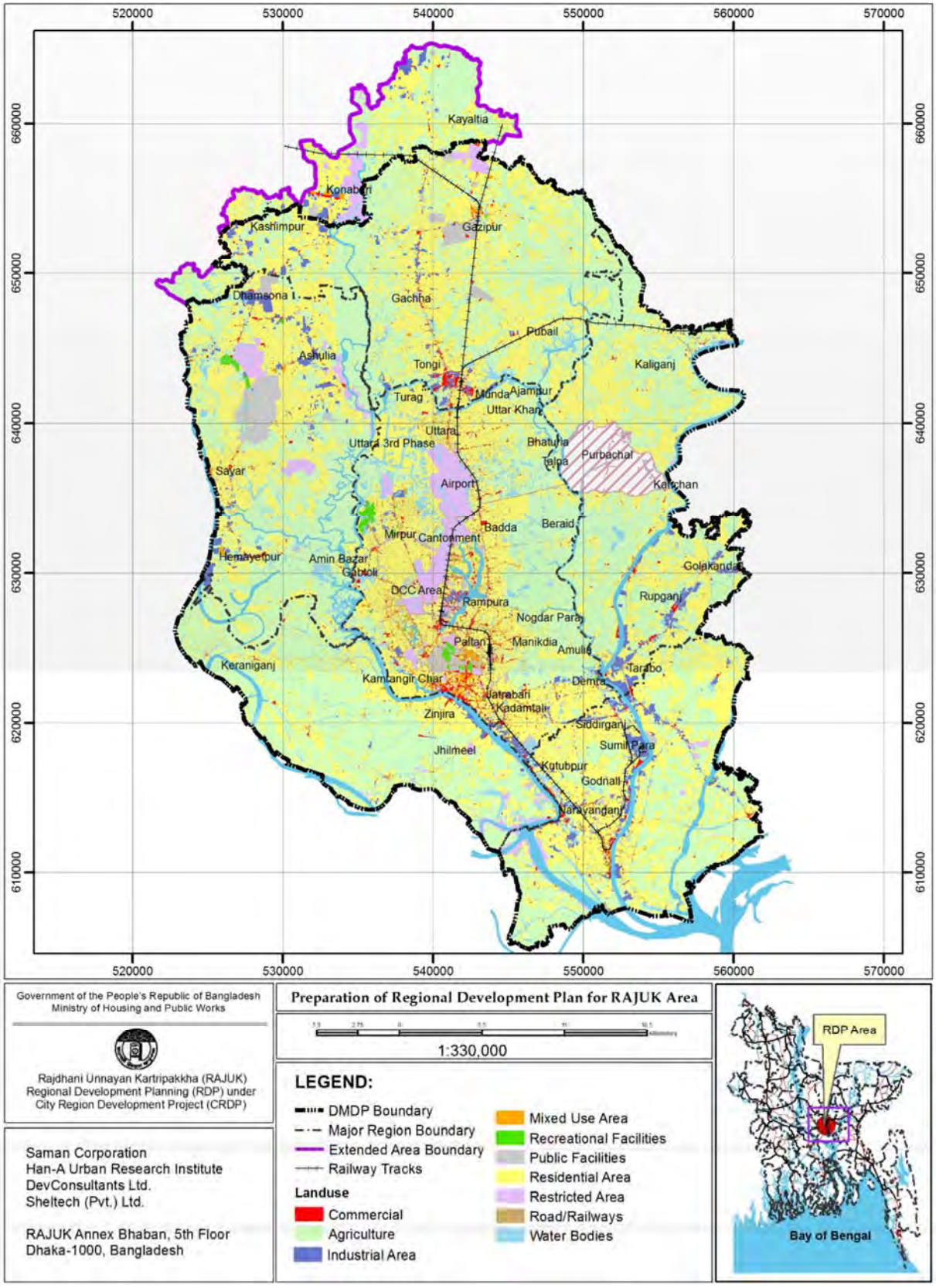
The total RAJUK area is 152,000 ha; in which the Northern Region accounts the largest area with 23.4%, followed by Dhaka Central Region with 19.8% and Western Region with 16.6%. In terms of land use type, the agricultural use is still dominant, which shares more than 40% of the total area in RAJUK. These 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 13,000 ha 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 540 ha of industrial area which are mainly in Pallabi, Mirpur and Hazaribag Thanas; and 690 ha 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; 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, 7,100 ha 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 2,030 ha 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, Hazrat Shahjalal 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 17,200 ha is the second largest in RAJUK area, followed by Dhaka Central Region with 18,000 ha. 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 14,000 ha 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 860 ha 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). 9,800 ha of agricultural land covers mostly the eastern fringe area with low lying land. Some part of waterbody with 1,300 ha 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

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

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 area 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-Aricha, 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 700 ha of the industrial area includes the Savar Export Processing Zone located along the Nabinagar-Tangail road. Some other industrial establishment is located along Dhaka-Aricha 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 140 ha 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 Energy Commission, Bangladesh Livestock Research Institute, etc. Those areas cover about 1,200 ha. There are also about 750 ha 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 910 ha 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 and by the Buri Ganga River on Keraniganj Upazila..

240 ha of commercial area is all located in City Corporation area alongside 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 8,800 ha of agricultural land and 2,400 ha 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. 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 • High availability of lands for development including unused land and many agricultural lands in GDA • Relatively clear role-sharing among the regions in RAJUK	• Presence of huge flood prone areas • Widely scattered low density settlement in the rural area • Weak connectivity to the Dhaka Central Region from other areas • Lack of capacity for land-use management failing control to private developers • Concentration of public facilities and restricted area in the city center which occupies the prime area for urban development • Lack of appropriate housing development plan for low income group
Opportunities	**Threats**
• On-going preparation of Regional Development Planning • On-going new town development by public and private	• Reduction of vegetation areas and waterbody due to conversion to disordered land development • Increase in spontaneous development led by Industrialization and commercialization • 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) Dhaka Master Plan (1958 – 1978)

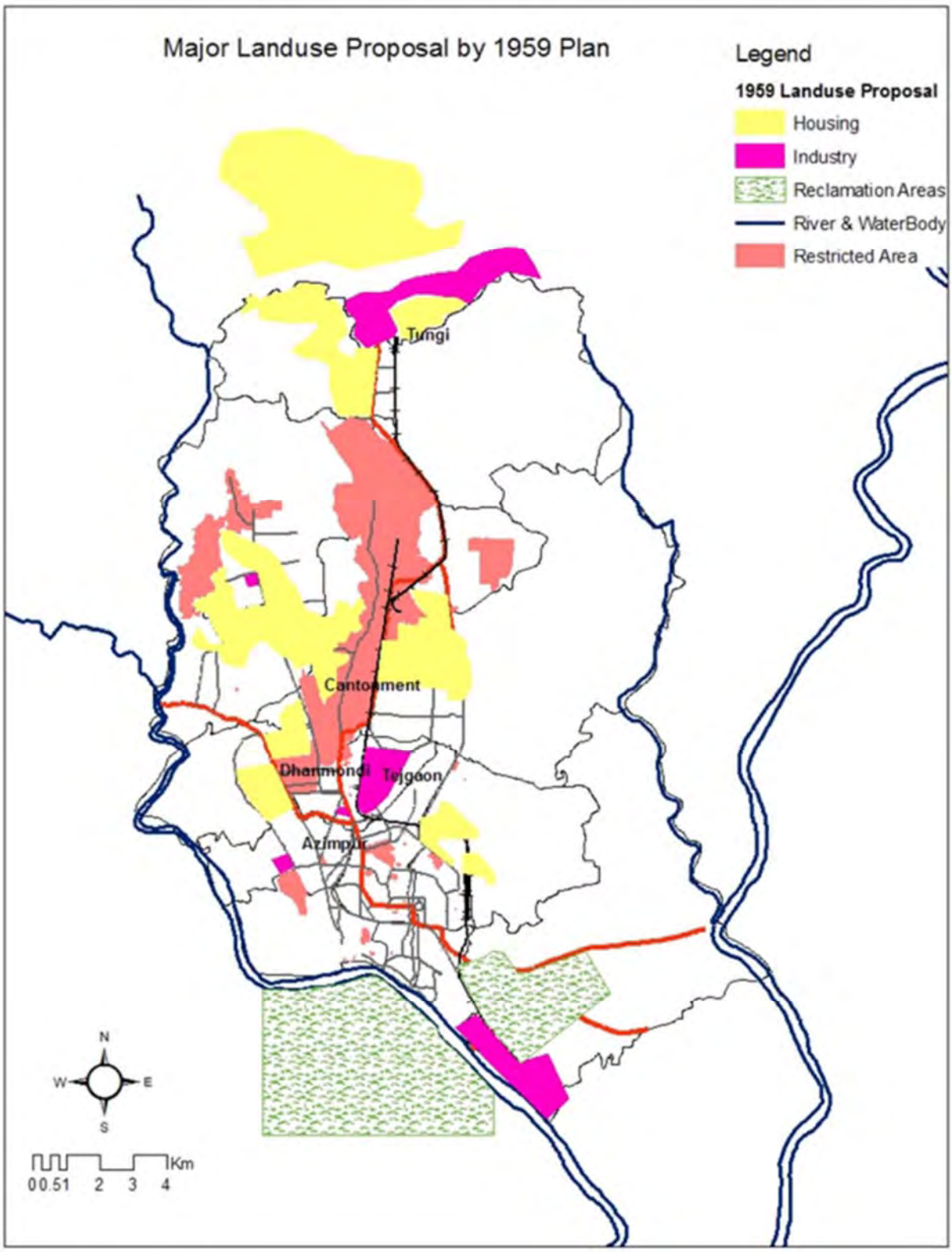
The first comprehensive master plan was formulated in 1958 with the objective to establish planning principles rather than to lay down a detailed and inflexible scheme. In this master plan, two main problems of Dhaka City were identified such as; shortages of flood free land, and the congestion in the 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 Dhaka 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.



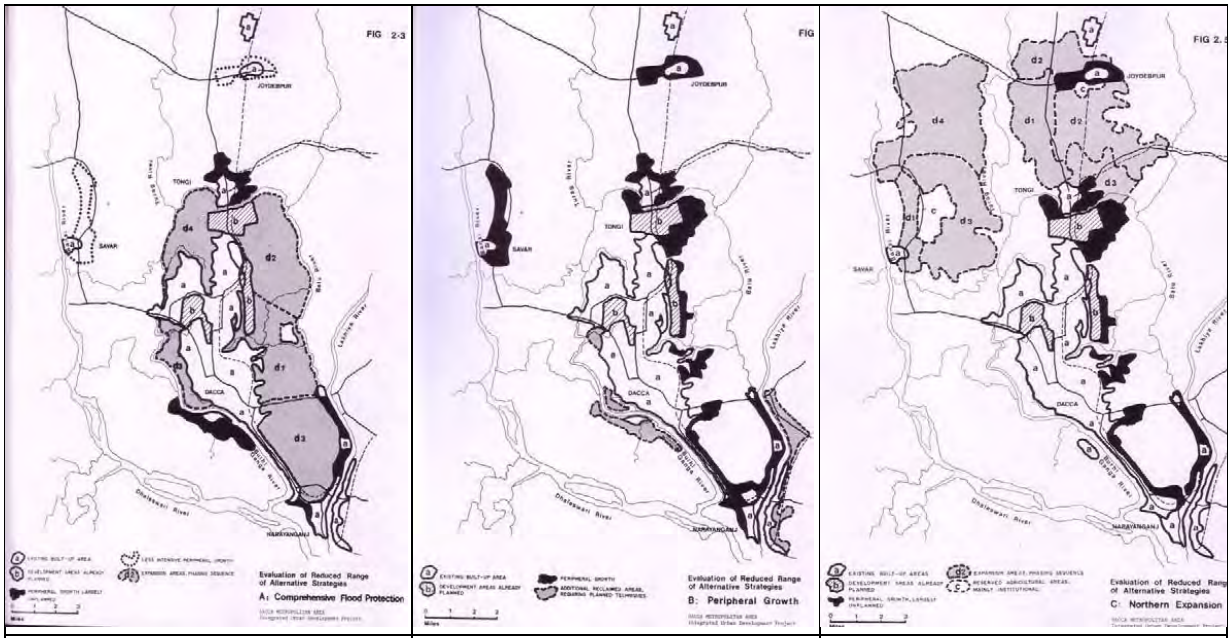
Source: Planning and Developmnet of Dhaka – A Story of 400 Years

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:

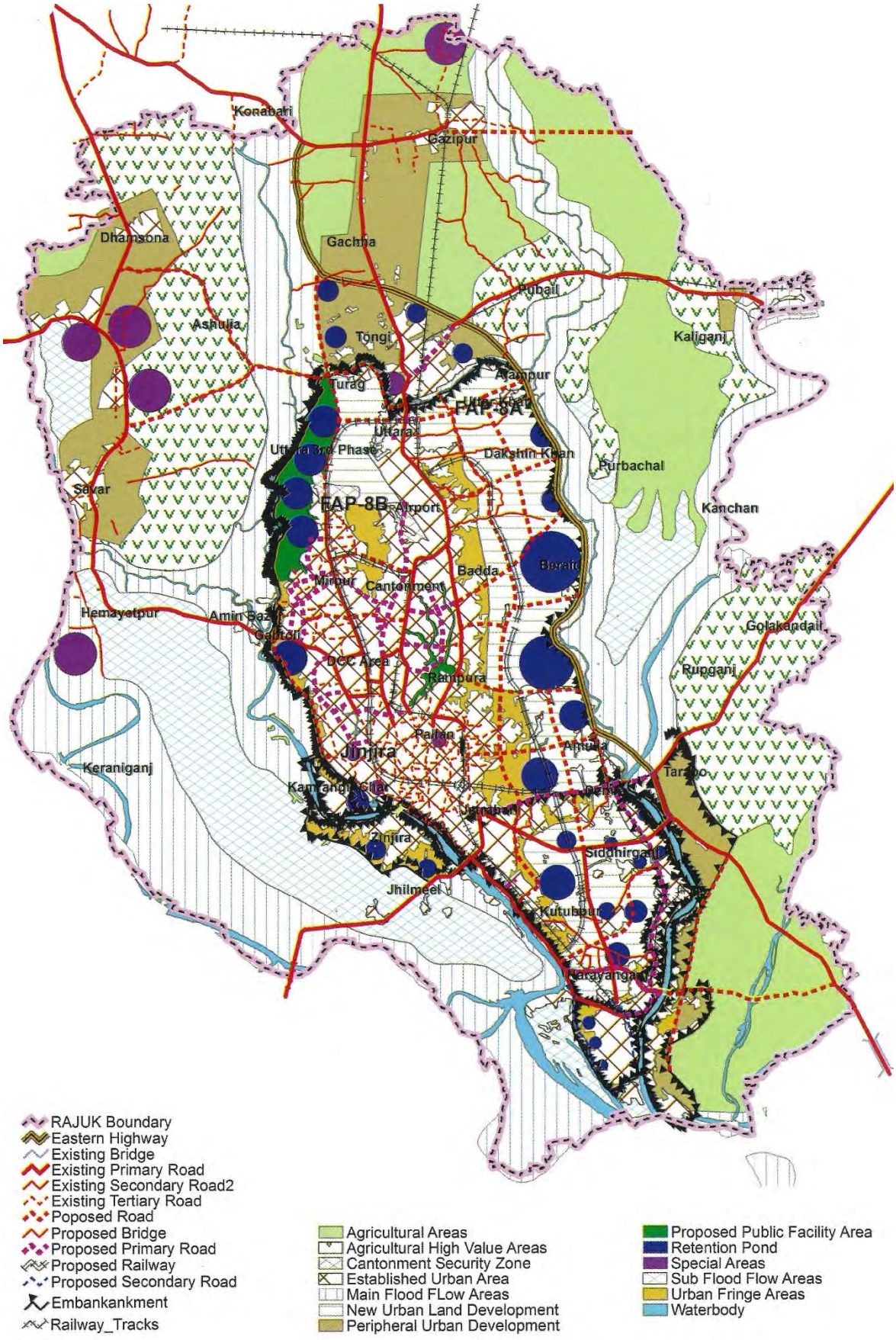
i **Spatial and Environmental Sectors:** To conserve and promote areas of high agricultural value; to expand winter cropping and culture fisheries in Narayanganj-Narsingdi FCDI project area, to control land development within flood flow zone; to prevent pollution at Lakhya River and its tributary and 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

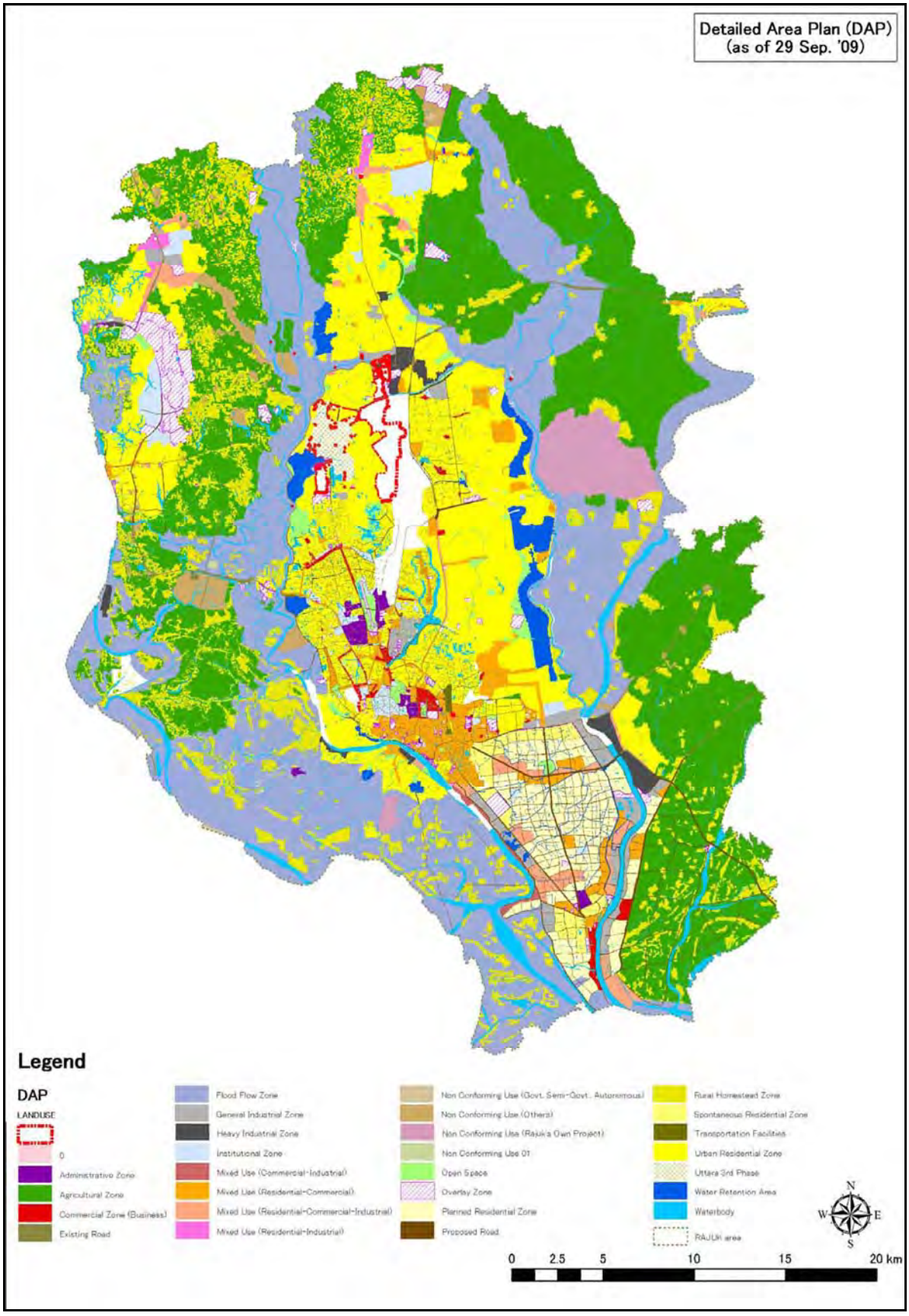
Based on the Structure Plan, UAP was prepared, covering the existing urban area and its adjacent areas. The UAP describes the salient features for each of the 26 Spatial Planning Zones (SPZ), including DCC, Narayanganj, Jinjira, Uttara, the Eastern Fringe, Tongi, Gazipur, Savar and Dhamarai/Dhamsona. 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	8,290 ha	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 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

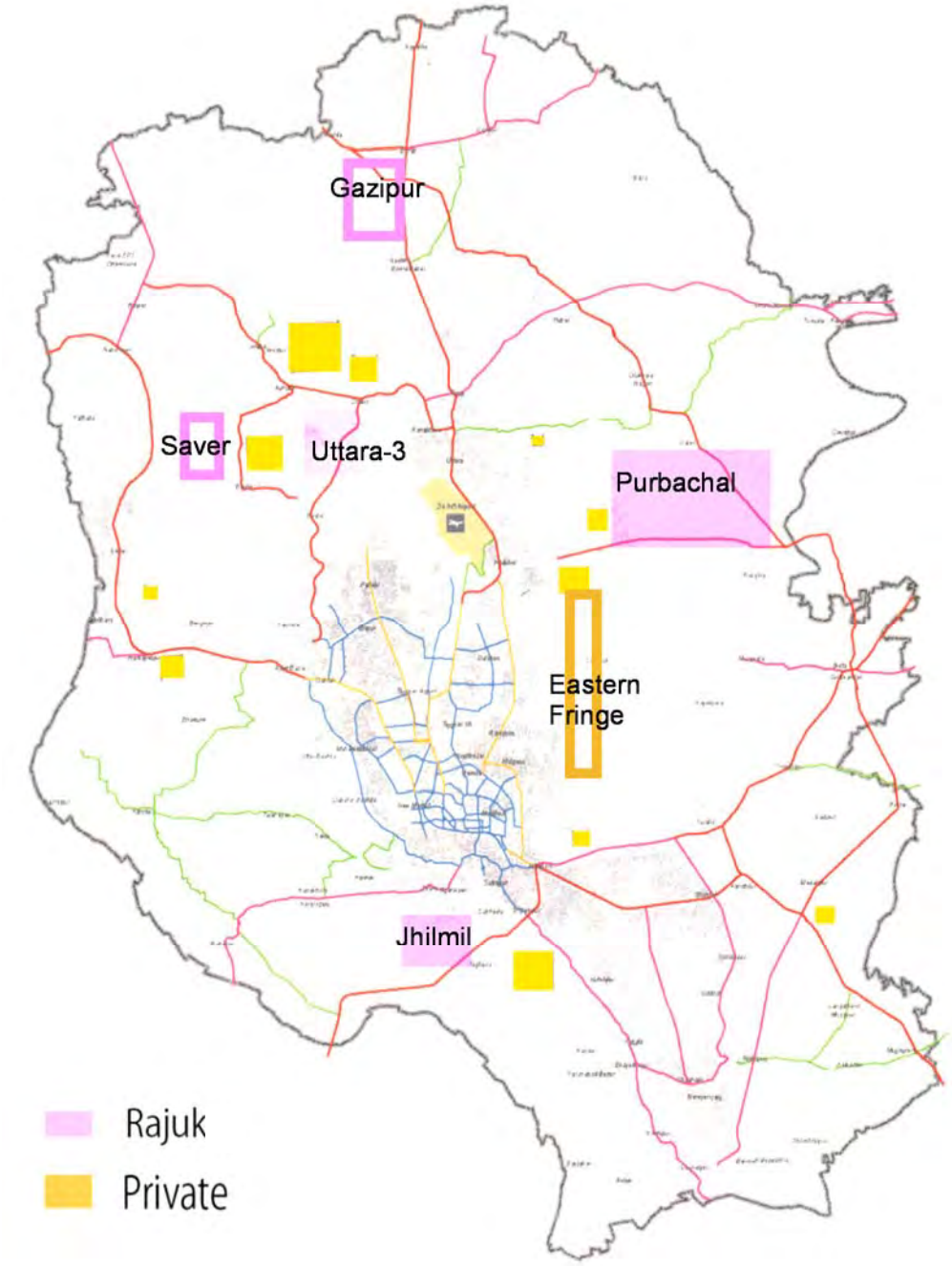
Source: RAJUK

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 5,000 ha.

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

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 17,000 ha. 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 industral 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

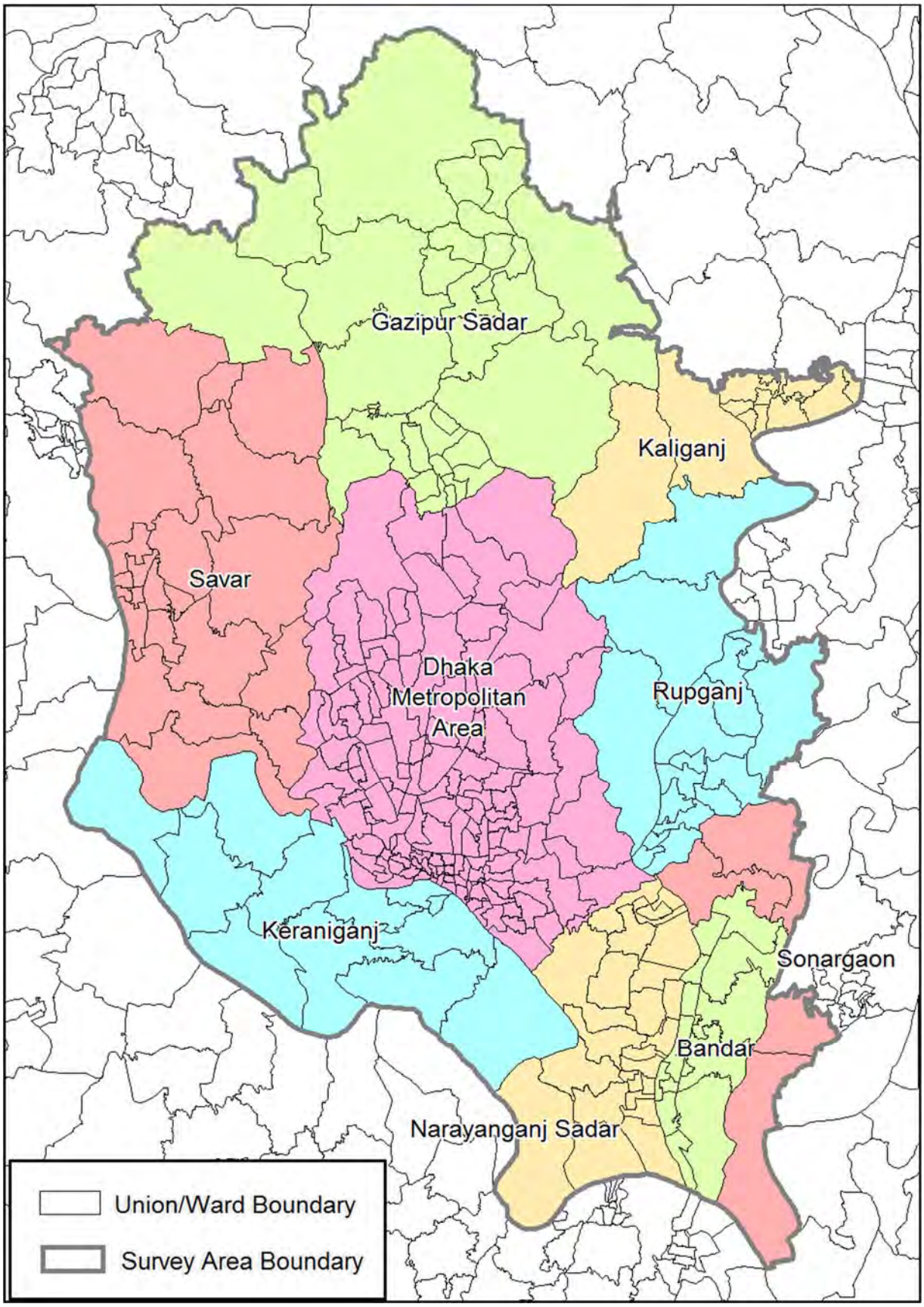
The study conducts four traffic surveys, namely; the Household Interview Survey, the Cordon Line Survey, the Screen Line Survey and the Public Transportation Users' Opinion Survey. Although DHUTS earlier conducted similar traffic surveys, it would not be appropriate to develop database for this study 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.

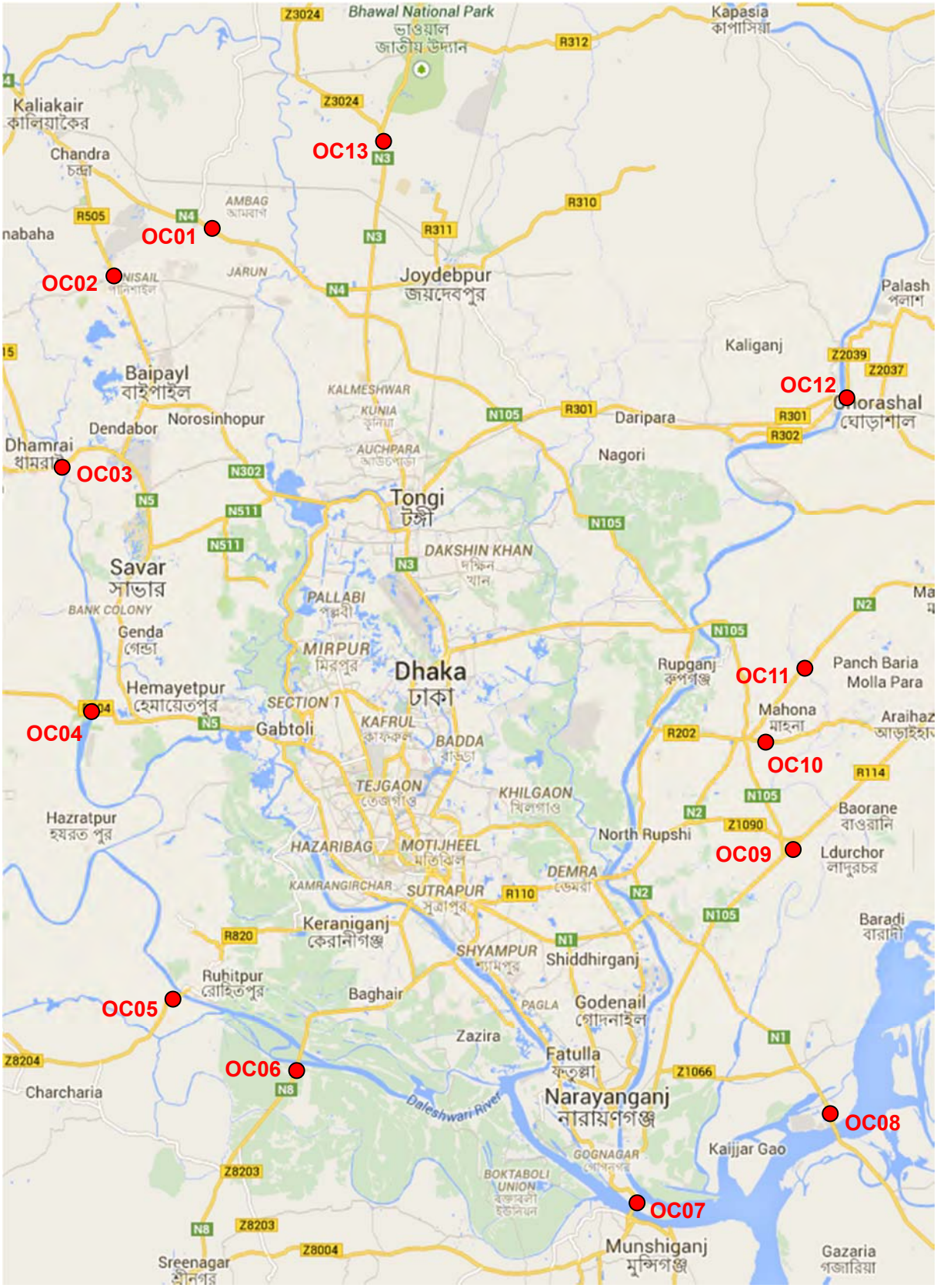
Passenger count and OD interview surveys are conducted in public transport terminals/stations excluding bus terminals where the passenger count survey is not required. Basically, survey period is 24 hours however in case of terminal that is not a 24-hour operation, the survey period adjusts as per the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

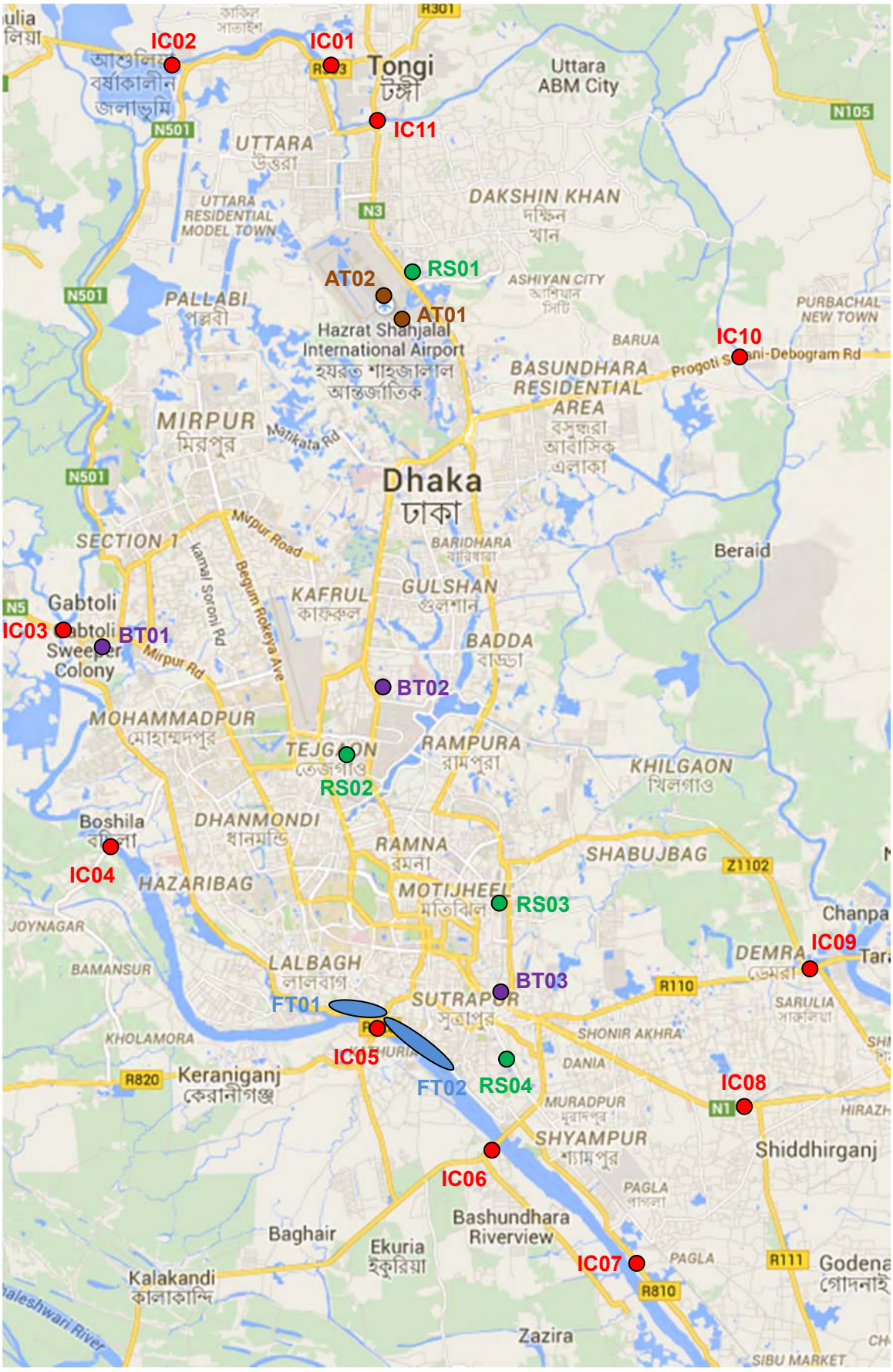
Seq.	Category	Code	Survey Station		Survey Period (hours)		
					Traffic Count	OD Interview	Vehicle Occupancy
1	Roadside	IC01	Tongi Bypass Road	Boundary of DMA	24	-	16
2		IC02	Tongi-Ashulia-Zerabo-EPZ Road	Boundary of DMA	24	-	16
3		IC03	Dhaka-Aricha Highway	Boundary of DMA	24	-	16
4		IC04	Third Buriganga 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

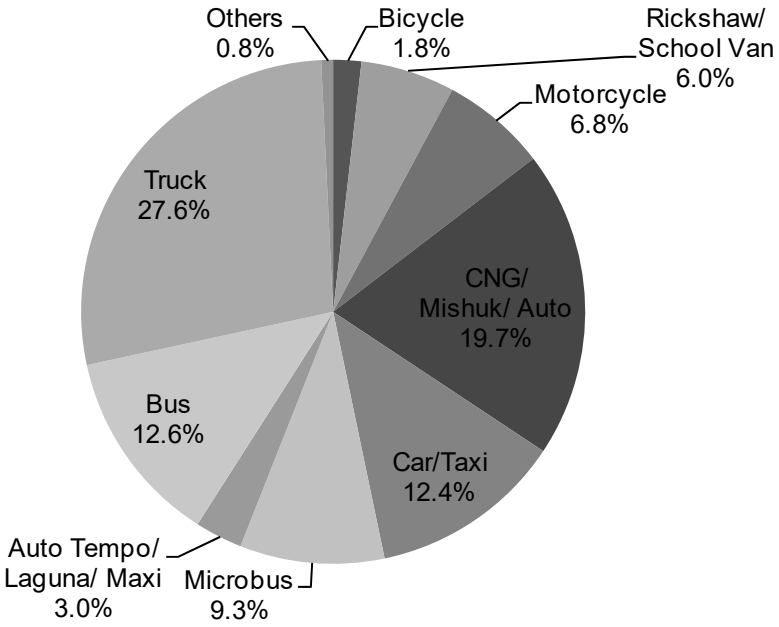
Continued – Actual Location and Survey Date and Time of the Cordon Line Survey

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, Badamtoli 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

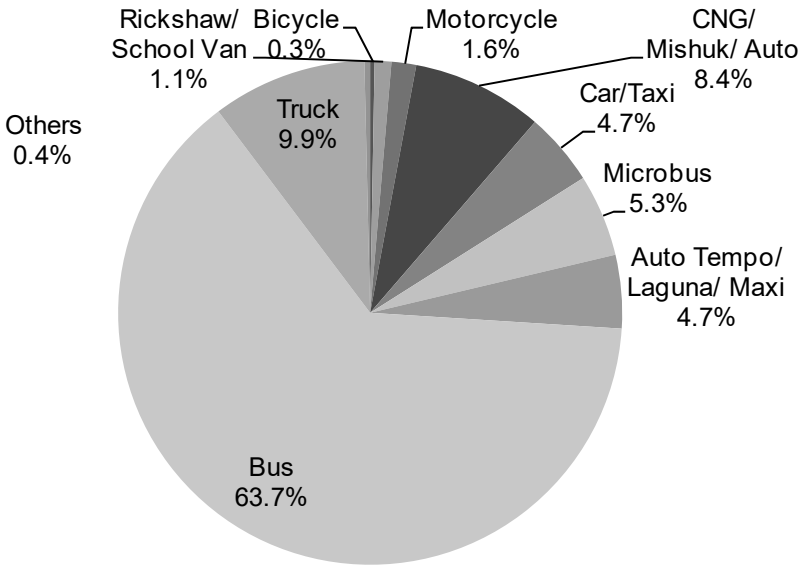
(3) Results of the Inner Cordon Line Survey

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

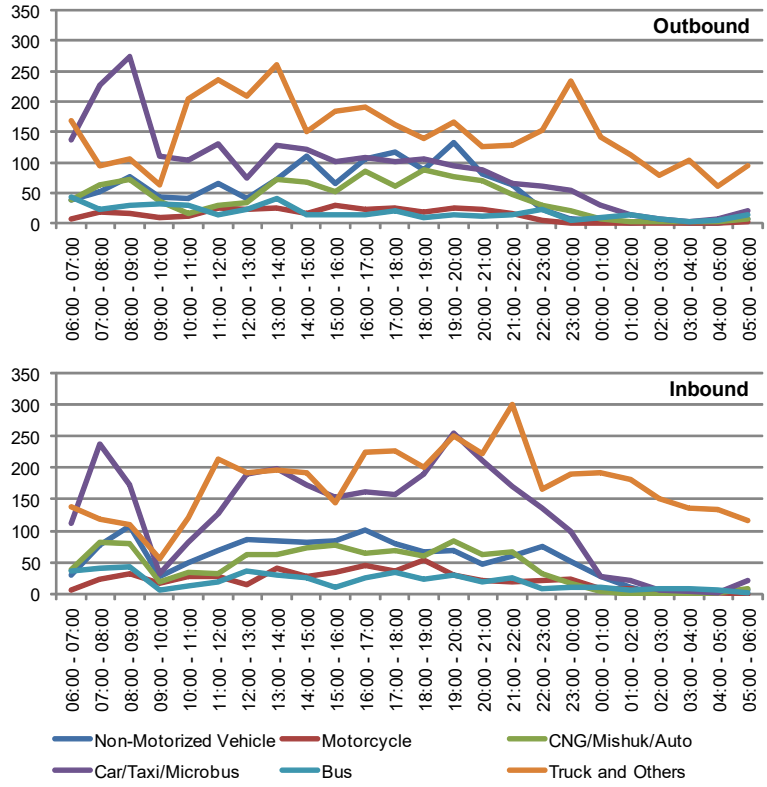
Source: Cordon Line Survey 2014, JICA Study Team

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

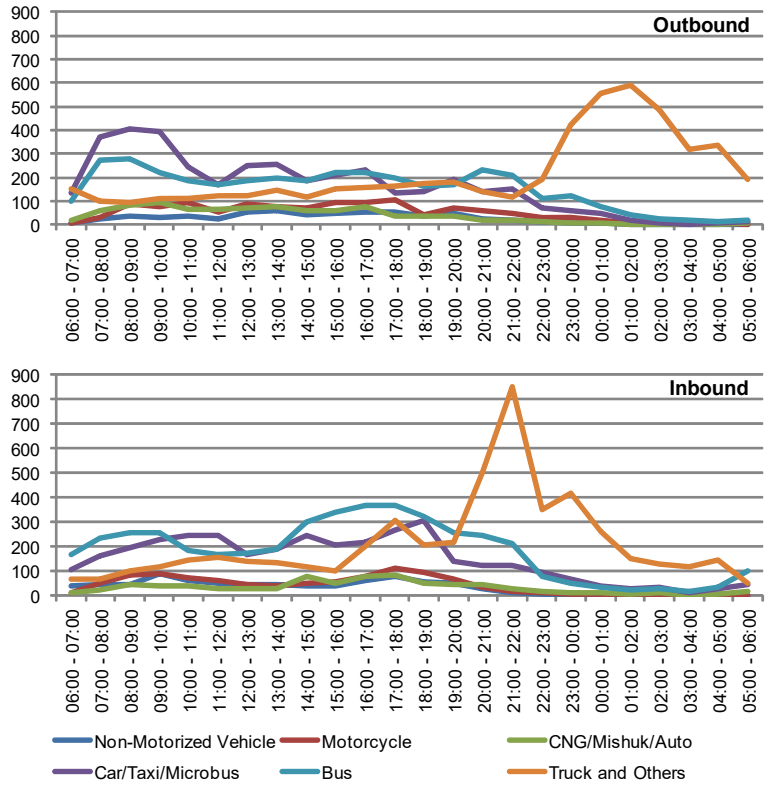
Note: Figures include drivers and conductors as well. Dashes ("-") indicate no samples were observed.

Source: Cordon Line Survey 2014, JICA Study Team



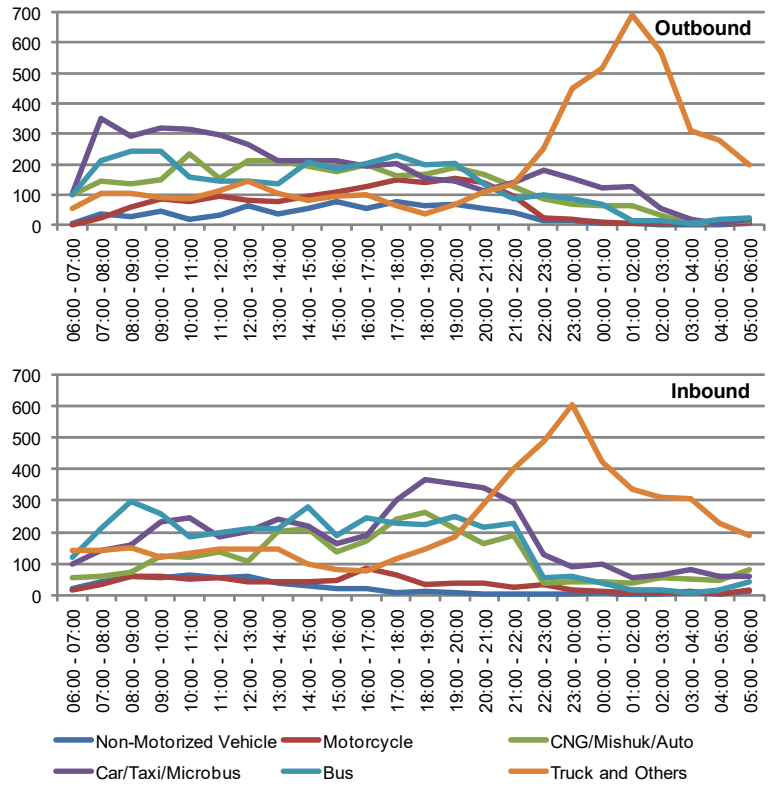
Source: Cordon Line Survey 2014, JICA Study Team

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



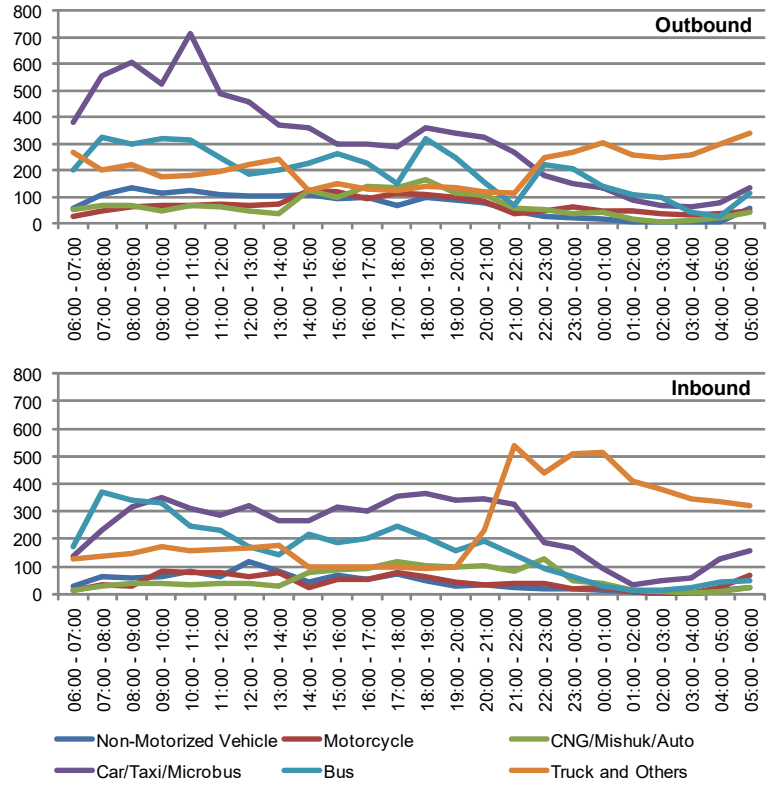
Source: Cordon Line Survey 2014, JICA Study Team

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:

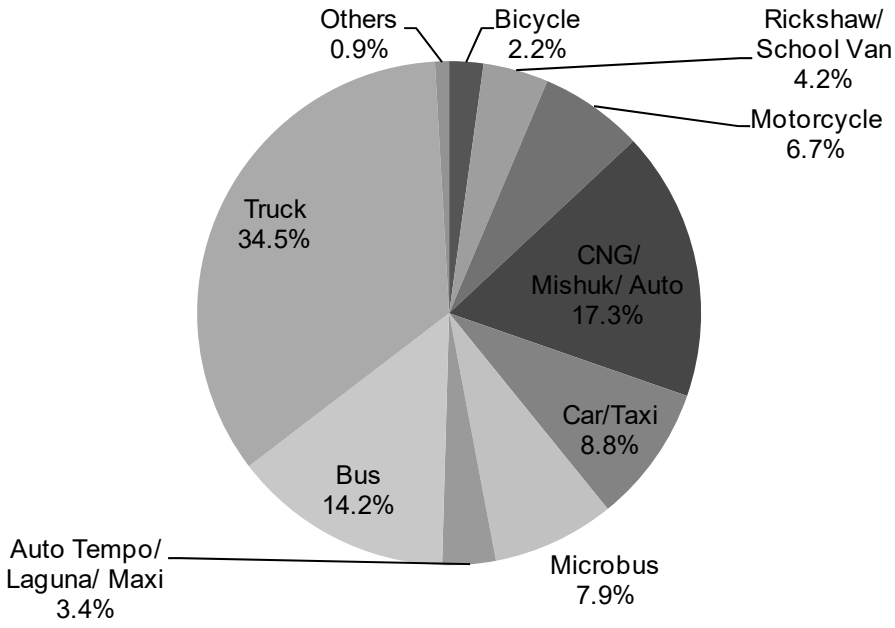
- Non-Motorized Vehicle: Bicycle, Rickshaw and School Van;
- Motorcycle: Motorcycle;
- CNG/Mishuk/Auto: CNG/Mishuk/Auto;
- Car/Taxi/Microbus: Car, Taxi, and Microbus/Jeep;
- Bus: Auto Tempo/Laguna/Maxi, Bus/Minibus, AC Bus, Staff Bus and School/Collage/University Bus; and
- Truck and Others: 3-axle Truck/Trailer,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

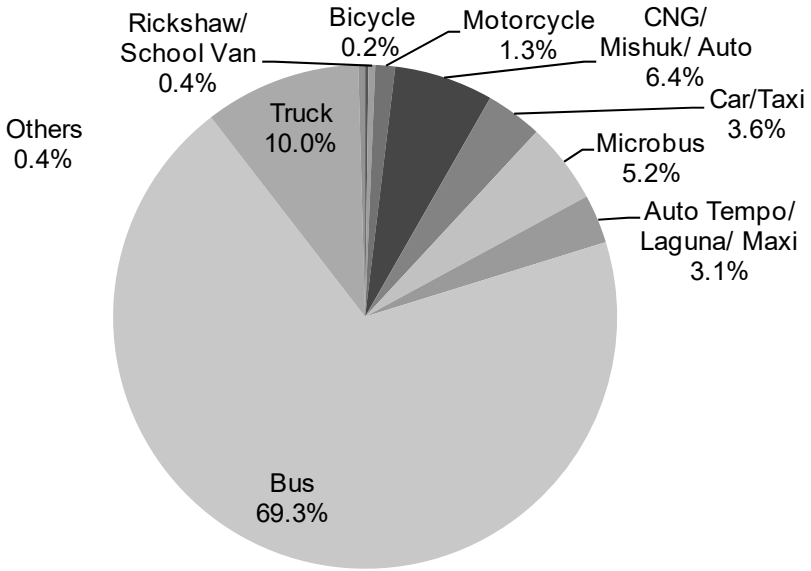
As for the roadside traffic count surveys, observed daily traffic volumes were 123 thousand vehicles and 916 thousand passenger trips. Figure 3.10 and Figure 3.11 illustrate observed modal shares based on vehicular and passenger volumes. The result shows public transportation modes have a share of 85% 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

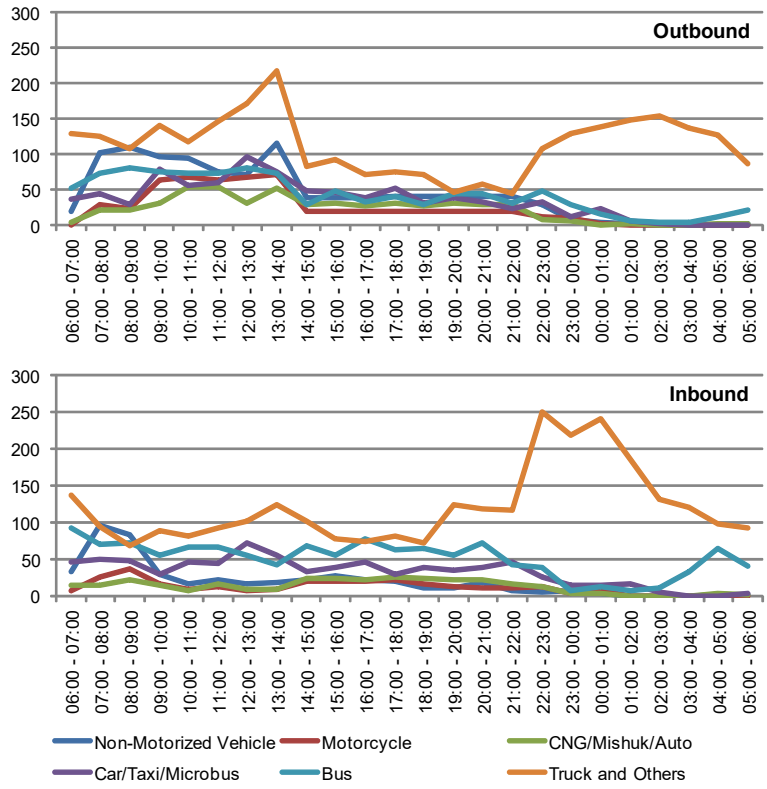
Survey Station	Non-Motorized Vehicles				Motorized Vehicles															Grand Total
	Bicycle	Rickshaw	School Van	Total	Motorcycle	CNG/ Mishuk/ Auto	Car	Taxi	Auto Tempo/ Laguna/ Maxi	Microbus/ Jeep	Bus/ Mini-bus	AC Bus	Staff Bus	School/ Collage/ University Bus	3-axle Truck/ Trailer	Tanker/ Tank Lorry	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

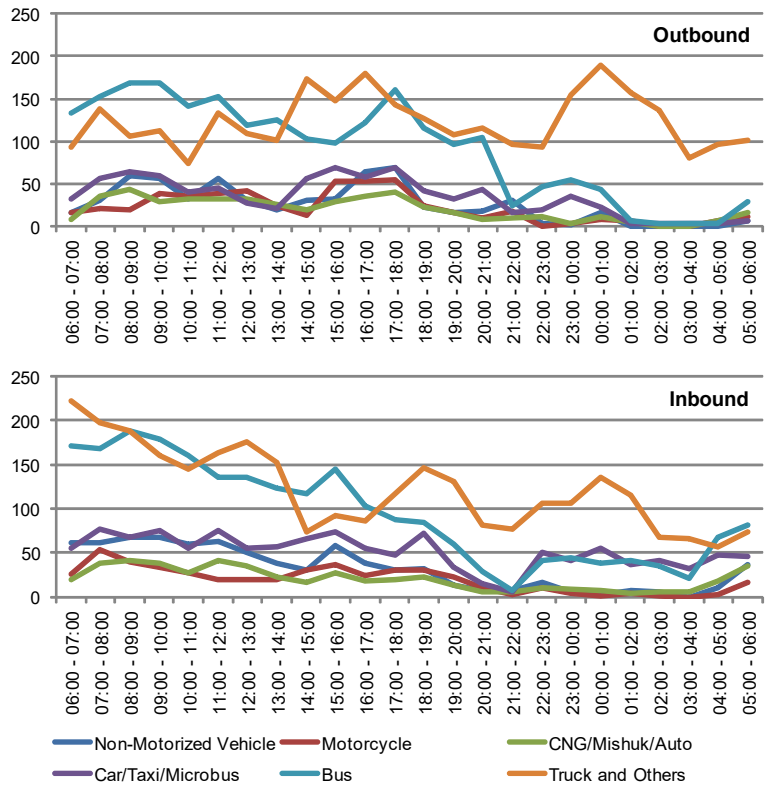
Survey Station	Non-Motorized Vehicles			Motorized Vehicles														
	Bicycle	Rickshaw	School Van	Motorcycle	CNG/ Mishuk/ Auto	Car	Taxi	Auto Tempo/ Laguna/Maxi	Microbus/ Jeep	Bus/ Mini-bus	AC Bus	Staff Bus	School/ Collage/ University Bus	3-axle Truck/ Trailer	Tanker/ Tank Lorry	2-axle Truck	Pick-up/ 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



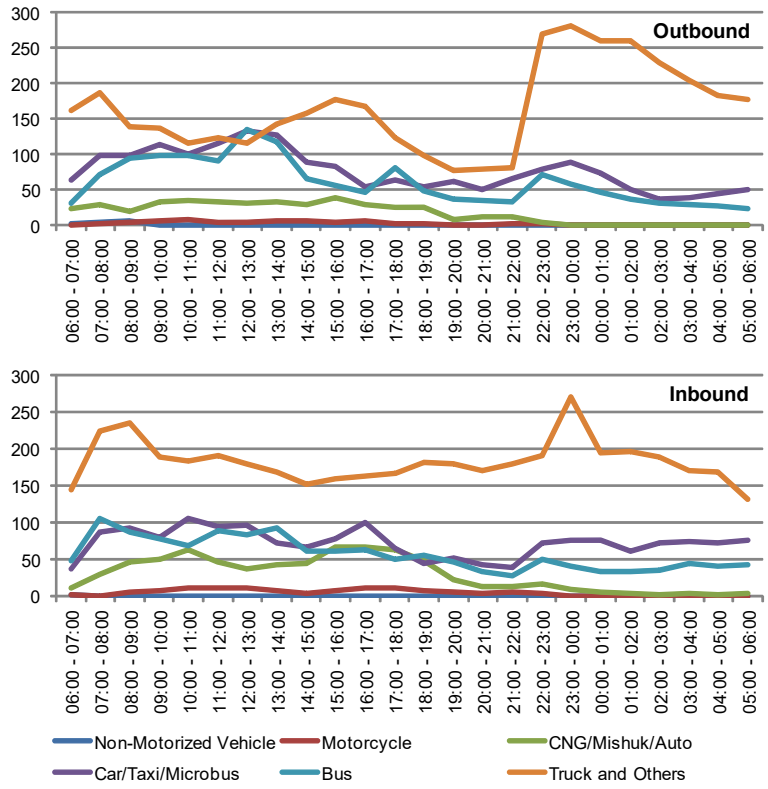
Source: Cordon Line Survey 2014, JICA Study Team

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



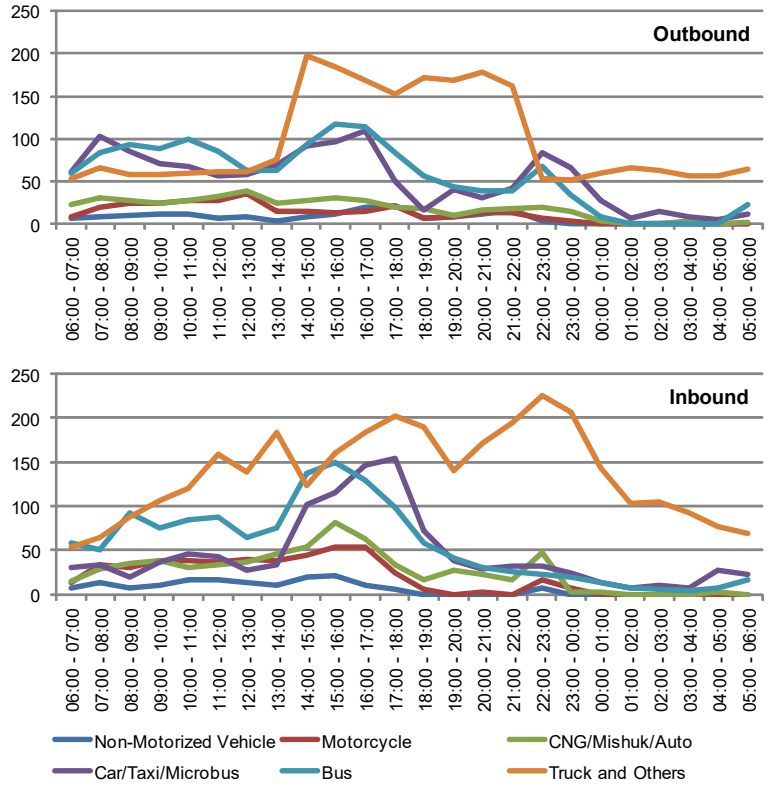
Source: Cordon Line Survey 2014, JICA Study Team

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)



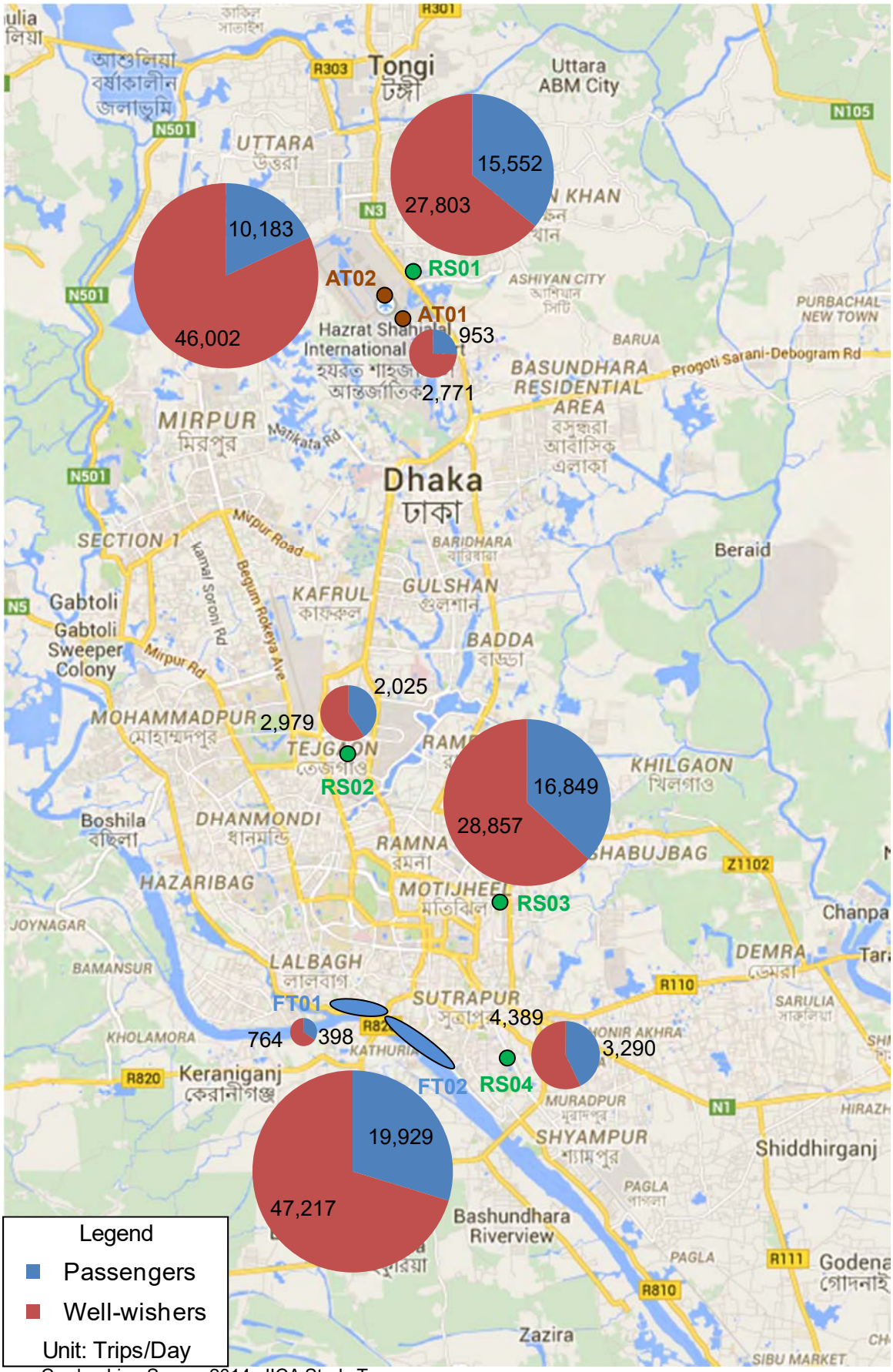
Source: Cordon Line Survey 2014, JICA Study Team

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.

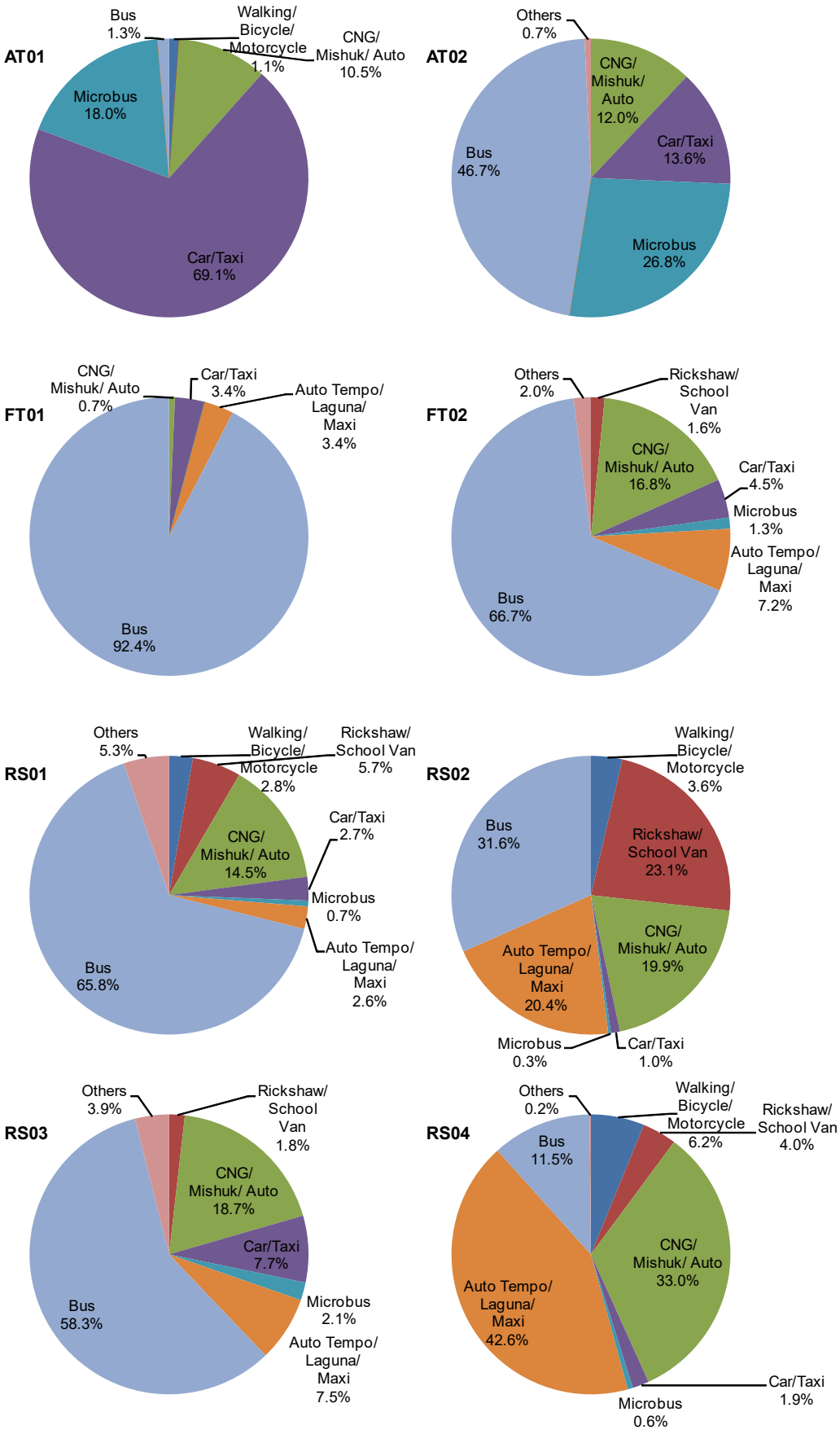
Figure 3.18 and Figure 3.19 show the daily number of trips by mode between the Survey Area and the other divisions and districts. Some 90% of long-haul trips rely on the road transport while there are higher demands of the inland water transport from/to various districts in Barisal and Chandpur, Chittagong.

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.



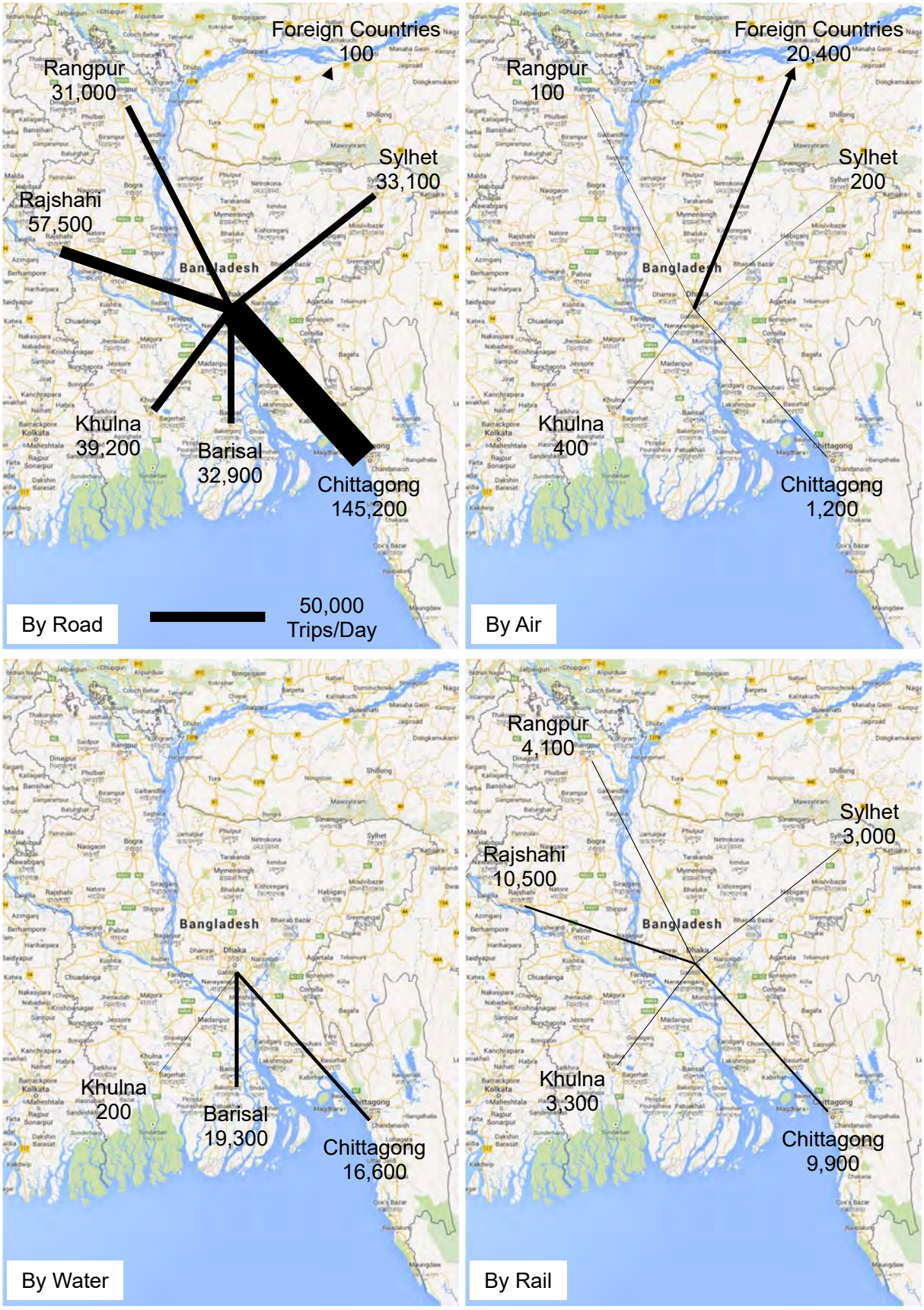
Source: Cordon Line Survey 2014, JICA Study Team

Figure 3.16 Daily Trip Attraction to Public Transportation Terminals



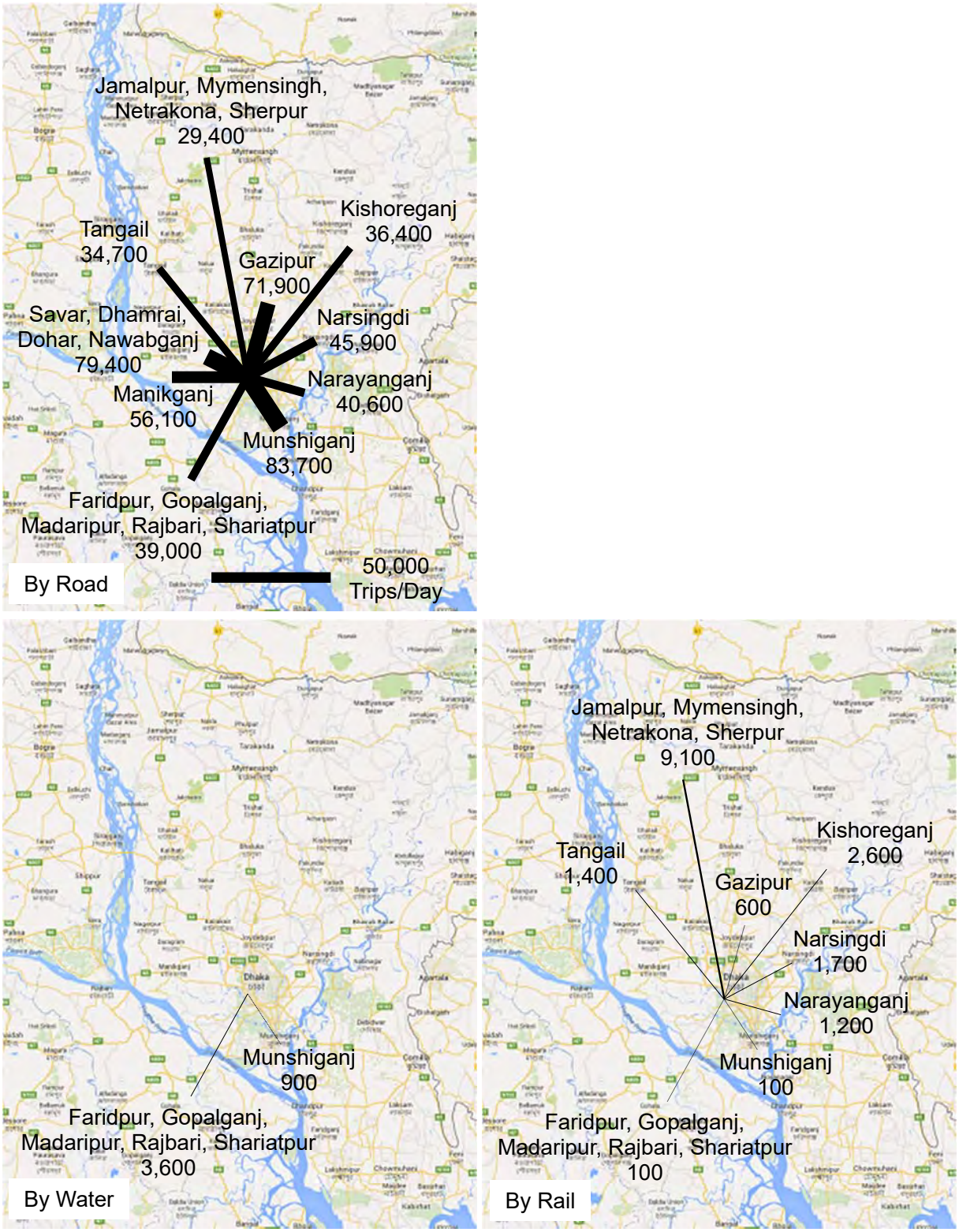
Source: Cordon Line Survey 2014, JICA Study Team

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.

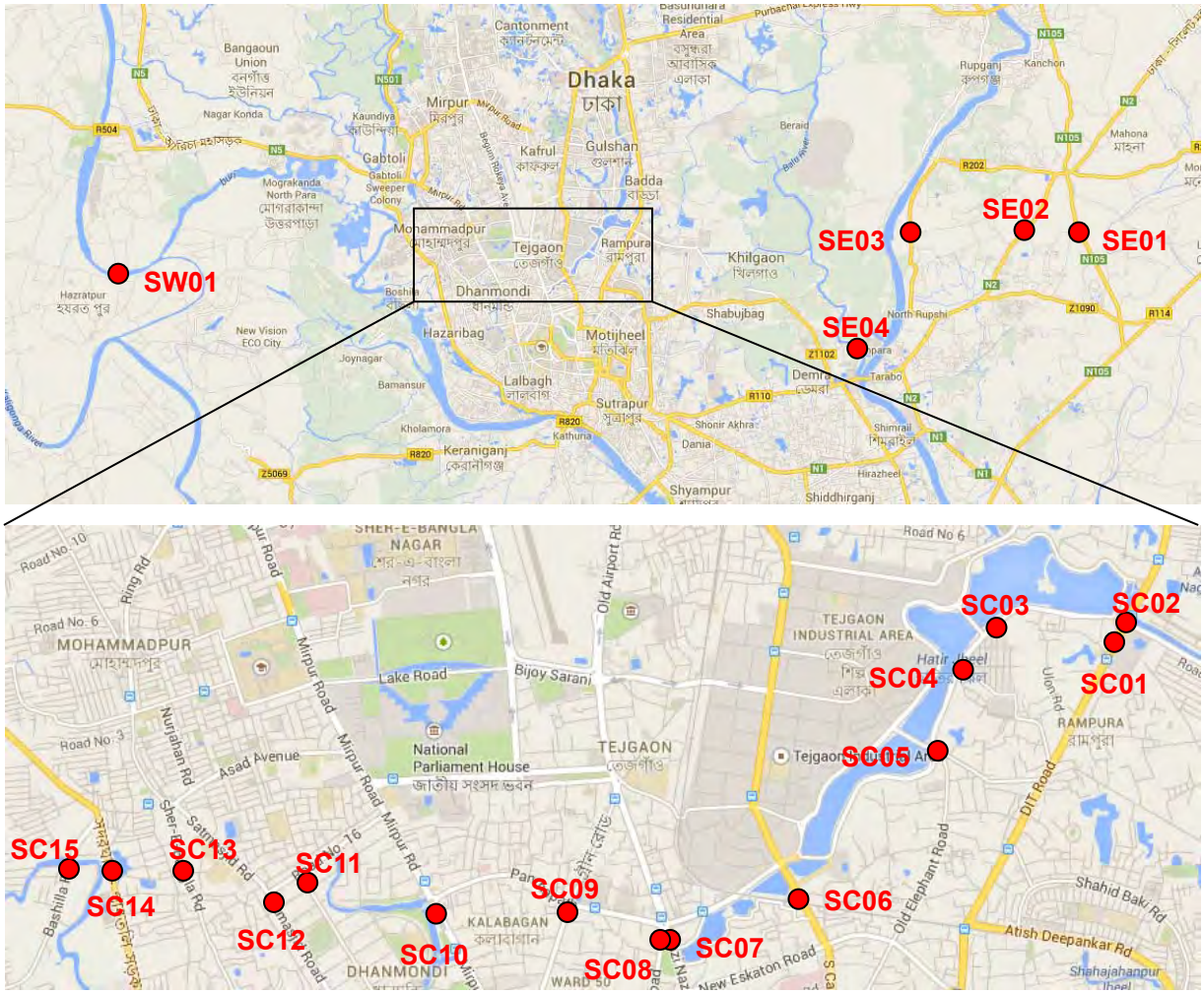
The vehicular traffic count survey is conducted for 24 hours from 6 AM to 6 AM the following day at all stations. The vehicle occupancy survey is conducted for 16 hours from 6 AM to 10 PM simultaneously with the vehicular traffic count survey at all stations except for the station SC02 where the vehicle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

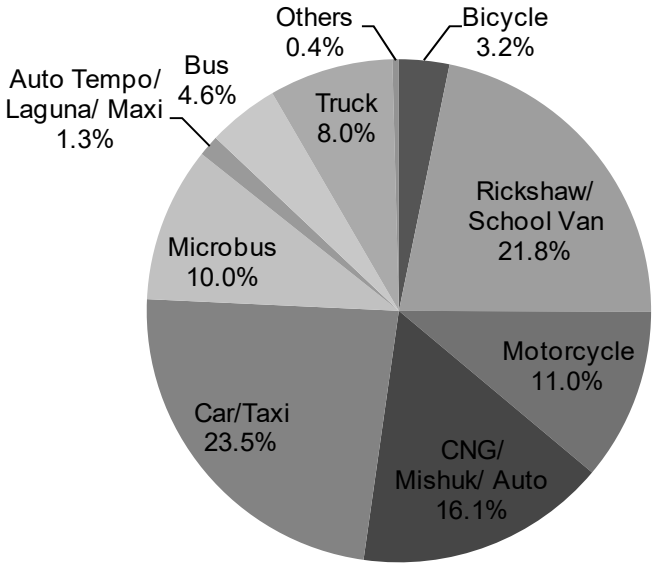
Table 3.10 Actual Location and Survey Date and Time of the Screen Line Survey

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

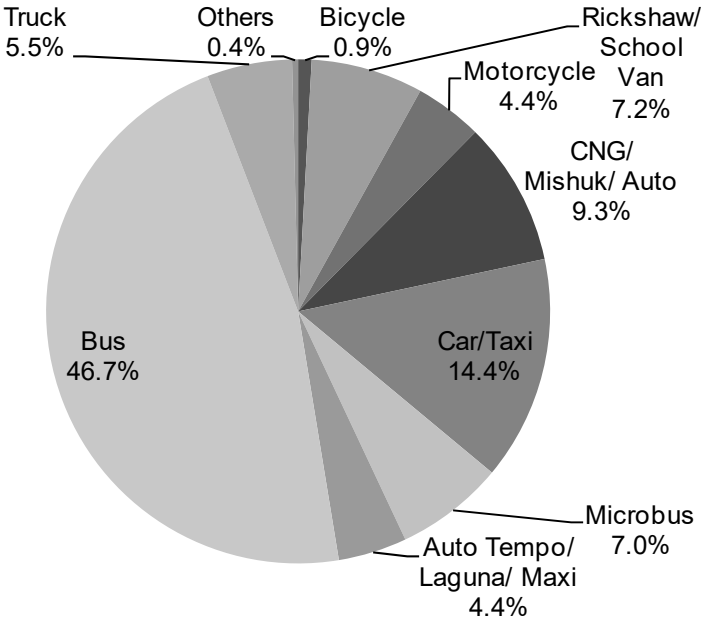
(3) Survey Results

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

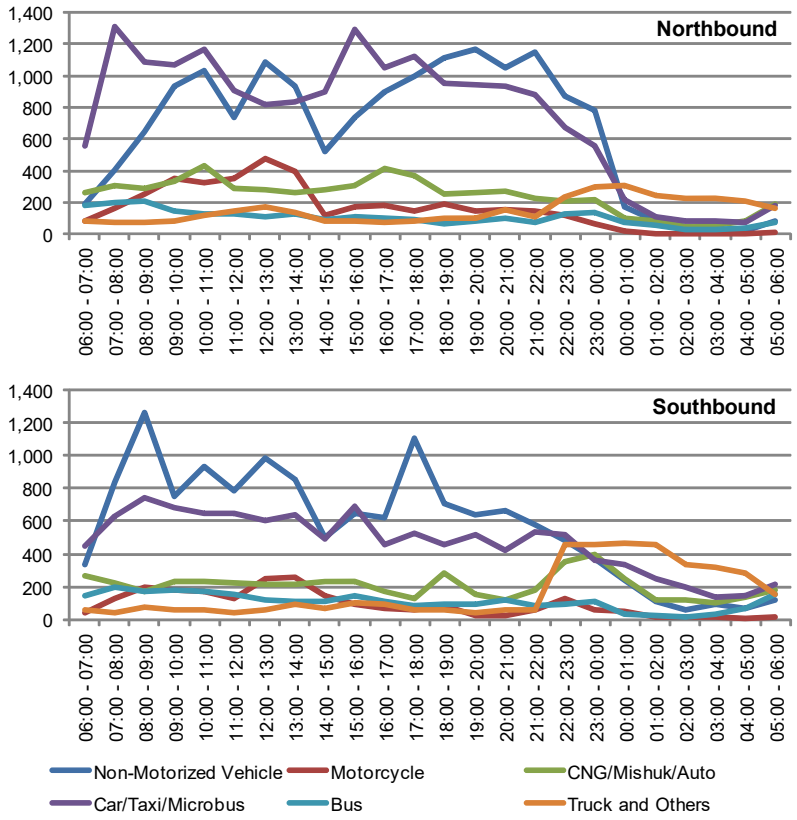
Survey Station	Non-Motorized Vehicles				Motorized Vehicles															Grand Total
	Bicycle	Rickshaw	School Van	Total	Motorcycle	CNG/ Mishuk/ Auto	Car	Taxi	Auto Tempo/ Laguna/ Maxi	Microbus/ Jeep	Bus/ Mini-bus	AC Bus	Staff Bus	School/ Collage/ University Bus	3-axle Truck/ Trailer	Tanker/ Tank Lorry	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

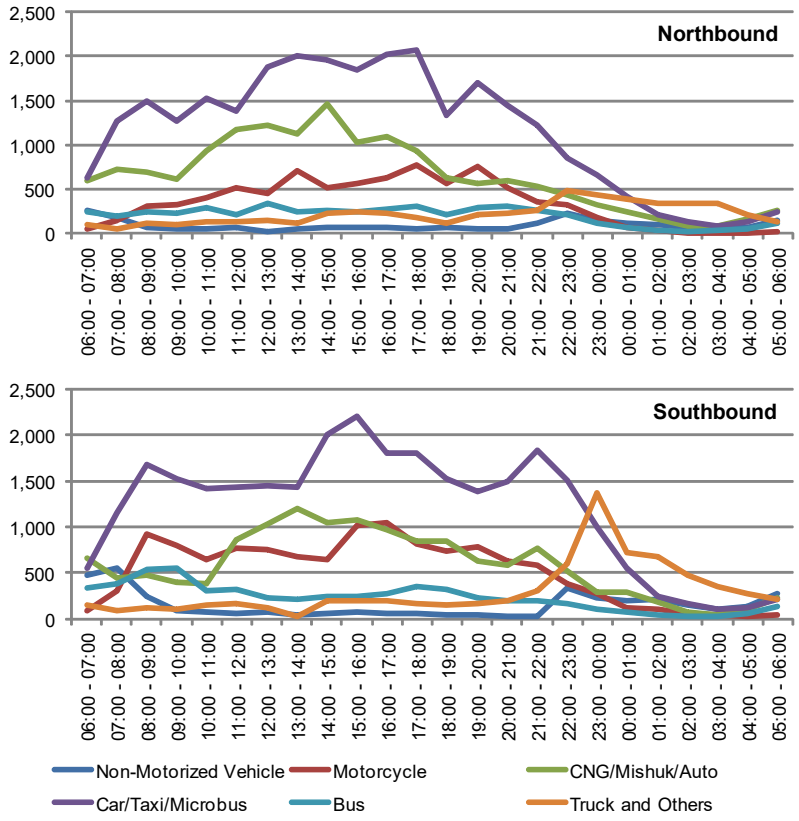
Survey Station	Non-Motorized Vehicles			Motorized Vehicles													
	Bicycle	Rickshaw	School Van	Motorcycle	CNG/ Mishuk/ Auto	Car	Taxi	Auto Tempo/ Laguna/Maxi	Microbus/ Jeep	Bus/ Mini-bus	AC Bus	Staff Bus	School/ Collage/ University Bus	3-axle Truck/ Trailer	Tanker/ Tank Lorry	2-axle Truck	Pick-up/ 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



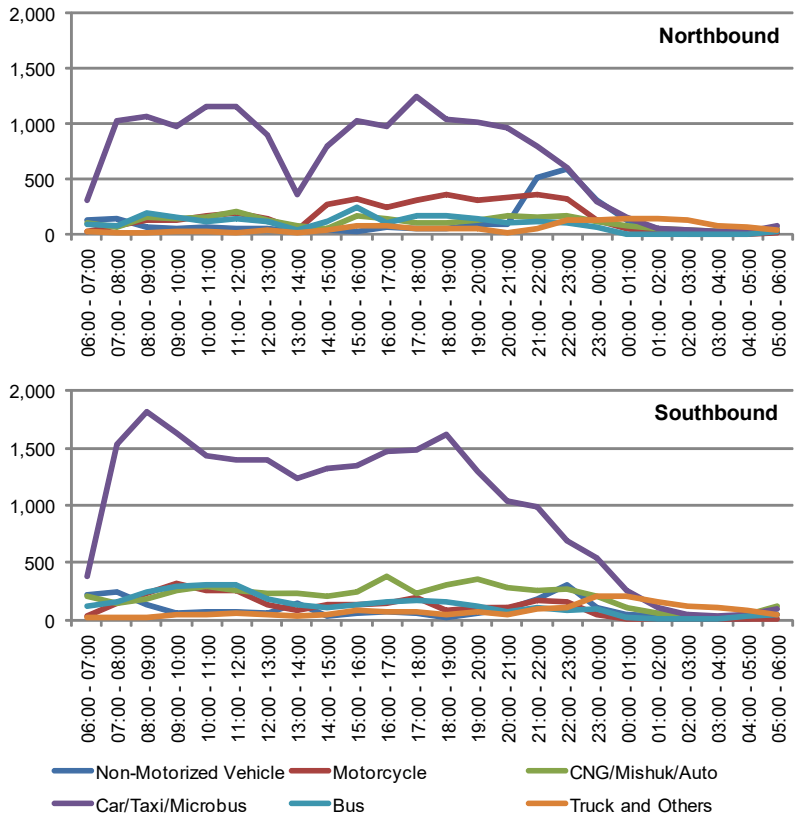
Source: Screen Line Survey 2014, JICA Study Team

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



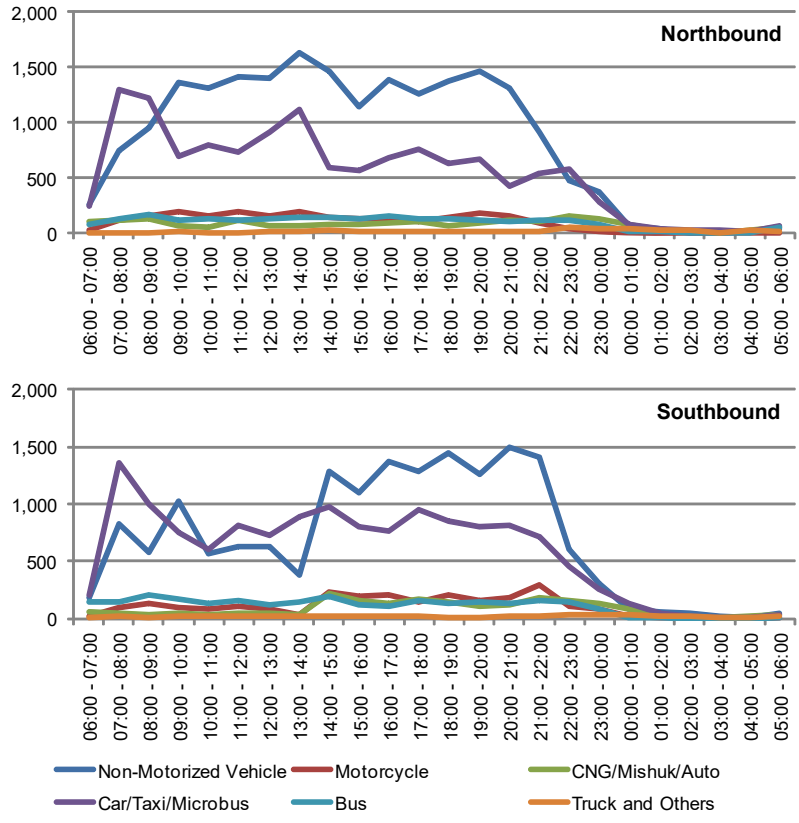
Source: Screen Line Survey 2014, JICA Study Team

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.

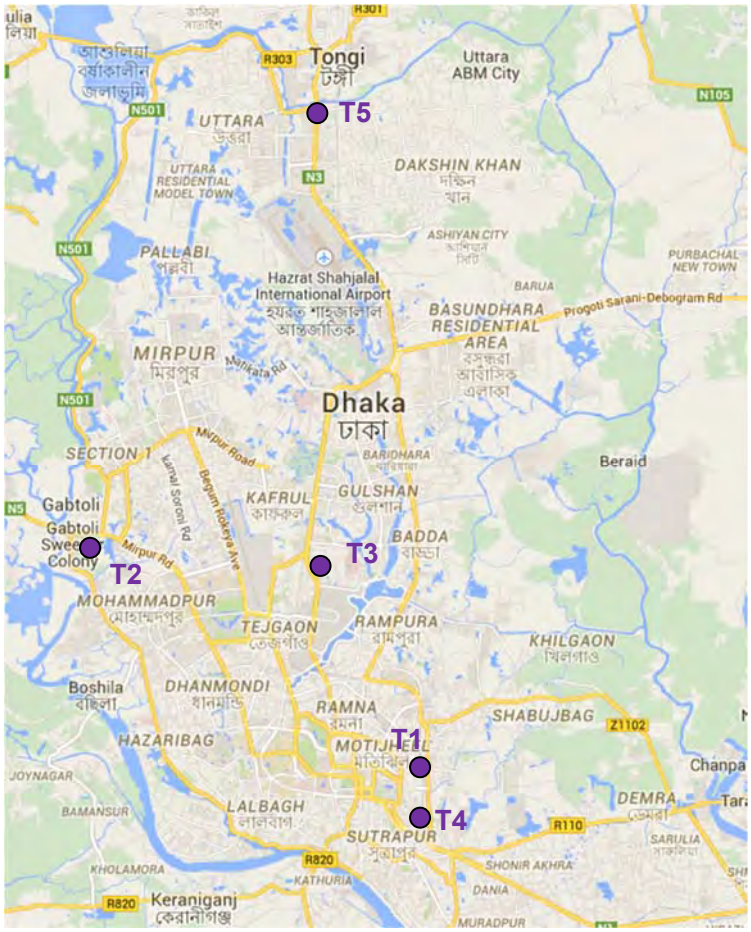
(2) Survey Coverage

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

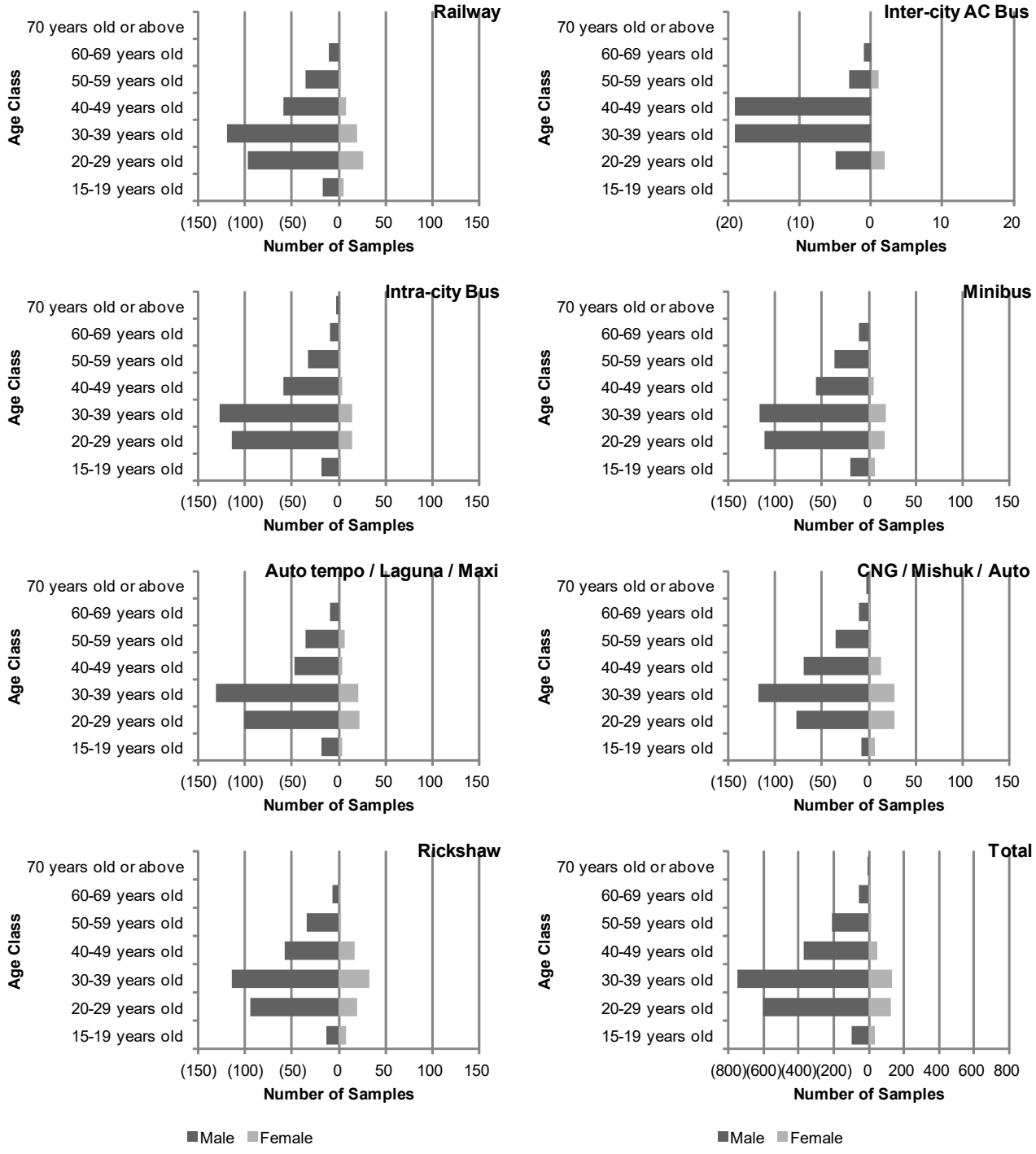
Table 3.14 Survey Date of the Public Transportation Users' Opinion Survey

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.

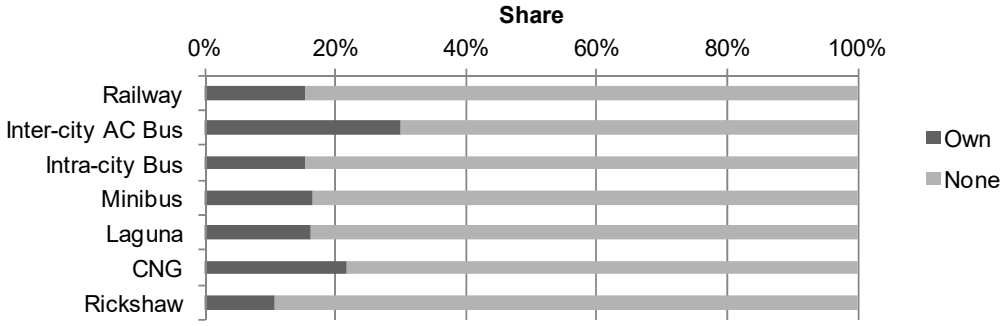


Source: Public Transportation Users' Opinion Survey 2014, JICA Study Team

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

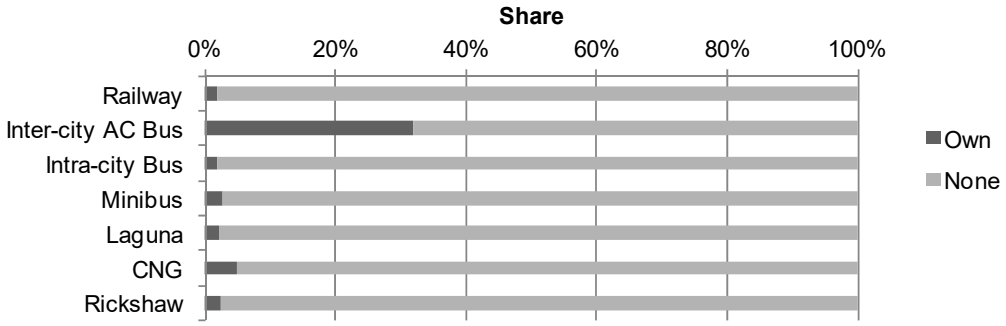
Few numbers of public transportation users have their own vehicle. Figure 3.29 and Figure 3.30 show motorcycle and car ownership of the interviewees. Excluding inter-city AC bus passengers, average motorcycle and car ownership rates are 16% and 3%

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.



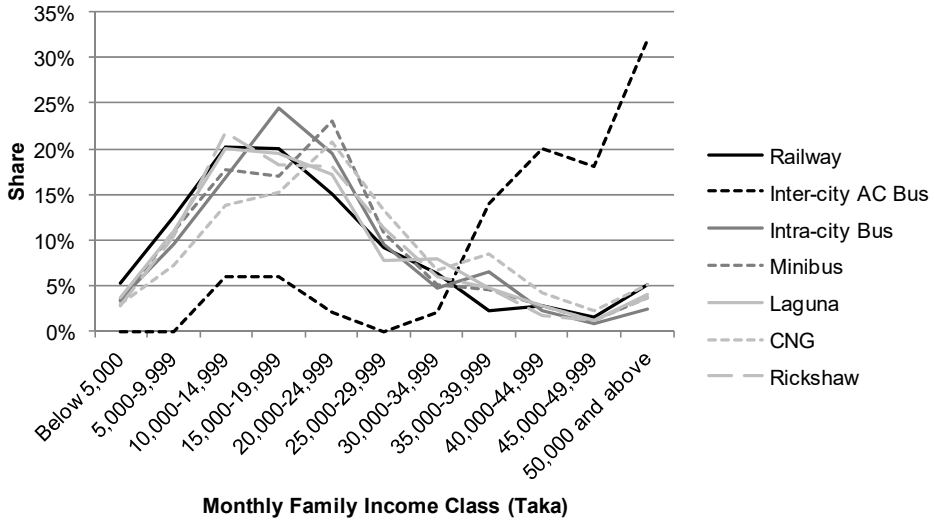
Source: Public Transportation Users' Opinion Survey 2014, JICA Study Team

Figure 3.29 Motorcycle Ownership of Public Transportation Users



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

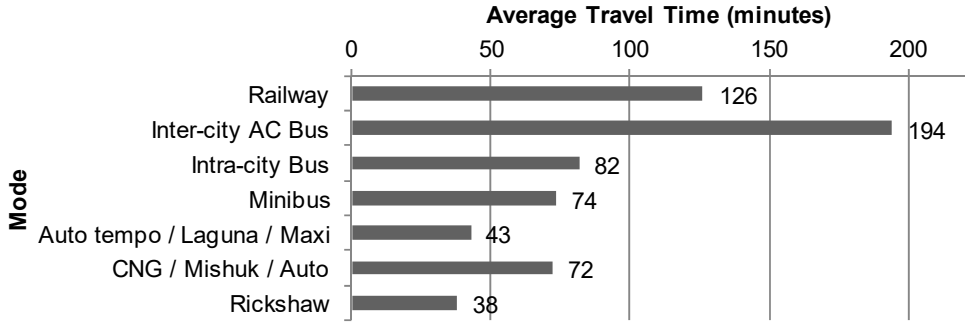
Figure 3.30 Car Ownership of Public Transportation Users



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

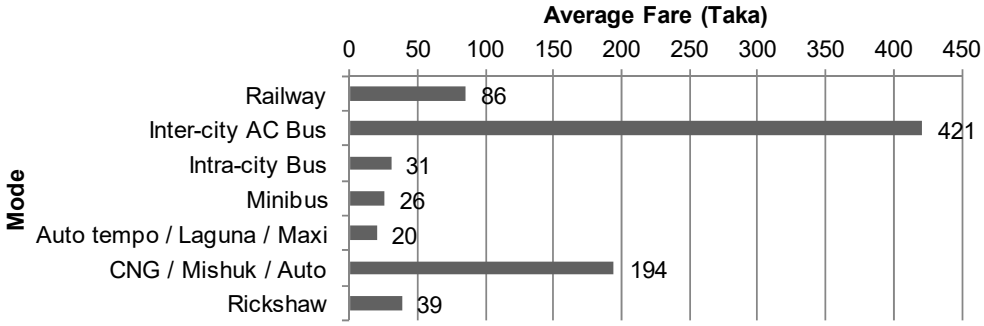
Figure 3.31 Distribution of Monthly Family Income of Public Transportation Users

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

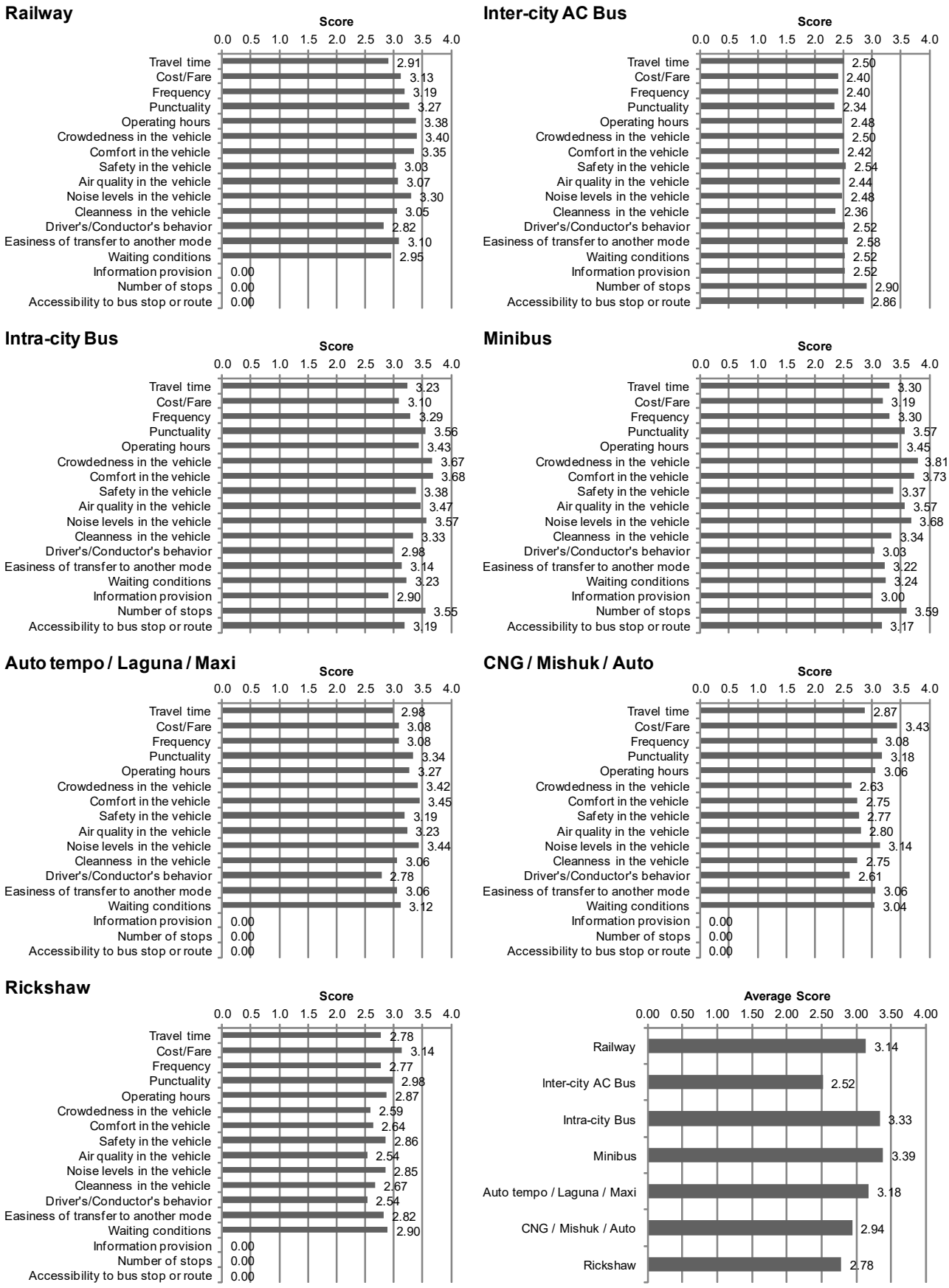
Figure 3.32 Average Travel Time



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.

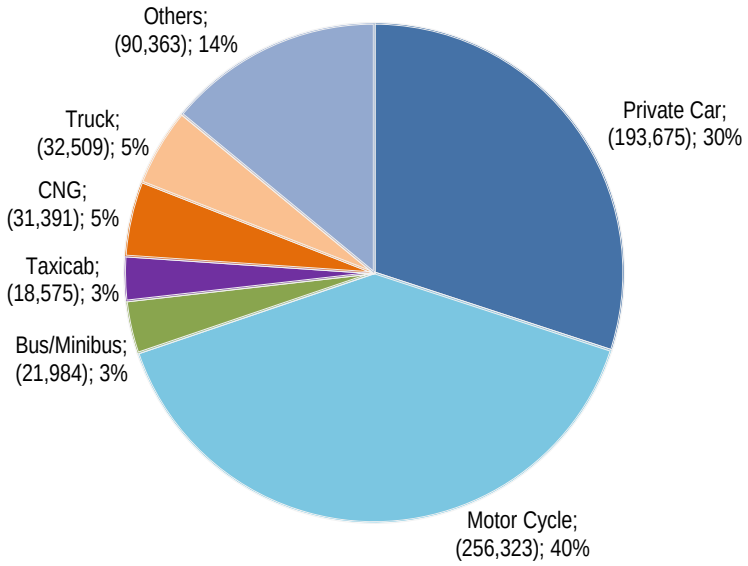
Public transportation terminals are especially encouraged to enhance the transport hub function which has to equip enough spaces for turnaround and parking of public and private vehicles for the terminal access. Terminals are also suggested to have wide, flat, shaded and lighted sidewalks to secure passengers'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

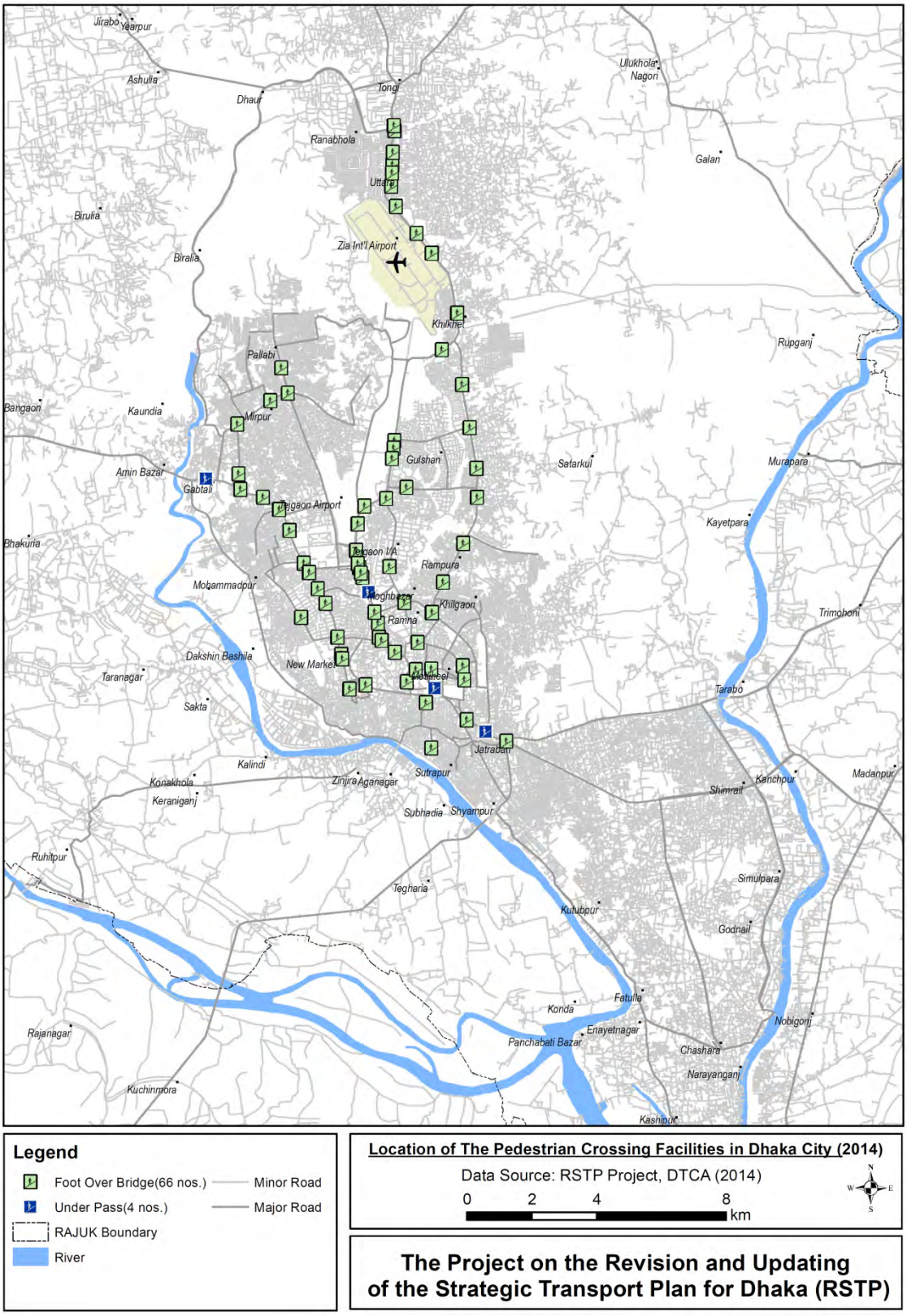


Figure 4.3 Location of the Pedestrian Crossing Facilities in Dhaka City

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

- Installation of temporary vendor shops by the hawkers on 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

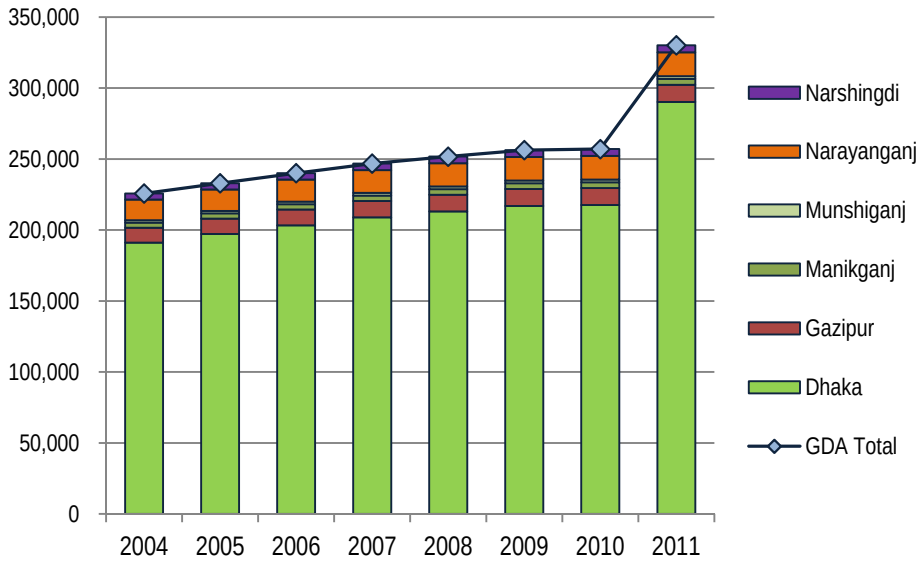
Bicycle is a useful and environment friendly transport which plays an important role as access for commuting in developed countries. However, only 2% bicycle trips were found on arterial roads in Dhaka city. In the past, bicycle was used for commuting to school and to office mostly in rural areas. As 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

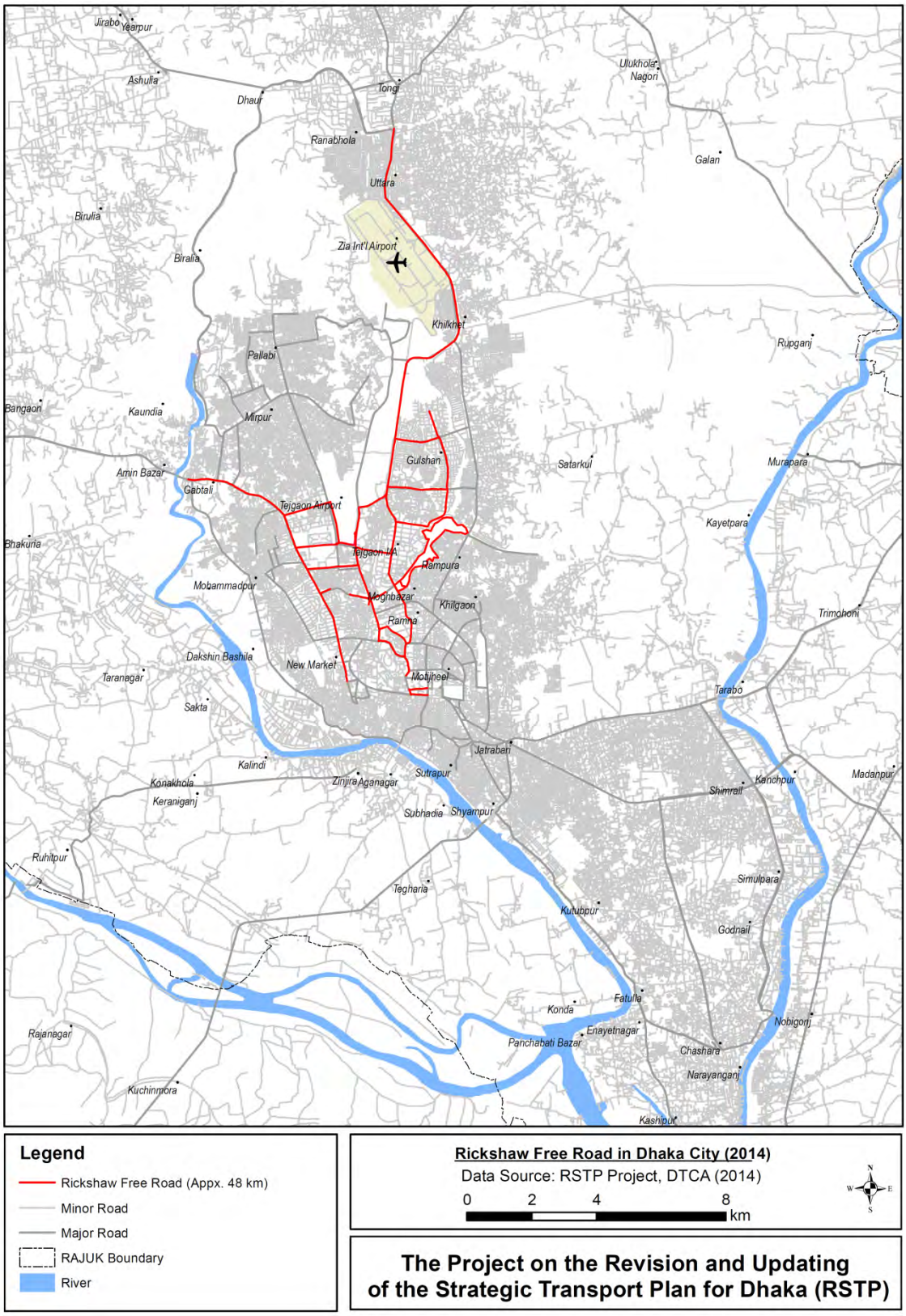


Figure 4.8 Rickshaw Free Roads in Dhaka city

(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

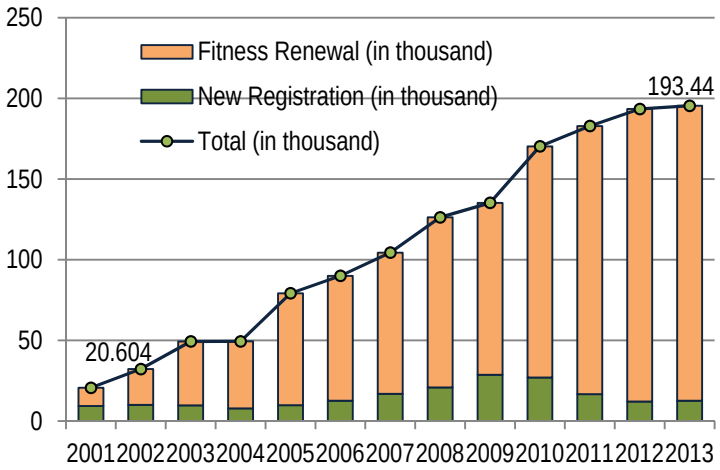
In GDA, private cars are mainly classifies into three types: sedan car, four-wheeled jeep and 6-10 seater microbus. Basically, private cars are used by the middle and high income people with some families owning more than one vehicle. As shown in Figure 4-1, private cars are accounted for 30% of vehicle 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, 1m^3 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

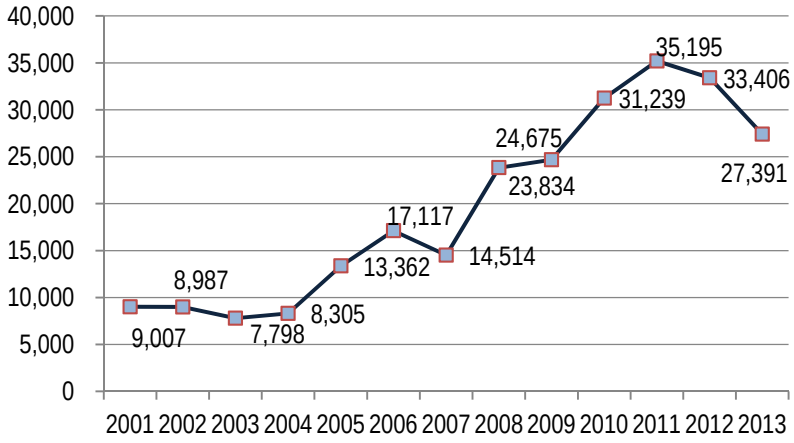
Long queue for CNG makes the road width narrow

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

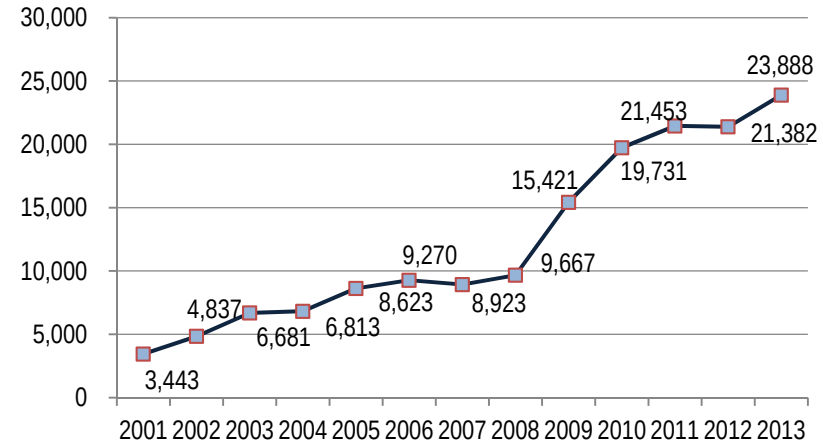
Violation of traffic signal

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.

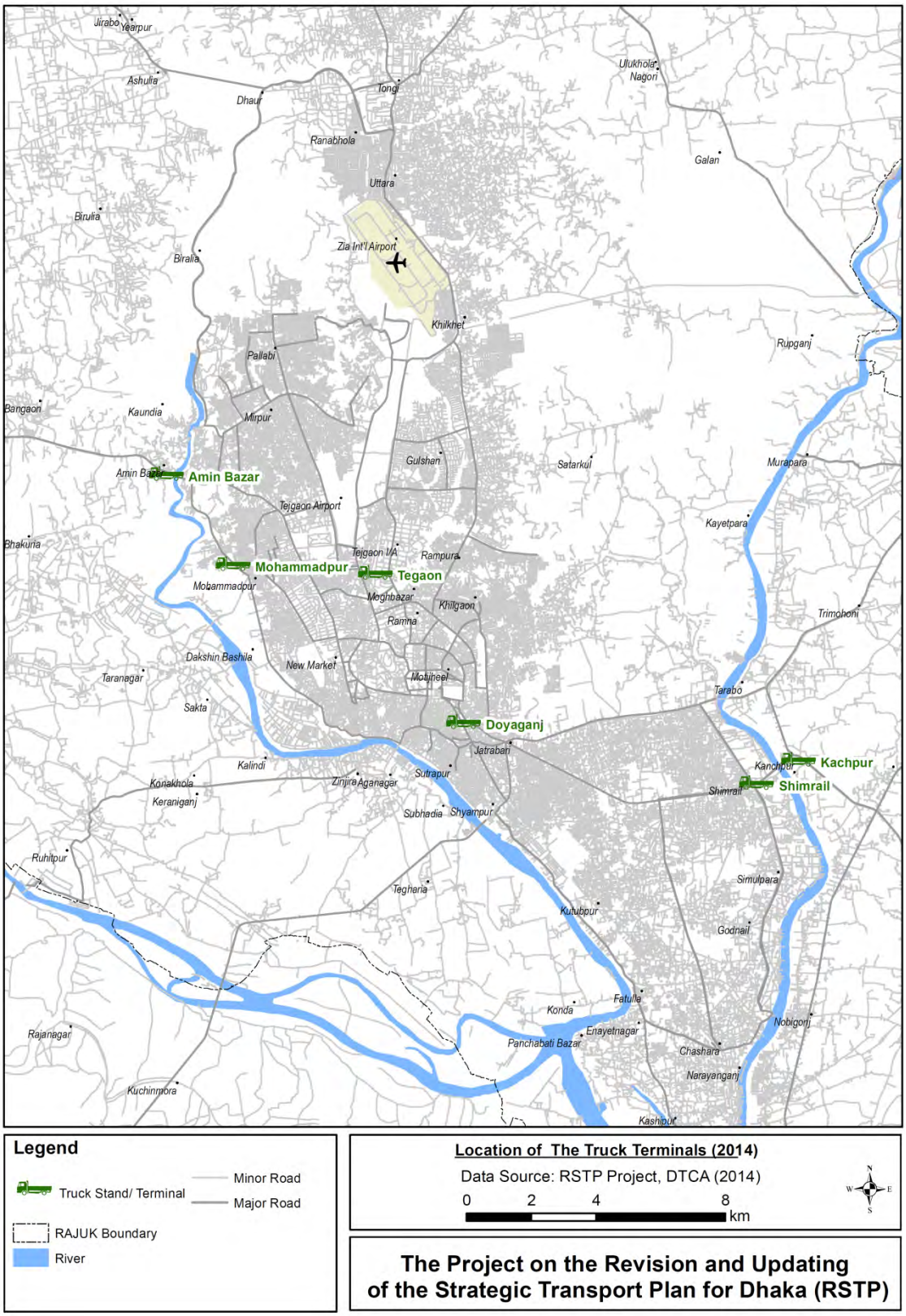
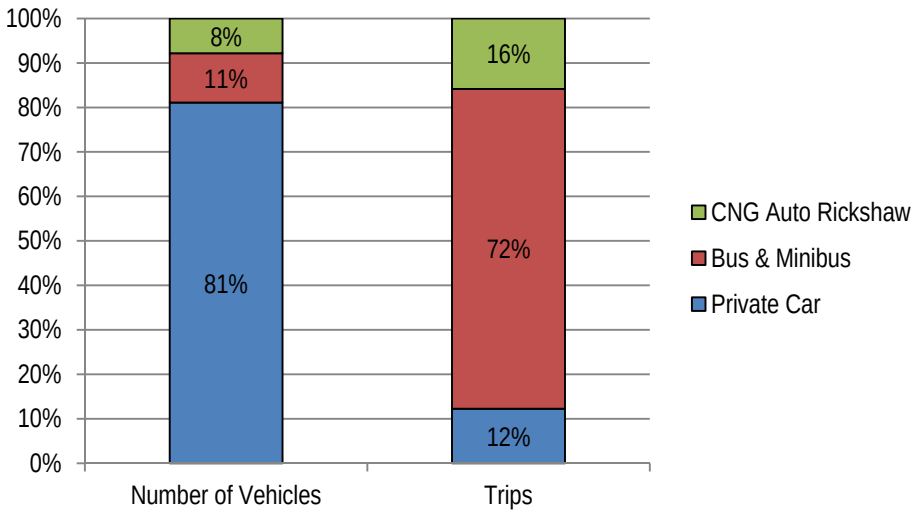


Figure 4.15 Location of the Major Truck Terminals

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.

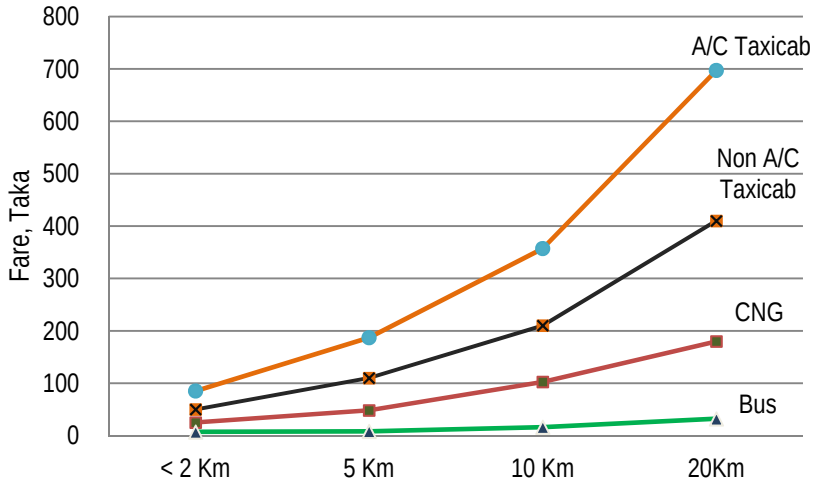
In Figure 4-16, generated trips by private cars, different types of buses and CNG in 2009 are shown with registered vehicles of each type. Buses and minibuses are generating 72% of person trips with only 11% of the share in registered vehicles.



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)

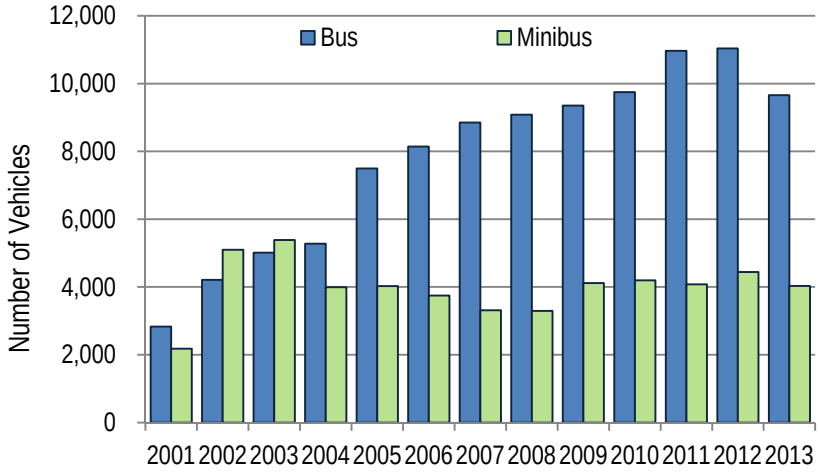
New Registered	**'01**	**'02**	**'03**	**'04**	**'05**	**'06**	**'07**	**'08**	**'09**	**'10**	**'11**	**'12**	**'13**
Bus	1.2	1.3	0.7	1.0	1.2	1.1	1.4	1.1	1.4	1.3	1.5	1.2	1.0
Minibus	1.1	2.3	1.1	0.4	0.3	0.1	0.1	0.2	0.2	0.3	0.1	0.1	0.1
Sub-total	2.3	3.6	1.8	1.4	1.5	1.3	1.5	1.3	1.6	1.6	1.7	1.3	1.1
Fitness 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. 40,500m^2	App. 500	App. 2000	87
Mohakhali	App. 36,400 m^2	App. 300	App. 800	60
Gabtoli	App. 123,400 m^2	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

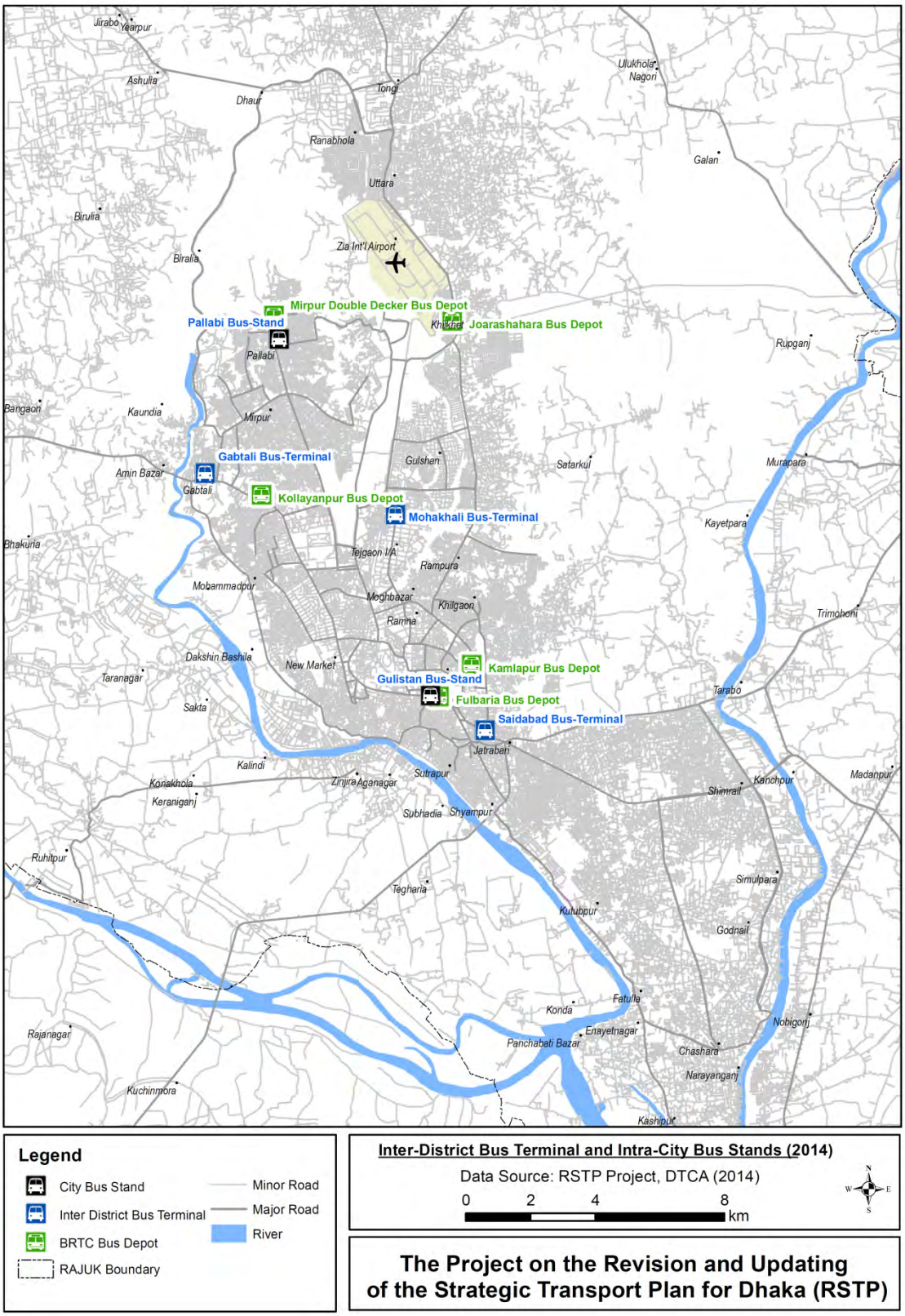


Figure 4.24 Inter-District Bus Terminal and Intra-city Bus Stands in Dhaka

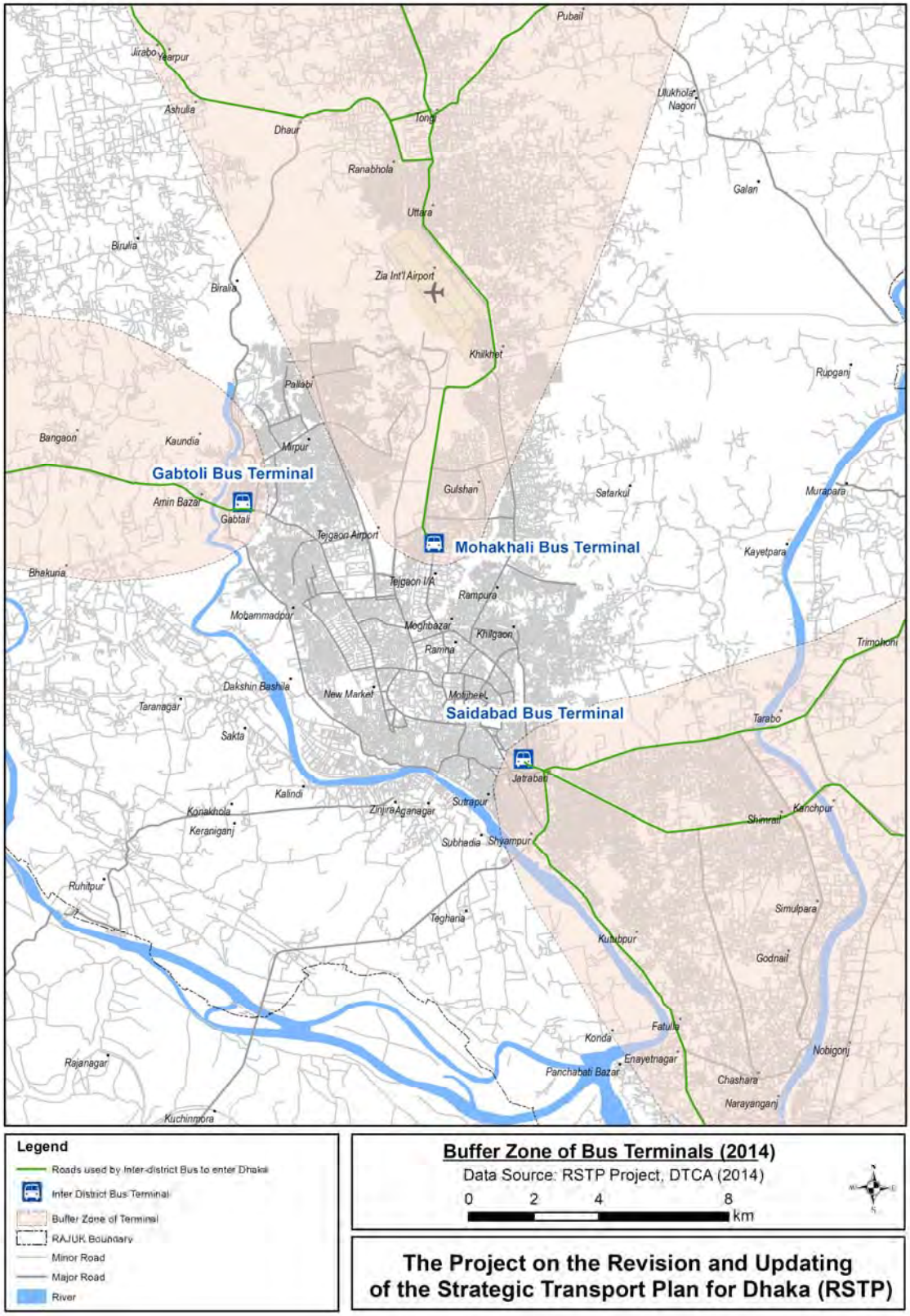


Figure 4.25 Buffer Zone of the Inter-District Bus Terminal

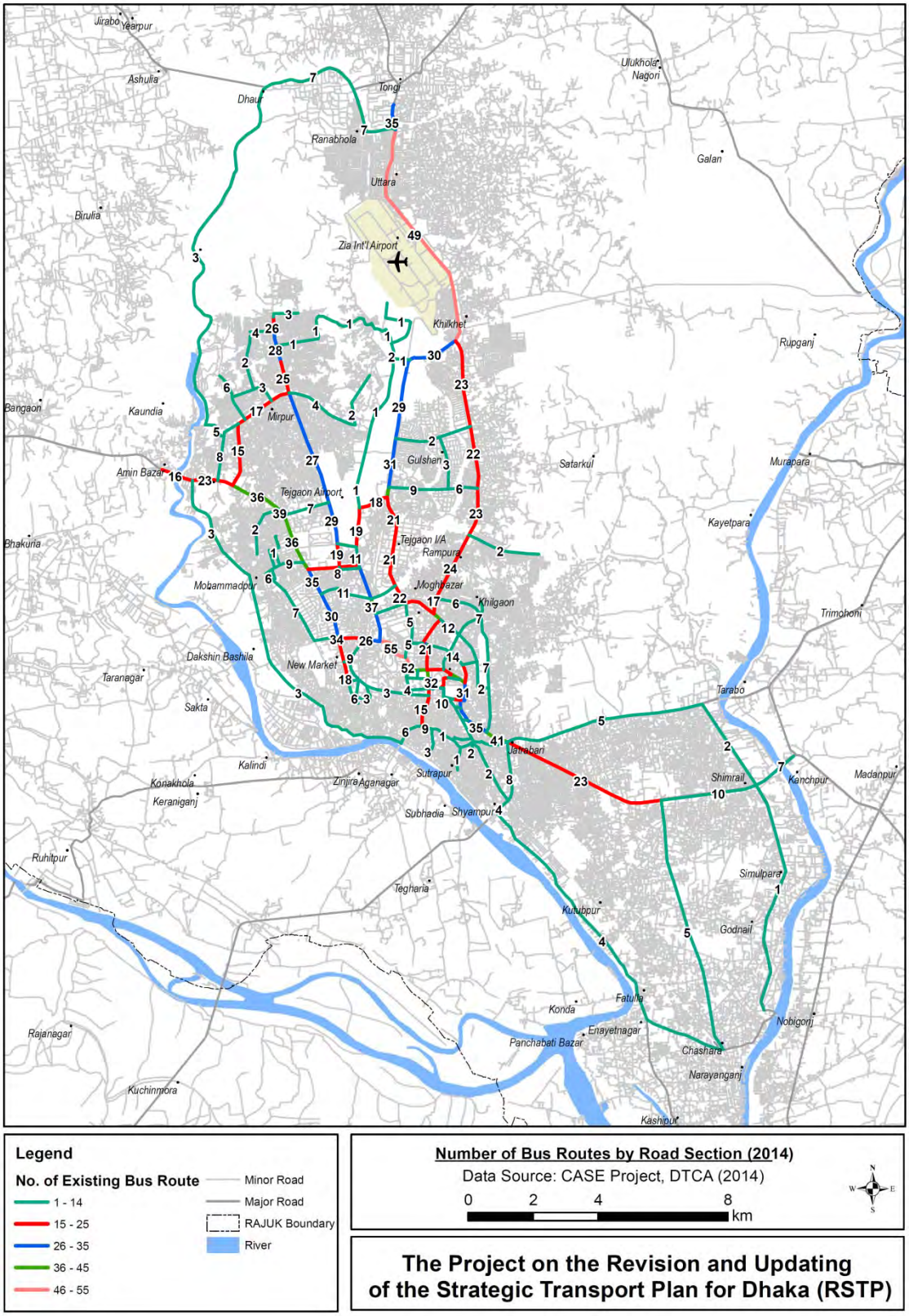


Figure 4.26 Number of Bus routes by Road Section

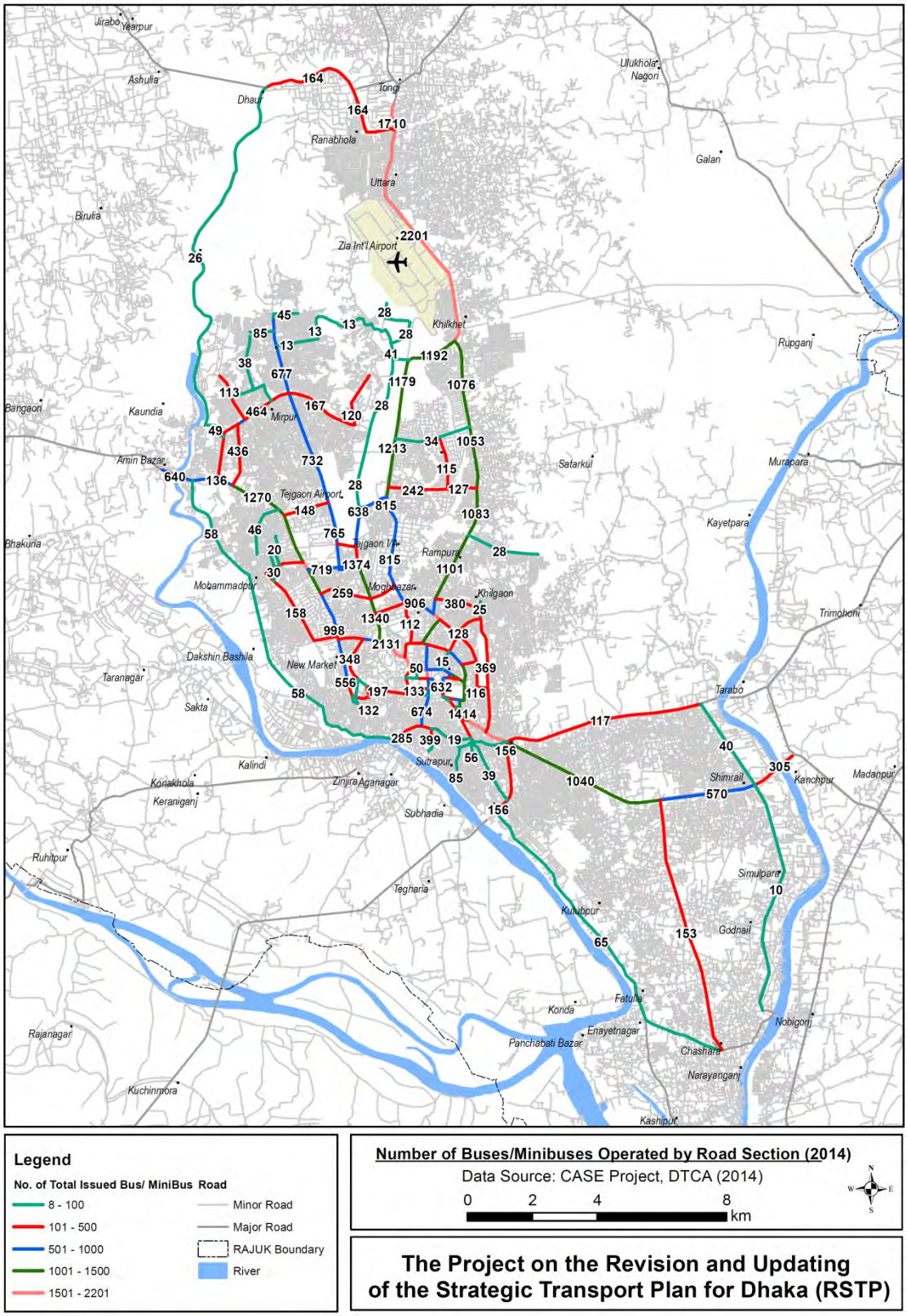


Figure 4.27 Number of Buses/ Minibuses Operated by Road Section

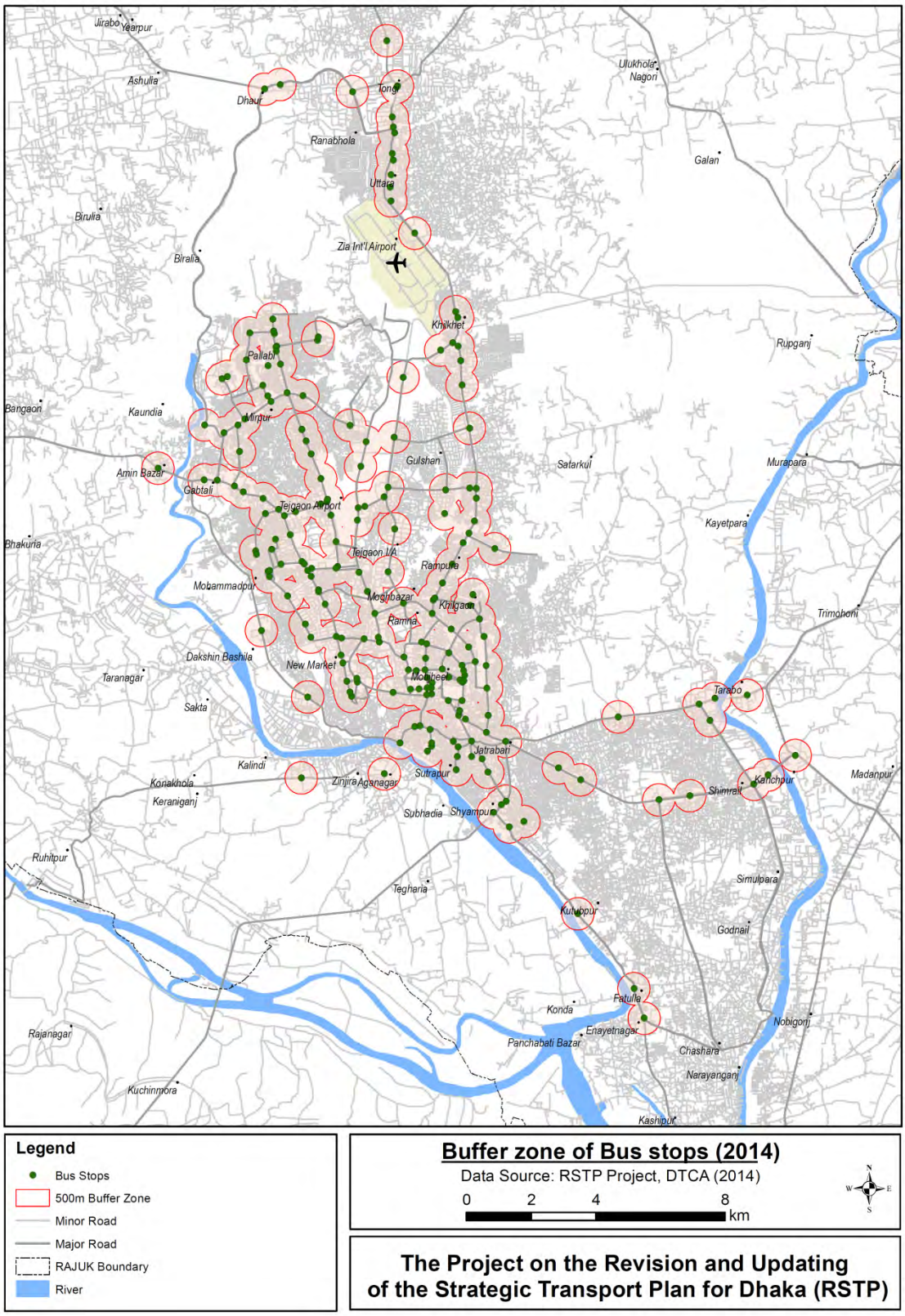


Figure 4.28 Buffer zone of the Bus Stops

(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.

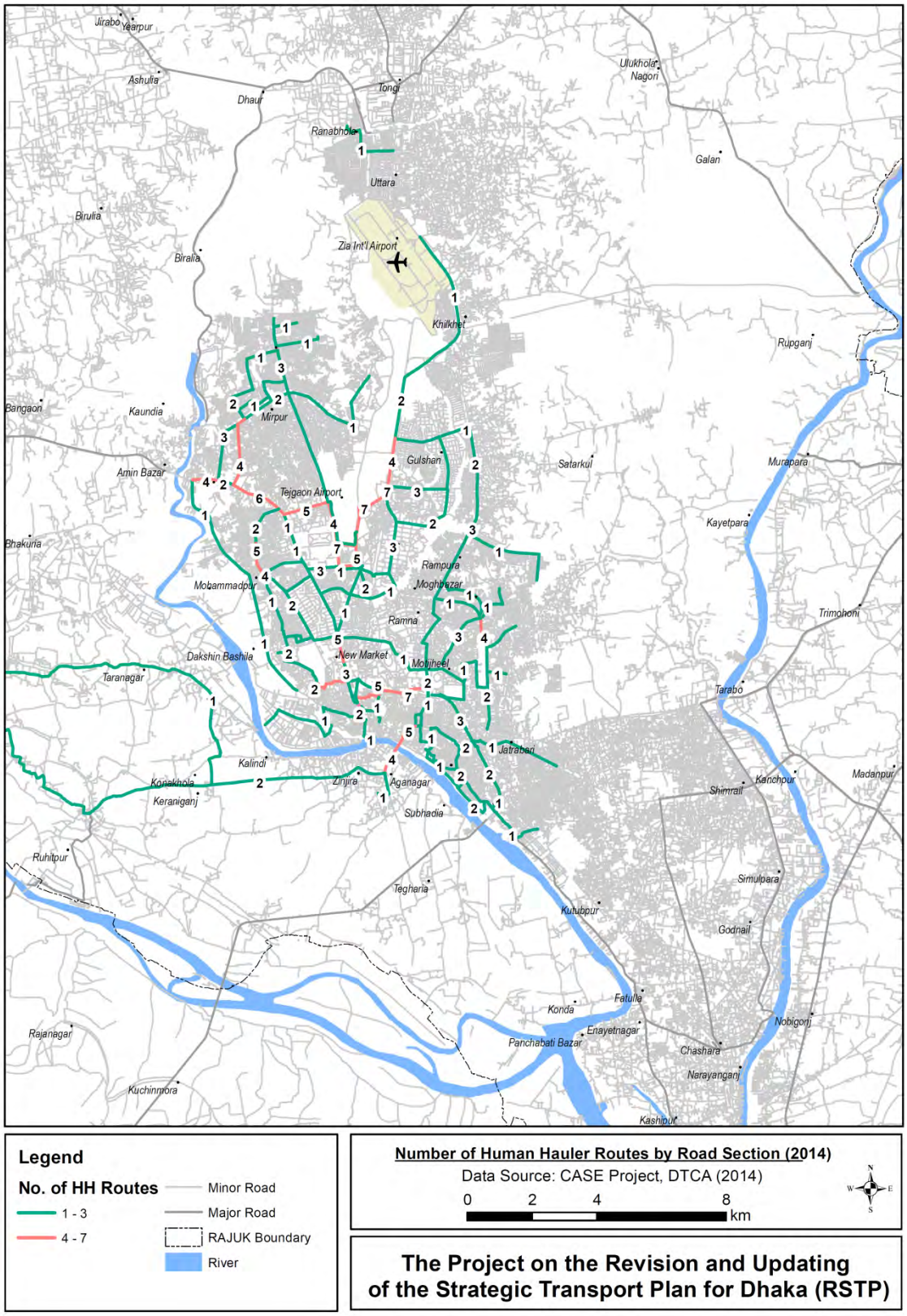


Figure 4.30 Number of Human Hauler Routes by Road Section

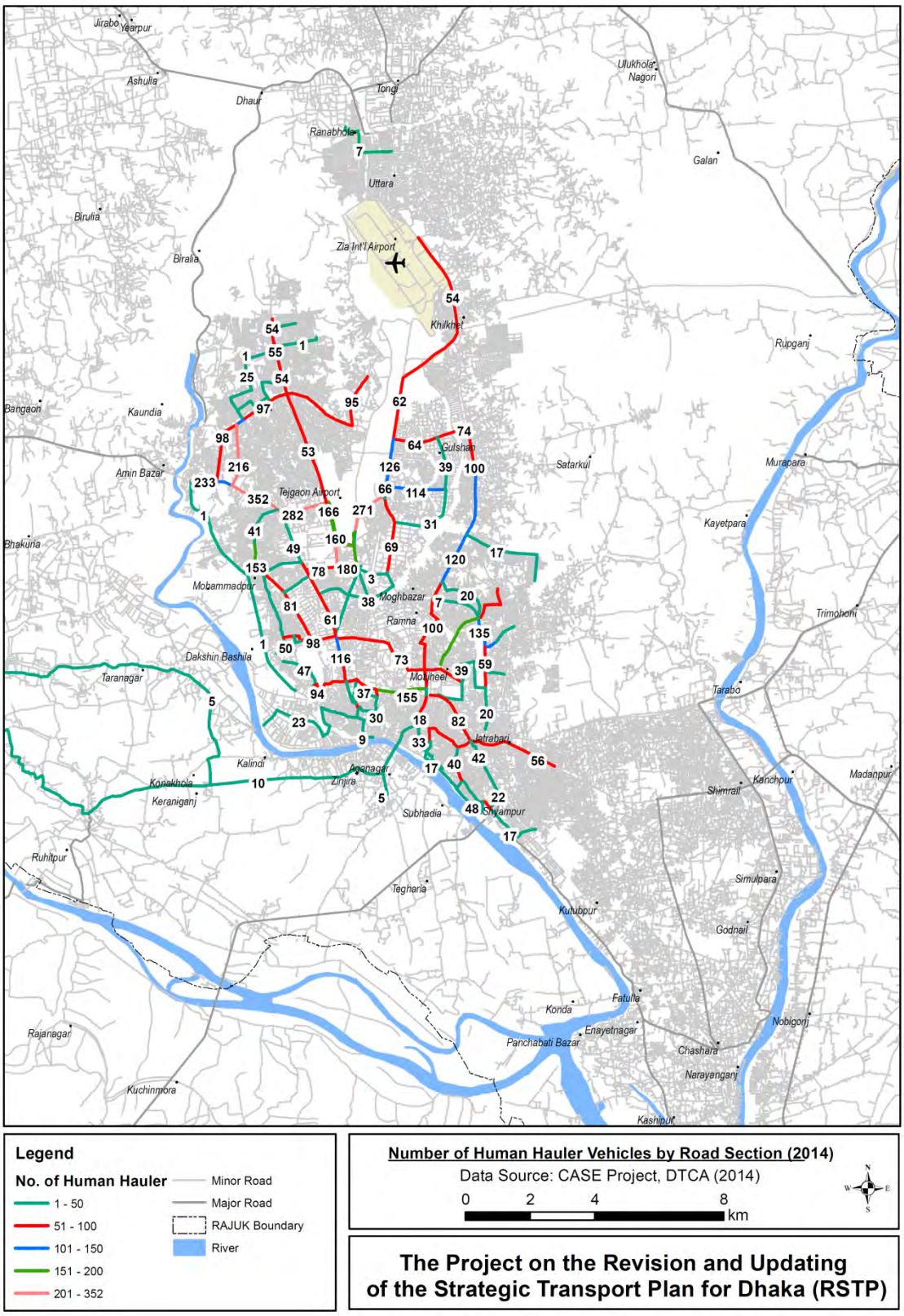


Figure 4.31 Number of Human Hauler Vehicles by Road Section

(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 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.

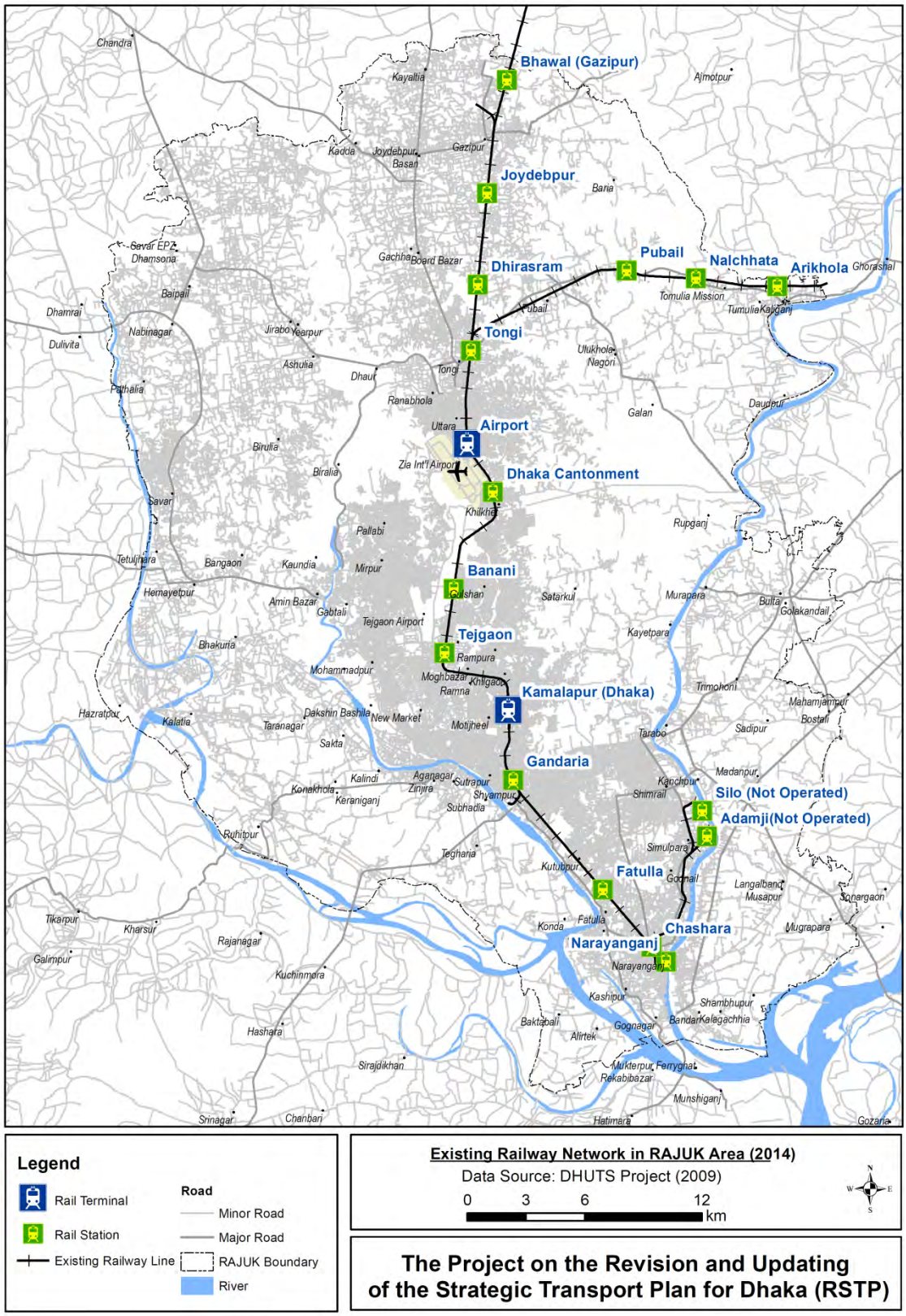


Figure 4.32 Existing Railway Network in RAJUK area

(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

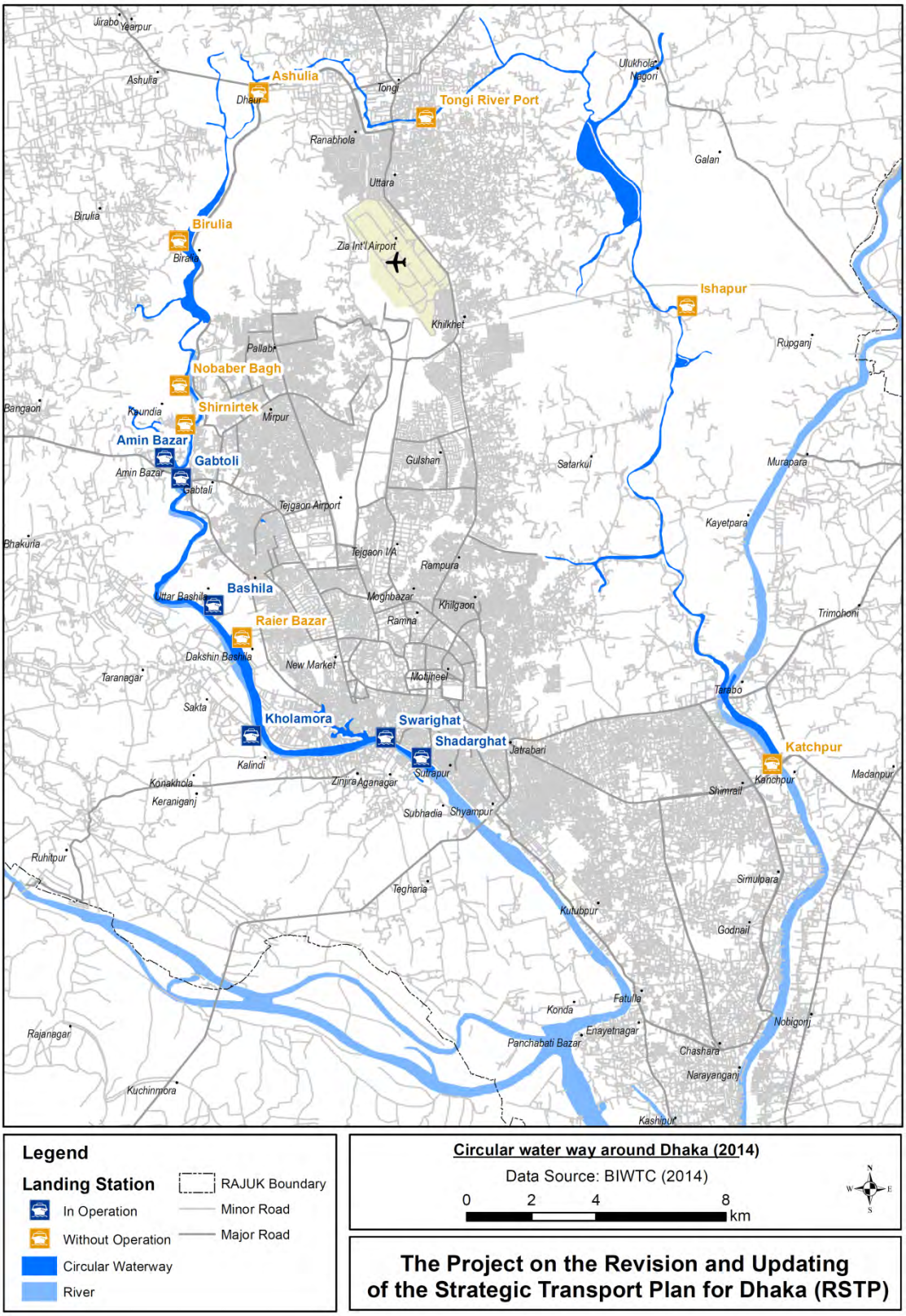


Figure 4.34 Circular water way Network around Dhaka

(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

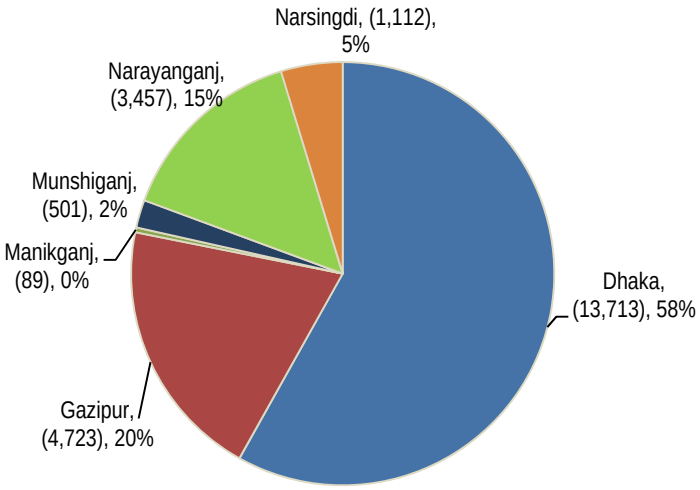
Some common taxicab related issues are:

- 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 and 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.

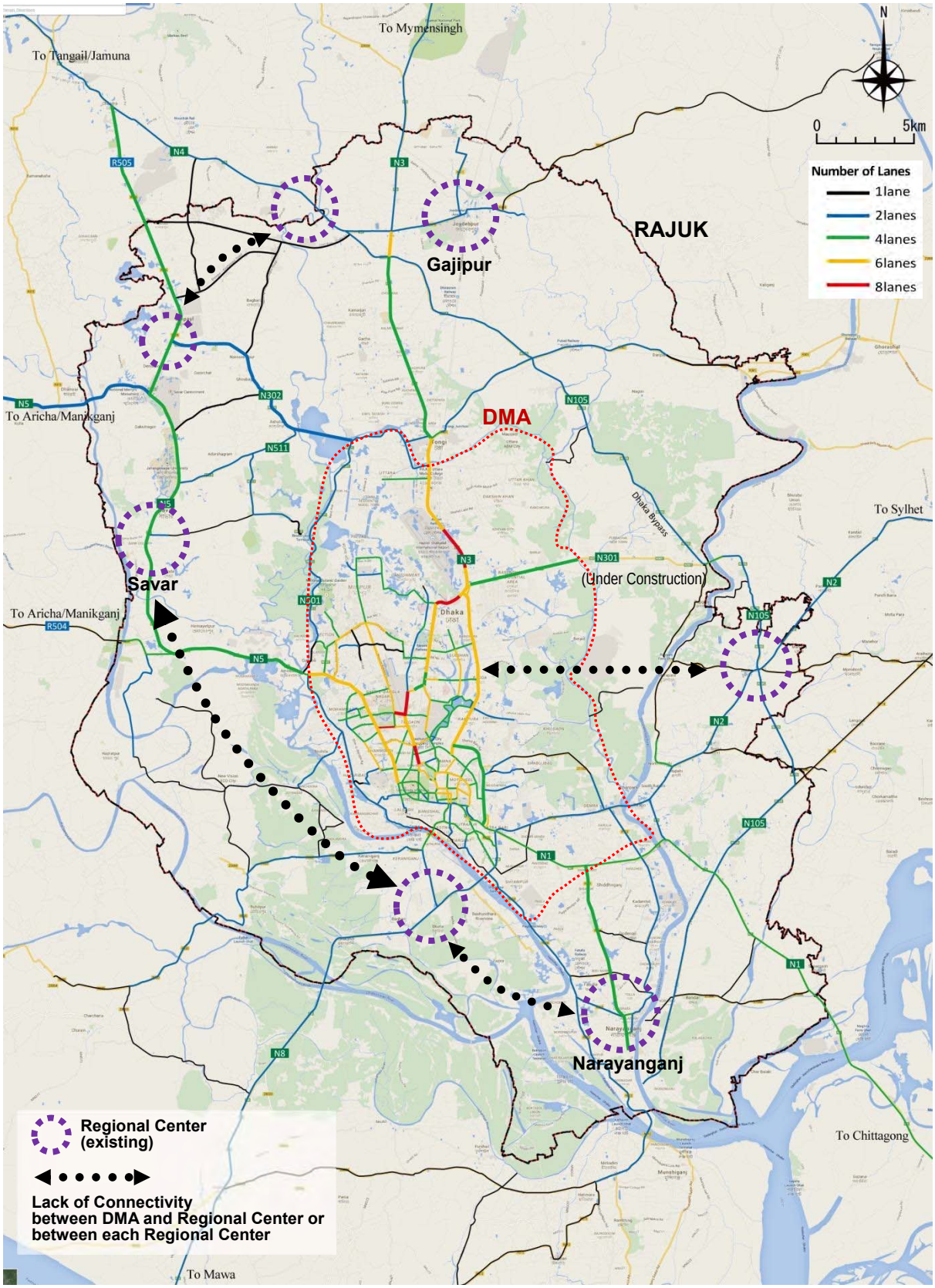


Figure 4.39 Major Road Network in RAJUK Area

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 I & 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 Hanif Refueling Station
10	Dhaka-Aricha Highway/N5	Ganda
11	Dhaka-Aricha Highway/N5	Near Bishmail Bus Stop
12	Dhaka-Aricha Highway/N5	Nayarhat Bus Stop
13	Dhaka -Mawa Highway	Near Rajendrapur Bus Stop
14	Bandor -Madanpur Hghway	Madanpur
15	Bostail - Madanpur highway / N105	Madanpur
16	Bulta Highway/ N 105	Near Premier Bank Office on Bulta Highway
17	Dhaka City Bypass/N105	Near Sector 21 of Purbachal
18	Dhaka City Bypass/N105	Dhakinkhan
19	Dhaka-Ashuliya Highway /N302	Nishchintopur
20	Anarkoli Road /N511	Near Doshaid Bazar Bus Stop
21	Narayanganj highway	Barma bus Stop
22	Dhakeshori - Jalkuri Road / R111	Near Jalkuri BRTC AC bus stop
23	Murapara College Main Road	Near Mongolkhali Bus Stop
24	Tongi -Gorashal Highway /R301	Nimtoli
25	Savar Manignaj Highway /R504	Shingair
26	Nabinagar -Chandra Road/R505	Near Baipayl Bus Stop
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

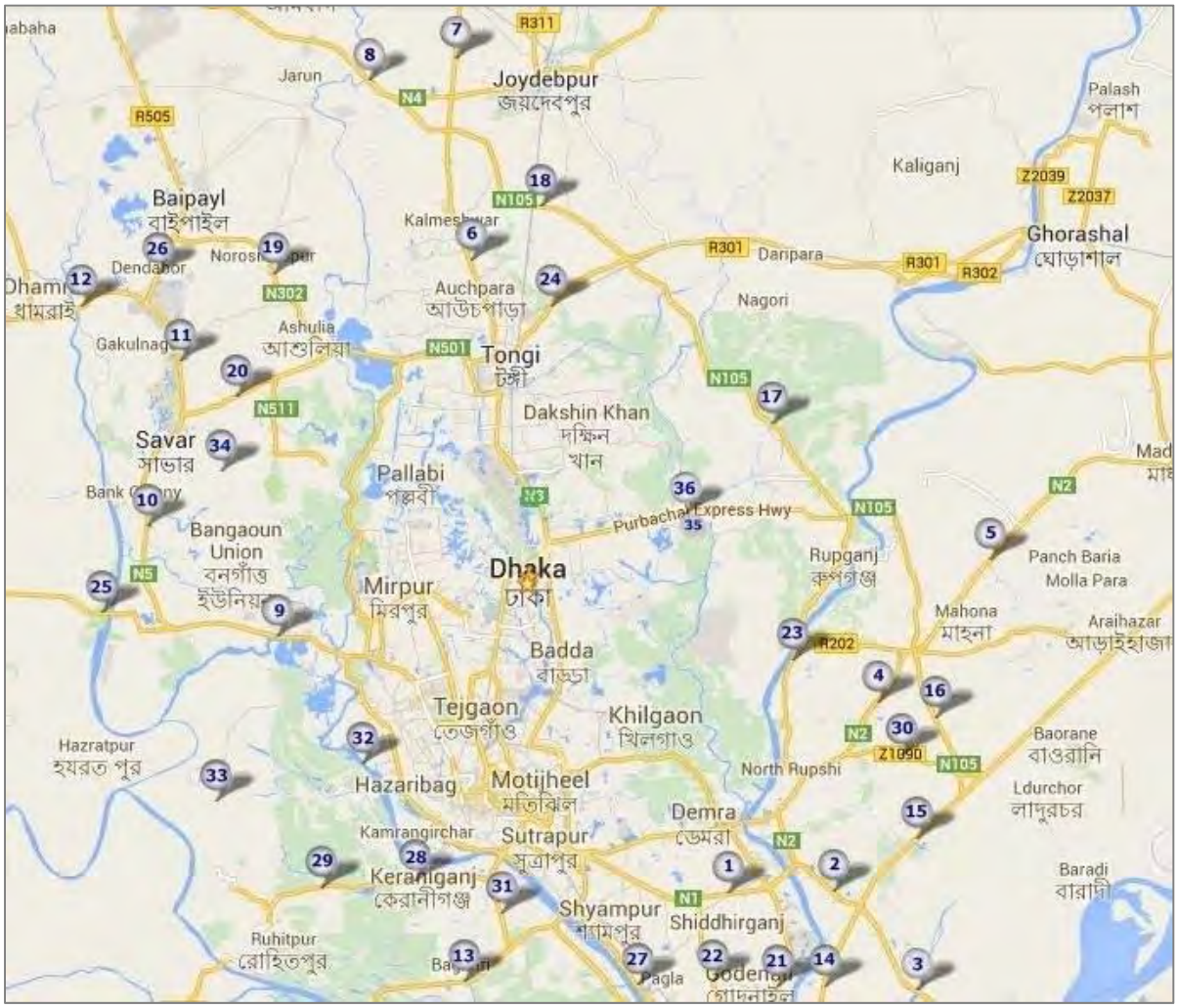


Figure 4.41 Inventory Survey Locations

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.

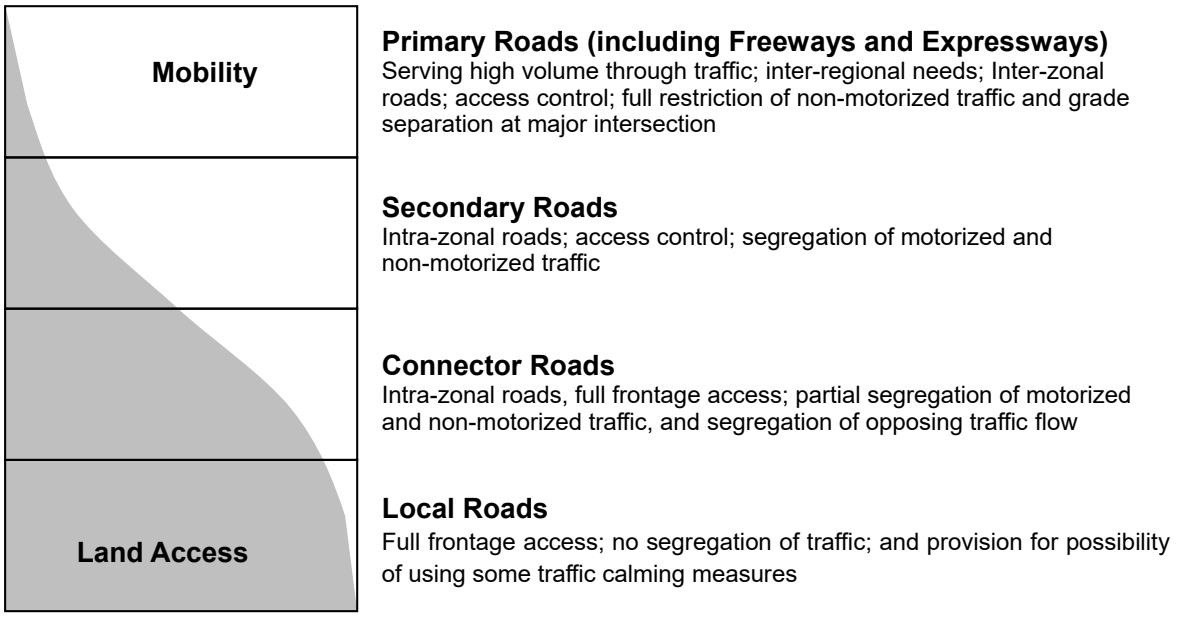


Figure 4.46 Relationship of Functionally Classified Highways to Mobility and Land Access

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