

## 5. ORGANIZATION AND INSTITUTIONS

### 5.1 General

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

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

##### 1) STP-2005

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

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

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

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

##### 2) DHUTS-2010

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

##### 3) SISCETRA-2011

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

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

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

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

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

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

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

#### 4) IBA-2011

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

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

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

#### 5) BRT (ADB Project)

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

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

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

6) IDC-2014

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

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

7) The Dhaka Bus Network

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

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

- I. The range of desirable new institutional/regulatory/licensing frameworks, business models and route/service restructuring options available for application to Dhaka area public transport;
- II. The high probable options with a success rate within one year, 2-4 years, and 5 or more years, with the given industry, governmental and political constraints.

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

**Table 5.1 Summary of Past Studies**

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

Source: JICA Study Team

## (2) Current Organizations and Institutions Related to Transport Sector

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

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

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

Dhaka Transport Co-ordination Authority (DTCA)

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

Bangladesh Road Transport Corporation (BRTC)

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

Bangladesh Road Transport Authority (BRTA)

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

Dhaka Mass Transit Company (DMTC)

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

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

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

Raidhani Unnayan Katripakkha (RAJUK)-

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

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

Dhaka Metropolitan Police (DMP)

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

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

Dhaka City Corporation (DNCC & DSCC)

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

The concern legislation is shown in Table 5.2.

**Table 5.2 Concern Legislation to Agency**

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

Source: JICA Study Team

## 5.2 Transport Sector Administration

### (1) National Integrated Multimodal Transport Policy (NIMTP)

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

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

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

## (2) Main Player of Transport Sector Project

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

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

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

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

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



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

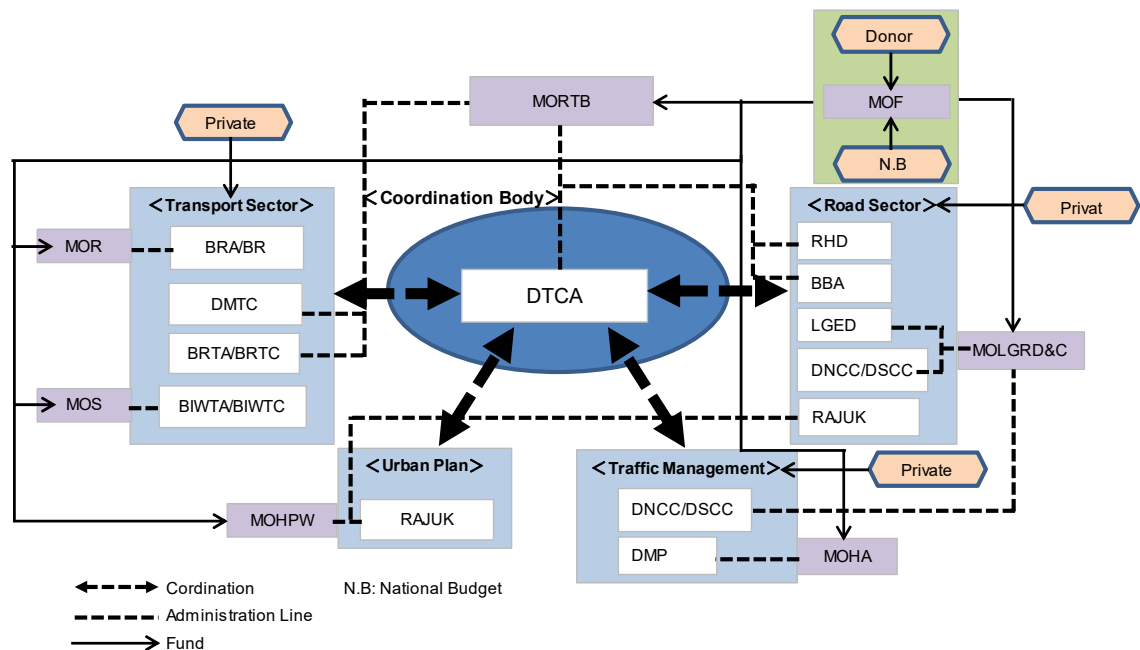
DTCA will be the central organization for research, policy development and planning, training, and coordination for traffic and transport in the STP area.

The primary functions of DTCA are:

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

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

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



Source: JICA Study Team

**Figure 5.1 Interrelation of Concern Agencies**

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

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

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

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

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

### (3) Function of Each Organizations

#### 1) BRTA

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

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

#### [Present Mandates]

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

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

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

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

## 2) DMP

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

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

The main mandated functions are:

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

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

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

## 3) DCC

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

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

[Dhaka North City Corporation (DNCC)]

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

[Dhaka South City Corporation (DSCC)]

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

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

4) RAJUK

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

The jurisdiction of RAJUK comprises an area of 590 Sq. mile (1528 Sq. km) which includes the whole of Dhaka City Corporation, Narayangonj, Tongi, Savar and Joydevpur Powrashava and Keranigonj, Rupgonj and Siddhirgonj upazila.

The major functions of RAJUK are:-

[Planning & Regulation Functions]

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

[Development Functions]

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

- Construction of markets and shopping centers.

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

#### 5) DMTC

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

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

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

#### 6) RHD

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

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

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

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

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

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

**Table 5.3 Main Agency Function**

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

Source: JICA Study Team

(4) Proposal of Measures over the Past Studies

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

**Table 5.4 Proposed Measures and Current Progress**

Agency	Proposed Measures	Current Progress
DTCA	<ol style="list-style-type: none"> <li>1. DTCA legislation to be enacted;</li> <li>2. Separate agency DMTC to be created for MRT/BRT;</li> <li>3. Adequate and technically skilled manpower to be provided;</li> <li>4. Jurisdiction to be clear and authority to be exercised;</li> <li>5. Transport planning and MRT/BRT implementation to be trained</li> </ol>	<p>No.1 and No.2 have been done.</p> <p>No.3,4 and 5 are under progress.</p>
DNCC/DSCC	<ol style="list-style-type: none"> <li>1. Strengthening of good governance, manpower and legal compliance;</li> <li>2. Making training and logistic materials;</li> <li>3. Coordination with other organizations;</li> <li>4. Supplementary of expertise/skilled manpower</li> </ol>	No or very little progress.
DMP	<ol style="list-style-type: none"> <li>1. Strengthening of personnel motivation &amp; training;</li> <li>2. Adequate manpower &amp; logistics;</li> <li>3. Improvement of work environment &amp; inter-agency coordination;</li> <li>4. Improvement of mixed traffic &amp; improper location of bus/truck stands</li> </ol>	No or very little progress
RAJUK	<ol style="list-style-type: none"> <li>1. Strengthening of staff skill and training;</li> <li>2. Inviting of expertise;</li> <li>3. Allocate the senior positions to RAJUK staffs only;</li> <li>4. Strengthening of manpower &amp; logistics;</li> <li>5. Improvement of motivation &amp; skills with high volume of works;</li> <li>6. Improvement of technology of land use planning</li> </ol>	No or very little progress
BRTA	<ol style="list-style-type: none"> <li>1. Strengthening of expertise/skilled manpower, and adequate Office infrastructure;</li> <li>2. Allocation of adequate funds;</li> <li>3. Improvement of adequate manpower and weak enforcement ;</li> <li>4. Adequate training program and coordination;</li> <li>5. Improvement of organizational setup and logistic support;</li> <li>6. Improvement of monitoring system;</li> <li>7. Practical Rules and Ordinance to be enacted</li> </ol>	No or very little progress

Source: JICA Study Team

(5) Approval Process of Candidate Project

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

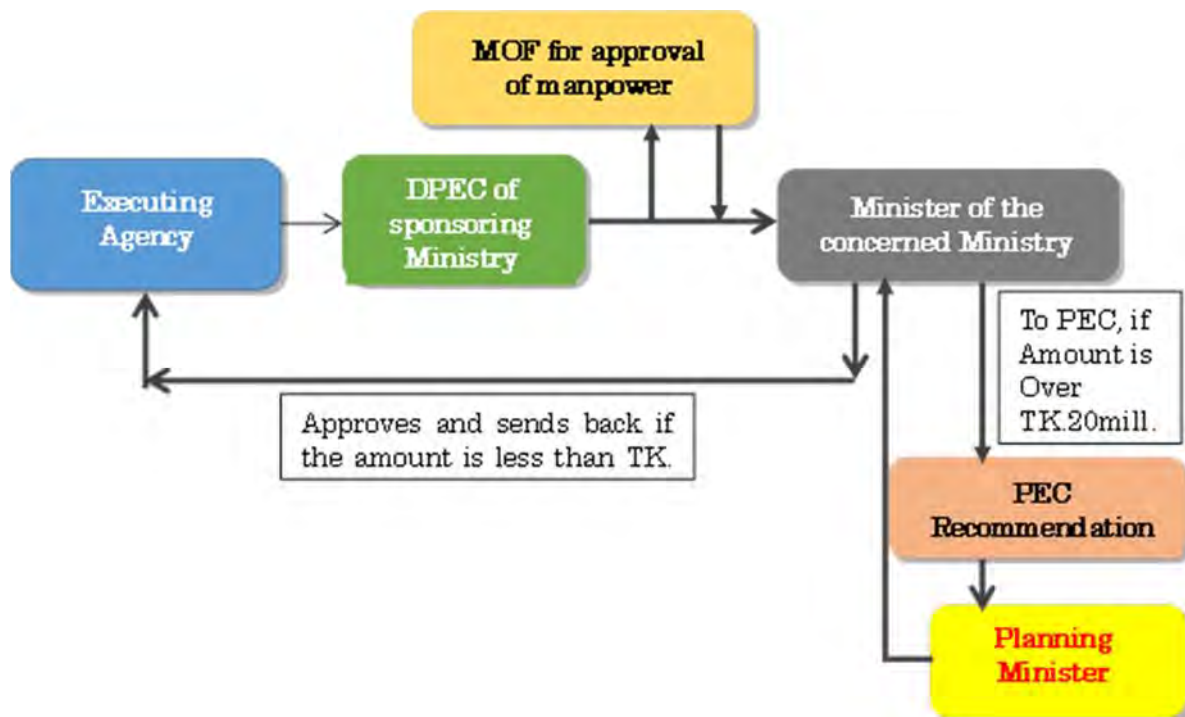
1) Approval authority for Survey/Study projects

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

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

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

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



Source: JICA Study Team

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

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



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

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

Source: GOB Project Approval Process –A Scoping Study, Aid Effectiveness Unit of MOF, August 2010

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

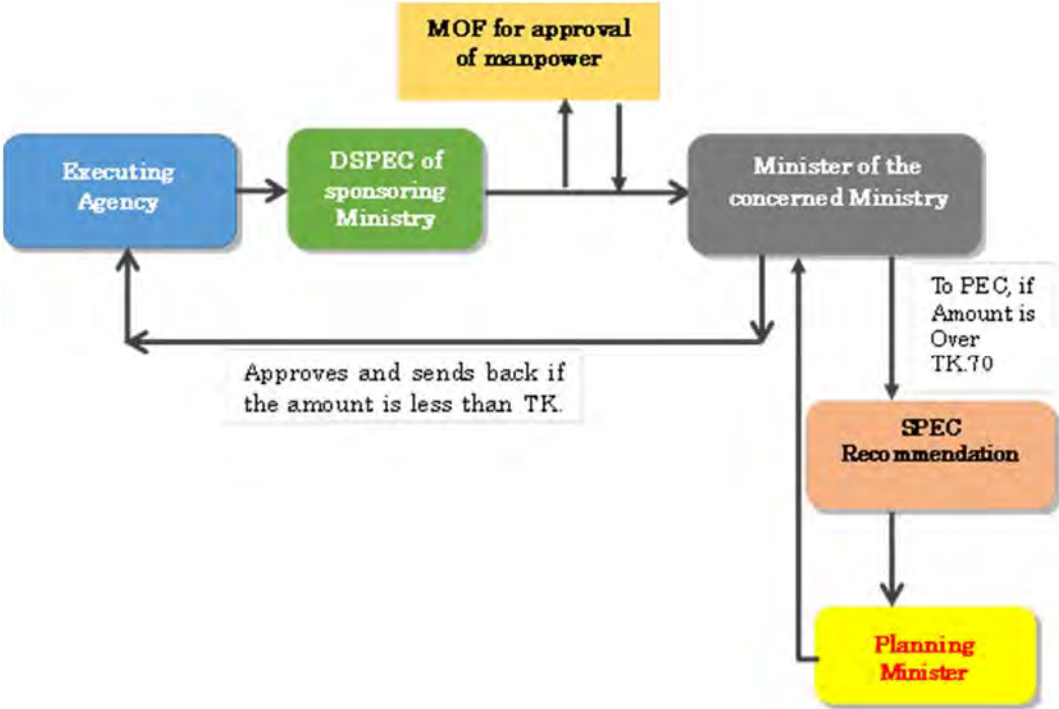
01	Member of the concerned Division of the Planning Commission	Chairperson
02	Division Chief of the Sector/Division of the Planning Commission	Member
03	Representative of the General Economic Division of the Planning Commission.	Member
04	Representative of the concerned sponsoring Ministry/Division	Member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

Source: GOB Project Approval Process –A Scoping Study, Aid Effectiveness Unit of MOF, August 2010

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

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

- I In the case after the Technical Assistance proposal is finalized, the sponsoring Ministry approves Survey/Study project Proposals up to Tk 70.00 (seventy) million. Moreover, the project proposal will be examined by a committee named Departmental Special Project Evolution Committee (DSPEC) also chaired by the concerned Secretary, but with different committee composition.
- II If the amount is more, it will be sent to the Planning Commission for approval of the Planning Minister. The composition of the committee will be different and named as Special Project Evolution Committee (SPEC) which will be chaired by Member of the concerned Division of the Planning Commission.



Source: JICA Study Team

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

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

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

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

Source: GOB Project Approval Process –A Scoping Study, Aid Effectiveness Unit of MOF, August 2010

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

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

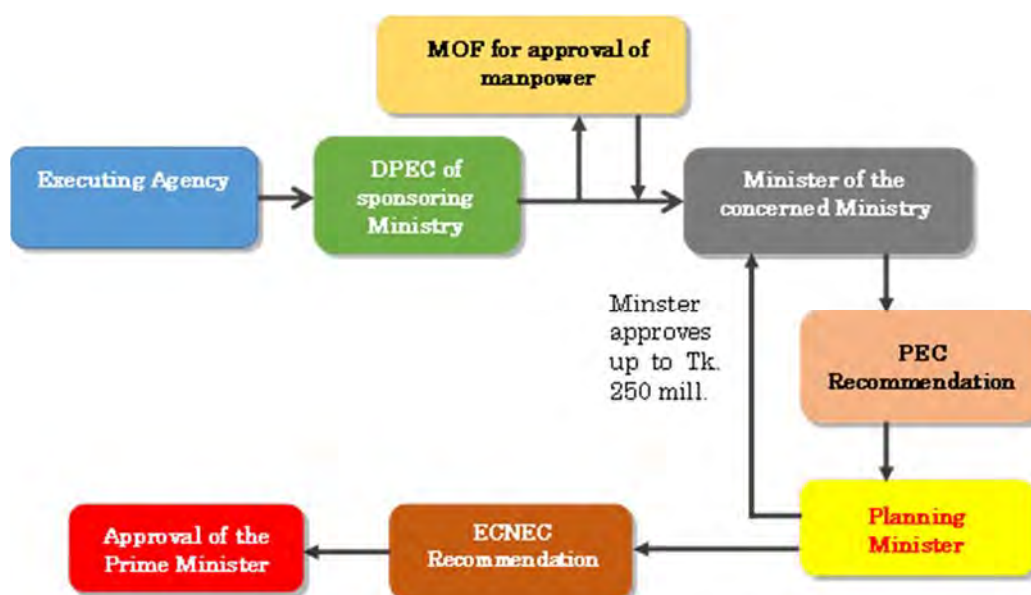
Source: GOB Project Approval Process –A Scoping Study, Aid Effectiveness Unit of MOF, August 2010

3) Approval authority for Development Project Proposal (DPP)

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

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

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



Source: JICA Study Team

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

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

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

**Table 5.9 Composition of NEC and ECNEC**

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

Source: GOB Project Approval Process –A Scoping Study, Aid Effectiveness Unit of MOF, August 2010

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

#### (1) Summary of Past Studies Findings

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

**Table 5.10 Summary of Previous Studies Findings**

<b>Findings</b>	<b>Study Title</b>	<b>Recommendation</b>	<b>Current Improvement</b>
Lack of skilled and experienced technical manpower in most of the transport related agencies.	BRT(ADB) SISCETRA STP	1. Institutional development and capacity enhancement with approved new organogram; 2. Recruitment and placement of experienced and skilled manpower.	1. Most of the agencies proposed new organogram; 2. Recruitment rules for new proposed posts have not yet been prepared.
Formation of a Government owned company for construction, operation and maintenance of MRT/BRT.	SISCETRA IBA DHUTS	1. To prepare legislative documents and get approval of the GOB	1. GOB owned company named DMTC has been formed under Company Act 1994.
Coordination among the transport related agencies is very poor.	SISCETRA IBA DHUTS, STP BRT(ADB)	1. New organogram for the agencies to be approved, with a focal point on coordination.	1. No improvement as yet (Coordination DTCA)
For DTCA, BRTA and RAJUK most of the higher posts are on deputation from other agencies.	STP SISCETRA	1. Career path for the department officers should not be blocked. There should be recruitment for these posts if the department officers are not qualified.	1. No improvement as yet. 2. Career building opportunity of department officers not visible.
Awareness of the Drivers, Commuters, and Pedestrians was found to be at the bottom level and measures should be taken to increase them.	STP SISCETRA BRT	1. DMP and BRTA should do more campaign, workshops, seminars etc. 2. Awareness on road transport may be included in primary education curriculum.	1. BRTA and DMP's campaign, workshops, seminars etc. are insufficient. (Coordination DTCA)
Vehicle emission level and noise level are very high and measures should be taken to eradicate or lower them.	STP	1. DMP and BRTA should take action to write Manuals with the help of the Department of Environment (DoE).	1. Guideline has been prepared. 2. Enforcement initiative is inadequate. (Coordination DTCA)
DTCA do not have legislative and functional capability to coordinate with all the transport related agencies.	STP SISCETRA	1. Organogram of the DTCA should be properly rearranged with correct and adequate number of posts for executing such activities; and it should be empowered with legislative authority.	1. Legislation has been enacted. 2. No action is visible as yet on Functional authority.

Source: JICA Study Team

(2) Arising Issues from Current Observation

Summarized below are the recommendations of this study on issues that need to be addressed as revealed from the analysis and observations made of the previous studies on Transport sector and current improvements:

- 1) The Road Safety will be discussed with concern agencies. The improvement of urban transport system should not be ignored. The DTCA should be the unitary coordination body for the Road Safety system of greater Dhaka for which it should be organizationally empowered. And the enforcement agency (BRTA and DMP) should be manned and equipped properly so that they can take action against faulty vehicles as well as organize workshops/seminars on public awareness, driver's and operators awareness and most importantly on Road Safety.
- 2) Effective Management Information System and database system should be developed so that DTCA can provide support to other agencies which will be treated as an important tool for coordination. It should also be able to supervise, monitor and coordinate the activities of other agencies involved in transport sector with due respect to transport planning and land use planning.
- 3) In spite of new development projects; transport related projects are coming up without proper coordination. DTCA should be strengthened to take the lead to conduct periodic coordination meetings and provide data and information to other agencies.

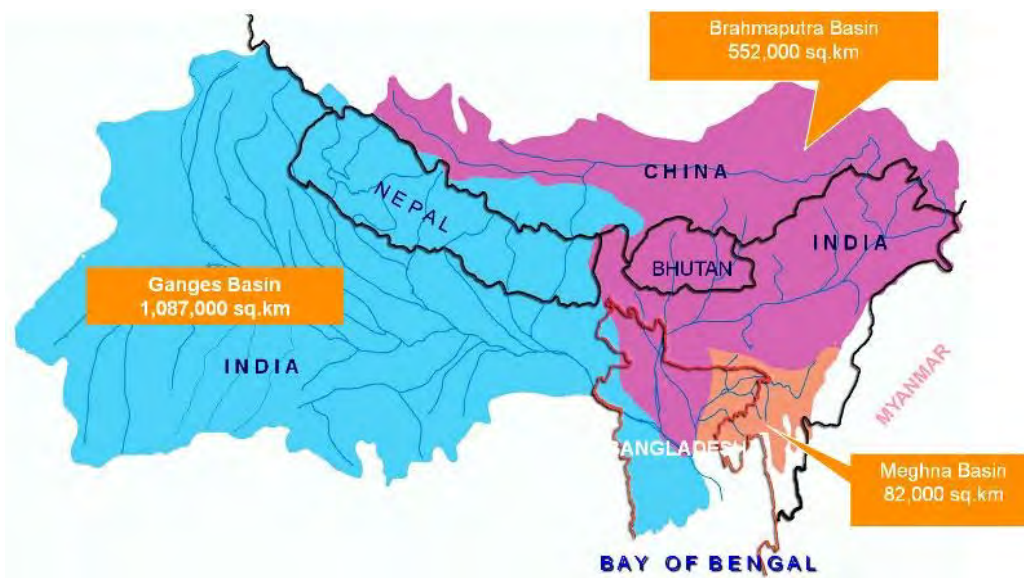
## 6. ENVIRONMENTAL CONDITION

### 6.1 Natural Environment

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

The People's Republic of Bangladesh is located in the delta formed by three major rivers; Ganges River, Brahmaputra River and Meghna River in confluence, and is a flat, low-lying country comprising an alluvial plain formed by tributaries and distributaries of these major rivers. Floodplains (80%), terraces (8%) and hills (12%) cover the land area. The hill zone is relatively small and mainly located in the southeast.

The three major rivers are international rivers that encompass India, Nepal, Bhutan, China and Myanmar, as well as Bangladesh in their basins, with total catchment area of about 1.721 million km<sup>2</sup>. Bangladesh's territory area is about 147,000 km<sup>2</sup>, covering merely about 8.5% of the total catchment area (Figure 6-1).



Source: BWDB presentation

**Figure 6.1 Major rivers flowing through Bangladesh**

With regard to the climate, Bangladesh is located at the foot of the Himalayas, in one of the regions having the highest rainfall in the world, under the influence of tropical monsoon climate. The year is distinctly divided into a dry season and a rainy season. About 70% of the yearly precipitation occurs in the rainy season from June to September.

Bangladesh has about some 310 rivers running through it, and receives inflows from the outside of the country through the three major rivers and others, and the total inflow is estimated to amount to about four times the precipitation within the country (total yearly runoff of surface water through rivers is about 1,200 billion cubic meters). Because the period during which the inflows enter across the national borders nearly coincides with the rainy season of the country, the flat, low-lying delta of Bangladesh is inevitably inundated during the rainy season.

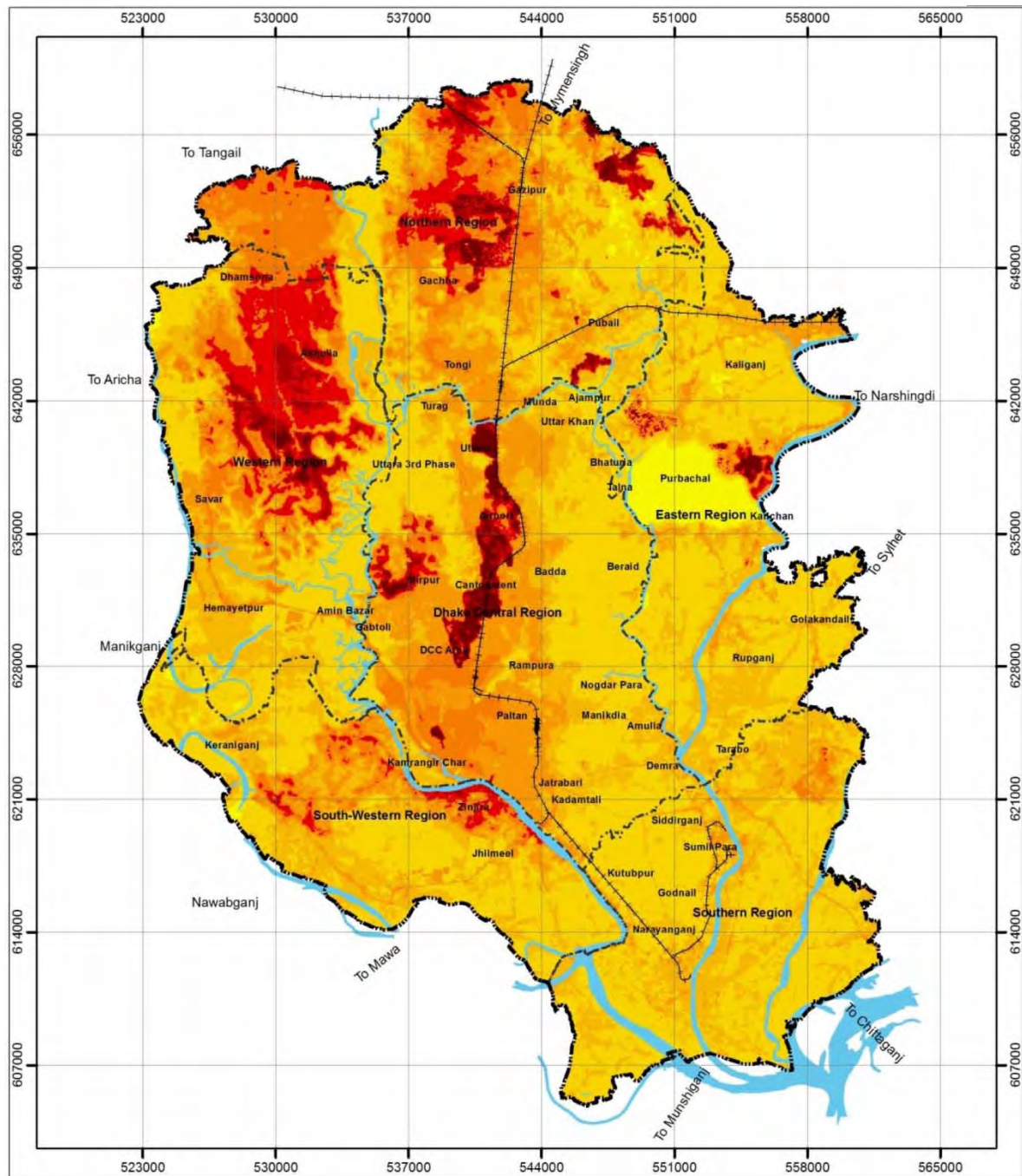
Low lying swamps and marshes located in and around the city are other major topographic features. The elevation of DCC area varies from 2 to 13 m above the mean sea level. The most of the developed areas in RAJUK area are at an elevation of 6 to 8 meters above the mean sea level (refer Figure 6.2).

Bengal Basin covers a vast area of the north-east part of the Indian Plate. It includes Bangladesh and part of West Bengal, Tripura and Assam of India. The Bengal Basin is bounded by the Indian Peninsular Shield on the west, on the north by the Precambrian Shillong Massif, on the east by the Arakan-Yoma Fold Systems and to the south it is open to the Bay of Bengal.

Bengal Basin consists of a large alluvial basin floored with Quaternary sediments deposited by the Ganges, Brahmaputra and Meghna rivers and their tributaries. In the active floodplain areas two major areas of Pleistocene sediments are within Bengal Basin and are known as the Barind Tract and Madhupur Tract (refer Figure 6.3).

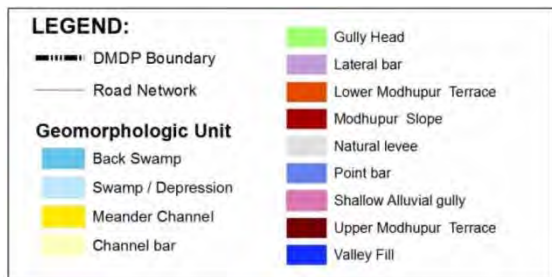
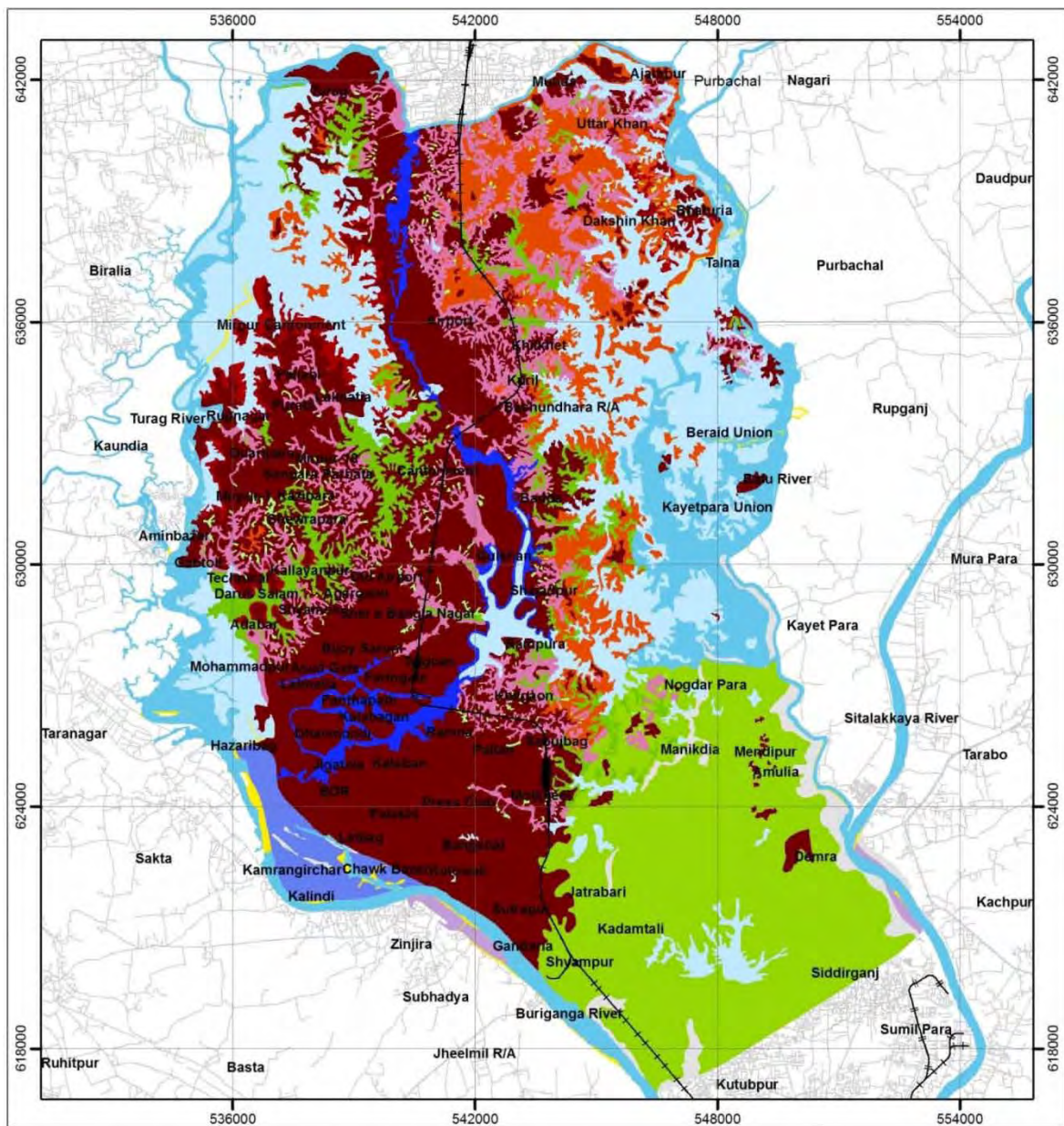
Part of the RAJUK area is covered by Pleistocene Madhupur Clay and Holocene sediments of the Ganges- Brahmaputra floodplain. The Madhupur Clay is situated in north-west part and lies elongated from the middle of the north to south of the project area and these are oxidized Pleistocene sediments. In the east, south and western half of the RAJUK area are covered by the Ganges-Brahmaputra floodplain sediments. The area has been divided into 6 geological units and these are: i) Chandina Alluvium, ii) Alluvial Silt and Clay, iii) Alluvial Sand, iv) Alluvial Silt, v) Marsh Clay and Peat and vi) Madhupur Clay Residuum as shown in Figure 6.4.





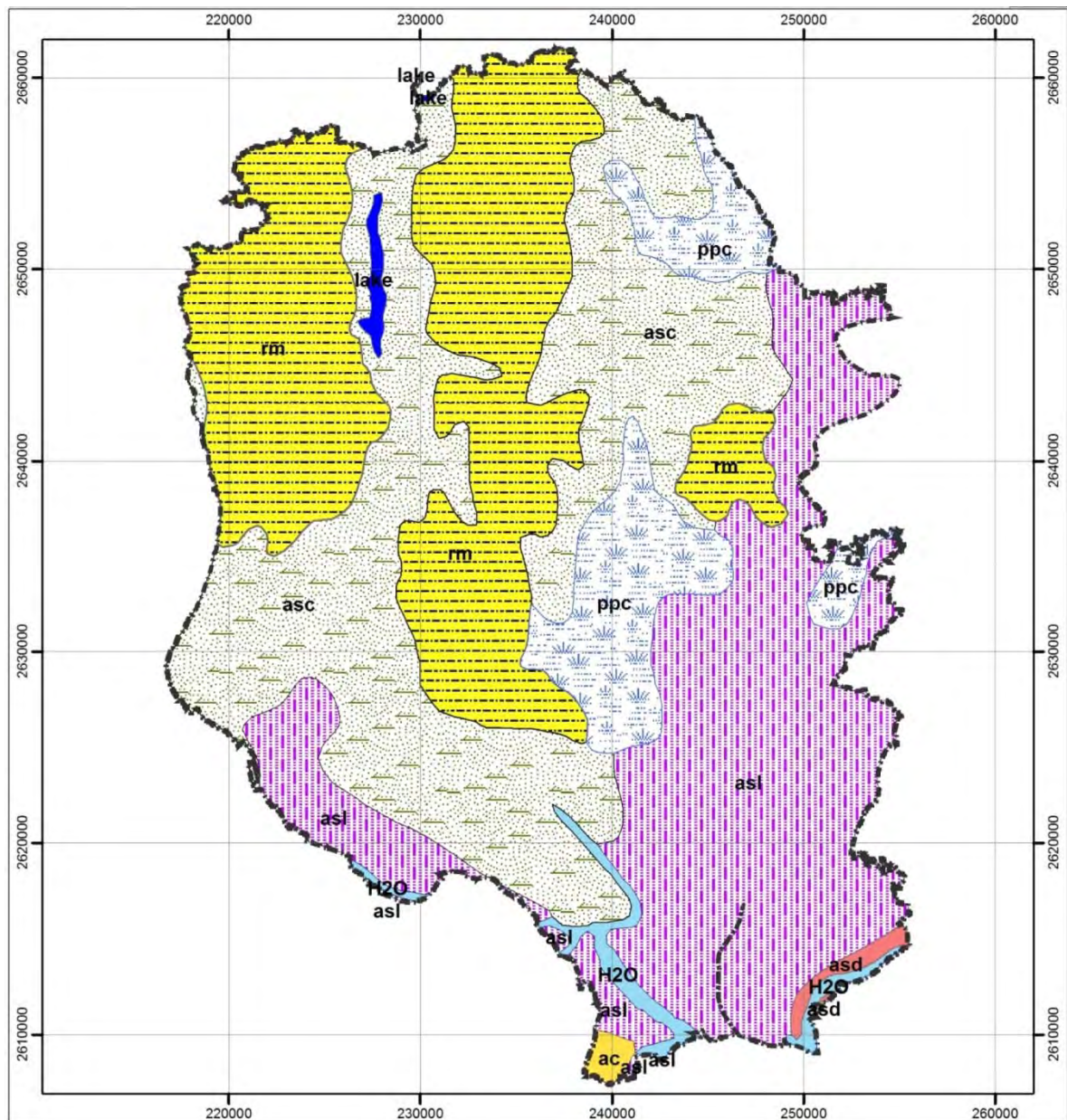
Source: Regional Development Planning, RAJUK, 2014

**Figure 6.2 Digital Elevation/Terrain model of RAJUK Area**



Source: Regional Development Planning, RAJUK, 2014

**Figure 6.3 Geomorphologic Situation of Dhaka Central Part of RAJUK Area**



Source: Regional Development Planning, RAJUK, 2014

**Figure 6.4 Generalized Geology of RAJUK area**

## 1) Soil

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

Topsoil is usually a ploughed layer 5 cm to 80 cm thick. The floodplain topsoil varies in thickness from 5 cm to about 15 cm. The subsoil is the layer undisturbed by tillage. In the floodplains it ranges from 15 cm to 45 cm. The topsoil grades uniformly into the substratum which may range from loose sand to Madhupur clay (Soils Resource Development Institute).

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

## 2) Seismology

The National Seismic Zoning Map (Geological Survey of Bangladesh (GSB)) divides the country into three regions (Figure 6.5). The city of Dhaka falls within the medium-risk zone (zone 2). In the medium risk zone, shocks of moderate intensity are possible, with a probable maximum magnitude of 6-7 on the Richter scale. This map clarifies the seismological status of the various regions of the country.

The earthquake risk factor for this zone 2 is 0.15, while the risk factors for zone 1 and zone 3 are 0.075 and 0.25 respectively. More than 20 large earthquakes have been recorded in and around Bangladesh over the last 130 years (MPO, 1987). These earthquakes were centered in the Shillong Plateau in Assam in the Arakan Yoma Ranges and in the Indo-Burman Ranges in Myanmar (Table 6.1).

**Table 6.1 Seismic attribute over the years**

Year	Epicenter	Magnitude
1762	Arakan Yoma	8.4
1885	Bengal	7.0
1897	Shillong	8.7
1918	Sreemangal, Sylhet	7.6
1923	NER/Tangua hanor	7.1
1944	NER/Hakaluki hanor	6.0
1950	Assam	8.5
1967	NER/Khowai	5.1
1968	NER/Khowai	5.2
1971	Tripura	5.5

Source: NERP

A recent study by Comprehensive Disaster Management Program (CDMP) on the liquefaction susceptibility of Dhaka indicates that the city's eastern and south-western parts lie within the high to very high liquefaction susceptibility range. These parts are recently filled and developed marshy lands. Liquefaction is a physical process of ground failure that takes place during earthquake. In Dhaka, an earthquake from either Madhupur or Dauki fault might cause severe liquefaction effects to buildings, especially those developed on marshy lands on the eastern and western fringes, and even within the city in the infill areas like Begunbari and parts of Mirpur.



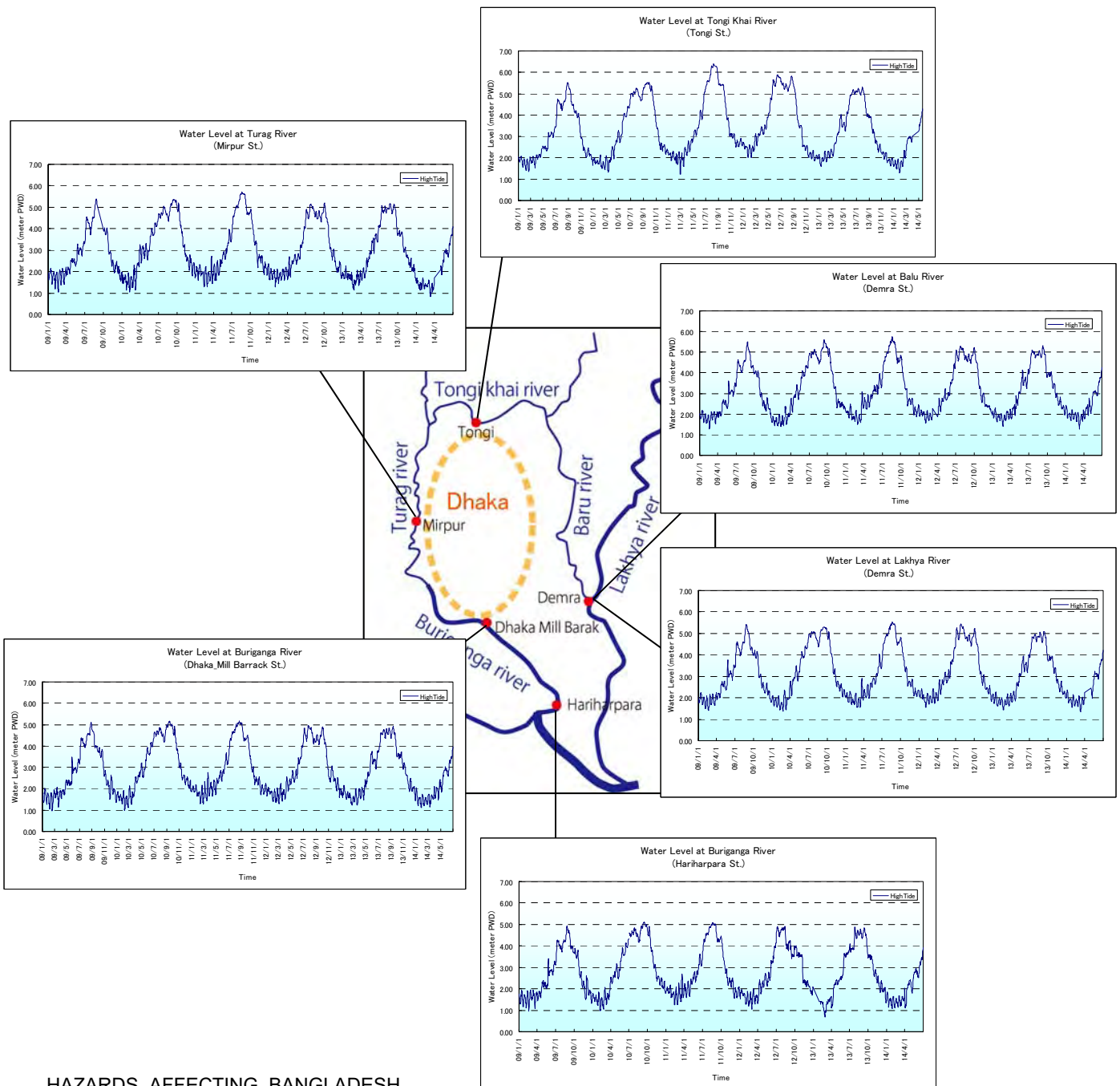
Source: Ministry of Power, Energy & Mineral Resources Division

**Figure 6.5 National Seismic Zoning Map of Bangladesh**

(2) Hydrological Characteristics

1) River water level

Dhaka, the capital of the People’s Republic of Bangladesh, is surrounded by tributaries and branches of the three major rivers. The urban district of Dhaka is delimited by Turag River, Buriganga River, etc. on the east, and Balu River, Situlakhya River, etc. on the west. Water levels in these rivers vary in sync with the water level in the major rivers, and rise as high as 5.0 to 6.0 m in an ordinary rainy season, but are about 1.0 to 2.0 m in the dry season.

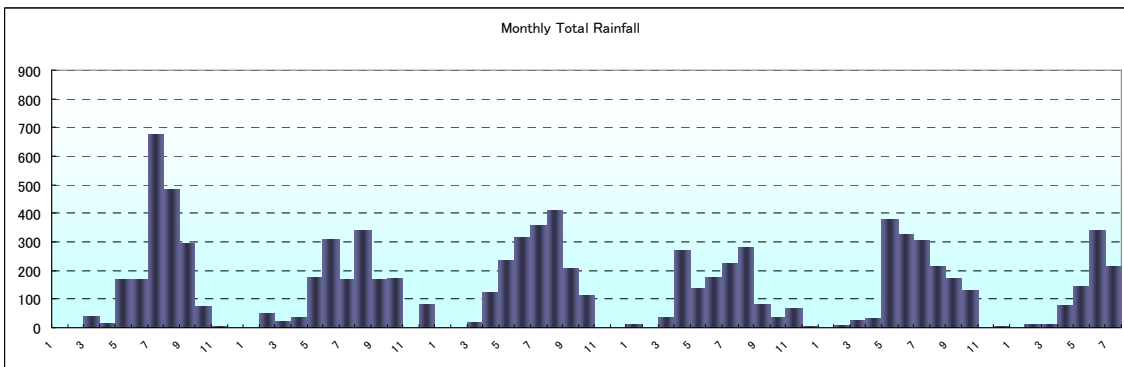
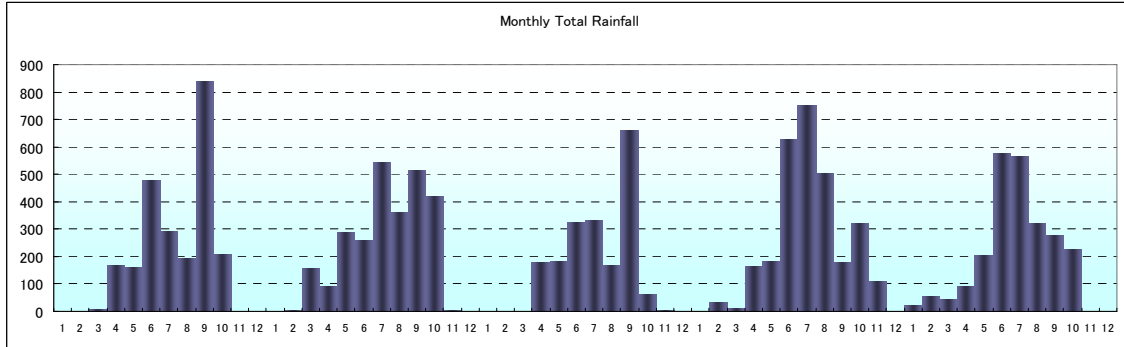


HAZARDS\_AFFECTING\_BANGLADESH

Figure 6.6 Variations in water levels in rivers around Dhaka in recent 5 years

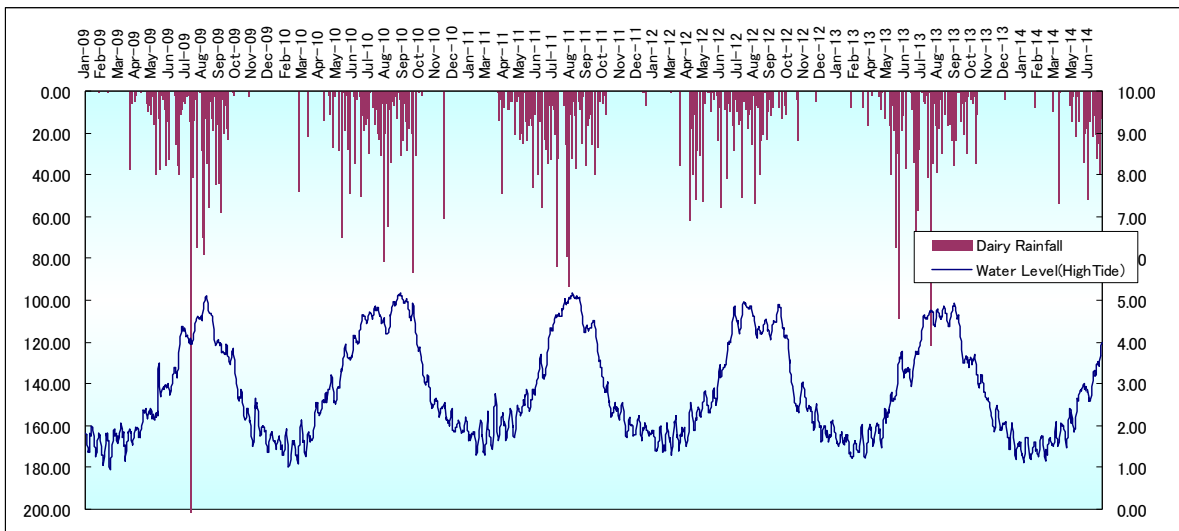
2) Precipitation

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



Source: HAZARDS\_AFFECTING\_BANGLADESH

**Figure 6.7 Monthly precipitation in recent 10 years**



Source: HAZARDS\_AFFECTING\_BANGLADESH

**Figure 6.8 Daily precipitation in Dhaka and variations in water level in Buriganga River in recent 5 years**

### 3) Groundwater Table of Dhaka City

There are various reasons that are responsible for gradual declination of groundwater level in Dhaka city of which high groundwater withdrawal from the aquifer is the most crucial. In addition, rapid urbanization including construction of roads, buildings, other engineering structures, flood protection dams, and embankments are continuously hindering the natural groundwater recharges from rainfall and perennial water sources existing in and around the city (Rahman and Alam, 2005). A network of 22 lakes, canals, and small rivers facilitate the natural drainage for the floodwaters and groundwater recharge in this city. Illegal encroachment and disappearances of them also depreciated groundwater recharge over the last four decades.

In Bangladesh, the depth of water tables varies from less than a meter to more than 30m. The shallowest water table occurs in the coastal region whereas the deepest water table occurs in the

Barind Tract and Dhaka City (more than 30m from the ground surface) (Banglapedia, 2006).

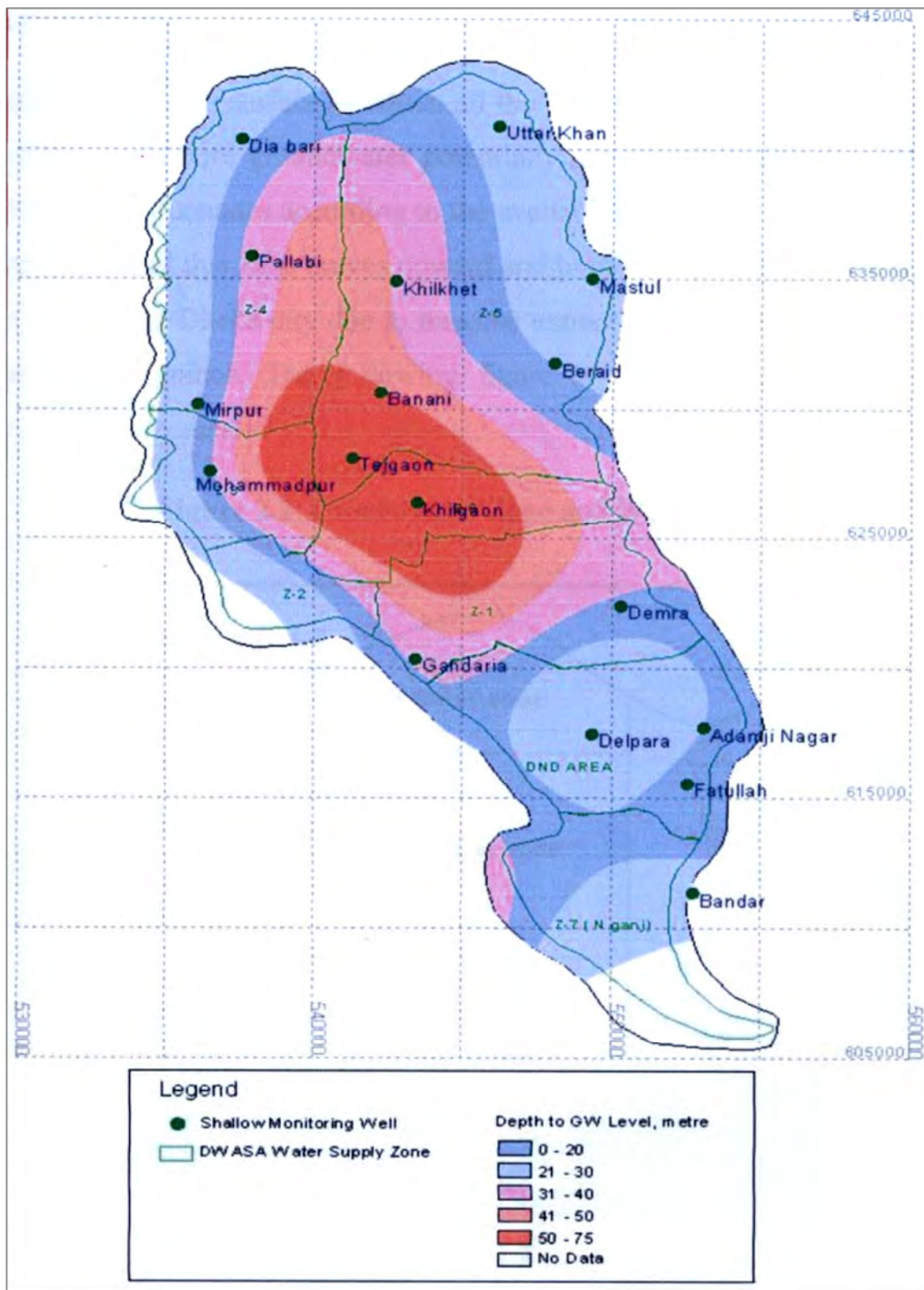
The depth to the water table moves seasonally with annual recharge and discharge conditions. The amount of seasonal fluctuation varies from less than a meter to more than 10m depending on the local hydro geological conditions, amount of groundwater abstraction and natural discharge of groundwater. In recent years, there is a declining trend in the water table due to larger amount of groundwater withdrawal.

Geologically, Dhaka city is under the category of the Pleistocene terraces mostly composed of the Madhupur clay deposits. There is little variation in the surface elevation of the city. The thickness of the Madhupur clay ranges from 8 m to about 45 m with an average thickness of 10m in this city. The underlying layer is known as “Dupi Tila” composed of sand particles that are considered as the main aquifer of Dhaka city. The impermeable clay layer of variable thickness overlies the sandy layer that makes the groundwater aquifer mostly confined in nature. The total thickness of the Dupi Tila aquifer varies from 100m to about 200m with an average thickness of 140m. Some scientific studies on the groundwater of the city revealed that the aquifer piezometric level which is the natural water level of a confined aquifer of the city main aquifer, has gone down significantly in last few years due to over-withdrawal of groundwater (Akther, Ahmed and Rasheed, 2009).

### 4) Groundwater Depletion of Dhaka City

In Dhaka city, groundwater extraction started from a depth of 100 meters and in some extreme condition the well goes up to 300 meters to reach the main aquifer. The depletion rate varies from area to area as in Mirpur the groundwater level dropped 53.75 meters between 1991 and 2008 at a rate of 3.2 meter per year. While the decline was 1.1 m/y in Mohammadpur, 2.2 m/y in Sabujbagh, 0.5 m/y in Sutrapur, and 0.8 m/y in Dhaka Cantonment during the same period (The Daily Star, 2010). The city’s groundwater level has dropped about 20 meters over the last seven years at a rate of 2.81 meter per year, and from the year 2000, the rate is increasingly high.

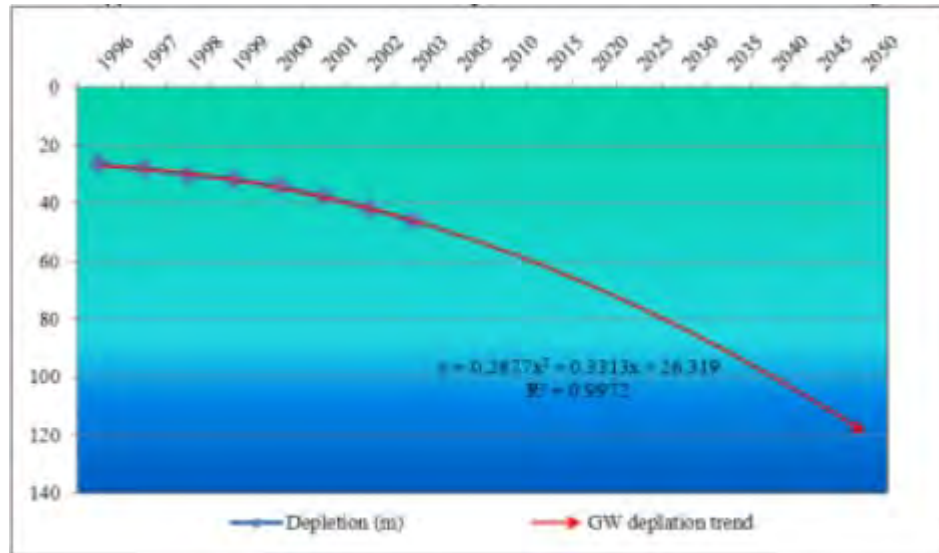




Source: DWASA, 2008

Figure 6.9 Ground water Zoning Map of upper Dupitila Aquifer System

Taking into account the current groundwater depletion trend at 2.81 m/y, a projection has been made for 2050 and it predicts that the groundwater table will be lowering down to 120 meters by 2050 from the existing water table (Figure 6.10). This depletion will hamper the constant water supply as many of the operating deep wells may shut down due to water unavailability. The production cost may rise at the highest peak.



Source: Dhaka City State of Environment 2005, 2011

**Figure 6.10 Groundwater Depletion Trend of Dhaka City**

### (3) Wetland Characteristics

#### 1) Function of Wetland

Dhaka city play important roles of flood control and environment protection, by performing various functions as listed below. However, wetlands have been in an irreversible course of disappearing in recent years, as poorly planned development projects are rampant, while relevant regulatory agencies remain poorly coordinated.

Functions of wetlands

##### A. Water retention for flood water

Mitigates the inundation damage by temporarily retaining the flood water coming from rivers.

##### B. Drainage of rain water from urban district

Rain water falling in Dhaka is stored in wetlands in the surrounding areas, while rain water falling in the urban district is discharged through drainage and khals into rivers.

##### C. Recharging of ground water

According to a survey conducted by SWMC in 2000, about 95% of water supplied to Dhaka was ground water from a depth of 1.02 m to 2.46 m during the period from 1995 to 1999. It can be seen that the lowlands play an important role of recharging the ground water.

#### D. Preservation of ecological system and biodiversity

A wetland, that includes diverse ecological elements such as waterbody, habitat of emergent plants and forests, makes a great contribution to the preservation of ecological system and biodiversity.

#### E. Contribution to local economy

Most of the wetlands are fertile floodplains, which are highly valued and utilized as rice paddies or fields to cultivate other agricultural products in the dry season. In the rainy season, the wetlands join with the neighboring rivers and provide a fishing ground. Thus the wetlands are integrated in the economy of the local residents.

#### F. Field of recreation activities

The vast expanse of wetlands surrounding the urban district provides an open, natural landscape and a field for recreation activities.



Source: JICA Study Team

**Figure 6.11 Wetland (Rupgonj)**

## 2) Wetland Loss

Map in Figure 6.12 shows that the main wetlands of Dhaka have been squeezed substantially over the years. Analysis revealed that area covered by wetlands in the city significantly reduced over the period 1960 to 2008 (Islam 2010). In 1960, the area of the open water body was about 2,952 ha, which became about 1,991 ha in the year 2008. The amount of the open water body reduction is 961 ha. There has been a yearly wetland loss of 5.67% from 1999 to 2003 as against 1.23 % from 1989 to 1999. The wetlands in the south-western corner retreat towards the Turag River in between Mirpur and Mohammadpur area. Minor reduction of the wetland has been occurred in the Pallabi-Cantonment area as well where low-lying areas were filled and levelled for the urban extension.

From 2005 to 2011 in just six years, the wetlands adjacent to Dhaka shrank from 5.85 km<sup>2</sup> to 3.95 km<sup>2</sup> when local water bodies and lowlands were converted to commercial, industrial and residential zones. If the current trend continues, experts said, by the year 2037 all wetland of Dhaka will disappear, posing a serious threat to the city's existence. (BCAS, Abu Syed, 2012)

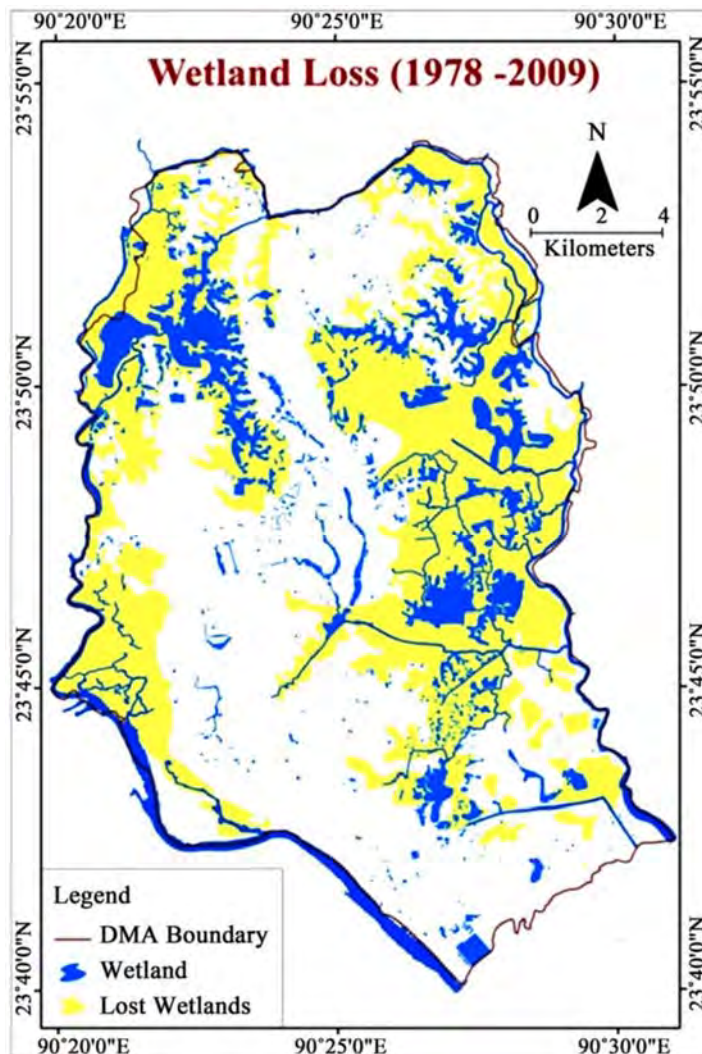
The rainy seasons in Dhaka are getting shorter but more intense. The wetlands serve as flood basins for the city - they help the rainwater to run off. With the

depletion of the wetlands, the city's drainage systems are no longer able to function properly, resulting in frequent water-loggings. (CGEC, Ataur Rahman, 2012)

Not only for preventing drainage congestion and water logging but also for sustainable development, as well as for various environmental benefits all the remaining wetlands in and around Dhaka City must be preserved. Wetlands ecosystems help regulate climate change by storing and capturing carbon. Wetland play important role as carbon sinks to mitigate the effects of climate change.

Most of the natural drainage channels of Dhaka City disappeared or are on the way to extinction due to illegal encroachment and filling. Most of these developments do not have required approvals from appropriate authorities including the RAJUK or have obtained the same using their political influences or using unfair practices. In addition, without there being any systematic plans by RAJUK for land development and development control in such fringe areas, the intrinsic ability of these flood flow zones to retain or store excess water during periods of high rainfall is getting reduced.

It was reported by an expert from BUET that in a recent study conducted in Boro Beraid, Satarkul, Kathaldia and Dumni moujas in the city's eastern fringe areas, severe socio-economic impacts have been reported on the original residents due to the earth filling. These people now face forced displacement from their ancestral homes as well as their traditional livelihood based on agriculture. Even though they are provided compensation amounts, in the absence of any comprehensive rehabilitation policy and with the low skill sets of the displaced people, the signs of impoverishment are even more pronounced. It has even been reported that due to the unlawful modalities adopted by the land developers, 53.2% of the affected locals are forced to sell their lands due to the tactics adopted by the developers, while 25.8% were compelled to sell just because their lands were turned into enclaves within areas filled up by developers. (Regional Development Planning, RAJUK, 2014)



Source: Survey Report (RAJUK 2014)

**Figure 6.12 Wetland Loss in RAJUK between 1978 and 2009**

(4) Protected Area

1) National Park, Sanctuaries and Other Conservation Sites

Based on Bangladesh Wildlife Preservation Order 1973 Protected Areas (PAs) is classified into national parks, wildlife sanctuaries, game reserves and private game reserves. Bangladesh has 37 nationally designated protected areas (17 national parks and 17 wildlife sanctuaries). Covering approximately 266,000 ha, this covers 10.72% of Total Forest Area of the country. A part of the Sundarbans forest (59,600 ha from its East, West and South sites) and 9,772 ha of Tanguar Haor have been designated as Ramsar sites in the country. In addition, since February 4, 1999, UNESCO has classified 139,700 ha of land in the Sundarbans covering three regions - East, West, and South - as World Heritage Sites. Under the RAJUK area, there is only one national park, Bhawal National Park in Gazipur.

Bhawal National Park

Bhawal National Park is one of the oldest national parks in Bangladesh encompassing an area of 5,022 ha. The park was established in 1982 to protect the

biological, ecological and geographic significance of the area, providing recreational facilities for the visitors. It is a moist deciduous forest known as Sal (*Shorea robusta*) forest, which spread over the plains of the central and northern regions of the country (FSB, 2000). The Park is situated about 40 kilometers away from Dhaka City, along the highway of Dhaka-Mymensingh. About 180.25 ha (18 %) of this core area of the park was privately owned out of which only 24.38 ha (13.5%) of land is transferred to government, i.e. Forest Department (Anon., 2002).

The Park has 220 plant species, including 43 different tree species, 19 shrubs, 3 palms, 27 grasses, 24 vines, and 104 herbs. The wildlife in the park includes 13 mammals, 9 reptiles, 5 birds and 5 amphibians.

Unfortunately illegal deforestation has stripped the area of much of this natural vegetation, in fact only 600 km<sup>2</sup> remains of what was once a magnificent forest. New trees and woodlands have been planted in an effort to help the forest recover, but it will most likely take many years before they are mature enough to support the incredible animal diversity that was once so common in this area.



Source: JICA Study Team

**Figure 6.13 Bhawal National Park Sal (*Shorea robusta*) forest and Bhawal National Park Sal forest and wetland**

2) Environmentally Critical Area

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

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

(5) Biodiversity

1) Ecosystems

The ecosystems of Bangladesh could be categorized into two major groups, i.e. (i) land based and (ii) aquatic. The land-based ecosystems include forest and hill

ecosystems, agro-ecosystem and homestead ecosystem; while seasonal and perennial wetlands, rivers, lakes, coastal mangroves, coastal mudflats and chars, and marine ecosystem fall into the aquatic category.

Each of the ecosystems has many sub-units with distinct characteristics as well (Table 6.2). IUCN Bangladesh in 2002 classified the country into twenty five bio-ecological zones, some of which are constituted of one or more than one type of ecosystems.

Under the RAJUK area, Moist Deciduous Forest (Sal Forest), Agro-ecosystem, Homestead Ecosystem and Wetland Ecosystem are observed.

**Table 6.2 Type of Ecosystem**

Category	Type of Ecosystem		Total Area (km <sup>2</sup> )	% of land area
Land based	Forest Ecosystem	Tropical Evergreen and Semi-evergreen Hill forest	6,700	4.54
		Moist Deciduous Forest (Sal Forest)	1,200	0.81
	Agro-ecosystem		N.A.	N.A.
	Homestead Ecosystem		27,670	20
Aquatic	Forest Ecosystem	Mangrove Forest	6017	4.07
		Freshwater Swamp Forest	N.A.	N.A.
	Coastal and Marine Ecosystem		Coast: 714 (km)	N.A.
	Wetland Ecosystem		1720.09	1.16

Source: JICA Study Team

## (6) Ambient Air Quality

### 1) General

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

The main air pollutants in Dhaka are Nitrogen Oxides (NO<sub>x</sub>), Sulfur Dioxide (SO<sub>2</sub>), Particulate Matter (PM), usually expressed as PM with diameter of 10 microns or smaller: PM<sub>10</sub>, or PM<sub>2.5</sub> microns or smaller: PM<sub>2.5</sub>, Carbon Monoxide (CO), Ozone, and Lead. The motor vehicles and traditional brick kilns contribute predominantly to the air pollution. The motor vehicles are major source of PM pollution that contributes to the risk of developing cardiovascular and respiratory diseases, as well as lung cancer. Most of the PM pollution comes from the diesel-run vehicles. Hundreds of brick kilns operate during the dry season from November to April in the low agricultural land surrounding Dhaka City and generate smoke dust including SO<sub>2</sub>, NO<sub>x</sub> and hydrocarbons that contribute to worsening the ambient air and damage of public health.

Table 6.3 represents the current air quality standards for Bangladesh.

**Table 6.3 National Ambient Air Quality Standards for Bangladesh**

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

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

Notes:

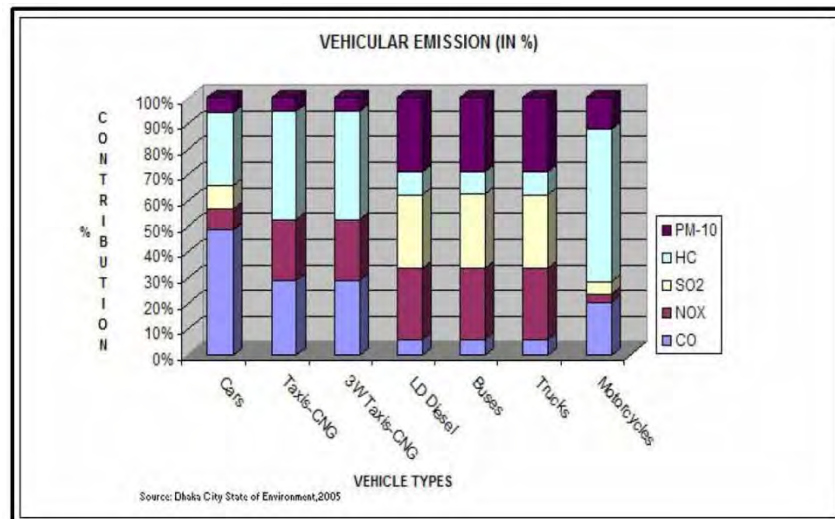
(a) Not to be exceeded more than once per year.

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

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

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

Contribution of air pollution from different sectors is summarized below. (Dhaka Metropolitan Development Plan Strategic Environmental Assessment, 2007)



Source: Dhaka City State of Environment 2005

**Figure 6.14 Air Pollution from Vehicles in Dhaka**



### Transport

Analysis of the emission inventory presented in Figure 6.14 indicates that the diesel vehicles contribute approximately 80% of the air pollution from mobile sources. The ageing fleet of diesel vehicles along with the high sulphur content in diesel is considered as prime reasons for such high levels of air pollution. CNG Taxis and 3-wheelers also contribute to the NO<sub>x</sub> load. Poor maintenance coupled with poor fuel quality, traffic congestion, poor transport infrastructure planning and lack of coordination between the agencies involved in planning and executing of land use and transport planning add to the vehicular air pollution in the city.

### Solid Waste

The practice of burning of a part of the municipal solid waste collected contributes to air pollution. The existing municipal solid waste landfill sites (both temporary and permanent) are sometimes put on fire and emit fumes and gases contributing to air pollution including methane and non-methane organic compounds, for example benzene, etc.

### Brick Kilns

Large number of brick kilns has been setup in the fringe areas of the city, especially in the northern parts and all along Tongi and Turag river banks. The significantly high levels of air pollution from these kilns has substantial impacts on the air quality especially during dry winter months

### Industries

Industries in Tejgaon Industrial Area are a major source of industrial air pollution. Also, the Tanneries and hide dealers in Hazaribagh area, which is a predominantly residential area, discharge effluent and emit foul odour (decaying carcasses and treatment chemicals), impacting the health of workers and residents. The rolling mills in Fatullah also pollute the air in this region.

## 2) Air Quality Survey

### CASE Project

In order to address the growing public concern over air pollution, GOB took up the Air Quality Management Project (AQMP) - a World Bank supported Learning and Innovation loan which became operational in September 2000 and closed on December 2007. As a follow-up, Clean Air and Sustainable Environment (CASE) project has been implemented with the World Bank financial support, implemented by DOE of MOEF, and carries out real-time measurements of ambient level pollutant, aiming to define the nature and severity of pollution in the cities; identify pollution trends in the country; and develop air models and emission inventories. Monthly report which summarizes the air quality data collected at the different Continuous Air Monitoring Stations (CAMS) in operation under the Department of Environment (DOE) air quality monitoring network, is prepared to present, analyze and make available of these data to the general public, stakeholders, researchers and policy makers to develop effective air pollution abatement strategies

### Parameters of CASE Project

CASE project monitors the criteria pollutants such as carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), PM<sub>10</sub> and PM<sub>2.5</sub>. Monitoring is performed to demonstrate attainment or non-attainment of national ambient air quality standards to assess the trends of air pollution levels.

**Monitoring Stations of CASE Project**

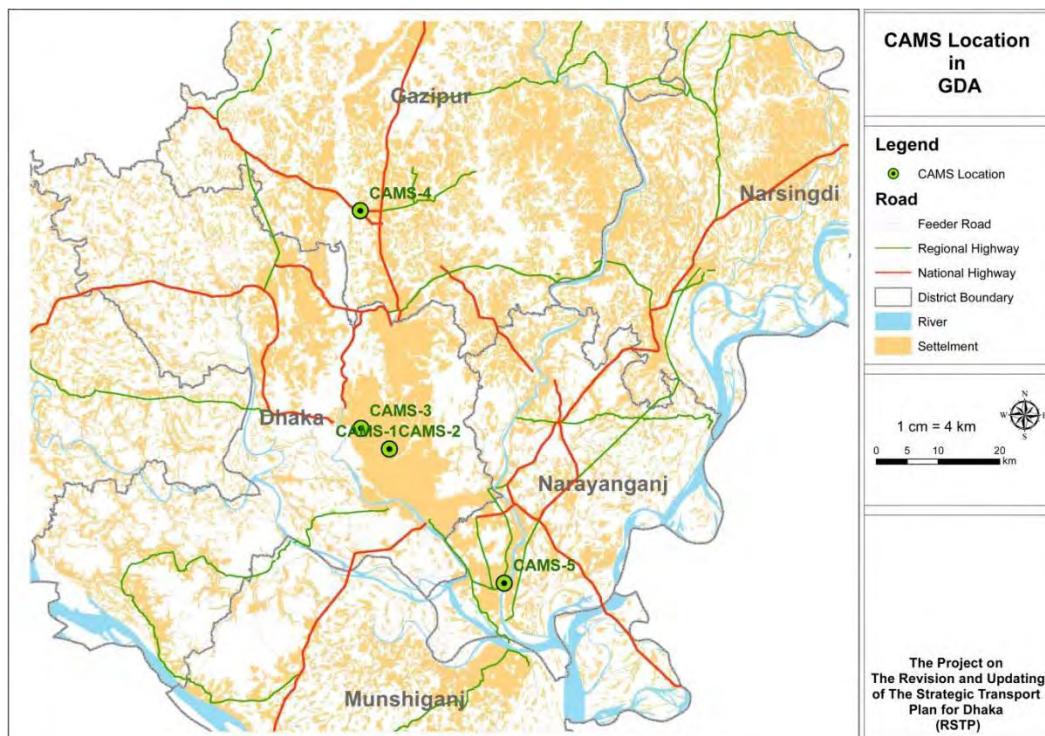
The data has been collected from the Air Quality monitoring Network stations under DoE. Out of the five CAMS (Continuous air quality monitoring station) obtained from previously implemented AQMP, three CAMS (BARC-Dhaka, Chittagong and Rajshahi) were continuously operated, although some of the analyzers need comprehensive repair/maintenance. Under CASE Project, the data of 8 major cities (Namely, Dhaka, Narayanganj, Gazipur, Chittagong, Rajshahi, Khulna, Barisal and Sylhet) of Bangladesh are obtained.

The ambient air quality monitoring network of Bangladesh consists of eleven (11) fixed CAMS. In RAJUK area, there are 5 CAMS as described in the table below.

**Table 6.4 Description of Monitoring Network**

City	ID	Location	Lat/Lon	Monitoring Capacity
Dhaka	CAMS-1	Sangshad Bhaban, Sher-e-Bangla Nagar	23.76N 90.39E	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, SO <sub>2</sub> , NO <sub>x</sub> , O <sub>3</sub> , and HC concentrations with meteorological parameters.
	CAMS-2	Firmgate	23.76N 90.39E	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, SO <sub>2</sub> , NO <sub>x</sub> , O <sub>3</sub> , and HC with meteorological parameters.
	CAMS-3	Darus-Salam	23.78N 90.36E	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, SO <sub>2</sub> , NO <sub>x</sub> , and O <sub>3</sub> with meteorological parameters.
Gazipur	CAMS-4	Gazipur	23.99N 90.42E	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, SO <sub>2</sub> , NO <sub>x</sub> , and O <sub>3</sub> with meteorological parameters.
Narayanganj	CAMS-5	Narayanganj	23.63N 90.51E	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, SO <sub>2</sub> , NO <sub>x</sub> , and O <sub>3</sub> with meteorological parameters.

Source: CASE Project



Source: JICA Study Team

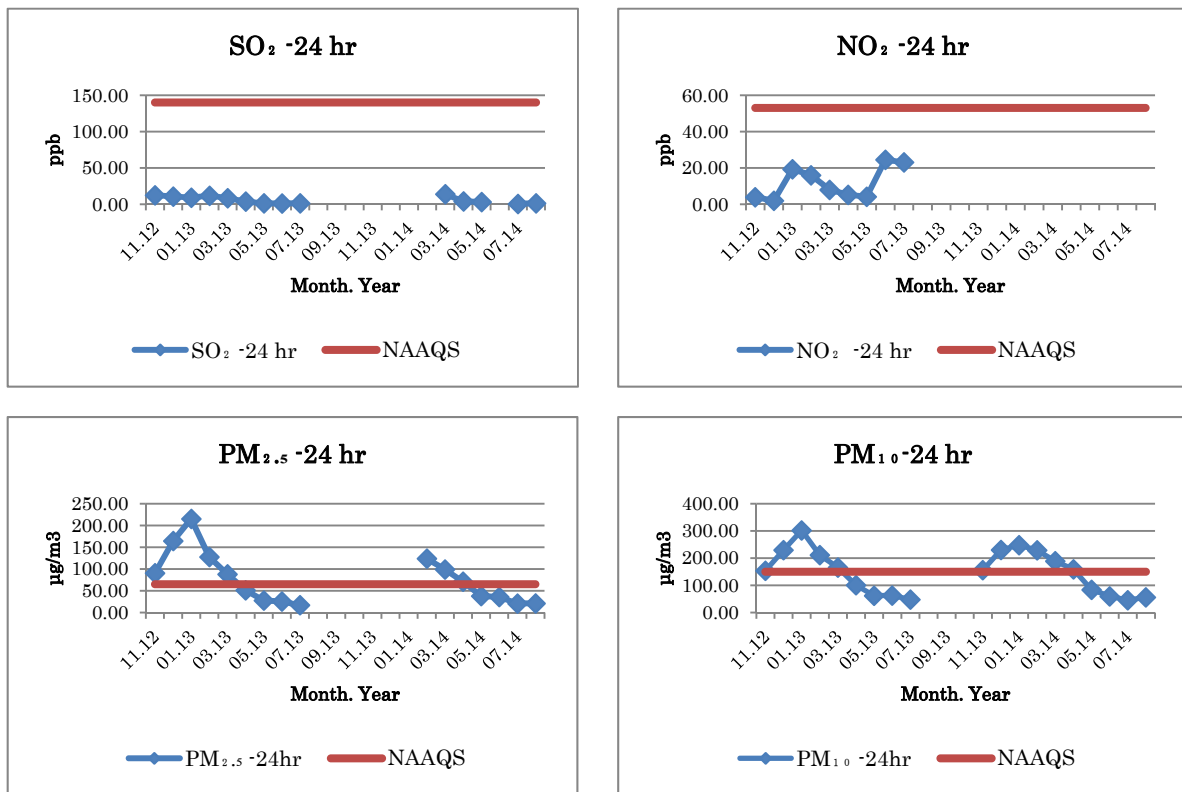
**Figure 6.15 CAMS location**

Summary of Data

Following five figures show the monthly average of air pollutants from November 2012 to August 2014 captured at 3 CAMS under the RAJUK area.

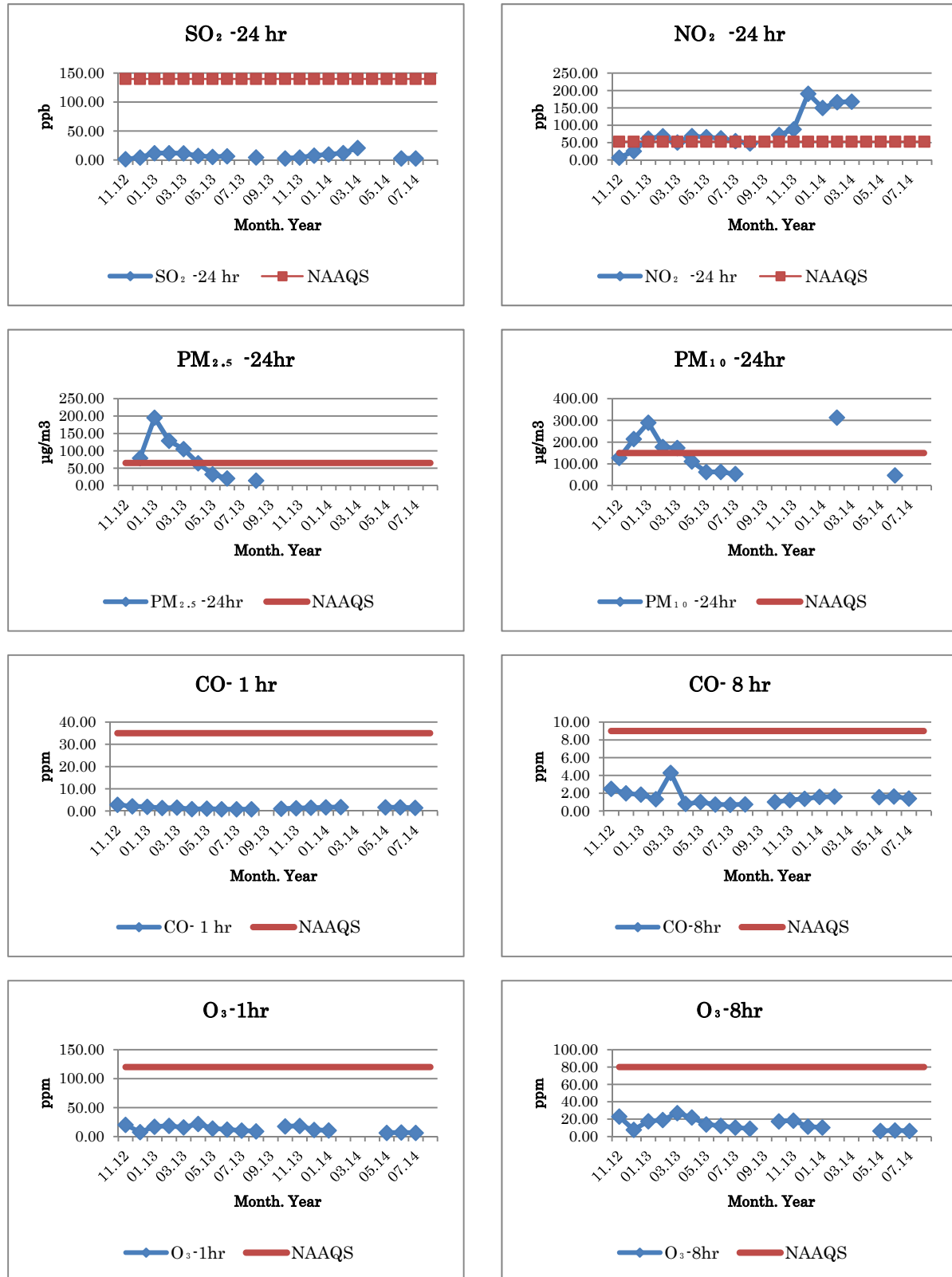
The most serious pollutant from the health point of view in Dhaka is Particulate Matter (PM). Usually in the dry seasons the pollution level reached highest peak and gradually decreases during wet season. The 24-hour average for both PM<sub>10</sub> and PM<sub>2.5</sub> concentrations were found noncompliance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

The gaseous pollutants except NO<sub>x</sub> measured at different CAMS did not exceeded limit values of the national air quality standards. Since NO<sub>x</sub> have only annual standard, so for this pollutant daily 24-hours average concentration levels were compared with the annual average. Maximum 24 hours NO<sub>x</sub> concentration at some stations found exceeded the annual average of standard value during the dry season.



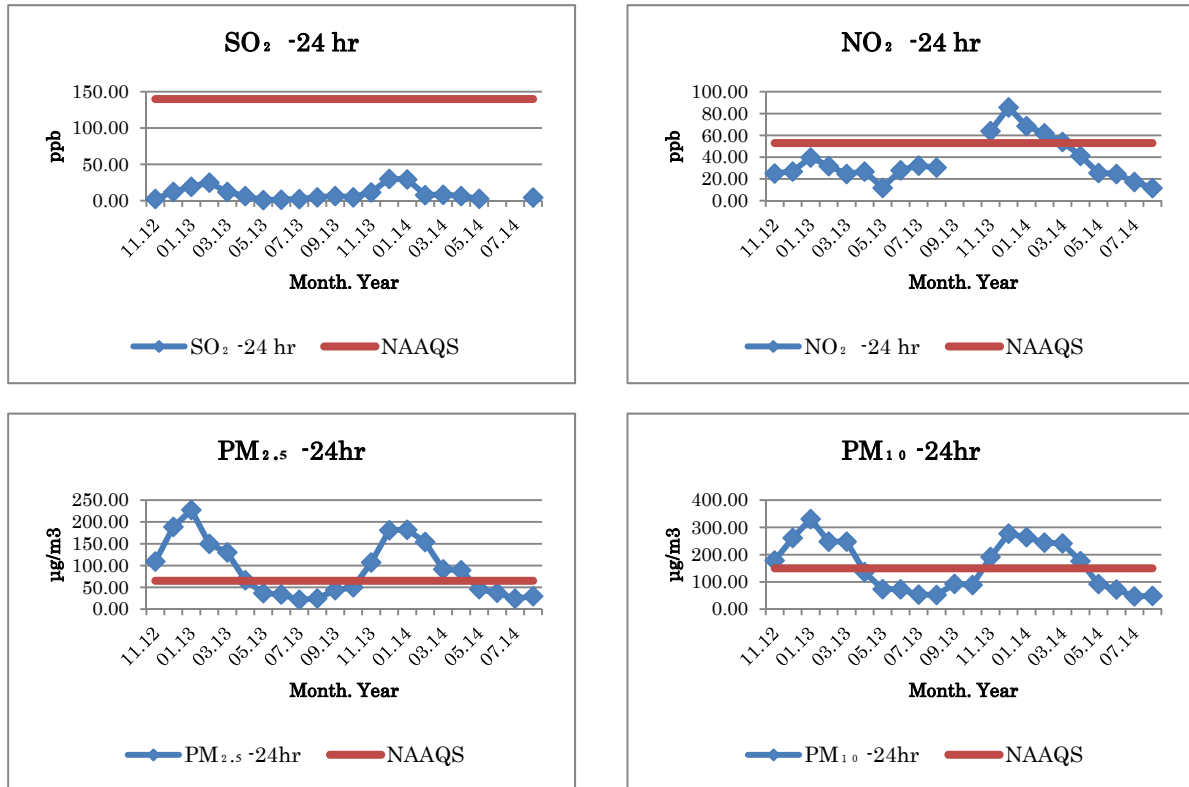
Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.16 Ambient Air Quality Data measured at CAMS-1 from Nov.2012 to Aug.2014**



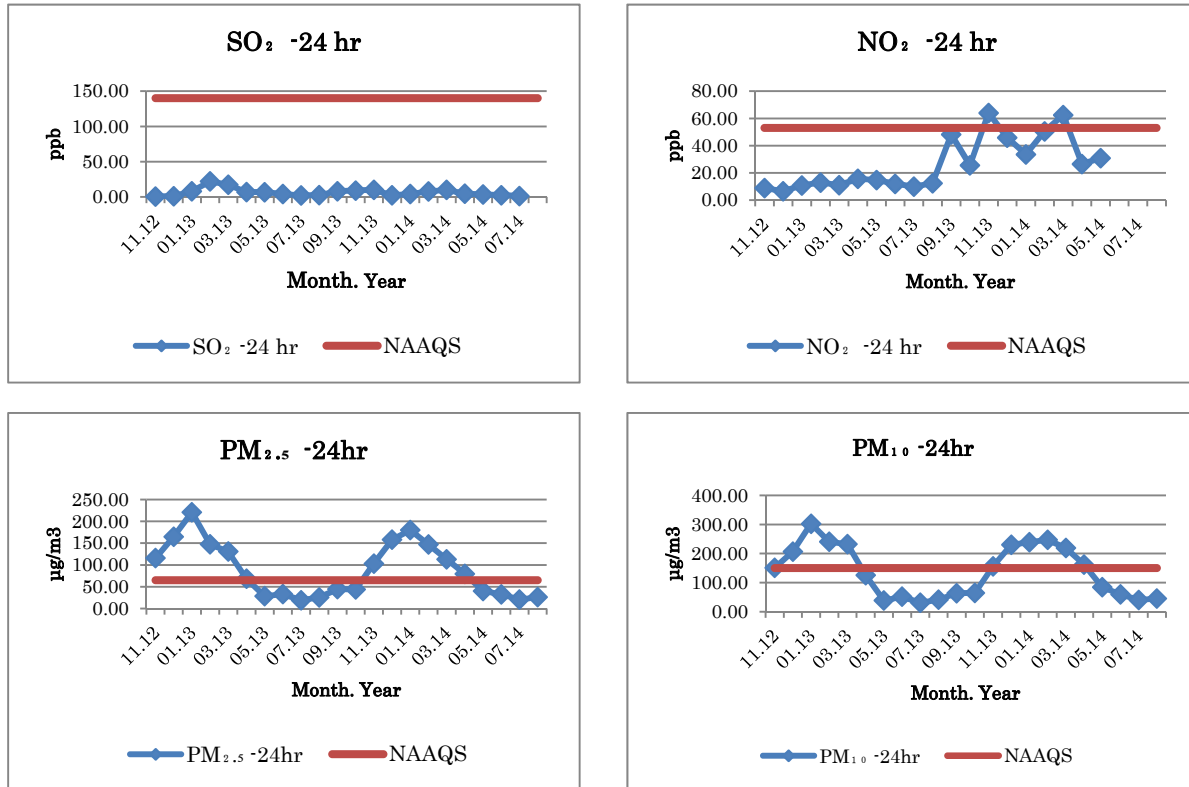
Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.17 Ambient Air Quality Data measured at CAMS-2 from Nov. 2012 to Aug. 2014**



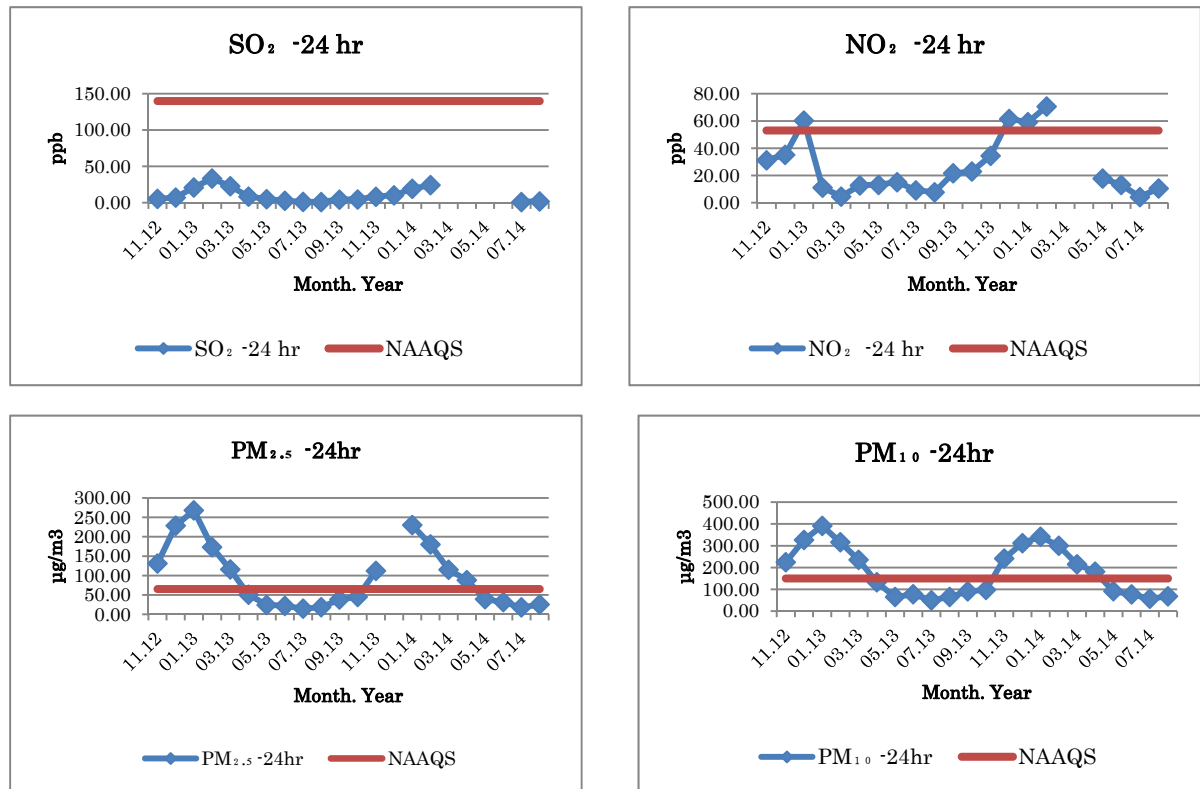
Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.18 Ambient Air Quality Data measured at CAMS-3 from Nov. 2012 to Aug.2014**



Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.19 Ambient Air Quality Data measured at CAMS-4 from Nov. 2012 to Aug. 2014**



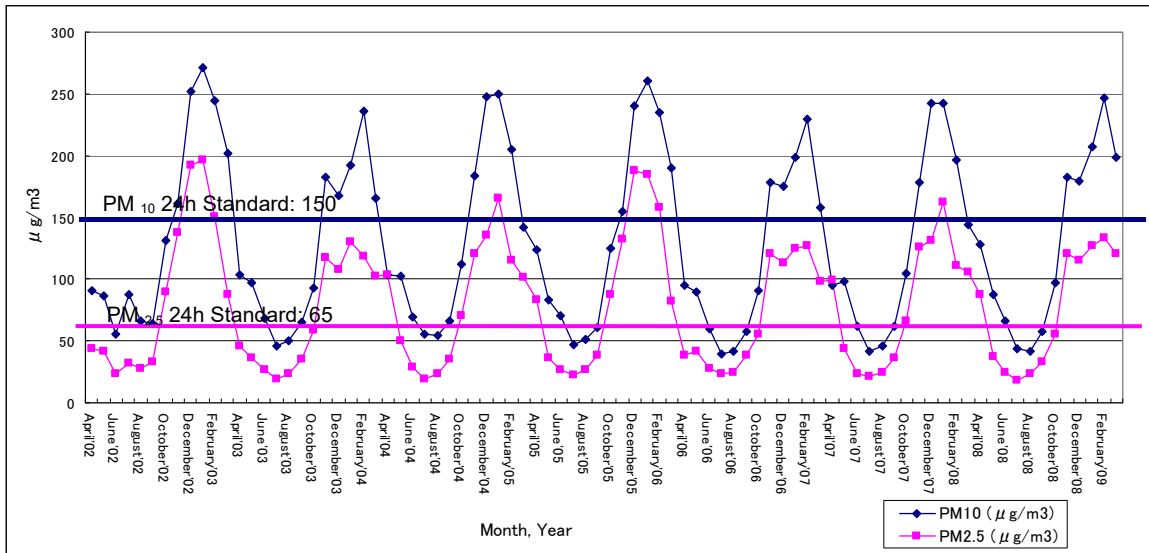
Source: Graphs are made by JICA Study Team based on the data of the CASE Project

**Figure 6.20 Ambient Air Quality Data measured at CAMS-5 from Nov. 2012 to Aug.2014**

#### Air Quality Management Project (AQMP)

In 2002, a continuous air quality monitoring station (CAMS) was established at the premises of the national Parliament Building, the Jatiyo Sangsad, located at the heart of the capital city, Dhaka, under the World Bank- financed Air Quality Management Project (AQMP).

Plotting the average concentrations by month from 2002 to shows a consistent trend in the seasonal variation of PM concentrations (Figure 6.21). In 2002 to 2007, the highest concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> occur in January. High concentrations of PM generally occur from November to February when the country experiences mild winters. On the other hand, concentrations are generally lower from May to September, when most rainfall is received.



Source: Department of Environment

**Figure 6.21 Monthly Average Level of PM<sub>10</sub> and PM<sub>2.5</sub> in Dhaka**

### 3) Ambient Air Quality Measurement

There are 5 CAMS under the RAJUK area: 3 CAMS in the central Dhaka and one each at Gazipur and Narayanganj. The study team will carry out the actual field measurement of ambient air quality in the fringe areas, such as Purbachal, Jheelmil and Savar, during the dry month.

## (7) Noise Environment

### 1) General

Level of noise in Dhaka City is now a major concern for the general people because it has exceeded the tolerance level. According to WHO survey at 45 locations of Dhaka City, most of the traffic points and many of the industrial, residential, commercial, silent and mixed areas are suffering noises exceeding the standard limits of Bangladesh. WHO found noise levels of 70 dB in Dhaka Medical College, 75 dB in Shakhari Patti, 90 dB in English Road, 88 dB in RAJUK avenue and 85 dB in Tejgaon, though the standard limit for those area are 50, 55, 60, 70 and 75 dB(A) respectively.

The noise standards are presented in Table 6.5 together with WHO guidelines.

**Table 6.5 Noise Standards of Bangladesh and WHO Guideline**

Category of areas	Bangladesh Noise Standards*1 (Equivalent sound level in dBA)		Guidelines for Community Noise (WHO, 1999)	
	Day (6:00-21:00)	Night (21:00-6:00)	Day (7:00-22:00)	Night (22:00-7:00)
Silent zone	45	35	-	-
Residential area	50	40	55	45
Mixed area	60	50	-	-
Commercial area	70	60	70	70
Industrial area	75	70	70	70

Source: JICA Study Team

Note: 1) Standards for Sound, Environment Conservation Rules, 1997

These are mainly due to vehicular horns and movement, loudspeakers from processions and meetings, high volume of audio players from roadside small business enterprises and others.

Noise exposure, in fact, causes an extreme threat to human health, especially for elderly people and children. Moreover, the traffic personnel, rickshaw pullers, open vehicle drivers, road side workers, small scale business enterprise workers etc. are exposed for long-term noise pollution which might cause severe mental and physical health problems.

## 2) Noise Pollution

To prevent noise pollution, the Government of Bangladesh enacted Noise Pollution (Control) Rules in 2006. However, the actual situation has not been improved, as the data collected by several different researches suggests. The examples of noise pollution in Dhaka City are presented in Table 6.6 and Table 6.7.

**Table 6.6 Measured Noise Levels in Some Sensitive Areas of Dhaka**

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

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



**Table 6.7 Noise Levels in Selected Areas of Dhaka**

Area	Noise level (dBA)
Sayedabad Bus Terminal	106
Bangla Motor	106
Sonargaon Hotel	104
Farmgate	104
Mohakhali Crossing	103
Maghbazar	103
Mowchak	103
Gabtuli	102
Jatrabari	100
Tejgaon Industrial Area	97
Mirpur-1	97
Kakrail	92
Gulistan	90
Sapla Chattar Motijheel	89
Sadarghat	87
Mirpur-10	86
BIRDEM Hospital	81
Dhanmondi Residential Area	78
Gulshan Residential Area	70
Banani and Baridhara Residential Area	68

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

Under the JICA Preparatory Survey on Dhaka Urban Transport Network Development (DHUTS) Phase II, noise surveys were conducted at five locations along the proposed MRT Line 6 in October, 2010. The most of the project site run through mix and commercial area. The surveyed noise levels far exceeded the Bangladesh Standards at all locations and times.

**Table 6.8 Result of Noise Survey in the Project Site**

No.	Location	Noise Level (Equivalent sound level in dBA)	
		Day (6:00-21:00)	Night (21:00-6:00)
1	Pallabi Near to Police Station, Mirpur	83	78
2	South Side of Farmgate on ground level, Farmgate	90	85
3	South Side of Farmgate on foot over bridge (7m above ground), Farmgate	89	85
4	South Side of Bangla Academy along Sir Sayed Road	76	68
5	South Side of Banga Bhaban along Folder Street	91	89

Source: DHUTS, Phase II, Environmental Impact Assessment Study (Draft).

### 3) Noise Measurement

The regular monitoring of noise levels in the RAJUK area has not been conducted by DOE or relevant agencies of the local governments. The noise data are available in the only limited urbanized area in Dhaka City.

The acoustic environment of rural areas is expected to be silent due to low noise level and the homestead gardens also acts as the noise barrier to the receivers (settlers). However, there are no measurement data.

Therefore, the study team will carry out the actual field measurement of noise levels in the fringe areas of Dhaka City, such as Gazipur, Jheelmil and Savar.

## 6.2 Social Environment

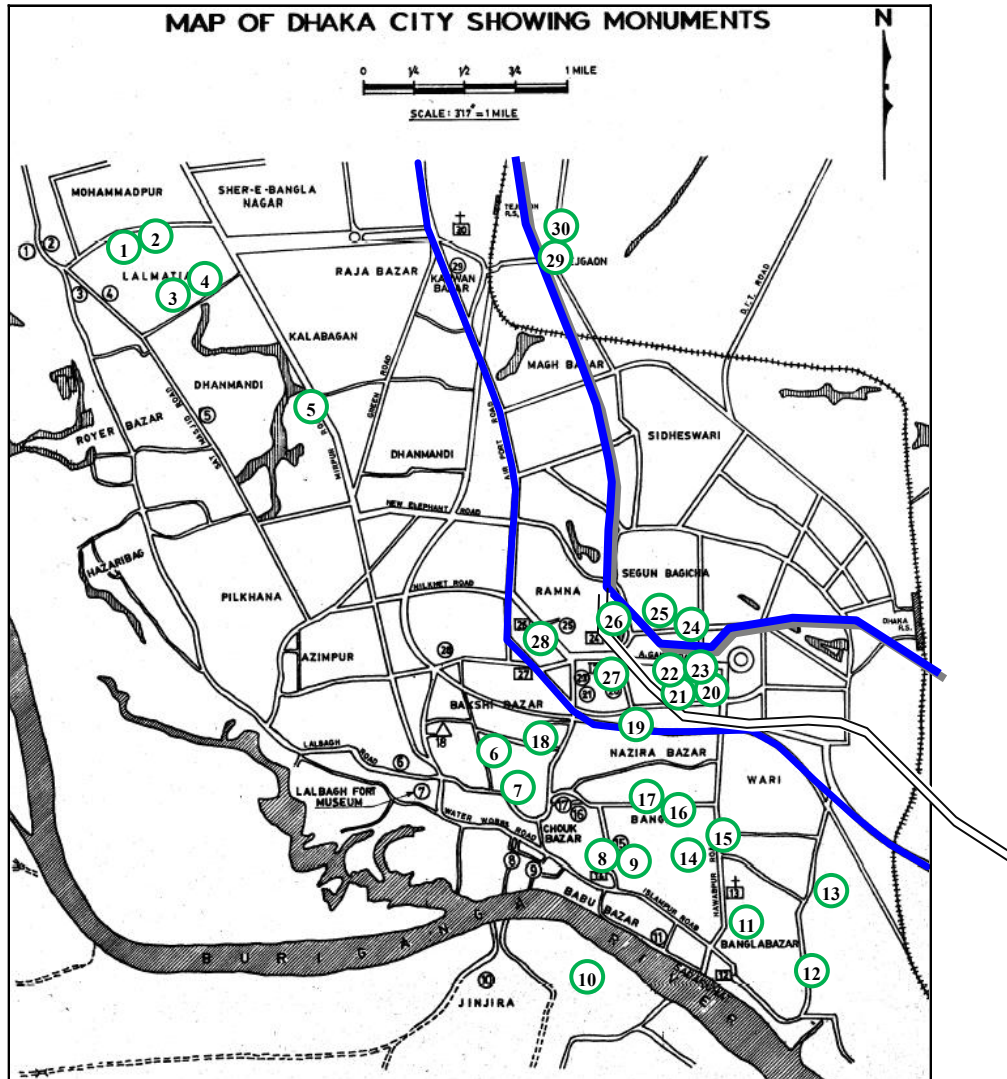
### (1) Historical and Cultural Resources

The historic areas, buildings, monuments or other features or buildings and structures of recognized architectural significance contribute to the cultural, social, economic, political, artistic or architectural heritage. The following 74 archeological sites in RAJUK area are to be protected as per existing law (Table 6.9). Some of the prominent archeological sites in Dhaka City are plotted on the map in Figure 6.22.

**Table 6.9 List of Protected Archaeological Sites in Greater Dhaka**

No.	District	Thana/Upazila	Name of Archaeological Sites
1	Dhaka	Mohammadpur	Sat Gumbad Mosque
2	Dhaka	Mohammadpur	Tomb near Sat Gumbad Mosque
3	Dhaka	Lalbagh	Khan Mohammad Mridha Mosque
4	Dhaka	Lalbagh	Lalbagh Fort
5	Dhaka	Lalbagh	Gate way of the South East corner of Lalbagh Fort
6	Dhaka	Lalbagh	Lalbagh Fort Mosque
7	Dhaka	Lalbagh	Audience & Hammam of Lalbagh Fort
8	Dhaka	Lalbagh	Tomb of Pari Bibi
9	Dhaka	Kotwali	Tomb of Nawab Nusrat Jang
10	Dhaka	Kotwali	Tomb of Nawab Shamsud Daulah
11	Dhaka	Kotwali	Tomb of Nawab Quamarul Daulah
12	Dhaka	Kotwali	Tomb of Nawab Gaziuddin Haider
13	Dhaka	Kotwali	Chhoto Katra
14	Dhaka	Kotwali	Bara Katra
15	Dhaka	Kotwali	Tomb of Bibi Champa
16	Dhaka	Kotwali	Nawabbari Gateway near Ahsan Manzil
17	Dhaka	Kotwali	North Brook Hall
18	Dhaka	Kotwali	Ruplal House
19	Dhaka	Ramna	Haji Khawaja Shahbaz Mosque
20	Dhaka	Ramna	Tomb of Haji Khawja Shahbaz
21	Dhaka	Ramna	Musa Khan Mosque
22	Dhaka	Ramna	Nimtai Deury
23	Dhaka	Sutrapur	Jamindar Bari
24	Dhaka	Sutrapur	Shankhanidhi House
25	Dhaka	Sutrapur	Shankhanidhi Dance House
26	Dhaka	Sutrapur	Bhajahari Lodge
27	Dhaka	Sutrapur	Radha Krishna Temple
28	Dhaka	Narinda, Sutrapur	Tomb of Colombo Sahib
29	Dhaka	Narinda, Sutrapur	Tomb of Reverend Joseph Paget
30	Dhaka	Sutrapur	Rose Garden
31	Dhaka	Dhanmondi	Old Eidgah at Dhanmondi
32	Dhaka	Badda	Ancient Portion of Beraid Bhuyanpara Jame Mosque
33	Dhaka	Savar	Building of Raja Harish Chandra
34	Dhaka	Savar	Buruj of Raja Harish Chandra
35	Dhaka	Savar	Rajashan Mound
36	Dhaka	Savar	Sree Sree Kanailal Ziu Bigraha Mandir (Kanailal Akhra)
37	Dhaka	Savar	Chhoto Bangla Mandir
38	Dhaka	Savar	Shorovuz Mohaprovu Biggraha Mandir
39	Dhaka	Savar	Boro Mandir
40	Dhaka	Savar	Gopaler Akhra
41	Dhaka	Savar	Kashimpur Jaminderbari
42	Dhaka	Savar	National Mausoleum
43	Dhaka	Nawabganj	Temple of Khelaram Data
44	Dhaka	Keraniganj	Jinjira Palace and Gate
45	Gazipur	Kaliakoir	Borai Bari Archaeological Site
46	Narayanganj	Sonargaon	Goaldi Mosque
48	Narayanganj	Sonargaon	Panam City
49	Narayanganj	Sonargaon	Choto Sardar Bari
50	Narayanganj	Sonargaon	Mausoleum of Ghiyasuddin Azam Shah
51	Narayanganj	Sonargaon	Panam Bridge
52	Narayanganj	Sonargaon	Taksal Poddar Bari
53	Narayanganj	Sonargaon	Mozumpur Mosque
54	Narayanganj	Bandar	Khandakar Mosque
55	Narayanganj	Bandar	Tomb of Haji Baba Saleh
56	Narayanganj	Bandar	Sonakanda Fort
57	Narayanganj	Bandar	Gazir Mound
58	Narayanganj	Rupganj	Math, Chandhi Mandap, Pati Mandir
59	Narayanganj	Rupganj	Murapara Rajbari
60	Narayanganj	Sadar	Hajiganj Fort
61	Narayanganj	Sadar	Tomb of Bibi Maryam
62	Narayanganj	Sadar	Dewan Bazar College Mosque
63	Narayanganj	Fatullah	Pagla Bridge
64	Manikganj	Saturia	Baliati Palace
65	Manikganj	Harirampur	Machain Shahi Jami Mosque
66	Manikganj	Shibalaya	Teota Zamindar Bari Dol
67	Munshiganj	Tungibari	Sonarong Temple
68	Munshiganj	Tungibari	Baba Adam Mosque
69	Munshiganj	Tungibari	Mirkadim Bridge
70	Munshiganj	Sadar	Idrakpur Fort
71	Munshiganj	Rampal	Tank of Harish Chandra
72	Narsingdi	Palash	Parulia Shahi Mosque
73	Narsingdi	Belabo	Asam Rajar Gar (Botashwar)
74	Narsingdi	Belabo	Paritakto Vita (Wari)

Source: Department of Archaeology, Bangladesh



Source: Department of Archaeology, Bangladesh

**Figure 6.22 Location of Archeological and Historical Monuments and Religious sites**

- |  |                            |                         |
|--|----------------------------|-------------------------|
| 1. List of Monuments                   | 14. St. Mary's Cathedral   | of Haji Khawaja Shahbaz |
| 2. Sat Gumbad Mosque                   | 15. The American Church    | 27. Salimullah Hall     |
| 3. Unknown Tomb near Sat Gumbad Mosque | 16. Sitara Mosque          | 28. Dara Begum's Tomb   |
| 4. Alakuris Mosque                     | 17. Baoli                  | 29. BUET                |
| 5. Dara Begum's Tomb                   | 18. Kartalab Khan Mosque   | 30. Khwaja Ambar Mosque |
| 6. Old Eidgah                          | 19. Dhakeswari Temple      | 31. St. Augustin Church |
| 7. Khan Muhammad Mridha Mosque         | 20. Hussaini Dalan         |                         |
| 8. Lalbagh Fort                        | 21. Fazlul Huq Hall        |                         |
| 9. Bara Katra                          | 22. Curzon Hall            |                         |
| 10. Chhoto Katra                       | 23. Dhaka City Corporation |                         |
| 11. Kadamtali Circle                   | 24. Musa Khan Mosque       |                         |
| 12. Ahsan Manzil                       | 25. Greek Memorial         |                         |
| 13. Northbrook Hall                    | 26. Tomb and Mosques       |                         |

(2) Housing, Slum, and Open land

1) Housing

Housing Shortage

Government's lone effort in terms of resources, capabilities and initiatives are not adequate to meet the housing need of such a growing population. As a result the gap between the increasing housing needs (due to rapid urbanization) and supply became wider. According to Bangladesh Bureau of Statistics 2011, total housing units in RDP area was 3.12 million compared to the total number of households of 3.35 million exhibiting a housing shortage of 0.24 million. (Regional Development Planning, RAJUK, 2014)

Housing Type and Condition

In Bangladesh housing are categorized in mainly following 4 type by the materials used for construction.

- Pucca: Strong houses of flats and bungalows. They are made up of wood, bricks, cement, iron rods and steel. Such houses are called permanent houses.
- Semi- Pucca: Walls are made partially of bricks, floors are cemented and roofs of corrugated iron sheets.
- Kutcha: Made up of wood, mud, straw and dry leaves. It is temporary house which people live at one place for a very short time. They build houses that can be moved from one place to another.
- Jhupri: made of jute sticks, tree leaves jute sacks etc.

The Table below shows the Housing type and tenancy of houses and accessibility to Infrastructure service under RAJUK area. It shows that the urban area of Dhaka city, Gazipur and Narayanganj, more than 50 % live in rented permanent housing, whereas rural area majority live in temporary housing. In terms of urban infrastructure, sanitation infrastructure are mostly covered in Dhaka and Gazipur, however the rest of RAJUK area need further development. Electricity supply are covered in Dhaka and Gazipur, however the rest of RAJUK area are hardly supplied.

**Table 6.10 Housing Type and Tenancy**

Administrative Unit	Number of Households	Housing Type				Tenancy of House		
		Pucca	Semi-pucca	Kutcha	Jhupri	Owned	Rented	Rent free
Dhaka Zila	2,639,630	1,203,667	965,371	419,468	51,124	710,009	1,849,318	80,303
		45.6%	36.6%	15.9%	1.9%	26.9%	70.1%	3.0%
Gazipur Zila	809,761	93,828	349,855	354,614	11,464	417,366	375,540	16,855
		11.6%	43.2%	43.8%	1.4%	51.5%	46.4%	2.1%
Manikganj Zila	323,741	9,734	32,306	275,374	6,327	302,665	12,595	8,481
		3.0%	10.0%	85.1%	2.0%	93.5%	3.9%	2.6%
Munshiganj Zila	310,664	24,602	37,992	241,743	6,327	254,380	40,527	15,757
		7.9%	12.2%	77.8%	2.0%	81.9%	13.0%	5.1%
Narayanganj Zila	663,088	137,218	222,634	295,270	7,966	349,372	294,743	18,973
		20.7%	33.6%	44.5%	1.2%	52.7%	44.5%	2.9%
Narsingdi Zila	473,937	33,926	106,537	328,917	4,557	409,618	54,476	9,843
		7.2%	22.5%	69.4%	1.0%	86.4%	11.5%	2.1%
TOTAL	5,220,821	1,502,975	1,714,695	1,915,386	87,765	2,443,410	2,627,199	150,212
		28.8%	32.8%	36.7%	1.7%	46.8%	50.3%	2.9%

Source: JICA Study Team

**Table 6.11 Accessibility to Infrastructure Services**

Admini- strative Unit	Number of households	Toilet Facility				Source of Drinking Water			Percentage of Electricity Connection
		Sanitary (With Water Seal)	Sanitary (No Water Seal)	Non- Sanitary	None	Tap	Tube-well	Others	
Dhaka Zila	2,639,630	1,370,203	1,097,484	161,935	10,008	1,752,969	842,709	43,952	2,560,764
		51.9%	41.6%	6.1%	0.4%	66.4%	31.9%	1.7%	97.0%
Gazipur Zila	809,761	237,756	422,083	133,437	16,485	296,714	492,993	20,054	679,844
		29.4%	52.1%	16.5%	2.0%	36.6%	60.9%	2.5%	84.0%
Manikganj Zila	323,741	61,123	173,694	82,346	6,578	170,561	302,665	12,595	8,481
		18.9%	53.7	25.4%	2.0%	52.7%	93.5%	3.9%	2.6%
Munshiganj Zila	310,664	73,547	180,482	51,477	5,158	279,763	254,380	40,527	15,757
		23.7%	58.1%	16.6%	1.7%	90.1%	81.9%	13.0%	5.1%
Narayanganj Zila	663,088	158,427	359,473	133,937	11,251	631,604	349,372	294,743	18,973
		23.9%	54.2	20.2%	1.7%	95.3%	52.7%	44.5%	2.9%
Narsingdi Zila	473,937	95,895	193,694	144,297	40,051	345,183	409,618	54,476	9,843
		20.2%	40.9%	30.4%	8.5%	72.8%	86.4%	11.5%	2.1%
Total	5,220,821	1,996,951	2,426,910	707,429	89,531	3,476,794	2,651,737	466,347	3,293,662
		38.2%	46.5%	13.6%	1.7%	66.6%	50.8%	8.9%	63.1%

Source: JICA Study Team

### Affordability

The affordability issue is another serious aspect of housing problems. Naturally, the private developers are focusing on providing somewhat luxurious housing for the higher income classes. The problem of acute housing needs of the lower income households thus becomes the task of the government and public sector in Bangladesh.

### 2) Slum

The lack of proper housing infrastructure for various sections of the urban society is a crucial problem in Dhaka. With a rapid influx of population from the rural areas into Dhaka, the ability of the city to provide proper housing infrastructure to the migrant workers is under severe stress. Therefore due to the high land prices and the unavailability of housing infrastructure for low income groups, the migrants take shelter in one of the slums within Dhaka, preferably close to their place of work. Many parts of the city have witnessed intensification of slums. The number of slums in Dhaka has increased from 1125 in 1998 to 4,966 slum clusters in 2005 (Centre for Urban Studies, 2006). These slums are very densely populated with an average of 0.2 million people per km<sup>2</sup>. Some of the slums are considered to be illegal and often evicted by government agencies from time to time without any proper rehabilitation. In addition, many of the slums have developed gradually mostly in marginal areas of the city, and in many cases in low lying areas adjoining rivers and drainage khals or by filling up wetlands. Therefore, they are vulnerable to flooding and associated flood risks.

### Infrastructure services

Even though approximately 30% of the Dhaka's population lives in slums, access to urban services are poor. Amongst the poorest people in the slums, only 9% of households have a sewer line, and 27% obtain water through piped supply. Only 2% of the identified slums are within 100 meters of a public toilet. Only 7% of slums have

a public health clinic and 26% have a government school. It is pertinent to add that the slums themselves led to further environmental degradation through discharge of untreated household waste and sewage into the surrounding water bodies. (Dhaka Metropolitan Development Plan Strategic Environmental Assessment, WB, 2007)

The slum dwellers are also more prone to various vector borne diseases because of the lack of good quality drinking water and proper sanitation facilities.

#### Economical activities

Most of the slum dwellers work as readymade garment industry workers, rickshaw pullers, household helps, rag pickers, etc., and make an important contribution to Dhaka's economic growth by contributing labour to business or by providing necessary urban services. The income level of slum dwellers varies between US\$17–50 per month (for men) and US\$4-2,118 (for women). (Dhaka Metropolitan Development Plan Strategic Environmental Assessment, WB, 2007)

### (3) Public Open Space and Landscape

Role of open spaces that are located within or beyond the city boundary is enormous for social, economical, ecological as well as aesthetic purpose of the urban population. As a direct effect of the unplanned urbanization and lack of development control, Dhaka has very little open space in form of park, gardens etc. Due to the diversity and complexity of management of open spaces, the total open spaces are not calculated from reliable sources. Within the RDP area (1610 km<sup>2</sup>) open spaces under recreational category is 987.15 acres (i.e.0.248% area), whereas in DAP (1528 km<sup>2</sup>) open spaces of all category, including vacant and unused land, is 6962.54 acres (i.e.1.84% area). (Regional Development Planning, RAJUK, 2014)

Under DCC, there are parks of 185 acres, and the total area of newly developed parks is only 79.0285 acres. However importantly, some of the areas demarcated for parks have been illegally occupied by encroachers having political influence to set up temporary markets, bus stops, slums, etc. This in spite of the fact that Bangladesh Open Spaces and Wetland Protection Act 2000 does not allow parks open spaces and wetland to be converted for any other uses.

Considering the nature of the land and the type of use, all the public open spaces within built-up areas of Dhaka City can be ordered under the following four categories. The locations are presented in the map of Figure 6.23 to Figure 6.25.

#### 1) Urban Parks

These are large open spaces in metropolitan scale, used purely for the recreational purpose and to have ecological balance. They are basically the open spaces like Ramna Park, Chandrima Udayan, Osmani Udayan, Suhrawardy Udayan etc. in Dhaka which are maintained by PWD (occupying from 50- 80 acres of land).

#### 2) Urban Recreational Areas

Open spaces developed and assigned for more or less organized out-door recreational facilities both at metropolitan and the community level. These are either large areas like Stadiums, Swimming pools and Tennis Complex at metropolitan scale of Dhaka, or intermediate sized areas like Armanitola Play Field at local scale in residential areas (usually 2-9 acres). Besides, relatively small size open spaces are used at local level as Children's Park with play equipment (usually less than an acre).

3) Urban Development Open Spaces

Open spaces which shape, control and site urban development. These include urban plazas/parks of various sizes in commercial and institutional areas of Dhaka. They are mainly intermediate to small sized green areas with pavements; like Pantha Kunja, Anowara Udayan, Gulistan Park etc. (usually 2- 8 acres). Some of these areas have historic, cultural or political importance like Bahadur Shah Park, Central Shaheed Minar, and Mukhtangan Park etc.

4) Functional Open Spaces

Some open spaces are very much functional in nature, like Eidgah, Nursery, and Car Parks. However, the trend of open markets, like Chawk of Old Dhaka is not in use. Even so, many road side areas act as open markets in Dhaka. Moreover, some of the open spaces have multi-use like local Children's Park cum Road-side green buffers; e.g. Pantha Kunja; or like Urban Plaza cum Historic Monument e.g. Central Shaheed Minar.

Besides, other two type of public open space are also available, which some of them are covered under protected areas mentioned earlier.

5) Urban Forests / Natural Park

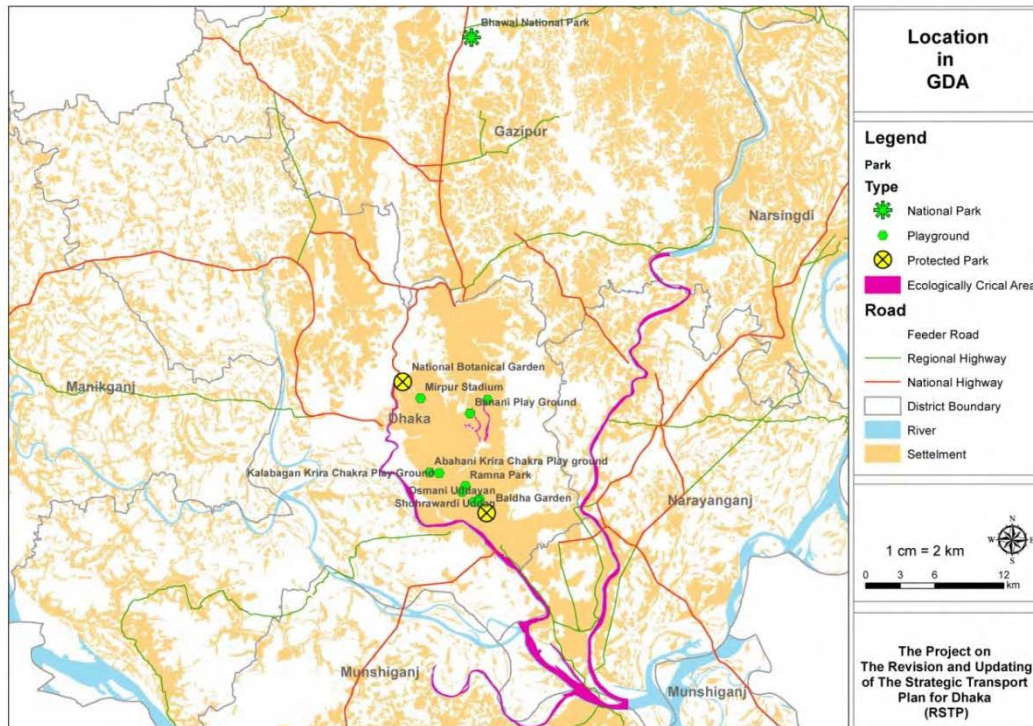
Forest areas include National Park, botanical garden, urban forest, roadside forestry and orchard garden etc. Bhawalgarh forest including the Safari park is the largest forest area and included in the forest land use category. Forest in Dampara mouza of Biralia union also belongs to this group. These are fairly big open areas as picnic spots or naturally pleasant sites in the form of Natural Park from suburban areas in the periphery of the city.

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

6) Protected area

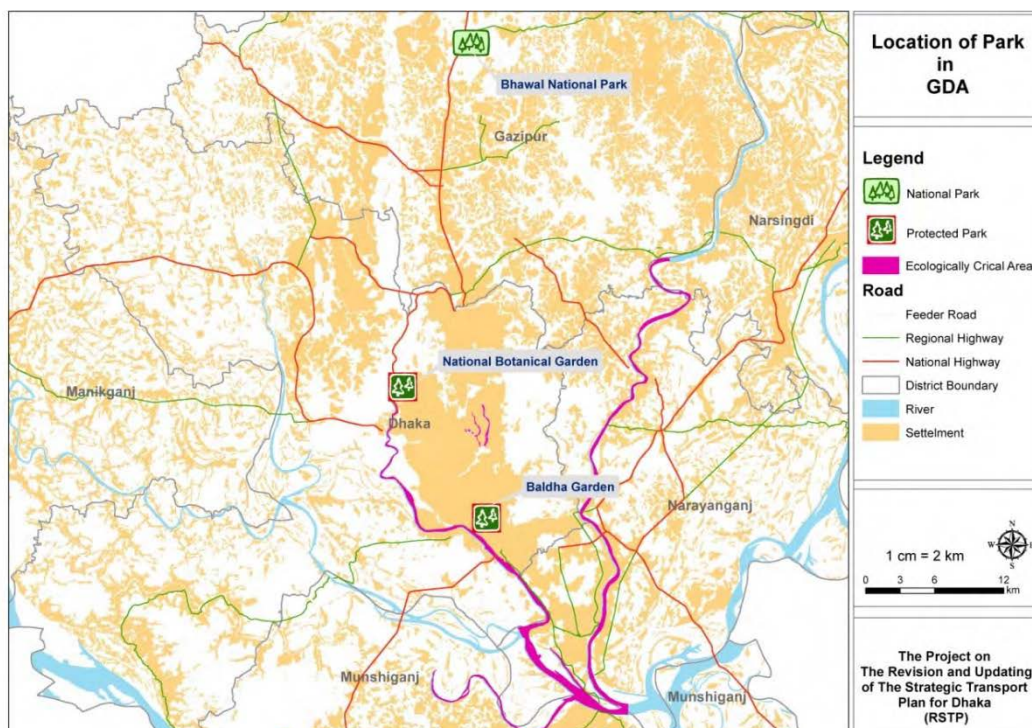
Special areas of scenic and other natural values facilitated for public recreational use.





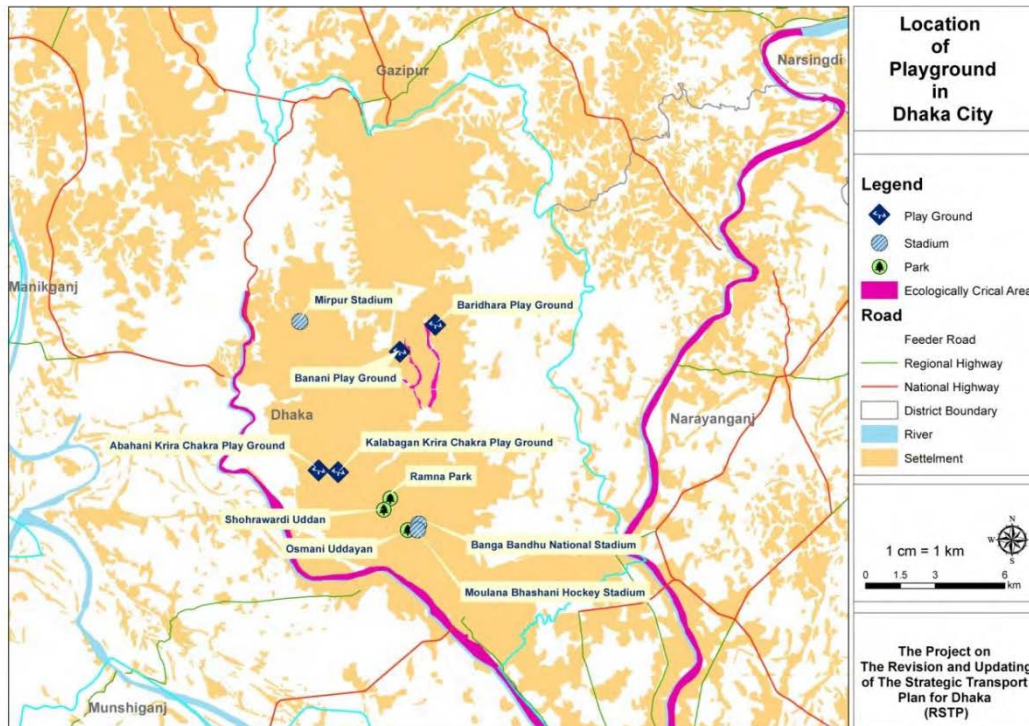
Source: JICA Study Team

**Figure 6.23 Location of Public Open spaces in Greater Dhaka Area (GDA)**



Source: JICA Study Team

**Figure 6.24 Location of National Parks and Botanical Gardens in GDA**



Source: JICA Study Team

**Figure 6.25 Location of Playground in Dhaka City**

#### (4) Water bodies

RAJUK area is covered by a network of natural water body including river, canal and pond. Water body has an immense importance for environmental concern as mentioned earlier, but also for active and passive recreation of people. Indeed, the water bodies of Dhaka had immense quality in addition to drainage purpose. Landscape of these areas is very important to uphold its role in hydrological as well as ecological and economical context of Dhaka.

##### 1) Rivers and banks

Most of the rivers around RAJUK area are distributaries of Brahmaputra, Jamuna and Meghna River. Generally, these rivers flow from north to south direction. The remarkable rivers are Bangsi, Turag, Tongikhal, Buriganga, Dhaleshwari, Kaliganga, Gazikhal, Banar, Balu, Shitalakshya, Lohajang, Bhubaneshwari, Ichamati, Malik Bader Khal, Gajahatar Khal, Ilshamari etc. Although most of the rivers have lost their individuality, till now they play important roles for Dhaka city. Among these rivers Buriganga, Bangshi, Turag, Balu and Shitalakshya are just beside the city and carry most of the runoff of RDP area.

Historically, the natural landscape of rivers and their banks were essentially rich in scenic beauty and sparkling environment. When the embankment of Buriganga, named as Buckland, was constructed it used to be a recreational promenade of Dhaka. Due to intense pressure of urbanization most of the banks of these rivers are now eroded, being encroached and the water has also become polluted. Thus the resources have become blight of the city and in most cases the city faces back to these resourceful areas due to their present condition.

## 2) Khals

Khal are the important elements of Dhaka's wetlands for their immense role in drainage of the city. These Khals used to be connecting channels of rivers surrounded by the greater Dhaka district. It is estimated that there are approximately 40 natural canals/khals, total about 145 km that works as the natural drainage system Dhaka city. Out of these 40 canals, 26 canals are under jurisdiction of Dhaka WASA, a major part for which is under threat of encroachment and filling. These khals drain 80% storm water of the city to the surrounding rivers (Khan 2006). The major khal systems are as follows (Chowdhury et al.1998b):

- Degun - ibrahimpur - Kallyanpur khal system that drains to Turag River;
- Dhanmondi - Paribagh - Gulshan - Banani - Mohakhali - Begunbari khal system that drains to Balu River;
- Segunbagicha - Gerani - Dholai khal system that drains to Balu and Buriganga river

## 3) Retention ponds

A number of low-lying areas are identified as retention ponds. In fact, a retention pond has drainage facilities leading to another location. They are more or less kept for flood control when large amount of rain create flash flooding in the city. They need to be designed to hold a set amount of water temporarily and slowly draining to another location. To ensure their greater role for drainage of the city, such areas need to be protected from encroachment as they act as natural water collection areas for surface run off.

Major Retention Areas of Dhaka City and Characteristics of Rivers around Dhaka City is shown in Table 6.12.

**Table 6.12 Major Retention area of Dhaka City**

Name	Length (m)	Avg. Depth (m)	Area (Km <sup>2</sup> )	Volume (m <sup>3</sup> )
Dhanmondi Lake	2,400	2.5	0.176	440,000
Ramna Lake	400	4.5	0.02	90,000
Crescent Lake	650	2.5	0.016	40,000
Gulshan Lake	3,800	2.5	0.48	1,200,000
Hateer Jheel	3,000	2	1.078	2,160,000

Source: Regional Development Planning, RAJUK 2014

### 6.3 Natural Disaster and Flooding

#### (1) Flood and Inundation Characteristics

Basic mechanism of inundation occurring in Dhaka is such that rising water levels in the three major rivers cause back flows in the tributaries, which in turn make it difficult to drain the surface water, thus resulting in inundation in the wetlands and in the surrounding areas in the hinterland.

A major inundation (called banna in Bengali) that causes damages to human lives, properties, agriculture, etc. is caused when discharges through the three major rivers increase and river water of rising level flows into the city through portions of lower elevation, thus inundating an extended area.

In recent years, major inundations occurred in 1988 and in 1998, bringing about significant damages. During these inundations, water level in Buringanga River in the western part of Dhaka exceeded 7.0 m.

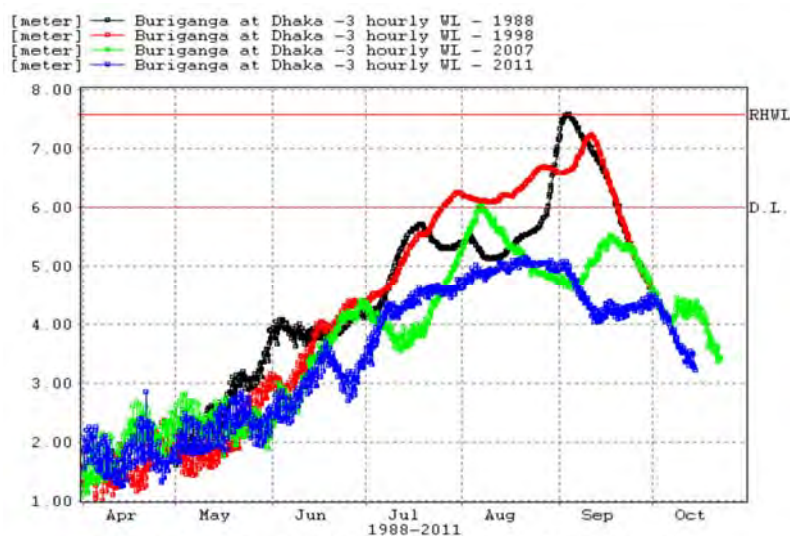


Figure 3. 6 : Comparison of Hydrograph on Buriganga at Dhaka(Milbarak)

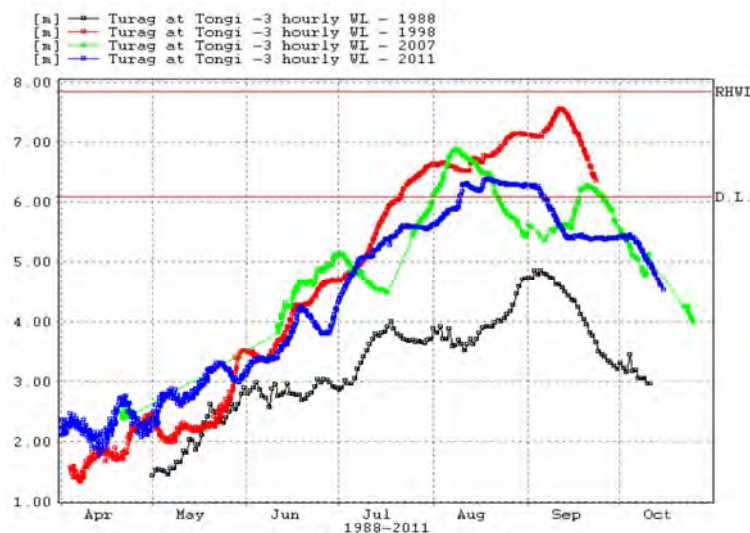


Figure 3. 7 : Comparison of Hydrograph on Tongi Khal at Tongi

Source: Annual Flood Report 2011, FFWC, BWDB

**Figure 6.26 Water levels in rivers around Dhaka during major inundations in recent years**

Dhaka city has been built on the delta formed by rivers, and the ground is believed to be formed almost solely from silt and fine sand. As a result, river banks are subjected to erosion by fluctuating water level and flowing river water.

Inundation by river water in Dhaka is characterized by the very slow process of flood water to recede, resulting in an elongated period of inundation. Typical duration of inundation in the last 50 years is from 15 to 45 days, during which the residents continue to suffer direct and indirect consequences.

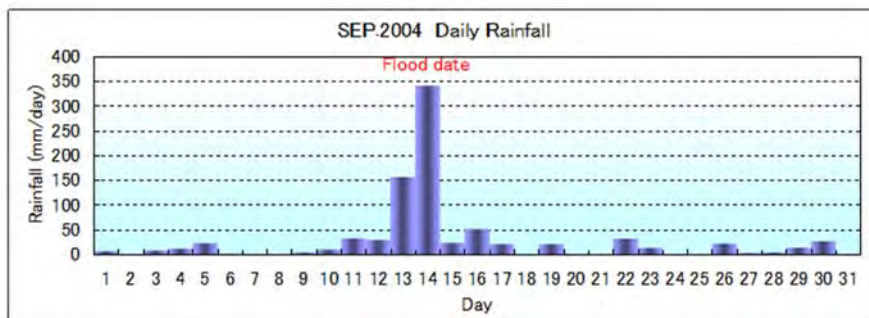
Another form of inundation that affects Dhaka is the inundation by inside water. In case water levels in rivers rise when there has been a torrential rain in Dhaka, inundation damage by inside water occurs because the flood water cannot be drained into rivers. Flood water of inundation caused by inside water is usually shallow, and there is no risk of many lives to be lost. Halcrow (2006) postulates that an inundation due to drainage failure that causes properties damage is brought about by a deluge having probability of occurring once in ten years.

A recent case of inundation by inside water is one that affected a large part of the urban Dhaka in 2004.

This inundation occurred when rising water levels in the rivers caused Balu River in the eastern Dhaka to overflow thus inundating the lowland areas of the city. In the western Dhaka, overflow from Turag River flooded the inside land through culverts and opened regulators.

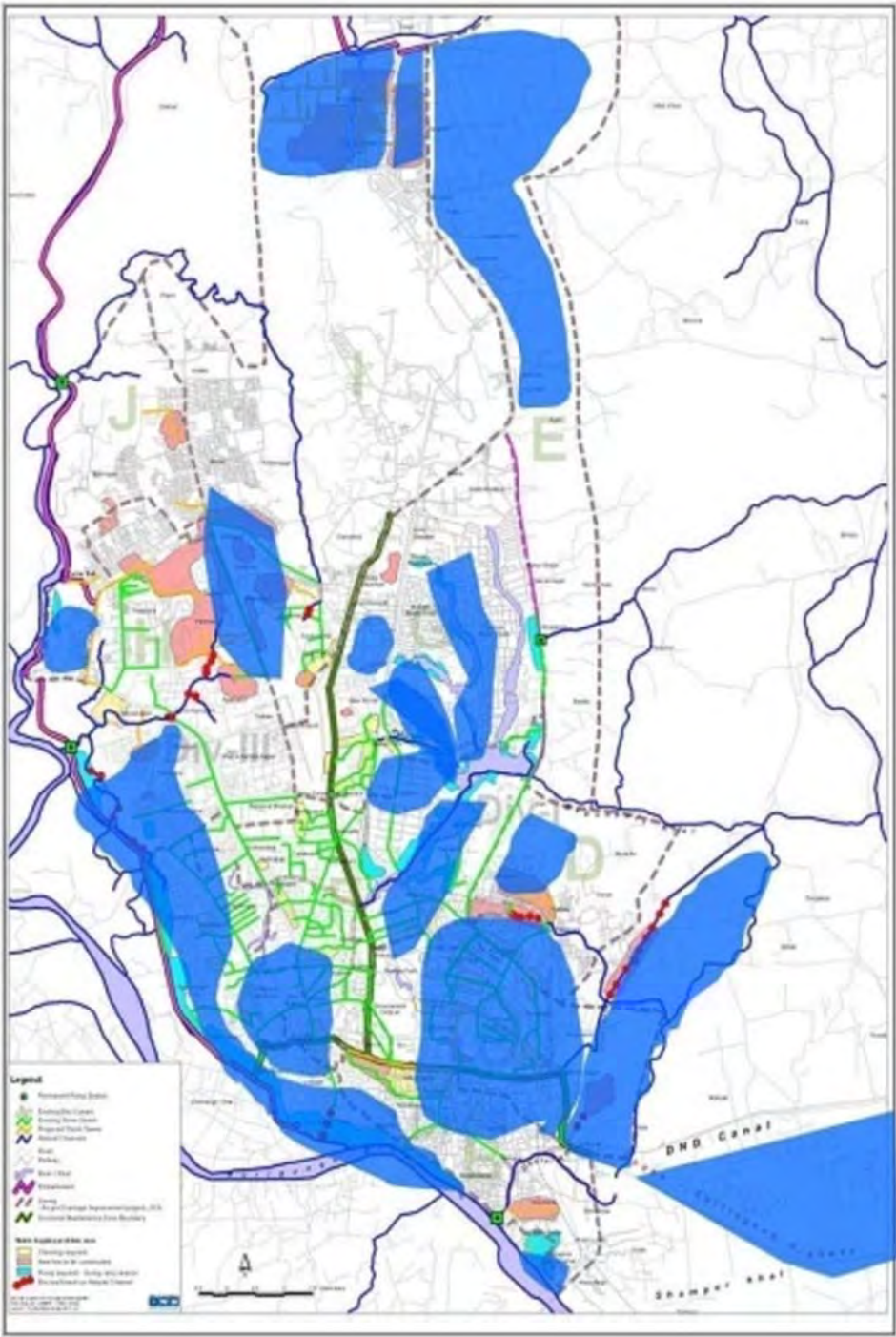
The inundation damage by inside water was caused by an intense rainfall in Dhaka when the regulator was closed so as to protect the urban Dhaka from the flooding river water.

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



source: Halcrow Report

**Figure 6.27 Daily rainfall in September 2004**



Source: Survey Report (RAJUK 2014)

**Figure 6.28 The inundation map of Greater Dhaka, 2004**

There were water channels, natural drainages and lowland areas in and around Dhaka in the past, contributing to the retention and discharge of rain water. However, rapid sprawl of the urban district in recent years has decreased the water retention areas, leading to a loss of water retaining capability of the urban district. In addition, haphazard urban development carried out in disregard of the topography, coupled with the failure of timely building storm water drainages and negligence of maintenance services, has been aggravating the problem of rain water remaining in the urban district.

Rain water remaining over an extended period of time not only causes inconvenience to the residents' lives, traffic and other activities, but also causes environmental and hygienic problems such as odor and health hazard due to fouled storm water.



Source: Survey Report (RAJUK 2014)

**Figure 6.29 Water logging condition (Purba Jurain of Dhaka city)**



Source: JICA Study Team

**Figure 6.30 Left: Street without drainage, Right: Drainage clogged with garbage**

## (2) Flood control policy of Dhaka City

Flood control policy of Dhaka City was established as part of FAP in 1990s, with the basic idea of preventing inundation by river water by building embankment and draining rain water from urban area by pumping. The flood control policy is intended to be prepared for disasters having probability of occurring once in one hundred years. Construction of the storm water drainage system in the city, on the other hand, is planned to cope with events having probability of occurring once in five years.

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

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

In the central part of the city, a project is now being implemented to construct a multipurpose waterfront that includes flood control function.

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

Dhaka is one of the most densely populated cities in the world. The trend toward nuclear families also makes it increasingly difficult to meet the demands for housing within the existing urban district. To tackle this problem, projects to develop housing lands have been carried out by the public and private sectors, making the urban district continue to sprawl. There has been a restriction on housing development in the eastern part of Dhaka because it is a lowland with elevation of 5 to 6 m. However, demands for housing development in this district have been growing because the district is located near the existing urban district.

The most challenging about the housing development in the eastern part of Dhaka is the need for flood control measures. As described above, a project to construct embankment, reservoirs to keep inside water and pumping stations has been put into place in the eastern Dhaka under the revised Eastern Bypass Study (2006). The following problems have been pointed out for this project.

#### 1) Setting the embankment crown height

In the past inundations, water levels in the three major rivers rose to 15 m or higher, and those in Buriganga River and Balu River surrounding Dhaka rose to almost 8 m. Since the ground height in eastern Dhaka is about 5 to 6 m, it is feared that building the embankment with crown height of 8 m would lead to increased flooding energy in the event of dyke break, resulting in significant damages.

#### 2) Timing of embankment construction

If building of embankment lags behind the urban development works, risk of inundation damage increases. If building of embankment in the downstream proceeds ahead of building of embankment in the upstream, overflow from the upstream would be prevented by the downstream embankment from returning to the river, so as to be retained in the inside over an extended period of time.

#### 3) Protection against bank erosion

The embankment should be protected with revetment installed over the height range of the varying water level. River sand will be used as the embankment material, when the actual conditions surrounding the project are considered. If this is the case, the surface behind the revetment must be installed with a soil draw-out prevention material, to prevent the sand behind the revetment from being drawn out giving rise to the danger of collapsing revetment and fragile embankment.



4) Drainage of inside water

Building an embankment makes it difficult to drain the inside water. To drain inside water, it is necessary to install pumps, sluice gates and other facilities. It is also required to establish well-defined rules for operating these facilities, and a reliable system must be put in place that is capable of ensuring correct operation and management of the facilities.

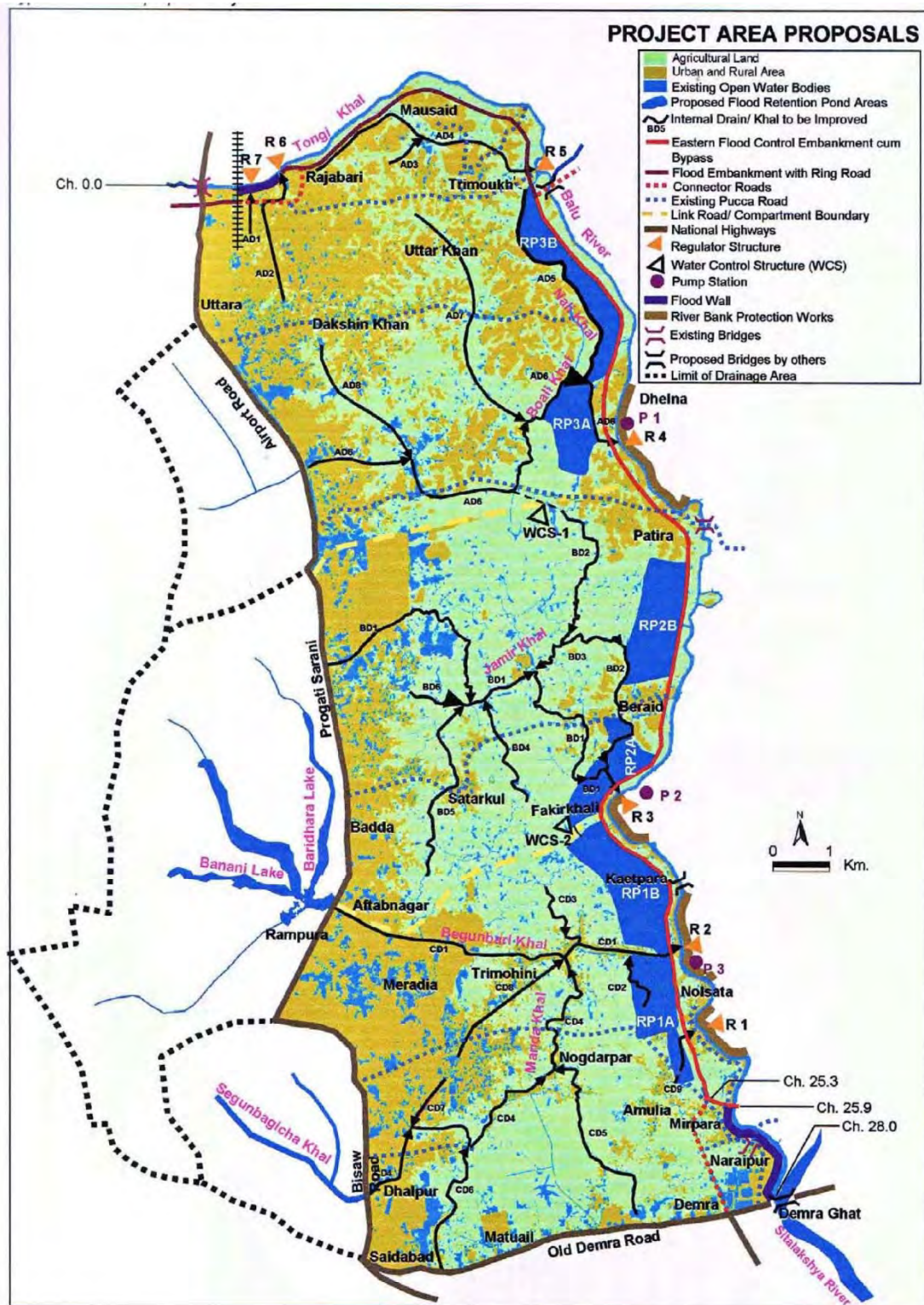
5) Loss of wetlands

The eastern Dhaka has wetlands scattered therein that are valuable not only for their flood control functions as buffer and water retention in case of river overflow, but also for their contribution to the preservation of diversity in the natural environment. Water in the wetlands comes mainly from the overflow from rivers, ground water and rain water. Construction of embankment would stop the harmless, ordinary flooding (barsha) from occurring, thus causing the wetlands to diminish and weakening their functions, with the supply of water and fishes from rivers interrupted.

(4) Development in eastern district by landfill

First Dhaka Eastern Bypass study was undertaken in 1998 under World Bank TA. The study was updated in June 2006 with a new name of "Updating/Upgrading the Feasibility Study of Dhaka Integrated Flood Control Embankment cum Eastern Bypass Road Multipurpose Project".

The main objective of the project is to provide flood protection for the eastern part of Dhaka in order to mitigate damage and loss as a result of flooding by the Balu River and from internal flood water. The project will also deliver transport benefits, but they are secondary to those of flood defense. All the proposals under this project refer to Figure 8.3-11 as below. Total project cost at constant 2005 prices and excluding physical contingencies was estimated at BDT 19.0 billion (US\$233 million) in the report.



Source: RAJUK

**Figure 6.31 Proposals for Eastern Area from Updating/Upgrading the Feasibility Study of Dhaka Integrated Flood Control Embankment cum Eastern Bypass Road Multipurpose Project**

The purpose of flood control may also be achieved by raising the ground level, instead of embankment. There are following merits in raising the ground level compared to the construction of embankment:

- Since the development works effectively serve as flood control works at the same time, there is no possibility of flood damage to increase in the developed area due to the time lag with the implementation of flood control measures.
- Even if an inundation does occur, it is caused by spill that has far less flooding energy than a dyke break has.
- Drainage of rain water from the developed area is made easier.
- It is made possible to clearly distinguish the housing areas to be protected from inundation damage and the farmlands to be utilized as before (present use of farmlands can be continued).

Raising the ground level involves the following problems:

- A vast amount of land reclamation material would be needed to raise the ground level to a height free from inundation (about 10 m), as the current ground level is 5 to 6 m in the eastern Dhaka.
- If there is a weak soil layer underneath the reclaimed land, the ground may subside due to the weight of landfill.
- Most probably, river sand will be used as the reclamation material, similarly in the case of embankment (In fact, river sand is used in the development works currently in process). This gives rise to the fear of liquefaction in the event of an earthquake, as the river sand has high water permeability.
- Protection against erosion must be implemented in portions of the reclaimed land that would make contact with the river water or flood water.
- Reclaimed lands must be connected with each other by a traffic network (it will be required to build traffic system (mainly roads) at a raised height (surface height of the reclaimed land)).
- Haphazard development works may generate areas of poor drainage around the reclaimed lands.

## 7. FINANCIAL STRUCTURES AND BUDGETING

This chapter provides an overview of financial structures and budgeting in Bangladesh based on government documents to provide legal framework, general ideas of basic structures and processes including the Constitution of Bangladesh (1972), General Financial Rules and Planning Commission documents. In addition to the basic structure and current status of the national budgeting system, local and urban authorities, state-owned enterprises and the private sector are reviewed. Finally, the chapter discusses financial capacity of the Government for investment in the transport sector on the basis of the current situation.

### 7.1 Legal Framework, Basic Structure and Process of the National Budget

#### (1) Legal Framework for National Budget System

The Constitution of the People's Republic of Bangladesh 1972 (the Constitution) and The General Financial Rules (1998) are major legal documents in relation to government finance and budget.

Regarding the Constitution, Legislative and Financial Procedures in Chapter II of Part V defines the basic legal framework for the Government budgeting process. Articles 80-92 of Chapter II outline the requirements of budgetary procedures (Table 7.1).

**Table 7.1 Contents of Articles 80-92 to Regulate Budgetary Process**

Article	Contents
Article 80	Legislative procedure
Article 81	Money Bills
Article 82	Recommendation for financial measures;
Article 83	No taxation except by or under Act of Parliament;
Article 84	Consolidated Fund and Public Account of the Republic (1) All revenues received by the Government, all loans raised by the Government, and all moneys received by it in repayment of any loan, shall form part of one fund to be known as the Consolidated Fund (2) All other public moneys received by or on behalf of the Government shall be credited to the Public Account of the Republic
Article 85	Regulation of public moneys
Article 86	Moneys payable to public account of republic;
Article 87	Annual financial statement (1) there shall be laid before Parliament in respect of each financial year, a statement of the estimated receipts and expenditure of the Government for that year, in this Part referred to as the annual financial statement. (2) The annual financial statement shall show separately-(a) the sums required to meet expenditure charged by or under this Constitution upon the Consolidated Fund; and (b) the sums required to meet other expenditure proposed to be made from the Consolidated Fund; and shall distinguish expenditure on revenue account from other expenditure;
Article 88	Charges on consolidated fund
Article 89	Procedure relating to annual financial statement
Article 90	Appropriation Act
Article 91	Supplementary and excess grants
Article 92	Votes on account, votes of credit, etc.

Source: JICA Study Team made based on the Constitution of the People's Republic of Bangladesh 1972

The General Financial Rules stipulates the basic financial rules, and in particular Chapter 5 – Budget, Grants and Appropriation defines procedures for preparation and submission of budget estimates. The Rules provides that under Article 87 of the Constitution, a statement of the estimated receipts and expenditure of the Government for each financial year has to be laid before the Parliament. In addition, it states that the Constitution refers to this statement as “the Annual Financial Statement”, and in common it is called “the Budget”.

Compilation of General Financial Rules was first published during the British rule. Through revisions of the Compilation of Financial Rules, the present General Financial Rules was approved by the President in 1998. With the publication of the approved General Financial Rules, the two sets of rules which were in operation i.e., the Compilation of General Financial Rules and Bangladesh Financial Rules became inoperative and shall have no effect. All departments and Government functionaries henceforth currently follow the revised version of the General Financial Rules 1998. Departmental authorities observe these rules, supplemented by the special orders and instructions, if any, contained in their departmental regulations. The rules contain compilation of previous rules in addition to the Account Code and Treasury Rules.

The contents related to non-development (revenue) budget and development budget preparation of the rules under Chapter 5 are summarized below

1) Non-development Budget

General procedure of preparation and submission of budget estimate is as follows:

- a. The Finance Division prepares the Budget and for this purpose other Ministries/Divisions/Departments are required to furnish materials on which the estimates are to be based;
- b. The Budget Monitoring and Resource Committee in the Finance Division headed by the Finance Minister monitors the budget on the basis of review of progress of revenue collection, inflow of foreign assistance, expenditure trend against the budget and all other pertinent issues;
- c. Dates of submission of budget estimates is given in appendix 3 of the rules;
- d. Estimates of revenue, receipts and revision;
- e. Preparation of estimates of expenditure;
- f. Estimates of new expenditure, new civil works and proposed for new civil works and its schedule; and
- g. Discussion with administrative ministries

2) Development Budget

General procedure of preparation and submission of budget estimate is stated as follows.

- a. Every year the Planning Commission issues guidelines for preparation of the proposed and revised Annual Development Programme (ADP).
- b. A Programming Committee constituted in the Planning Commission with participation of Finance Division, Economic Relations Division and Implementation, Monitoring and Evaluation Division examines development proposals, fixes their priorities and determines the allocations to be provided in the ADP.
- c. After the ADP is finalized, particulars of each development project included in the Programme, showing the Revenue and Capital components and receipts, if any, are furnished to the Finance Division for incorporation in the Budget.

- d. The Finance Division then classify the allocation for the project/scheme according to the Classification Chart.

The following table summarizes the legal framework.

**Table 7.2 Legal Framework of National Budget System**

<b>Laws and Regulations</b>	<b>Year</b>	<b>Contents/Activities</b>
The Constitution of the People's Republic of Bangladesh	1972	Articles 80-92 in Chapter II of Part V refer to legislative and financial procedures. The contents are as below. <ul style="list-style-type: none"> <li>• Article 84 defines the Consolidated Fund and the Public Account of the Republic</li> <li>• A statement of the estimated receipts and expenditure in respect of each financial year shall be prepared (Article 87)</li> <li>• Annual financial statement shall show as the sums required to meet expenditure charged by or under this Constitution upon the Consolidated Fund (Article 87)</li> <li>• Annual financial statement shall show as the sums required to meet other expenditure proposed to be made from the Consolidated Fund (Article 87)</li> </ul>
The General Financial Rules	1998	Chapter 5 of the General Financial Rules refers to non-development budget and development budget and the contents are as below: <ul style="list-style-type: none"> <li>• The Finance Division of the Ministry of Finance is responsible for budget preparation</li> <li>• All Ministries/Divisions/Departments are required to furnish materials on which the estimates</li> <li>• The Budget Monitoring and Resource Committee in the Finance Division headed by the Finance Minister monitors the budget</li> <li>• The Rules refers to dateline and times schedule for budget preparation</li> <li>• The Planning Commission is responsible for issuing guidelines for preparation of the proposed and revised Annual Development Programme (ADP).</li> <li>• A Programming Committee constituted in the Planning Commission with participation of Finance Division examines the ADP</li> </ul>

Source: JICA Study Team

## (2) Basic Structure of Budget

The central government financial statements (Finance Accounts) consists of two parts – (i) the Consolidated Fund, which shows receipts and payments of government money as authorized by the Constitution and each year's Appropriation Act, and (ii) the Public Account, a group funds that receive and pay 'other money'. The Consolidated fund includes all revenues, proceeds of loan and loan repayment to the Government. All other public money received by Government credited to the Public Account.

The budgetary measure essentially governs the aggregate management of Government's revenue and expenditure. Within the broad premise of the fiscal policy, the Government has to (a) prepare estimate of revenue collection (b) prepare expenditure plans and (c) identify the probable sources for financing the budget deficit. The main source of Government revenue is tax revenue. Public revenue principally consists of direct and indirect taxes and they account for more than 80 percent of the total receipts. The rest comes from different non-tax revenues such as fees, charges and tolls. These financial documents are annually published together with supporting statements of actual

expenditures compared with budget authorizations, variances and explanations of variances (the Appropriation Accounts).

The budget and accounts for the Consolidated Fund are divided into 'Development Budget' and 'Revenue Budget'. Broadly, Development Budget contains all those expenditures that are supported both by domestic resources and foreign aid/loans. These include capital construction, incremental operating and maintenance expenditures, and technical assistance. The Revenue Budget contains government revenues from taxes, aid and loans, recurrent expenditures insofar as they are not in the Development Budget (typically the staff costs), interest on development loans and some 'non-development' capital expenditures such as administrative buildings.

Administratively, the Finance Division of the Ministry of Finance has overall responsibility for the orchestration of the Revenue and Development Budget preparation process. The Budget Wing of Finance Division has responsibility for collation and examination of Ministerial Revenue Budget submissions and for their summarization and passes through Parliament to final publication. The Development Wing is also responsible for the Development Budget process but the Planning Commission is mainly responsible for preparation of the Annual Development Programme (ADP) which after preparation is converted into the Development Budget by the Development Wing. All processes end in the presentation of the Budget in the Parliament by the Finance Minister and its enactment.

### (3) Development Budget Allocation Process among Sub-sectors

Although the Government of Bangladesh introduced Medium Term Budget Framework (MTBF) in the FY 2007-08, the traditional resource allocation process still exists in the country. The majority of the ministries have introduced the new MTBF system and receive allocations based on it. Some other ministries still now continue to follow the previous system. Figure 7.1 presents the traditional process, and Figures 7.2 and 7.3 show the process of MTBF budget allocation and approval.

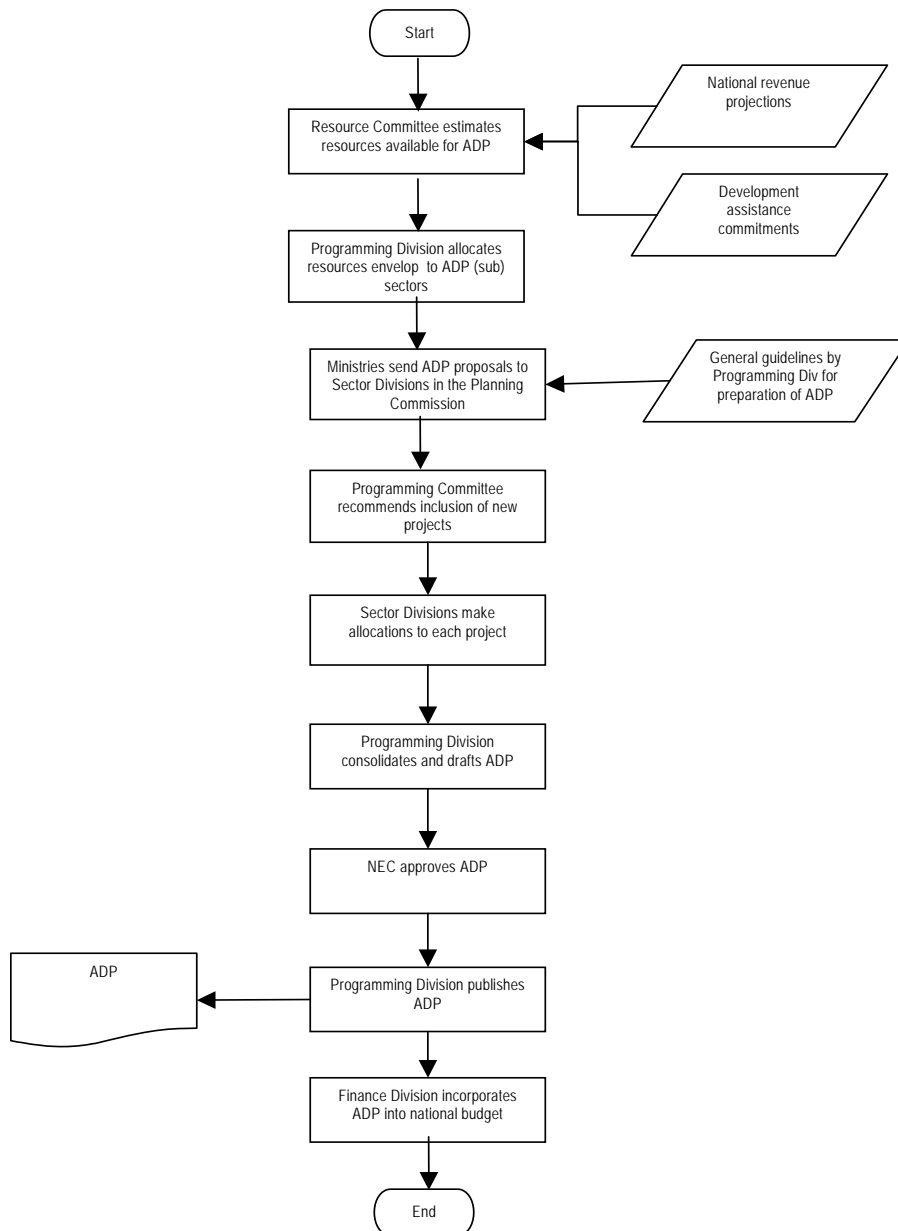
#### 1) Traditional Budget Allocation Process

The Programming Committee headed by the Member (Programming), Planning Commission prepares the Annual Development Programme (ADP) under the traditional arrangement based on the projection of potential resources from government revenue, external assistance and internal borrowing. The members of the Programming Committee are representatives of the sector divisions of the Planning Commission, line ministries/divisions and executing agencies responsible for reviewing and recommending proposals for inclusion of new projects in the ADP. The following are basic process of budget allocation.

- a. The Resource Committee headed by Finance Minister estimates resources available for ADP. The Programming Committee also reviews ADP implementation, resource availability and sectorial priorities to allocate/reallocate resources under the ADP.
- b. National Economic Council (NEC), headed by the Prime Minister approves medium and long-term development plans including ADP, Revised Annual Development Programme (RADP) and carries out periodic review of ADP implementation; while Executive Committee for NEC (ECNEC), also chaired by the Prime Minister and Minister in charge of Finance and Planning, as the alternative Chairperson, approves all public sector investment projects having a total cost exceeding Tk. 250 million and reviews and approves important economic policies of the Government.

- c. The Programming Division in Planning Commission makes ADP allocations to the sectors/sub-sectors. The allocation is communicated to the line ministries through sector Divisions of the Planning Commission for preparation of proposal for use of the allocation.
- d. The Programming Division provides general guideline for preparation of proposals consistent with national goals and international commitments. The guidelines reflect priorities and strategies enunciated in time bound national development plans (such as the Five Year Plan), the Poverty Reduction Strategy (PRS), the Millennium Development Goals (MDGs), and periodic policy and strategy pronouncements of the Government. Line ministries; has the tendency to deviate from the guidelines primarily under the influence of subjective non-economic considerations.
- e. The Programming Committee reviews the ADP proposals received from the line ministries, against the allocations indicated by the Programming Division, paying attention to new projects and the performance of on-going projects.
- f. After its review the committee decides upon the inclusion of new projects and allocations to ongoing projects. Some of the major criterion use in deciding the level of final allocation includes, among others.
- g. The sector divisions of the Planning Commission then finalize the ADP proposals by making specific allocations to each project.
- h. The Programming Division takes the draft sector/sub-sectors program, reviews them and consolidates them into a draft ADP.
- i. The draft ADP is submitted to NEC for approval and finally the Programming Division publishes the ADP, which is incorporated into the national budget by the Finance Division.





Source: JICA Study Team

**Figure 7.1 The Traditional Process of Development Budget Allocation in Bangladesh**

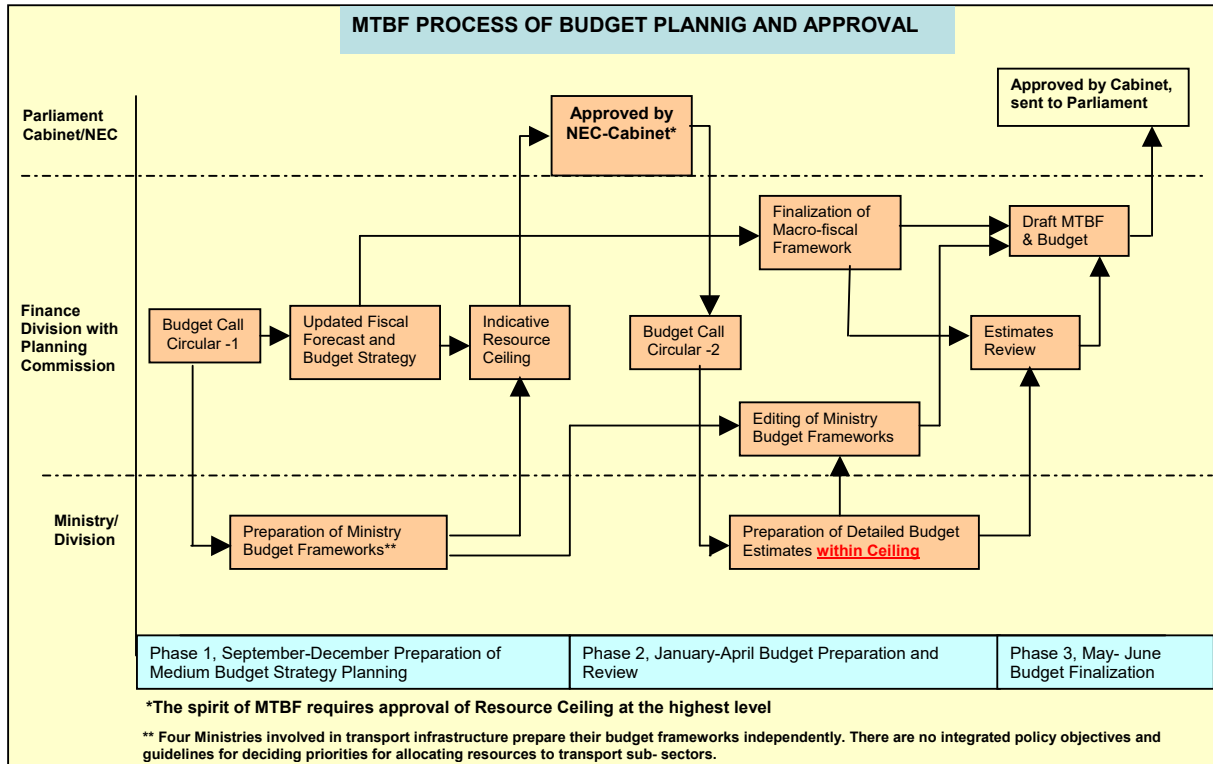
2) Medium Term Budget Planning and Approval:

The Medium Term Budget Framework (MTBF), a new budgeting approach which is generally known as Medium Term Expenditure Framework (MTEF) is a multi-year approach to budgeting that sets a medium term framework for government receipts and expenditures. The MTBF links the spending plans of government to its policy objectives and requires a reliable estimates of resources available for expenditure, as government spending plans must respect a reasonable view of what government receipts (both revenue and foreign assistance) are likely to be over the medium term. Under MTBF system, line ministries are provided with greater responsibility for resource allocation decisions and resource use. The MTBF requires decision makers to balance what is affordable in aggregate against the policy priority of the country. The MTBF consists of a top-down resource envelop, a bottom-up estimation

of the current and medium term cost of existing policy and, ultimately the matching of these costs with available resources.

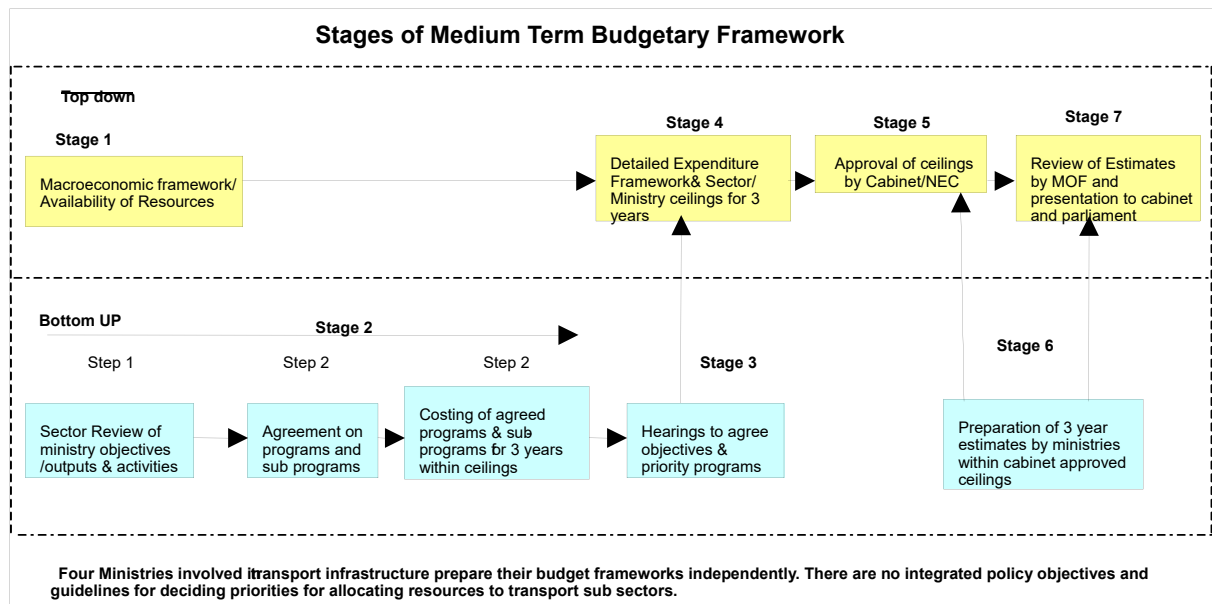
This is policy-based budget providing an overall medium-term macro/fiscal resource framework and expenditure policies, and the issuance of Cabinet-approved expenditure ceilings at the beginning of the budget preparation process as shown in Figure 7.2 and Figure 7.3.

Other improvements include merger of development and non-development budget in one envelop. Improvements in the use of forward estimates and the linking of the bottom-up planning and budgeting with the top-down resource framework will be required in order to make the budget an effective tool for government policy.



Source: JICA Study Team

**Figure 7.2 Medium Term Budget Planning and Approval**



Source: JICA Study Team

**Figure 7.3 Stages of Medium Term Budgetary Framework**

#### (4) Administrative Authorities of Development Budget

The Ministry of Finance mainly is responsible to prepare and place the development budget before the Parliament and three divisions of the ministry along with other key agencies are involved. The divisions and key agencies are stated as below:

##### A. Ministry of Finance

- Development Wing of Finance Division
- Economic Relations Divisions
- Internal Resources Division (National Board of Revenue)

##### B. Other key agencies

- Planning Commission under Ministry of Planning
- National Economic Council (NEC)
- Administrative Ministries/Divisions//Departments

The Development Wing of Finance Division prepares the Development Budget along with Planning Commission and for this purpose other Ministries/Divisions/Departments are required to furnish materials on which the estimates are to be based. Most of the Ministries/Divisions/ Departments depend for these materials on local offices that collect the revenue or incur expenditures.

Planning Commission under Ministry of Planning issues guidelines for preparation of the proposed and revised estimates for Annual Development Program (ADP). A Programming Committee constituted in the Programming Division of the Planning Commission is mainly in charge of preparation of development programmes and determination of allocations in ADP.

**Table 7.3 Administrative Authorities of Development Budgeting**

Administrative Authorities		Responsibility
Ministry of Finance	Development Wing of Finance Division	<ul style="list-style-type: none"> <li>• Development Wing of Finance Division has overall authority to prepare development budget, its allocation and control</li> </ul>
	Economic Relations Division (ERD)	<ul style="list-style-type: none"> <li>• ERD leads as the focal point of the Government for interfacing with the development partners as well as for co-ordination of all external assistance inflows into the country</li> <li>• It assesses the needs of external assistance, devises strategy for negotiations and mobilizing foreign assistance, formalizes and enables aid mobilization through signing of loans and grant agreements, determines and executes external economic policy.</li> </ul>
	Internal Resources Division (IRD)	<ul style="list-style-type: none"> <li>• IRD is responsible for domestic resource mobilization for the country through NBR</li> <li>• National Board of Revenue (NBR) under IRD is responsible for formulation and continuous reappraisal of tax policies and tax laws in the country</li> <li>• Under the overall control of IRD, NBR administers the excise, VAT, customs and income tax</li> </ul>
Ministry of Planning	Planning Commission (Programming Division)	<ul style="list-style-type: none"> <li>• Preparation of development programmes</li> <li>• Determination of the sizes of the Annual Development Programmes (ADP) and sectorial allocations/ proportions.</li> <li>• Formulation of ADP and revision of ADP.</li> </ul>
National Economic Council (NEC)		<ul style="list-style-type: none"> <li>• Approving the development programmes</li> </ul>
Administrative Ministries/ Divisions/ Departments		<ul style="list-style-type: none"> <li>• Preparation of base documents for proposed projects and administrative procedures</li> </ul>

Source: JICA Study Team

#### (5) Procedure of Development Fund Release

Development budget has several components depending on the type of project and nature of financing. The development project may have expenditure in foreign currency for import of equipment and services (either financed from government's own resources or from donor sources). There are several other items financed in local currency by the government from its cash resources or reimbursable project aid from donors, to meet local expenditures of the project.

On the basis of ADP allocation, fund is released in four installments. Extra allocations are released in additional installments. At the beginning of the year (within 15th July) the Administrative Ministry/Division issues break up order with the approval of the competent authority, in accordance with the provision of approved DPP/TAPP. In respect of unapproved/revised projects, which are not very common these days, the concurrence of Finance Division and Planning Commission is necessary for issuing break up order and any change in revenue or capital allocation. If there is any discrepancy between the proposed break up order and the DPP/TAPP allocation, the concurrence of Finance Division and Planning Commission is required to be obtained. In case of any change in the original allocation, revised break up order is necessary in accordance with the revised allocation.

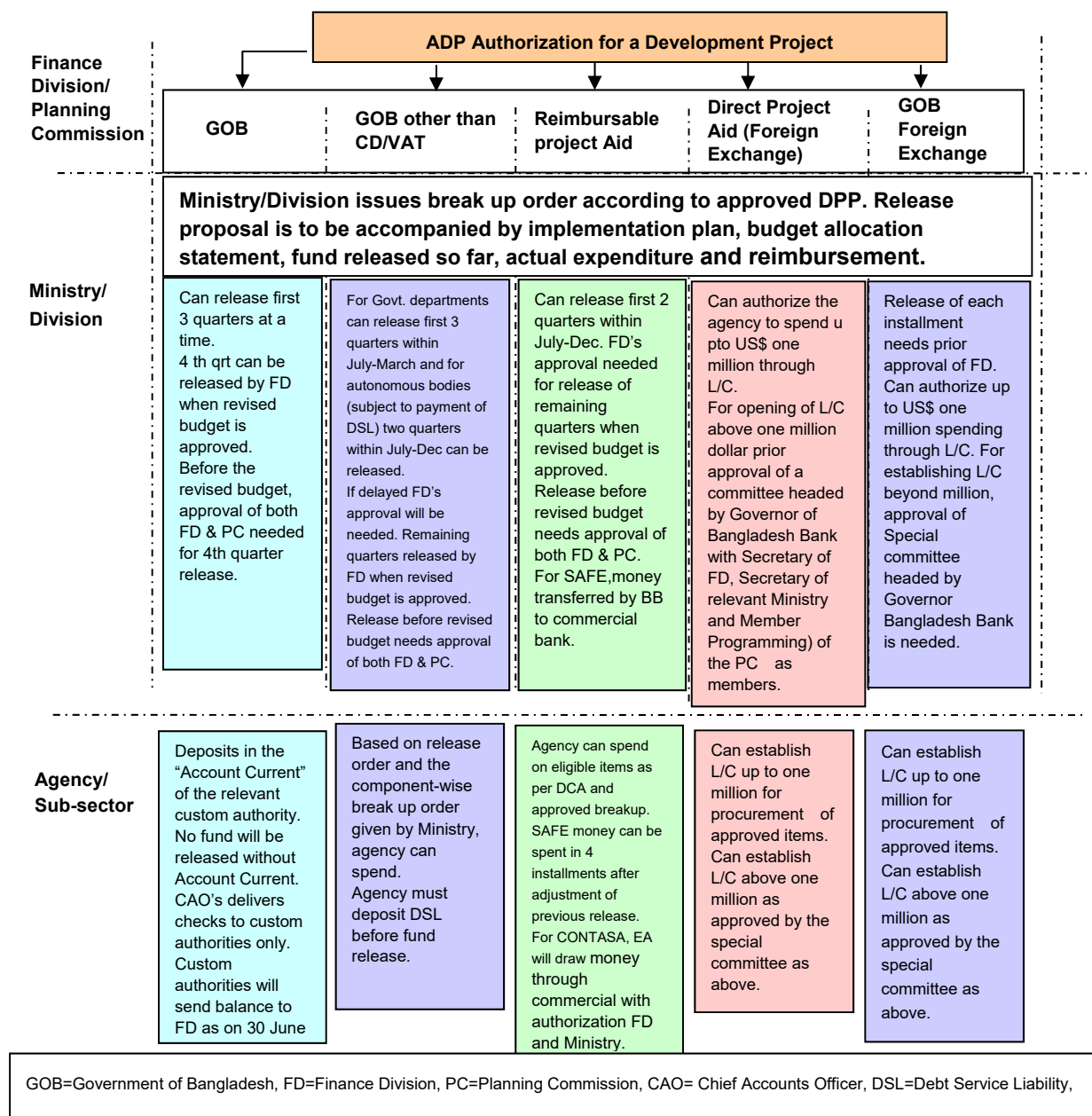
The release proposal is required to be accompanied by the implementation plan and the statement showing the budget allocation, fund released so far, actual expenditure and reimbursement. Copies of all release orders issued from the Administrative Ministry/Division are required to be sent to relevant section of the Development Wing of

Finance Division. Fund release without depositing the DSL dues in cash requires the prior approval of Finance Ministry.

Custom Duty (CD) and Value Added Tax (VAT) are required to be paid on imported equipment which is allocated from government resources and are paid following standard procedures. CD&VAT amount cannot be spent for other purposes. The exact amount of CD&VAT is assessed by the custom on arrival of the equipment at the port and based on custom classification of equipment/components, types etc.

**Procedures for release of Reimbursable Project Aid:** The Administrative Ministry/Division is authorized to release up to two quarters during July-December period on the basis of budget allocation. During January-June period of the relevant financial year funds for any quarter including third and fourth quarters can be released with the concurrence of Finance Division. Release of fund at one installment (First-Fourth) will require the concurrence of Planning Commission and Finance Division. Subject to the payment of DSL installment in cash, the same procedure is applicable in respect of autonomous/semi-autonomous bodies. Release of fourth quarter before the finalization of revised ADP will require the concurrence of Planning Commission and Finance Division.

**Procedures for release of Reimbursable Project Aid (Special Accounts) - SAFE Account (Special Account in Foreign Exchange):** In accordance with the proposal of the Administrative Ministry/Division, Finance Division issues authorization order according to budget allocation at the beginning of the financial year in favor of the commercial bank. On receiving the authorization, Bangladesh Bank will transfer money to the Project Account in four installments. After adjustment of the fund released in previous quarter, the fund for next quarter will be released. The same procedure will be applicable in respect of the autonomous/semiautonomous bodies, and also for Unapproved/Revised Unapproved Projects. The following Figure 7.4 describes the follow diagram of development projects fund released procedures.



Source: JICA Study Team

**Figure 7.4 Development Fund Release Flow Chart**

(6) Institutional Structure of Public Accounting and Auditing

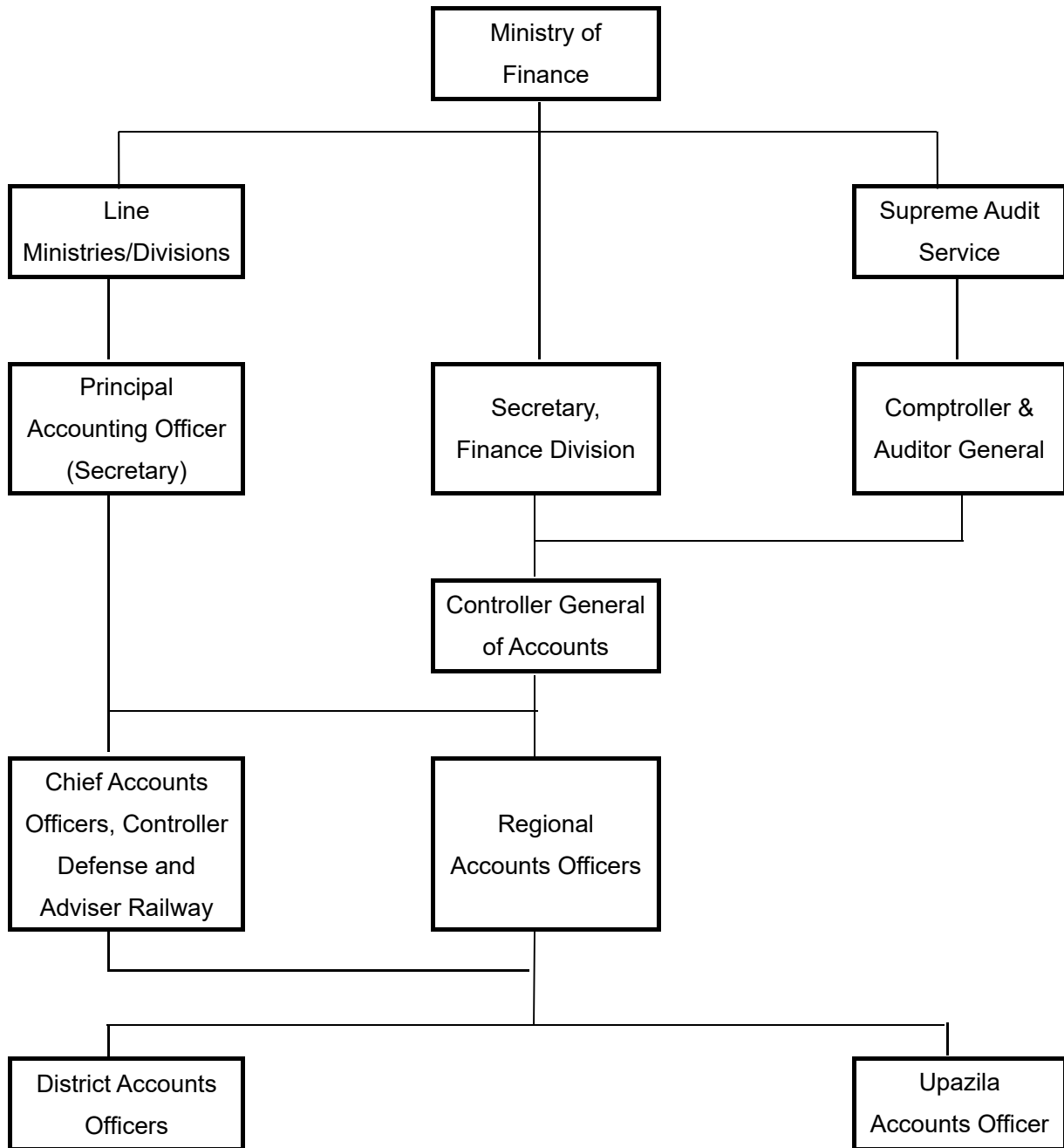
Part VIII of The Constitution of Bangladesh 1972– The Comptroller and Auditor-General provides the basic legal institutional structure of keeping the Government Accounts. Articles 127-132 under the Part VIII stipulate basic matters on the comptroller and auditor-general. The following table summarize the contents.

**Table 7.4 Contents of PART VIII-The Comptroller and Auditor-General-**

Article	Contents
Article 127	establishment of office of Auditor-General
Article 128	<p>Functions of Auditor-General which are:</p> <ul style="list-style-type: none"> <li>-The public accounts of the Republic and of all courts of law and all authorities and officers of the Government shall be audited and reported on by the Auditor-General and for that purpose he or any person authorized by him in that behalf shall have access to all records, books, vouchers, documents, cash, stamps, securities, stores or other government property in the possession of any person in the service of the Republic.</li> <li>-Without prejudice to the provisions of clause (1), if it is prescribed by law in the case of anybody corporate directly established by law, the accounts of that body corporate shall be audited and reported on by such person as may be so prescribed.</li> <li>-Parliament may by law require the Auditor-General to exercise such functions, in addition to those specified in clause (1), as such law may prescribe, and until provision is made by law under this clause the President may, by order, make such provision.</li> <li>-The Auditor-General, in the exercise of this function under clause (1), shall not be subject to the direction or control of any other person or authority.</li> </ul>
Article 129	<p>Term of office of Auditor-General which are:</p> <ul style="list-style-type: none"> <li>-The Auditor-General shall, subject to the provisions of this article, hold office for five years from the date on which he entered upon his office, or until he attains the age of sixty five years, whichever is earlier.</li> <li>-The Auditor-General shall not be removed from his office except in like manner and on the like ground as a judge of the 84 Supreme Court.</li> <li>-The Auditor-General may resign his office by writing under his hand addressed to the President.</li> <li>-On ceasing to hold office the Auditor-General shall not be eligible for further office in the service of the Republic.</li> </ul>
Article 130	Acting Auditor-General
Article 131	Form and manner of keeping public accounts which are the public accounts of the Republic shall be kept in such form and in such manner as the Auditor-General may, with the approval of the President, prescribe.
Article 132	<p>Reports of Auditor-General are to be laid before Parliament:</p> <p>The reports of the Auditor-General relating to the Reports of public accounts of the Republic shall be submitted to the President, who shall cause them to be laid before Parliament.</p>

Source: JICA Study Team

The Constitution of the Republic has made the Comptroller and Auditor General is responsible, with the approval of the President, for the form and manner of keeping Government Accounts. In addition, the Comptroller and Auditor General (Additional Functions) Act, 1974 gives certain specific accounting tasks which are preparation of the Annual Financial Account and the Annual Appropriation Accounts. Though the Comptroller and Auditor General is responsible for the form and manner of keeping Government Accounts, however, the Finance Division, Ministry of Finance, has the ultimate financial administration and expenditures control in practice. The following diagram below Figure 7.5 summarizes the existing institutions dealing with financial administration.

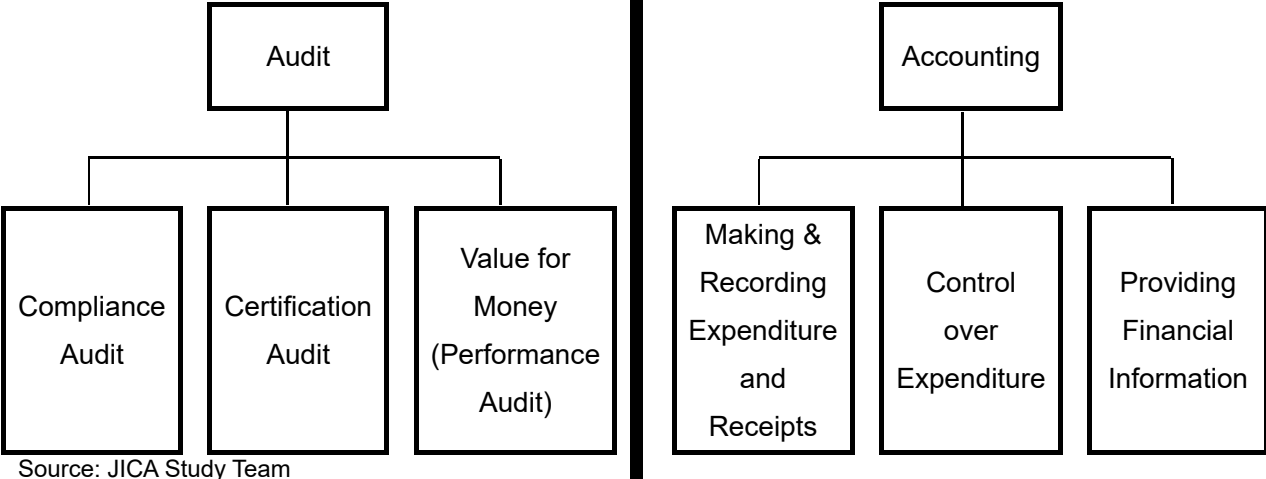


Source: JICA Study Team

**Figure 7.5 Existing Institutional Structure of Financial Administration**

From the above discussions, it is worthwhile to mention here about accounting and auditing functions. The Constitution, Acts of Parliament, Rules and Regulations contained in different publications of the Government together with instructions issued from time to time provide the framework for financial administration including budgeting, accounting and certain audit functions. The Ministry of Finance presents the budget to the Parliament but the Comptroller and Auditor General prepares and submits the finance accounts, the appropriation accounts and audit reports each year to the President, who lays them before Parliament. These are dealt with on behalf of Parliament through standing committees. These include the Public Accounts Committee, the Estimates Committee and the Public Undertakings Committee.





Source: JICA Study Team

**Figure 7.6 Division between Auditing and Accounting**

**Accounting Monitoring and Controlling:**

The process of control and evaluation is built in the system in the forms of rules and procedures for performing the task. Annual financial accounts are submitted to the Controller General of Accounts for incorporation in the Finance Accounts of the Republic. At the end of the fiscal year appropriation account relating to expenditure brought to the account during the financial year providing comparison between final grant and expenditure is prepared. Consolidated financial report (appropriation account + financial accounts) of the Republic as prepared by Comptroller & Auditor General is placed before the Parliament. C&AG is mandated by the Constitution to carry out independent audit of the accounts all of sectors/ sub-sectors of the government and to report on them to the Parliament.

**Internal Control:**

Internal control refers to the Government's or department's whole system of controls, financial and otherwise, established in order to provide reasonable assurance of efficient and effective public services, reliable financial information and reporting and compliance with applicable laws and regulations. The internal audit is part of its internal control system. It is an independent and objective appraisal service within an organization and aims to help line ministries improve their risk management, control and governance. As a key element in the framework of internal control there is an audit committee is to provide support to the Public Accounting Officer by acting as an interface with the Auditor General and the internal auditors. Their dealings with the auditors enable them to assess the degree of assurance that the Public Accounting Officer can obtain from the audit process.

**External Control:**

A broad range of external controls exists to oversee and discipline the operations, financial and otherwise, of service departments/ministries. These controls are broadly exercised by the central ministries like the Ministry of Finance, Office of the Auditor-General and the Parliamentary Committees. The broadening of such control optimizes the quality and effectiveness of public spending by way of minimizing the potential risk of wastage, irregularities and leakage in the use of public resources. In dealing with the external audit, the audit committee is expected to consider the Auditor General's audit report for the Ministry; review action taken in response to audit findings and assemble the Ministry's case for matters reported to Public Accounts Committee. As

a part of external control, the Ministry of Finance provides guidance on financial management issues regulates financial management across ministries/ sectors/ sub-sectors and regulates internal control across government of Bangladesh.

**Independent External Audit:**

The Constitution of the Republic provides authority to the Comptroller and Auditor General of Bangladesh to audit the accounts of government agencies, public bodies and public companies and to report to Parliament. The office of the Comptroller and Auditor General assists the Parliament in ensuring accountability and transparency of the Government in the use of public resources. With the independence guaranteed by the constitution, the Comptroller and Auditor General carries out:

- Independent (external) audit in order to fulfill its role as a watchdog agency;
- Evaluation of the effectiveness of internal control and internal audit functions;
- Performance or value for money audits to enhance accountability,
- Reporting, as necessary to Standing Committee on Public Accounts (PAC)/ Committee on Public Undertakings (PUC);
- Reporting to ministries on the effectiveness or otherwise of internal audit;
- Following up audit reports to ensure that effective action has been taken.

**7.2 Current Status of National Budget**

This section provides an overview of current status of national revenue and expenditure and its average growth which is one of the influential factor for the determination of future economic development of the country. Moreover, the section describes the development expenditure by sectors and trend.

(1) Current Status of National Revenue and Expenditure

The main source of government revenue is tax revenue. Public revenue principally consists of direct and indirect taxes and they account for more than 80 percent of the total receipts. The tax receipts consists of taxes on income and wealth (direct), taxes on commodities and transaction (indirect) and other taxes and duties. The rest comes from different non-tax revenues such as income from property, fees, charges and tolls. The Revenue-GDP ratio is an accepted determinant of the stage of economic development of a country. In FY2004-2005, Revenue-GDP ratio was 10.6% which kept the same rate up to the FY2006-2007 (10.5%). The ratio has been slowly growing to 12.9% in FY2010-2011. In FY2012-13, total revenue collection stood at 12.2 percent of GDP as shown in Table 7.4.

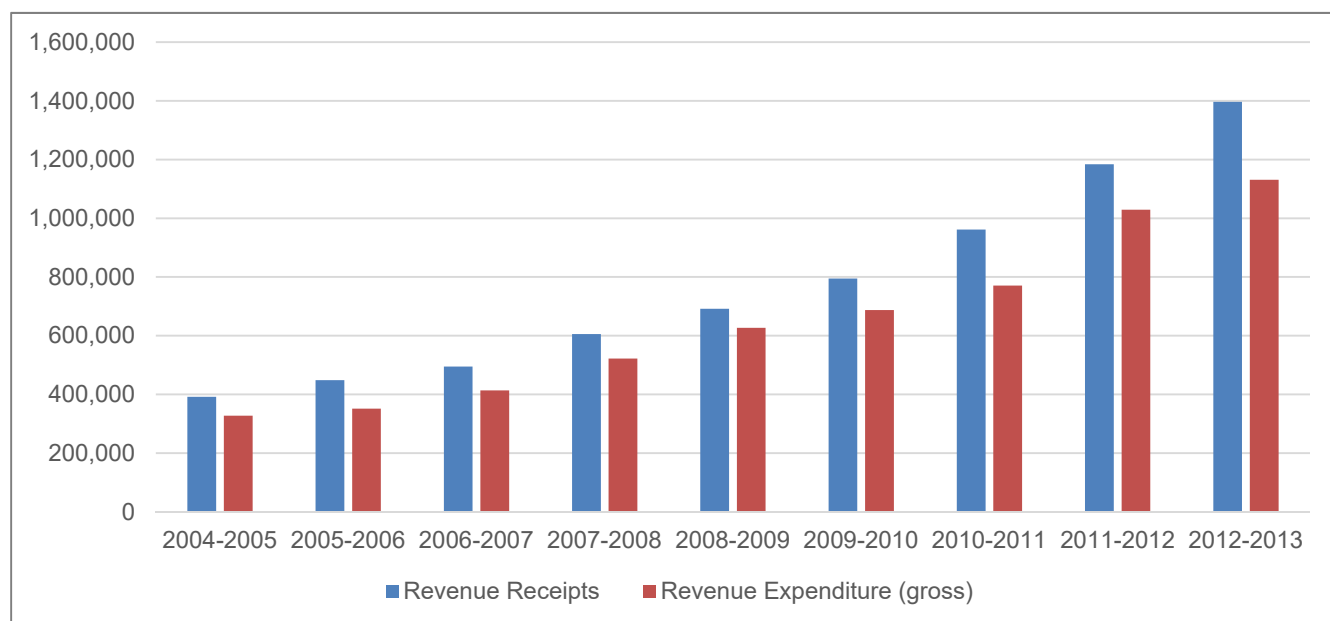
The public expenditure includes non-development expenditure and development expenditure. Non-development expenditure is relating to “Revenue Budget” and development expenditure relating to “Development Budget”. Revenue expenditure mainly consists of consumption expenditure (salaries, wages & services), transfer payment (interest payment, grant to local bodies, city corporations and autonomous bodies) and subsidies and pension payment. While development expenditure is expenditure for agriculture, flood control, industry, infrastructure and other service development. In FY2004-2005, development expenditure ratio to total expenditure was 36.4 percent and the ratio is decreasing by the following years (Table 7.5). In FY2011-2012, the share of development expenditure was 25.3 percent which represents non-development is increasing instead of development budget. Therefore, it could be mentioned in here that such low development expenditure in the field of the transport infrastructure causes recent chronic transport congestion and conflict.

**Table 7.4 Recent Trend of Consolidated Receipts and Expenditures**

Million BDT

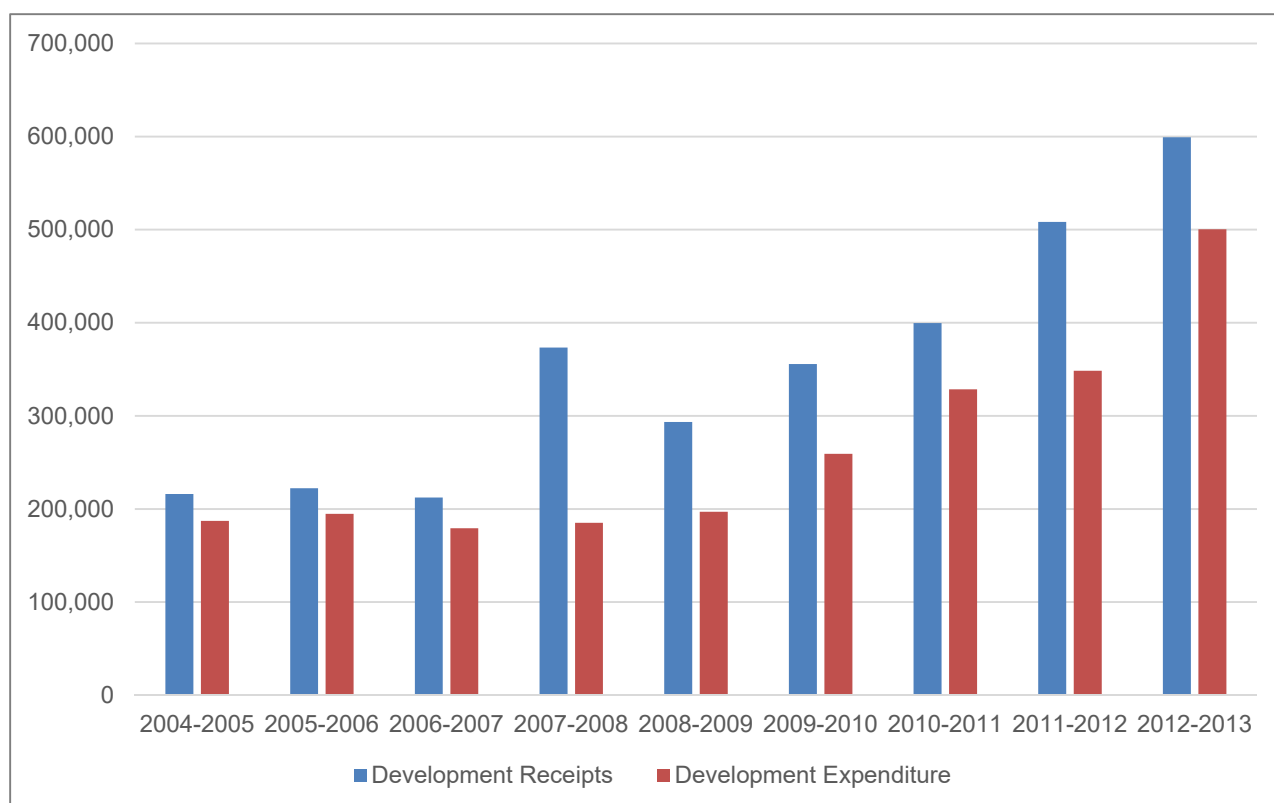
Heads	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	AAGR 2004-2012
Revenue Receipts	392,000	448,680	494,720	605,390	691,800	794,840	961,877	1,183,850	1,396,702	17.21
Development Receipts	216,110	222,320	212,290	373,350	293,420	355,590	399,610	508,310	599,260	13.60
Total Receipts	608,110	671,000	707,010	978,740	985,220	1,150,430	1,351,487	1,692,160	1,995,962	16.02
Revenue Expenditure (gross)	327,736	351,544	413,551	521,923	626,760	687,110	771,030	1,029,030	1,131,330	16.75
Development Expenditure	187,260	194,720	179,280	185,060	197,000	259,170	328,550	348,500	500,353	13.07
Total Expenditure	514,996	546,264	592,831	706,983	823,760	946,280	1,099,580	1,377,530	1,631,683	15.51
GDP at current producer's price	3,707,070	4,157,279	4,724,769	5,458,224	6,147,952	6,943,243	7,967,040	9,147,842	11,412,612	15.09
GDP growth rate (%)	5.96	6.63	6.43	6.19	5.74	6.07	6.46	6.52	6.01	
% of revenue receipts to GDP	10.6%	10.8%	10.5%	11.1%	11.3%	11.5%	12.1%	12.9%	12.2%	
% of total receipts to GDP	16.4%	16.1%	15.0%	17.9%	16.0%	16.6%	17.0%	18.5%	17.50%	
% of Development Expenditure to Total Expenditure	36.4%	35.6%	30.2%	26.2%	23.9%	27.4%	29.9%	25.3%	30.70%	

Source: Statistical Yearbook of Bangladesh-2012



Source: Statistical Yearbook of Bangladesh-2013

**Figure 7.7 Recent Trend of Receipts and Expenditures in "Revenue Budget"**



Source: Statistical Yearbook of Bangladesh-2013

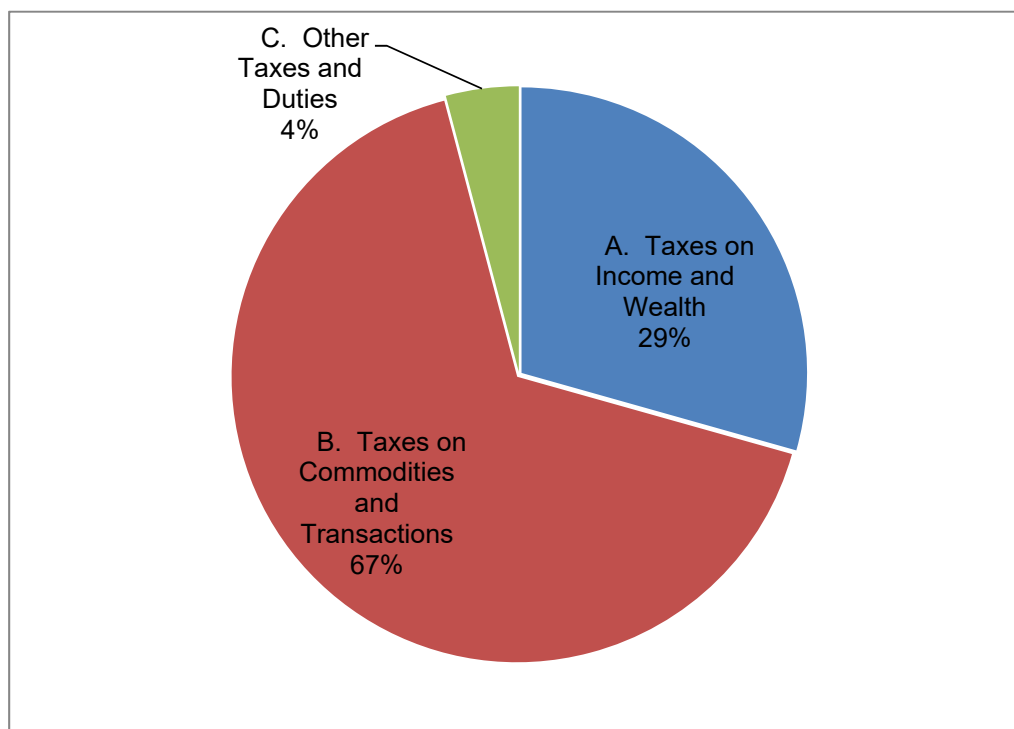
**Figure 7.8 Recent Trend of Receipts and Expenditures in “Development Budget”**

## (2) Current Status of Revenue Budget

The National Board of Revenue (NBR) under Internal Resources Division (IRD) of the Ministry of Finance is the central authority for tax administration and policy formulation in Bangladesh. The Government has been taking various measures to increase direct and indirect taxes such as: (a) steps for raising direct tax are increasing tax exemption limit, increase in tax coverage and investment ceiling; (b) steps for indirect tax are five-tier supplementary duty rates readjust to eight-tier, duty imposed on finished goods and luxury items and impose duty on tobacco items; (c) steps for VAT are simplification of VAT system and increase in VAT coverage; and (d) imposing of supplementary tax.

In consideration of national revenue, Bangladesh has one of the lowest levels of tax revenues in the world though the revenue collection is increasing many folds in the recent years. Bangladesh remains heavily dependent on trade-based taxes. To increase the domestic resource mobilization as well as development budget, there will need policy options for: (i) broadening the tax base, (ii) reducing tax exemptions, (iii) improving tax administration, (iv) tightening billing and collection in the delivery of public services. As for national expenditure, Bangladesh has one of the lowest levels of government spending in the world. Such low level of expenditures results from the fact that the Government has not been able to mobilize large volumes of resources domestically with the government own tax. As a result, budget financing remains heavily reliant on domestic borrowing.

Table 7.5 and Figure 7.9 shows the recent trend of national revenue collection. The structure of revenue is shared at 67% by taxes on commodities and transaction including VAT. The share of taxes on income and wealth is 29%. However, the AAGR is 16.98 percent in the FY2004-2005 to FY 2011-2012.



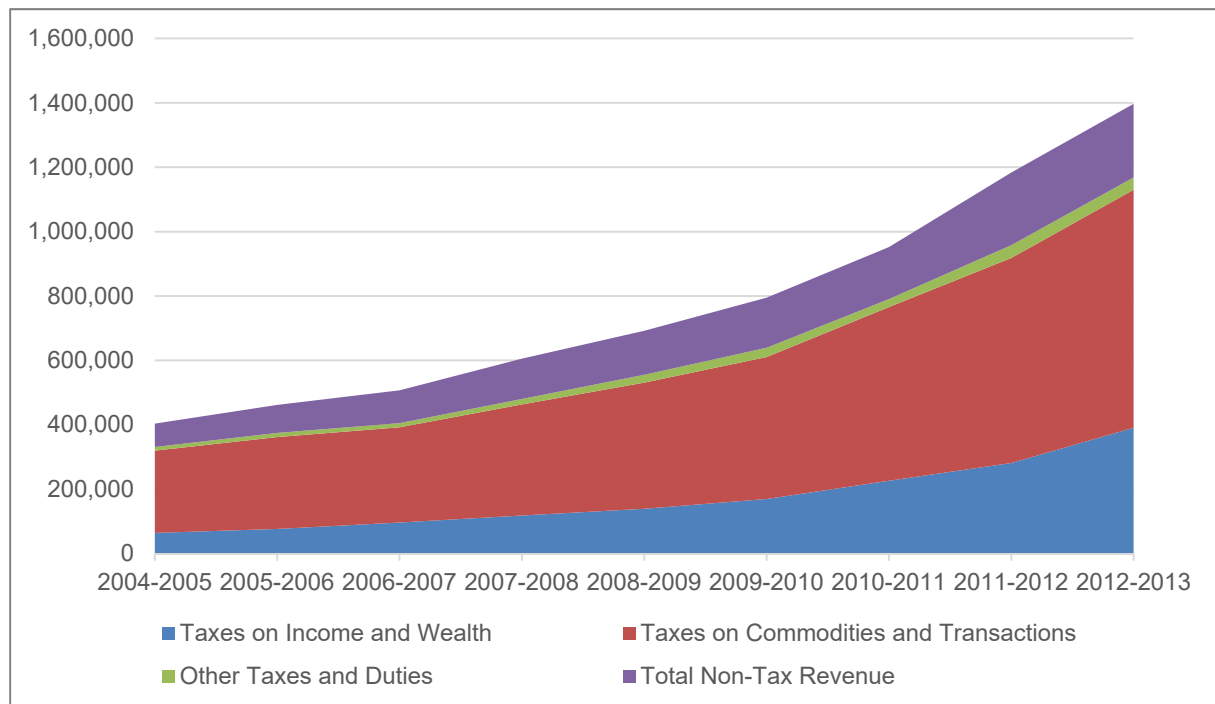
Source: Statistical Yearbook of Bangladesh-2013

**Figure 7.9 Breakdown of the National Revenue Component (2011-2012)**

**Table 7.5 Recent Trend of the Government Revenue Budget**

Heads	Million BDT									
	2004 -2005	2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	2011 -2012	2012- 2013	AAGR 2004-2012
1. Total Tax Revenue	319,500	361,750	392,470	480,120	555,256	639,660	790,524	957,850	1,163,242	17.53%
A. Taxes on Income and Wealth	64,430	76,750	96,389	118,375	139,466	169,521	226,304	281,307	390,970	25.28%
B. Taxes on Commodities and Transactions	255,070	285,000	296,081	344,990	391,420	440,760	539,310	637,130	739,112	14.22%
C. Other Taxes and Duties	11,520	13,100	12,581	16,755	24,370	29,279	24,910	39,413	38,160	16.15%
2. Total Non-Tax Revenue	72,500	86,930	102,250	125,270	136,544	155,280	161,353	226,000	228,460	15.43%
Total Revenue Receipts	392,000	448,680	494,720	605,390	691,800	794,840	951,877	1,183,850	1,396,702	17.21%
GDP	3,707,070	4,157,279	4,724,769	5,458,224	6,147,952	6,943,243	7,967,040	9,147,842	11,412,612	15.09%
% to GDP	10.6%	10.8%	10.5%	11.1%	11.3%	11.4%	11.9%	12.9%	12.24%	

Source: Statistical Yearbook of Bangladesh-2013



Source: Statistical Yearbook of Bangladesh-2013

**Figure 7.10 Breakdown of the National Revenue Component**

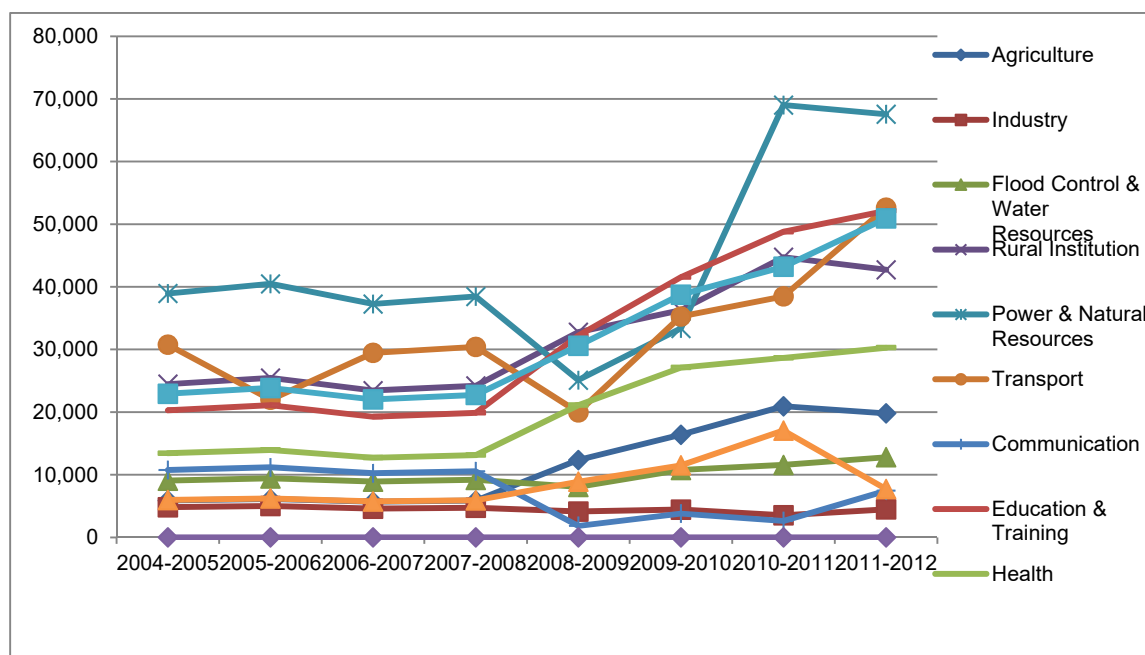
### (3) Current Status of Development Budget

Public sector plays crucial role of making economic growth to increase public expenditures in infrastructure as well as health and human resource development which has direct impact on poverty reduction. It is found the Table 7.6 and Figure 7.11 that the transport sector is one of the major recipients of public sector allocations. Though the development expenditure in FY 2010-2012 was BDT 38,471 million in the transport, but it is increased in BDT 52,642 million in the FY2011-2012 because of some mega projects such as Padma Bridge and railway sector investment. It could be assumed that the expenditure will grow more for the future mega projects such as construction metro rail in Dhaka city, Eastern Bangladesh Bridge Improvement and railway investment.

**Table 7.6 Development Expenditure by each Sector**

Million BDT									
Heads	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Agriculture	5,883	6,117	5,679	5,863	12,352	16,389	20,934	19,800	26,962
Industry	4,812	5,004	4,579	4,725	4,125	4,428	3,518	4,471	17,137
Flood Control & Water Resources	9,050	9,410	8,898	9,184	8,057	10,768	11,553	12,800	15,934
Rural Institution	24,478	25,454	23,445	24,198	32,765	36,267	44,734	42,730	67,714
Power & Natural Resources	38,934	40,485	37,265	38,465	25,096	33,352	69,028	67,548	104,978
<b>Transport</b>	<b>30,754</b>	<b>21,980</b>	<b>29,462</b>	<b>30,409</b>	<b>19,970</b>	<b>35,265</b>	<b>38,471</b>	<b>52,642</b>	<b>82,081</b>
Communication	10,748	11,177	10,225	10,554	1,840	3,808	2,618	7,454	6,861
Education & Training	20,283	21,092	19,258	19,879	32,206	41,548	48,792	52,130	65,345
Health	13,418	13,946	12,718	13,128	21,107	27,110	28,652	30,270	35,088
Population Control & Family Planning	NA	NA	NA	NA	NA	NA	NA	NA	NA
Physical Planning & Housing	22,932	23,845	22,022	22,737	30,594	38,743	43,204	50,930	58,440
Others	5,968	6,210	5,729	5,918	8,888	11,492	17,046	7,719	19,823
% of Transport to Total									
<b>Total</b>	<b>187,260</b>	<b>184,720</b>	<b>179,280</b>	<b>185,060</b>	<b>197,000</b>	<b>259,170</b>	<b>328,550</b>	<b>348,494</b>	<b>500,363</b>

Source: Statistical Yearbook of Bangladesh-2013



Source: Statistical Yearbook of Bangladesh-2013

**Figure 7.11 Development Expenditure by each Sector**

### 7.3 Local and Urban Authorities

This section provides an overview of current institutional framework for local and urban development authorities, authorities for urban services, local administrative structures, financial management of local authorities and authorities for management of Dhaka Metropolitan areas.

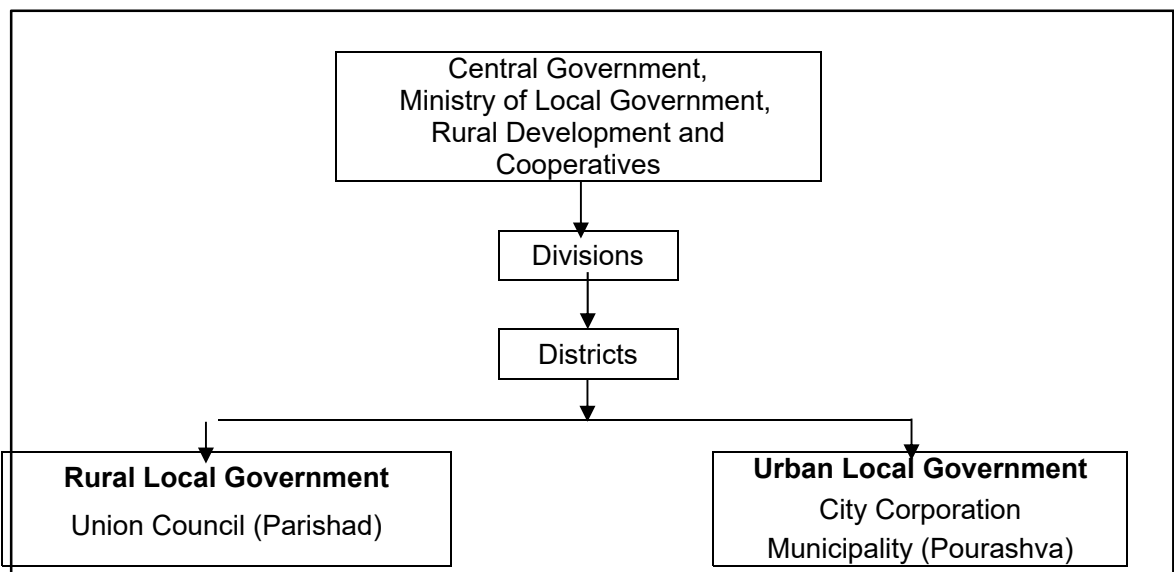
#### (1) Local Administrative Structure

Local governments are the basic administrative and political units in Bangladesh. Two types of local government institutions exist in Bangladesh which are the urban local government and rural local government. The urban local governments are divided into two types. In the divisional town level, the City Corporation functions whereas

Pourashava (Municipality) functions in other towns. At the local level, Pourashava is the basic planning and development authority. Through the Pourashava Bill 2009, the Pourashava authorities were empowered to prepare Master Plan, implement development schemes and exercise building control. A Pourashava consists of a Mayor, Councilors whose number is fixed by the government and women Councilors of reserved seats. The Mayor and Councilors of a Pourashava are elected by direct election on the basis of adult franchise. The Pourashava (Municipal) Act, 2009 has given the Pourashavas wide responsibilities, but the administrative, financial and technical capabilities of the Pourashava are not adequate to meet the challenges associated with rapid urbanization in the country.

A City Corporation has seven departments including the secretariat, but Dhaka City Corporation has 16 departments. The departments in all City Corporations except for Dhaka City Corporation are Secretariat, Engineering, Health, Education, Revenue, Conservancy and Accounts. In contrast, the departments in Dhaka City Corporation are Secretariat, Accounts, Chief Executive Officers (CEO) office, Conservancy, Engineering, Establishment, State, Health, Information Technology, Internal Audit, Law, Public Relation, Revenue, Slum Development, Social Welfare, Transport and Urban Planning.

A Union Parishad is the lowest rural Local Government Institutions in Bangladesh. The Local Government (Union Parishad) Act 2010 provides the legal framework for the Unions Parishad. Section 47 of the Union Parishads Act provides the overall functions of Union Parishad namely: (a) administration and establishment issues; (b) maintaining law and order; (c) services for public welfare; and (d) planning and implementing local economic and social development.



Source: JICA Study Team

**Figure 7.12 Local Administrative Structure**

**Special Purpose Authorities:** There are also some special purpose agencies that provide special services to the city dwellers. These are Water Supply and Sewerage Authority, Electricity Supply Authority, Road Transport Authority, etc. These are water and sewerage authorities i.e. DWASA and CWASA which are working in two metropolitan cities of Dhaka and Chittagong respectively. The other agencies involved in the development activities of Dhaka Metropolitan Area, e.g. Dhaka Transport Coordination Authority (DTCA) which is mainly responsible for planning and development of transportation facilities within Greater Dhaka Area. DTCA is under the Ministry of Road Transport and Bridges.



**Other Development Authorities:** Pourashava were originally created for planning and management of urban areas. Later on separate planning and development organizations were created for the cities of Dhaka (RAJUK), Chittagong (CDA), Khulna (KDA) and Rajshahi (RDA) which are under the Ministry of Housing and Public Works. The development authorities in these cities are authorized to undertake local urban planning as well as infrastructure and site development activities for housing, commercial and industrial use. The authorities are also empowered to exert development control functions. The effectiveness of these authorities, however, is generally limited by such factors as inadequate management and financial system, multiplicity of institutions with urban development function within their jurisdictions, uncoordinated development, lack of integration with other agencies, inadequate manpower, and lack of public participation.

(2) Local Government Financial System

Municipal councils (in cities and municipalities) and union councils are legislative bodies corresponding to Parliament at the central level. Elected Mayors or Chairman head them. Each Municipal Council and the Ministry of Local Government nominate and appoint an Executive Committee for day-to-day administration. The Executive Committee is headed by a Chief Executive Officer (CEO) and is accountable to the Council. Below the Executive Committee there are departments, divided functionally. The Union Council organization is very simple, which a Secretary, an Assessor, and a Tax Collector, headed by an elected Chairman.

Each city corporation is governed by its own ordinance, while all municipalities are under the Pourashava Ordinance and union councils are under the Local Government Ordinance. These laws impose a similar framework for budget preparation. Budgets have to be submitted to the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C) for approval. Accounts of receipts and expenditure are to be kept in the prescribed manner and form, and an Annual Statement of Accounts is to be prepared and sent to the Government by 31 December. All Local Government Institutions (LGIs) are subject to audit by the C&AG. He sends his report to the Government, and a copy to the LGI which "shall forthwith remedy any defects or irregularities and report to the Government the action taken by it".

As in central government, the budget is divided into a Revenue budget and a Development budget. The budget timetable, procedure and forms are set by the MLGRD&C. LGIs are legally required to balance their budgets. Revenue budgets go through Budget/Accounts Section, the CEO, the Council and the MLGRD&C. Development budgets start with proposal for projects in each ward. The Chairman/Mayor forwards proposals to Engineering Section for feasibility study and cost estimation. Project estimates are consolidated into the Development budget, which follows the same path of approvals as the Revenue budget.

(3) Current Status of Agencies Involved and Local Finance in Dhaka Metropolitan Administration

There are many organizations involved in the development process and providing services to the Dhaka Metropolitan areas. Apart from local authorities, the national authorities are providing different services to the Dhaka areas which are Urban Development Department (UDD), National Housing Authority (NHA) and Public Works Department (PWD) under Ministry of Housing and Public Works (MOHPW), the Department of Public Health Engineering (DPHE) and Local Government Engineering Department (LGED) under Ministry of Local Government, Rural Development and Cooperatives (LGRD&C), Department of Environment (DOE) under Ministry of Environment and Forest (MOEF), Roads and Highways Department (RHD) and Bangladesh Road Transport Authority (BRTA), Bangladesh Road Transport Corporation

(BRTC) and Bangladesh Bridge Authority (BBA) under Ministry of Road Transport and Bridges. There are also special purpose agencies that provide special services to Dhaka City dwellers which are Dhaka Water Supply and Sewerage Authority (DWASA) under LGRD&C, Dhaka Electric Supply Company Limited (DESA) and Dhaka Power Distribution Company Limited (DPDC) under Ministry of Power, Energy and Mineral Resources (MOPEMR).

Moreover, there are three local level agencies are directly involved for the development of Dhaka Metropolitan areas and its services. One of them, Rajdhani Unnayan Kartipakha (RAJUK) is authorized to undertake local urban planning as well as infrastructure and site development activities for housing, commercial and industrial use. The authority is also empowered to exert development control functions. Dhaka Transport Coordination Authority (DTCA) under Ministry of Road Transport and Bridges is involved mainly for planning and development of transportation facilities. Moreover, Dhaka City Corporations (DCCs) is responsible for overall maintenance of public assets and day-to-day services for the city.

Drastic changes in the physical, economic and social structure in the Dhaka areas resulting from rapid urbanization has been posing serious challenges for sustainable urban development. Dhaka city is now afflicted with innumerable problems ranging from law and order situation to deteriorating environmental conditions. Poor city management and low efficiency are exacerbating the problems. The quantity of solid waste generated at present varies between 3000 to 3500 tons per day. DCC is capable of collecting only 50% of this waste, leaving the remaining half unattended. A part of this waste either remains in the streets or on nearly open ground. Some of the waste flows to the open drains and blocks the normal drainage flow. As a result, water logging sometimes disrupts the normal city life for days during monsoon. The serious health hazard posed by this situation is of major concern. The situation with respect to water supply is also quite unsatisfactory. The Dhaka Water and Sewerage Authority (DWASA) is capable only in an average of 80% of water supply. Only a limited segment of the population is enjoying adequate supply of water while for the rest of the population the water supply is quite inadequate.

Dhaka city traffic has reached nightmare proportions, often causing huge delays in covering small distances with associated productivity losses. Extreme traffic congestion on urban roads is a major challenge for big as well as intermediate urban centers in Bangladesh. Rapid urbanization in Bangladesh during the last few decades increased transport demand quite significantly leading to manifold increase in the number of motorized and non-motorized vehicles on the streets. The increase in the number of vehicles without concomitant expansion of road facilities has led to severe congestion on roads and deterioration in urban environment. The situation further deteriorated due to insufficient public transport facilities and weak management of traffic. Non-existence of transport planning and inefficient traffic engineering result in low quality traffic management. Moreover buses are in short supply and there is no metro rail (presently study for detail design) system to handle day-to-day commuter traffic in the city.

The followings show the local fiancé in Dhaka Metropolitan area.

**Table 7.7 Dhaka City Corporation (DCC) Revenue Receipts**

Million BDT			
Heads	2005-2006	2009-2010	2010-2011
<u>Revenue Receipts</u>			
Tax Revenue & other charges	2101.9	3474.0	4481.5
Yearend balance	1015.9	1460.5	1388.0
<u>Other Receipts</u>			
Government Grants & others	765.0	338.8	407.5
Foreign aided projects & others	2477.7	2971.8	6610.0
<b>Total</b>	<b>7376.4</b>	<b>9705.6</b>	<b>14350.0</b>

Source: Budget, Dhaka City Corporation

Note: Presently, Dhaka City Corporation bifurcated into (a) Dhaka North City Corporation and (b) Dhaka South City Corporation since 2011-2012 Financial Year.

**Table 7.8 Dhaka City Corporation (DCC) Expenditure**

Million BDT			
Heads	2005-2006	2009-2010	2010-2011
<u>Non-Development Expenditures</u>			
Revenue Expenditure	2080.7	3064.5	3470.0
Other Expenditure	240.0	212.5	190.0
Sub-total	2320.7	3277.0	3660.0
<u>Development Expenditure</u>			
GOB Fund	2458.0	2906.8	3480.0
Foreign aided projects & others	2477.7	2971.8	6610.0
Sub-total	5025.7	5878.6	10090.0
<b>Total</b>	<b>7346.4</b>	<b>9155.6</b>	<b>13750.0</b>

Source: Budget, Dhaka City Corporation

Note: Presently, Dhaka City Corporation bifurcated into (a) Dhaka North City Corporation and (b) Dhaka South City Corporation since 2011-2012 Financial Year.

It is found from the above revenue receipts and development budget for the mega city like Dhaka, a major constraint is the lack of adequate funding as well as domestic resource mobilization. It could be assumed that the domestic resource mobilization is the prime issues for Dhaka city, though even with best city governance unless new sources of funding are found it will be difficult to meet the demand and development needs of the urban sector. Presently, much of the financing comes from the Government's own budget; property taxes and user charges for urban services are very limited. So, Dhaka city needs to emphasize resource mobilization through much better implementation of the property tax and stronger cost recovery of key urban services. Therefore, there will need policies include steps to improve land and property valuation, better tax collection through improvements in property tax administration, and setting prices for urban services with due regards to cost.

## 7.4 State-Owned Enterprises (SOEs)

### (1) Outline of SOEs

State-Owned Enterprises (SOEs) are governed according to their respective status. Legally they are autonomous bodies, but the respective ministries appoint their boards of directors and in practice SOEs are highly regulated by their ministries. All personnel, investment, borrowing, dividend, pricing and major procurement decisions have to be cleared with the ministry. The Ministry of Finance (Monitoring Cell) approves budget.

SOEs are quasi-fiscal entities, legally separate from the Government. However, they have a number of fiscal effects. They receive equity injections, loans and subsidies from the Government; they repay loans, and pay interest, taxes and dividends. There are also major effects on macroeconomic balances that are off the budget. Supplier credit is guaranteed by the Bangladesh Bank on a counter guarantee by the Ministry of Finance. Where a corporation cannot meet its debt service liability, it borrows further from the commercial banks. Since 1995, all offers of supplier credit have to be cleared by a committee including the Finance Secretary, Planning Secretary and Bangladesh Bank Governor.

SOEs have very limited operational autonomy, although they carry out commercial activities. In practice, they are suffering from considerable bureaucratic and political interference. Most have excessive staff but lack adequate professionally trained staffs with technical and managerial skills. SOEs' weak economic performance is due to several factors in particular; (i) weak governance and accountability, leading to considerable investment misallocations, operational inefficiencies, over employment and inadequate revenue collection, (ii) inappropriate administered prices, many SOE products have been priced significantly above world market or competitive price level, (iii) insufficient disengagement of the public sector in commercial activities. SOEs remain a drain on public resources

**Departmental Enterprises e.g. Bangladesh Railway (BR):** As Bangladesh Railway is an enterprise; earning revenues that are relate to their expenditures, they produce commercial accounts on an accrual basis. However, as they have remained as government departments, consolidation of their accounts with the rest of the government requires parallel cash accounts or conversion of their accrual accounts back onto a cash basis. The budget of the Bangladesh Railway has been part of the Government budget since 1985. It has been making large losses.

### (2) National Budget for SOEs

SOEs are subject to a similar planning and budgeting framework to central Government ministries. Each corporation prepares its estimates in January, together with its revised estimates for the current year. All projects have to be approved by the Planning Commission and included in the Annual Development Plan (ADP). Projects that a SOE is proposing to finance itself are also included in the ADP, but only after the Monitoring Cell (Ministry of Finance) has certified to the Planning Commission that the SOE will have the necessary funds after paying its liabilities (debt service liability, customs, etc.). The Revenue and Development budgets are submitted through the respective administrative ministries to the Monitoring Cell, which scrutinizes revenue budgets, ensures that they allow for operating and maintenance expenditures arising in projects taken over by the Government, negotiates targets and gives final approval during the March/May period. However, total expenditures, has been increasing in every financial year on account of increased subsidy and transfers to the SOEs sector.

### (3) Key Issues on SOEs' Financial Management

Public sector of Bangladesh, however, extends far beyond the central government, comprising a large State-Owned Enterprise (SOE) sector and a dominant public financial sector. SOEs that operate in traditional utilities, infrastructure and the manufacturing sector account for more than 20 percent of public sector employment. In addition to being a drain on public resources through a range of subsidies and contingent liabilities, they also exert considerable influence on the economy through the supply of vital inputs and services and their pricing policies.

Appointments of board members and chief executive are the most important decisions affecting public enterprise performance. The present quality of directors and top executives is very mixed. These personnel should appoint strictly on their qualifications, experience and track record in business. The procedure in India is for the Minister to make each appointment from a short list of candidates prepared from a central database of qualified personnel. This may be considered for adoption in Bangladesh.

**Table 7.9 Net Profit/Loss of selected State-Owned Enterprises**

Unit: Million BDT

Name Enterprises	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Bangladesh Inland Water Transport Corporation (BIWTC)	265.0	271.3	277.1	284.3	261.8	282.7	226.5	139.2	471.4
Bangladesh Inland Water Transport Authority (BIWTA)	(190.1)	(173.1)	(206.3)	(135.9)	44.7	(76.1)	(15.7)	144.4	196.9
Bangladesh Road Transport Corporation (BRTC)	(353.1)	(389.2)	(359.2)	(373.3)	(308.6)	(246.0)	(620.6)	(746.6)	(542.8)
Bangladesh Bridge Authority (BBA)	1432.8	1620.0	1553.1	1849.7	1835.3	978.6	1165.1	684.0	(181.2)
Dhaka WASA	39.1	284.2	63.5	127.5	14.7	95.0	85.3	203.0	98.2
Bangladesh Power Development Board (BPDC)	(6,183.0)	(9,380.9)	(9,040.9)	(9,932.4)	(8,286.1)	(7,357.6)	(45,870.1)	(63,598.6)	(50,261.1)
RAJUK	488.7	549.7	706.0	561.9	832.8	2,020.5	1,341.6	1,568.8	1528.1
<b>Total of Bangladesh</b>	<b>(26,816.1)</b>	<b>(35,735.3)</b>	<b>(22,758.9)</b>	<b>(9,9828.5)</b>	<b>(32,828.8)</b>	<b>(27,765.5)</b>	<b>(9,1914.7)</b>	<b>(94,148.0)</b>	<b>(26,260.5)</b>

Source: Bangladesh Economic Review (2014)

## 7.5 Government Budget for Transport Sector Development

### (1) Public Investment in the Transport Sector

Public sector involvement in the transport sector of Bangladesh consists of ownership and operation of nine state-owned enterprises (SOEs). Except for the two sea ports, the SOEs have poor financial performance. The poor financial performance of the SOEs and their weak capital structure created a huge financial liability on the government. However, the situation has been improving in recent years. To address the problem, the government has been pursuing the two-pronged policy of privatization and restructuring of public sector transport SOEs for achieving improved administrative, management and operational performances.

The government recognizes the importance of substantially upgrading the transport infrastructure while also improving transport services. In recognition of this, it has been giving priority to transport in budget allocations, improving the performance of public

transport entities through policy and institutional reforms, and encouraging the private sector in both building infrastructure through PPP and in providing transport services.

**Table 7.10 Transport Sector Investment in Sixth Five Year Plan**

Financial Year	Plan Investment (Million BDT)
2010-2011	53,700.0
2011-2012	71,530.0
2012-2013	81,470.0
2013-2014	96,700.0
2014-2015	111,720.0
% of total allocation	15.7

Source: Sixth Five Year Plan

(2) Roads and Highways

The Roads and Highways Department (RHD) is a major public sector agency directly responsible for planning, design, construction, improvement and maintenance of primary and secondary road network in the country, which include National and Regional Highways and Zila Roads. RHD is also responsible for the operation, and maintenance of a ferry system in the country. However, gradual replacement of ferry system with bridges is a broad dimension of RHD. The Government is fully aware about the importance and role of road and road transport. As such, it has been making substantial investments in building physical infrastructure including road network because of its paramount need as a pre-requisite for socio-economic development of the country. Table 7.11 shows the Government budget and donor agencies involvement to improve the RHD's road networks.

**Table 7.11 RHD Allocation and Expenditure during FY 2004-05 to FY 2013-14**

Financial Year	Allocation			Expenditure			Annual expenditure in overall percent
	Development Budget	Revenue Budget (Maintenance)	Total	Development Budget	Revenue Budget (Maintenance)	Total	
2004-05	2361.31 (PA 657.09)	866.86	3228.17 (PA 657.09)	2206.00 (PA 586.02)	866.86	3072.86 (PA 586.02)	95.19%
2005-06	1989.87 (PA 558.47)	861.55	2851.42 (PA 558.47)	1801.36 (PA 468.16)	822.81	2624.17 (PA 468.16)	92.03%
2006-07	2245.44 (PA 659.80)	437.98	2683.42 (PA 659.80)	1745.32 (PA 468.47)	437.22	2182.54 (PA 468.47)	81.33%
2007-08	1852.29 (PA 423.86)	627.37	2479.66 (PA 423.86)	1526.83 (PA 293.25)	627.37	2149.95 (PA 293.25)	86.70%
2008-09	1399.28 (PA 543.65)	717.51	2116.79 (PA 543.65)	1213.13 (PA 409.52)	530.10	1743.23 (PA 409.52)	82.35%
2009-10	2308.21 (PA 597.87)	610.00	2918.21 (PA 597.87)	1966.57 (PA 430.75)	606.52	2573.09 (PA 430.75)	88.17%
2010-11	2063.61 (PA 492.36)	667.80	2731.41 (PA 492.36)	1842.59 (PA 303.72)	658.97	2501.56 (PA 303.72)	91.58%
2011-12	2440.51 (PA 359.79)	704.90	3145.41 (PA 359.79)	2317.14 (PA 248.60)	701.78	3018.92 (PA 303.72)	95.98%
2012-13	3382.87 (PA 363.86)	1135.61	4518.48 (PA 363.86)	3370.03 (PA 353.72)	1135.61	4505.64 (PA 353.72)	99.72%
2013-14	3465.04 (PA 473.66)	1239.64	4704.68 (PA 473.66)	3454.06 (PA 465.16)	1237.68	4691.74 (PA 465.16)	99.72%

Source: Planning Cell, Roads and Highways Department (RHD)  
PA=Project Aid

### (3) Railways

Historically the railway enjoyed a monopoly as a carrier and used to carry most of the principal commodities in the country such as cement, coal, fertilizer, raw jute, stone, food grain, sugar cane etc. With gradual emergence of road transport, railway started losing its modal share and overtime it declined to 4% in the recent years. Presently, BR is a SOE losing agency. However, Bangladesh Railway (BR) has planned to undertake many projects about 149 within next 10 years. With the implementation of the on-going as well as new projects BR will be able to regain its market share and be self-sustainable and create other business opportunities. Tables 7.12 and 7.13 show the operating expenses and operating income of Bangladesh Railway.

**Table 7.12 Operating Expenses of Bangladesh Railway**

Million BDT									
Heads	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
General Administration	1129.5	2645.5	1385.6	1370.6	1514.4	1725.4	2345.3	1990.3	1997.3
Repairs and Maintenance	2451.1	2718.2	3152.5	3995.5	3976.2	4339.5	4529.2	4827.5	4896.3
Operating Staff	1034.0	617.0	978.3	604.3	713.5	809.3	832.4	767.5	702.9
Operating Fuel	920.7	1208.0	1609.3	1870.2	2214.3	2058.0	2104.0	2561.0	2979.4
Operating other than Staff & Fuel	462.6	962.2	554.3	1084.5	1025.4	988.8	1272.8	1265.5	1208.4
Miscellaneous	942.8	1450.4	1651.2	1960.0	2283.4	2650.8	3834.2	4259.1	3939.2
<b>Total</b>	<b>6950.8</b>	<b>9601.7</b>	<b>9331.2</b>	<b>10885.4</b>	<b>11727.4</b>	<b>12572.0</b>	<b>14918.1</b>	<b>15671.1</b>	<b>15623.8</b>

Source: Information Book, Bangladesh Railway, 2013

**Table 7.13 Net Operating Income**

Million BDT									
Heads	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Public Service Obligation Compensation	860.0	860.0	860.0	860.0	860.0	860.0	860.0	860.0	860.0
Welfare Gain	133.2	210.1	164.8	266.1	265.7	208.5	315.2	369.9	390.6
Total Operating Revenue	5449.4	5512.8	5552.4	6742.5	7379.2	6731.6	7470.7	7264.2	9293.3
Total Operating Expenses	6950.8	9601.7	9331.2	10885.4	11727.4	12572.0	14918.1	15671.1	15623.8
<b>Net Operating Income</b>	<b>(1501.4)</b>	<b>(4088.8)</b>	<b>(3778.8)</b>	<b>(4142.9)</b>	<b>(4348.2)</b>	<b>(5840.4)</b>	<b>(7447.4)</b>	<b>(8406.9)</b>	<b>(-) 6330.4</b>

Source: Information Book, Bangladesh Railway, 2013

### (4) Rural Roads

Local Government Engineering Department (LGED) is major public sector agency directly responsible for design, construction, improvement and maintenance of Upazila, Union and Village roads along with other activities. The other activities of LGED are: (a) rural development and institution; (b) physical planning, water supply and housing; and (c) agriculture. The LGED made significant contribution towards rapid expansion of the rural transport network resulting in rapid growth of transportation services. The following table shows the expenditure during the FY 2009-10 to 2012-2013.

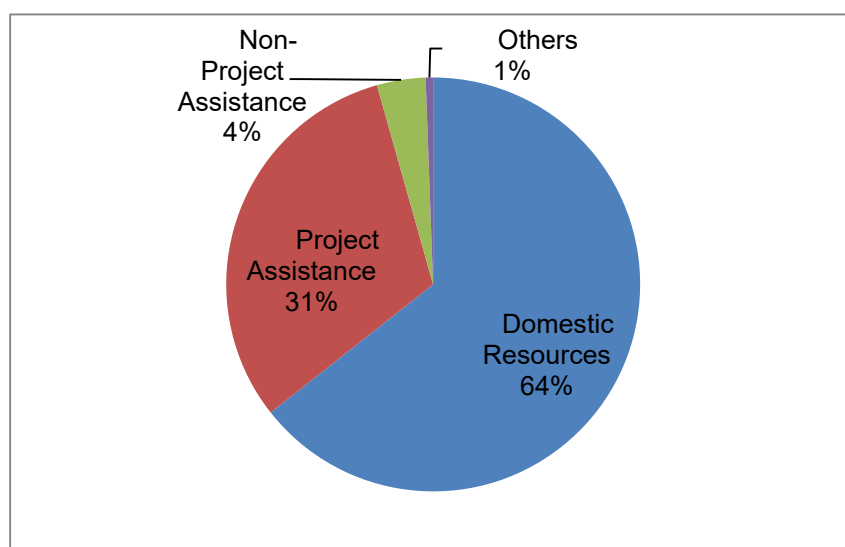
**Table 7.14 Expenditure during FY 2009-10 to 2012-2013 under LGED**

Million BDT				
Financial Year	Sector	GOB	Project Aid	Total
2009-2010	Rural Development & Institution	18,840	10399	29240
	Physical Planning, Water Supply and Housing	2,284	4686	6970
	Agriculture	296	437	734
	Transport	14,21	0	1421
	<b>Total</b>	<b>22842</b>	<b>15524</b>	<b>38366</b>
2010-2011	Rural Development & Institution	21817	9233	31050
	Physical Planning, Water Supply and Housing	1513	2713	4227
	Agriculture	402	429	831
	Transport	2424	0	2424
	<b>Total</b>	<b>26158</b>	<b>12376</b>	<b>38534</b>
2011-2012	Rural Development & Institution	24395	8254	32649
	Physical Planning, Water Supply and Housing	2381	3757	6139
	Agriculture	202	896	1098
	Transport	2241	0	2241
	<b>Total</b>	<b>29220</b>	<b>12908</b>	<b>42129</b>
2012-2013	Rural Development & Institution	35028	10638	45666
	Physical Planning, Water Supply and Housing	2987	4385	7370
	Agriculture	363	1290	1653
	Transport	2008	0	2008
	<b>Total</b>	<b>40387</b>	<b>16312</b>	<b>56699</b>

Source: Project Monitoring and Evaluation Unit, LGED, 2014

## 7.6 Financial Resources

The financial resources for development expenditure consist of domestic resources and foreign assistance. As shown about 64% of development expenditure is the domestic assistance which is increasing yearly. Presently, the share of project assistance is 31% and non-project assistance only 4% which is combined as foreign assistance. The Figure 7.12 and Table 7.15 show the financial resources and historical trend of financing for development expenditures.



Source: Statistical Yearbook of Bangladesh-2013

**Figure 7.12 Share of financial Resource**



**Table 7.15 Historical Trend of Financing for Development Expenditures**

Heads	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	AAGR 2004-13
Development Expenditure	205,000	215,000	216,000	225,000	290,000	285,000	358,800	456,510	601,370	14.40%
Domestic Resources	152,110	182,030	174,390	167,100	165,150	280,960	429,010	426,900	736,580	21.80%
Foreign Assistance	115,410	114,320	111,960	174,120	151,440	182,340	151,440	236,230	264,420	10.92%
Project Assistance	66,200	74,750	85,290	94,990	111,900	124,800	134,300	207,200	239,730	17.45%
Non-Project Assistance	45,570	35,170	22,730	72,800	35,400	55,320	13,500	25,200	20,600	-9.45%
Others	3,640	4,400	3,940	6,330	4,140	2,220	3,640	3,830	4,190	1.77%
Total Resources	267,520	296,350	286,350	341,220	316,590	463,300	580,450	738,930	1,001,000	17.93%
Balance	(-)62,520	(-)81,350	(-) 70,350	(-)116,220	(-)26,590	(-)178,300	(-)221,650	(-)221,650	(-)399,630	

Source: Statistical Yearbook of Bangladesh-2013

## 7.7 Private Sector Participation

### (1) National Policy and Current Status of PPP in Bangladesh

The Government of Bangladesh has adopted the Bangladesh Private Sector Infrastructure Guidelines (PSIG) on October 2004 by a notification of the Cabinet Division. PSIG establishes procedures to identify, procure and implement Private Infrastructure Projects and establishes institutional arrangements to monitor and expedite implementation of these projects at national level. For promotion and efficient processing of Private Infrastructure Projects in Bangladesh, a national Private Infrastructure Committee (PICOM) was also set up under the Prime Minister's Office on October 2005 headed by the Principal Secretary of the Government.

In addition, the Finance Division of the Ministry of Finance published the "Invigorating Investment Initiative through Public Private Partnership" in 2009 and based on the position paper the "Policy and Strategy Paper for PPP" was announced in 2010 which decided to establish a PPP Office under the Prime Minister's Office and a PPP unit under the Finance Division. The process of PPP project implementation was clarified in the paper and in accordance with the framework, 42 projects are listed as of 2015 June.

However, the private sector involvement in transport infrastructure has been very limited so far, although there is great potential for the same, particularly in major highways. On those highways, where traffic and potential toll income are high, the private sector could be invited to invest on Build –Operate- Transfer (BOT) basis. In such cases, Government may have to assume the role of acquiring land, and possibly fund part of the equity. In these cases, concession periods could be of the order of 25 to 30 years, with provision for three yearly tariff reviews. However, where traffic levels do not warrant BOT involvement, the Government could consider the annuity concept where the private sector could invest in improving a highway on an existing right of way (ROW), and recoup its investment from annual Government payments.

### (2) PPP Projects in Transport Sector

Development and maintenance of the transport infrastructure in the country is essentially the responsibility of the public sector. However, in view of resource constraints, Bangladesh needs an active involvement of the private sector to enhance access to capital as well as to bring in efficiencies in service operation. Currently the involvement of the private sector is limited mainly to providing services in some of the sub-sectors such as road, inland water and shipping. They have also very limited participation in civil aviation and rail services. Absence of regulatory institutions, an appropriate legal framework, inadequacy of capable and educated transport providers, and bureaucratic procedures and practices are some of the factors that inhibit private sector involvement. The following Table 7.16 shows the PPP Projects and their status in below.

**Table 7.16 PPP Project in Transport Sector**

Transport Organizations	Project Name	Estimated Costs USD in million	Status
RHD	Dhaka-Chittagong Expressway	9121.0	Solicited Project
RHD	Upgrading of Joydevpur-Debogram-Bhulta-Madanpur Road into 4 lane	140.0	Solicited Project
RHD	Upgrading of Hemayetpur-Singair-Manikganj Road into 4 lane	84.0	Solicited Project
RHD	Upgrading of Jatrabari-Sultana Kamal Bridge-Tarabo Road into 4 lane	54.0	Solicited Project
MPA	2 Jetties at Mongla Port through PPP	50.0	Negotiation
BBA	Dhaka Elevated Expressway	1,088	Agreement signed with Concessionaire
DCC	Gulistan – Jatrabari Flyover		Partially operating

Note: Solicited Project means approved by the Government

## **8. REVIEW OF PREVIOUS AND ON-GOING TRANSPORT PLANS**

### **8.1 Introduction**

In Dhaka, there are several urban transport master plan. The Greater Dhaka Metropolitan Area Integrated Transportation Study (DITS), the 1<sup>st</sup> urban transport master plan was prepared in 1994 by an initiation of the Government of Bangladesh (GOP) with the assistance from UNDP.

And 2<sup>nd</sup> urban transport master plan is the Dhaka Urban Transport Project (DUTP). This project was one of the first World Bank projects aimed at easing the complex transport problems facing Bangladesh's capital. The World Bank's aim was to help the Government of Bangladesh develop, refine, and implement appropriate strategies for managing road traffic and services in Dhaka. It also aimed to assist in the preparation of an urban transport policy and a 20-year strategic transport plan for the Dhaka Metropolitan Area (DMA). The project closed on June 30, 2005. The DUTP included five (5) studies and projects, namely physical improvement projects in urban infrastructure, STP as long term transport strategic plan, and two (2) feasibility studies for Dhaka Eastern Bypass Project and Jatrabari Flyover Project.

In this chapter, recently-implemented urban transport master plan projects, STP and DHUTS are reviewed and important three on-going projects, MRT Line 6, BRT Line3 and Dhaka Elevated Expressway are reviewed also.

### **8.2 Strategic Transport Plan (STP)**

#### **(1) Overall**

Strategic Transport Plan (STP) was prepared in 2004 by Dhaka Transport Coordination Board (DTCCB) under the Ministry of Communication with assistance from the World Bank. The STP laid out a 20-year (long-term) transport plan for the greater Dhaka area and its transport strategy underscored a balance between public transport and private mode of transport and anticipated future demand forecast. The plan is divided into four periods, of 5 years each, beginning in 2005 and ending in 2024.

Urban development scenario in STP was selected "Growth Pole Scenario" with the concept of satellite sub-urban cores. These sub-urban cores would be build up with not only housing but also working space and connected with CBD by UMRTs.

#### **(2) Proposed Projects**

##### **1) Strategic Road Networks Proposals**

STP has suggested a number of important transport components, such as a number of strategic road links, some Expressway, the Mass Rapid Transit (MRT) System and a Circular Water-way for Dhaka. Many of the STP roads were derived from DMDP as indicated earlier. Besides those a number of new arterial roads were also recommended by STP. Table-2.3 contains a list of those roads, which are expected to serve Dhaka City. Many of the STP road links when fully completed will become major arterial road network of Dhaka and facilitate smooth traffic movement along east-west and north-south directions.

##### **2) Mass Rapid Transit (BRT and MRT)**

STP recommended 3 Bus Rapid Transit (BRT) lines and 3 Metro Rail (MRT) lines. Due to shorter lead-in time for design, financing and the construction, it was proposed that the BRT lines move ahead in the early years whilst the Metro system.

### 3) Elevated Expressways

STP recommended 3 - elevated expressways which are as follows:

- a) Gulistan-Jatrabari Flyover: This project was developed and proposed by Dhaka City Corporation (DCC) to be implemented as a PPP project (BOT basis). It will be a 10 km. dual 2-3 lane expressway. The project work is currently in progress and assumed to be completed by mid-2013.
- b) The Elevated Expressway: A 20 km elevated expressway proposed by Roads & Highways Department (RHD), was to be developed in 2-phases. Under Phase-I, Gulistan to Mohakhali portion of the flyover was proposed to be built and in Phase-II, from Mohakhali flyover to the north was proposed to be built. It would be dual 3-lane expressway.
- c) Mogh Bazar-Mouchak Flyover: This is a project being developed by Local Government Engineering Department (LGED) with financing from the Kuwait Fund. STP suggested that this connection be provided at locations, somewhere in the area of Paribagh and Bangla Motors before plans are finalized for project.

### 4) Major Interchange Development Potential

With the development of new mass rapid system, the following intersecting nodes will become viable for major new commercial and residential developments.

- Airport Road / Kamal Attaturk - Intersection of Line 3, 4 & 5.
- Tejgaon - Intersection of Lines 4, 5 & 6.
- Saidabad Bus Terminal - Served by Lines 1, 2, 4 & 6.
- Proposed Projects by phase

### (3) Project Phases

STP recommended phasing of the projects as follows:

#### 1) Phase 1 (2005-2009)

- Design and construction of six road projects primarily to establish the east-west connection and the plan to join the city through the Dhaka by-pass. These 6 projects are: i) MES to Mirpur, ii) Panthapath to Rampura, iii) Tejgaon Airport Tunnel, iv) Merul Badda to Golakandail, v) Tongi to Ghorashal and vi) Malibag to Janapath.
- Planning, design, financing and preparatory work of three expressways in readiness for the implementation of Phase 1 and Phase 2.
- Planning, design and construction of an extensive Traffic Management system to re-capture lost capacity on major routes.
- Preliminary engineering on 12 road projects for inclusion in Phase 2.
- A comprehensive survey and inventory of the existing bus operations.
- Implementation of Traffic Management measure on major routes to incorporate the first BRT lines.
- Production of Design Guidelines for the mass rapid transit systems including both BRT and Metro systems.
- Implementing around 30 km of the BRT line. As suggested these lines are Line 1 from Uttara to Saidabad and Line 2 from Gabtoli to Saidabad.

2) Phase 2 (2010-2014)

- Design and construction of 12 road projects creating a major advance in the city's infrastructure.
- Completion of three major elevated expressway projects following agreements on PPP arrangements and financing.
- Preliminary engineering on 16 road projects scheduled for Phase 3A.
- Continued development of the BRT network and opening of 16km Line 3.
- Final design and financing plans for the first Metro Line – No.5.
- Complete rationalization of regular bus services to complement the mass rapid transit system.

3) Phase 3A (2015-2019)

- Design and construction of 16 road projects aimed at opening up the eastern and western fringe areas.
- Preliminary engineering on 17 road projects scheduled for Phase 3B.
- Final design and financing plans for the second and third Metro Lines – No. 4 and 6.
- Completion of construction on Metro Line No. 5.

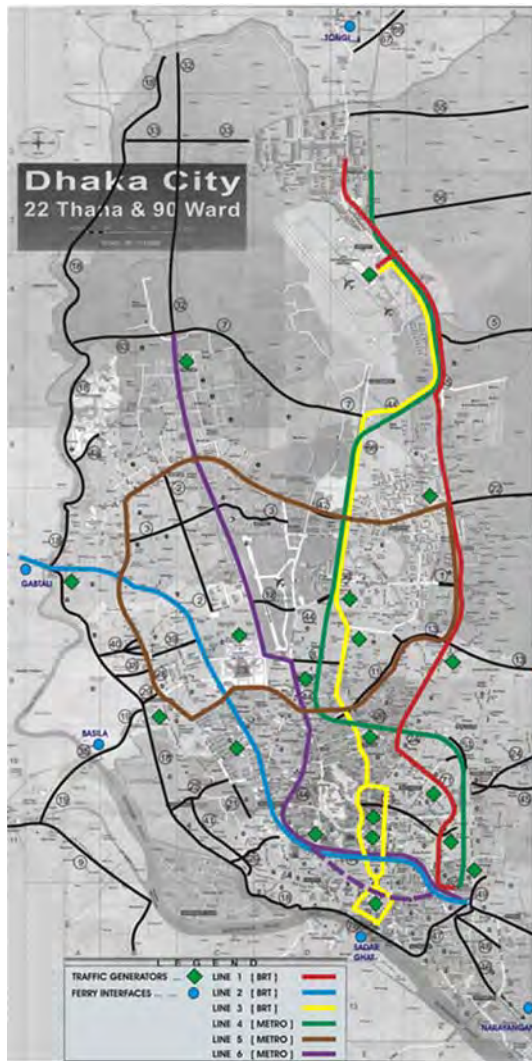
4) Phase 3B (2020-2024)

- Design and construction of 17 road projects aimed at completing the city highway network.
- Completion of the construction for the Metro Lines No. 4 and 6.

(4) Review of STP

Population growth and urbanization of GDA are changed rapidly more than predicted figures of STP. And Growth Pole Scenario which proposed in STP hasn't happened. And more existing Dhaka faced the phase 2 and will move to the next phase, Phase 3A. But only one BRT line and one MRT line are only one BRT line (BRT Line 3) is still in design stage, construction from Gzipure to Hazrat Shahjalal International Airport is expected to start in late 2014, and bus operation will start in mid of 2015. And MRT Line 6 is at the detail design stages and will start operate in 2019. On the other hand, construction of flyovers proposed and un-proposed in STP have been constructed without other transport infrastructures and traffic congestion beyond the flyover is still congested.

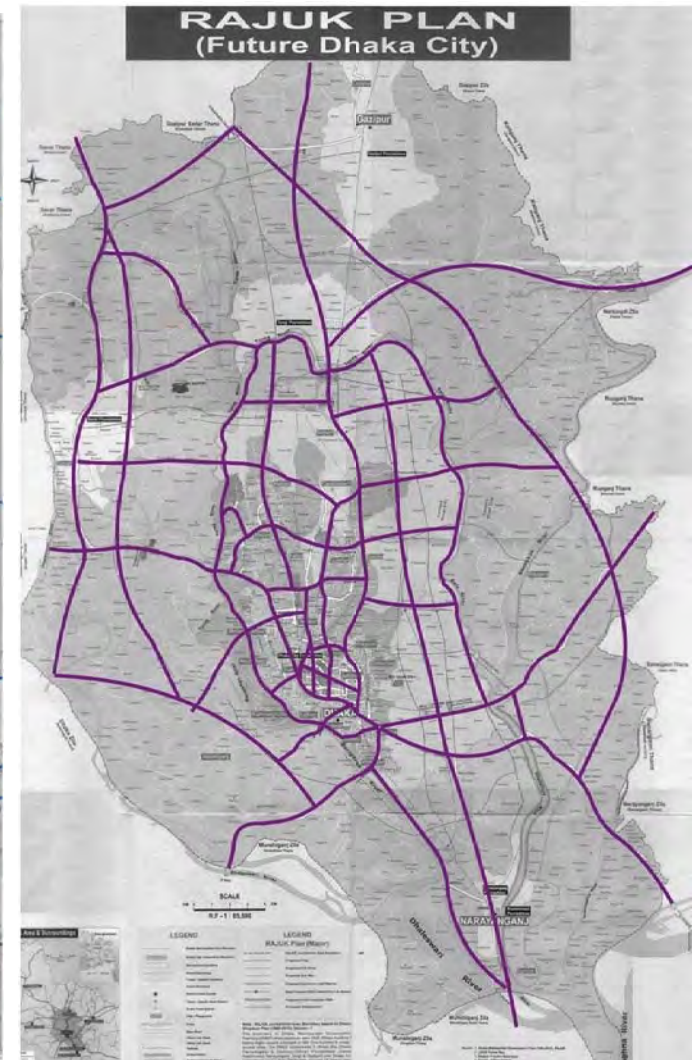
Not only socio-economic environment but also urban transport environment are quite different with supposed environments in STP. So JICA RSTP study team will revise and update the STP based on new environments.



Mass Rapid Transit Network



Roads Package



Highway System

Source: The strategic transport plan for DHAKA

Figure 8.1 Proposed Transport System in STP

### 8.3 Dhaka Urban Transport Network Development Study (DHUTS), 2010

#### (1) Overall

Dhaka Urban Transport Network Development Study (DHUTS) was conducted in 2010 by JICA to formulate the urban transport network in Dhaka up to 2025. DHUTS showed the strategy and implementation plans including the public transportation development plan, the road network development plan, the traffic management plan and the institutional development.

The urban transport development policies of DHUTS are:

- Introduction of mass transit system based on hierarchy of public transport system presently.
- Developing an intermodal public transport system consisting of MRT that is proposed to introduce to Dhaka and bus and para-transit systems requires the efficient integration and interconnection of the different public transport elements.
- Transport cost of public bus is comparatively cheaper than the other modes for low-income peoples.
- Mass rapid transit railway (MRT) system in order to solve traffic congestion in the Central Business District (CBD) need to be developed to promote new urban development to accommodate increasing population and to promote appropriate urban development.

#### (2) Proposed Projects in DHUTS

##### 1) Public Transport Development Plan

The four key policies for public transport development plan were recommended by DHUTS. These included the introduction of mass transit system based on hierarchy of public transport system, building an integrated public transport system, public transport for low income sectors, and a public transport system that promotes urban development. In addition, the Mass Rapid Transit system (MRT) plan was recommended in order to accommodate future population increases. A total of eight MRT lines will be constructed by 2050 according to DHUTS. MRT Line 6 was especially recommended as the most urgent project.

##### 2) Road Network Development Plan

DHUTS showed the road network development plan which included the improvement of existing road networks, improvement of missing links, the development of grid type road networks, provision of urban expressway networks, and improvement of inner ring roads. The recommended road network development plan based on above policies is shown in the figure below.

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

- a) To improve based on hierarchical and functional road network.
- b) To improve the primary road network to link between CBD of Dhaka and urban cores, satellite communities and division centers.
- c) To improve the missing link within the urbanized area in order to prepare efficient road network.
- d) To develop the grid type road network for newly development areas taking into consideration the geographic feature of the Eastern Fringe Area,
- e) To construct the Urban Expressway to make backbone road network in the center of Dhaka.

- f) To improve Inner Ring Road to serve traffic from Dhaka to regional centers in RAJUK area but also in Bangladesh.

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

- a) To develop the road network taking into consideration hierarchy and road functions,
- b) To development as concept of ring and radial road network.

### 3) Traffic Management Plan

The traffic management plan included improvement of bottleneck intersections, improvement of parking systems, improvement of traffic safety facilities, improvement of traffic signal control, introduction of ITS system, traffic safety education and Institutional coordination.

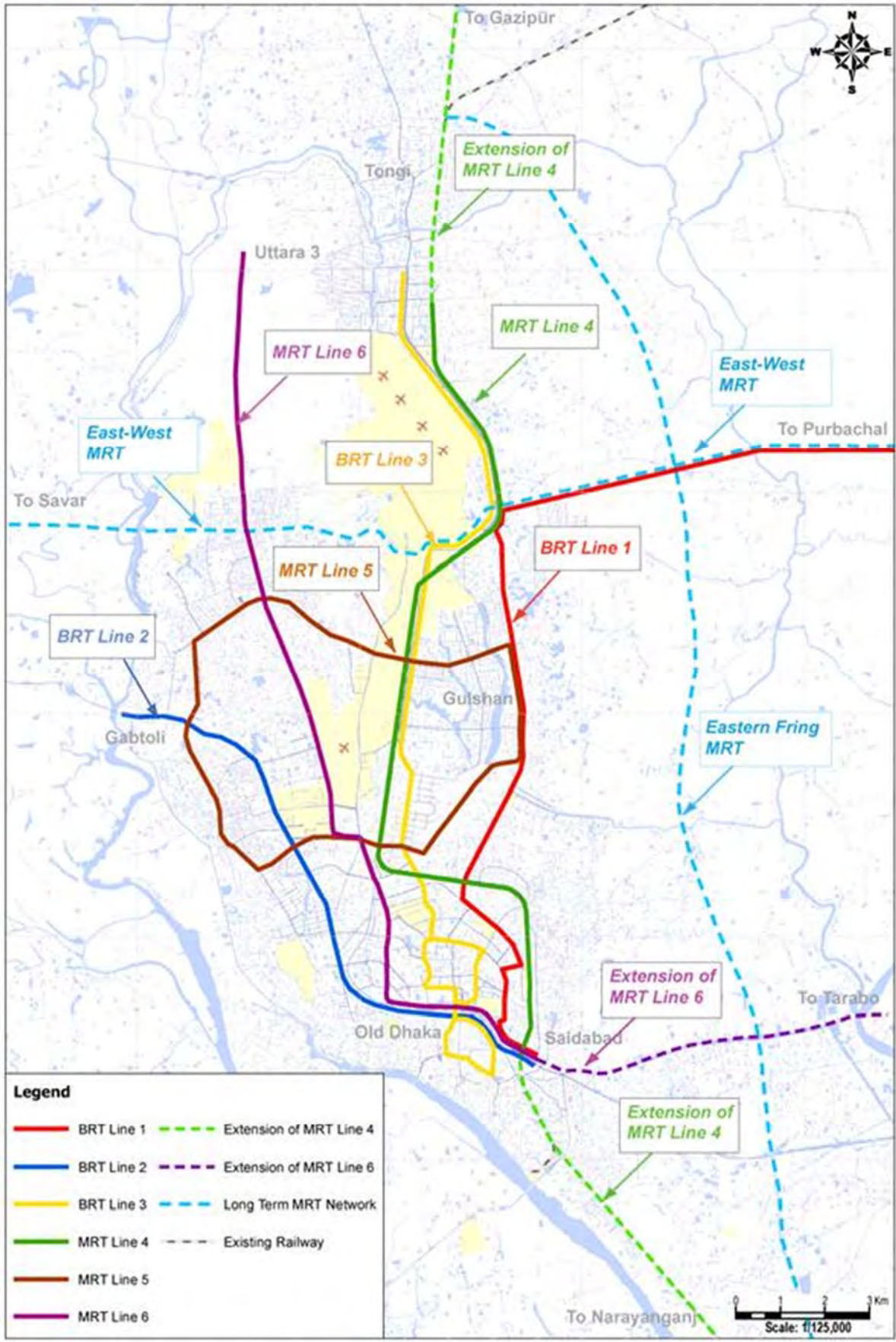
### 4) Institutional Development

DHUTS recommended the establishment of the Dhaka Mass Transit Authority (DMTA). The DMTA is expected to assume the functions of the Dhaka Transport Coordination Board and to determine public transport projects including MRT and BRT systems. The establishment of the MRT operating company (DMTC) was also recommended.

### (3) High Priority Projects proposed in DHUTS

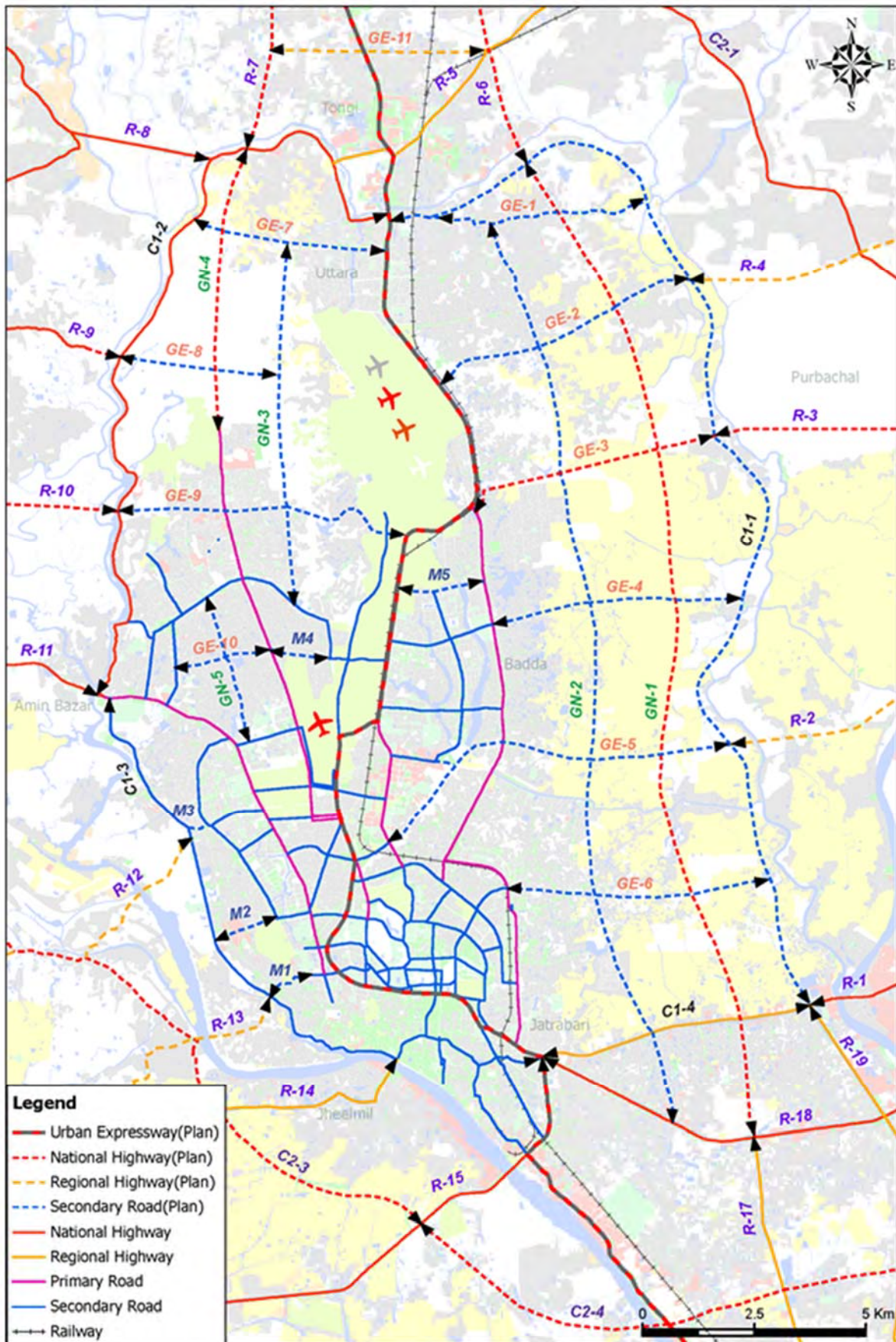
- a) Public Transport Projects
  - MRT Line 6 Project
  - BRT Line 3 Project
- b) Road Projects
  - Eastern fringe road project
  - Southern section of middle ring road
  - Flyover projects
- c) Traffic Management
  - Comprehensive traffic management project
- d) Organizational development for DMTA and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





Source: Dhaka Urban Transport Network Development Study, JICA

**Figure 8.2 Mass Rapid Transit Plan by DHUTS**



Source: Dhaka Urban Transport Network Development Study, JICA

**Figure 8.3 Network Plan by DHUTS**

## 8.4 MRT line 6

### (1) Background

Japan International Cooperation Agency (JICA) conducted the Dhaka Urban Transportation Network Development Study (DHUTS) Phase 1 from March 2009 with the DTCA as its counterpart agency. The study's objectives were to conceptualize basic urban development scenarios for the DMA up to 2025 and to select priority projects that would be integrated into the scenarios. That study recommended the prioritization of constructing an MRT Line 6. As a result, JICA conducted the feasibility study on MRT Line 6 under DHUTS Phase 2. Following this study, the GOB and JICA concluded the loan agreement on the "Dhaka Mass Rapid Transit Development Project" on February 2013 which was the blueprint for the construction of an MRT Line 6.

### (2) Existing Situation

DMTC (Dhaka Mass Transit Company) was established under the Ministry of Road Transport and Bridges as the MRT Company in 2013. And since September 2014, General Consultant has been implementing the design works and preparing tender documents for MRT line 6. And at the same time, Institutional Development Consultant (IDC) for the Dhaka MRT Line 6 has started.

### (3) Schedule

There are eight kind of bid, six packages for civil works and one package for system and one package for locomotive.

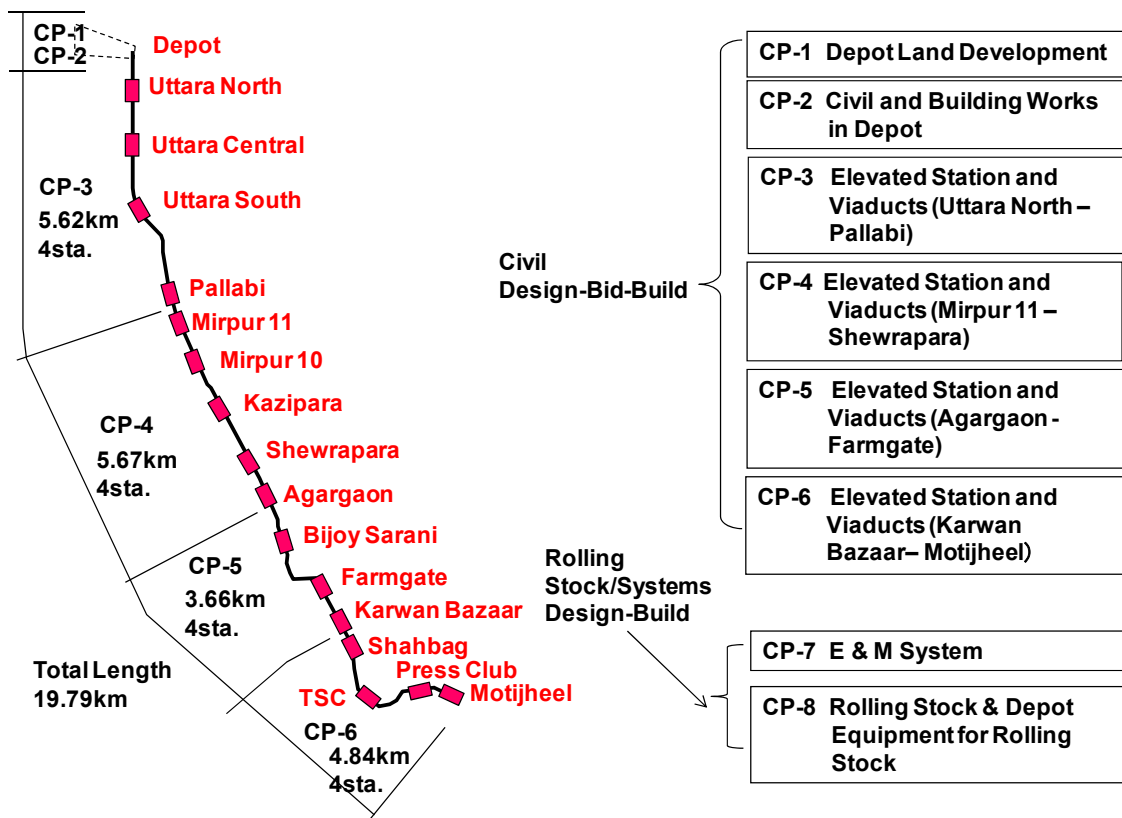


Figure 8.4 MRT Line6 Alignment

DMTC hopes to open the MRT Line 6 immediately. And the project schedule was made tightly to implement the trial operation of MRT Line 6 within 2019. Civil Design Bid, CP-1: Depot Land Development will be start from January 2015.

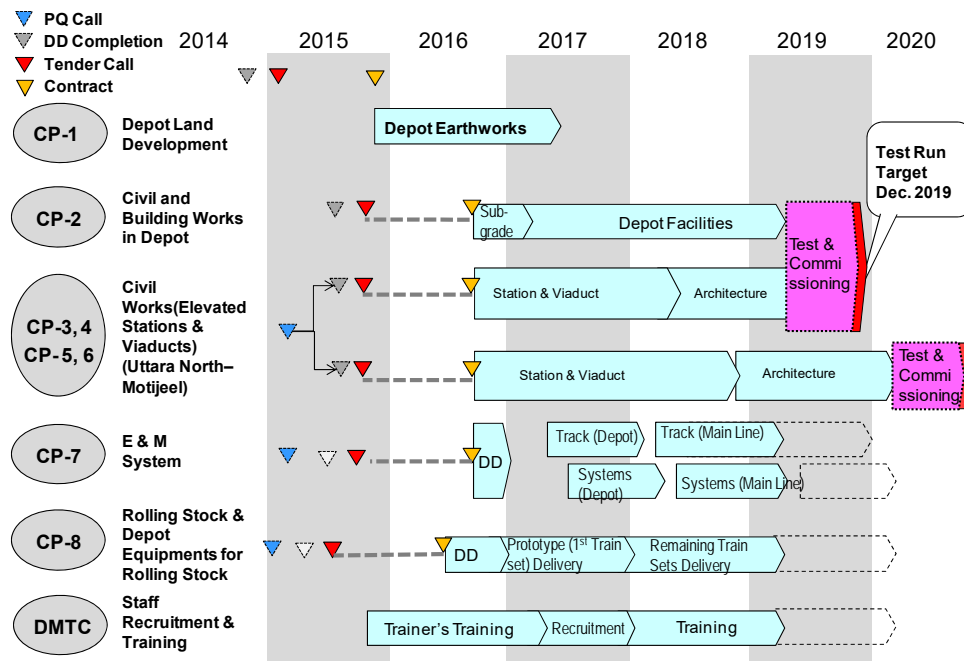


Figure 8.5 Schedule

## 8.5 BRT line 3

### (1) Overall

Dhaka Transport Coordination Authority (DTCA) continues to make satisfactory progress in the implementation of this component. The Bus Rapid Transit (BRT) Feasibility Study has been completed, and the ongoing Detailed Design Study is providing key inputs for the preparation of Dhaka BRT project.

### (2) Demand Estimation in Feasibility Study

In that report, scenarios have been defined combining the future public network and the forecasted mobility by bus for each time horizon. Public network includes the conventional and mass transit network and is built on the road network. They are as follows:

- Current situation
- Scenario 0: public network 2009 and bus mobility matrix 2016
- Scenario 1: public network 2016 and bus mobility matrix 2016
- Scenario 2: public network 2016 and bus mobility matrix 2020
- Scenario 3: public network 2020 and bus mobility matrix 2020
- Scenario 4: public network 2020 and bus mobility matrix 2030
- Scenario 5: public network 2030 and bus mobility matrix 2030

The corridor exploitation has been designed considering that the Northern section of the BRT corridor (Gazipur-Airport) would be already in operational. Therefore, BRT Line 3 busway would stretch from Gazipur to Keraniganj. With these hypotheses, results show that 54% of the demand of BRT Line 3 routes in 2016 travel from/to the Gazipur-Airport section from/to the corridor under study. The percentage of inner trips along the corridor varies over time, from 46% in 2016 to 82% in 2020 and 59% in 2030.

Demand varies slightly per direction, with more passengers in northbound routes (11% to 22% more).

**Table 8.1 Alternate demand capacity estimation**

Scenario	Total Number of Passengers (pax/day)	Passenger Demand per Direction	
		North -South	South - North
Scenario 1	667,966	315,239	352,727
Scenario 2	781,867	368,928	412,939
Scenario 3	1,034,109	479,746	554,362
Scenario 4	1,457,981	667,466	780,516
Scenario 5	1,293,842	581,780	712,062

Source: ALG, BRT and Corridor Restricting Implementation Study and Preliminary Design Work for the Ultra-Mohakahali-Ramna-Sadar Ghat Corridor in Dhaka, 2013

(3) Project Cost

Capital investment cost is estimated around USD 207.7 million, including initial investment cost USD 175m and rolling stock (USD 208m inclusive). The following table recapitulates the initial investment items:

**Table 8.2 Capital investment cost**

Items	Investment
- Civil Works	116,238,616 (67%)
- ITS + Equipment	11,175,813 (6%)
- Project Planning + Design	12,741,443 (7%)
- Resettlement Plan	11,830,165 (7%)
- Land Acquisition	18,532,246 (11%)
- Environmental Management Plan	4,160,000 (2%)
<b>Sub Total</b>	<b>174,678,283 (100%)</b>
- Rolling Stock	32,975,005
<b>Total</b>	<b>207,653,288</b>

Source: ALG, BRT and Corridor Restricting Implementation Study and Preliminary Design Work for the Ultra-Mohakahali-Ramna-Sadar Ghat Corridor in Dhaka, 2013

(4) Greater Dhaka Sustainable Urban Transport Project (BRT Gazipur-Airport)

At government request, the PPTA consultants analyzed 6 main corridors in Greater Dhaka's fringes and recommended a corridor in the northern part of Dhaka's metropolitan area as the one with the best potential to organize urban development and support a mass-transit infrastructure. BRT was then recommended as the best mass-transit mode for the selected corridors, with 20% of its length located within DCC area, and 80% located within Tongi and Gazipur Pourashava Area (TGPA)

To remove the congestion, a dedicated bus lane with adequate number of lanes according to traffic volume will be constructed at the center of the road where high capacity articulated buses will ply. There will be 2+2 elevated section of length 4.5 km along with 8 lanes Tongi Bridge with ramp at Abdullahpur. Besides footpath will also be constructed on the two sides of road for easy movement of pedestrians specially garments workers. All these measures will make mass transportation efficient reducing congestion considerably. Access roads will be developed to remove congestion and efficient traffic flow in the adjacent areas. Adequate parking of private vehicle, taxi, CNG (auto-rickshaw) will be provided in main BRT stations for easy transfer of passengers.

Total Investment Cost will be BDT 20,398.50 million (Note: investment cost is revising presently) and Project Implementation Schedule will be from December 2012 to December 2016 (Note: implementation schedule also revising presently).

## 8.6 Dhaka Elevated Express Way

### (1) Background

Dhaka, capital of Bangladesh is the largest and most densely populated city, with 18 million people. As the population of the city is increasing rapidly, the transport sector needs to expand to meet this rapid growth of the country. The huge number of growth in transport resulting in high levels of traffic congestion and operational difficulties. In order to minimize the acute traffic congestion, Bangladesh Bridge Authority (Government of Bangladesh) intends to deliver a project for the construction of approximately 23 km of Elevated Expressway in the northern part of Dhaka City on a Public Private Partnership (PPP) basis.

The four lane Elevated Expressway will commence at Shahjalal International Airport and run alongside New Airport Road, with the rail alignment through the Mohakhali, Tejgaon and Moghbazar to Kamalapur Railway-station and then the alignment crossing over Jatrabari before connecting to Dhaka Chittagong Highway.

Link: Palashi-Katabon-Hatirpul-Hotel Sonargaon (backside) - Moghbazar Rail Crossing.

### (2) Objective

The purpose of the Expressway is to increase traffic capacity within and around the city by improving connectivity between northern part of Dhaka City with the Central, South and South-Eastern part. In addition to providing a much-needed increase in traffic capacity, the Expressway will be designed to relieve existing overloaded roads. Access and distribution to the Expressway will be designed to avoid adding congestion to existing facilities.

### (3) Project Scope

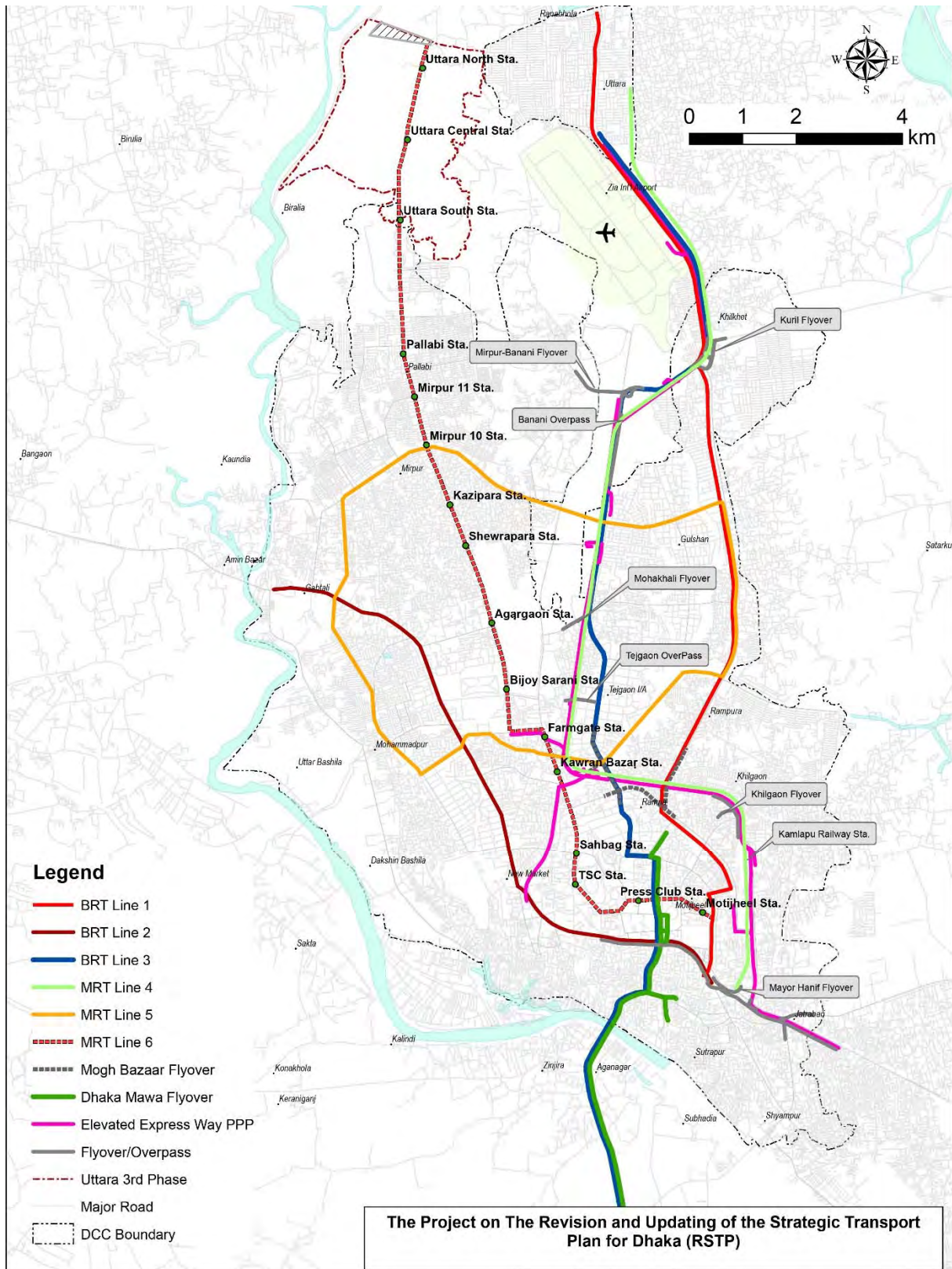
Design, construction, operation and maintenance of the approximately 23 km elevated expressway including construction of culverts, toll plazas, underpass and overpass, lay byes, wayside amenities; installation of computerized toll collection system, providing adequate lights and development of service areas with all required facilities.

### (4) Objectives

The main objectives of the Project is to support implementation of Dhaka Elevated Expressway PPP project on the following components:(a) Land acquisition and resettlement;(b) Relocation of existing utilities (DWASA, DPDC, BTCL, Titas gas etc.) to construct the Dhaka Elevated Expressway from Hazrat Shahjalal International Airport to Kutubkhali of Dhaka-Chittagong Highway.(c) Consultancy for feasibility study, land acquisition, Environment & Social Assessment, Financial modeling, transaction & legal advisory functions.(c) Supervision of Construction activities through Independent Engineer etc.

### (5) Main route

The route of the Dhaka Elevated Expressway shall commence at Shahjalal International Airport and run alongside New Airport Road, along the rail alignment through the Mohakhali, Tejgaon and Moghbazar to Kamalapur rail station and then the Expressway shall pass through Golapbag south of the Kamalapur Stadium, east of Jatrabari and connect to Dhaka-Chittagong Highway near Kutubkhali. Elevated Link 1 Manik Mia Avenue-Holy Cross College-Tejgaon Crossing Elevated Link 2 Palashi-Katabon-Hatirpul-Hotel Sonargaon (backside)-Moghbazar Rail Crossing Project Cost: 8,703 Crore



Source: General consultant of MRT Line 6

**Figure 8.6 Urban Transport Projects**



Source: BRT and Corridor Restructuring Implementation Study and Preliminary Design work for the Uttara – Mohakhali – Ramna – Sadar Ghat Corridor in Dhaka

**Figure 8.7 BRT line 3 Network**



## 8.7 Review of Transport Related Studies

### (1) Master Plan of Bangladesh Railway, 2014

The introduction of the Railway Master Plan contains a brief description of the main activities undertaken leading to a long term Master Plan for the Bangladesh Railway (BR). In order to develop balanced transport infrastructure in Bangladesh, the Government of Bangladesh approved the National Land Transport Policy (NLTP) in April, 2004 and is actively formulating the Integrated Multi-modal Transport Policy (IMTP) as envisaged in the NLTP as well as a revised Poverty Reduction Strategy, MDGs, Sixth Five Year Plan and Vision 2021. Both the NLTP and the IMTP place emphasis on the preparation of long-term plan for each of the transport sub-sector identifying railways as a priority. The NLTP provides different strategic options for railways such as upgrading and expansion of railway infrastructure, achieving higher quality services and operations and establishing international rail links. However, in order to survive as a viable mode, it must significantly improve its efficiency, service quality and establish better connectivity.

Moreover, in November 2004, the Ministry of Planning approved the Revised Terms of Reference (ToR) of Transport Sector Coordination (TSC) Wing of the Physical Infrastructure Division of the Planning Commission. This ToR also emphasised need for the preparation of future Railway Master Plan. To this end, TSC Wing consulted Ministry of Communications (then BR was under the Ministry of communications) and planned for preparation of a 20-year Railway Master Plan with the support of DfID's funded international consultants. Preparation of the plan commenced immediately with the followings:

- increase railway efficiency with interventions to make best use of assets;
- extend railway (infrastructure) to meet policy objectives;
- integrate railway network in a multi-modal approach;
- allow railway to play a greater role in the overall transport sector with a view to contributing to economic and social development;
- prepare railway for playing role in regional and international context;
- establish Broad Gauge throughout the country to bring uniformity in the Gauge System;
- extend its network within the capital city Dhaka by introducing metro system to reduce traffic congestion and
- modernize its loco workshops and training institute with a view to increase its operation and human capacity.

This plan sets out the infrastructure requirements to achieve these goals. The cost estimates for investment presented in this report were developed from a review of available reports, along with BR's own cost estimates. Although the plan does not present Economic Internal Rates of Return (EIRR) for the proposed investments, but provides a comprehensive discussion on the benefits of rail transport to the nation and the value of strategic investment to facilitate freight and passenger movement. In the preparation of this long-term Master Plan, the following activities were undertaken:

- A review and study of previous reports and documents of relevance;
- Comprehensive data collection on passenger and freight movement from Central Railway Building, Bangladesh Railway, Chittagong ;
- The creation of a computer based GIS mapping, and network analysis (trip assignment model) using dynamic segregation model;
- The forecasting of key parameters, and the selection of a preferred scenario for future railway networks;

- The development of transportation strategies to cater to the national and regional traffic demands;
- The formulation of a programme of works for the next 20 years;

Originally preparation of the Master Plan was overseen by a Steering Committee chaired by the Secretary, Ministry of Communications along with the following officials as members: Director General of Bangladesh Railway, Division Chief of Physical Infrastructure Division, Chief/Joint Chief of Ministry of Communications, Chairman of Chittagong Port Authority, Chairman of Mongla Port Authority, Chairman of Land Port Authority, Chairman of BIWTA, Joint Chief of ERD of Ministry of Finance, Joint Chief of Planning Wing of Ministry of Shipping, Additional Chief Engineer (Planning & Maintenance) of RHD and Deputy Chief (Eco) of the Ministry of Communications, who also served as the Member Secretary of the committee.

Lastly, Bangladesh Railway has been separated from the Ministry of Communications and now under the Ministry of Railways. As a result, this Master Plan again was reviewed by a committee headed by the Secretary, Ministry of Railways. The members of this Review Committee are Director General of Bangladesh Railway, all Additional Director Generals and General managers of Bangladesh Railway, Joint Chief of Rail Wing, Planning Commission, Joint Chief of TSC Wing, Planning Commission, Director General of IMED, Joint Secretary of ERD and Deputy Chief of Ministry of Railways. The TSC Wing of the Planning Commission coordinated the preparation of the Railway Master Plan.

## (2) Road Master Plan of RHD, 2010

The Road Master Plan (RMP) has been developed in response to the direction provided by the National Land Transport Policy, which committed the Government to 'develop a long term (20 year) Road Master Plan. The Road Master Plan for Bangladesh is intended to be the guiding document for investment in the road sector over the next twenty years. It has been compiled following a thorough diagnosis of the existing problems of the RHD road network, and the future challenges to be faced.

The recommendations include concrete actions and affordable solutions to adequately address each of the identified problem areas. It was approved by the Ministry of Communication on 2 June 2009.

## (3) Annual Development Programme (ADP) 2012-2013

The principal objective of yearly ADP formulation is to raise standard of living and poverty alleviation of the people. 6th five year Plan (2011-2015) has been prepared to achieve these targets and has prioritized employment generation, nutrition, maternity health, sanitation and safe drinking water, standard education system, law and order, electricity and energy, local governance and monitoring system.

The size of ADP in the year 2012-2013 Fiscal year stands at tk 55,000 (Tk Fifty Five thousand) crore of which 61% is in local currency and 39% project assistance .The amount has been allocated to 17 sectors and different developmental assistance programs. ADP size of 2012-2013 stands at 20%more than that of 2011-12 ADP and 34% more of revised ADP.

1037 projects have been included in 2012-2013 ADP of which 1002 projects have been transferred from revised 2011-2012 ADP while new 35 projects have been added. Out of total projects, 857 projects are of investment program, 128 are of technical assistance and 52 are under JVC.

Physical Planning, water supply and housing is an important sector under ADP which deals with water supply and Drainage of large and small towns, improvement of rural

sanitation system, and improvement of infrastructure in City Corporation areas. The activities will assist to achieve the MDG and Poverty alleviation targets.

126 projects have been included this sector (114 projects under investment, 8 projects under TA and 4 projects under JVC). Total allocation for 2012-2013 stands at tk. 5290.83 crore (Tk. Five thousand Two hundred Ninety Crore and Eighty Three Lakh only) for physical Planning, Water Supply and Housing sector only.

## 9. URBAN DEVELOPMENT CONTEXT

### 9.1 Vision and Key Spatial Development Strategies

#### (1) Vision of Dhaka Structure Plan

##### 1) Vison

The draft report of Dhaka Structure Plan (2016-2035) was published by RAJUK in October 2015. And in that report, “Making Dhaka A Livable, Functional & Resilient Metropolitans Respecting Local Social-Culture Fabric & Environmental Sustainability” was defined as the Vison.

The vision stands upon three pillars – **Livability, Functionality & Resilience**. It also has two conditions– respect towards a. local socio-cultural fabric & b. environmental sustainability. The pillars are forward looking in nature playing the role of driving forces for the plan. The conditions are more of restraining nature, not in limiting sense, but as guiding rails to keep the forward movement in the desired direction. Bringing a simple analogy, if the pillars are the accelerator that gives speed, the conditions are the brakes and steering wheel that guide and control that speed.

Livability here refers to a collection of qualities considered desirable by inhabitants of a locality. It is concerned mainly with the experience from an individual resident’s perspective. Consequently, enhancing livability is supposed to enhance the experience of a resident of living within a community in a positive way. Parameters that come forth while judging livability of an area may include, but not limited to, the following:

- Accessibility to services & facilities
- Affordability (housing, transportation etc.)
- Meaningful employment opportunity
- Safety & security
- Cleanliness & hygiene
- Social equity & justice
- Sense of community
- Availability of quality education & healthy facilities
- Attractiveness & adequacy public places
- Walkability
- Healthy natural environment
- Interesting cultural activities
- Opportunities for public participation

The term **Functionality** is related to the efficiency with which the components of an urban system operate. It sees the settlement from above to get the larger picture. In a way, it is the organizational or city manager’s perspective that is more concerned with large systems and their functioning than an individual’s experience of those systems. The essence of functionality are the effectiveness and efficiency of key systems like:

- Transport
- Drainage
- Social services (health & education)
- Utility/life support systems

- Economy
- Energy
- Natural environment & ecosystem
- Governance

**Resilience** is perceived here as the capability of a community to prevent catastrophic events and also the ability to recover in case the event occurs. It can be compared with the immune system of human body. Regarding the Metropolitan Region, essential components of resilience are, first, to be aware of the disaster risks that threaten everyday life of its inhabitants and, second, to create the capacity to prevent and recover from any disaster that does occur. Thus it incorporates both the preventive and curative aspects. The vision is to make the Metropolitan Region resilient to:

- Natural & anthropogenic hazards
- Economic downturn/depression
- Climate change impacts

The first condition, **respecting local socio-cultural fabric**, mainly points to being aware of and sensitive to the social and cultural background of the community in question. It also means that the usual norms and ways of life of the people have to be acknowledged and considered when judging the appropriateness of any policy decision taken in the plan. The term local here is deemed significant because the Metropolitan Region and its communities are not of uniform in nature. Therefore, the community in question would be the community that is most directly impacted by any particular policy.

The second condition of **respecting environmental sustainability** intends to make sure that while the pillars try to attain certain milestones concerning the human systems, they don't ignore other systems present in the area that together form the greater whole. The essence of this condition is understanding the inherent interdependency of human beings on many natural & ecological processes. It is the realization that disrupting the natural balance of these systems which apparently seem disconnected to the proper functioning of a city or region will ultimately hamper human systems too because of this high level of interdependency, and will eventually be self-defeating.

## **2) Long-term Planning Policy Framework of Dhaka Structure Plan**

In Dhaka Structure Plan, 8 planning policies are defined as follows;

### Promote a Livable City in Dhaka Metropolitan Region (DMR)

- Promote compact urban development and well connected and hierarchical networked city within DMR
- Revitalize the old Dhaka and recast and improve the land use of the underutilized areas of Dhaka Core
- Facilitate thriving economic activities by means of sustainable and inclusive planning
- Establish effective linkages promoting a vibrant regional connectivity in order to foster the development in regional centers;
- Prudently guide the developments in growth management areas within the DMR

### Establish and operationalize zones and centers

- Plan all future developments focusing proposed strategic zones, urban core center, regional centers, sub-regional centers, specialized centers and community centers

- Plan for making urban Centers as attractive place for living
- Plan for options required for establishing well connectivity among inter and intra zones and centers
- Plan for establishing regional viz-a-viz national connectivity with zones and centers

#### Gear-up the economy in DMR

- Create employment opportunities specially for the medium and low income groups
- Plan for lifting up informal economic activities into higher productive level
- Plan and facilitate provision of essential infrastructure and services for the estimated workforce of the priority industrial locations within affordable commuting distance
- Facilitate development of ICT sector in the Dhaka Core area
- Encourage compact and clustered industrial growth
- Plan housing options close to the job locations for major industrial clusters

#### Provide better public facilities and preserve natural environment

- Protect flood plains for reducing flood vulnerability, absorbing heat generated by 'urban heat island', preserving bio-diversity, and providing breathing space
- Plan for loop closing system for integrated water management
- Introduce 3R strategy to minimize waste generation
- Plan for identifying sustainable location for public toilet
- Plan for school zoning concept to reduce travel demand
- Provision of healthcare facilities proportionate to future population

#### Preserve Natural Environment

- Protect places of special uses, open space and heritage value
- Create energy efficient and comprehensive risk sensitive land use planning
- Adequate options in plans to preserve and provide sufficient green areas in and around DMR
- Plan to preserve all possible natural environment in and around DMR
- Plan for reducing the level of environmental pollution
- Introduce effective ETP in all major industrial enterprises

#### Well connected transportation network

- Plan for improved public transport services keeping options for walking and cycling
- Plan for an integrated mass transport system (BRT/MRT) for RAJUK area keeping options for rail, road and water ways
- Plan for ring road and major roads to connect regional centers to increase the mobility
- Locate long term transport networks for passengers and freight movement
- Tackle traffic congestion introducing Advanced Technologies and keep Dhaka Metropolis moving

#### Affordable Housing for City Dwellers

- Plan for housing for city population in accordance with the need of the increasing population

- Locate housing close to work places in a decentralized manner
- Increase housing supply for low and middle income group of people
- Create planned and environmentally sound housing neighborhood

#### Putting the Plan in Practice

- Specify the responsibilities in implementing the plan in effective manner
- Plan for capacity building of concerned agencies/ individuals required for implementing the plan
- Identify mechanism for facilitating effective coordination among the agencies concerned
- Identify a single organization/institution for looking after city development and management

## (2) **Vision of RSTP**

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

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

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

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

Relocating industrial areas in CBD to the suburbs by the developing logistic artery such as the three ring roads and bypass roads in order to reduce industrial waste.

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

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

Reducing environmental strains to coincide urban transport projects, and developing urban transport network such as the three ring roads and public transport system as the transport backbones, in order to reduce CO<sub>2</sub> emissions and promote the development of low-carbon city.

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

Realizing this vision from a viewpoint of urban transport will be done through the following main strategies: Realizing this vision from a viewpoint of urban transport, the following main strategies are essential to make it through.

- Strategy 1: Develop public-transportation-oriented urban areas to ensure people's mobility and to promote an environment-friendly society.
- Strategy 2: Upgrade and revitalize existing built-up areas in the city center and urban fringe areas.
- Strategy 3: Develop modern and competitive new urban centers to attract diversified quality investments that will generate employment opportunities.
- Strategy 4: Develop efficient infrastructure and services to ensure convenient and competitive socio-economic activities and affordable services.
- Strategy 5: Prepare effective disaster prevention measures to protect against natural and man-induced disasters.
- Strategy 6: Strengthen institutions for effective urban management and capacity building.

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

### (3) Key Spatial Development Strategies

Urban development involves a wide range of complex and interactive issues that requires comprehensive study and should be done in an integrated manner. Like in the case of transportation development that closely affects land-use pattern and vice versa. Since land-use pattern and water environment are determinant factors for the quality of living conditions, for this reason, key strategies must be set in such a way that development objectives are addressed and at the same time actions and projects of related subsectors are clearly formulated. Six core strategies were worked out to wit:

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

For large urban areas, like Dhaka, the effective way to meet transportation demand is to provide the city a high-quality public transportation system which should be developed in integration with urban development. The core network will be the mass rapid transit (MRT) and bus rapid transit (BRT) while secondary and feeder services will be by buses of different sizes and types of services. However, establishing a good public transportation system is not an easy task at all, it requires huge amount of funds as well as operation and management capacities over a long period of time. Moreover, fares that can be collected from commuters will hardly pay for the investment cost and if the system is poorly developed, it can only attract limited number of passengers. It is clearly noted based on experiences of successful cities that mass transit networks serve as the backbone of the urban structure and is integrated with urban land use and development.



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

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



Residential areas in Singapore integrated with public transportation development.



Sub-center development at a railway station in Tokyo.

**Figure 9.1 Residential Areas in Singapore and Sub-center Development in Tokyo**

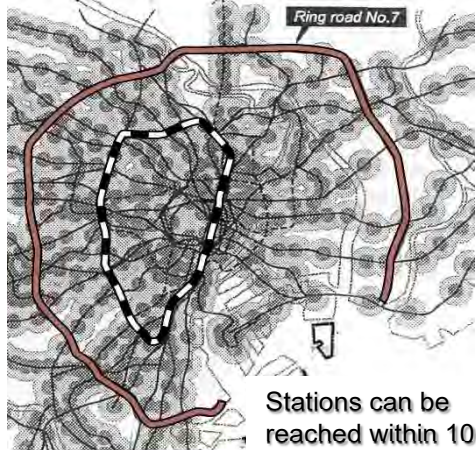
**Box 9.1 Mass Transit Development in Large Urban Areas**

**Tokyo:** Tokyo forms a large metropolitan region with a total of 20 million people and extensive socio-economic activities. Although its urban areas are congested, Tokyo functions efficiently and safely. People can travel on set schedules at reasonable costs and comfort levels largely because of the availability of an extensive metro and urban rail network. The many rail lines that densely cover the city center allow the people to reach a metro station within five to ten minutes walk. In outer areas, the rails are connected to good feeder bus services.

**Singapore:** With a population of 4 million, Singapore is admired for its strategically planned urban development which has taken place since the 1960s. More than 80% of the citizens are housed in new towns which are provided with high-quality amenity and urban services. These new towns are connected to the CBD by a modern metro system and feeder services including bus and AGT.<sup>1)</sup>

**Curitiba, Brazil:** Curitiba is always referred to as the city that has achieved great success in sustainable development based on a unique integration of land-use management and high-quality BRT.

Tokyo Public Transport Network  
(High-density UMRT network in Urban Area)



Curitiba Land-use Plan  
(High-density land use along Busway)



Singapore Conceptual Plan  
(High-density new town development integrated with UMRT and Urban Expressway)

1) Automated guideway transit is a small-capacity transportation system which is computer-operated.

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

Many parts of the existing urban areas suffer from extremely dense living environments with deteriorating buildings and poor urban services. Although in general, the people are satisfied with their current living conditions, it can be foreseen that the situation will eventually turn for the worse and the people will become unhappy as incomes increase and a higher quality of life is demanded. A doable mechanism must be developed to prepare for such possibility.

In the urban fringe, it is a growing concern that the progress of suburbanization may intensify the expansion of unplanned developments which will worsen the living conditions of existing communities. Adequate infrastructures must then be provided well ahead of the progress of such unplanned development.

Dhaka must be provided with alternative and more effective mechanisms that can promote the upgrading of existing urban areas including the following:

- (a) Land Readjustment: Many cities in Japan experienced unplanned developments during their own periods of rapid urbanization. The key intervention was to reorganize the urban structure by adjusting lands, modifying the rights of various stakeholders for the common good, and securing fund sources for infrastructure development (see Box 9.2).
- (b) Urban Renewal: A similar concept can be applied for the improvement of a congested urban areas without relocating the people and relying on government budget.
- (c) Development of Adequate Institutional Framework and Active Involvement of the Community: Clear rules and guidelines should be established to facilitate stakeholder participation, including the affected communities, who will equitably share the roles and shoulder part of the costs of development. The government is currently encountering increasing difficulties in implementing resettlement.

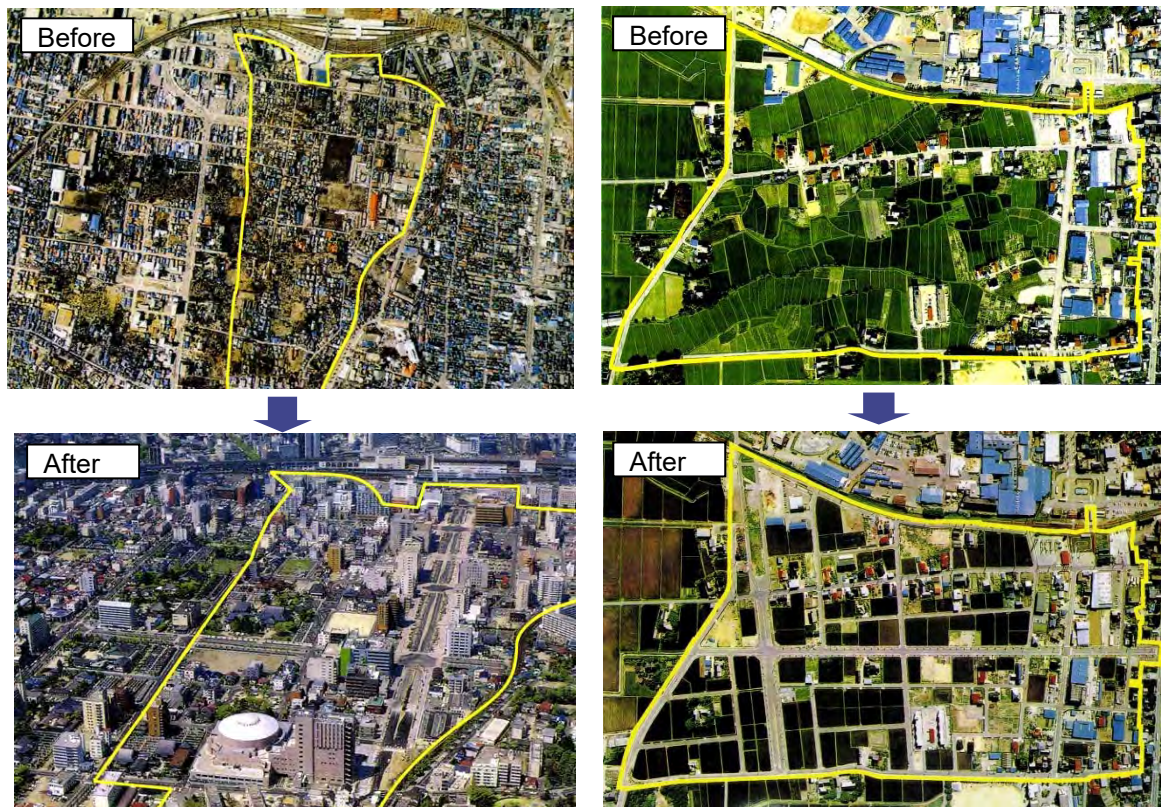
### Box 9.2 Concept of Land Readjustment

**What is land readjustment:** Land re-adjustment is an urban planning method wherein a group of landowners (or those who hold the rights to a land) cooperate in amalgamating their lands and allowing their subdivision in accordance with the urban plan in order to construct the necessary public facilities such as roads, parks, schools, etc. In this process, the resettlement of landowners will be in the same area and not to a different location.

**Why land readjustment:** Land re-adjustment makes it possible to provide lands for infrastructure development and to regulate land use and spatial structure in a comprehensive manner.

**Where can land readjustment be applied:** In Dhaka, land readjustment can be applied both in the urban core and urban fringe. A practical area of application is where roads are planned. Necessary space for roads will be generated in a comprehensive land readjustment project, as was the experience in Japan (see photo below), where no cost for land acquisition was incurred.

#### Japan's Experiences in Area Redevelopment



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

In order for the large city to be competitive and meet the need for diverse socio-economic activities, modern and new urban centers for commercial and business purposes must be developed. This can be achieved by attracting quality investments which will apparently generate employment. Quite numbers of large cities in Asia have developed or continuously developing these types of new CBDs. One of these cities is Dhaka which has started to develop the Uttara Residential Model Town, Purbachal and many others, while similar large-scale developments are taking place in the eastern fringe area in Dhaka. A modified planning concept from residential into a more business or commercial, these areas portrays a better chance of being developed as multi-functional urban centers. Since this type of developments is more attractive to the private sector, the role of the government must be limited to that of a facilitator or a regulator while ensuring that the benefits from the development are equitably shared among stakeholders- the people, developers and the government – and that the public interest expressed in the city plan is always protected.

While the potential role of new urban center is significantly important in developing a strategic and an efficient urban structure for Dhaka, considerations must be given to the following:

- (a) **Mixed Use:** Urban centers should provide adequate space and variety of services for different people and activities. Mixed land uses can make urban centers attractive and effective. Residential use should not dominate but should occupy an adequate portion of urban centers.
- (b) **Clear Role and Identity of Urban Centers:** In order for urban centers to become competitive, their respective roles and identities must be made clear.
- (c) **Appropriate Transportation Access:** Since urban centers generate and attract large traffic demand, both public and private, they must be integrated with mass transit, while ensuring the effective use of cars and motorcycles.

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

Infrastructure is the most fundamental factor that determines the efficiency and quality of urban activities. It also shapes how public funds are spent. An inferior and inadequate road network results to a worsen traffic congestion, an increase vehicle operating costs and waste of time for road users. Moreover, an incompetent traffic management reduces the efficiency of given facilities as well as traffic safety levels. While poor performance of infrastructure services including transportation, power, water supply, drainage, sanitation, etc. lowers the quality of services and will eventually add to the over-all service costs. All these inefficiencies become a burden to the city authorities as well as to the people in general.

Infrastructure development in urban areas must be planned and implemented in an integrated manner. Road development without consideration to surrounding land uses will neither contribute to an effective development of urban areas nor protect life. Unsynchronized development of utilities will cause repetitive road diggings such as inadequate collection which may reduce efficiency of drainage system and degrade sanitary conditions.

Since infrastructure development requires a large amount of public funding and is critical to sustain urban development, socio-economic activities, and living conditions, due consideration must be given to the following:

- (a) Coordinated Development: Infrastructure development aims to promote the quality of socio-economic activities and living conditions. This type of infrastructure must be planned and implemented in a much more coordinated manner.
- (b) Effective Operation and Maintenance: Inefficiency in operation and management of infrastructure will not only spoil socio-economic activities but also increase the cost of services, thereby increasing the burden on government and users.
- (c) Private Sector Participation: In order to ensure the sustainability of infrastructure development and services, the private sector including providers and users, must fully participate in the development process and operation. This will also encourage efficiency and the provision of quality services

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

Dhaka is situated in an area that is vulnerable to various hazards such as flooding, inundation, land subsidence, river erosion, earthquake, etc. History would show that the city has in fact already suffered from a number of disasters. Densely inhabited urban areas with limited or narrow roads and no open spaces are at risk from fires that can ravage the whole areas in an instant. In such situations, response to emergencies and relief activities would also be greatly hampered. Therefore, existing urban areas must be upgraded, while future development must avoid such pitfalls to guarantee the protection of life and property.

In order to promote disaster-free urban areas and ensure safety and security of life and property as well as efficient socio-economic activities, Dhaka must consider the following:

- (a) Realization of Flood-free Urban Areas: There are many negative effects due to flooding. In addition to the many negative effects due to flooding such as direct damage to life, health and property, this also creates traffic congestions, damage infrastructure and downgrade the image of the city.
- (b) Disaster Preparedness and Rescue: The current structure of existing urban areas makes it difficult to provide necessary rescue operation in case of fires and emergencies. There is a need to reorganize the urban areas in this aspect.
- (c) Earthquake Preparedness: Dhaka's urban areas are not free from the threat of earthquakes. There is a need for a long-term strategy to reorganize the urban structure in a way that the central function of the city will not be directly compromised in the event of earthquakes.

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

Managing large urban areas is quite difficult as challenges are so complex and interdependent that no solution can be done from one discipline alone. It is thereby required to have a wide-range, integrated and location-specific solutions which can profoundly test a city's technical and financial capacities. On the other hand, a city that is properly managed can bring immense benefits that can be enjoyed by all stakeholders. To ensure that this happens to Dhaka, the following key areas must be carefully looked into:

- (a) Development of alternative implementation methods to carry out urban development (e.g. land readjustment, urban renewal, etc.).
- (b) Encouragement of public-private partnerships.
- (c) Involvement of stakeholders in the development process.
- (d) Provision of open and business-friendly environment.
- (e) Enhancement of planning and administrative capacities for urban management.

## **9.2 Urban Development Scenario**

### **(1) Introduction**

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

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

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

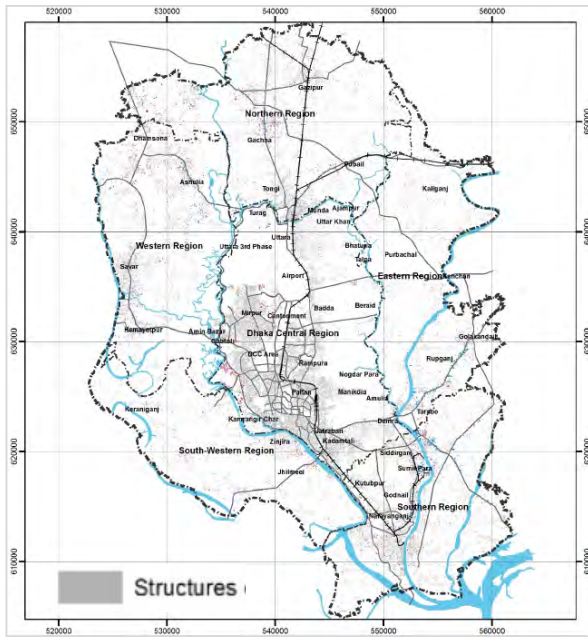
### **(2) Current Urban Development Characteristics and Trends**

#### **1) Overall Urban Development Direction**

The urban development direction of RAJUK area and Dhaka City is highly affected by their physical location, particularly their topography. There are several rivers, swampland, and depressions within RAJUK area that limits its urban expansion. Urbanization initially occurs in elevated areas that are not affected by flooding. This is where Dhaka City was established. When all elevated areas within and around Dhaka City have been developed, the urban development has shifted to low-lying areas, vegetated areas and wetlands.

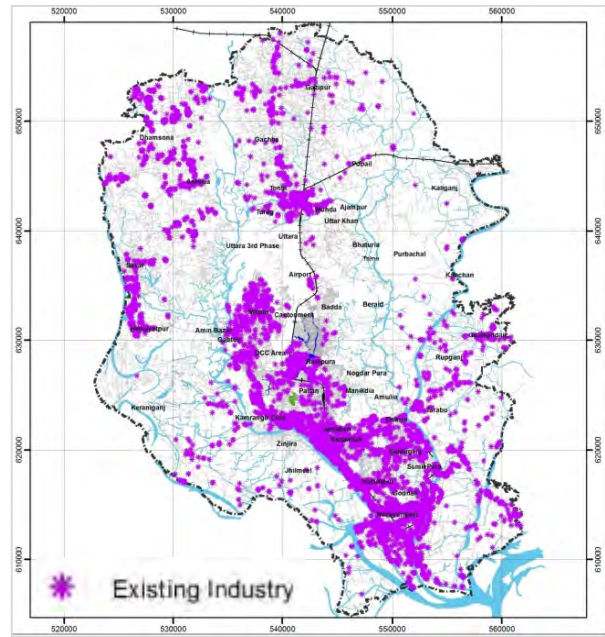
In the year 1970's, the direction of urban expansion was northward and in lowlands, where the dominant type of land used were the cultivated areas and water bodies. As urbanization progress, many water bodies, depressions and cultivated land were developed. This phenomenon can be seen mostly in Dhaka City. In late 1970's to early 1990's, the urban expansion was extended further to the north, north-west and west part as an outcome of the construction of bridges over rivers. After the year 2000, more vegetated areas, wetlands, and lowland areas were converted to urban use. The construction of bridge over the Buriganga River also accelerated urban expansion in the south areas.

Although the urbanization has expanded to all directions, the development pattern of RAJUK remained highly monocentric, with Dhaka City still as the center (see Figure 9.2 and Figure 9.3). The previous plans, such as the DMDP Structure Plan in 1995-2015, and the Strategic Transport Plan of Dhaka recommended the decentralization or multi polarization of urban functions; but the situation had not changed. Though RAJUK has several satellite town developments in different areas, still they are under developed and remained in the conceptual stage.



Source: Survey Report on Preparation of Regional Development Planning for RAJUK under CRDP

**Figure 9.2 Structural Distribution in RAJUK (2014)**



Source: Survey Report on Preparation of Regional Development Planning for RAJUK under CRDP

**Figure 9.3 Industrial Distribution in RAJUK (2014)**

## 2) Housing Development

There are several ongoing and planned housing projects by RAJUK and other private developers. However, the capability to provide housing units is much lesser than the requirement due to the rapid increase of the population. As a result, there is a significant housing backlog every year that affects particularly the low-income households. RAJUK has some housing projects but they have limited resources. Meanwhile, private developers usually aim the middle to high-income households. Therefore, low-income households are forced to live in temporary structures or in slum.

### Public Housing Development Projects (RAJUK)

The development of RAJUK reflects the government policies in the sense that, it is a national government agency that is empowered to control urban development, and to provide the urban master plan. The development especially in Purbachal new town, which is the largest town development in Bangladesh, is influencing the regional urbanization trend. Table 9.1 shows the current status of RAJUK development projects.



**Table 9.1 Ongoing and Planned Housing Development Projects by RAJUK (As of 2014)**

Project Name	Area (ha)	Planned Population	Planned Population Density (person/ha)	Target Year of Completion	Status
Purbachal	2,489	1,000,000	400	2015	Ongoing
Uttara 3 <sup>rd</sup> Phase	813	600,000	734	Dec. 2014	Ongoing
Jhilmil Residential	154	133,000	860	Around 2020	Ongoing
Apartment Project in Kamrangirchar	-	-	-	-	Under F/S
Savar Satellite Town	906	-	-	-	Planned
Gazipur Satellite Town	1,749	-	-	-	Planned
Kamrangirchar P. S.	-	-	-	-	Planned
East Baridhara	About 809	-	-	-	Planned

Source: RAJUK

### Private Housing Development Projects

Private developers in the housing market of Dhaka play a very vital role due to the demand of the rapid increase in population. As of the year 2014, 77 housing projects by private developers were officially approved. However, the recent economic situation restrained the smooth implementations of the said projects; there are only 18 projects that were implemented (see Table 9.2). Most of these projects are located in the fringe areas of Dhaka's urban area and along the major roads. These private housing developments have resulted in urban sprawl.

Aside from the 18 ongoing projects, the implementation of the 59 approved housing projects was postponed due to the recent economic conditions. If these projects will be implemented at the same scale of the ongoing projects, the total land area of private housing projects will reach to 5,000ha. In addition to that, there are small projects with areas less than 4 acres each, which do not require official approval.

**Table 9.2 Ongoing Private Housing Projects in 2014**

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

Source: RAJUK

Slums and Squatter Areas

Most of the informal settlements inside and around Dhaka City are situated on vacant government land and wetlands. These informal settlements comprises single-story make shift houses. The houses in slums and squatters areas have a very low quality, extremely small floor spaces and very densely located on flood-prone areas.

In the early 1960’s, some areas of the city were zoned as low income- areas, but some of these were gradually transformed into a middle income areas or were mixed with the middle-income group areas. Due to the increasing prices of land and housing/apartment costs in Dhaka City, the lower-income groups have been forced to live in the outskirts of the metropolitan area.

**(3) Regional Development Plan’s Urban Development Orientation**

In the year 2015, the existing Structure Plan expired. Hence, a Regional Development Plan (RDP) was undertaken in order to prepare a new Structure Plan for RAJUK area from 2016-2035. As of July 2014, the Interim Report was already submitted which reviewed related plans, programs and policies; formulated strategic land use zones as well as the vision and objective of the Structure Plan 2016-2035; identified urban management strategy; and identified sector issues which the revised Structure Plan would address. In this report, the vision and objectives of the Dhaka Structure Plan 2016-2035 are stated as shown below.

**Table 9.3 Vision and Objectives of Regional Development Planning**

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

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

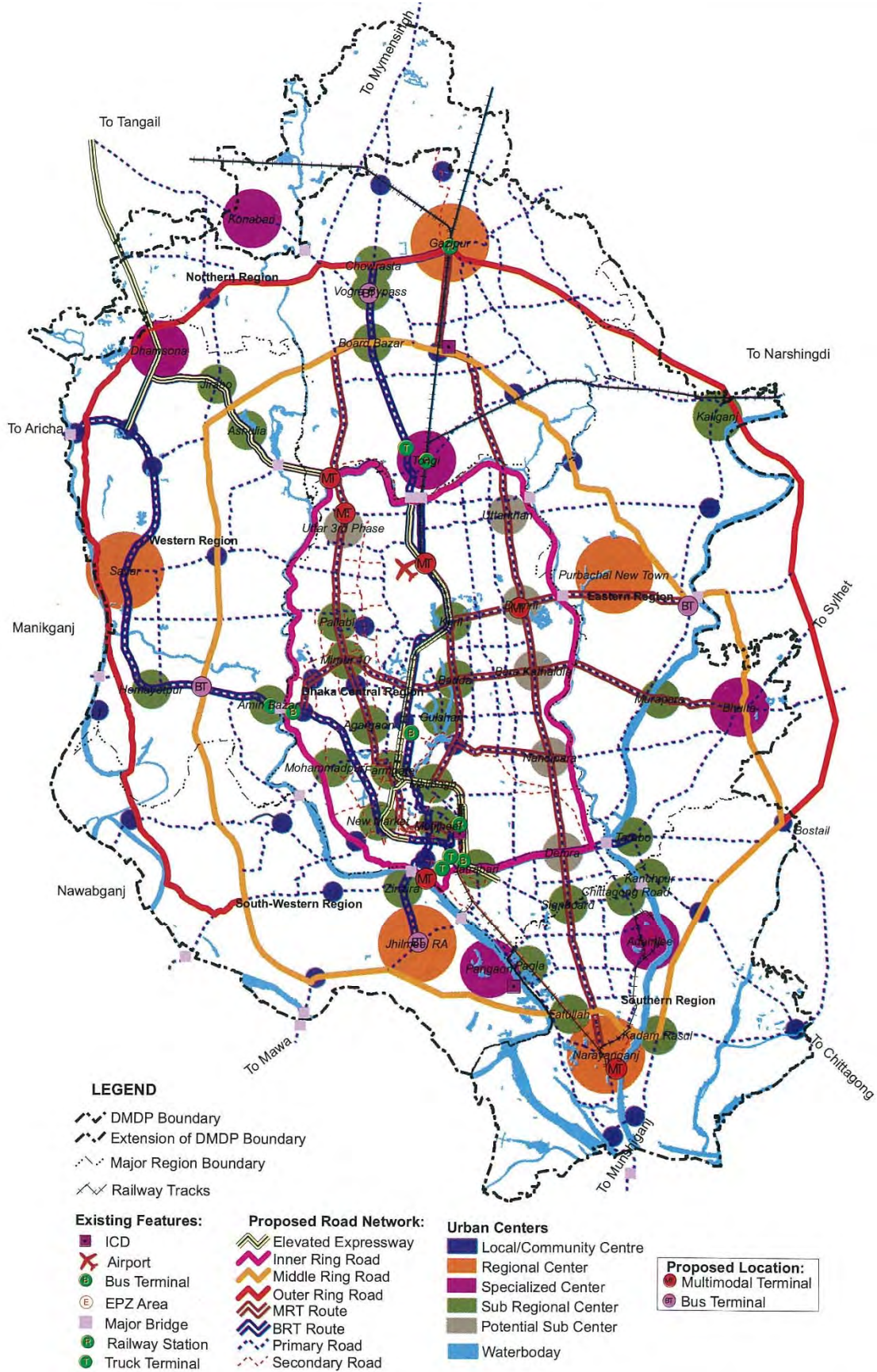
As the above objectives imply, the main theme of the spatial structure is to promote local decentralization. The decentralization of urban functions and services can release the pressure currently experienced by the city. Moreover, the required urban services will be provided nearer to living spaces.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

The proposed urban hierarchy is shown in Table 9.4 and Figure 9.4.

**Table 9.4 Urban Hierarchy in Regional Development Planning**

Hierarchy	Function/Feature	Location/Area
Core	<ul style="list-style-type: none"> <li>- Central focal point for the entire planning area</li> <li>- High density, varied range of housing, sophisticated, high skill and highly paid knowledge-based jobs, full range of business and professional services, historic and landmark public spaces and sites and a destination for national and international art, culture and entertainment</li> </ul>	Dhaka City Corporation area
Regional Centre	<ul style="list-style-type: none"> <li>- Function as the capital of each region</li> <li>- The focal point of regional development and generally an urban administrative headquarters</li> <li>- Provide full range of services. Wide range of economic activity and employment</li> </ul>	Other City Corporation Major Pouroshava
Sub-regional/ Major Centre	<ul style="list-style-type: none"> <li>- Major business and shopping centre for its sub-region</li> <li>- Supporting local employment</li> <li>- Providing goods and services of wide range to meet the local demand</li> </ul>	DCC Wards Union Headquarters
Specialized Centre	<ul style="list-style-type: none"> <li>- Centre of economic activities and major employment</li> </ul>	Important employment destination such as Dhamsona, Tongi, etc.
Local Centre	<ul style="list-style-type: none"> <li>- Cluster of activities serving local needs</li> <li>- Supporting convenience of residents</li> </ul>	City Corporation Wards Neighbourhoods Para/Mahallah

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



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

**Figure 9.4 Conceptual Structure Plan for RDP Area (2016 - 2035)**

#### (4) Assessment of Alternative Urban Growth Scenarios

##### 1) Alternative Urban Growth Scenarios

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

- i. **Trend Scenario:** This scenario shows a future urban development situation where in the current trend of urbanization and population continues without significant intervention to the growth of urban areas. Urbanization will progress along arterial roads and in areas adjacent to existing urbanized areas. The future population of RAJUK area will reach to 32.5 million or 203 persons/ha in terms of population density.
- ii. **RDP Scenario:** This scenario refers to the future land use and population framework indicated in the RDP. Aiming for a polycentric urban structure, the population will be dispersed into suburban areas. The future population of RAJUK area will reach to 24.5 million or 153 persons/ha.
- iii. **RSTP Scenario:** This scenario is the combination of the Trend Scenario and the RDP Scenario, new suburban areas will be developed comprising housing, business, and shopping areas. Thus, residential areas and workplaces will be put in closer proximity to each other. This concept can contribute to reduce traffic congestion. Selected growth corridors will be developed to connect the CBD and suburban areas. The future population of RAJUK area will reach 25.4 million or 159 persons/ha.

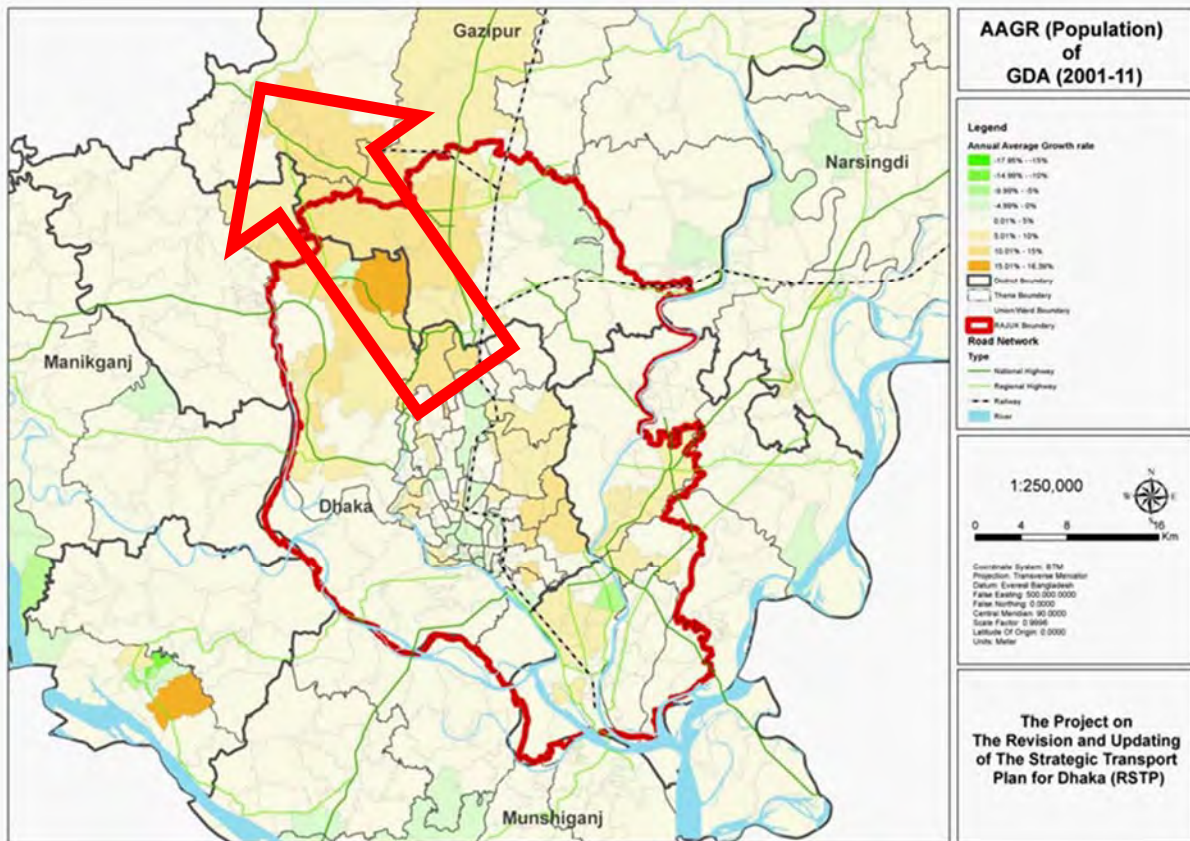
##### 2) Trend Scenario

In estimating the future population and urban development pattern under the Trend Scenario, the following assumptions were made:

- i. There would be average increase and decrease in population rates between 1991–2001 and 2001–2011;
- ii. Urban infrastructure would be provided to support the above growth; and
- iii. No strategic intervention to urban and transportation development would be implemented.

Under this scenario, the future population of RAJUK was estimated to be about 32.5 million. Population would increase toward the north and the west along Dhaka–Mymensingh Road and Dhaka Aricha Highway in an unplanned manner, while the growth in Dhaka City would slow down to less than 2%/year. The fastest population growth would be in the Western Region, which will also account for the highest population density at 417 persons/ha in 2030.

The main concern in this scenario would be the continuous congestion in the existing city center and the spawning of new crowded urban areas in the Northern and Western Regions as a result of urban sprawl toward less populated areas. Without an appropriate urban development direction, the situation of Dhaka City would worsen, and the disparity between Dhaka City and other areas would widen.



Source: JICA Study Team

**Figure 9.5 Trend Scenario**

**Table 9.5 Population Growth under Trend Scenario**

Region	Area (ha)	Population (000)				Density (person/ha)				Population Growth (%/year)		
		2011 (actual)	2015	2025	2035	2011	2015	2025	2035	11-15	15-25	25-35
Central	30,700	8,841	9,401	9,223	5,422	288	306	300	177	1.55	-0.19	-5.17
Northern	36,300	1,626	2,395	6,228	25,891	45	66	172	713	10.17	10.03	15.31
Eastern	23,800	611	684	820	934	26	29	34	39	2.89	1.83	1.30
Southern	27,800	1,965	2,268	2,908	3,586	71	82	105	129	3.64	2.52	2.12
South Western	16,600	794	919	1,230	1,919	48	55	74	116	3.72	2.95	4.55
Western	24,600	1,286	2,173	6,816	18,407	52	88	277	748	14.01	12.11	10.45
Total	159,800	15,123	17,840	27,226	56,159	95	112	170	351	4.22	4.32	7.51

Source: JICA Study Team

### 3) RDP Scenario

Under the RDP Scenario, the future population was projected based on a medium growth rate which was considered as the desired case. As a result, the future population of RAJUK would reach to more than 24.5 million by 2030 and population density with 153 persons/ha. By that time, the population density of Central Region would be 408 persons/ha, although this area is already highly crowded even at present. The urban

development direction will be promoted continuously in the Central Region and expanded towards the Northern and Western Regions.

The direction of the development under the RDP Scenario follows the concept laid out by the previous plans and studies, such as the Strategic Transport Plan for Dhaka (STP), and the Preparatory Survey Report on Dhaka Urban Transport Network Development Study in Bangladesh (DHUTS). However, other concerns under this scenario are as follows:

- i. Unclear regional functions in RAJUK area: It is clear that the RDP Scenario aims to promote decentralization and to develop multiple urban centers within the regions or communities and make services more accessible to people. However, the function of each region in RAJUK was not mentioned (e.g., the Central Region will function as the administrative center, etc.).
- ii. Lack of relocation sites for public facilities: The RDP Scenario mentioned the importance of relocating or locating workplaces in areas close to residential areas. However, the concentration of government offices and education facilities in Dhaka City is one of the significant causes of traffic congestion in the city. This needs to be solved by relocating these facilities farther, away from residential areas.
- iii. No proposal on new industrial zones: Presently, the industrial estates concentrate on Dhaka and Narayanganj which is not the ideal situation. In accordance with the urbanization, Dhaka should be the commercial and services center. Hence, relocating the industrial estates to suburban areas is inevitable.
- iv. No plan for utilizing the old airport land: Many studies and research papers mentioned that the old airport is the traffic bottleneck in Dhaka. Furthermore, this area has very high value from the viewpoint of urban development. Some interventions should be included in the plan.

**Table 9.6 Population Growth under RDP Scenario**

Region	Area (ha)	Population (000)				Density (person/ha)				Population Growth (%/year)		
		2011 (actual)	2015	2025	2035	2011	2015	2025	2035	11-15	15-25	25-35
Central	30,700	8,841	9,805	11,754	13,052	288	319	383	425	2.62	1.83	1.05
Northern	36,300	1,626	2,086	3,375	4,843	45	57	93	133	6.43	4.93	3.68
Eastern	23,800	611	669	799	913	26	28	34	38	2.32	1.79	1.34
Southern	27,800	1,965	2,231	2,827	3,224	71	80	102	116	3.22	2.39	1.33
South Western	16,600	794	878	1,088	1,283	48	53	66	77	2.54	2.16	1.66
Western	24,600	1,286	1,639	2,488	2,990	52	67	101	122	6.26	4.26	1.86
Total	159,800	15,123	17,309	22,331	26,306	95	108	140	165	3.43	2.58	1.65

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

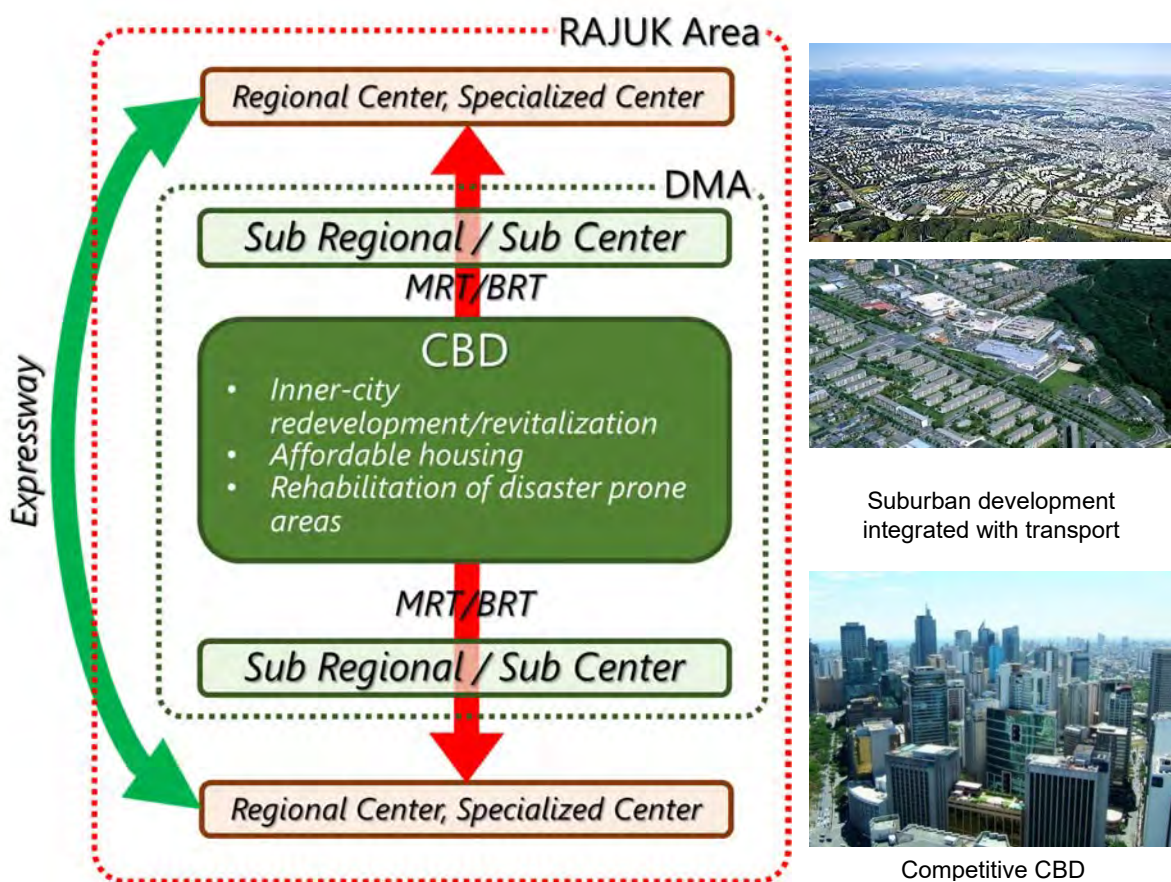
#### 4) RSTP Scenario

##### Development Concept

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

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

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



Source: JICA Study Team

**Figure 9.6 Proposed Spatial and Transport Framework for RAJUK Area**

Proposed Spatial Structure

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

- i **DCC Area (Urban Core):** As the capital of Bangladesh, the DCC area functions as the administrative and economic center which focuses on the service sector.



Commercial and business activities can be dispersed in the old and new central business districts (CBDs) such as Motijheel, Tejgaon, Gulshan, and Cantonment. It is expected that Tejgaon Airport would be converted to urban use.

- ii **Purbachal (Regional Centre):** This will be developed as a new town which can provide the residential and work spaces, as well as basic public services. Providing workplaces within the new town will show a new concept of urban development.
- iii **Gazipur (Regional Centre):** This will be the regional center in the northern region, providing social and economic services. This will also be the gateway to north Bangladesh.
- iv **Savar (Regional Centre):** This will be the regional center in the western region, since several universities, training centers, and research institutes are located in this area, Savar can be the educational center of RAJUK and Bangladesh. The accumulation of R&D centers here can also attract high-tech industries including IT parks. This area is one of the candidate relocation sites for tertiary education facilities currently located in the DCC area;
- v **Jhilmill (Regional Centre):** This will be a bedroom community for people commuting to DCC area. Its larger residential areas can provide better living environment. Mass transit service will ease the commute from Jhilmill to DCC area; and,
- vi **Narayanganj (Regional Centre):** This will be the regional center in the southern region, considering the strategic location of Narayanganj in terms of logistics and the significant number of industrial establishments, Narayanganj will be an industrial center of RAJUK.

Together with the major urban centers, the following corridors were identified as growth corridors with high development potentials, considering current urbanization trends and land conditions. Improvement of connectivity among main urban centers will accelerate the multiplication of urban functions in RAJUK.

- a. East–West Corridor (Purbachal–Savar)
- b. North–South Corridor (Gazipur–Narayanganj)
- c. North–South Corridor (Gazipur–Jhilmil)
- d. Ring Corridor

## 5) Recommended Scenario

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

- i. Population in inner core of Dhaka will decrease by decentralization;
- ii. The decreased population of the inner core will be distributed in the eastern fringe and suburban areas along the selected growth corridors. For the distribution in suburban areas, new urban core areas will be emphasized which will become satellite towns and sub-CBDs of the metropolis;
- iii. Industrial facilities in Dhaka's inner city will be relocated to suburban areas (e.g., Narayanganj and Tongi), considering the government relocation policy and urban redevelopment movements;

- iv. The western part of RAJUK will become the educational center and will be expected to generate new types of industry such as IT industry; and
- v. The trend of population growth in North-west area of RAJUK will be reflected.

## **(5) Urban Development Potentials in RAJUK Area**

### **1) Methodologies**

The Grid analysis is a method used to analyse different geographical information relating to the designated area by grids based on the location defined by longitude and latitude. It provides easier comparison quantitatively and historically. In addition to this, it allows to calculate the scored values inside the grids. The values can be obtained not only from statistics but also from the locations and areas of geographical characteristics, natural environment, roads and railways, public facilities, cultural heritages and so on. This analysis method is applied to the process of preparation of a spatial plan and a disaster management plan by the government. Thus, this report uses this method for estimation of the future population. The size of each grid is 250m and has an area of 6.25ha. Different geographical information is added to the grids coming from the existing GIS databases which have been developed by JICA, RAJUK, etc.

### **2) Urban Development Potentials**

A transport system in metropolitan area should be planned based on urban development trend and population activities. A thorough examination of urban development scenario and future urbanized area is essential to define the framework of transport planning; this is called as “Urban Development Potential Analysis”.

This analysis applies a grid system of 250m each for data compilation and scoring by level.

Urban development potential consist various factors, however, those factors can be classified into two according to the effects to urban development as “Negative” or “Positive”.

Generally, the development of urban area is spread according to the increasing economic activities of the existing developed areas in CBD to peripheral area. Without any control factors, such areas continues to be developed as sprawled areas. One of the controlling factors of urban development is geographical or natural condition such as rivers, slopes, forests, and so on. Another controlling factor is the control of human activities by administrative and institutional methods. Therefore, these two factors are considered as “Negative Elements” in this analysis.

On the other hand, the existing developed areas have been developed by various factors. Those factors which define urban development are assessed as “Positive Elements”.

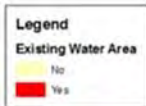
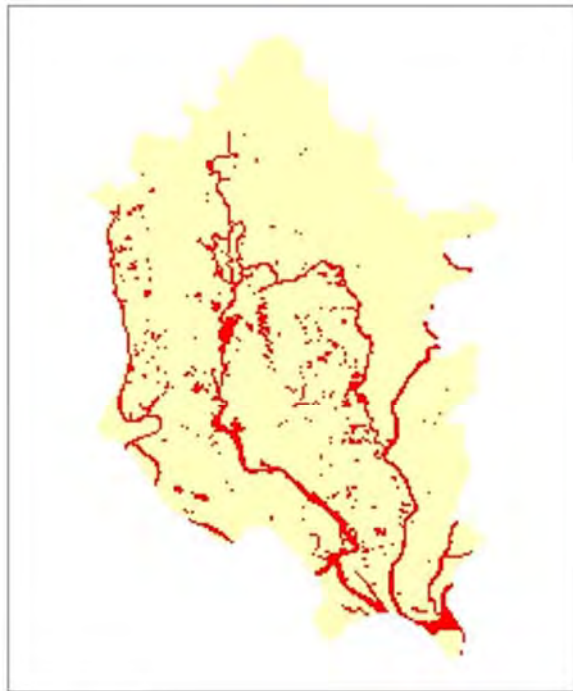
Finally, overall urban development potential will be calculated based on the following formula.

“Overall Urban Development Potential” = “Positive Elements” – “Negative Elements”

#### Negative Elements

The negative element for urban development is identified by the following factors.

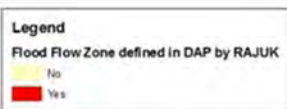
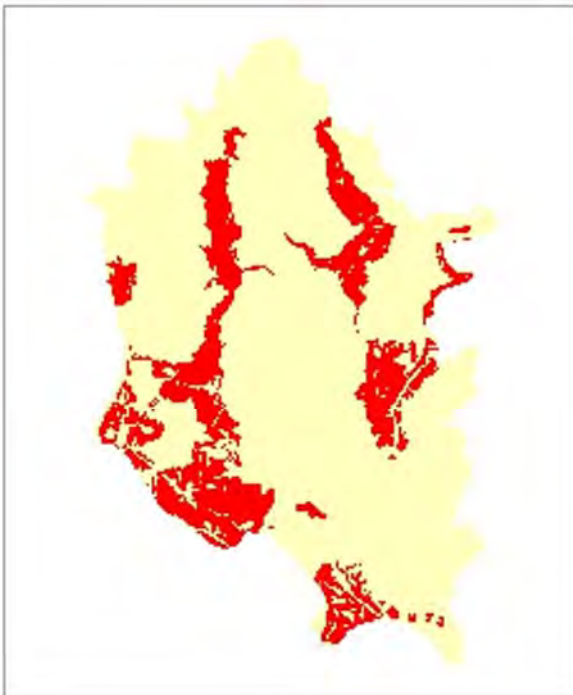
- A. Water body in the existing land use map by RAJUK
- B. Water Retention Area Defined in DAP by RAJUK
- C. Flood Flow Zone Defined in DAP by RAJUK



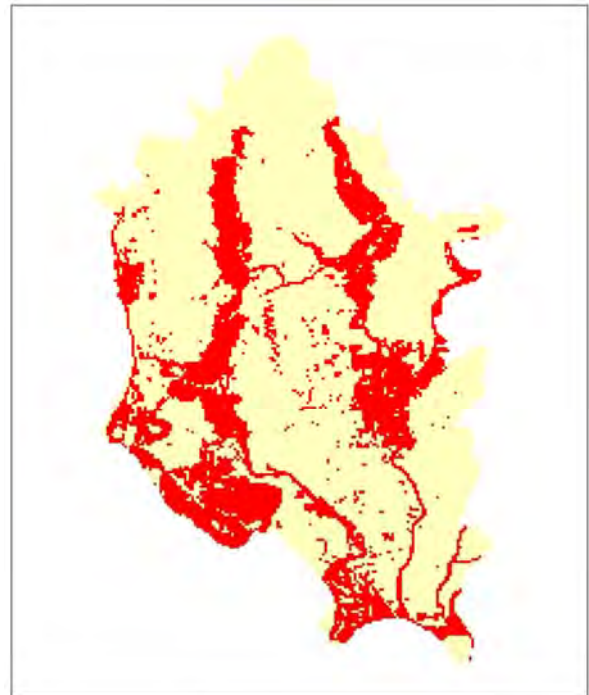
**A Waterbody from Existing Land Use**



**B Water Retention Area Defined in DAP by RAJUK**



**C Flood Flow Zone Defined in DAP by RAJUK**  
 Source: JICA Study Team



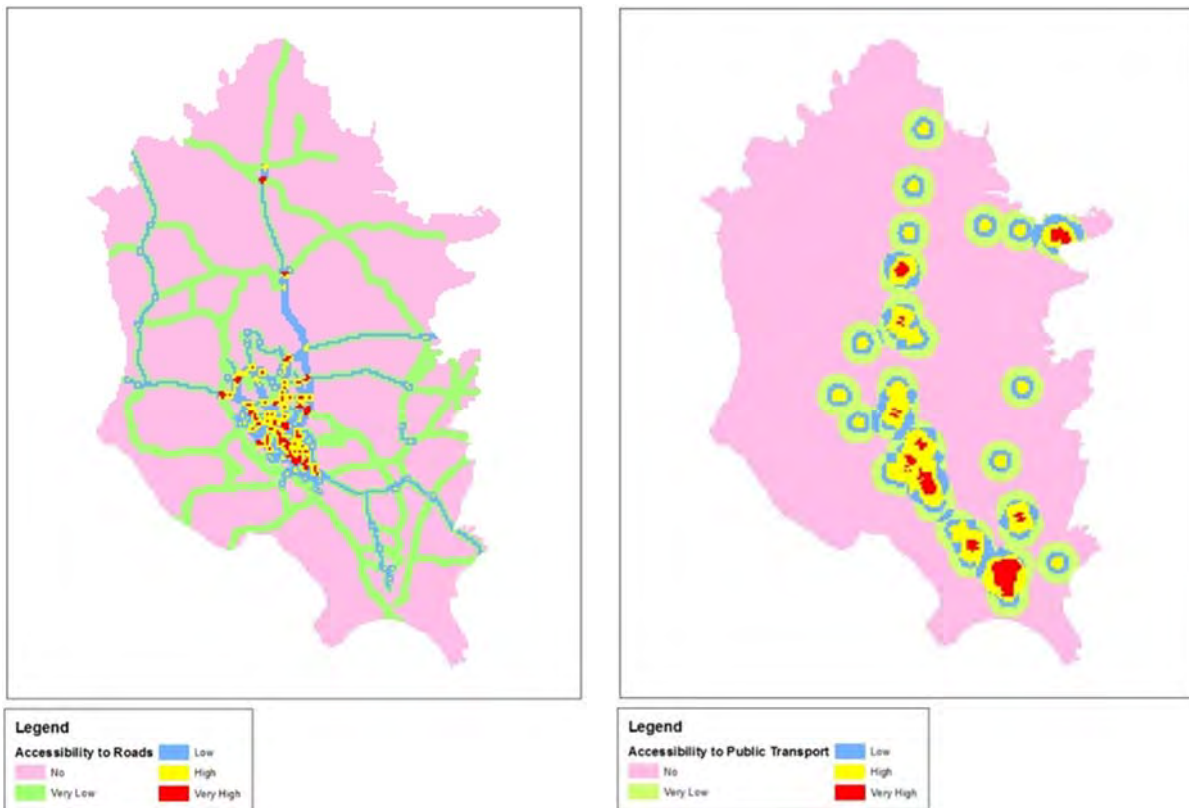
**Negative (Where any of A or B or C is existing)**

**Figure 9.7 Negative Elements**

Positive Elements

The positive element for urban development is identified by the following factors.

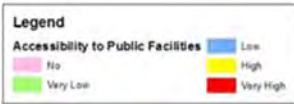
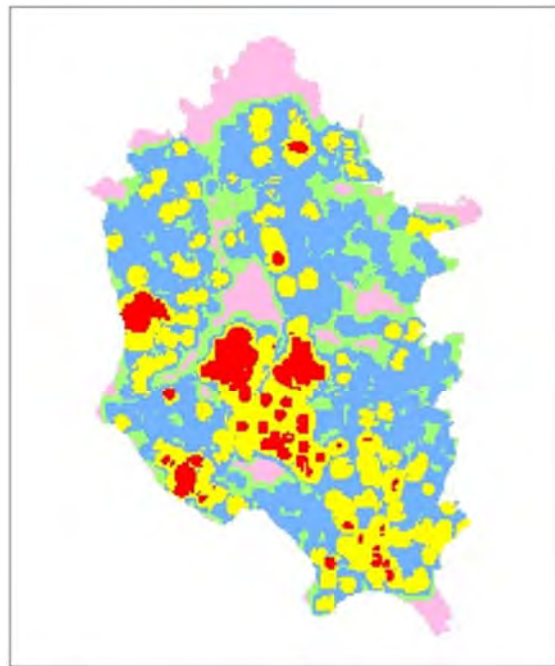
- D. Accessibility to Roads
- E. Accessibility to Public Transport Modes (Bus Terminal, Ferry Port, Railway Station, Airport)
- F. Accessibility to Public Facilities (Administrative Facilities, Educational Facilities, Health Facilities, Religious Facilities, Security Facilities (Police Station, Fire Station))
- G. Accessibility to Urban Services (Piped Water Supply, Electricity, Drainage, Sewage, Gas)
- H. Accessibility to People Attraction Areas (Industrial Area, Commercial Area, Recreational Facilities)



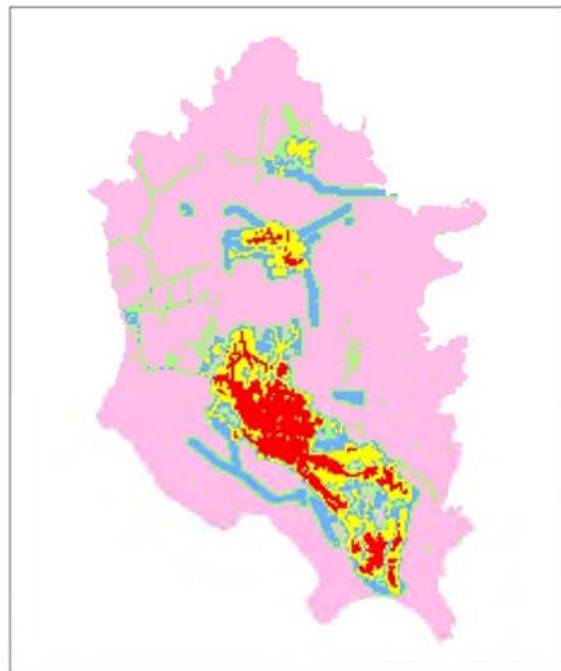
**D Accessibility to Roads**  
Source: JICA Study Team

**E Accessibility to Public Transport Modes**

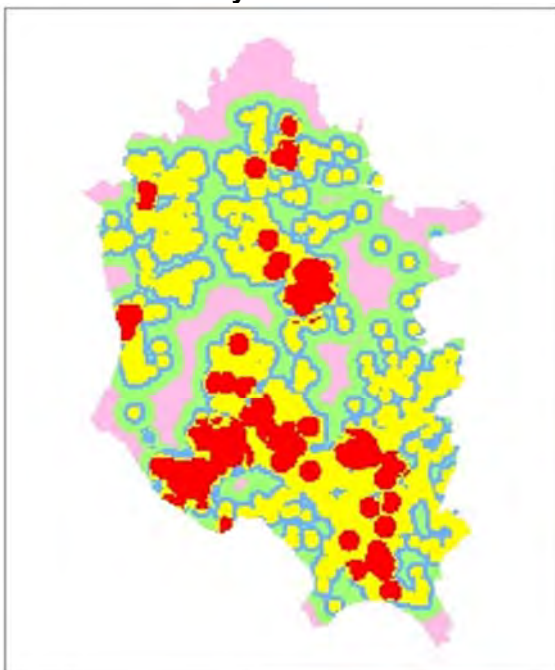
**Figure 9.8 Positive Elements (1)**



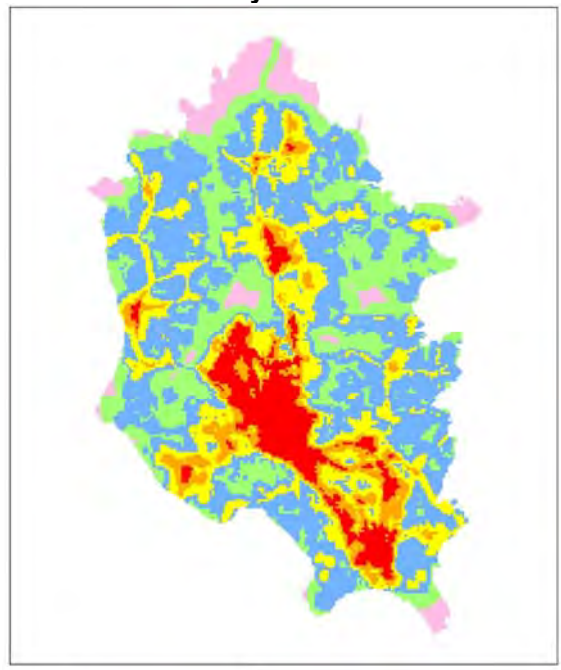
**F Accessibility to Public Facilities s**



**G Accessibility to Urban Services**

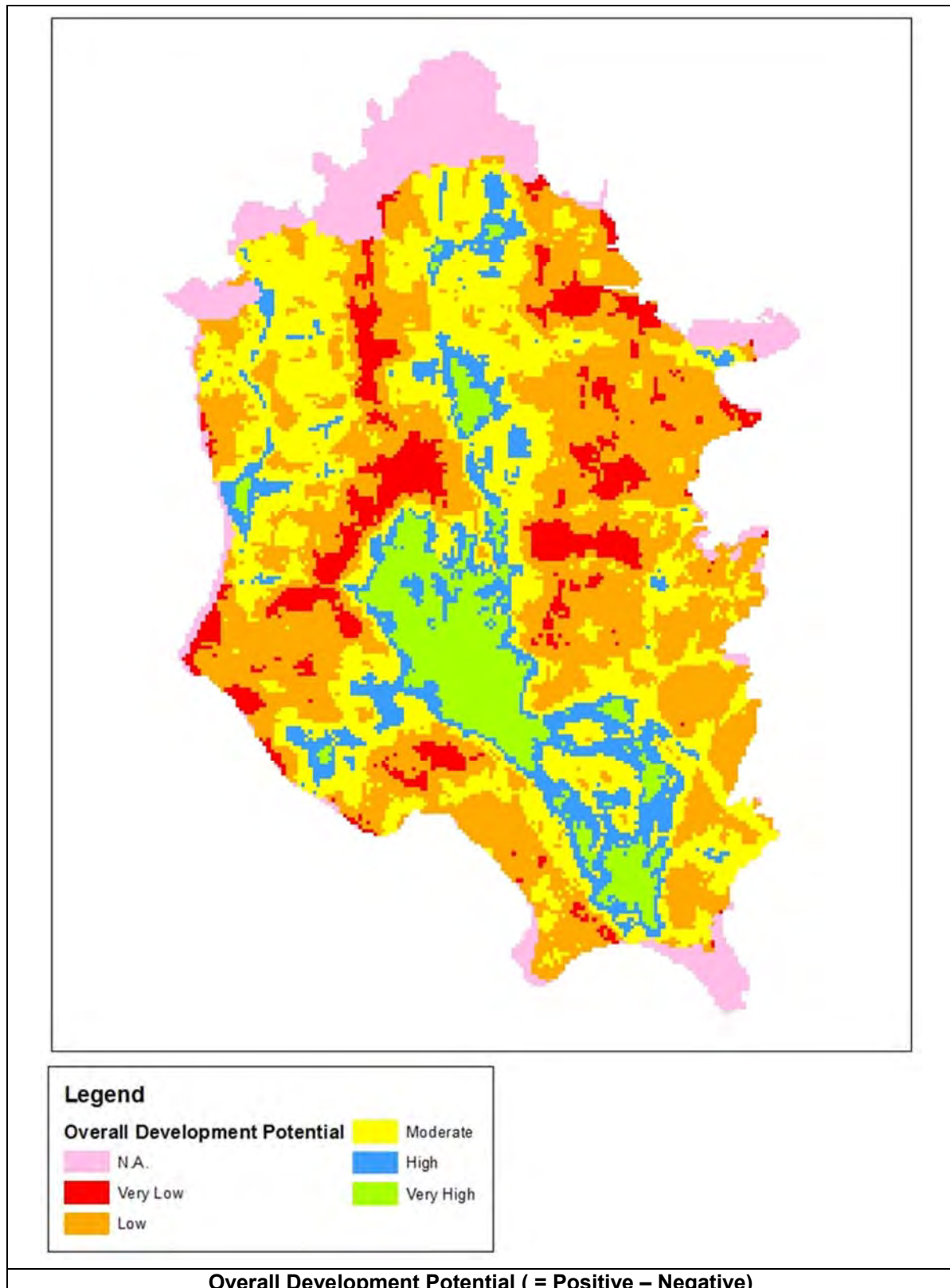


**H Accessibility to People Attraction Areas**  
Source: JICA Study Team



**Positive Elements (Aggregation of D, E, F, G, H)**

**Figure 9.9 Positive Elements (2)**



Source: JICA Study Team

**Figure 9.10 Overall Development Potential**

## (6) Socio-Economic Framework

### 1) Projection of Population

#### General

Populations increase through natural or social growth. Since data on natural growth rates in the study area are not available, the national average was used to estimate the growth rates in the study area, as shown in Table 9.7.

**Table 9.7 Natural and Social Growth of Population**

	Population (000 persons)		Population Growth (%/year)		
	2001	2011	AGR	Natural	Social
RAJUK Area	10,100	15,023	4.05	1.24	2.81
Outside RAJUK	8,061	9,381	1.53	1.24	0.29
Total (GDA)	18,161	24,404	3.00	1.24	1.76

Source: JICA Study Team

In RAJUK area, the population increase was attributed mostly to migration from other regions. The districts of Dhaka and Gazipur are the areas where most people settled in.

**Table 9.8 Ratio of People Living in their Birthplaces in 2011**

District	Dhaka	Gazipur	Manikganj	Munishiganj	Narayanganj	Narshingdi
People living same region (%)	49.2	59.1	96.3	91.3	75.8	92.0

Source: Population Census 2011

Considering the above trend, the future population was projected in three cases as follows:

**Case A:** Half of the potential land for urban development would be developed with the current gross population density (208 person/ha);

**Case B:** New town developments by RAJUK and private developers would be pursued intensively; and,

**Case C:** Considering that the population capacity of RAJUK is around 28 million, the population growth rate of RAJUK would decline sharply as it reaches the capacity. Meanwhile, areas outside RAJUK will attract immigrants more instead of RAJUK area.

#### Population Projection Case A

Under Case A, RAJUK area's population up to 2030 will increase at an annual growth rate of 3.03% based on UN estimates. After 2030, the UN forecasts the growth rate to decline to 0.64% due to population saturation. Areas outside of RAJUK will grow at the same pace as in 2001-2011 up to 2020. After 2020 they will grow at the same pace of the country. As a result, the population of GDA and RAJUK area will reach at 39.9 million and 27.4 million by 2035, respectively.

**Table 9.9 Future Population Case A**

	Population (million)						AGR (%/year)			
	2011	2015	2020	2025	2030	2035	'15-'20	'20-'25	'25-'30	'30-'35
RAJUK	14.8	17.3	20.1	23.3	27.1	27.4	3.03	3.03	3.03	0.64
Outside	9.6	10.2	11.1	11.6	12.1	12.5	1.60	0.96	0.79	0.64
Total (GDA)	24.4	27.6	31.1	34.9	39.2	39.9	2.49	2.31	2.31	0.64

Source: JICA Study Team

#### Population Projection Case B

Under Case B, natural population growth will be the same as the national trend. Migration will decline based on the rate of internal migration, i.e., from rural to urban, during 2004-2011 period as shown in the population census.

**Table 9.10 Rural-to-Urban Migration Rate**

1991	2004	2011
0.562%	0.479%	0.429%

Source: Population Census 2011

As a result, the population in RAJUK area will grow rapidly until 2040, reaching 31 million by 2035. The population of GDA, reflecting the rapid growth of RAJUK area, will be 43.2million, while the population outside RAJUK area will almost be the same as the Case A population. As mentioned earlier, the population of RAJUK area will unlikely reach more than 30 million due to its capacity.

**Table 9.11 Future Population under Case B**

	Population (million)						AGR (%/year)			
	2011	2015	2020	2025	2030	2035	'15-'20	'20-'25	'25-'30	'30-'35
RAJUK	14.8	17.3	20.6	24.0	27.6	31.3	3.50	3.16	2.82	2.52
Outside	9.6	9.6	10.3	10.9	11.4	11.9	1.37	1.19	1.00	0.84
Total (GDA)	24.4	26.9	30.8	34.9	39.0	43.2	2.76	2.52	2.27	2.04

Source: JICA Study Team

#### Population Projection Case C

Under Case C, taking into account that the population of RAJUK area will hardly exceed 28 million, the population growth rate of the area will decline sharply as the area reaches its population capacity. Meanwhile, areas outside RAJUK will become alternative places and thus attract immigrants. Based on this, the migration rate of RAJUK area in 2020-2025 will drop to half of its rate during the period 2015-2020, a fourth in 2025-2030, and will be null after 2030. On the other hand, the migration rates outside RAJUK area in 2020-2025 will be double than that of 2015-2020, 1.5 times in 2025-2030, and after 2030 will be the same as that in 2015-2020. As a result, future population under Case C would be similar to Case A; however, the population of RAJUK area will grow slowly compared with Case A.



**Table 9.12 Future Population under Case C**

	Population (million)					
	2011	2015	2020	2025	2030	2035
RAJUK	15.0	17.4	20.2	23.2	25.1	26.3
Outside	9.4	9.5	10.6	10.7	12.0	12.2
Total (GDA)	24.4	26.9	30.8	33.9	37.1	38.5

Source: RSTP Estimate

#### Population Projection for GDA

To project the population of GDA, the cohort component method was applied to population projection for GDA. In this method, the components of population change including 1) birth rate, 2) survival rate, 3) social growth and 4) male to female ratio are projected separately for each cohort (5-year group). The assumptions for the projection are as follows:

- i. Birth rate and survival rate will be the same as that of the national urban area;
- ii. Birth rate is set by total fertility rate (TFR) and age specific fertility rate (ASFR). The TFR will decline up to the time the target of Vision21 (TFR=1.7) is achieved. The ASFR will constantly decline with the same pace as that of the TFR;
- iii. Survival rate is set by infant mortality rate and age specific death rate. Those rates are set so as to improve the conditions to enable to achieve the target of Vision 21 and will continue with the same pace from 2011- 2021;
- iv. Social growth from 2001 to 2011 was estimated by cohort component method that the future social growth will continue at the same pace during the 2001-2011 periods; and Male-to-female ratio is set at 50%.

Based on the above assumptions, the future population of GDA is estimated to reach 38.9 million by 2035.

**Table 9.13 Future Population of GDA**

	2015	2020	2025	2030	2035
Population (mil.)	26.0	29.2	32.4	35.6	38.9

Source: JICA Study Team

Note: the population is based on the unadjusted population

The adjusted population shown above is the total population of both genders, while the cohort analysis is based on unadjusted population. The other estimates were based on the adjusted population. The result is adjusted to conform to other estimates.

**Table 9.14 Future Adjusted Population of GDA**

	2015	2020	2025	2030	2035
Population (mil.)	27.1	30.4	33.7	37.0	40.4

Source: JICA Study Team

#### Future Population Framework

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

**Table 9.15 Comparison of Population Estimates**

(unit: million persons)

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

Source: JICA Study Team

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

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

**Table 9.16 Selected Future Population Framework**

(unit: million persons)

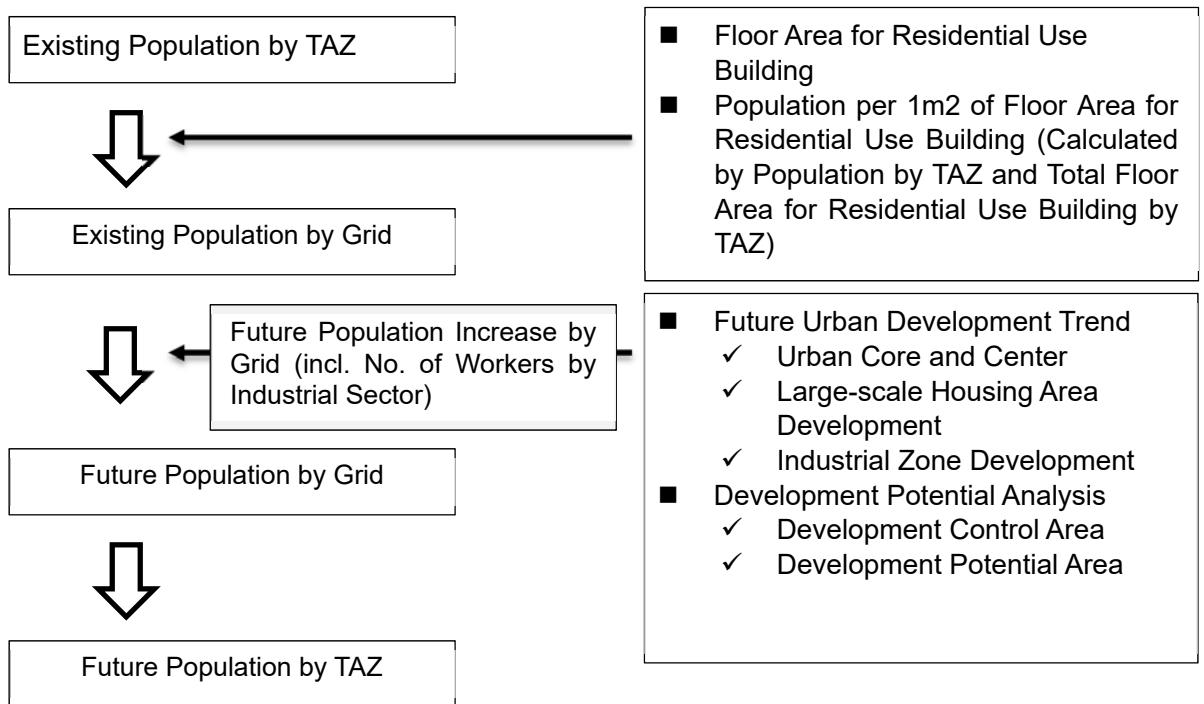
	2020	2025	2030	2035
RAJUK Area	20.2	23.2	25.1	26.3
Outside Area	10.6	10.7	12.0	12.2
Total (GDA)	30.8	33.9	37.1	38.5

Source: RSTP Estimate

#### Methodology of Population Breakdown to Traffic Analysis Zones

The estimation of future population by TAZ based on administrative zone is not enough to express the real situation of population distribution along the proposed transport network because of the average population density in the large area zone. It is difficult to identify the station's location and its buffer zone while population is concentrated. However, a grid analysis is suitable for the analysis of future population distribution for demand forecast and for the assessment of hazards and accessibilities to urban facilities. The grid system prepared for this analysis contains the information of the geographical characteristics, the disaster hazard levels, and the accessibility to transport/public facilities and so with the urban services in the form of the scores. Moreover, an analysis of development control and potential areas can be conducted using the scores in the grids.

The work flow to calculate the future population by TAZ using this grid system is shown in Figure 9.11. At first, based on the existing population by TAZ, existing population by grid is estimated by using the floor area for residential use building and an indicator of population per 1m2 of floor area for residential use building by TAZ. Then, based on the estimated population by grid, future population by grid is estimated according to the future urban development trend and development potential analysis. Finally, the future population by grid is aggregated to future population by TAZ.



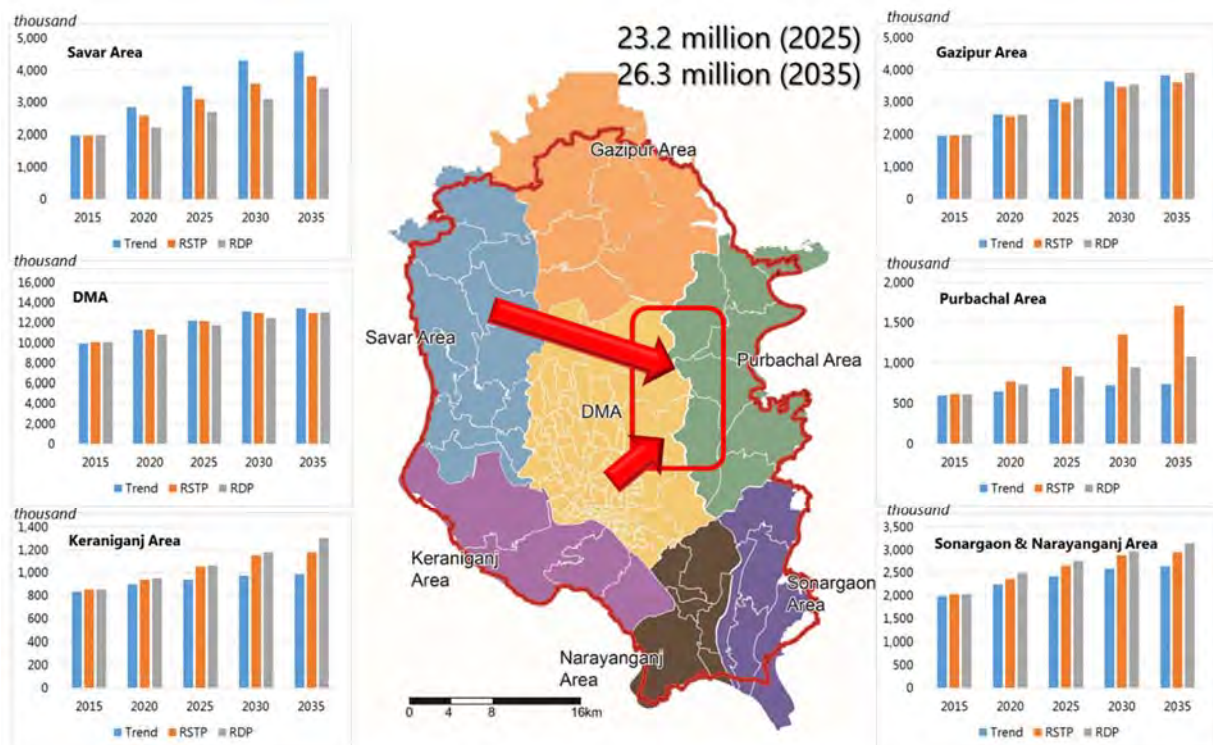
Source: JICA Study Team

**Figure 9.11 Work Flow for Calculation of Future Population by Zone**

**Table 9.17 Summary of Forecast Population**

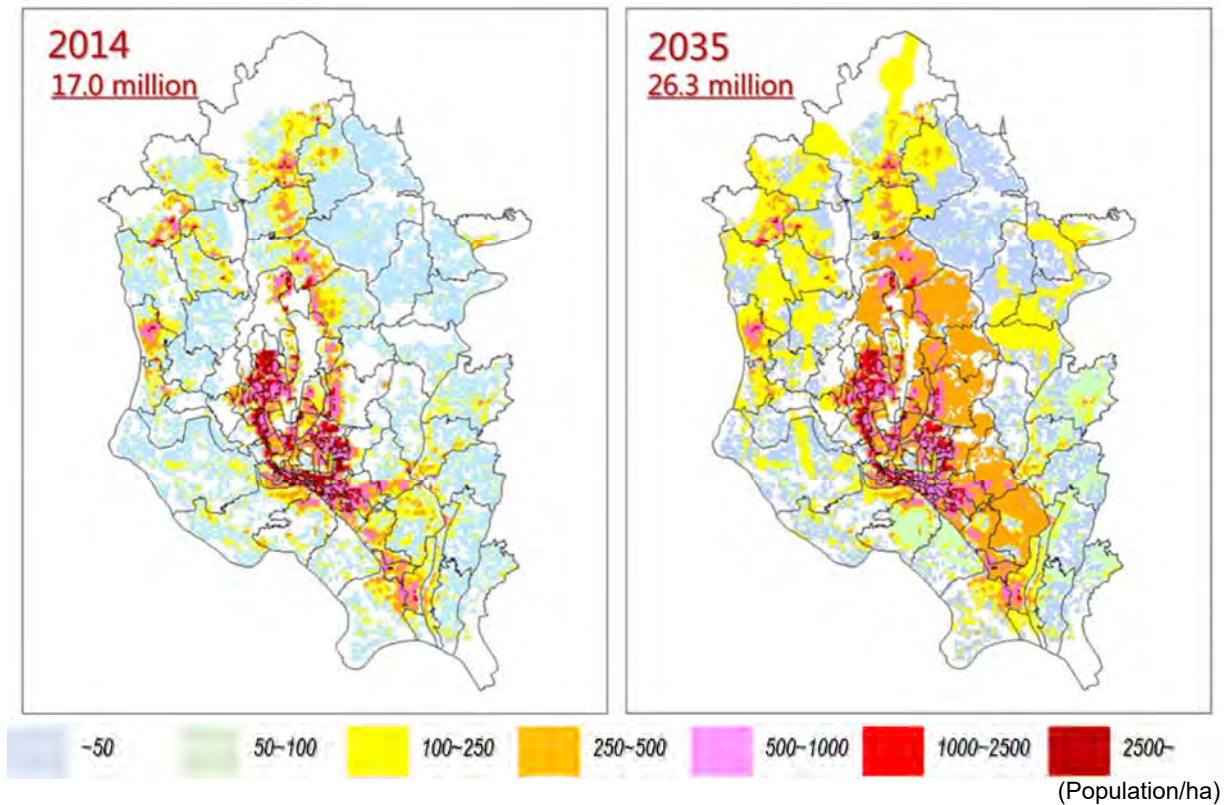
		2015	2020	2025	2030	2035
DMA	Trend	9,934	11,310	12,217	13,143	13,434
	RSTP	10,050	11,361	12,149	12,948	12,959
	RDP	10,066	10,834	11,756	12,461	13,046
Gazipur	Trend	1,969	2,617	3,100	3,642	3,824
	RSTP	1,984	2,554	2,977	3,462	3,603
	RDP	2,003	2,599	3,109	3,551	3,910
Purbachal	Trend	600	655	689	724	734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

Source: JICA Study Team



Source: JICA Study Team

**Figure 9.12 Population by Area**

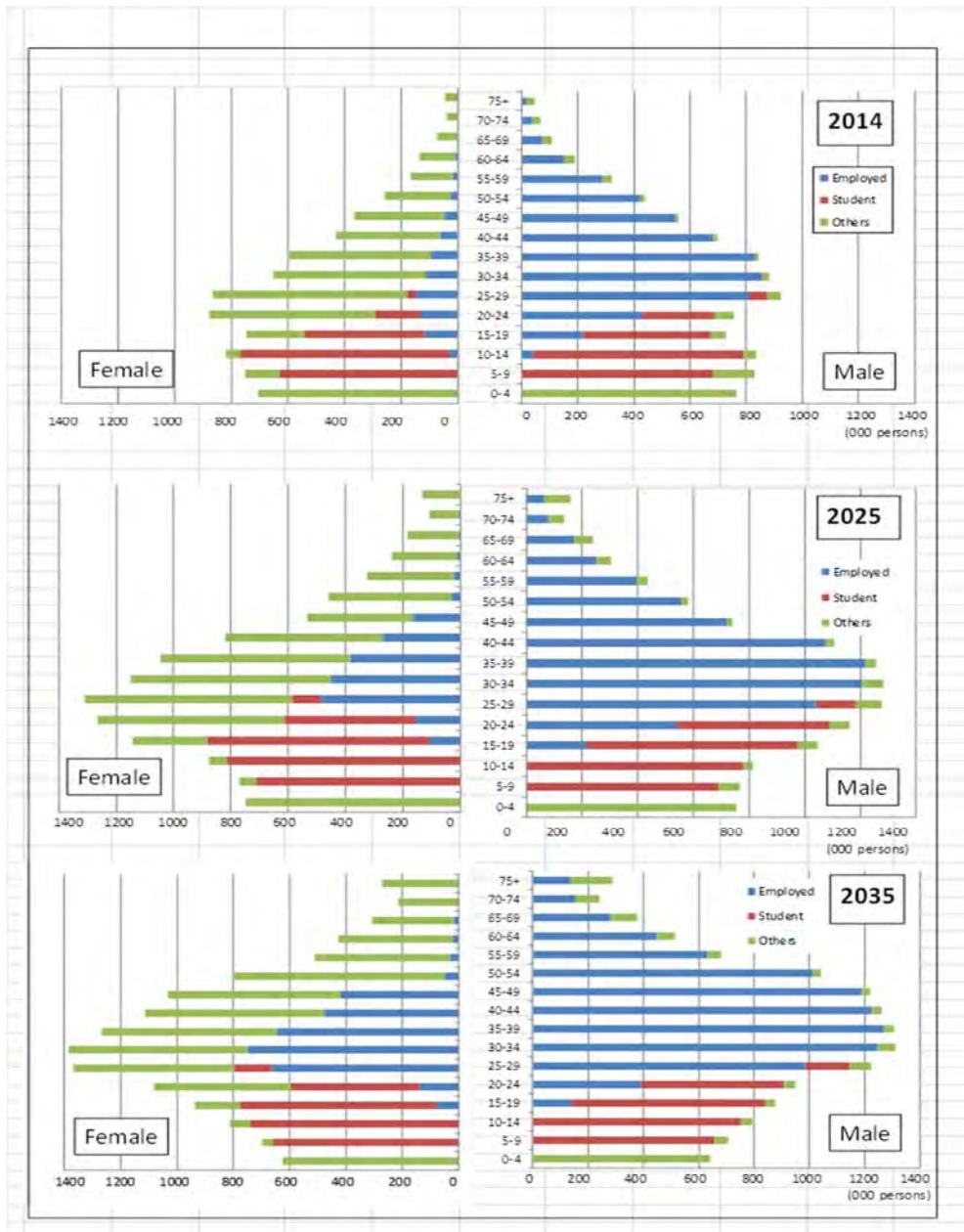


Source: JICA Study Team

**Figure 9.13 Population Density in RAJUK Area**

Population by Social and Economic Status

Population in RAJUK has been projected by sex and 5 year age group for future years. Population by socio-economic status such as employed, students, housewife, retired and unemployed were estimated taking school enrolment ratio and labor force participation rate for male and female into consideration as depicted in Figure 9.14.



Source: RSTP Estimate

**Figure 9.14 Population by Socio-Economic Status in 2014, 2025 and 2035**

These diagrams indicate the increase of school enrolment at higher education and increasing labor force participation of female population.

## 2) Employed Population by Industrial Sector

Employed population by industrial sector in 2014, 2025 and 2035 was estimated as shown in Table 9.18. In RAJUK, employed population in primary sector composed the small portion of the employment. The employed population in the tertiary sector consists of two third of all sectors in RAJUK in 2014 and would be on major industry in 2025 as well as in 2035.

**Table 9.18 Employed Population by Industrial Sector: 2014, 2025 and 2035.**

Unit: 000 persons

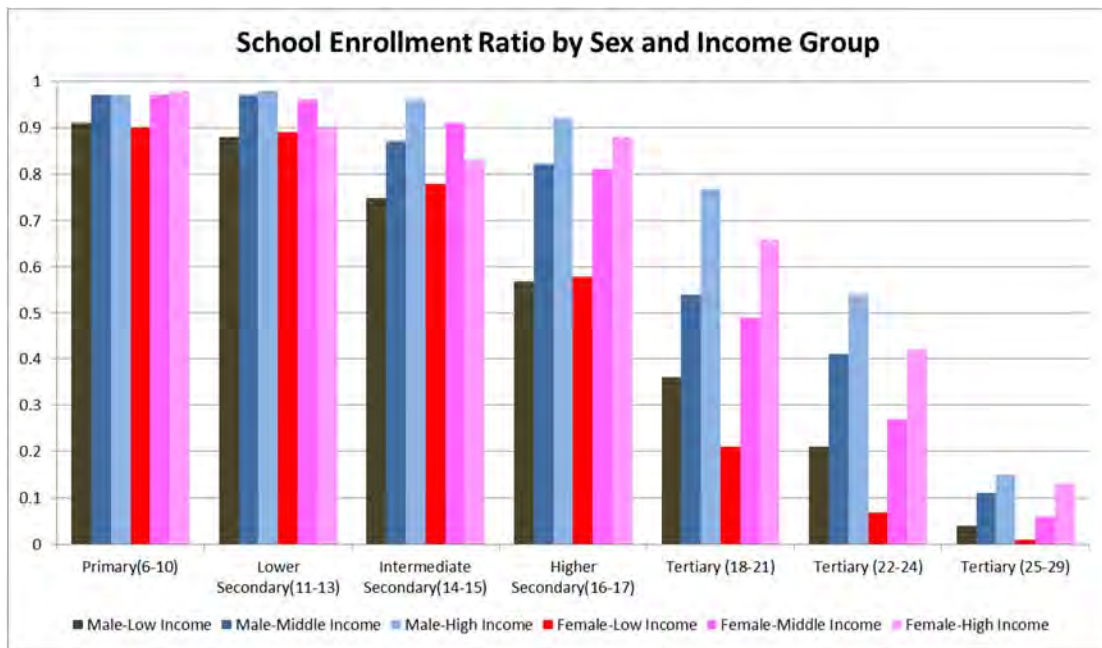
Sector	2014	2025	2035
Primary	150	130	120
Secondary	1,980	3,340	3,900
Tertiary	4,060	6,130	8,180
Total	6,190	9,600	12,200

Source: RSTP Estimate

### 3) Number of Students and Pupils by Grade of Education

School enrolment rates vary according to the grade of education, sex and income level as illustrated in Figure 9.15.

In RAJUK area, more than 90 percent of children go to primary school although school enrolment rate of low income group indicate lower enrolment rate. Income factor affect school enrolment when they are at higher secondary school or in tertiary education level. School enrolment of female is lower when they are in tertiary education but in secondary education level, female school enrolment rate is slightly higher than those of males.



Source: RSTP Household Interview Survey, 2014

**Figure 9.15 School Enrollment Ratio by Sex and Income Group**

Number of students and pupils has been estimated based on 5-year age group population and school enrolment rate for male and female by income group. As indicated in Table 9.19, the number of students would increase from 2015 to 2025; however, the number would decrease from 2025 to 2035 due to reduction of young generation population.

**Table 9.19 Number of Students by Education Level**

Unit: 000 persons

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

Source: RSTP Estimate

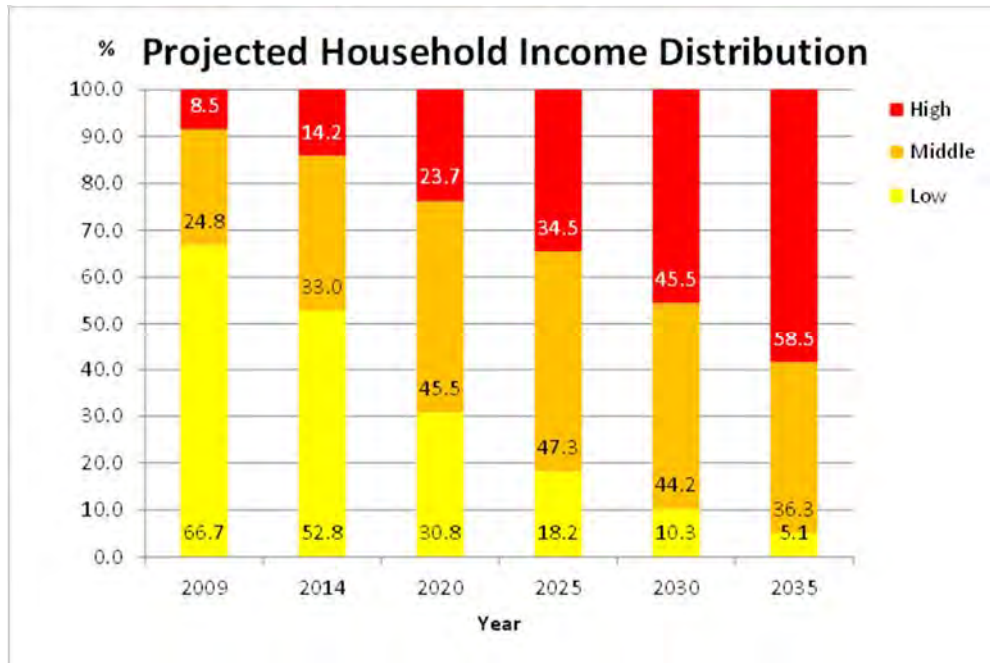
#### 4) Gross Regional Domestic Product (GRDP)

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

#### 5) Household Income

Household income at real term is assumed to increase in proportion to the GRDP growth and composition of household income group, it has been changed accordingly with the increase of household income as illustrated in Figure 9.20. This implies that about 60 percent of households would belong to high income group and their travel characteristics would be those of high income group at present.





Source: RSTP Estimate

**Figure 9.16 Estimated Composition of Income Groups**

## (7) Spatial Distribution of Population and Employment

### 1) Employed Population by Industrial Sector

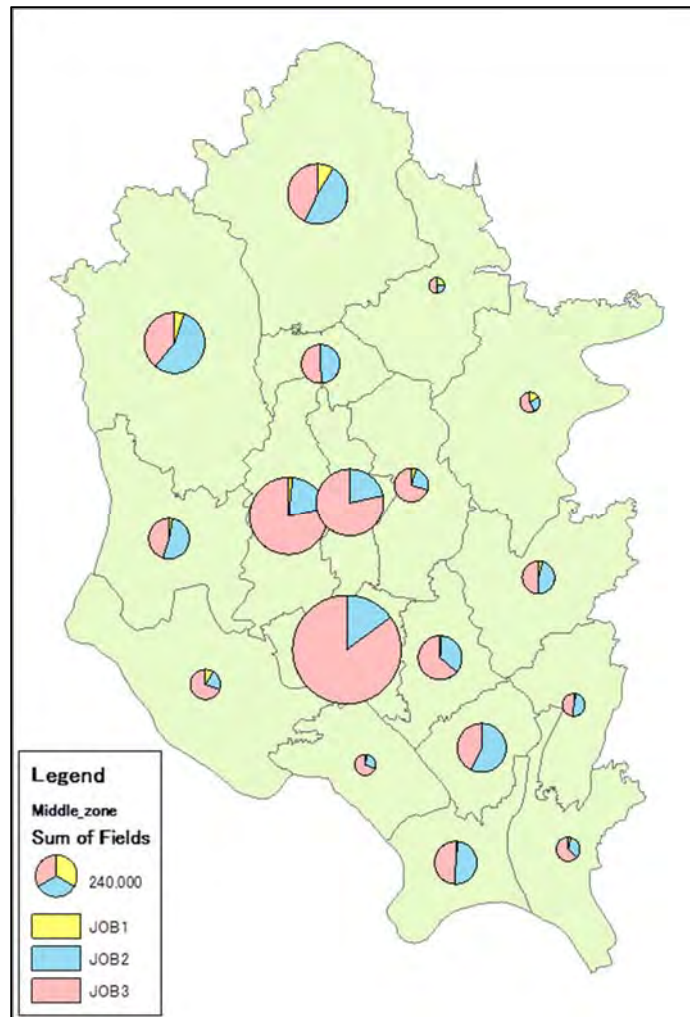
Majority of employed population belongs to tertiary sector which includes commercial industry and service industry. More than 75 percent of jobs consist of tertiary sector in urban area as depicted in Figure 9.17. Employed population in secondary industry are seen in suburban areas such as Savar, Ashulia, Gazipur and Narayanganj.

Distribution of employed population in secondary sector has been estimated as follows;

- Employed population in secondary sector has been allocated at planned specialized centers
- Manufacturing factory would be located in suburban areas along the major arterial roads such as Middle Ring Road.

Distribution of employed population in tertiary sector has been estimated as follows;

- Two thirds of service industry jobs are regarded as population-serving jobs.
- The remaining jobs in tertiary industry go for basic industry and they would work at regional centers as well and sub-regional centers as proposed in DSP.



Note: JOB1: Primary industry, JOB2: Secondary industry, JOB3: Tertiary industry  
Source: RSTP Household Interview Survey 2014

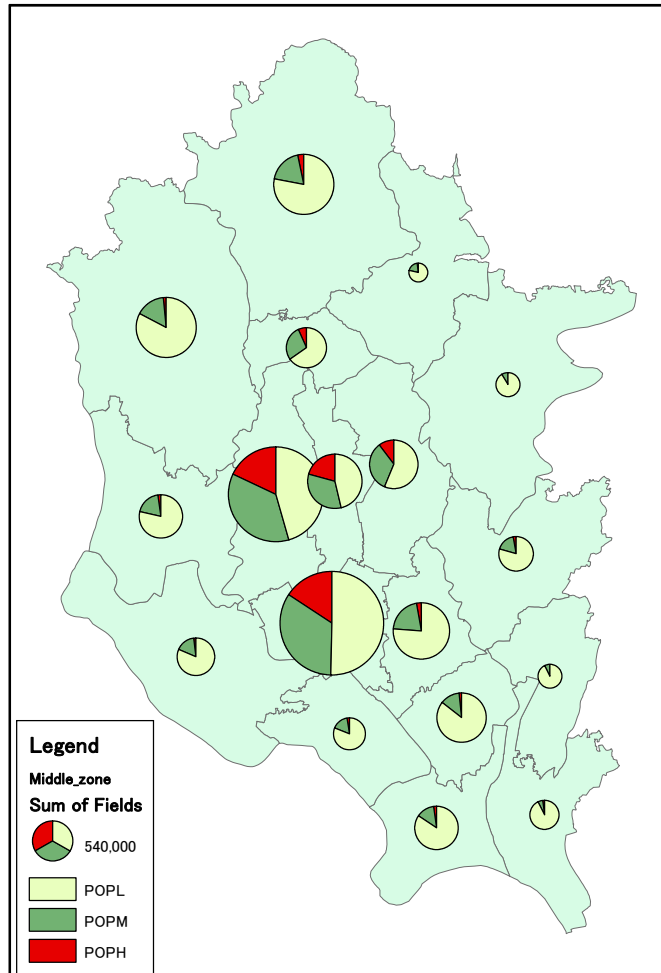
**Figure 9.17 Spatial Distribution of Employed Population by Industrial Sector 2014**

## 2) Number of Students and Pupils

The locations of primary/secondary schools in principle are close to residence; therefore, the number of pupils at primary/secondary schools is the same as those pupils at residence. The number of students at tertiary education such as universities is assumed to be the same as the present location. Some additional schools are assumed to be built in sub-regional centers.

### 3) Population Distribution by Income Level

The distribution of population by income level in 2014 is illustrated in Figure 9.18. This figure indicates that high income households are located in the central area of Dhaka. In suburban area, 80 percent of households are low income households.



Note: POPL: low-income, POPM: Middle-income, POPH: High-income  
Source: RSTP Household Interview Survey 2014

**Figure 9.18 Spatial Distribution of Population by Income Level 2014**

The household composition by income level has been estimated based on the present household income composition obtained from RSTP Household Interview Survey and growth of income has been estimated for the existing urban area. In the newly developed area, household income composition of the existing well-developed area has been applied.

### **9.3 Regional Structure**

#### **(1) General**

Considering the rapid urbanization of RAJUK area, the urban issues in RAJUK will not be solved within the area in the near future. Therefore, it is advisable to prepare a plan for a wider area, i.e., the Greater Dhaka Area (GDA). The same concept of developing urban centers and corridors can be applied for GDA. In RAJUK area, due to existing traffic congestion, introducing mass transit system along urban corridors is essential. On the other hand, at GDA level, developing the road network to include expressways is needed.

#### **(2) Possible Scenario for the Regional Structure of GDA**

##### **1) Urbanization**

The intensive urban developments at peripheral areas of DCC in recent years will absorb a lot of population to form a conurbation with DCC. However, it will bring various types of critical issues in urban activities as well as the urban environment simultaneously. Anyhow, RAJUK area will become almost urbanized everywhere. As Gazipur and Kaliacoir showed already, rapid urbanization happens even at the cities located more than 20km from the center of DCC in future.

- a) Within a 10-km radius from the central area of DCC: The area will almost be fully developed to form a conurbation including Purbachal. At present, the population of DCC (North and South) is 7 million, and the future population of the area will be around 12–14 million.
- b) 10km–20km: The area within a 20-km radius has almost the same size as RAJUK area and will be urbanized in most parts including Savar and the part of Gazipur and Narayanganj. The area from Gazipur to Narayanganj will be a conurbation.

##### **2) Polar Cities**

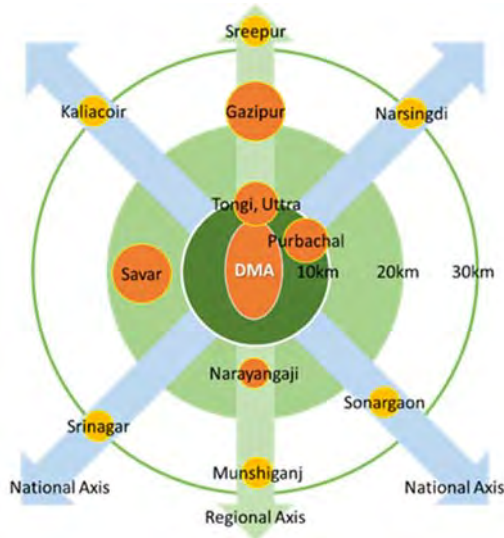
In order to ease the urban problems derived from the intensive concentration of population and urban functions in an expanded Dhaka conurbation, there is a need to develop cities with job opportunities as well as functions for managing and servicing surrounding areas.

- a) In between 10-20km radius, there are growing cities to be known not only as bedroom suburbs but also an employment centers. These cities are Narayanganj, Gazipur, and Savar; Purbachal will soon become one too. If more urban functions will be added, those cities will shoulder some of the burden concentrated in the central area as the sub-center of Dhaka agglomeration.
- c) If properly developed, cities located around 30 km from the central area can become regional centers, sharing functions necessary to the metropolitan area.
- d) Outside of RAJUK area, low-population settlements are located in every direction but are densely distributed in the north-west part of GDA. The area has also the potential for attracting factories, which will enhance urbanization through changing settlements with higher population density. Among these areas there will be the growth centers.

##### **3) Transport Axis**

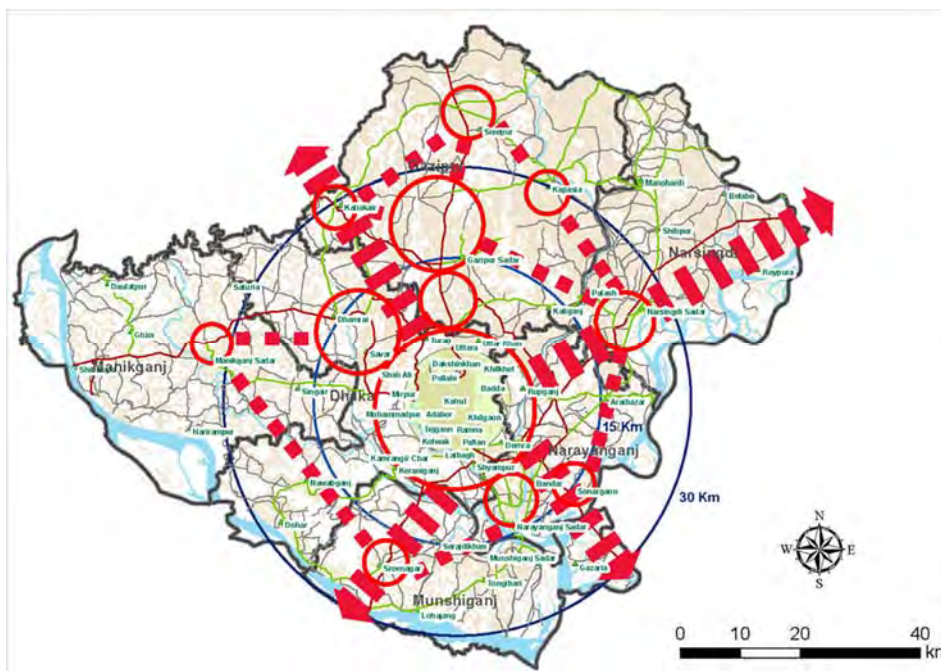
There are two major axes in the context of international and national network, i.e., Sirajganj - Comila - Chittagong and Jessore - Padma Bridge – Sylhet (Figure 9.19). These axes will support the growth of cities. In this region there is the regional axis from the north to the south passing through Gazipur and Narayanganj. At this

moment the urbanization is found along this axis, however the development potential will depend on the improvement of transport systems coping with the increasing demand. And it will be indispensable to improve regional network connecting not only connecting the central area and the suburbs but cities in GDA, especially connecting polar cities(Figure 9.20).



Source: JICA Study Team

**Figure 9.19 Future Regional Structure of GDA**



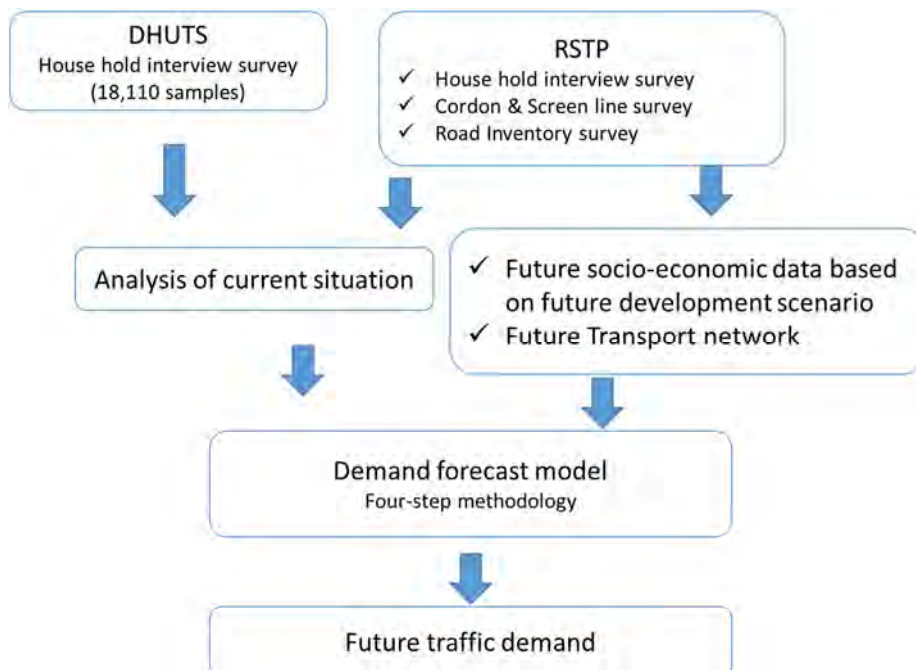
Source: JICA Study Team

**Figure 9.20 Preliminary Concept of Spatial Structure of GDA**

## 10. TRAFFIC DEMAND FORECAST

### 10.1 Methodology of Traffic Demand Forecast

The traffic demand forecast model for Dhaka was designed based on the result of the Household Interview Survey (HIS) conducted by DHUTS and the traffic survey results conducted by RSTP which includes the HIS, the Cordon and the Screen Line Survey and the Road Inventory Survey. As shown in Figure 10.1, the current traffic demand characteristics were analyzed based on the results of the aforementioned surveys and through these, the demand forecast model is developed along with the input data from the future socio-economic data based on the future development scenario and the future transport network. Consequently, future traffic demand can be formulated as an output of demand forecast model as shown in below study flow.



Source: JICA Study Team

**Figure 10.1 Flow of Traffic Demand Forecast**

### 10.2 Current Traffic Demand Characteristics

In this section, the current traffic demand characteristics will be shown based on the HISs.

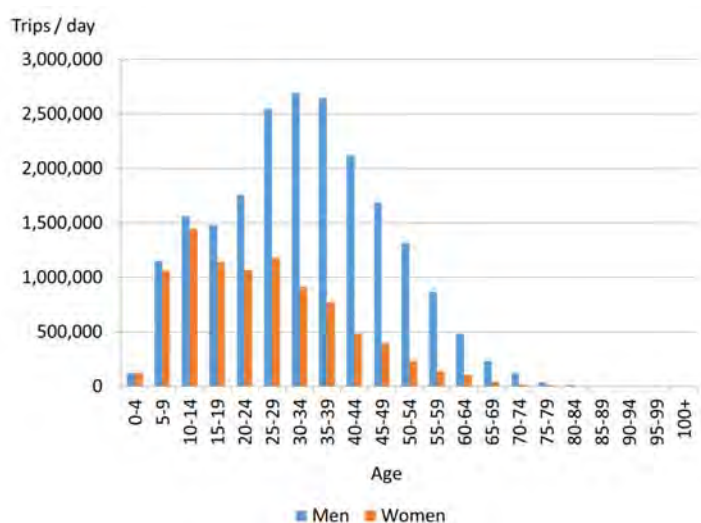
#### (1) Number of Daily Trips and Trip Rate by Gender and Age Group

Table 10.1 and Figure 10.2 shows the number of daily production trips and trip rates as per gender and age group which accordingly indicates that 20.9 million trips from man and 9.1 million trips from woman are generated per day within the study area while trip rates of man and woman are 2.26 and 1.18 respectively. The main factor of the gender's rate difference, which is almost halfway is that women of Dhaka, in their own unique traits, generally prefer not to go out.

**Table 10.1 No. of Trips and Trip Rate by Gender and Age Group**

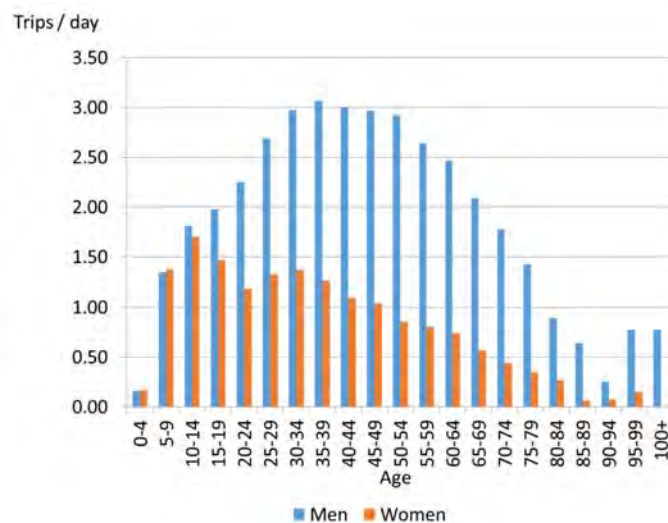
Age	No. of Trips (trip/ day) 2014		Trip Rate (trip/person) 2014	
	Men	Women	Men	Women
0-4	123,792	122,252	0.16	0.17
5-9	1,152,669	1,060,255	1.35	1.37
10-14	1,562,769	1,441,682	1.81	1.70
15-19	1,483,891	1,140,635	1.98	1.47
20-24	1,756,339	1,066,495	2.25	1.19
25-29	2,546,950	1,179,925	2.69	1.33
30-34	2,695,034	916,641	2.98	1.37
35-39	2,642,783	776,310	3.07	1.27
40-44	2,122,619	487,580	3.00	1.09
45-49	1,686,280	395,014	2.97	1.04
50-54	1,315,869	231,498	2.92	0.86
55-59	867,923	141,419	2.64	0.81
60-64	482,929	104,353	2.47	0.74
65-69	234,160	43,710	2.09	0.57
70-74	125,213	18,980	1.78	0.44
75-79	39,037	6,945	1.43	0.35
80-84	10,821	3,513	0.89	0.26
85-89	3,183	273	0.64	0.06
90-94	438	437	0.25	0.08
95-99	630	431	0.77	0.15
100+	1,140	0	0.77	0.00
Total	20,854,469	9,138,347	2.26	1.18

Source: JICA Study Team (2014)



No. of Trips by Gender and Age Group

Source: JICA Study Team (2014)



Trip Rate by Gender and Age Group

**Figure 10.2 No. of Trips and Trip Rate by Gender and Age Group**

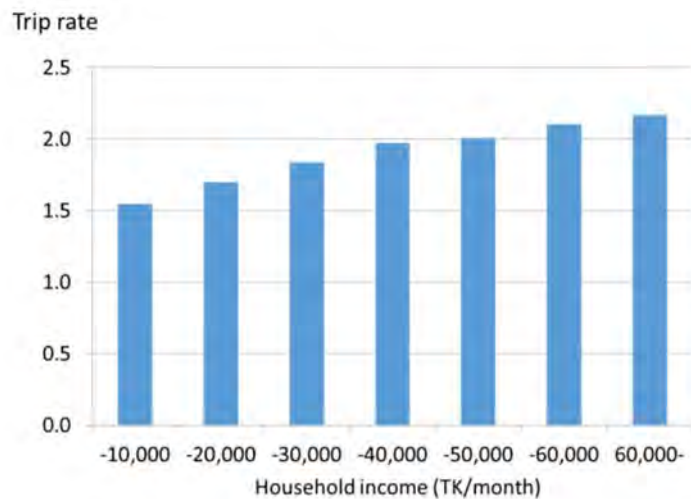
**(2) Number of Production Trips and Trip Rate by Household Income**

The number of production trips and trip rate as per household income as shown in Table 10.2 and Figure 10.3 indicates that trip rate of high income group is higher than lower income group. These results correspond to the group’s lifestyles and business activities as those with high income produces more business trips, shopping trips etc.

**Table 10.2 Number of Trips and Trip Rate by Household Income**

Household Income	No. of Persons	No. of Trips	Trip Rate
-10,000	4,385,230	6,790,764	1.5
-20,000	6,425,757	10,926,274	1.7
-30,000	2,543,249	4,675,755	1.8
-40,000	1,108,730	2,187,447	2.0
-50,000	637,617	1,279,353	2.0
-60,000	441,094	927,568	2.1
60,000-	1,157,875	2,510,857	2.2

Source: JICA Study Team (2014)



Source: JICA Study Team (2014)

**Figure 10.3 Number of Trips and Trip Rate by Household Income**

**(3) Number of Generation and Attraction Trips by Area**

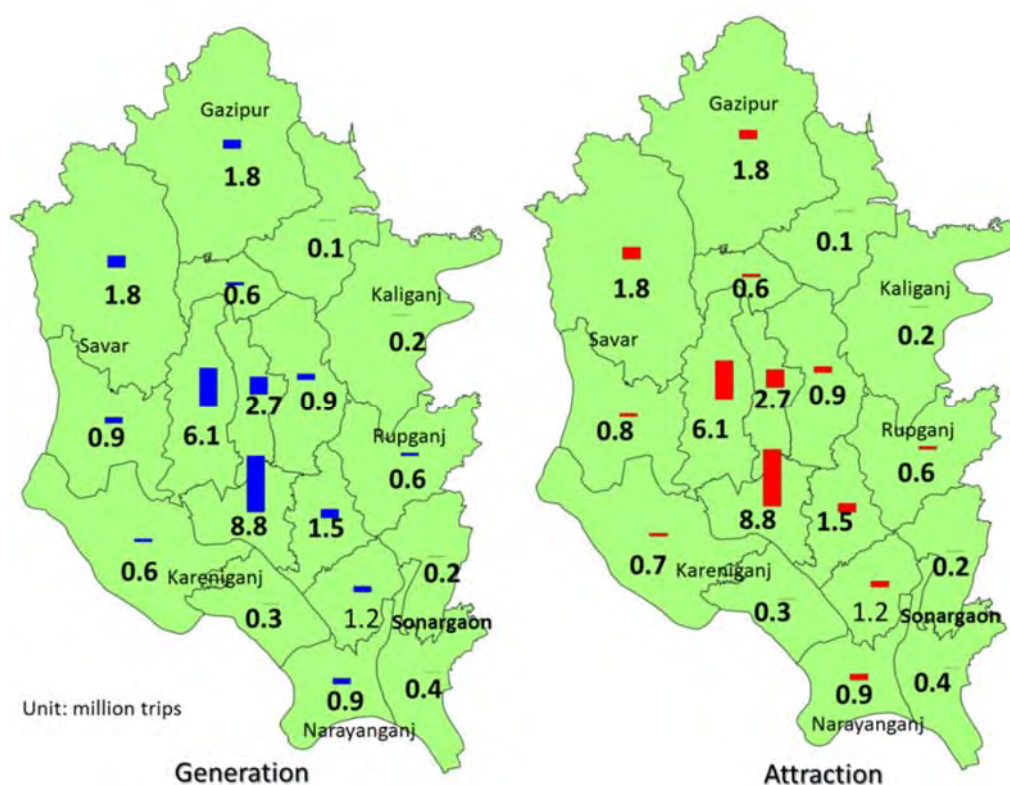
Number of Generation and Attraction Trips by area as shown in Table 10.3 and Figure 10.4 indicates that in Dhaka area, South Dhaka which includes Old Dhaka and West Dhaka which includes Mirpur are the busiest area with daily generation/attraction trips of 8,763,834/8,785,059 trips and 6,107,144/6,111,365 respectively. This is followed by Gulshan area with generation/attraction trips of 2,744,676/2,737,625 trips per day. While outside of DMA, Gazipur and North Savar generate and attract huge trips of 1,751,735/1,753,703 and 1,831,507/1,833,950 trips per day.



**Table 10.3 Number of Generation and Attraction Trips by Area**

Area		Generation (Trips/day)	Attraction (Trips/day)
1	South Dhaka	8,763,834	8,785,059
2	West Dhaka	6,107,144	6,111,365
3	Airport, Gulshan	2,744,676	2,737,625
4	East Dhaka	921,062	895,423
5	South East Dhaka	1,503,671	1,504,896
6	Tongi	800,058	799,883
7	Gagipur	1,751,735	1,753,703
8	East Gazipur	128,708	128,902
9	Kaliganj	225,521	225,872
10	Rupganji	573,109	573,569
11	North Sonargaon	249,079	250,066
12	South Sonargaon	356,433	356,309
13	North Narayanganj	1,162,379	1,163,787
14	South Narayanganj	933,591	936,115
15	South kareiganj	341,589	341,047
16	North Kareiganj	632,067	671,125
17	South Savar	881,353	839,546
18	North Savar	1,831,507	1,833,950

Source: JICA Study Team (2014)



Source: JICA Study Team (2014)

**Figure 10.4 Number of Generation and Attraction Trips by Area**

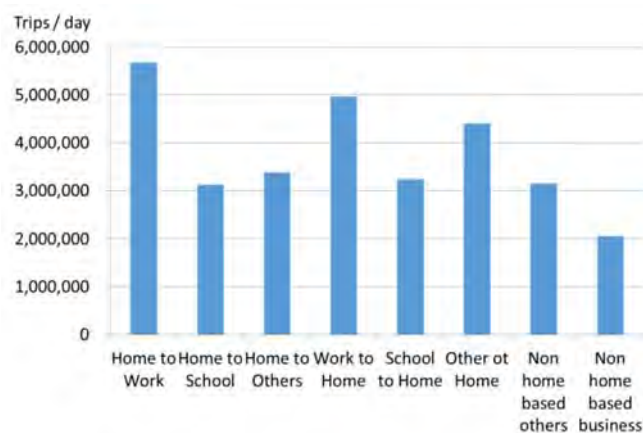
#### (4) Number of Trips by Purpose by Age Group

Trips by purpose by age group as shown in Table 10.4, Figure 10.5 and Figure 10.6 indicates that purposes of “Home to Work” trip and “Work to Home” trip generate the highest trip while “Home to School” and “School to Home” trips account for the major purpose of young age groups. “Home to Work” trip and “Work to Home” trip increases by the age group of 20’s to 50’s while it decreases at age group of over 60’s as “Home to Other” trip and “Other to Home” trip increases.

**Table 10.4 Number of Trips by Purpose by Age Group**

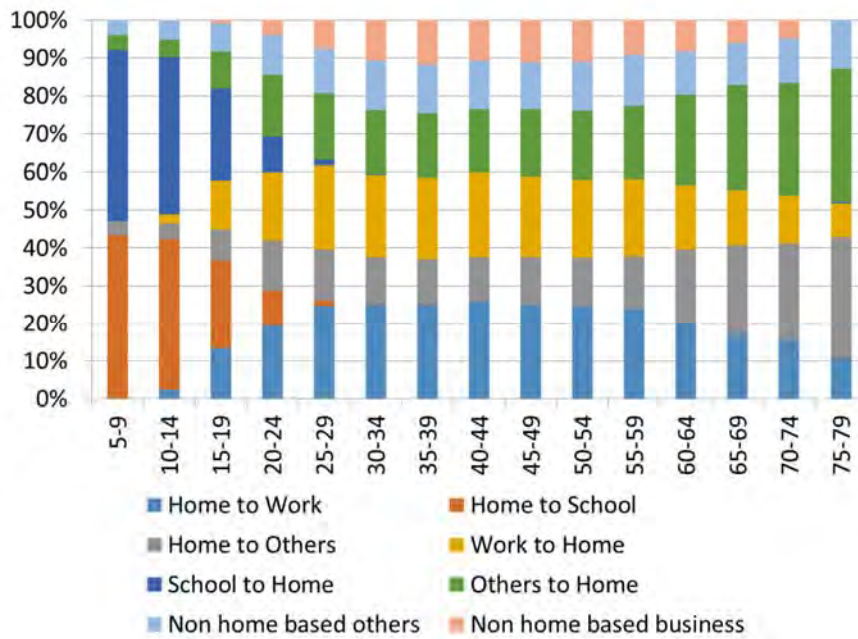
Age	Home to Work	Home to School	Home to Others	Work to Home	School to Home	Others to Home	Non home based others	Non home based business
0-4	3,856	26,194	83,868	3,008	27,570	85,730	11,868	3,950
5-9	634	960,869	80,127	714	997,111	84,343	88,699	427
10-14	71,180	1,200,826	124,372	70,392	1,247,638	134,434	150,215	5,392
15-19	351,657	611,944	214,826	336,292	636,945	253,803	194,561	24,499
20-24	551,217	261,229	370,305	509,202	263,460	458,950	299,521	108,950
25-29	919,760	53,740	504,181	824,780	53,631	649,537	438,417	282,829
30-34	909,218	6,256	443,815	780,845	7,184	608,248	472,280	383,829
35-39	859,751	2,179	408,358	729,078	2,436	573,362	443,759	400,171
40-44	673,917		308,073	584,746		431,295	333,479	278,689
45-49	517,781	338	265,845	440,175	338	366,966	256,217	233,634
50-54	380,565		198,080	318,139		281,009	198,420	171,154
55-59	240,488		141,446	204,882		193,805	136,206	92,515
60-64	116,826		115,518	99,819		139,756	66,212	49,151
65-69	47,684		65,201	40,500		76,711	30,720	17,055
70-74	21,946		37,441	18,211		42,709	16,906	6,980
75-79	5,026	116	14,620	4,078	116	16,162	5,864	
80-84	837	304	5,983	1,134	304	5,285	487	
85-89	368		1,284	368		1,342	95	
90-94			465			410		
95-99		315	90		315	185	156	
100+	275		295	275		295		

Source: JICA Study Team (2014)



Source: JICA Study Team (2014)

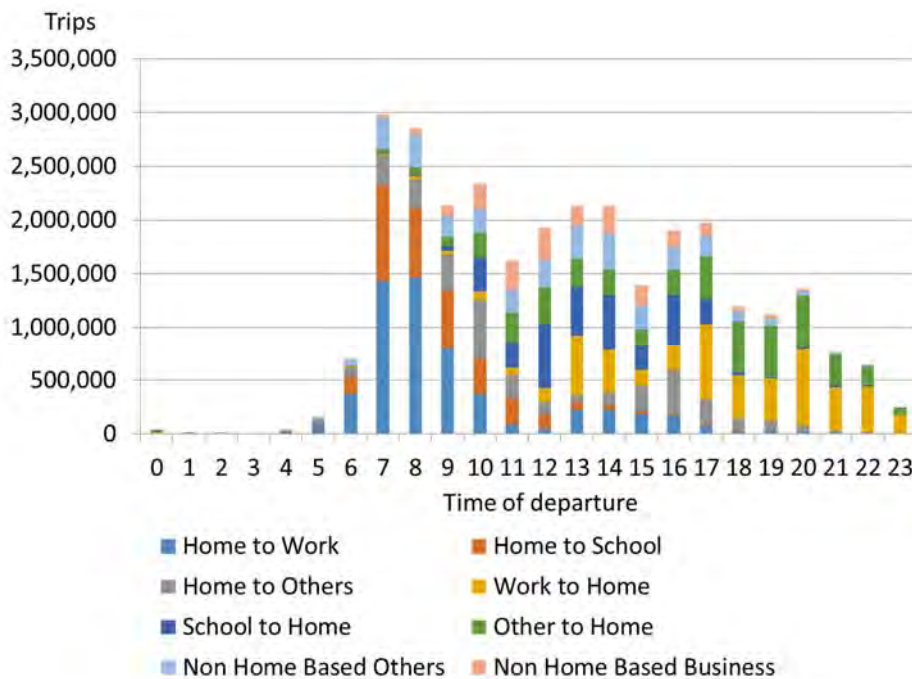
**Figure 10.5 Number of Trips by Purpose**



Source: JICA Study Team (2014)

**Figure 10.6 Rate of Trips by Purpose by Age Group**

**(5) Number of Trips by Purpose by Time of Departure**



Source: JICA Study Team (2014)

**Figure 10.7 Number of Trips by Purpose by Time of Departure**

**Table 10.5 Number of Trips by Purpose by Time of Departure**

Time	Home to Work	Home to School	Home to Others	Work to Home	School to Home	Other to Home	Non Home Based Others	Non Home Based Business
0	286	0	371	18,836	1,072	15,012	1,390	221
1	336	0	187	6,292	466	2,586	745	206
2	491	0	0	2,690	1,453	619	0	0
3	3,184	0	733	0	0	193	317	393
4	20,438	986	10,484	776	0	218	3,142	188
5	98,848	6,425	35,217	834	0	2,099	11,223	1,621
6	377,679	152,719	88,294	9,651	126	9,455	57,865	9,711
7	1,432,432	890,919	280,029	12,540	2,551	43,966	288,639	33,671
8	1,463,657	645,325	267,719	37,898	7,333	64,789	311,800	55,906
9	799,753	540,158	343,139	33,415	45,142	82,458	197,038	94,038
10	369,405	330,777	557,005	79,464	309,495	235,142	221,644	235,701
11	88,621	245,421	217,416	63,384	246,366	277,935	213,125	268,810
12	47,474	132,644	127,084	120,880	598,885	346,510	256,736	299,069
13	227,342	69,213	65,249	562,527	457,593	262,735	303,726	182,921
14	218,268	49,280	118,784	401,403	512,790	237,246	337,150	256,030
15	188,853	15,586	244,550	149,163	220,789	163,755	221,285	190,580
16	164,779	13,023	423,127	229,418	474,427	235,403	212,201	148,737
17	68,307	6,460	248,916	706,140	235,150	397,205	195,556	113,877
18	19,377	4,044	126,022	393,532	34,905	475,851	95,847	50,382
19	20,846	944	102,848	392,554	15,468	479,727	68,549	36,438
20	18,155	854	54,210	720,500	16,933	482,517	45,251	20,363
21	9,619	549	23,238	398,807	21,452	288,301	16,725	9,389
22	6,244	98	11,253	426,833	8,166	179,432	11,211	4,396
23	1,648	0	2,962	176,302	1,531	60,459	3,565	2,866

Source: JICA Study Team (2014)

The number of trips by purpose by time of departure is shown in Figure 10.7 and table 10.5. The morning peak starts from 7 am to 9 am which is mainly occupy by “Home to Work” trip and “Home to School” trip. Whereas evening peak time is not clearly identified as “Work to Home” trip and “School to Home” trip starts from 12am and it continues up to 23pm.

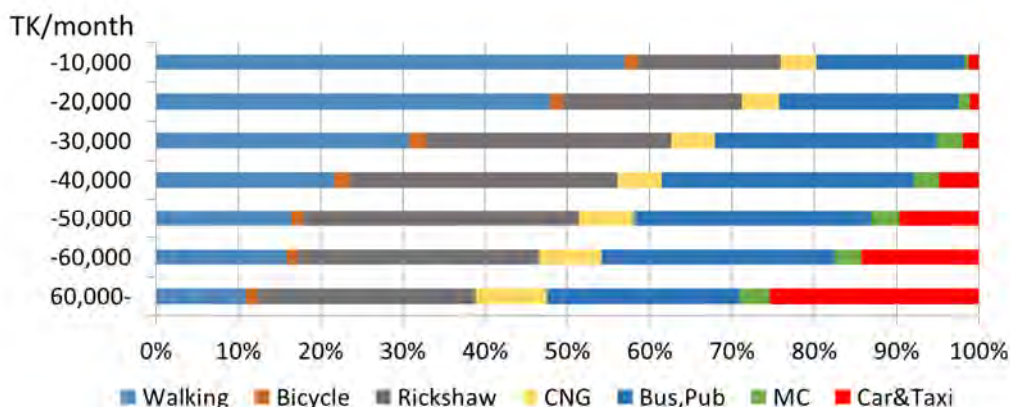
**(6) Modal Share by Household Income Group**

Table 10.6 and Figure 10.8 show the number of trips and modal share by household income. For low income group, “Walking” is the major mode of travel while “Car” share increases as income increases. The share of “Bicycle” and “Motorcycle” are few in each group. Figure 10.9 shows the modal share without walking and bicycle wherein “Rickshaw” and “Bus” shares slightly declining with increasing income.

**Table 10.6 Number of Trips by Household Income Group**

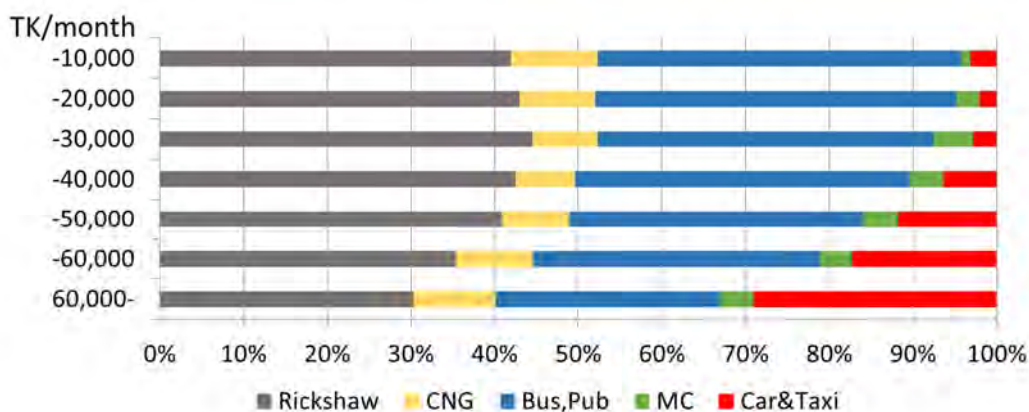
Household Income	Walking	Bicycle	Rickshaw	CNG	Bus, Pub	MC	Car&Taxi	Truck
-10,000	3,862,950	109,988	1,179,024	291,634	1,218,638	31,621	88,169	8,739
-20,000	5,225,472	174,795	2,371,689	496,249	2,383,301	150,475	114,170	10,122
-30,000	1,437,480	93,116	1,398,807	244,804	1,262,478	147,755	89,422	1,893
-40,000	472,057	43,344	710,566	119,225	667,818	67,367	106,409	661
-50,000	209,785	18,857	428,469	85,463	368,064	44,239	123,334	1,141
-60,000	147,047	13,032	271,819	70,879	262,368	29,648	132,709	65
60,000-	274,736	33,387	666,329	217,701	590,079	88,922	639,439	267
unknown	103,376	6,389	206,206	33,975	198,399	14,928	131,424	101

Source: JICA Study Team (2014)



Source: JICA Study Team (2014)

**Figure 10.8 Modal Share by Household Income Group with Walking and Bicycle**

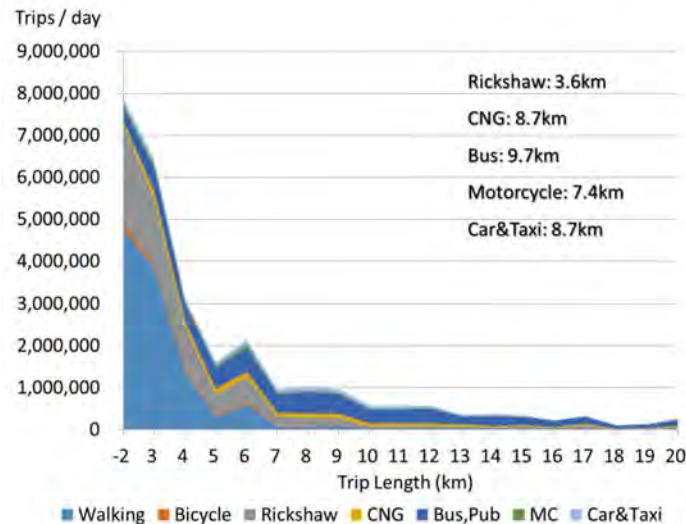


Source: JICA Study Team (2014)

**Figure 10.9 Modal Share by Household Income Group without Walking and Bicycle**

### (7) Trip Length

The number of trips by mode by trip length is shown in Figure 10.10. “Walking” and “Rickshaw” are selected for short distance travel while “Bus” is selected for long distance travel. The average trip length each mode are recorded as 3.6km for Rickshaw, 8.7km for CNG, 9.7km for Bus, 7.4km for Motorcycle and 8.7km for car & Taxi.



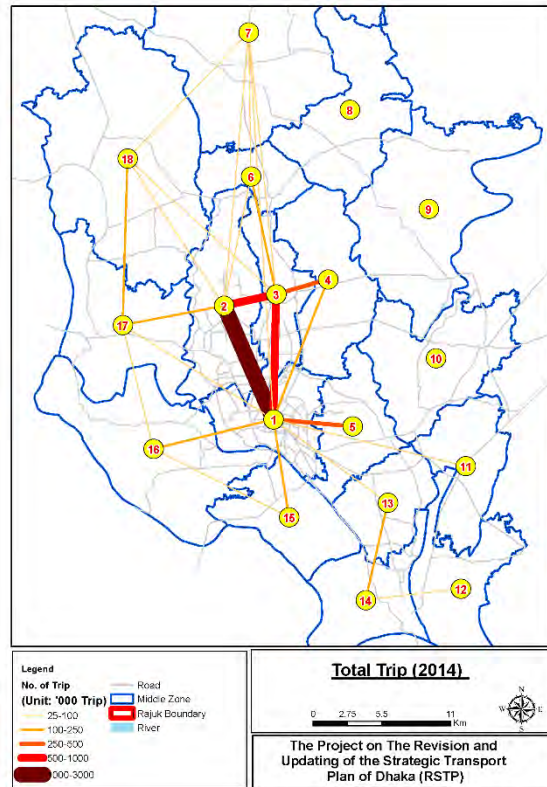
Source: JICA Study Team (2014)

**Figure 10.10 Number of Trips by Mode by Trip Length**

### (8) Desire Line and Current Road Situation

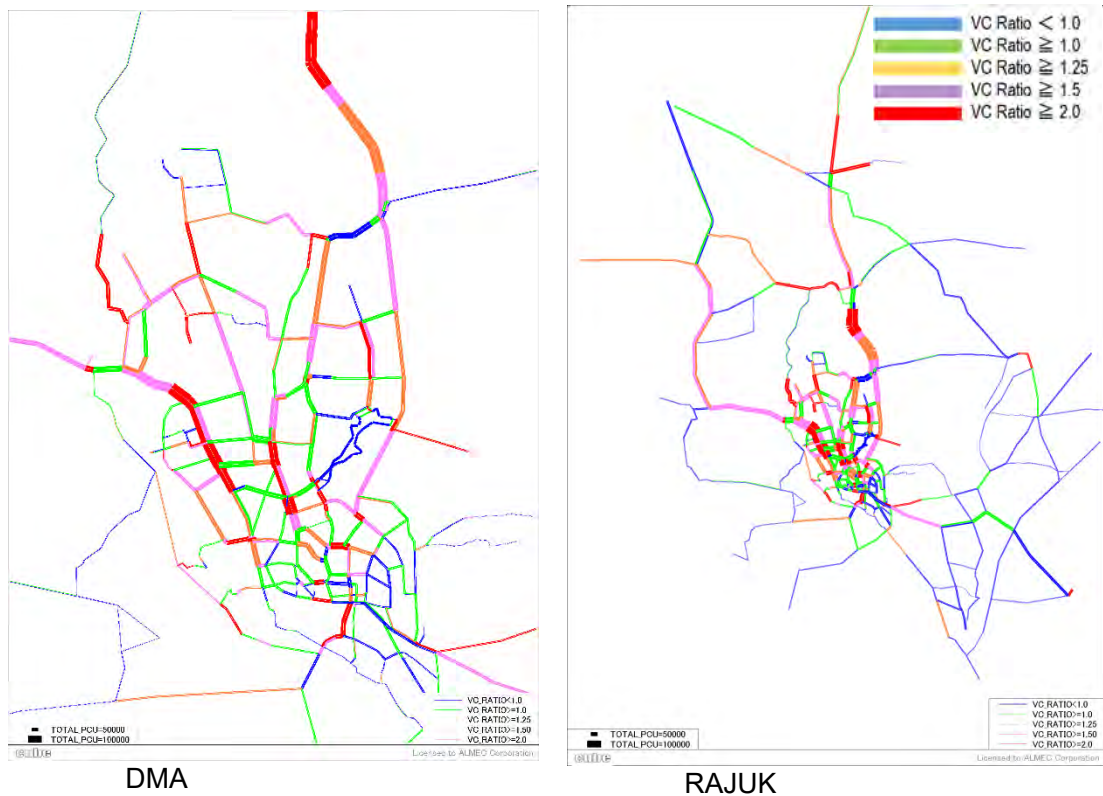
Figure 10.11 shows the desire line for all purpose. The zone numbers on the figure shows 1: South Dhaka, 2: West Dhaka, 3: Gulshan, 4: East Dhaka, 5: South East Dhaka, 6: Tongi, 7: Gazipur, 8: East Gazipur, 9: Kaliganj, 10: Rupganj, 11: North Sonargaon, 12: South Sonargaon, 13: North Narayanganj, 14: South Narayanganj, 15: South Kareniganj, 16: North Kareniganj, 17: South Savar and 18: North Savar. The busiest corridor is between South Dhaka and West Dhaka with 2.1 million trips per day. Following busy corridors are between West Dhaka and Gulshan with 0.9 million and between South Dhaka and Gulshan with 0.9 million. In the outside of DMA, the travel between South and North Savar is heavy.

Figure 10.12 shows the current road situation which was calculated from a road assignment model. The road width and color show the traffic volume and the congestion ratio. According to assignment results, most roads in DMA are congested particularly Mirpur road, New airport road and DIT road shows heavy congestion. In outside of DMA, some primary roads which connect DCC and the cities in RAJUK are congested especially Dhaka-Aricha HW and Dhaka-Bogra HW. Average congestion ratio in RAJUK during peak hour is 1.2 which means the road capacity lacks 20% to the traffic volume. The average travel speed of road transport in the morning peak is 6.4 km/h which is faster than walking speed but lower than bicycle speed.



Source: JICA Study Team

**Figure 10.11 Desire Line in 2014**



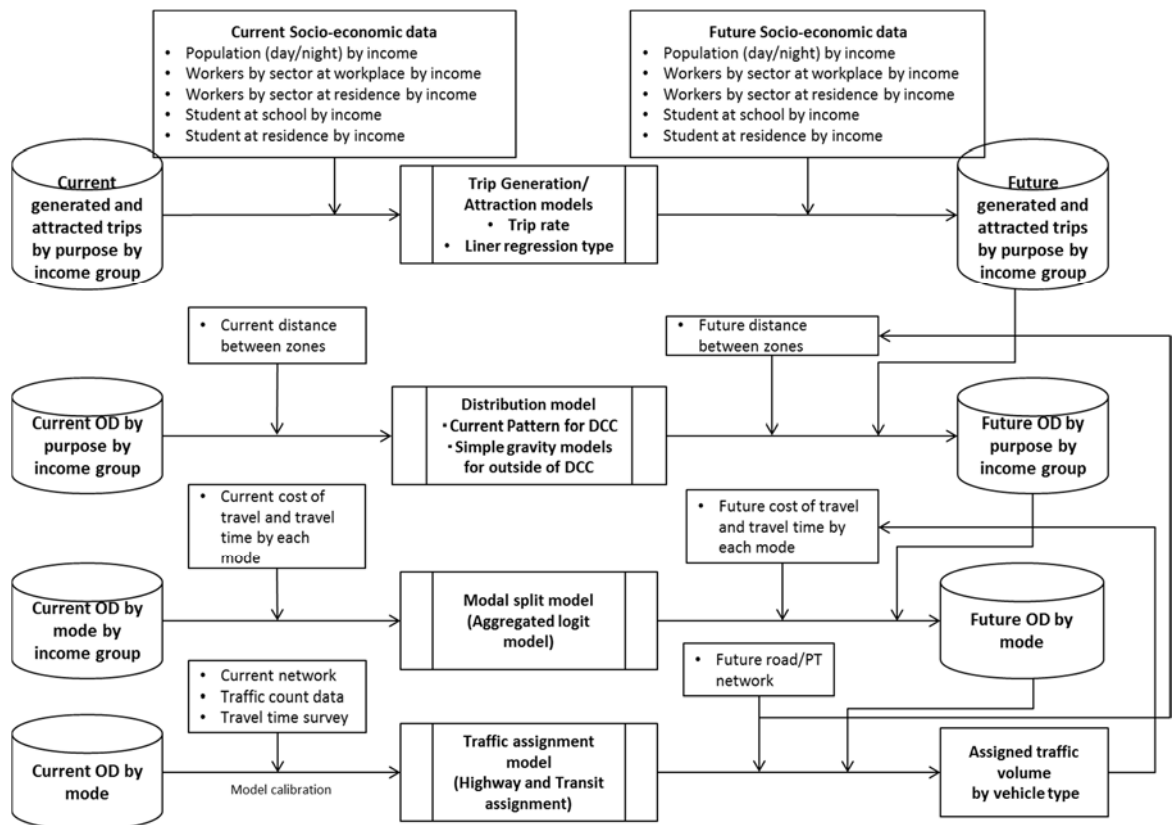
Source: JICA Study Team

**Figure 10.12 Road Situation in 2014**

### 10.3 Demand Forecast Model

#### (1) Outline

The demand forecast model in Dhaka was developed based on the conventional four steps demand forecast process. The demand model was constructed separately for low household income group (less than 20,000 TK/ month), middle household income group (20,001 – 50,000 TK/ month) and high household income group (more than 50,001 TK/ month) as their traffic characteristics are different. The outline of the four steps demand forecast modelling procedures and flow of data is briefly illustrated below. The model is consisted four steps which are trip generation/ attraction step, distribution step, modal split step and traffic assignment step. These steps will be explained in the following sections.



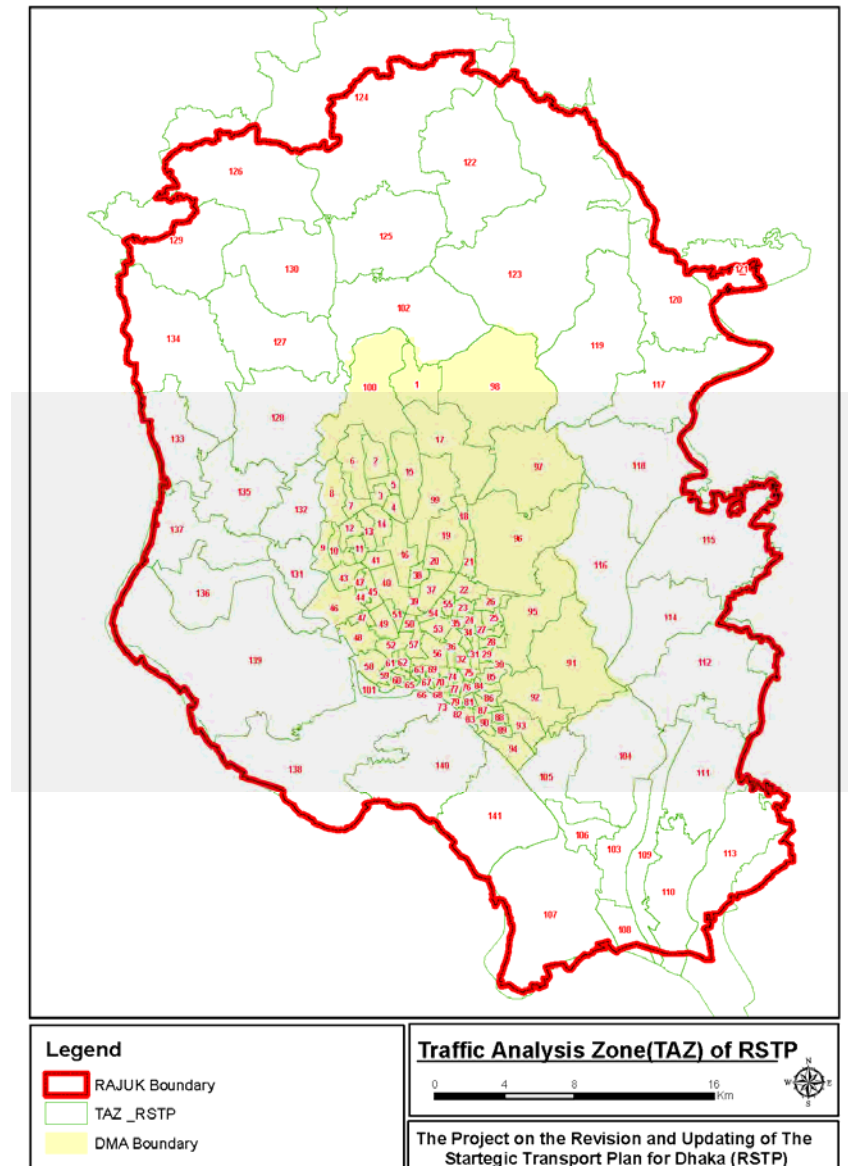
Source: JICA Study Team

**Figure 10.13 Outline of the Four Steps Demand Forecast Model**

#### (2) Zone System

The study area is divided into 141 internal zones as shown in Figure 10.14. In addition, there are 49 external zones representing outside areas of RSTP study area and 5 special trip generation zones representing airport, ferry terminal and rail stations. The zone system is summarized in Table 10.7.





Source: JICA Study Team

**Figure 10.14 Zone System**

**Table 10.7 Summary of Zone System**

Area description		Number of zones
Internal zone	DCC	90
	DMA	11
	RAJUK	40
External zones	Outside of RAJUK	49
Special generator zone	Airport	1
	Ferry terminal	1
	Rail station	3
Total		195

Source: JICA Study Team

### (3) Trip Generation and Attraction Models

The trip generation and attraction models used trip rate and liner regression techniques. The trip rates and parameters of model were estimated separately by household income group by trip purpose. As trip purpose, eight purposes were applied to modelling. These are “Home to Work”, “Home to School”, “Home to Others”, “Work to Home”, “School to Home”, “Other to Home”, “Non home based others” and “Non home based business”.

### (4) Trip Distribution Models

The urban structure in DCC will not dramatically change as most of the land in this area has already been developed. It is therefore expected that there won't be much change in the trip pattern in the said area. Meanwhile, trip distribution pattern of surrounding area of DCC will have a drastic change due to the rapid increase of population as a result of new urban development. Considering this scenario, a current trip pattern method was adopted for DCC and a gravity model was developed for RAJUK area excluding DCC. The current trip pattern method will also be literally applied as a current trip distribution in the future. On the other hand, the gravity model can predict trip distribution between zones by using Newton's law of universal gravity which can be applied to new development area. The equation of the gravity model is given below. The models were designed reparatory by purpose by household income group.

$$T_{ij} = k * \frac{G_i^\alpha * A_j^\beta}{d_{ij}^\gamma}$$

Where,  $G_i$ : Total trip generation in zone i  
 $A_j$ : Total trip attraction in zone j  
 $d_{ij}$ : Shortest route distance between zone i and j  
 $\alpha, \beta, \gamma$ : Parameters  
k: Constant

### (5) Modal Sprit Model

Firstly, walking and bicycle trips are excluded from all trips based on current share by distance between zones. The current share of walking and bicycle is shown in Table 10.8 that was derived and calculated from the result of HIS data.

A binary logit model was adopted as a modal sprit model. The model structure and model equation is shown below.

$$P = \frac{1}{1 + e^{k + \sum \alpha x}}$$

Where,  $\alpha$ : Parameter  
k: Constant  
x: Time difference, Cost Difference

The time and cost between zones by mode for input of the modal sprit model were calculated as below.

### **Time**

Car, MC, CNG: From assignment results

Bus & Train: Access and waiting time for bus (10 min) + In vehicle time of bus (Considering boarding and alighting time, it was applied 80% of road assignment result) + Access time to rail station (100m / 4km/h) + Waiting time of rail (half of headway, Maximum is 30 min) + In vehicle time of rail

Rickshaw: 75% of road travel time from assignment result, however maximum speed is 6km/h

### **Cost**

Car: Toll + Vehicle operation cost / Average occupancy

MC: Toll + Vehicle operation cost / Average occupancy

CNG: CNG fare / Average occupancy excluding driver

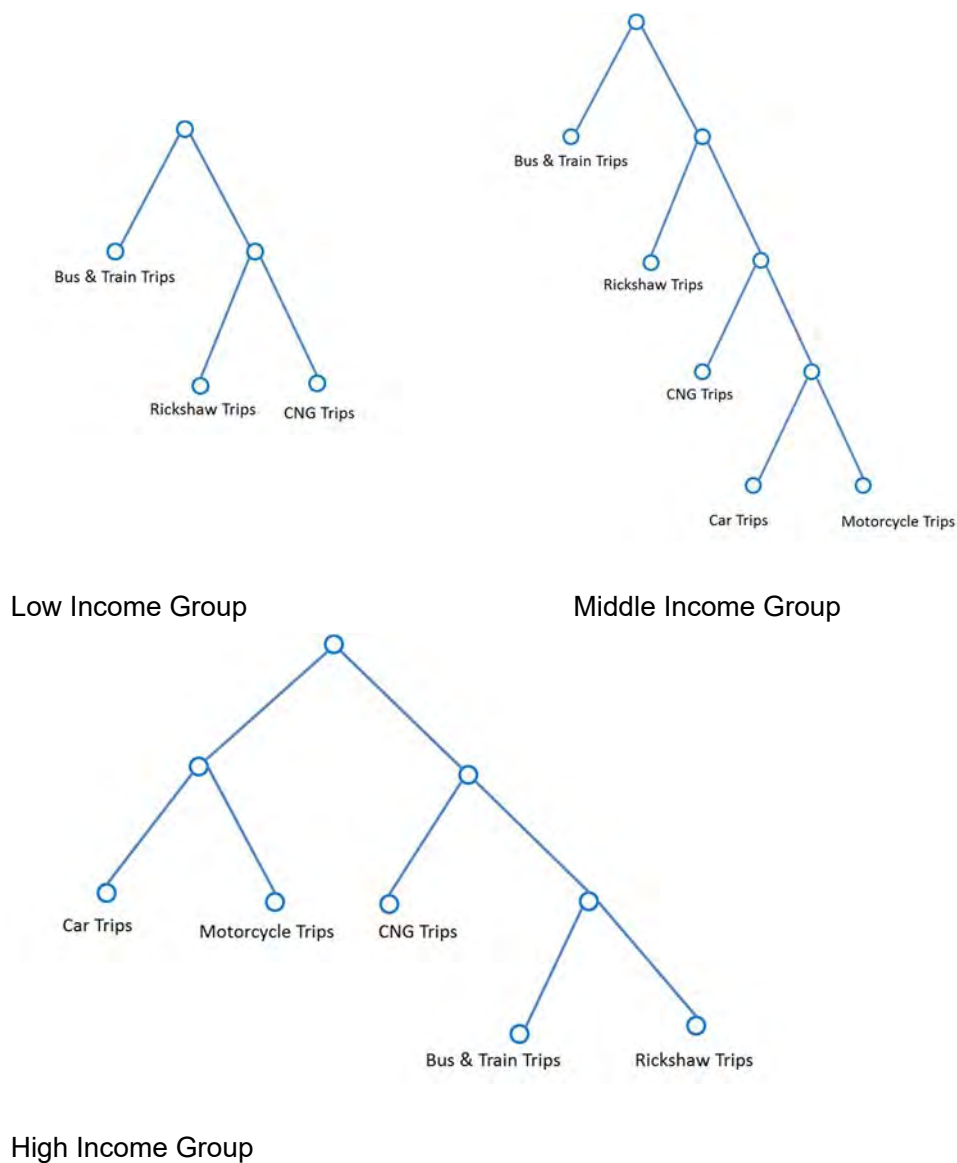
Bus & Train: Bus fare + Rail fare

Rickshaw: Rickshaw fare / Average occupancy excluding driver

**Table 10.8 Share of Walking and Bicycle by Travel Distance**

Dist (km)	Low Income	Middle Income	High Income
>2	70%	50%	37%
3	69%	47%	28%
4	59%	27%	13%
5	31%	13%	3%
6	22%	10%	3%
7	12%	7%	3%
8	12%	4%	2%
9	11%	3%	2%
10	10%	2%	1%
10<	0%	0%	0%

Source: JICA Study Team



Source: JICA Study Team

**Figure 10.15 Structure of Modal Split Model**

**(6) Trips from External and Special Generator Zones**

Current numbers of trips from external and special generator zones were collected by the cordon survey. These were expanded up to trips on 2025 and 2035 using growth rate of GRDP.

**(7) Traffic Assignment**

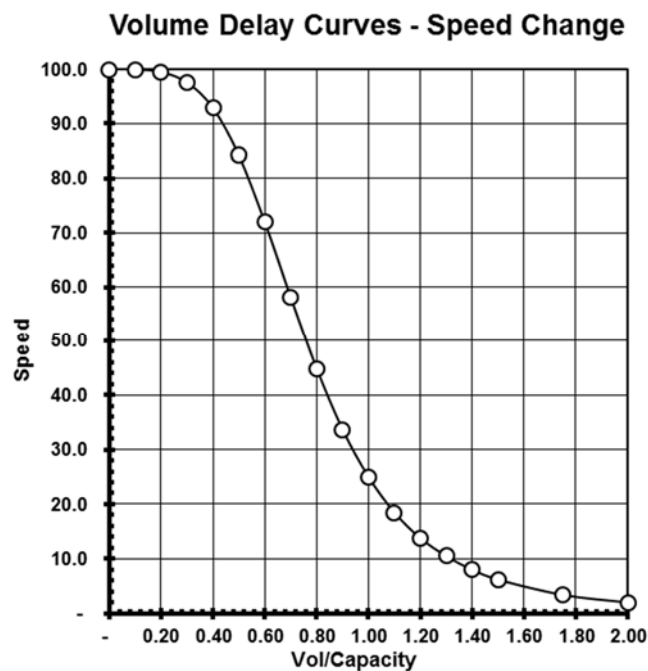
There are two traffic assignment processes namely; highway assignment for private modes including Motorcycle, CNG, Car and Truck and transit assignment process for Bus and Rail.

The highway assignment process was derived from a well-known 'equilibrium' method, where the traffic from each O/D pair is assigned iteratively to the network until no cheaper/ quicker route could be found. The shortest path building was based on the generalized cost. The equilibrium method re-calculates the new travel time based on the road capacity and assigned traffic volume after each assignment iteration. The

speed/ flow i.e., volume delay function was calibrated according to the network, and is based on the BPR function. The general form of the BPR function is described below and is graphically depicted in Figure 10.16.

$$\text{BPR function} \quad t = t_0 \left\{ 1 + \alpha \left( \frac{X}{C} \right)^\beta \right\}$$

Where, t : Travel time  
 $t_0$  : Free flow time  
 X : Traffic volume  
 C : Road capacity  
 $\alpha, \beta$  : Parameter  $\alpha = 3.0, \beta = 4.0$



Source: JICA Study Team

**Figure 10.16 BPR Function**

The transit assignment model assigns the public transport trips to bus & railway routes as operated. The transit assignment process is based on minimum generalized cost of travel between each origin and destination pair, and it includes: fare, access/ egress time, walk time, wait time, in vehicle time and transfer time. The output from the transit assignment model is the boarding and alighting passengers at bus stop, rail station, and line volumes.

## 10.4 Future Traffic Demand

### (1) Number of Trips

As projected, the total production trips within the study area by 2025 and 2035 will be 42 million and 51 million trips per day respectively as shown in Table 10.9. An increase of 13 million trips in 2025 and 22 million trips in 2035 from 2014 due to population

growth, increasing in income, increasing education continuance rate and so on. The number of production trips from external and special generator zones is likewise expected to increase by triple in 2035 from 2014 due to the projected economic growth.

Table 10.10 shows the number of production trips by area wherein South Dhaka will produce more than 10 million trips per day in 2035 while its growth rate is not significantly higher. On the other hand, the growth rate of the surrounding area of DMA is higher compare to DMA area. Meanwhile, the production trips from Kaliganj in 2035 will be eight times higher than that of 2014 while Narayanganj and North Savar will produce more than 4 million trips per day.

**Table 10.9 Summary of Number of Trips**

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

Source: JICA Study Team

**Table 10.10 Number of Production Trips by Area**

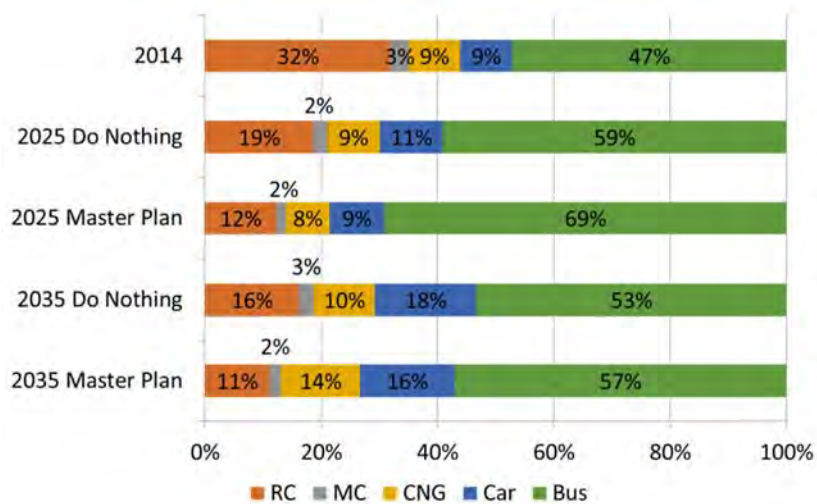
Area	2014 (Trips)	2025 (Trips)	2035 (Trips)	Growth Rate 2014-2025	Growth Rate 2014-2035
1. South Dhaka	8,764,000	9,614,000	10,092,000	1.10	1.15
2. West Dhaka	6,107,000	6,861,000	7,788,000	1.12	1.28
3. Gulshan	2,745,000	3,165,000	4,169,000	1.15	1.52
4. East Dhaka	921,000	2,140,000	3,207,000	2.32	3.48
5. South East Dhaka	1,504,000	2,743,000	3,276,000	1.82	2.18
6. Tongi	800,000	1,426,000	1,628,000	1.78	2.04
7. Gazipur	1,752,000	3,195,000	4,255,000	1.82	2.43
8. East Gazipur	129,000	213,000	252,000	1.65	1.95
9. Kaliganj	226,000	1,015,000	2,030,000	4.49	8.98
10. Rugganj	573,000	916,000	911,000	1.60	1.59
11. North Sonargaon	249,000	419,000	411,000	1.68	1.65
12. South Sonargaon	356,000	778,000	750,000	2.19	2.11
13. North Narayanganj	1,162,000	2,013,000	2,249,000	1.73	1.94
14. South Narayanganj	934,000	1,393,000	1,722,000	1.49	1.84
15. South Kareniganj	342,000	889,000	938,000	2.60	2.74
16. North Kareniganj	632,000	899,000	1,118,000	1.42	1.77
17. South Savar	881,000	1,680,000	2,022,000	1.91	2.30
18. North Savar	1,832,000	3,342,000	4,362,000	1.82	2.38
Total	29,909,000	42,701,000	51,180,000	1.43	1.71

Source: JICA Study Team

**(2) Modal Share**

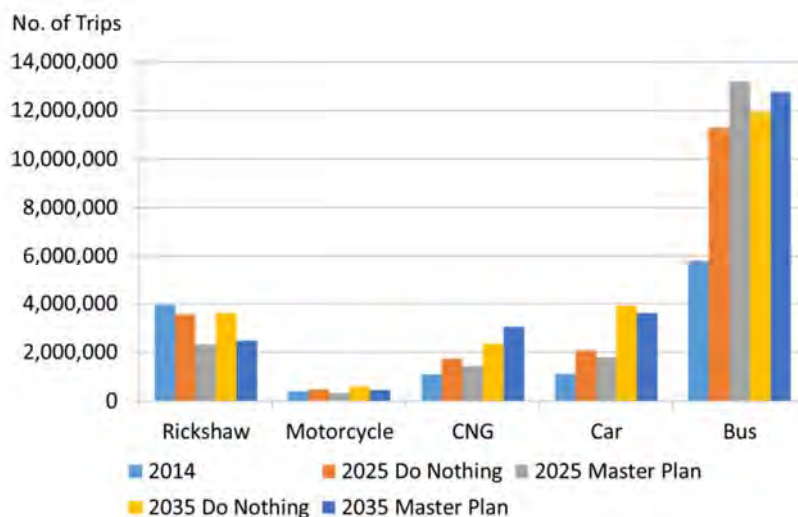
Modal share changes depending on the transport network. As shown in Figure 11.17, the rickshaw share will decrease while the bus share will increase at any given cases. As per the master plan case in 2035, the bus share can be kept 57% as highest share due to the expansion of MRT and BRT lines. Meanwhile, car share will be expected to double due to upgrading of income.

Figure 10.18 shows the number of inter trips by mode as per each cases. As projected, the number of rickshaw and motorcycle trips will be in constant or will show a slight decline while CNG, Car and Bus trips will increase significantly. As a result of increasing trip length, walking and rickshaw trips will convert to other modes, particularly to bus trip. In here, rail trip is also included in bus trip.



Source: JICA Study Team

**Figure 10.17 Modal Share of Inter Trips in 2025 and 2035**



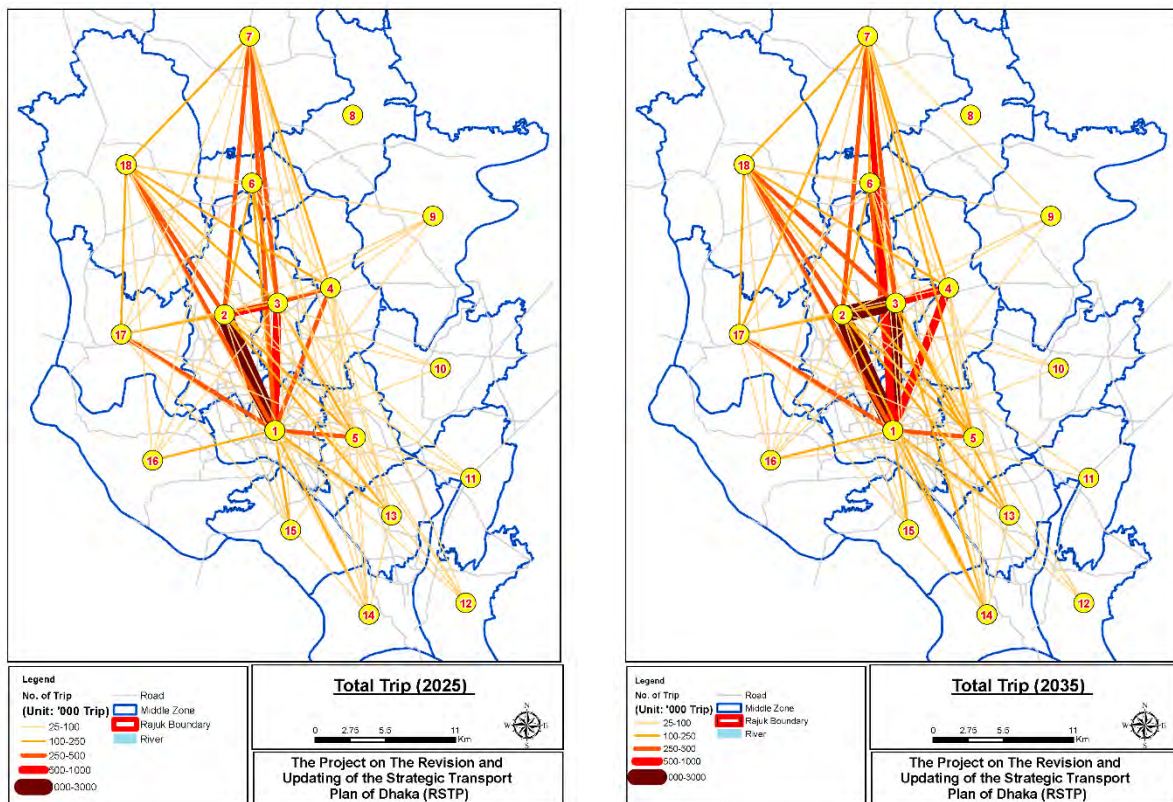
Source: JICA Study Team

**Figure 10.18 Number of Trips by Mode in 2025 and 2035 excluding Intra Trips**

### (3) Desire Line

The desire lines in 2025 and 2035 are presented in Figure 10.19. The trips within the DCC area are estimated to be still in huge number. The corridor between South and West Dhaka in 2035 is the busiest with 2.6 million trips per day, followed by the corridor between West Dhaka and Gulshan with 1.1 million trips and corridor between South Dhaka and Gulshan with 1.0 million trips.

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



Source: JICA Study Team

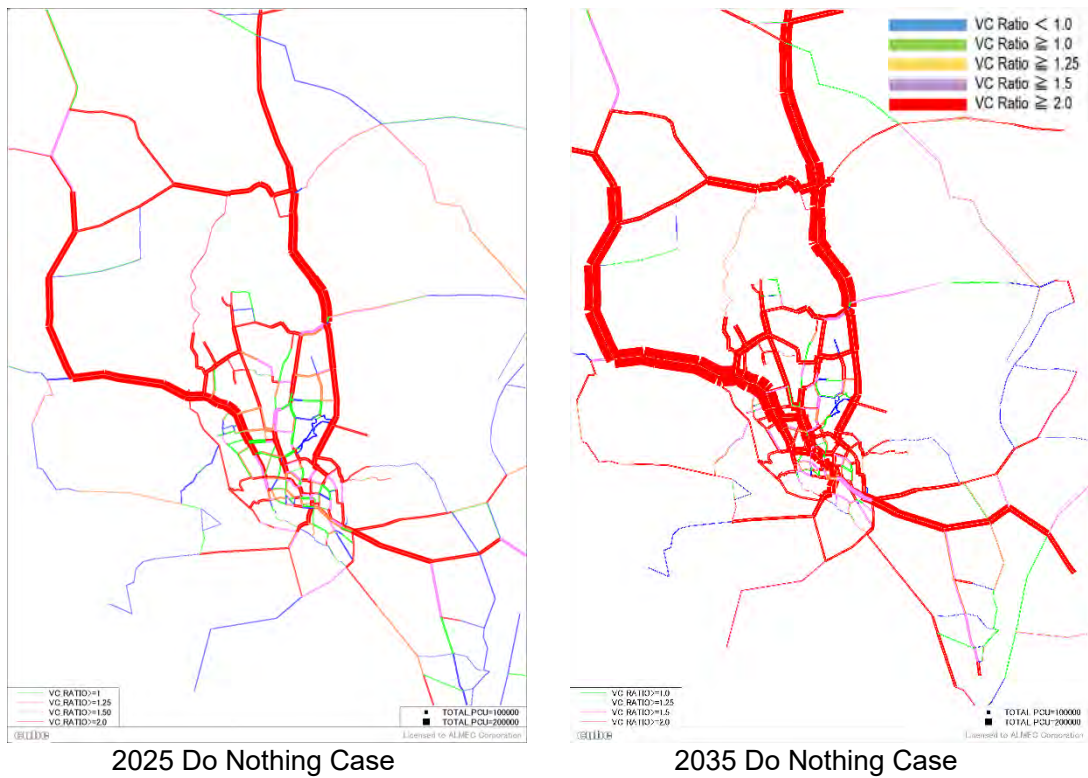
**Figure 10.19 Desire Line in 2025 and 2035**

### (4) Assignment Results

Figure 10.20 shows the highway assignment results of do nothing case in 2025 and 2035. Highway assignment results of do nothing case as shown in Figure 11.20 indicates that the road transport in Dhaka by 2035 will not be worked out due to heavy traffic congestion if there won't be provisions of any roads and public transport. The average congestion ratio by 2035 will be 3.7 compared to 1.2 in 2014 and the average travel speed will decline to 4.7 km/h from 6.4 km/h in 2014.

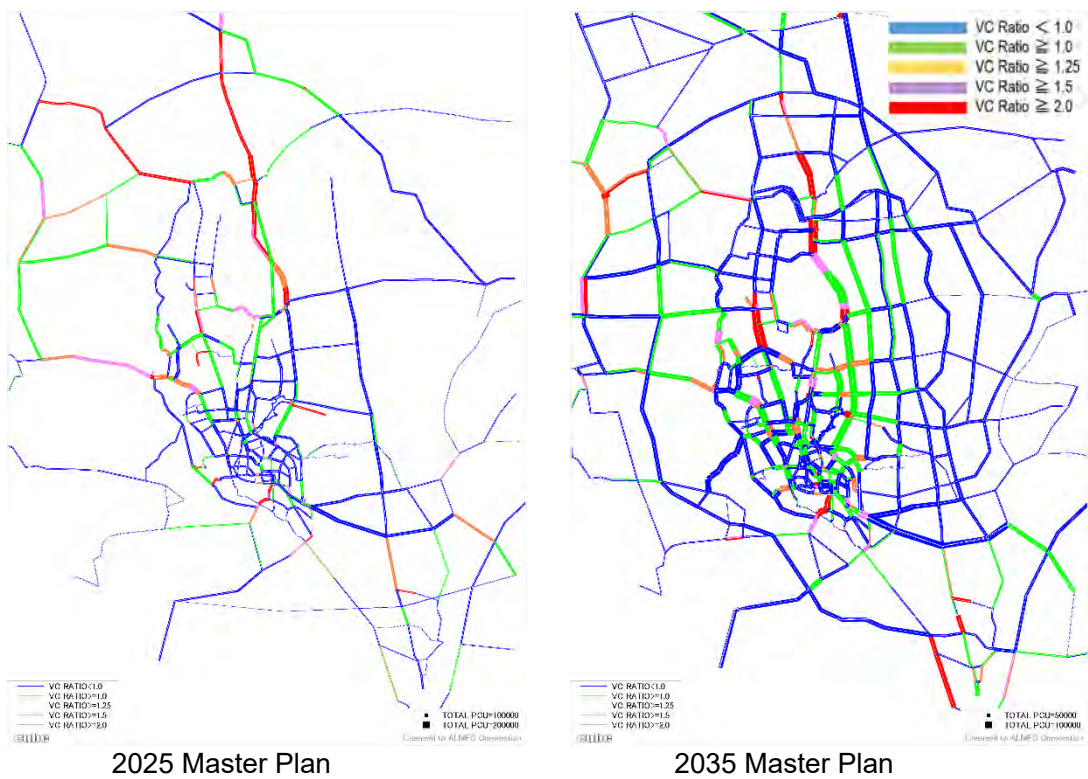
Whereas if the RSTP masterplan get implemented, the road congestion will be solved as presented in Figure 10.21. The average congestion ratio and the travel speed in 2035 will be 0.8 and 13.7 km/h. The person-hours can save 35 million hours per day compared to the do nothing case.





Source: JICA Study Team

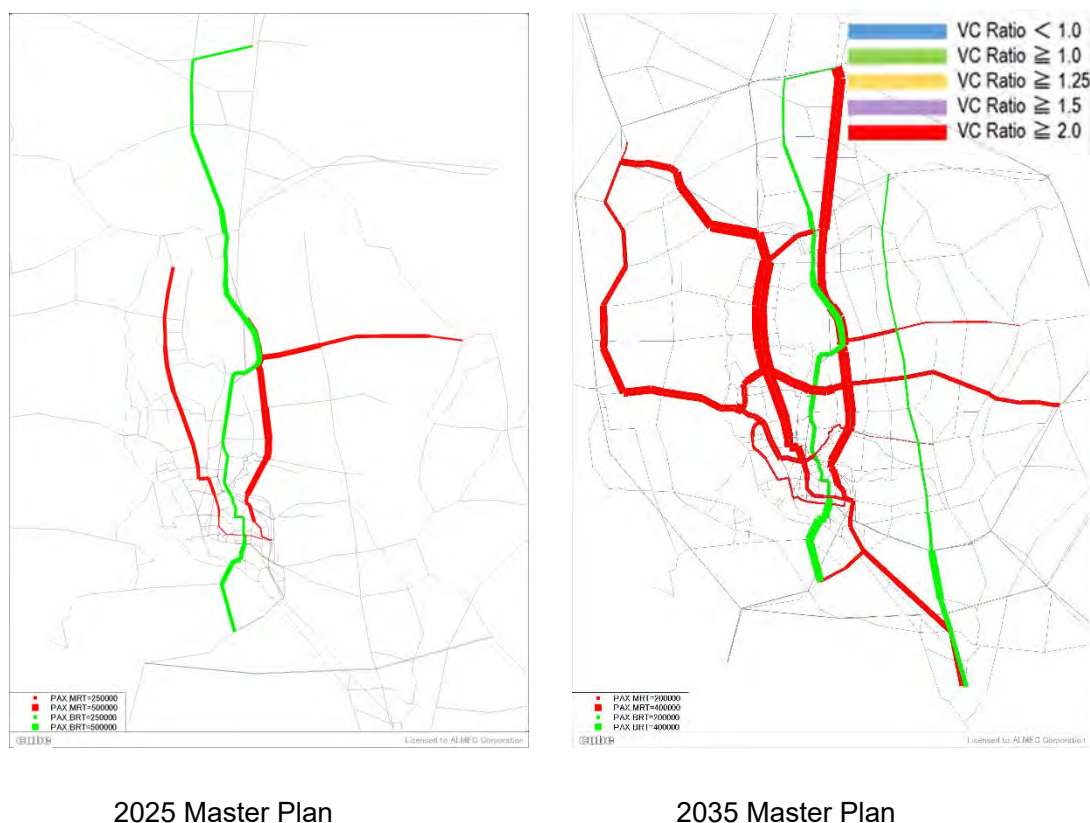
**Figure 10.20 Highway Assignment Results of Do Nothing Case in 2025 and 2035**



Source: JICA Study Team

**Figure 10.21 Highway Assignment Results of Master Plan Case in 2025 and 2035**

The transit assignment results of master plan case in 2025 and 2035 are shown in Figure 10.22 and Table 10.11. The total daily ridership of MRT and BRT in 2025 and 2035, as estimated, will be 3.7 million and 9.0 million respectively. Particularly, MRT1, BRT3 and MRT6 are projected a huge passengers of 1.8 million. Highest PPHPD will be recorded by MRT6 with 45,860 persons in 2035, followed by MRT1 with 37,770 persons.



Source: JICA Study Team

**Figure 10.22 Transit Assignment Results of Master Plan Case in 2025 and 2035**

**Table 10.11 Number of Passengers of MRT and BRT in 2025 and 2035**

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

Source: JICA Study Team

As presented in “Modal Share” section, the bus and rail share will have the highest share up to year 2035. However, it might be difficult to keep high bus share due to popularization of motorcycle. Therefore it was studied that Bus and Rail share will decline to 40% and this declined trips were converted to Motorcycle trips. The results are shown in Figure 10.23. The traffic congestion will slid to worst compared to the masterplan case due to the increasing motorcycle trip. The average congestion ratio and the average speed in 2035 will be 1.2 and 8.8 km/h. The rail user will decrease compared to the master plan case. However total daily ridership will still be estimated to 2.1 million in 2025 and 5.8 million in 2035 as shown in Figure 10.24 and Table 10.12.



2025 (Bus & Rail Share: 40%)

2035 (Bus & Rail Share: 40%)

Source: JICA Study Team

**Figure 10.23 Highway Assignment Results in 2025 and 2035 (Bus & Rail Share: 40%)**



2025 (Bus & Rail Share: 40%)

2035 (Bus & Rail Share: 40%)

Source: JICA Study Team

**Figure 10.24 Transit Assignment Results in 2025 and 2035 (Bus & Rail Share: 40%)**

**Table 10.12 Number of Passengers of MRT and BRT in 2025 and 2035 (Bus & Rail Share: 40%)**

Line	2025		2035	
	Daily Ridership (Pax/day)	PPHPD	Daily Ridership (Pax/day)	PPHPD
MRT1	765,700	18,360	1,189,500	23,760
MRT2	-	-	721,800	14,870
BRT3	1,022,800	12,870	1,153,200	15,990
MRT4	-	-	233,300	12,620
MRT5	-	-	997,800	20,280
MRT6	297,900	8,730	1,158,600	29,340
BRT7	-	-	320,900	13,130
Total	2,086,400	-	5,775,100	-

Source: JICA Study Team

## 11. URBAN TRANSPORT NETWORK DEVELOPMENT SCENARIO

### 11.1 Overall Transport Policy

#### (1) Current Urban Development Scenario

City growth – in terms of population, urbanization, scale of economic activities, and household income levels – has been rapid in Dhaka. It is unlikely to slow down due to the unique position of the city as the economic engine of the entire Bangladesh. The population in RAJUK area will be 26.3 million in 2035. A large part of this growth will be accounted by in-migration, as rural population gets attracted into the city by expanded job opportunities and prospects of better lives. Household income is expected to grow by about 4 times of the current levels. As a consequence, some of the dramatic changes that will ensue are:

- **Expanding urbanization:** Although the central areas will retain their density, suburbanization will occur through a mushrooming of medium- to low-density residential areas as households with higher incomes seek larger living spaces, better environment, and car ownership. The adjoining areas will become closely intertwined with the city's social and economic activities.
- **Progressing motorization:** As economy grows, household car ownership ratio will increase inevitably. The current rate of car ownership is 3.3% and the current rate of motorcycle ownership is 9.4% in RAJUK area and those rate will increase sharply with increase in income by 2035. Coupled with the population growth and longer trip length, stress to road users will be strong due to congestion, uncomfortable commuting, long travel times and parking space scarcity.
- **Worsening living conditions for low-income groups in the central areas:** Urban redevelopment will be accelerated in the central areas for business and commercial activities, therefore exerting pressures on property values and on low-income households to relocate.

As other cities in developed and developing countries have experienced, such a scale of urban growth will entail painful adjustments on the residents of the city.

Dhaka and its adjoining areas would continue to be the main link of Bangladesh to the global economy. The country's global competitiveness will therefore rely on the efficiency of transport system in the Dhaka urban area.

#### 1) Objectives

The city's future should be livable as well as competitive and its transport sector should support and facilitate this objective. The overall goal of urban transport is to:

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

Accordingly, eight specific objectives in the master plan are identified:

- Promotion of social understanding about urban transport problems and issues
- Effective management of urban growth and development
- Promotion and development of attractive public transport
- Efficient traffic control and management
- Effective management of transport demand

- Comprehensive development of transport space and environment
- Enhancement of traffic safety and reduced environmental impacts
- Strengthening of urban transport administrative and management capacities

## **2) Sector Constraints**

The biggest constraint is funding. There is simply no way for Dhaka to buy itself out of its existing and emerging problems. Hence, it must turn more and more to the private sector – especially in the provision of transport services, rather than for the government to assume sole responsibilities. Even if the city has a lot of funds, it cannot continuously expand the provision of roads without destroying the fabric of the city nor overcoming ROW obstacles in an expeditious manner. Besides, as apparent from other cities, adding more roads only leads to a vicious cycle of more cars and more congestion.

Getting more commuters on public transport is a must; however, to rapid motorization, this has become a challenging issue. Unlike many developing cities which struggle against the erosion of a high share of public transport, Dhaka's public transport is fortunate to have a high modal share presently. This advantage should be maintained or strengthened even further, requiring Government involvement.

A third constraint is weak institutional capability to cope with urban and transport challenges under an uncertain and changing policy environment. One way to overcome the lack of funds is to improve government's ability to harmonize land use with transport development. This, however, entails expertise and processes that are also scarce in the public sector.

## **3) On-going Initiatives**

Even before the completion of the overall master plan, some flyovers have been recently completed, and several feasibility studies and detail design works are on-going for elevated expressway, BRT Line 3, MRT Line 6, bridges and other transport infrastructures. These projects have strategic and long-term implications – not only for the master plan, but also with impacts on the city's future.

## **4) Revised Policies**

With a long-term historical perspective and a deep awareness of sector constraints, the need for new policy directions becomes clear.

A key feature of this new direction is greater reliance on the private sector in the building of transport infrastructure and operation of major transport functions, which is consistent with the national policy towards a market-based economy. Bangladesh is already moving towards this end, but success will rely on creating acceptable partnership agreements to provide greater investor confidence. This will require various policy reforms and public sector practices – such as in the method of procuring infrastructure projects, price regulation, and in the operation of governmental or semi-governmental enterprises. Such reforms may need to be triggered by privatizing existing enterprises (whether profitable or not) involves in activities where the private sector can/should make a useful contribution.

Parallel to this initiative is developing commercial public sector entities that are profit-oriented and business-like in their operations. This will also allow the public sector to compete on a level playing field with the private sector and between foreign and local companies.

Commercialization of public service provision will ensure better efficiency and combined with private sector participation (PSP), will deliver more sustainable projects. For infrastructure projects, Dhaka needs a pro-active approach; conducting feasibility studies to establish the business case for PSP, including the level of government support required in each project, and marketing these opportunities to the private sector.

For passenger transport services, the public sector also needs to increase its management role, while maintaining its regulatory role, in the delivery and outcome of transport services. This entails a more participatory approach in service delivery, taking greater responsibility and being more accountable for transport outcomes. This will require building skills and capacity in management; relying less on regulations alone to reach issues and taking a more commercial approach to managing the structures of service delivery.

This specifically includes developing 'partnering relationships' with the private sector to deliver public transport services, with sustainable business models under franchise or PPP arrangements. The public sector may take partnership risks where it is in the best position to manage such risk. Sharing risk and supporting industry with appropriate regulations will strengthen its participation and control.

Building investor trust in the regulatory framework is a key requirement and will require the public sector to set high standards of governance, eradicating conflict of interests and create a system of regulatory independence and fairness.

For city expansion, better urban controls are needed to preserve the ROW (specifically, alignment and width) for future roads, rather than just planning neat and elegant arrangement of land uses per-se. Designated ROWs will provide a clear signal to the private sector on where future growth shall be, and strategically define the future shape of the city. Tax and other incentives can be used to encourage this kind of developments outside the CBD, rather than relying on the traditional instruments of administrative controls (such as grant or denial of building permits). This new policy direction will entail, among others, the following:

- (a) Adoption or promulgation by law of the future road network in undeveloped areas, in a flexible rather than rigid sense, that will allow minor changes in alignment without altering the overall network,
- (b) Removing proposed future roads, at least the primary or major arterials, from the land market.
- (c) Preparation of an integrated urban development plan with urban transport development plan for Dhaka, preferably on a GIS foundation.

Inter-city and interagency collaboration will become increasingly necessary, as the urban development spreads outside traditional city boundaries thus requiring more coordinated and integrated transport solutions.

Aside from the aforementioned three policy directions, a number of issues could also emerge to affect future policies. These are: sustainability, resettlement, and environmental issues, which all require a long-term outlook. Aside from economic and technical viability, transport projects need to be planned for sustainability (maintained, operated, and supported with funds over its life), minimum dislocation, and environmental soundness.

## 11.2 RSTP Overall Transport Development Policy

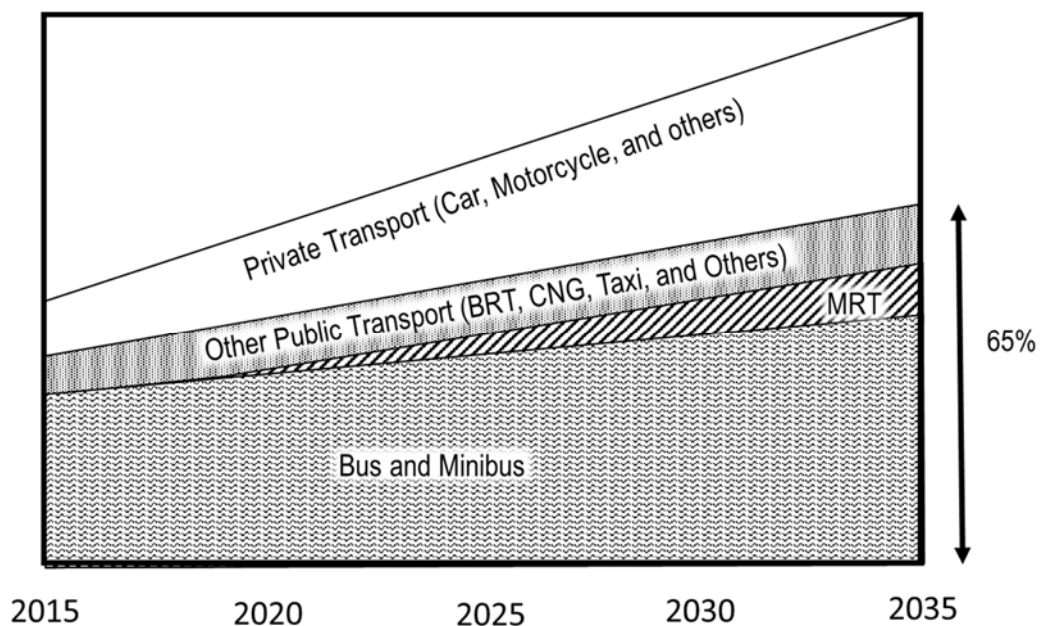
### (1) Goal

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

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

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

It should be noted that the modal shift is indicative (Figure 11.1). If at least the 60% share for public transport is not maintained, the resulting plan would overestimate the requirement for bus-rail capacity, but underestimate vehicular volume on roads, thereby affecting feasibility of many road projects.



Source: JICA Project Team

**Figure 11.1 Indicative Target for Modal Share for 2035**



## (2) Objectives and Strategies

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

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

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

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

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

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

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

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

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

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

### D. Efficient Traffic Control and Management

The current road capacity is not efficiently utilized due to widespread on-road parking, various types of encroachments and poor traffic control and management. Infrastructure capacity is largely dependent on how it is operated, managed and maintained. Better traffic management will improve capacity as well as improve safety,

amenity, and environment of the city and its people. It is also reliant on better regulation, management and enforcement combined with facility improvement and ICT technology.

Suggested policies are:

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

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

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

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

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

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

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

#### G. Enhancement of Traffic Safety

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

- G1. Establishment of traffic safety audit system;
- G2. Elimination of traffic accident black spots;
- G3. Improvement of licensing and vehicle inspection system;
- G4. Strengthening of traffic enforcement system;
- G5. Strengthening of first aid response system.

#### H. Strengthening of Transport Sector Administrative and Management Capacities

The tasks to be accomplished for the city's present and future are enormous and require a comprehensive and coordinated approach involving a wider range of players.

The role of the related authorities in leading the process is very important. Suggested measures are:

- H1. Strengthening of transport- related organizations;
- H2. Promotion of private sector participation;
- H3. Improvement of infrastructure development and management system
- H4. Strengthening of planning and management capacity;
- H5. Securing of development funds.

**(3) Main Features of RSTP**

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

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

The inter-relationship between these focuses and the identified policies is illustrated below:



Source: JICA Project Team

Figure 11.2 Main Features and Policies of RSTP

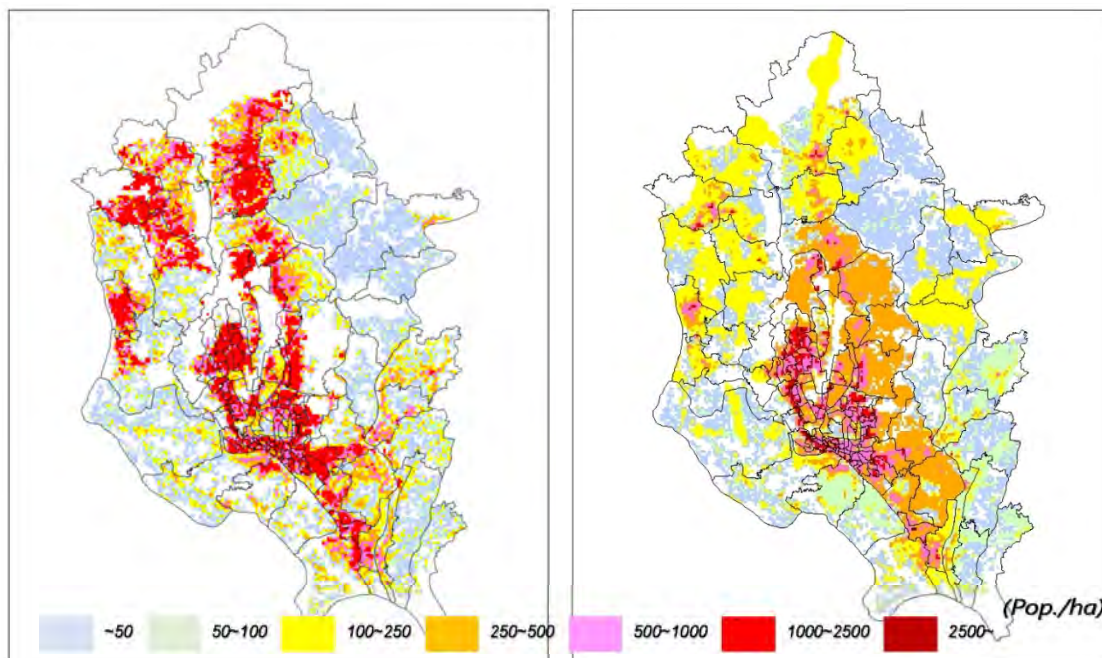
### 11.3 Land Use and Transport Integration

#### (1) General Concept

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

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

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



Pop. 26.3 million (2035)  
**Trend Scenario**  
Urban Development without any policies

Pop. 26.3 million (2035)  
**RSTP Scenario**  
Urban Development integrated urban transport network

Source: JICA Study Team

**Figure 11.3 Population Density of Trend Scenario and RSTP Scenario**

## (2) RSTP Concept

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

### 1) Integrated Urban Development

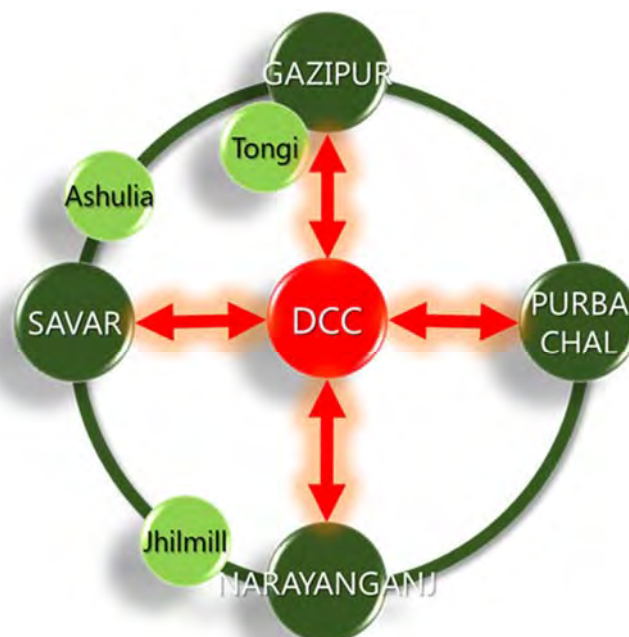
Land use and urban development must be reorganized along the mass transit corridors in a way that socio-economic activities are more effectively articulated with mass transit. This requires a review of the existing urban master plan which is rather road-transportation-based. And infrastructure development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

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

Traffic management needs to be implemented in CBD urgently for increasing demand of private modes.

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

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



Source: JICA Study Team

**Figure 11.4 Integrated urban Development Concepts of RSTP**

## 11.4 Roads

### (1) Key Principles

The main principles to be considered are as follows:

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

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

### (2) Network Pattern

Network patterning is known as an effective method in network planning. The road network of RSTP adopts the ring and radial patterns because of the existing road network and land-use characteristics which are suitable for the pattern.

### (3) Road Hierarchy

To develop a proper road network, a systematic and hierarchical functional classification is necessary. The hierarchical classification of functions is composed of expressways, urban primary roads, secondary roads, and tertiary roads.

- (a) Urban Primary Road System: The urban primary road system services the major portions of trips entering and leaving urban areas as well as the majority of throughway travel that wants to bypass the city center. In addition, significant intra-urban travel, such as between CBDs and outlying residential areas, between major urban core communities, or between major suburban centers, is served by urban arterials. For the proposed road network, the urban primary road is divided into major arterial system and minor arterial system. The major arterial system forms a significant framework linking up with the regional primary road network, while the minor arterial system provides trunk linkages between district centers and other sub-centers.
- (b) Urban Secondary Road System: The urban secondary road system interconnects with urban primary road system. It provides services to travels with moderate trip lengths at a somewhat lower level of travel mobility than primary roads. This system also distributes travel to geographic areas that are smaller than those

identified with those of higher road systems. Secondary roads must serve not only vehicular traffic but also various transportation and non-transportation activities.

- (c) Urban Tertiary Road System: The urban tertiary road system aims to provide access to areas located along the roads and to serve not only vehicular traffic but also to non-motorized vehicle and pedestrian traffic, as well as roadside non transportation activities. Some urban streets that have commercial frontage serve fairly substantial volumes of traffic. However, this traffic is of terminal in nature; thus, it does not provide movement throughout the area.

## **11.5 Public Transport**

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

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

- a) Define clearly the role and capability of Bangladesh Railway: BR has the potential to contribute to inter-city and suburban/urban transport services. However, these two services are often contradictory in large urban areas, mainly due to the differences in the nature of their services and required operation.
- b) Develop rapid mass transit system: A network of MRT and BRT must be developed to provide the city with a core public transport system offering high-quality services and integrating all major urban areas and activity centers.
- c) Establish sustainable mechanism to develop MRT/BRT network: MRT/BRT requires a large amount of investment and a lengthy period of time before it is realized. It must be developed as a network with good coverage and in integration with efficient feeder services. Strategies for an integrated development, strategic funding, and phased development must be made clear to sustain the development of the envisioned network.

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

Buses are and will be the most important mode of public transportation system in Dhaka. Although urban rail is expected to play a major role in the future, the coverage will be limited and many corridors and areas will remain that will not be served because it requires lengthy time and huge costs for construction of such system. Buses also provide important feeder services for MRT/BRT. Main planning principles should be as follows:

- a) Develop an integrated and attractive bus system: Bus services must be developed as an integrated network to provide convenient services between origins and destinations, comprising various types of modes and services including BRT, express buses, air-conditioned buses, minibuses, wagons, etc. The services must also be attractive and competitive enough to encourage a shift from private transport.
- b) Establish a sustainable bus operation and management system: The present dominance of buses and minibuses in Dhaka may not guarantee further successes in the future when diversified services are required, more bus units needs to be managed and wider areas have to be covered. Besides, people demand improved



services at affordable prices. Hence; sustainable bus operation and management systems must be established.

- c) Provide adequate environment for private sector to invest in public transport services: An effective way to improve bus services is providing fair competition among operators. Since Dhaka needs expanded and diversified bus services, providing opportunities for new investors to offer such services in a competitive manner must be considered.

## **11.6 Traffic Management and Safety**

The traffic flow in Dhaka is quite different from the traffic flow in other countries. The differences exist in vehicle composition, traffic management facilities, and traffic operation practice. As a result of such differences, traffic in Dhaka is inefficient and unsafe as evidenced by the chaotic traffic condition at many intersections and the extremely high accident rate.

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

With the number of vehicles in the study area which are expected to grow in the coming years, traffic congestion will become severe. Travel time is increasing due to the congestion of bottleneck points and traffic accidents have become a serious social problem. By simply constructing new roads or widening the existing roads cannot solve this problem, even if funds are available; nor can Dhaka can keep converting lands into roads. This situation needs a greater reliance on a more efficient use of the existing road network. To achieve this, and to realize an efficient and safe traffic, proper traffic management plays a very vital role.

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

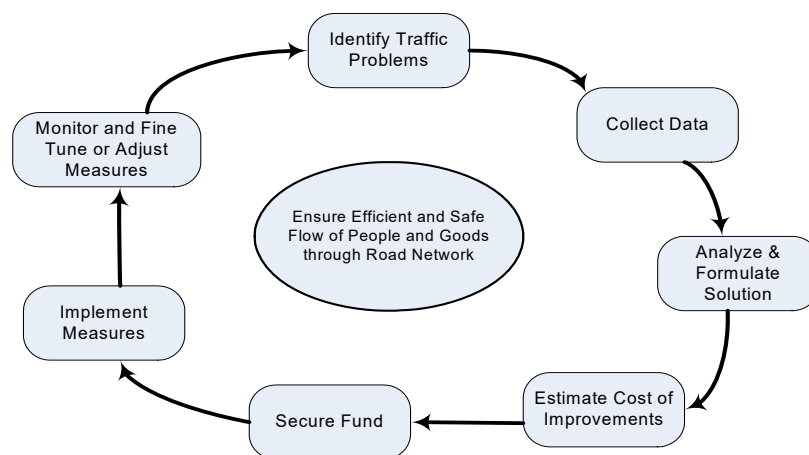
### **(2) Traffic Management Process**

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

The process is shown in Figure 11.5. It normally starts with the identification of traffic management problems and issues. The cause of problem is then analyzed based on the data collected and a solution is formulated, which may include a hard component, like intersection geometry improvement or signal installation, and a soft component such as traffic discipline campaign or stricter enforcement. Since any traffic improvement measure will incur cost, it must first be estimated and the budget must be secured before implementation. It is important to review the results of the measures to determine their effectiveness and to accumulate experiences and knowledge.

### **(3) Classification of Traffic Management Measures**

There are a variety of traffic management measures. Some of them are intended to improve efficiency, while others aim to enhance safety. Table 11.1 lists them by applicable area. It is noted that one measure can be applied to intersection, corridor, or area. Moreover, most of the measures can be applied in combination with other measures to get maximum benefits.



Source: JICA Study Team

**Figure 11.5 Traffic Management Process**

**Table 11.1 Classification of Traffic Management Measures**

Area	Category	Measures
Intersection	Geometric Improvement	<ul style="list-style-type: none"> <li>• Geometry, island, channelization, median, lane assignment</li> <li>• Wheelchair slope</li> </ul>
	Signal	<ul style="list-style-type: none"> <li>• New signal</li> <li>• Signal phase and timing updating</li> <li>• Flasher</li> </ul>
	Marking	<ul style="list-style-type: none"> <li>• Stop line, pedestrian crossing, lane line, directional arrow</li> </ul>
	Regulation	<ul style="list-style-type: none"> <li>• Turning restriction</li> </ul>
	Public transit	<ul style="list-style-type: none"> <li>• Transit signal priority</li> <li>• Exclusive bus lane at approach</li> <li>• Exemption of left turn ban</li> </ul>
	Others	<ul style="list-style-type: none"> <li>• Curve mirror, lighting</li> </ul>
Corridor	Segregation	<ul style="list-style-type: none"> <li>• Median, separator</li> </ul>
	Pedestrian	<ul style="list-style-type: none"> <li>• Mid-block pedestrian crossing</li> </ul>
	Sidewalk	<ul style="list-style-type: none"> <li>• Widening, guardrail, pavement, tree &amp; plant</li> </ul>
	Pavement marking	<ul style="list-style-type: none"> <li>• Lane line, mid block pedestrian crossing,</li> </ul>
	Regulation	<ul style="list-style-type: none"> <li>• One-way, speed limit, truck ban, no parking, pedestrian mall, transit mall</li> <li>• Reversible lane</li> </ul>
	Demand management	<ul style="list-style-type: none"> <li>• Exclusive/priority bus lane</li> <li>• High occupancy vehicle (HOV) lane</li> </ul>
	Sign	<ul style="list-style-type: none"> <li>• Regulatory sign, guide sign</li> </ul>
	Parking	<ul style="list-style-type: none"> <li>• No parking, paid parking, free parking</li> </ul>
	Public transit	<ul style="list-style-type: none"> <li>• Exclusive/priority bus lane</li> <li>• Contra-flow bus lane</li> </ul>
	Others	<ul style="list-style-type: none"> <li>• Street lighting</li> </ul>
Area	Demand management	<ul style="list-style-type: none"> <li>• Traffic cell</li> <li>• Pedestrian mall, transit mall</li> <li>• Road pricing</li> <li>• Truck ban</li> </ul>
	Signal	<ul style="list-style-type: none"> <li>• Area traffic control (ATC) system</li> </ul>
	Information	<ul style="list-style-type: none"> <li>• Traffic information system</li> <li>• Parking guidance system</li> </ul>
	Regulation	<ul style="list-style-type: none"> <li>• School zone</li> </ul>

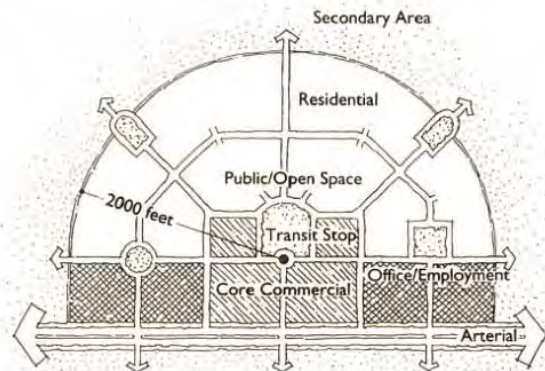
Source: JICA Study Team.

## 11.7 Concept and Importance of Transit Oriented Development (TOD)

### (1) TOD Concept and Importance

A transit-oriented development (TOD) is a compact area of mixed-use residential and commercial designed to maximize access to public transport, and also frequently encourage transit ridership. A TOD area typically is composed of a center with a transit station or stop (train station, metro station, tram stop, or bus stop), surrounded by relatively high-density development with progressively lower-density development spreading outward from the center. TODs are generally located within a radius of 400 to 800 m from a transit stop, or 600 m in average as a comfortable walking distance (around 10-minute walk).

Design principles of TOD, stated by Calthorpe, are to: (i) organize growth on a regional level to be compact and transit-supportive; (ii) place commercial, housing, jobs, parks, and civic uses within walking distance of transit stops; (iii) create pedestrian-friendly street networks that directly connect local destinations; (iv) provide a mix of housing types, densities, and costs; (v) preserve a mix of housing types, densities, and costs; (vi) preserve sensitive habitat, riparian zones, and high-quality open space; (vii) make public spaces the focus of building orientation and neighborhood activity; (viii) and encourage infill and redevelopment along transit corridors within existing neighborhoods. Figure 11.6 illustrates the spatial structure of the TOD centered by a transit stop.



Source: Peter Calthorpe *The Next American Metropolis: Ecology, Community, and the American Dream*, 1993

**Figure 11.6 TOD Concept**

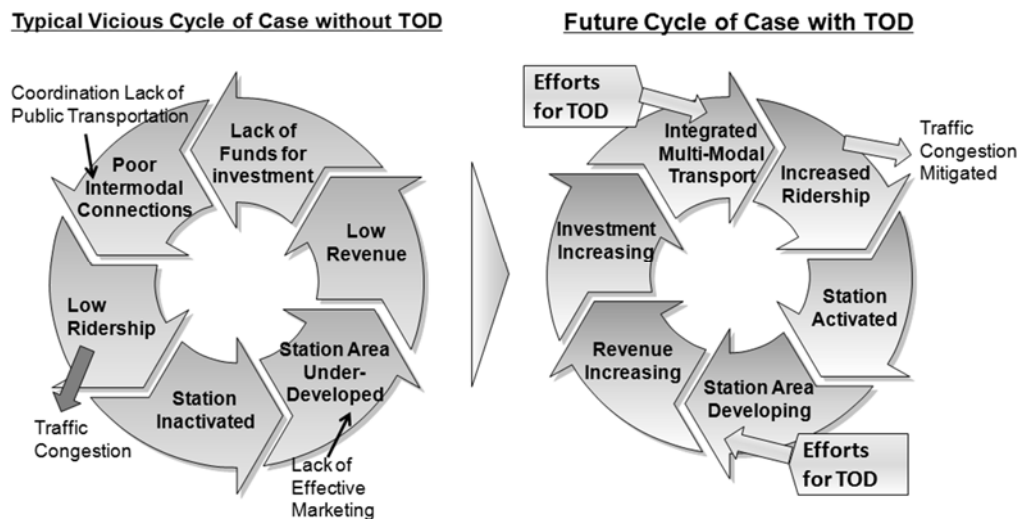
TOD was initially conceived as counter-approach to shift the society from the auto-oriented to a rather compact urban form. TOD contributes to creation of environmentally friendly society, because a shift to public transportation from private motorized transportation modes lessen energy consumption and CO<sub>2</sub> emissions, leading to “smart growth”. At the same time, a shift to public transportation also reduces space occupancy per passenger, thus, enabling more efficient urban space usage. According to NTT Data Institute of Management Consulting, a space occupancy per passenger of railway is, 1/25 that of railway, 1/2 that of bus transit, and 1/6 that of cars. In addition, railways generates 1/4 the CO<sub>2</sub> emission compared to bus transit, and 1/9 to cars.

TOD forms urban space of high-density, multi-uses, and flow of many people, urban development projects can become financially viable with property value increase, which attracts private investors and developers while the government can gain more tax income from value capture. In addition to these, macro benefits influence areas of TOD when well planned are as follows; enjoy urban services provided near stations, good walking urban space, leading to universal designed, and comfortable urban space.

### (2) Required Function to enhance MRT/BRT Utilization

Even if the MRT/BRT network is completed, it will not function in case of no related facilities. It is essential to establish feeder service from/to station and station plaza as

transfer facility in order to act railway properly. Figure 11.7 shows typical virtuous and vicious cycle by with/without integration among transport modes. As shown in the figure, in case of poor intermodal connections, it will be vicious cycle that the number of passengers and station users decreases due to inconvenience, station area development is not proceeded due to low number of passengers, and few fund for intermodal connection function enhancement can be allocated due to low revenue. In order to stop the vicious cycle and change it to virtuous cycle, it is important to enhance connecting function between railway and the other transit modes at station.



Source: JICA Study Team

**Figure 11.7 Virtuous Cycle by with/without Integration among Transport Mode**

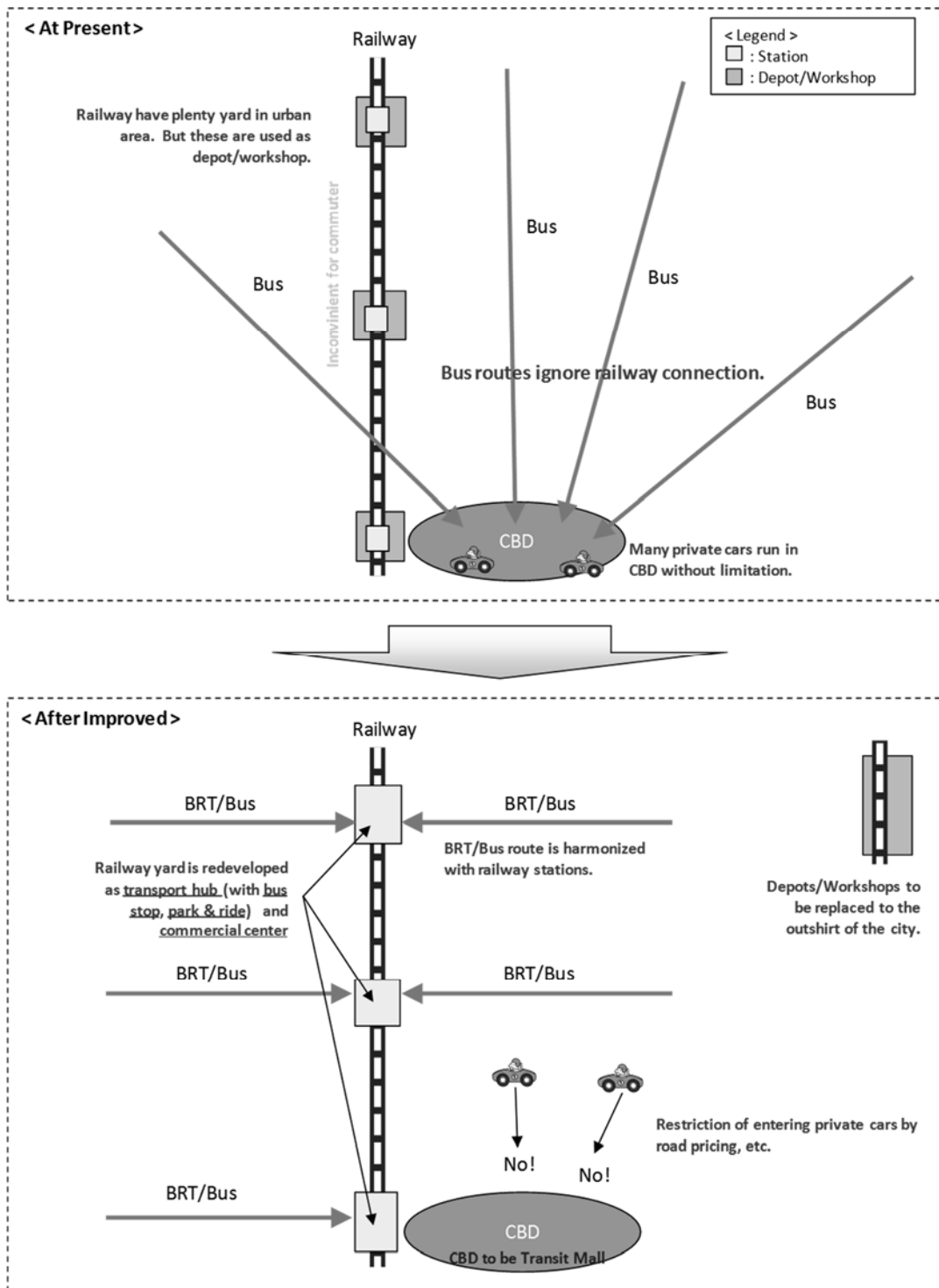
Having no MRT/BRT stations in Dhaka, here are an example of Bangladesh Railway (BR) station.

The schematic figure of the current BR line is shown as “at-present” in the figure below. It is pointed out that low network density, deteriorated infrastructure, low travel speed, low punctuality and low comfortability, etc. lead to low modal share of the current railway. These are a part of main reasons, but not all. The current railway stations are not incorporated in the current public transport network, even bus network which is usually integrated to railway networks in case of the other cities. The current bus network ignores railway stations and connect the origins and the destinations directly. Although some railway stations have potential yard for transport hub, these are currently used as depot, workshop, etc. The yard usage causes poor station access of both buses and neighboring people who can access on foot.

In order to change the situation, the following countermeasures should be conducted.

- Improvement and expansion of railway network
- Improvement of station function as transport hub (station and station plaza): to improve transfer function at railway station, and to enhance integration between railway and the other public transportation like buses, etc. (see “after improved” in the figure below)

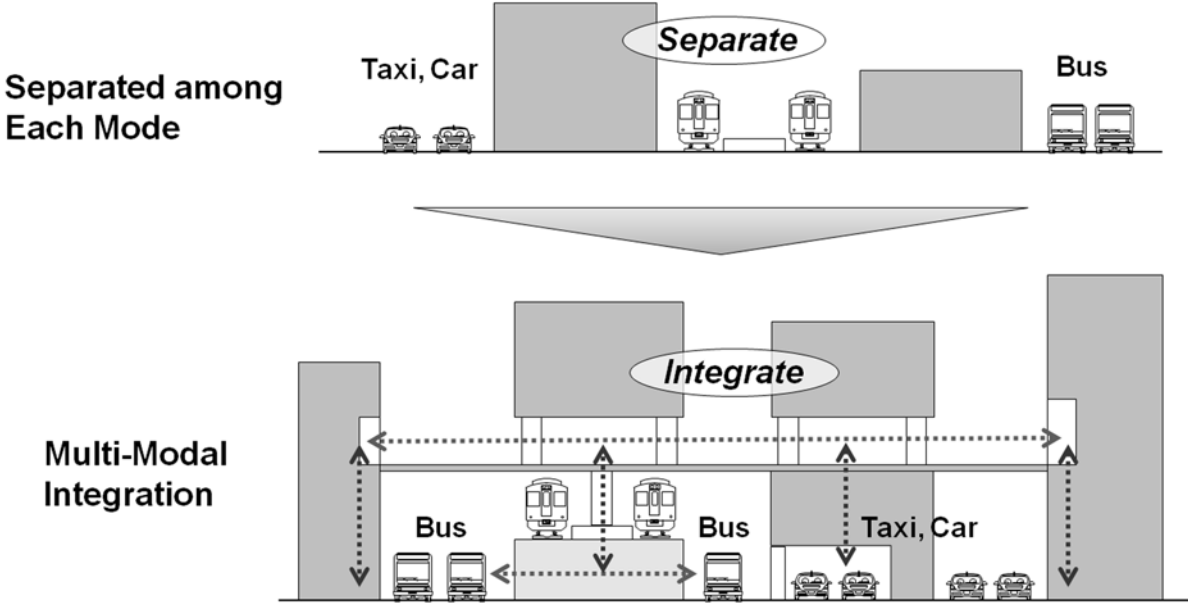
In addition, as shown as “after improved” in Figure 11.8, it is important to conduct measure for entering restriction of private car to CBD concurrently (changing CBD to transit mall), in order to realize convenience of public transport emphasizing mass transit and walking.



Source: JICA Study Team

**Figure 11.8 Schematic Image among Railway Improvement/Modernization, Railway Land Development and Integrated Multi-Modal Transport**

Image of transport hub function improvement at railway station is shown in Figure 11.9 .Integration among each transport mode would be a key of TOD because the non-Integration cause time-loss and uncomfortable transfer for passengers, and results in less-use of public transportation. The integration should be designed by combination of horizontal movement and vertical movement for passenger smooth transfer.



Source: JICA Study Team

**Figure 11.9 Schematic Image of Station Improvement for Multi-Modal Facility Integration**

Furthermore, in order to realize abovementioned “b)”, redevelopment of the current station yard is essential in middle/long-term, although small station plaza improvement with transfer function enhancement is effective in short-term. In case of MRT/BRT, TOD concepts need to be introduced to establish new stations.

## **11.8 Financing Capacity of the Government for Investment in the Transport Sector**

### **(1) Financial Capacity of National Government**

#### **1) Overview of Current Status**

Over the past years, there has been significant progress in the revenue collection. During this time, revenue collection has been increasing at the rate of 15.88 percent and this created an additional fiscal space for the Government, Therefore, the budget deficit remained stable and within the target. The foreign assistance and project assistance is increasing at the rate of 10.77 percent and 17.70 percent respectively but non-project assistance shows declining trend, which means loan assistance, is increasing in the country. On the other hand, the costs of increasing subsidies were met by borrowing from the banking system; the government burden is also increasing so as to keep SOEs in operation. However, the Government needs more financial flow to maintain transport infrastructure asset which had been constructed for the past years and to implement large projects such as sea ports, long bridges and to improve transport network including mass-rapid transit in Dhaka city.

Moreover, Bangladesh's annual development program (ADP) has been moving ahead slowly due to lack of coordination and proper policy guidelines. It is known that the reasons for the lower speed of project implementation also includes delay in preparation and approval of projects, lack of human resource and interruption in appointment of project director, consultants and the decision to present documents for procurement and difficulty in acquisition of land.

In addition, government has a practice of revising the ADP every year. Sometimes, the government changes the ADP by inclusion of new or exclusion of some listed projects in the middle of the year. The causes for revision includes delays in approval of projects, procurement related problems and shortage of fund for the projects.

In line with the urbanization strategy, it would need a more balanced growth of urban centers across the entire country through proper institutional reforms that involves the establishment of locally elected and accountable municipalities and city corporations. Property tax base needs reform to strengthen their financial autonomy along with block grants from the budget, based on principles of equity and population. Special emphasis needs to be given to improving land administration and management to arrest the spiraling urban land prices that is becoming a binding constraint to the expansion of manufacturing and modern services as well as limiting the ability to provide affordable housing.

#### **2) Budget Projection**

Chapter 7.2 explains the current status of national budget which shows the revenue and expenditures that have been increasing every year. In order to determine the financing capacity for the infrastructure development, the Study Team made a projection of GDP growth and national budget below.

##### GDP projection

GDP projection as shown in Table 11.2, Bangladesh has been showing the stable GDP growth performance, around 6% per year in the past ten years. Many organizations made a projection of future GDP growth based on the different projections, the study team estimated the GDP growth in the future. The following tables show projected GDP growth rate by each organization.

**Table 11.2 Short-term GDP Growth Projection by International Organizations**

	2015	2016	2017	2018	2019
IMF	6.4%	6.8%	7%	7%	7%
WB	6.3%	6.7%	6.7%	-	-
ADB	6.1%	6.4%	-	-	-

Source: IMF World Economic Outlook, WB Global Economic Prospect and Asian Development Bank Outlook2015

**Table 11.3 Long-term GDP Growth Projections by Research Institute and Companies**

BEF	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050
	8.7%	9.4%	9.3%	8.4%	7.7%	6.5%	6%
PWC	2014 - 2020	2020 - 2030		2030 - 2040		2040 - 2050	
	6.51%	5.14%		5.24%		4.58%	

Source: "Vision 2030: What Lies Ahead for Bangladesh in Post MDGs World?" Dr. Mustafa K. Mujeri, June 2014 and PWC World in 2050, Feb. 2015

The range of the projected GDP growth rate is from 6.1% to 8.7% in 2015-2020. In the long run, PWC projected the lowest rate of 5.14% in 2020-2030, 5.24% in 2030-2040 and 4.58 in 2040-2050. On the other hand, BIDS's projection shows much higher growth rate, particularly it projected over 9% between 2020 and 2030.

The economic growth of Bangladesh is estimated on the assumption that labor force and capital stock will increase and the government will ensure sound macroeconomic policies and stable macro environment. However, political turmoil sometimes stops economic activities and political unrest is one of the critical factors which affect the national economic growth in Bangladesh. Actually, ADB and WB lower the GDP growth projection due to the hartal in 2014-2015.

World Economic Outlook by IMF projects GDP growth rate for emerging economy as (2015 and 2020); "Emerging market and developing economies" 4.26% and 5.27%. India receives the highest projection rate among the BRICs countries as 7.46% in 2015 and 7.75% in 2020 (refer to the Table 12.4). Even the majority of the emerging countries that follow BRICs countries called such as "Next Eleven" or "VISTA" receive the projection rate below 6%.

The Perspective Plan of Bangladesh 2010 – 2021 has GDP growth projection with 8.0% in 2015 and 10.0% in 2021 based on the 6.1% growth rate in 2010. This plan is made by the Planning Commission therefore the official document of the GOB. However, it is made in 2012 and considering the change in the global economy thereafter, it is safe to say, the projection is too challenging under the current situation.



**Table 11.4 GDP Growth Rate Projection for emerging Countries**

Unit: annual percent change

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Emerging market and developing economies	5.16%	5.00%	4.59%	4.26%	4.74%	5.03%	5.11%	5.24%	5.27%
BRICs Countries									
- Brazil	5.16%	5.00%	4.59%	4.26%	4.74%	5.03%	5.11%	5.24%	5.27%
- Russia	3.40%	1.30%	0.62%	-3.83%	-1.10%	1.00%	1.50%	1.50%	1.50%
- India	5.08%	6.90%	7.17%	7.46%	7.47%	7.55%	7.65%	7.70%	7.75%
- China	7.76%	7.75%	7.36%	6.76%	6.30%	6.00%	6.10%	6.33%	6.33%
Next Eleven Countries									
- Bangladesh	6.26%	6.07%	6.11%	6.31%	6.76%	7.00%	7.00%	7.00%	6.74%
- Egypt	2.22%	2.10%	2.16%	4.04%	4.26%	4.48%	4.68%	4.96%	5.03%
- Indonesia	6.03%	5.58%	5.03%	5.20%	5.50%	5.80%	6.00%	6.00%	6.00%
- Iran	-6.61%	-1.91%	2.97%	0.56%	1.29%	1.55%	1.76%	2.00%	2.11%
- South Korea	2.29%	2.97%	3.32%	3.28%	3.46%	3.67%	3.69%	3.69%	3.68%
- Pakistan	3.84%	3.70%	4.14%	4.30%	4.70%	4.82%	5.00%	5.00%	5.00%
- Turkey	2.13%	4.12%	2.90%	3.15%	3.60%	3.59%	3.55%	3.49%	3.49%
- Mexico	4.01%	1.39%	2.13%	3.00%	3.32%	3.52%	3.76%	3.76%	3.77%
- Nigeria	4.28%	5.39%	6.31%	4.75%	4.95%	5.25%	5.52%	5.77%	5.95%
VISTA Countries									
- South Africa	2.22%	2.21%	1.53%	2.00%	2.10%	2.40%	2.70%	2.80%	2.80%
- Argentina	0.80%	2.89%	0.47%	-0.31%	0.12%	0.26%	0.35%	0.40%	0.45%

Source: IMF World Economic Outlook Database April 2015

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

**Table 11.5 GDP Growth Projections**

Unit: Billion Taka

	2014-15	2016	2017	2018	2019	2020	2030	2050	Remarks
GDP growth rate	6.1%	6.5%	6.8%	6.8%	6.8%	6.9%	6.7%	6.0%	
nominal GDP	13,395	14,342	15,356	16,442	17,605	18,763	30,768	68,230	Budget Speech 2015 and JST
GDP deflator index	200	214	229	245	262	279	455	996	JST estimate based on IMF data
real GDP	6,698	7,133	7,618	8,136	8,689	9,289	17,766	56,979	

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

#### Projection of revenue and development expenditure

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

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

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

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

**Table 11.6 Revenue and Expenditure Projections (Case 1)**

Unit: Billion TDB

	2014-15	2016	2017	2018	2019	2020	2030	2050	Remarks
GDP growth rate	6.1%	6.5%	6.8%	6.8%	6.8%	6.9%	6.7%	6.0%	JST estimate
nominal GDP	13,395	14,342	15,356	16,442	17,605	18,763	30,768	68,230	Budget Speech 2015 and JST
GDP deflator index	200	214	229	245	262	279	455	996	JST estimate based on IMF WEO
real GDP	6,698	7,133	7,618	8,136	8,689	9,289	17,766	56,979	
Revenue	1,875	2,008	2,150	2,302	2,465	2,627	4,307	9,552	
% of GDP	14%	14%	14%	14%	14%	14%	14%	14%	
tax revenue	1,473	1,578	1,689	1,809	1,937	2,064	3,384	7,505	
% of GDP	11%	11%	11%	11%	11%	11%	11%	11%	
Development expenditure	857	918	983	1,052	1,127	1,201	1,969	4,367	
% of GDP	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	Budget speech 2015
ADP among Development expenditure	804	861	921	987	1,056	1,126	1,846	4,094	
% of GDP	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	Budget speech 2015
Infrastructure among ADP	295	430	461	493	528	563	923	2,047	
% of GDP	2.2%	3%	3%	3%	3%	3%	3%	3%	Target value of seventh 5year plan

Source: JICA Study Team

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

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

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

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

**Table 11.7 Revenue and Expenditure Projections (Case 2)**

Unit: Billion TDB

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

Source: JICA Study Team

### 3) Investment for transport sector

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

**Table 11.8 Projected Budget for Transport Sector**

	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2030	2050
% of ADP	24%	24%	25%	25%	25%	25%	20%	20%
Case1	185	207	221	247	264	281	369	819
Case2	185	224	258	288	308	328	492	1,092

Source: JICA Study Team

#### (2) Financial Capacity of Dhaka Metropolitan Administration

The urban local authority, Dhaka City Corporation (DCC) is responsible for the preparation of their respective annual budgets. By law, they are required to solicit participation of the citizens in the budget preparation process. Normally, the personnel of the corporation in the finance or accounts department prepare the draft budget which is then presented to the Mayor. Generally the budget is prepared along a set structure with some nominal adjustments such as; a certain percentage change in each approved head which is shown in the Table 11.9. It is found from same tables that the DCC is seriously weak in financial strength. It is not able to raise enough property or holding taxes and incapable of innovating new sources for revenue earning.

**Table 11.9 Debt service liabilities of Dhaka City Corporation (DCC)**

	Million BDT
Total Principal due on June 2012	1342.1
Total Interest due on June 2012	1781.7
Total Due on June 2012	2123.8

Source: Bangladesh Economic Review (2012)

#### (3) Key Issues and Recommendation

- (a) Drastic changes in the physical, economic and social structure in the Dhaka areas resulting from rapid urbanization has been posing serious challenges for sustainable urban development. On the other hand, the resource mobilization is not matching with the need for developing urban facilities including transportation services.
- (b) There is a scope to increase property tax in Dhaka city and it is necessary to examine the possibility.
- (c) In order to promote economic development in the country especially in Dhaka, it is necessary to increase investment in the Dhaka city infrastructures such as water supply, road and footpath maintenance, construction of new transport network and also in mass-rapid transit.

- (d) At this moment, the ratio of revenue to GDP is very low compared with other developing countries such as Cambodia, Vietnam, Philippines, Nepal and Sri Lanka and so on. Therefore, the total budget allocated to transport sector is not sufficient to meet the demand. Government's efforts to increase tax revenue and other kind of revenues are essential as well as seeking new financing sources such as private involvement.
- (e) The Government has a keen interest to attract the private sector involvement in transport infrastructure, and adoption of private sector infrastructure policies and guidelines. The Government needs to consider more practical approach to attract private sector finances in infrastructure projects, such as measures of financial risk reductions and particularly in the roads and highways as well as urban transport mainly in Dhaka city.