PEOPLE'S REPUBLIC OF BANGLADESH
ROADS AND HIGHWAYS DEPARTMENT
BANGLADESH BRIDGE AUTHORITY
DHAKA TRANSPORT COORDINATION AUTHORITY
CHATTOGRAM DEVELOPMENT AUTHORITY

DATA COLLECTION SURVEY FOR ROADS AND BRIDGES SECTOR IN THE PEOPLE'S REPUBLIC OF BANGLADESH

FINAL REPORT

MAY 2023

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS GLOBAL CO., LTD.

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Abbreviation List

Abbreviation	Full Words
ACE	Additional Chief Engineer
ADB	Asian Development Bank
AEPZ	Adamjee Export Processing Zone
AH	Asian Highway
AI	Artificial Intelligence
AIIB	Asian Infrastructure Investment Bank
AMEZ	Abdul Monem Economic Zone
ARI	Accident Research Institute
ARIPA	Acquisition and Requisition of Immoveable Property Act
ARIPO	Acquisition and Requisition of Immoveable Property Ordinance
ASEAN	Association of South-East Asian Nations
AZE	Alliance for Zero Extinction
BARC	Bangladesh Agricultural Research Council
BBA	Bangladesh Bridge Authority
BBS	Bangladesh Bureau of Statistics
BCCT	Bangladesh Climate Change Trust
BCIM	Bangladesh-China-India-Myanmar
BEPZA	Bangladesh Export Processing Zone Authority
BEZA	Bangladesh Economic Zone Authority
BFA	Bangladesh Forestry Act
BFRI	Bangladesh Forest Reserch Institute
BIFFL	Bangladesh Infrastructure Finance Fund Limited
BIM	Building Information Modeling
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BIWTC	Bangladesh Inland Water Transport Corporation
BMMS	Bridge Maintenance Management System
BMS	Bridge Management System
BMW	Bridge Management Wing
BNEP	Bangladesh National Environmental Policy
BOT	Build-Operate-Transfer
BR	Bangladesh Railway
BRICS	Brazil, Russia, India, China, South Africa
BRT	Bus Rapid Transit
BRTA	Bangladesh Road Transport Authority
BSEZ	Bangladesh Special Economic Zone
BSMSN	Bangabandhu SheikhMujib Shilpa Nagar
BTILS	BIMSTEC Transport Infrastructure and Logistic Study
BUET	Bangladesh University of Engineering and Technology
BWPA	Bangladesh Wildlife Preservation Act

Abbreviation	Full Words
CBD	Central Business District
CCEA	Cabinet Committee on Economic Affairs
CDA	Chattogram Development Authority
CEO	Chief Executive Officer
CEPZ	Chattogram Export Processing Zone
CIM	Construction Information Modeling
CMA	Chattogram Metropolitan Area
CNDP	Comprehensive National Development Plan for Bhutan 2030
ComEPZ	Cumilla Export Processing Zone
D/D	Detailed Design
DC	Deputy Commissioner
DEE	Dhaka Elevated Expressway
DEPZ	Dhaka Export Processing Zone
DMP	Dhaka Metropolitan Police
DoE	Department of Environment
DoFo	Department of Forest
DOR	Department of Roads (Nepal)
DOR	Department of Roads （Bhutan）
DPP	Development Project Proposal
DTCA	Dhaka Transport Coordination Authority
DX	Digital Transformation
EAP	Environmental Action Plan
ECA	Environmental Conservation Act
ECAs	Ecologically Critical Areas
ECC	Environmental Clearance Certificate
ECR	Environmental Conservation Rules
EE	Executive Engineer
EFR	Environmental Finance Reform
EIA	Environmental Impact Assesment
EMP	Environmental Management Plan
EPZ	Export Processing Zone
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
EZ	Economic Zone
F/S	Feasibiliy Study
FIDC	Forest Industry Development Corporation
FWD	Falling Weight Deflectometer
G2G	Government-to-Government
GDP	Gross Domestic Product
GI	Gender Informed
GQ	Golden Quadrilateral (India)
HDM-４	Highway Development and Management Version-4

Abbreviation	Full Words
IBA	Inportant Bird Area
ICT	Information and Communication Technology
IEE	Initial Environmental Examination
IEPZ	Ishwardi Export Processing Zone
ILO	International Labor Organization
IMF	International Monetary Fund
IoF	Institute of Forestry
IoT	Internet of Things
IPA	Important Plant Area
IRI	International Roughness Index
IUCN	International Union for Conservation of Nature and Natural Resources
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
KBA	Key Biodiversity Area
KEPZ	Karnaphuli Export Processing Zone
LCC	Location Clearance Certificate
LCMS	Laser Crack Measurement System
LDC	Least Developed Country
LGED	Local Government Engineering Department
LOC	Line of Credit Loan
MEPZ	Mongla Export Processing Zone
MEZ	Meghna Economic Zone
MIS	Management Information System
MOC	Ministry of Construction (Myanmar)
MoEF	Ministry of Environment and Forest
MoEFCC	Ministry of Environment, Forest and Climate Change
MOF	Ministry of Finance
MOPIT	Ministry of Physical Infrastructure and Transport (Nepal)
MoRTB	Ministry of Road Transport and Bridges
MoWHS	Ministry of Works and Human Settlement (Bhutan)
MRG	Minimum Revenue Guarantee
NCS	National Conservation Strategy
NEC	National Economic Council
NEMAP	National Environmental Management Action Plan
NETIS	New Technology Information System
NFMP	National Forestry Master Plan
NFP	National Forest Policy
NHDP	National Highways Development Project (India)
NHN	National Highway Network (Nepal)
NIMTP	National Integrated Multimodal Transport Policy
NITI Aayog	National Institution for Transforming India

Abbreviation	Full Words
NLTP	National Land Transport Policy
NMT	Non-Mortorised Transport
NOC	No Objection Certificate
NP	National Park
OD	Origin Destination
ODA	Official Development Assistance
OJT	On the Job Training
ORR	Outer Ring Road
PBC	Performance Based Contract
PCU	Passenger Car Unit
PDPP	Preliminary Development Project Proposal
PIP	Priority Investment Plan
PMW	Planinng & Maintenance Wing
PPP	Public Private Partnership
PPPA	Public Private Partnership Authority
PPPTAF	PPP Technical Assistance Fund
PWD	Public Works Department
RAP	Resettlement Action Plan
RHD	Roads and Highways Department
RMMS	Road Maintenance Management System
ROW	Right of Way
RSMP	Road Sector Master Plan 2007-2027 (Bhutan)
RSTP	Revised Strategic Transport Plan for Dhaka
RTHD	Road Transport and Highways Division
SAARC	South Asian Association for Regional Cooperation
SASEC	South Asian Subregional Economic Cooperation
SBHS	Steels for Bridge High Performance Structure
SE	Superintending Engineer
SMVT	Slow-Moving Vehicle Traffic
SPSP	Steel Pipe Sheet Pile
SRN	Strategic Road Network (Nepal)
STP	Strategic Transport Plan for Dhaka
TA	Technical Assistance
TDM	Transport Demand Management
TOD	Transit Oriented Development
TOR	Terms of Reference
TPP	Technical Assistance Project Proposal
TSMP 2041	Transportation Sector Master Plan 2041
UEPZ	Uttara Export Processing Zone
UNDP	United Nations Development Programme
USD	United States Dollar

Abbreviation	Full Words
VAT	Value Added Tax
VGF	Viability Gap Funding
WB	World Bank
WHO	World Health Organization

1. INTRODUCTION

1.1 Survey Background

In the People's Republic of Bangladesh (hereinafter referred to as "Bangladesh"), economic growth has been increased with a GDP growth rate of average 6.5% in the past 10 years (IMF, 2022). Number of registered vehicles has also been increased with a rate of 13 % per year in Bangladesh, where road traffic accounts for 70% of all traffic modes (Bangladesh Bureau of Statistics, 2020).

It is expected to expand traffic demand in Bangladesh depending on large scale industrial development such as Matarbari Port, special economic zones, etc. However, missing links of road network at rivers have been hindering inter-city flow of goods and people. Thus, it is important in Bangladesh to develop reliable road network by increasing road capacity and eliminating missing links.

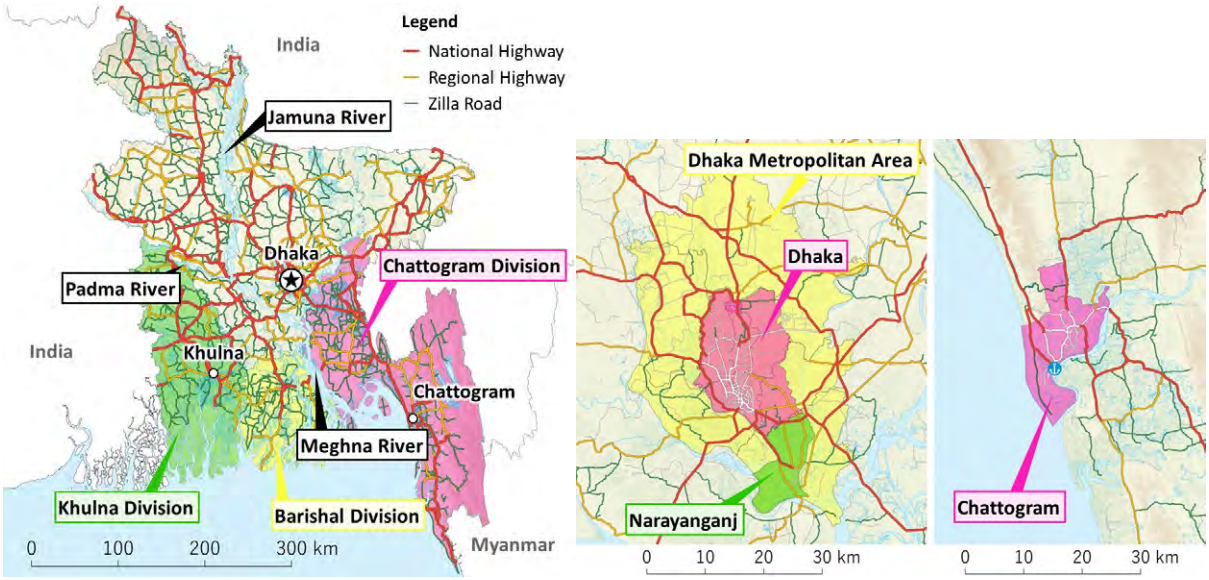
On the other hand, in urban area such as Dhaka and Chattogram, traffic congestion, traffic accident, damage of road facilities depending on increased number of private cars as well as inflow of large-sized vehicles into urban area have become serious issues. It is essential to implement the road development for eliminating these issues such as ring road construction, bypass construction, intersection improvement, etc. in urban area.

1.2 Objectives of the Survey

In this Data Collection Survey (hereinafter referred to as "the Survey"), priority road and bridge projects are selected to solve above issues. Studies required for implementing the priority project as a Japanese ODA project are also conducted.

1.3 Areas Covered by the Survey

Area covered by the Survey is shown in Figure S1.3.1.



Source: JICA Survey Team

Figure S1.3.1 Areas Covered by the Survey

1.4 Outline of the Survey

The Survey is comprised mainly of the following items.

- Review of Basic Information in Bangladesh
- Review of Road and Bridge Development Plans
- Preparation of Project Long List for Road and Bridge Projects
- Preparation of Project Short List and Selection of Priority Projects for Road and Bridge Projects
- Study on Necessity of Technical Assistant Project for Road and Bridge Sectors
- Consideration of Outline for Priority Road and Bridge Projects
- Recommendation for Priority Road and Bridge Projects

2. REVIEW OF BASIC INFORMATION IN BANGLADESH

2.1 Social and Economic Conditions

Bangladesh has 165 millions of population in 2022, which is 1.3 times of Japan, in approximately 40% of national land area of Japan. Although Bangladesh is a densely populated country, it is classified as a Least Development Country (LDC), with approximately 20% of population (in 2019) are sorted as poor.

The labour-intensive sewing sector is the main industry, and Japanese companies are expanding their presence in the country. However, the industrial structure is not upgrading since the industry other than sewing has not developed. In addition, they have other challenges, such as undeveloped basic infrastructure (electricity, transportation) and weakness to natural disasters (cyclones, floods and tidal waves).

2.2 Traffic Conditions

The road network in Bangladesh consists of eight categories: National Highways, Regional Highways and district roads under the Road and Highways Department (RHD) under the Ministry of Road Transport and Bridges (MoRTB), upazila roads, union roads, village roads A and village road B under the Local Government Engineering Department (LGED), and municipal road under local government.

Until recently, the majority of roads were two lanes round-trip (one lane in each direction), but the condition of the roads has improved significantly, with steady progress on projects to convert major arterial roads to four or six lanes. Pavement condition of major roads has also improved, with the pavement coverage achieving 100 % in recent years though 62% in 1991. However, only national highways function as reliable intercity roads since regional highways or lower ranked roads are narrow and of low standard.

At the river crossing locations, bridges have been constructed at the missing link points on national highways such as the Padma and Kalna bridges and the connectivity of the national land network has been improving. However, the road network is still divided by large rivers such as the Padma, Jamuna and Meghna, and ferry crossing services are still provided.

The low substitutability of the road network causes severe traffic congestion on the main arterial roads. Separation of transit traffic and intra-regional traffic is a major challenge since the existence of slow-moving vehicles such as rickshaws and CNG (three-wheelers), and the reduction of road space due to the parking of long-distance buses are the reasons for the congestion.

2.3 International Road Connectivity

Bangladesh is actively pursuing a free trade policy as a gateway between East Asia and South Asia due to its geographical advantage of facing the open sea. In addition to the Asian Highway Network, the South Asian Association for Regional Cooperation (SAARC) Corridors, the South Asian Subregional Economic Cooperation (SASEC) Corridors, the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) Corridors, and the Bangladesh-China-India-Myanmar (BCIM) Economic Corridor are recognized as the international Strategic Economic Corridors. The Government of Bangladesh is promoting road improvement projects along the corridors to strengthen connectivity with neighboring countries.

2.4 Institutional Framework of Executing Agencies

Ministry of Road Transport and Bridges (MoRTB) and the Ministry of Local Government, Rural Development and Cooperatives are responsible government agencies for the road and bridge sector in Bangladesh. Roads and Highways Department (RHD) under the MoRTB manages the main arterial roads including bridges less than 1.5 km in length, while Bangladesh Bridge Authority (BBA) manages the bridges longer than 1.5 km.

In addition to RHD and BBA, in the Chattogram Metropolitan Area (CMA), the Chattogram Development Authority (CDA) plans and develops infrastructure including roads and bridges, and acts as the implementing agency.

2.5 Private Sector Involvement

Since the government budget alone is insufficient to achieve the development goals set forth in the national policy "Vision 2041," infrastructure development through public-private partnerships (PPP) is considered one of the top priorities.

In Bangladesh, PPP projects are implemented through the identification of projects by ministries and the Public Private Partnership Authority (PPPA) or proposals from the private sector, through the preparation of a Preliminary Development Project Proposal (PDPP). After the PPPA is approved by the Cabinet Committee on Economic Affairs (CCEA), a feasibility study and evaluation of the government's Viability Gap Funding (VGF) are conducted for project implementation. All PPP projects are managed by the implementing agencies under the supervision of the PPP Agency.

3. ROAD AND BRIDGE DEVELOPMENT PLANS

3.1 Road and Bridge Development Plans in Bangladesh

3.1.1 Road Master Plan (2009)

The RHD's Road Master Plan is a long-term road development plan covering National Highways, Regional Highways and Zilla roads, and was formulated in 2009. Improving poor accessibility to rural areas due to inadequate road and bridge construction was identified as the most critical issue, and improvement of existing roads was placed as the highest priority program in order of road hierarchy. In addition, measures to improve traffic safety and axle-load control are also mentioned.

Many of the priority road improvement projects recommended in the Master Plan have already been completed, are under construction, or are being prepared for construction, but large-scale projects requiring vast area of the right of way and the associated resettlement have not yet been implemented.

RHD is currently conducting a study to revise the road master plan with the support of ADB. The revised master plan is expected to be prepared in around March 2023. However, it is delayed and the completion date has not been determined yet.

3.1.2 Bridge Master Plan

Until now, BBA projects have been allocated individually through government initiatives, but comprehensive development plans such as master plans have not been formulated. Recognizing the need to formulate a comprehensive development plan and implement projects systematically and steadily to

meet development demands in the transportation sector toward the "Vision 2041" goal of "becoming a developed country by 2041," BBA is currently conducting a study to formulate its own bridge master plan for the next 30 years (2020-2050) with financial assistance from ADB (To be completed in November 2024)[1].

3.1.3 Strategic Transport Plan for Dhaka

In 2005, the Dhaka Transport Coordination Authority (DTCA), in cooperation with the World Bank, formulated the Strategic Transport Plan (STP) for the Dhaka Metropolitan Area. The STP developed an urban transport policy for the 20 years to 2024, and proposed the establishment of an organizational structure for project implementation and maintenance, a proposed urban public transport system network of 3 BRT and 3 MRT lines for a total of 110 km, and the development of a total of 330 km of urban expressways as priority projects.

In 2014, with the cooperation of JICA, the transportation-related studies were conducted and updated into the Revised Strategic Transport Plan for Dhaka (RSTP), and priority projects were selected and preliminary studies were conducted for materializing the project implementation. RSTP was approved by the Government of Bangladesh in August 2016.

RSTP aims to ensure that the living environment in the Dhaka metropolitan area remains good in the future, and to increase the competitiveness and attractiveness of the industrial sector and to lead international trade throughout Bangladesh. Under the vision of "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", various development strategies were presented, with the indicator of maintaining a public transportation share of at least 60%.

3.1.4 Detailed Area Plan for Chattogram

The Detailed Area Plan for Chattogram is a comprehensive development plan that includes land use plans for each of the 12 planning zones, a flood control plan with a target year of 2015, a transportation plan, a plan for public services such as water, sewerage, and electricity, and an environmental conservation plan. It was formulated by the Chattogram Development Authority (CDA) in 2008.

[1] Feasibility study for Construction of Bridges over the river Meghna on Shariatpur-Chandpur road & Gazaria-Munshigonj road and preparation of Master Plan for Bangladesh Bridge Authority

3.2 Road and Bridge Development Plans in Neighboring Countries

3.2.1 Road and Bridge Development Plans in India

(1) National Highways Development Project

The National Highways Development Project (NHDP) was launched in 1998 and is a seven-phase development plan to build a high-standard road network connecting major cities in India by improving existing roads and constructing new roads.

Phase I includes the construction of a golden quadrilateral network connecting Delhi, Mumbai, Kolkata, and Chennai with 4-lane roads. Phase II includes the construction of north-south and east-west corridors. And subsequent phases include further widening from 4 lanes to 6 lanes.

(2) Bharatmala Pariyojana

Bharatmala Pariyojana was developed in 2015 as a master plan to develop road connectivity to border areas, coastal roads including road connections to non-major ports, improve efficiency of national corridors, economic corridors, inter-corridors, feeder routes in integration with the Sagarmala Plan (Port-led logistic development Plan).

(3) Strengthening Connectivity in India's Northeast

The road development in the northeastern region of India (Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Tripura and Mizoram) has delayed compared with other regions in India with a pavement coverage ratio of about 30% (national average: about 70%) and about 50% of 2 lanes or more (national average: about 80%). Many areas lack slope protection and roadside drainage for landslide countermeasures. This delay in road development is one of the bottlenecks for economic development, as it hinders the stable flow of people and logistics within the region and to neighbouring countries.

The importance of reducing regional disparities, including infrastructure development in the northeast region, was pointed out in India's 3-year Action Plan (2017) prepared by the National Institution for Transforming India (NITI Aayog). The Government of India established the Ministry of Development of North Eastern Region in 2001 to accelerate the northeast region's development for promoting socioeconomic development and reducing regional disparities. The Government of India has established the Special Accelerated Road Development Program for the North-East (SARDP) to improve road connectivity between major cities in the region.

3.2.2 Road and Bridge Development Plans in Nepal

(1) Sector Wide Road Programme and Priority Investment Plan

PIP was established in 1995 and a road network of 15 national highways and 51 feeder roads was planned. The planed network is connected to all the central cities of the states to allow the balanced regional development. Routes of feeder road were added in 1997.

PIP was revised in 2007 and road development programme for 2017 was formulated. Then following revised in 2016, the program was reconsidered to complete by 2022.

(2) Road Master Plan

The Road Master Plan established by DOR will include road widening of national highway network and 10-year road development plan for 2033. Capacity building of road planning for DOR will be implemented with ADB's assistance.

3.2.3 Road and Bridge Development Plans in Bhutan

The upper level plan for the transportation sector are Comprehensive National Development Plan for Bhutan 2030 (CNDP) implemented with JICA's assistance, Road Sector Master Plan 2007–2027 (RSMP), the 12th Five-Year Plan (2018–2023), Bhutan Transport 2040 (Integrated Strategic Vision), Road Classification and Network Information.

DOR is developing the Road Mater Plan with a target year of 2040 (Master Plan for National Highway Connectivity) with ADB's assistance. It will be completed in October, 2024.

3.2.4 Road and Bridge Development Plans in Myanmar

In 2013, JICA conducted the "The survey program for the national transport development plan in the Republic of the Union of Myanmar" and established Myanmar National Transport Development Plan with a target year of 2030. The development of 10 economic corridors and transportation networks are shown in the plan with the concept of "developing an efficient, modern, safe, and environmentally friendly transportation system for all Myanmar citizens in a sustainable manner and with planning coordination among transportation subsectors". The plan recommends a development strategy of road connectivity with classifying road function and resilience against natural disasters to build an efficient highways network.

Moreover, "Data collection survey on regional infrastructure in Myanmar" conducted in 2020 stated that function of road network was classified and prioritised with considered Asian Highway and International corridors as a strategy for road and bridge development in regional areas.

3.2.5 BIMSTEC Transportation Master Plan

BIMSTEC Transportation Master Plan was established in 2018 by technical assistance from ADB to promote BIMSTEC regional integration and to enhance multimodal connectivity. The Master Plan provides a framework for organizing a series of policies, strategies and projects to achieve a common vision of peace, prosperity and sustainability.

The master plan is a 10-year comprehensive development strategy and action plan for the improvement of both hard infrastructure such as road, railway, port, inland waterway, airport, multimodal transportation and trade facilitation, and soft infrastructure such as services for international transportation. Substantial financial resources are required to achieve the goals of the Master Plan. Investment to major projects which exclude on-going project are estimated approximately $22 billion over the 10-year (2018 - 2028).

4. ENVIRONMENTAL AND SOCIAL CONSIDERATION

4.1 Environmental Impact Assessment

Laws, regulations and standards related to environmental and social considerations were investigated. For environmental licensing of road and bridge projects, projects for national and international roads and bridges over 100 m are classified as Red category. Those projects require EIA approval. The EIA process requires 45 days for LCC approval, 30 days for EIA approval and 30 days for ECC approval.

With regard to EIA procedures in Bangladesh, Table S4.1.1 provides a comparison between the Bangladeshi legal system and the JICA Guidelines for Environmental and Social Considerations (January 2022 ver.).

Table S4.1.1 Comparison of JICA Guidelines and Bangladeshi Legal System in EIA Procedures

Item		JICA Guidelines	Laws and regulations relating to the country of Bangladesh.	Comparative analysis and proposed solutions
1	categorization	• Category A: Project proponent required to submit EIA report. EIA Report, RAP Report and Minority Report required 120 days prior to signing of agreement prior to environmental review. • Category C: Projects in this category, after classification • No environmental review required for. • Category FI: JICA will survey the relevant donor or implementing agency to confirm whether this category of project has appropriate environmental and social considerations in line with the Guidelines.	• Four categories - Green, Orange-A, Orange-B and Red - are classified according to their environmental significance and the location of the proposed development. • Green projects do not require either an IEE or an EIA. • Red category projects require both an IEE and an EIA.	• There is no equivalent category to JICA's FI category in Ba's legislation.
2	Scope of impacts to be investigated and considered.	• JICA will consider appropriate environmental and social considerations to be made by project proponents and others in order to avoid or minimize the impact of development projects on the environment and local communities and to prevent the occurrence of unacceptable adverse impacts.	• Assessments are carried out within the framework of obtaining an Environmental Clearance Certificate (ECC). • The environmental assessment begins when the project proponent starts the process of applying the ECC.	• In the Ba countries, there are classifications used to screen development projects. However, as they are carried out within the framework of ECC issuance, they are relatively vague in scope and are done by reference to the ranges given in the Guidelines.
3	Stakeholder and public consultation	• Project proponents and others will consult with a wide range of local stakeholders with a reasonable degree of public participation in order to reach an appropriate consensus, taking into account environmental and social factors in a way that best suits local circumstances.	• Information to local people, community consultation and public participation are recognized as important documents, but specific legislation to implement such processes has not yet been enacted.	• It can be said that there is almost no system in Ba country. Conduct meetings in line with the requirements of the Guidelines.
4	Disclosure of information on EIAs	• With regard to information on the environmental and social considerations of projects, JICA encourages project proponents and others to disclose and present information on environmental and social considerations to local stakeholders.	• No clear requirements for disclosure of information, including public hearings and comments. The Ba'ath government passed the Environment Act 2000 (Act No. 11 of 2000) to allow the public to prosecute non-compliance with the ECA (1995) and the ECR (1977).	• There are no legal requirements for disclosure of information in Ba'athist law, but some implementers have established clear recommendations/requirements for disclosure of information; there is a clear gap between the two, so the information is disclosed as required by the guidelines; the guidelines are not clear on the disclosure of information in the Ba'athist law, but there are clear recommendations/requirements for disclosure of information in the Ba'athist law.

Item		JICA Guidelines	Laws and regulations relating to the country of Bangladesh.	Comparative analysis and proposed solutions
5	EIA methods and tools	• JICA conducts environmental reviews according to the project category and refers to the corresponding environmental checklists for each sector, where applicable.	• Documents required include FS reports, IEE reports, EIA reports, Environmental Management Plans (EMPs), No Objection Certificates (NOCs), disaster management plans and relocation plans.	• There is no significant divergence between the two.
6	monitoring	• JICA shall confirm with the project proponent etc. the results of the monitoring of items with significant environmental impacts. The information necessary for JICA's confirmation monitoring shall be provided by the project proponent etc. by appropriate means (including in writing). JICA may conduct its own investigations as necessary. JICA will make the results of monitoring by the project proponent etc. available to the project proponent etc. to the extent that they are made publicly available.	• There is a process for updating the ECC that requires monitoring and evaluation. The DOE is responsible for following up and monitoring ECC conditions. The DOE prepares a compliance report for the endorser, which is published on its website. • There are no formal provisions for obtaining an independent assessment of EIA reports. There is also no formal mechanism or programme for independent audits of DOE-approved projects. Third party monitoring in approved laboratories is recommended.	• Monitoring methods and publication of results in guidelines, as no legal framework exists in Ba'ath government legislation, even though many countries define monitoring as part of their evaluation activities.

Source: JICA Survey Team

4.2 Land Acquisition and Resettlement

The framework for land acquisition and resettlement and the rights pertaining to the affected persons are established based on the Acquisition and Requisition of Immoveable Property Act (ARIPA-2017. Acquisition and Requisition of Immoveable Property Act, 2017). The former law, the Acquisition and Requisition of Immoveable Property Ordinance of 1982 (ARIPO-1982), regulates the acquisition and requisition of lands (temporary acquisition) carried out by the Government. It was amended in 1993 and 1994. It should be noted that the amount of compensation for land acquisition has been increased since ARIPA-2017 came into force.

The legal process for land acquisition is initiated after a site acquisition plan based on the Mouza Map has been submitted to the Deputy Commissioner (DC) of the district concerned. If there is a difference between the compensation and the reacquisition price, the difference is paid by the implementing agency through the NGO.

Differences between the Resettlement and Land Acquisition Laws in Bangladesh and the JICA Guidelines on Environmental and Social Considerations (January 2022 ver.) are shown in Table S4.2.1.

Table S4.2.1 Differences between Bangladesh Legislation on Land Acquisition and Resettlement and JICA Guidelines on Environmental and Social Considerations

No.	JICA Guidelines	Acquisition and Requisition of Immovable Property Act-2017.	JICA Guidelines and ARIPA-2017. Gap	Examples of measures taken in past projects
1	Involuntary resettlement and loss of means of livelihood must be avoided by considering all possible means.	Avoidance is practiced as a matter of practice, but there is no legal provision.	Not prescribed by Bangladesh national legislation.	Impact avoidance where possible.
2	Where avoidance is not possible, effective measures must be agreed with the subject to minimize the impact and compensate for the loss.	Impact minimization is a practice, but there is no legal provision.	Not prescribed by Bangladesh national legislation.	Take measures to minimize impact.
3	Resettled residents are provided with compensation and assistance to improve or at least restore their living standards, income opportunities and production levels to what they were prior to their displacement.	No direct provisions. Some provisions on rebuilding livelihoods in addition to compensation.	There are no adequate provisions for livelihood restoration in Bangladesh national legislation.	Develop compensation and support measures to improve and restore living standards.
4	Compensation must be based on the reacquisition price as far as possible.	Government projects are compensated at three times the market price and private projects at four times the market price (*The mouza rate (rate by administrative distinction) set by the DC (Deputy County Administrator) office is applied to the market price used to calculate land compensation).	The price on the left may not meet the reacquisition price.	Compensation at three times market value or reacquisition price, whichever is higher.
5	Compensation and other assistance must be provided prior to physical relocation.	no stipulations (e.g. law)	There is no provision for prior compensation in Bangladesh national legislation.	Provide compensation and other assistance prior to physical relocation.
6	In the case of projects where large-scale involuntary resettlement will occur, a resettlement plan must be prepared and made publicly available.	no stipulations (e.g. law)	There is no provision in the Site Acquisition Act, but there are relevant provisions in the EIA legislation, which have been created in practice.	Create and publish a RAP.
7	In the preparation of resettlement plans, sufficient information must have been made available to the public in advance and consultation with affected people and communities must have taken place on this basis.	no stipulations (e.g. law)	There is no provision for community consultation in Bangladesh national legislation.	Consultation with affected people and communities based on this, with sufficient information made public in advance.
8	During consultations, explanations must be provided in a language and style that is understandable to the affected population.	no stipulations (e.g. law)	There are no provisions on explanatory language in Bangladesh national legal regulations.	Explanations are given in the local official language.

No.	JICA Guidelines	Acquisition and Requisition of Immovable Property Act-2017.	JICA Guidelines and ARIPA-2017. Gap	Examples of measures taken in past projects
9	Appropriate participation of affected people and communities must be promoted in the planning, implementation and monitoring of measures related to involuntary resettlement and loss of means of livelihood.	no stipulations (e.g. law)	There are no provisions on resident/community participation in Bangladesh national legal regulations.	Facilitate resident and community participation in the planning, implementation and monitoring of measures related to involuntary resettlement and loss of means of livelihood.
10	Treatment mechanisms for complaints from affected people and communities must be in place.	There are provisions for arbitration.	Bangladesh national legislation has no provision for a grievance mechanism available to the general population.	Establish a grievance redress mechanism (GRM) for complaints from affected people and communities.
11	Affected populations are identified and recorded through initial baseline surveys (including population censuses, asset and property surveys and socio-economic surveys) to establish entitlements to compensation and assistance. This should be done as early in the project as possible to prevent undue influx of people seeking compensation, assistance or other benefits.	Prior to notification of property acquisition, the current status and nature of the property to be acquired is compiled. A reference date for entitlement is declared before the start of the Joint Verification Survey.	In JICA projects, the declaration is usually made on the date of the start of the census at the preparatory survey stage, whereas in the Bangladesh country legislation, the declaration is made after the F/S, including the site acquisition plan, is submitted by the operator to the DC.	For formal residents, the cut-off date declared after the F/S is submitted by the operator to the DC and before the start of the Joint Verification Survey is the official entitlement reference date, but the census start date during the FS period is the provisional cut-off date The off-date shall be. For informal residents, the cut-off date declared on the census start date shall be the entitlement reference date.
12	The recipients of compensation or assistance shall be those with legal rights to the land, those who do not have legal rights to the land but whose rights would be recognized under the legal system of the country concerned if they claimed them, and those whose legal rights and claims to the land they occupy cannot be confirmed.	There is a provision for compensation in respect of land lessees.	Under Bangladesh national legislation, those with no or unknown land rights are not included among the beneficiaries.	(i) those with legal rights to the land, (ii) those who do not have legal rights to the land but whose rights would be recognized under the legal system of the country concerned if they claimed them, and (iii) those whose legal rights and claims to the land they occupy cannot be confirmed are the recipients of compensation and assistance.
13	Where the livelihoods of the relocated population are land-based, land-based relocation strategies are prioritized	There is no regulation, but in practice it is the responsibility of the implementing agency to provide alternative sites.	There are no provisions for legal assistance in Bangladesh national legislation.	Where the livelihoods of the relocated population are land-based, priority should be given to land-based relocation strategies.

No.	JICA Guidelines	Acquisition and Requisition of Immovable Property Act-2017.	JICA Guidelines and ARIPA-2017. Gap	Examples of measures taken in past projects
14	Provide support during the transition period	no stipulations (e.g. law)	There is no provision in Bangladesh legislation for the provision of support during the transition period.	Provide support during the transition period.
15	Special consideration is given to the socially vulnerable among the resettled population, especially the poor and landless, the elderly, women, children, indigenous peoples and ethnic minorities.	no stipulations (e.g. law)	Bangladesh national legislation does not contain provisions on the consideration of socially vulnerable groups.	Provide for vulnerable groups in society.

Source: JICA Survey Team

4.3 Relevant Organizations

4.3.1 Ministry of Environment, Forestry and Climate Change

The Ministry of Environment, Forest and Climate Change (MoEFCC: Ministry of Environment, Forest and Climate Change) is the government agency responsible for matters related to national environmental policy and regulatory issues, which was reorganized into its current structure in 2016 with the addition of the Bangladesh Climate Change Trust (BCCT).

4.3.2 Department of Environment (DoE)

Department of Environment (DoE) was established in 1989 under the MoEF and is responsible for the following activities. It is also the body responsible for planning and implementation related to other environmental issues.

- Reviewing environmental impact assessments and issuing environmental clearances (ECs) where necessary
- Conducting environmental monitoring programs and enforcement measures.
- Developing and maintaining environmental databases
- Coordinating international events with MoEF.

4.3.3 Department of Forest (DoFo)

Department of Forest (DoFo) is responsible for the protection and management of the country’s forest reserves. The personnel of this organization are located in each region where forest reserves exist and are also responsible for the protection of wildlife in these reserves.

4.3.4 Bangladesh Climate Change Trust Division

The Bangladesh Climate Change Trust Division (BCCT) is a government trust established in 2010 to address issues caused by climate change. It works with government ministries, NGOs and the private sector to implement and evaluate climate change mitigation projects.

4.4 Gender

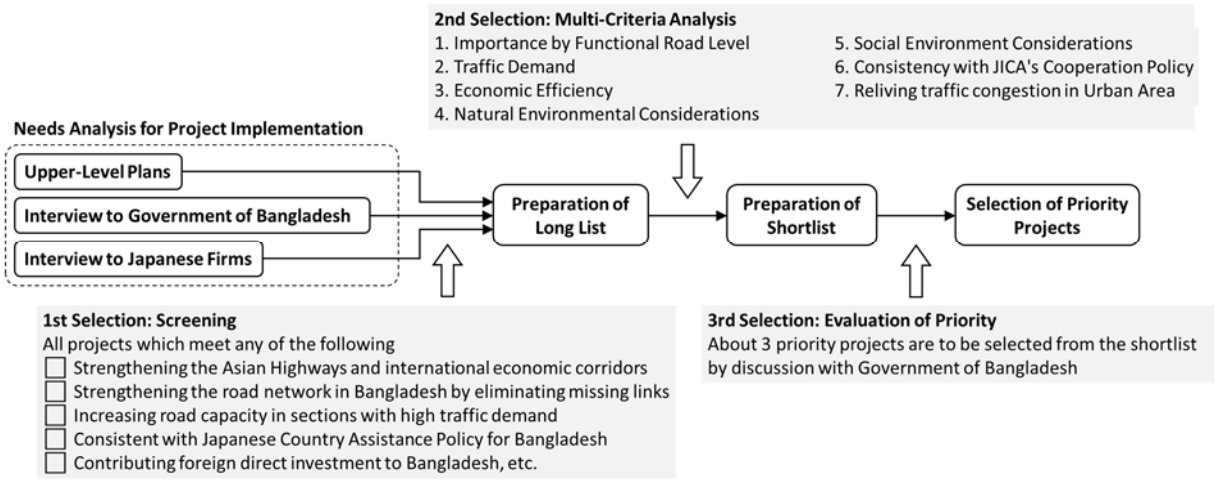
Key gender legislation and policies include Articles 27 and 28 of the Constitution, the National Women Development Policy (2011). In the transport sector, National Integrated Multimodal Transport Policy (2013) and Eighth Five Year Plan (FY2020 - FY2025) include the importance of transport access for women and vulnerable groups, cleaning of footpaths, mandatory introduction of bridges for road crossings and increased public transport.

5. SELECTION OF PRIORITY ROAD AND BRIDGE PROJECT

5.1 Procedure of Priority Project Selection

Priority projects are selected in accordance with the procedure shown in Figure S5.1.1

In the 1st step, all possible projects are selected as the long list by the needs analysis for project implementation as well as screening criteria. In the 2nd step, candidate priority projects are selected as the short list by multi-criteria evaluation from the long list. Finally, in the 3rd step, priority projects are selected by discussion among Bangladesh related authorities, JICA and JICA Survey Team.



Source: JICA Survey Team

Figure S5.1.1 Procedure of Priority Project Selection

5.2 Project Long List

Long List was prepared based on the needs of Bangladesh project implementation agencies. It was also confirmed if each project meets the following screening criteria.

- Projects strengthening the Asian Highways and international economic corridors
- Projects strengthening the road network in Bangladesh by eliminating missing links
- Projects strengthening the road network by increasing road capacity in sections with high traffic demand
- Projects contributing to ensuring redundancy and to enhancing resilience of the road network in the event of disaster
- Projects relieving traffic congestion in urban areas
- Projects securing and strengthening linkages with national, urban and regional development areas
- Projects consistent with Japanese Country Assistance Policy for Bangladesh and having positive synergy with other Japanese ODA projects
- Projects promoting/contributing foreign direct investment to Bangladesh

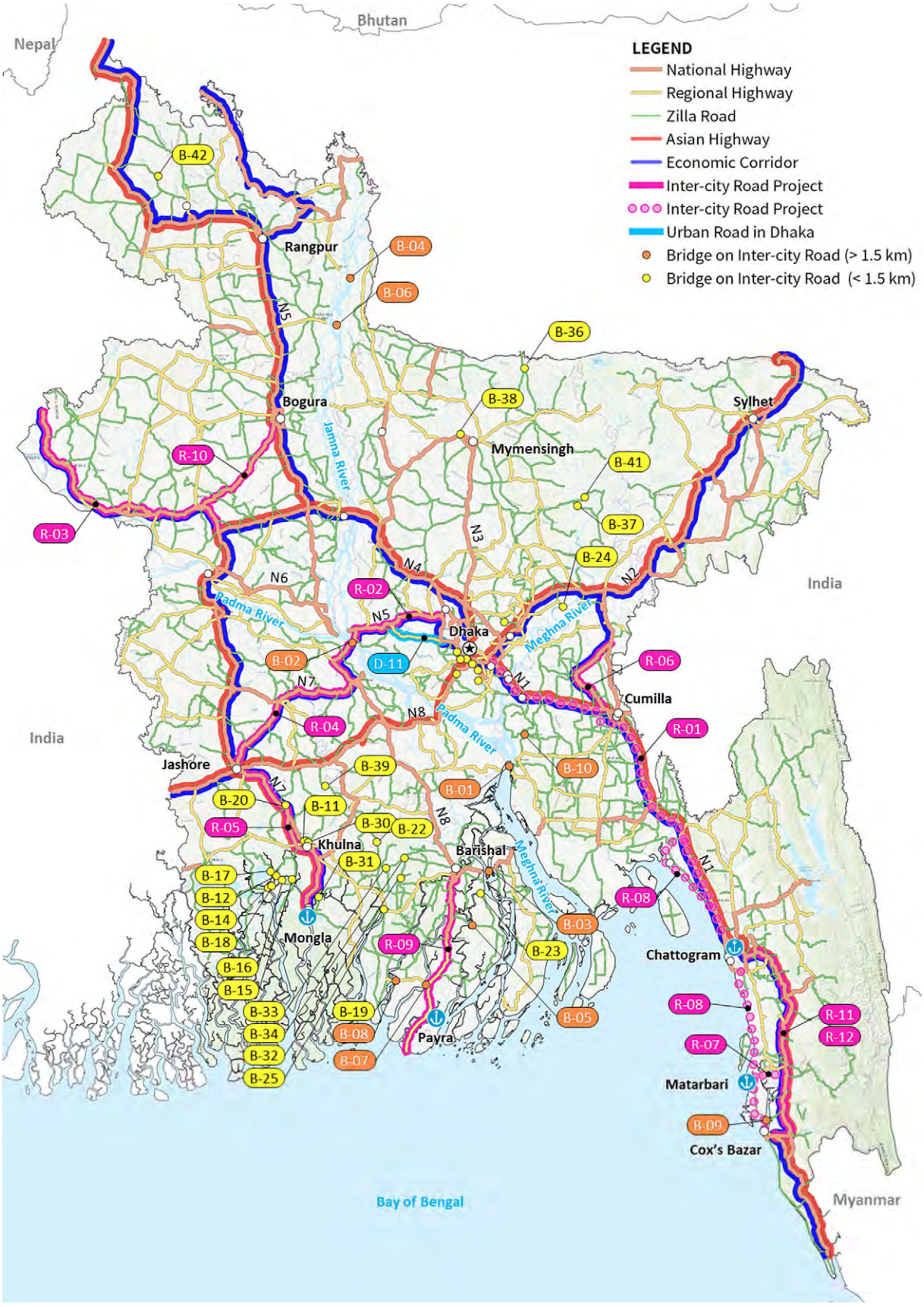
Project long list is shown in Table S5.2.1, and the location maps are shown in Figure S5.2.1, Figure S5.2.2 and Figure S5.2.3.

Table S5.2.1 Project Long List

No.	Project Type	ID	Project	Length (km)	Number of Lane
1	Inter-city Road	R-01 (1)	Dhaka – Chattogram Expressway (Dhaka - Cumilla)	100	4
2		R-01 (2)	Dhaka – Chattogram Expressway (Cumilla - Feni)	45	4
3		R-01 (3)	Dhaka – Chattogram Expressway (Feni - Chattogram)	72	4
4		R-02	N5 Dhaka - Paturia	57	4
5		R-03	N6 Natore - Sona Masjid	130	4
6		R-04	N7 Daulatdia – Magura - Jashore	118	4
7		R-05	N7 Jashore - Mongla	100	4
8		R-06	N102 (N1: Moynamoti～N2: Kutta)	80	4
9		R-07	Matarbari Port Access Road (Phase 2)	26	2
10		R-08 (1)	Marine Drive (Mirsharai – Chattogram)	65	4
11		R-08 (2)	Marine Drive (Chattogram – Matarbari)	50	4
12		R-08 (3)	Marine Drive (Matarbari – Cox's Bazar)	50	4
13		R-09	N8/R880/881 Barisal - Patuakhali - Kuakata Road	110	4
14		R-10	N502/N6 Bogura - Natore - Bonpara Road	80	4
15		R-11 (1)	Chattogram – Cox's Bazar Expressway (Chattogram - Chakaria)	85	4
16		R-11 (2)	Chattogram – Cox's Bazar Expressway (Chakaria - Cox's Bazar)	47	4
17		R-12 (1)	N1 Chattogram - Chakaria	85	4
18		R-12 (2)	N1 Chakaria - Cox's Bazar	47	4
19	Bridge on Inter-city Road	B-01	Meghna Bridge (Shariatpur – Chandpur Road)	6	4
20		B-02	Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)	6	4
21		B-03	Kalabador and Tetulia Bridges (Barisal – Bhola Road)	10	4
22		B-04	Jamuna Bridge (Chilmari-Rowmari Road)	10	4
23		B-05	Karkhana Bridge (Bakerganj – Bauphal Road)	2	4
24		B-06	Jamuna Multimodal Road-Rail Tunnel (Balashi, Gaibandha)	12	4
25		B-07	Payra Bridge (Patuakhali – Amtali – Barguna Road)	3	4
26		B-08	Bishkhali Bridge (R880 Barguna – Kakchira Road)	3	4
27		B-09	Cox's Bazar – Moheshkhali Bridge/Tunnel	3	4
28		B-10	Megha-Dhonagoda River Bridge (Matlab Uttar-Gazaria Road)	2	4
29		B-11	Jailkhana Ghat Bridge (Bhairab/ Rupsha River)	1.4	4
30		B-12	Phulbari Bridge (Bhodra River)	1.4	4
31		B-13	Swarighat Bridge (Buriganga River)	1.3	4
32		B-14	Delutia Bridge (Shibsa River)	1.3	4
33		B-15	Jhopjhopia Bridge (Jhopjhopia River)	1.2	4
34		B-16	Laxmikhola Bridge (Bhodra River)	1.2	4
35		B-17	Shundarmohol Bridge (Gangrail River)	1.2	4
36		B-18	Darulmollik Bridge (Shibsa River)	1.2	4
37		B-19	Bishkhali Bridge (Bishkhali River)	2.0	4
38		B-20	Shekirhat Bridge (Bhairab River)	1.2	4
39		B-21	Kunda Bridge (Dhalweshwari)	1.1	4
40		B-22	Atulnagar Bridge (Kaliganga River)	1.0	4
41		B-23	Matubborhat (Karkhana River)	1.0	4
42		B-24	Panthoshala Bridge (Meghna River)	1.0	4
43		B-25	Charkhali Bridge (Kocha River)	1.0	4
44		B-26	2nd Postogola Bridge (Dhalweshwari River)	0.9	4
45		B-27	Postogola (Parallal to 1st Bangladesh China Friendship Bridge) (Burig	0.8	4
46		B-28	Kamrangir Char (Buriganga River)	0.8	4
47		B-29	AK khan Economic Zone Bridge/ Danga Bridge (Shitalakhshya River)	0.8	4
48		B-30	Aatharobeki Bridge (Aatharobeki River)	0.8	4

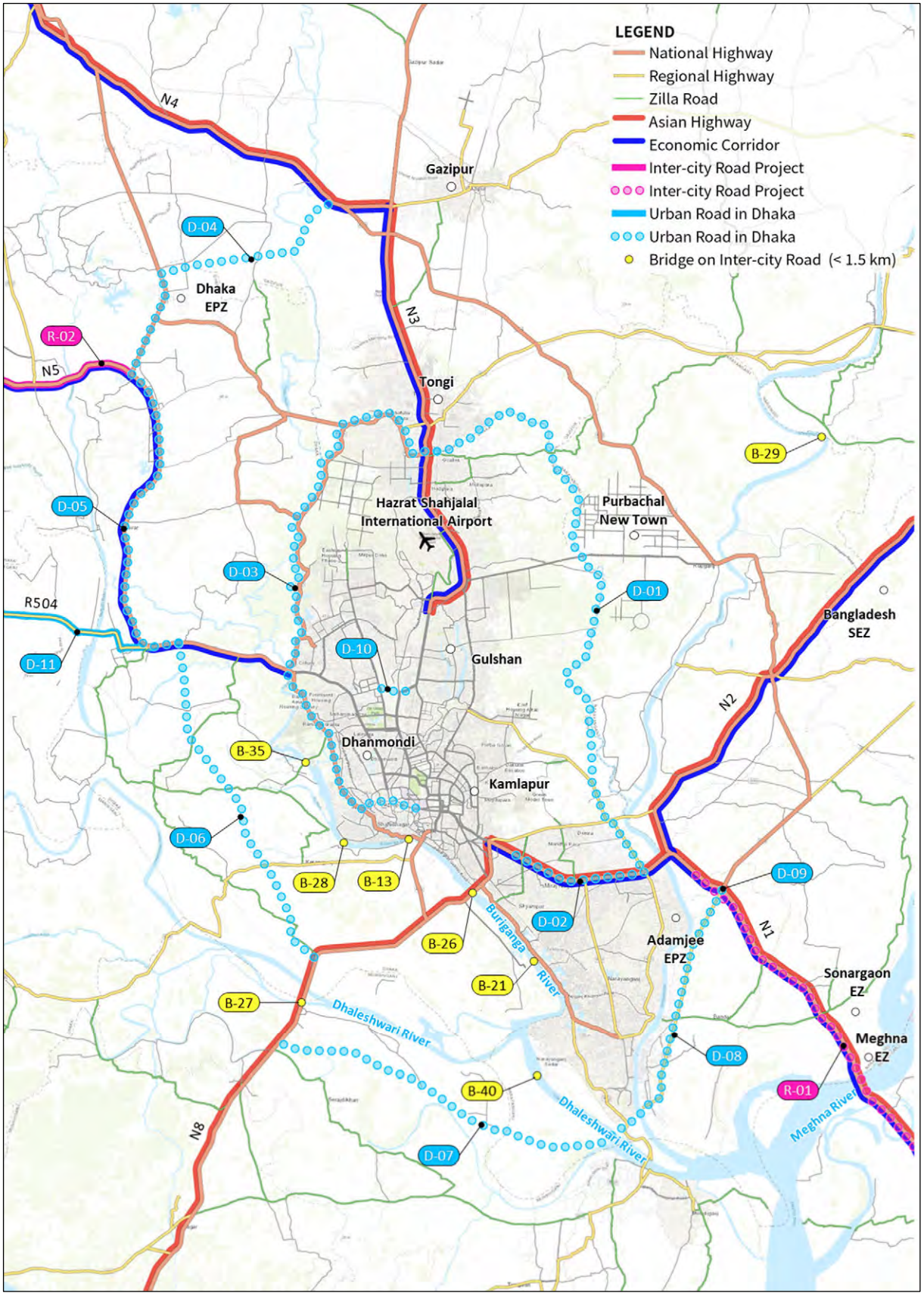
49	Bridge on Inter-city Road	B-31	Rampal Bridge (Mongla River)	0.8	4
50		B-32	Aamrajhuri Bridge (Gabkhan/Sandha River)	0.8	4
51		B-33	Shreeramkathi Bridge (Kaliganga River)	0.7	4
52		B-34	Swarupkathi Bridge (Shondha River)	0.7	4
53		B-35	2nd Basila Bridge (Turag River)	0.7	4
54		B-36	Shomeshwary Bridge (Shomeshwary River)	0.6	4
55		B-37	Balikhola Bridge (Dhonu River)	0.6	4
56		B-38	2nd Brahmaputra Bridge (Brahmaputra River)	0.6	4
57		B-39	Mohajon Borodia Bridge (Nabaganga/ Madhumati River)	0.6	4
58		B-40	Boktaboli Bridge (Dhalweshwari River)	0.5	4
59		B-41	Boroibari Bridge (Dhonu River)	0.5	4
60		B-42	Jayganj Bridge (Korotoa River)	0.5	4
61	Urban Road & Bridge in Dhaka	D-01	Dhaka Inner Ring Road (East: N3-N1)	31	4
62		D-02	Dhaka Inner Ring Road (04: N1 (R110 – Kanchipur Bridge)	9	4
63		D-03	Dhaka Inner Ring Road (Western Section)	34	4
64		D-04	Dhaka Outer Ring Road (North-1: N3-N5)	10	4
65		D-05	Dhaka Outer Ring Road (North-2: N5)	15	4
66		D-06	Dhaka Outer Ring Road (South-1: N5-N8)	21	4
67		D-07	Dhaka Outer Ring Road (South-2: N8 – 3rd Shitalakhya Bridge)	20	4
68		D-08	Dhaka Outer Ring Road (South-3: 3rd Shitalakhya Bridge – N1)	13	4
69		D-09	N1 Grade-separation (Madanpur)	3	1
70		D-10	Jahangir Gate Underpass	2	4
71		D-11	R504 (Hemayetpur～Manikganj)	32	4
72	Urban Road & Bridge in Chattogram	C-01	Chattogram Outer Ring Road	3	4
73		C-02	Riverside Road (branch of Karnaphuli River)	6	4
74		C-03	Riverside Road (left bank of Karnaphuli River)	18	4
75		C-04	N1-N106 Connector Road (Hatazari)	9	4
76		C-05	Viaduct (Right bank of Karnaphuli River)	4	4
77		C-06	Karnaphuli Bridge (Barrik Building - Proposed Second Town)	1.3	4
78		C-07	N107 Karnaphuli Bridge	0.8	4

Source: JICA Survey Team



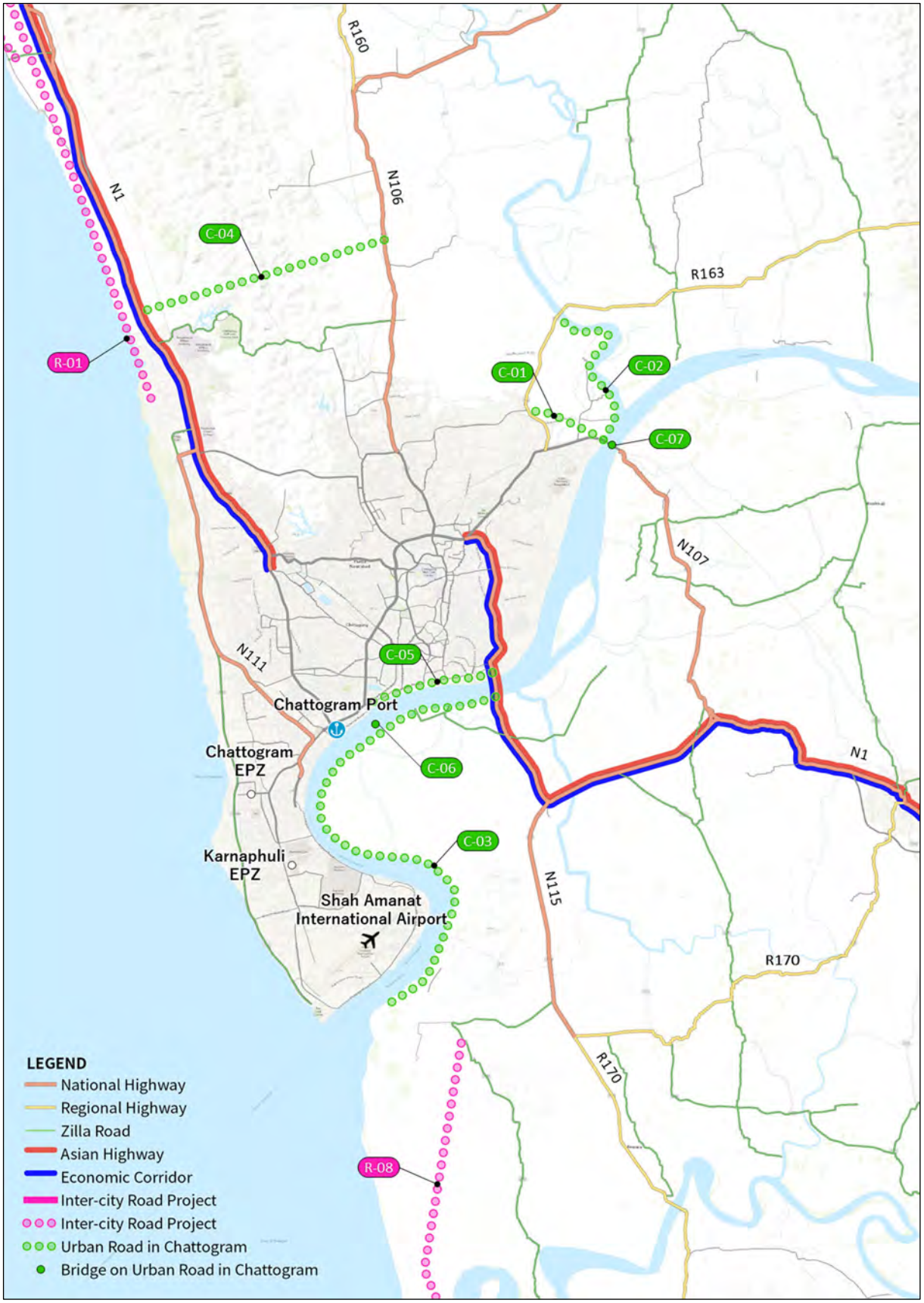
Source: JICA Survey Team

Figure S5.2.1 Location Map of the Long List (Nationwide)



Source: JICA Survey Team

Figure S5.2.2 Location Map of the Long List (Dhaka)



Source: JICA Survey Team

Figure S5.2.3 Location Map of the Long List (Chattogram)

5.3 Project Short List

5.3.1 Multi-criteria Evaluation

Each project in the long list was scored by the multi-criteria evaluation. Mult-criteria was prepared for both inter-city road / bridge project evaluation and urban road / bridge project evaluation, as inter-city road / bridge and urban road / bridge are required to have different functions. Mult-criteria for inter-city road / bridge project evaluation and those for urban road / bridge project evaluation are shown in Table S5.3.1 and Table S5.3.2, respectively.

Table S5.3.1 Multi-criteria Evaluation for Inter-city Road / Bridge Project

Evaluation Item	Evaluation Index	Point
1. Importance by Functional Road Level	Eliminating missing link, reliving traffic congestion or Ensuring redundancy & enhancing resilience of the following functional road level: A: Important Corridor B: National-level trunk Road C: Regional-level trunk Road D: District-level trunk Road E: Local-level Road	20
2. Traffic Demand	Future traffic volume in 2035 A: Over 60,000 PCU/day B: 40,000 - 60,000 PCU/day C: 20,000 - 40,000 PCU/day D: 10,000 - 20,000 PCU/day E: Less than 10,000 PCU/day	10
3. Economic Efficiency	Traffic volume (PCU/day) x Travel time saving (min) / Construction cost (million JPY) A: Over 40 PCU·min/day/mil.JPY B: 30 - 40 PCU·min/day/mil.JPY C: 20 - 30 PCU·min/day/mil.JPY D: 10 - 20 PCU·min/day/mil.JPY E: Less than 10 PCU·min/day/mil.JPY	20
4. Natural Environmental Considerations	Existence of Conservation Area in the project site such as ECA (Ecologically Critical Area), NP (National Park) and KBA (Key Biodiversity Area) A: No ECA, NP or KBA C: Located in KBA E: Located in ECA or NP	15
5. Social Environment Considerations	Scale of Affected House Holds (HHs) A: Less than 50 HHs B: 50 - 200 HHs C: 200 - 500 HHs D: 500 - 1000 HHs E: Over 1000 HHs	15
6. Consistency with JICA's Cooperation Policy	Number of matchings with following conditions 1. Application of advanced technologies 2. Contributing foreign direct investment to Bangladesh 3. Positive synergy with other Japanese ODA projects 4. Visibility of the project as bilateral cooperation project A: Match with 4 conditions B: Match with 3 conditions C: Match with 2 conditions D: Match with 1 condition E: No match	20
Total		**100**

Note: Total score = Point x Evaluation (A: 1, B: 0.75. C: 0.5, D: 0.25, E: 0)

Source: JICA Survey Team

Table S5.3.2 Multi-criteria Evaluation for Urban Road / Bridge Project

Evaluation Item	Evaluation Index	Point
1. Reliving traffic congestion in Urban Area	Type of project in urban area A: Elimination of Through Traffic from Urban Area C: Distribution of Local Traffic in Urban Area E: Spot Traffic Improvement	20
2. Traffic Demand	Future traffic volume in 2035 A: Over 60,000 PCU/day B: 40,000 - 60,000 PCU/day C: 20,000 - 40,000 PCU/day D: 10,000 - 20,000 PCU/day E: Less than 10,000 PCU/day	10
3. Economic Efficiency	Traffic volume (PCU/day) x Travel time saving (min) / Construction cost (million JPY) A: Over 40 PCU·min/day/mil.JPY B: 30 - 40 PCU·min/day/mil.JPY C: 20 - 30 PCU·min/day/mil.JPY D: 10 - 20 PCU·min/day/mil.JPY E: Less than 10 PCU·min/day/mil.JPY	20
4. Natural Environmental Considerations	Existence of Conservation Area in the project site such as ECA (Ecologically Critical Area), NP (National Park) and KBA (Key Biodiversity Area) A: No ECA, NP or KBA C: Located in KBA E: Located in ECA or NP	15
5. Social Environment Considerations	Scale of Affected House Holds (HHs) A: Less than 50 HHs B: 50 - 200 HHs C: 200 - 500 HHs D: 500 - 1000 HHs E: Over 1000 HHs	15
6. Consistency with JICA's Cooperation Policy	Number of matchings with following conditions 1. Application of advanced technologies 2. Contributing foreign direct investment to Bangladesh 3. Positive synergy with other Japanese ODA projects 4. Visibility of the project as bilateral cooperation project A: Match with 4 conditions B: Match with 3 conditions C: Match with 2 conditions D: Match with 1 condition E: No match	20
Total		**100**

Note: Total score = Point x Evaluation (A: 1, B: 0.75. C: 0.5, D: 0.25, E: 0)

Source: JICA Survey Team

5.3.2 Scoring

Scoring by the multi-criteria evaluation for inter-city road / bridge project and urban road / bridge project is shown in Table S5.3.3 and Table S5.3.4, respectively.

Table S5.3.3 Scoring for Inter-city Road / Bridge Project

	Project		Importance by Functional Road Level	Traffic Demand	Economic Efficiency	Natural Environmental Considerations	Social Environmental Considerations	Consistency with JICA's Cooperation Policy	Score	Rank	Sector-wise Rank
		Point	20	10	20	15	15	20	100		
1	R-01 (1) Dhaka – Chattogram Expressway (Dhaka - Cumilla)	Evaluation	A	A	C	A	E	B			
		Score	**20**	**10**	**10**	**15**	**0**	**15**	**70**	**5**	**3**
2	R-01 (2) Dhaka – Chattogram Expressway (Cumilla - Feni)	Evaluation	A	B	C	A	D	B			
		Score	**20**	**7.5**	**10**	**15**	**3.75**	**15**	**71.25**	**4**	**2**
3	R-01 (3) Dhaka – Chattogram Expressway (Feni - Chattogram)	Evaluation	A	B	C	A	E	B			
		Score	**20**	**7.5**	**10**	**15**	**0**	**15**	**67.5**	**6**	**4**
4	R-02 N5 Dhaka - Paturia	Evaluation	A	C	C	A	E	E			
		Score	**20**	**5**	**10**	**15**	**0**	**0**	**50**	**23**	**9**
5	R-03 N6 Natore - Sona Masjid	Evaluation	A	C	D	A	E	E			
		Score	**20**	**5**	**5**	**15**	**0**	**0**	**45**	**33**	**12**
6	R-04 N7 Daulatdia – Magura - Jashore	Evaluation	A	C	C	A	E	E			
		Score	**20**	**5**	**10**	**15**	**0**	**0**	**50**	**23**	**9**
7	R-05 N7 Jashore - Mongla	Evaluation	A	C	D	A	E	D			
		Score	**20**	**5**	**5**	**15**	**0**	**5**	**50**	**23**	**9**
8	R-06 N102 (N1: Moynamoti～N2: Kutta)	Evaluation	A	D	D	A	E	E			
		Score	**20**	**2.5**	**5**	**15**	**0**	**0**	**42.5**	**39**	**13**
9	R-07 Matarbari Port Access Road (Phase 2)	Evaluation	A	D	E	A	A	B			
		Score	**20**	**2.5**	**0**	**15**	**15**	**15**	**67.5**	**6**	**4**
10	R-08 (1) Marine Drive (Mirsharai – Chattogram)	Evaluation	B	D	E	A	E	C			
		Score	**15**	**2.5**	**0**	**15**	**0**	**10**	**42.5**	**39**	**13**
11	R-08 (2) Marine Drive (Chattogram – Matarbari)	Evaluation	B	D	E	A	E	C			
		Score	**15**	**2.5**	**0**	**15**	**0**	**10**	**42.5**	**39**	**13**
12	R-08 (3) Marine Drive (Matarbari – Cox's Bazar)	Evaluation	B	D	E	A	E	C			
		Score	**15**	**2.5**	**0**	**15**	**0**	**10**	**42.5**	**39**	**13**
13	R-09 N8/R880/881 Barisal - Patuakhali - Kuakata Road	Evaluation	B	C	D	A	E	E			
		Score	**15**	**5**	**5**	**15**	**0**	**0**	**40**	**45**	**17**
14	R-10 N502/N6 Bogura - Natore - Bonpara Road	Evaluation	B	D	D	A	E	E			
		Score	**15**	**2.5**	**5**	**15**	**0**	**0**	**37.5**	**53**	**18**
15	R-11 (1) Chattogram – Cox's Bazar Expressway (Chattogram - Chakaria)	Evaluation	A	B	C	A	E	B			
		Score	**20**	**7.5**	**10**	**15**	**0**	**15**	**67.5**	**6**	**4**
16	R-11 (2) Chattogram – Cox's Bazar Expressway (Chakaria - Cox's Bazar)	Evaluation	A	C	D	A	D	B			
		Score	**20**	**5**	**5**	**15**	**3.75**	**15**	**63.75**	**13**	**8**
17	R-12 (1) N1 Chattogram - Chakaria	Evaluation	A	B	B	A	E	B			
		Score	**20**	**7.5**	**15**	**15**	**0**	**15**	**72.5**	**3**	**1**
18	R-12 (2) N1 Chakaria - Cox's Bazar	Evaluation	A	C	C	A	E	B			
		Score	**20**	**5**	**10**	**15**	**0**	**15**	**65**	**10**	**7**
19	B-01 Meghna Bridge (Shariatpur – Chandpur Road)	Evaluation	B	C	D	A	C	C			
		Score	**15**	**5**	**5**	**15**	**7.5**	**10**	**57.5**	**16**	**8**
20	B-02 Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)	Evaluation	A	A	A	A	B	B			
		Score	**20**	**10**	**20**	**15**	**11.25**	**15**	**91.25**	**1**	**1**
21	B-03 Kalabador and Tetulia Bridges (Barisal – Bhola Road)	Evaluation	B	C	C	A	D	C			
		Score	**15**	**5**	**10**	**15**	**3.75**	**10**	**58.75**	**15**	**7**
22	B-04 Jamuna Bridge (Chilmari-Rowmari Road)	Evaluation	C	B	C	C	B	C			
		Score	**10**	**7.5**	**10**	**7.5**	**11.25**	**10**	**56.25**	**17**	**9**
23	B-05 Karkhana Bridge (Bakerganj – Bauphal Road)	Evaluation	D	D	D	A	B	C			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**10**	**48.75**	**27**	**16**
24	B-06 Jamuna Multimodal Road-Rail Tunnel (Balashi, Gaibandha)	Evaluation	C	D	E	C	C	C			
		Score	**10**	**2.5**	**0**	**7.5**	**7.5**	**10**	**37.5**	**53**	**36**
25	B-07 Payra Bridge (Patuakhali – Amtali – Barguna Road)	Evaluation	D	C	C	A	B	C			
		Score	**5**	**5**	**10**	**15**	**11.25**	**10**	**56.25**	**17**	**9**
26	B-08 Bishkhali Bridge (R880 Barguna – Kakchira Road)	Evaluation	D	C	C	A	C	C			
		Score	**5**	**5**	**10**	**15**	**7.5**	**10**	**52.5**	**20**	**12**
27	B-09 Cox's Bazar – Moheshkhali Bridge/Tunnel	Evaluation	B	D	C	A	A	A			
		Score	**15**	**2.5**	**10**	**15**	**15**	**20**	**77.5**	**2**	**2**
28	B-10 Megha-Dhonagoda River Bridge (Matlab Uttar-Gazaria Road)	Evaluation	D	D	D	A	A	C			
		Score	**5**	**2.5**	**5**	**15**	**15**	**10**	**52.5**	**20**	**12**
29	B-11 Jailkhana Ghat Bridge (Bhairab/ Rupsha River)	Evaluation	D	D	D	A	B	D			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
30	B-12 Phulbari Bridge (Bhodra River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**
31	B-13 Swarighat Bridge (Buriganga River)	Evaluation	C	C	E	A	D	D			
		Score	**10**	**5**	**0**	**15**	**3.75**	**5**	**38.75**	**52**	**35**
32	B-14 Delutia Bridge (Shibsa River)	Evaluation	E	E	E	A	A	D			
		Score	**0**	**0**	**0**	**15**	**15**	**5**	**35**	**56**	**38**
33	B-15 Jhopjhopia Bridge (Jhopjhopia River)	Evaluation	D	D	D	A	A	D			
		Score	**5**	**2.5**	**5**	**15**	**15**	**5**	**47.5**	**28**	**17**
34	B-16 Laxmikhola Bridge (Bhodra River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**
35	B-17 Shundarmohol Bridge (Gangrail River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**

	Project		Importance by Functional Road Level	Traffic Demand	Economic Efficiency	Natural Environmental Considerations	Social Environmental Considerations	Consistency with JICA's Cooperation Policy	Score	Rank	Sector-wise Rank
		Point	20	10	20	15	15	20	100		
36 B-18	Darulmollik Bridge (Shibsa River)	Evaluation	E	E	E	A	A	D			
		Score	**0**	**0**	**0**	**15**	**15**	**5**	**35**	**56**	**38**
37 B-19	Bishkhali Bridge (Bishkhali River)	Evaluation	D	C	C	A	C	C			
		Score	**5**	**5**	**10**	**15**	**7.5**	**10**	**52.5**	**20**	**12**
38 B-20	Shekirhat Bridge (Bhairab River)	Evaluation	E	E	E	A	B	D			
		Score	**0**	**0**	**0**	**15**	**11.25**	**5**	**31.25**	**60**	**42**
39 B-21	Kunda Bridge (Dhalweshwari)	Evaluation	C	D	E	A	B	D			
		Score	**10**	**2.5**	**0**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
40 B-22	Atulnagar Bridge (Kaliganga River)	Evaluation	E	E	B	A	A	D			
		Score	**0**	**0**	**15**	**15**	**15**	**5**	**50**	**23**	**15**
41 B-23	Matubborhat (Karkhana River)	Evaluation	D	E	A	A	A	D			
		Score	**5**	**0**	**20**	**15**	**15**	**5**	**60**	**14**	**6**
42 B-24	Panthoshala Bridge (Meghna River)	Evaluation	D	D	D	A	A	D			
		Score	**5**	**2.5**	**5**	**15**	**15**	**5**	**47.5**	**28**	**17**
43 B-25	Charkhali Bridge (Kocha River)	Evaluation	C	C	C	A	A	C			
		Score	**10**	**5**	**10**	**15**	**15**	**10**	**65**	**10**	**4**
44 B-26	2nd Postogola Bridge (Dhalweshwari River)	Evaluation	A	A	D	A	C	C			
		Score	**20**	**10**	**5**	**15**	**7.5**	**10**	**67.5**	**6**	**3**
45 B-27	Postogola (Parallal to 1st Bangladesh China Friendship Bridge) (Buriganga	Evaluation	A	C	E	A	A	C			
		Score	**20**	**5**	**0**	**15**	**15**	**10**	**65**	**10**	**4**
46 B-28	Kamrangir Char (Buriganga River)	Evaluation	D	C	C	A	C	D			
		Score	**5**	**5**	**10**	**15**	**7.5**	**5**	**47.5**	**28**	**17**
47 B-29	AK khan Economic Zone Bridge/ Danga Bridge (Shitalakhshya River)	Evaluation	D	E	D	A	B	D			
		Score	**5**	**0**	**5**	**15**	**11.25**	**5**	**41.25**	**44**	**28**
48 B-30	Aatharobeki Bridge (Aatharobeki River)	Evaluation	D	C	C	A	A	D			
		Score	**5**	**5**	**10**	**15**	**15**	**5**	**55**	**19**	**11**
49 B-31	Rampal Bridge (Mongla River)	Evaluation	D	D	D	A	B	D			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
50 B-32	Aamrajhuri Bridge (Gabkhan/Sandha River)	Evaluation	D	D	D	A	B	D			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
51 B-33	Shreeramkathi Bridge (Kaliganga River)	Evaluation	D	E	E	A	B	D			
		Score	**5**	**0**	**0**	**15**	**11.25**	**5**	**36.25**	**55**	**37**
52 B-34	Swarupkathi Bridge (Shondha River)	Evaluation	D	D	D	A	C	D			
		Score	**5**	**2.5**	**5**	**15**	**7.5**	**5**	**40**	**45**	**29**
53 B-35	2nd Basila Bridge (Turag River)	Evaluation	D	D	E	A	C	D			
		Score	**5**	**2.5**	**0**	**15**	**7.5**	**5**	**35**	**56**	**38**
54 B-36	Shomeshwary Bridge (Shomeshwary River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**
55 B-37	Balikhola Bridge (Dhonu River)	Evaluation	D	D	D	A	A	D			
		Score	**5**	**2.5**	**5**	**15**	**15**	**5**	**47.5**	**28**	**17**
56 B-38	2nd Brahmaputra Bridge (Brahmaputra River)	Evaluation	D	D	E	A	A	D			
		Score	**5**	**2.5**	**0**	**15**	**15**	**5**	**42.5**	**39**	**27**
57 B-39	Mohajon Borodia Bridge (Nabaganga/ Madhumati River)	Evaluation	D	D	D	A	B	D			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
58 B-40	Boktaboli Bridge (Dhalweshwari River)	Evaluation	D	E	E	A	C	D			
		Score	**5**	**0**	**0**	**15**	**7.5**	**5**	**32.5**	**59**	**41**
59 B-41	Boroibari Bridge (Dhonu River)	Evaluation	D	D	D	A	A	D			
		Score	**5**	**2.5**	**5**	**15**	**15**	**5**	**47.5**	**28**	**17**
60 B-42	Jayganj Bridge (Korotoa River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**

Note: R-12 (1) (2) will be implemented basically by widening of the existing road. However, construction of bypass will be required for some locations to avoid national parks along the road. “Natural Environmental Considerations” is evaluated as “A” considering the construction of bypass.

Source: JICA Survey Team

Table S5.3.4 Scoring for Urban Road / Bridge Project

Project			Importance by Functional Road Level	Traffic Demand	Economic Efficiency	Natural Environmental Considerations	Social Environmental Considerations	Consistency with JICA's Cooperation Policy	Score	Rank
		Point	20	10	20	15	15	20	100	
61 D-01	Dhaka Inner Ring Road (East: N3-N1)	Evaluation	A	A	C	A	D	C		
		Score	**20**	**10**	**10**	**15**	**3.75**	**10**	**68.75**	**9**
62 D-02	Dhaka Inner Ring Road (04: N1 (R110 – Kanchipur Bridge)	Evaluation	A	A	B	A	D	C		
		Score	**20**	**10**	**15**	**15**	**3.75**	**10**	**73.75**	**5**
63 D-03	Dhaka Inner Ring Road (Western Section)	Evaluation	A	A	B	A	E	C		
		Score	**20**	**10**	**15**	**15**	**0**	**10**	**70**	**7**
64 D-04	Dhaka Outer Ring Road (North-1: N3-N5)	Evaluation	A	B	B	A	C	D		
		Score	**20**	**7.5**	**15**	**15**	**7.5**	**5**	**70**	**7**
65 D-05	Dhaka Outer Ring Road (North-2: N5)	Evaluation	A	A	A	A	D	D		
		Score	**20**	**10**	**20**	**15**	**3.75**	**5**	**73.75**	**5**
66 D-06	Dhaka Outer Ring Road (South-1: N5-N8)	Evaluation	A	B	A	A	C	D		
		Score	**20**	**7.5**	**20**	**15**	**7.5**	**5**	**75**	**1**
67 D-07	Dhaka Outer Ring Road (South-2: N8 – 3rd Shitalakhya Bridge)	Evaluation	A	B	A	A	C	D		
		Score	**20**	**7.5**	**20**	**15**	**7.5**	**5**	**75**	**1**
68 D-08	Dhaka Outer Ring Road (South-3: 3rd Shitalakhya Bridge – N1)	Evaluation	A	B	B	A	D	D		
		Score	**20**	**7.5**	**15**	**15**	**3.75**	**5**	**66.25**	**10**
69 D-09	N1 Grade-separation (Madanpur)	Evaluation	E	A	A	A	D	C		
		Score	**0**	**10**	**20**	**15**	**3.75**	**10**	**58.75**	**11**
70 D-10	Jahangir Gate Underpass	Evaluation	E	B	E	A	A	C		
		Score	**0**	**7.5**	**0**	**15**	**15**	**10**	**47.5**	**13**
71 D-11	R504 (Hemayetpur～Manikganj)	Evaluation	C	D	D	A	D	E		
		Score	**10**	**2.5**	**5**	**15**	**3.75**	**0**	**36.25**	**17**
72 C-01	Chattogram Outer Ring Road	Evaluation	A	C	D	A	B	E		
		Score	**20**	**5**	**5**	**15**	**11.25**	**0**	**56.25**	**12**
73 C-02	Riverside Road (branch of Karnaphuli River)	Evaluation	C	C	D	A	B	E		
		Score	**10**	**5**	**5**	**15**	**11.25**	**0**	**46.25**	**14**
74 C-03	Riverside Road (left bank of Karnaphuli River)	Evaluation	C	E	E	A	C	E		
		Score	**10**	**0**	**0**	**15**	**7.5**	**0**	**32.5**	**18**
75 C-04	N1-N106 Connector Road (Hatazari)	Evaluation	A	E	E	A	B	E		
		Score	**20**	**0**	**0**	**15**	**11.25**	**0**	**46.25**	**14**
76 C-05	Viaduct (Right bank of Karnaphuli River)	Evaluation	C	E	E	A	C	D		
		Score	**10**	**0**	**0**	**15**	**7.5**	**5**	**37.5**	**16**
77 C-06	Karnaphuli Bridge (Barrik Building - Proposed Second Town)	Evaluation	C	C	A	A	A	C		
		Score	**10**	**5**	**20**	**15**	**15**	**10**	**75**	**1**
78 C-07	N107 Karnaphuli Bridge	Evaluation	C	C	A	A	A	C		
		Score	**10**	**5**	**20**	**15**	**15**	**10**	**75**	**1**

Source: JICA Survey Team

5.3.3 Project Short List

Projects shown in Table S5.3.5 are selected as the short listed project, as a result of scoring by the multi-criteria evaluation.

Table S5.3.5 Project Short List

No.	Project	Note
< Inter-city Road Project >		
R-01 (1)(2)(3)	Dhaka – Chattogram Expressway	New expressway connecting Dhaka and Chattogram
R-07	Matarbari Port Access Road (Phase 2)	Widening of Matarbari port access road (Japanese ODA Project) from 2 lanes to 4 lanes
R-11 (1)	Chattogram – Cox's Bazar Expressway (Chattogram - Chakaria)	New expressway connecting Chattogram and Chakaria
R-12 (1)	N1 Chattogram – Cox's Bazar (Chattogram - Chakaria)	Widening of N1 from 2 lanes to 4 lanes between Chattogram and Chakaria (Bypass for some locations)
< Inter-city Bridge Project >		
B-02	Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)	New bridge eliminating missing link at Padma River in N5
B-09	Cox's Bazar – Moheshkhali Bridge/Tunnel	New bridge / tunnel connecting Moheshkhali (Matarbari area) and Cox's Bazar
B-25	Charkhali Bridge (Kocha River)	New bridge eliminating missing link at Kocha River in regional road
B-26	2nd Postogola Bridge (Dhalweshwari River)	New bridge Parallel to existing bridge at Dhalweshwari River in N8
B-27	Postogola (Buriganga River)	New bridge Parallel to 1st Bangladesh China Friendship Bridge at Buriganga River in N8
< Urban Road / Bridge Project >		
D-02	Dhaka Inner Ring Road (R110 – Kanchipur Bridge)	New expressway (part of inner ring road in Dhaka)
D-05	Dhaka Outer Ring Road (North-2: N5)	New expressway (part of outer ring road in Dhaka)
D-06	Dhaka Outer Ring Road (South-1: N5-N8)	New expressway (part of outer ring road in Dhaka)
D-07	Dhaka Outer Ring Road (South-2: N8 – 3rd Shitalakhya Bridge)	New expressway (part of outer ring road in Dhaka)
C-06	Karnaphuli Bridge (Barrik Building - Proposed Second Town)	New bridge at Karnaphuli River running north-south in the east of Chattogram CBD
C-07	N107 Karnaphuli Bridge	Replacement of the existing bridge (narrow 1-way bridge) at Karnaphuli River in Chattogram

Source: JICA Survey Team

5.4 Priority Projects

Following 3 projects were selected as priority projects from the short list based on the discussion among Bangladesh related authorities, JICA and JICA Survey Team.

(1) R-01(1)(2)(3): Dhaka – Chattogram Expressway

- This is a new expressway construction project connecting Dhaka and Chattogram which are the two largest cities in Bangladesh. It is expected to have a large volume of traffic, thus have a significant economic impact. It is also a project in the Bay of Bengal Industrial Growth Belt (BIG-B), which is in line with Japanese Government's policy of cooperation.

(2) B-02: Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)

- This is a new bridge/tunnel construction project that eliminates the missing link of the Padma River on N5, which is a major trunk road in Bangladesh. It is expected to have a large volume of traffic, thus have a significant economic impact. By utilizing bridge or tunnel to cross the river that are currently crossed by ferries, it is possible to secure highly reliable transportation routes. In addition, the scale of resettlement are comparatively small and the project will be highly feasible.

(3) B-09: Cox's Bazar – Moheshkhali Bridge/Tunnel

- This is a new bridge/tunnel construction project at the Moheshkhali Canal river mouth between Moheshkari (Matarbari area) and Cox's Bazar urban area. In the Matarbari area, a power plant, port and access road projects are currently in progress as Japanese ODA projects. The implementation of this project will increase the effect of these projects. In addition, the construction cost and the scale of resettlement are comparatively small and the project will be highly feasible.

Although "R-12 (1): N1 Chattogram - Cox's Bazar (Chattogram - Chakaria)" was ranked the highest among the inter-city road projects in the project evaluation, this project is still being discussed in the Bangladesh-Japan Joint PPP Platform as "Chattogram-Cox's Bazar Highway Project (N1)". Therefore, this project was not further examined in this Data Collection Survey. Depending on the future discussions in the PPP Platform, this project may be considered as one of the priority projects with the same or higher priority than the above projects.

According to BBA, "B-01: Meghna Bridge (Shariatpur-Chandpur Road)" is the most important project. However, the project has not been selected as a short list and priority project in this survey, as this project will not be well effective without upgrading existing access roads to the bridge. However, if existing access roads are upgraded, the project effects will be increased and thus shoud be considered as a priority project.

6. NECESSITY OF OTHER PROJECTS

6.1 Intersection Improvement Project

In Bangladesh, cities and towns are generally located along inter-city trunk roads. However, trunk roads in Bangladesh have not enough connectivity and alternative routes, thus all traffic including through traffic and local traffic concentrate to these trunk roads. In particular, in cities around intersections between trunk roads, many people live there and traffic congestion occur. Main causes of traffic congestion are the concentration of shops near intersections and the stop of CNG and buses (passengers getting on and off). The separation of through traffic from local traffic is recognised as a challenge to ensuring smooth traffic flow on trunk roads.

For this challenge, RHD has promoted projects for the installation of dedicated Slow-Moving Vehicle Traffic (SMVT) lanes along trunk roads, which are being implemented in many cities and towns. Figure S6.1.1 compares intersections on National Highway 1 (near Dhaka) where SMVT lanes are not installed with those where they are. SMVT lanes is clearly effective to alleviate traffic congestion.

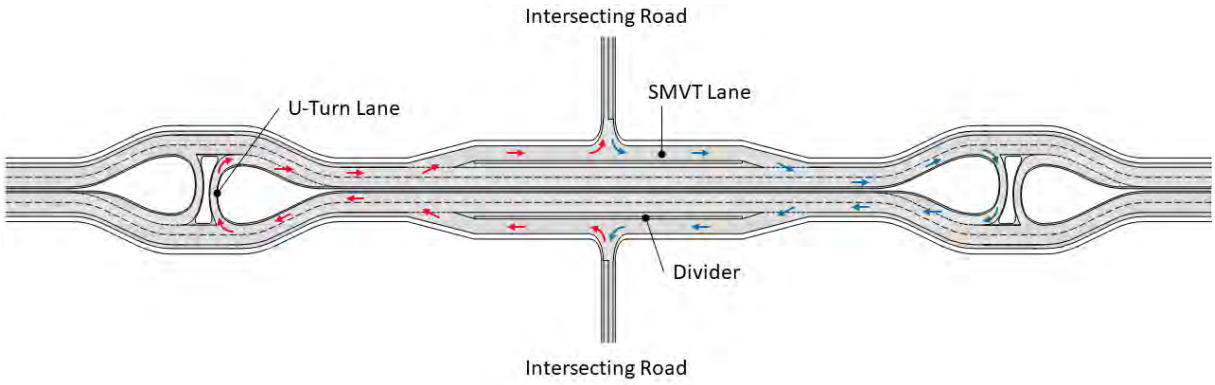
On the other hand, SMVT lanes cause issues for local traffic in some locations. As shown in Figure S6.1.2, where a median is installed, traffic who want to turn right from main line to crossing road, or who want to go straight from crossing road forces long travel for turnaround at a U-turn lane about 5 km away.

Intersections where through traffic is not separated from local traffic.

Intersections where through traffic and local traffic are separated.

Source: JICA Survey Team

Figure S6.1.1 Traffic Situation at Intersections



Source: JICA Survey Team

Figure S6.1.2 Intersections Widely Adopted in Bangladesh in Recent Years

In order to improve such a situation, construction of flyovers or bypass roads would be a possible solution and there are many intersections which require to solve traffic congestion by constructing flyover on the trunk road network in Bangladesh.

In this Data Collection Survey, priority road and bridge projects were selected from the long term plans prepared by each implementing agency. Selected priority projects are all large-scale projects, thus require a long period. On the other hand, the intersection improvement (flyover construction) project at congested intersections on trunk roads can be implemented relatively in short period, by small budget and with small impact on environmental and social issues. In addition, the number of project intersection

locations can be adjusted according to the budget. From this perspective, RHD proposed to include this intersection improvement project as well as large scale road and bridge projects into the priority project.

With regard to the locations for intersection improvement, intersections on National Highway No. 2 and No.4 were excluded, as they are scheduled to be upgraded through ADB-supported projects. Considering the synergistic effects with other Japanese ODA projects as well as the perspective of strengthening the international trunk road network, the major intersections on National Highway No.1 (between Dhaka and Chattogram) can be considered as a candidate for the project. In addition, the following intersections were proposed by RHD as candidates for the project. Regarding the intersection on National Highway No.2 (ID No. 5 in the table), which has a relatively short distance between intersections of about 800 m and is prone to congestion, the ADB-supported project does not include the grade-separation of this intersection, which is expected to require high construction technology, and thus the adoption of this advanced technology is expected.

Table S6.1.1 Candidate Locations for Intersection Improvement Projects

ID	Main Direction	Sub Direction	Number of Crossing Roads	Present Condition	Remarks
1	N1	R110	4	Separated by median strip	
2	N1	N105	4	At-grade intersection	Intersection between Dhaka Bypass and Dhaka Outer Ring Road
3	N1	Z1066	4	Separated by median strip	
4	N1	N102	3	At-grade intersection	
5	N2	N102/R220	3 + 3	Two consecutive at-grade intersections	N2 will be improved under Dhaka-Sylhet Road project but the grade-separation is not included in the scope of works.
6	N706	R765	3	At-grade intersection	R765 will be improved under WeCARE project
7	N706	N7	3	Roundabout	N7 will be improved under WeCARE project
8	N405	N4	3	At-grade intersection	N405 will be improved in SASEC II project
9	R370	R360	3	At-grade intersection	
10	R370	R371	3	Roundabout	

Source: JICA Survey Team

When flyovers are constructed, it is necessary to fully understand the traffic characteristics of Bangladesh and consider appropriate traffic management, paying particular attention to ruleless stop of buses at intersections.

6.2 Improvement of Existing Bridges

There are more than 20,000 bridges and culverts on the RHD's road network, and JICA has so far supported the "Eastern Bangladesh Bridge Rehabilitation Project (63 small and medium bridges)", "Western Bangladesh Bridge Rehabilitation Project (81 bridges), Kanchpur, Meghna, Gumti 2nd Bridges Construction and Existing Bridges Rehabilitation Project, and Cross Border Road Network Improvement Project (16 small and medium bridges and Kaluna Bridge). In addition to this, RHD has

constructed 100 bridges in 25 districts with its own budget, which were opened to traffic on November 7, 2022.

However, there are still many ferry crossings on Regional Highway and Zilla Roads and many bridges on the roads needed to be rehabilitated. Therefore, RHD is currently planning to replace the existing small to medium-sized bridges. The Preliminary Development Project Proposal (PDPP) for this project has been prepared for the government's approval. RHD expects that this project will be conducted by a Japanese ODA Loan Project as a continuation of the "Eastern Bangladesh Bridge Improvement Project" and the "Western Bangladesh Bridge Improvement Project".

Table S6.2.1 Summary of the Proposed Bridge Improvement Project

Zone		Number of Bridge	Total Length (km)
1	Rangpur	12	1,399
2	Rajshahi	23	1,748
3	Mymensingh	25	1,941
4	Dhaka	11	1,894
5	Gopalganj	14	982
6	Barisal	14	818
7	Cumilla	30	1,580
	Total	129	10,310

Source: RHD. 2022. Preliminary Development Project Proposal (PDPP) for Bangladesh Bridges Improvement Project (BBIP)

6.3 Technical Assistant Project for Road and Bridge Sectors

Operation & Maintenance of Bridge is executed by Bridge Management Wing and they utilize BMS (Bridge Management System) which was implemented in JICA Technical Cooperation Project of "Bridge Management Capacity Development Project". Periodic inspection of bridges and other structures once every three years was carried out directly by RHD. However, last year the inspection works started to be outsourced to private consultant firm. The inspection works in two zones (Cumilla, Rangpur) has been already outsourced, and this year the private consultant for other four zones are under selection. In other hand, BBA Operation & Maintenance of Bridge is outsourced to a private company under a five-year comprehensive maintenance contract.

Operation & Maintenance of Road is executed by Planning & Maintenance Wing and they are preparing the scope of Performance Based Contract (PBC) to make a trial in a project. It is planned to be extended to other routes/sections of their road network.

Regarding PPP projects, two road/bridge projects are under construction by RHD and BBA. Four road/bridge projects are listed on the Bangladesh-Japan Joint PPP Platform, and pre-F/S have been or are being conducted.

In this section, three sectors for “Technical Cooperation Projects” were studied: Bridge Operation & Maintenance, Road Operation & Maintenance, and PPP. As result, it was confirmed that Bridge Operation & Maintenance sectors has the greatest need for technical assistance from Japan.

Regarding the Bridge Operation & Maintenance sector, the maintenance cycle hasn’t been completed by RHD. The BMS tool developed during Technical Cooperation Project for Bridge Management Capacity Development in 2015-2018 hasn’t been fully utilized; and almost no repair/reinforcement projects have been implemented in Bangladesh. The Dhaka attack incident occurred during the technical cooperation project implementation had a big impact, however further support is required to establish a maintenance cycle and to enable RHD and other institutions in Bangladesh to carry out an efficient Operation & Maintenance activities by themselves.

Regarding the Road Operation & Maintenance sector, a maintenance cycle of inspection, examinations, evaluation, planning, design, construction and recording has been established using HDM-4 (Pavement management software system introduced by the World Bank). In recent years, the pavement condition has been improving steady. Therefore, the need for technical assistance from Japan is the lowest among these three sectors.

Regarding the PPP sector, Bangladesh has already developed a legal system, rules and regulations for public assistance, guidelines and manuals to implement the law. Several new road projects are being carry out under those schemes. On the other hand, technical and financial support is still necessary to promote the projects from Japanese companies, including those listed in the Bangladesh-Japan Joint PPP Platform.

1. INTRODUCTION

1.1 Survey Background

In the People's Republic of Bangladesh (hereinafter referred to as "Bangladesh"), economic growth has been increased with a GDP growth rate of average 6.5% in the past 10 years (IMF, 2022). Number of registered vehicles has also been increased with a rate of 13 % per year in Bangladesh, where road traffic accounts for 70% of all traffic modes (Bangladesh Bureau of Statistics, 2020).

It is expected to expand traffic demand in Bangladesh depending on large scale industrial development such as Matarbari Port, special economic zones, etc. However, missing links of road network at rivers have been hindering inter-city flow of goods and people. Thus, it is important in Bangladesh to develop reliable road network by increasing road capacity and eliminating missing links.

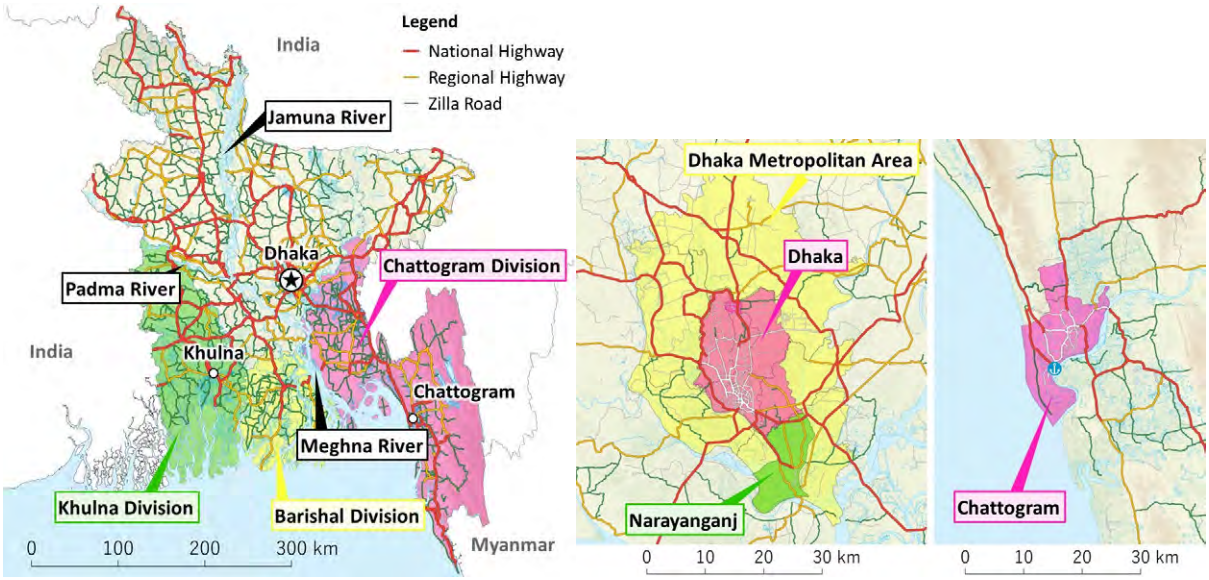
On the other hand, in urban area such as Dhaka and Chattogram, traffic congestion, traffic accident, damage of road facilities depending on increased number of private cars as well as inflow of large-sized vehicles into urban area have become serious issues. It is essential to implement the road development for eliminating these issues such as ring road construction, bypass construction, intersection improvement, etc. in urban area.

1.2 Objectives of the Survey

In this Data Collection Survey (hereinafter referred to as "the Survey"), priority road and bridge projects are selected to solve above issues. Studies required for implementing the priority project as a Japanese ODA project are also conducted.

1.3 Areas Covered by the Survey

Area covered by the Survey is shown in Figure 1.3.1.



Source: JICA Survey Team

Figure 1.3.1 Areas Covered by the Survey

1.4 Outline of the Survey

The Survey is comprised mainly of the following items.

- Review of Basic Information in Bangladesh
- Review of Road and Bridge Development Plans
- Preparation of Project Long List for Road and Bridge Projects
- Preparation of Project Short List and Selection of Priority Projects for Road and Bridge Projects
- Study on Necessity of Technical Assistant Project for Road and Bridge Sectors
- Consideration of Outline for Priority Road and Bridge Projects
- Recommendation for Priority Road and Bridge Projects

1.5 Survey Team Composition

The Survey was conducted by Oriental Consultants Global. Survey team composition is shown below.

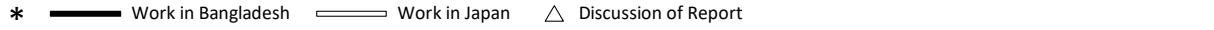
- Team Leader / Road Transport Plan (1)
- Deputy Team Leader / Road Transport Plan (2)
- Bridge Plan / Bridge Design (1)
- Road Design / Bridge Design (2)
- Traffic Demand Forecast / Economic & Financial Analysis
- Environmental & Social Considerations
- Road and Bridge Operation & Maintenance Plan

1.6 Survey Schedule

The Survey was conducted according to the schedule shown in Table 1.6.1.

Table 1.6.1 Survey Schedule

Work Item / Year/Month		2022					2023				
		8	9	10	11	12	1	2	3	4	5
1-1	Preparation of Draft Inception Report										
1-2	Discussion and Finalization of Inception Report										
2-1	Data Collection and Analysis on Basic Information										
2-2	Data Collection and Analysis on Road and Bridge Development Plan										
3-1	Preparation of Long List										
3-2	Preparation of Short List										
3-3	Consideration for Technical Assistance Project on Road and Bridge Sector										
3-4	Preparation and Discussion of Interim Report										
4-1	Selection of Priority Projects and Preparation of Project Outline										
4-2	Recommendation for JICA Preparatory Survey										
5-1	Preparation and Discussion of Draft Final Report										
5-3	Preparation and Discussion of Final Report										



Source: JICA Survey Team

1.7 Summary of the Survey

1.7.1 Review of Basic Information in Bangladesh

Basic information on the social and economic conditions, road traffic conditions, international road connectivity, etc. in Bangladesh was collected and analyzed.

The following development needs were confirmed in the analysis on road traffic conditions.

(1) Development of Bridge at Missing Links

In Bangladesh, where most of the country is low-lying and has many rivers, ferries are an important means of transport, with ferry services operating not only at these road missing link locations but also on the rivers themselves as travel routes. However, ferry accidents have been frequently occurred, such as overloading with passengers far exceeding capacity, sinking due to collision with other vessels, and

personal injury due to fire on board, making safety management an issue. In addition, ferry crossings require a certain amount of travel time, including waiting time, and are easily affected by weather and environmental factors, so there is a strong need to develop bridges that is superior in terms of timeliness and safety.

(2) Development of Intercity Roads

Due to the low substitutability of the road network, severe traffic congestion is caused on the main arterial roads. Additionally, the presence of slow speed vehicles such as CNGs (known as small three-wheelers) and rickshaws, and the reduction of road space due to the parking of long-distance buses, the separation of local traffic and inter-regional traffic is a major challenge. Therefore, there is a strong need for development of intercity roads such as construction of expressways and widening of existing national highways in order to separate local traffic from inter-regional traffic.

(3) Development of Urban Roads

Traffic in urban areas has an overwhelmingly small number of arterial roads despite its heavy reliance on road traffic, and the mixture of cars, buses, auto-rickshaws, rickshaws and trucks on all roads has led to chronic traffic congestion, which is a serious problem. In addition to population growth in urban areas, the further spread of cars is expected to increase due to economic growth, drastic improvement of urban transport is an urgent issue. Therefore, there is a strong need for development of urban roads such as ring roads to reduce traffic congestion in urban areas.

Also, in order to implement those projects, institutional framework of executing agencies, private sector involvement, application of advanced technologies and DX utilization were considered.

1.7.2 Review of Road and Bridge Development Plans

In order to select priority road and bridge projects, road and bridge development plans in Bangladesh were studied. Particularly, RHD Road Master Plan, BBA Bridge Master Plan, Strategic Transport Plan for Dhaka, Detailed Area Plan for Chattogram were studied.

In addition, road and bridge development plans in India, Nepal, Bhutan and Myanmar as neighboring countries are studied to confirm importance of trunk road network in the region including neighboring countries.

1.7.3 Preparation of Project Long List for Road and Bridge Projects

Priority projects were selected by 3-step selection in this survey. In the 1st step, all possible projects were selected as the long list by the needs analysis for project implementation as well as screening criteria. In the 2nd step, candidate priority projects were selected as the short list by multi-criteria evaluation from the long list. Finally, in the 3rd step, priority projects were selected by discussion among Bangladesh related authorities, JICA and JICA Survey Team.

In the long list preparation, it was also confirmed if each project meets the following screening criteria.

- Projects strengthening the Asian Highways and international economic corridors
- Projects strengthening the road network in Bangladesh by eliminating missing links
- Projects strengthening the road network by increasing road capacity in sections with high traffic demand
- Projects contributing to ensuring redundancy and to enhancing resilience of the road network in the event of disaster
- Projects relieving traffic congestion in urban areas
- Projects securing and strengthening linkages with national, urban and regional development areas
- Projects consistent with Japanese Country Assistance Policy for Bangladesh and having positive synergy with other Japanese ODA projects
- Projects promoting/contributing foreign direct investment to BangladesAs a result, a total of 78 projects were selected as the long list including 18 inter-city road projects, 42 bridge projects on inter-city road, 11 urban road & bridge projects in Dhaka and 7 urban road & bridge projects in Chattogram.

1.7.4 Preparation of Project Short List and Selection of Priority Projects for Road and Bridge Projects

Each project in the long list was scored by the multi-criteria evaluation. Evaluation items in multi-criteria include Importance by Functional (only for inter-city road / bridge project), Reliving traffic congestion in Urban Area (only for urban road / bridge project), Traffic Demand, Economic Efficiency, Natural Environmental Considerations, Social Environment Considerations and Consistency with JICA's Cooperation Policy.

15 projects including 4 inter-city road projects, 5 bridge projects on inter-city road, 6 urban road & bridge projects were selected as the short-listed project, as a result of scoring by the multi-criteria evaluation.

Finally, following 3 projects were selected as priority projects from the short list based on the discussion among Bangladesh related authorities, JICA and JICA Survey Team.

- R-01(1)(2)(3): Dhaka - Chattogram Expressway
- B-02: Padma Bridge/Tunnel (N5 Paturia - Goalonda Point)
- B-09: Cox's Bazar - Moheshkhali Bridge/Tunnel

1.7.5 Study on Necessity of Technical Assistant Project for Road and Bridge Sectors

The main objective of this survey is to select priority road and bridge projects as candidates of Japanese ODA Loan Projects. However, needs for other projects implementation were also studied, and necessity of the following projects were confirmed.

(1) Intersection Improvement Project

In Bangladesh, cities and towns are generally located along inter-city trunk roads. However, trunk roads in Bangladesh have not enough connectivity and alternative routes, thus all traffic including through traffic and local traffic concentrate to these trunk roads. In particular, in cities around intersections between trunk roads, many people live there and traffic congestion occur.

This project will be conducted to reduce traffic congestion at bottlenecks on trunk roads by construction of flyovers at congested intersections.

(2) Improvement of Existing Bridges

There are more than 20,000 bridges and culverts on the RHD's road network, and JICA has so far supported the "Eastern Bangladesh Bridge Rehabilitation Project (63 small and medium bridges)", "Western Bangladesh Bridge Rehabilitation Project (81 bridges), Kanchpur, Meghna, Gumti 2nd Bridges Construction and Existing Bridges Rehabilitation Project, and Cross Border Road Network Improvement Project (16 small and medium bridges and Kaluna Bridge).

However, there are still many ferry crossings on Regional Highway and Zilla Roads and many bridges on the roads needed to be rehabilitated.

This project will be conducted as a continuation of the "Eastern Bangladesh Bridge Improvement Project" and the "Western Bangladesh Bridge Improvement Project".

(3) Technical Cooperation Project for Road and Bridge Sectors

Three sectors for "Technical Cooperation Projects" were studied: Bridge Operation & Maintenance, Road Operation & Maintenance, and PPP. As result, it was confirmed that Bridge Operation & Maintenance sectors has the greatest need for technical assistance from Japan.

1.7.6 Consideration of Outline for Priority Road and Bridge Projects

The following information was collected to implement the selected 3 priority projects:

- Basic Information
- Project Outline
- Beneficiary of the Project
- Project Cost
- Project Implementation Schedule
- Implementation Agency
- Environmental and Social Considerations
- Project Effects
- Lessons Learned from Past Similar Projects
- Others

1.7.7 Recommendation for Priority Road and Bridge Projects

Major study items and key consideration for JICA Preparatory Survey for 3 priority projects were considered.

2. REVIEW OF BASIC INFORMATION IN BANGLADESH

2.1 Social and Economic Conditions

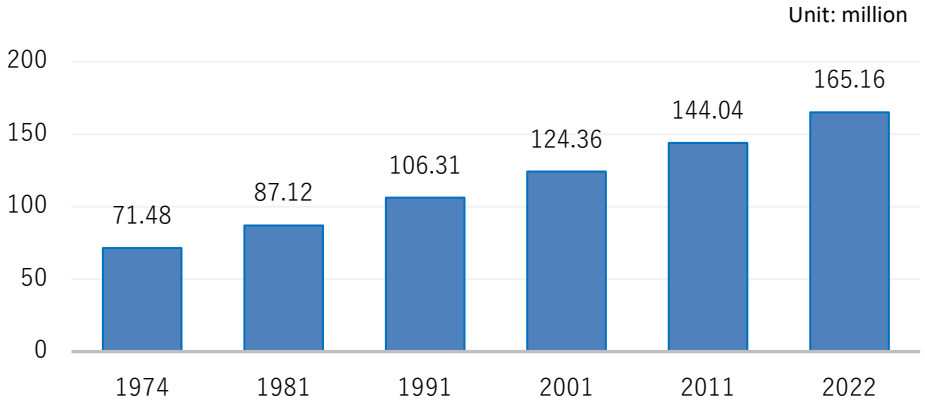
Bangladesh has 165 millions of population in 2022, which is 1.3 times of Japan, in approximately 40% of national land area of Japan. Although Bangladesh is a densely populated country, it is classified as a Least Development Country (LDC), with approximately 20% of population (in 2019) are sorted as poor.

The labour-intensive sewing sector is the main industry, and Japanese companies are expanding their presence in the country. However, the industrial structure is not upgrading since the industry other than sewing has not developed. In addition, they have other challenges, such as undeveloped basic infrastructure (electricity, transportation) and weakness to natural disasters (cyclones, floods and tidal waves).

(1) Population

According to the 6th Population & Housing census (2022) published by the Bangladesh Bureau of Statistics (BBS), the total population of Bangladesh is 165 million, an increase of about 21 million over the decade since the last survey in 2011. The average annual population growth rate is 1.22%, which was slightly decreased from 1.46% in the last survey, but the population is still growing, especially in urban areas.

By division, the division containing the capital city of Dhaka has the largest average annual population growth rate of 1.74%, followed by Chattogram with a growth rate of 1.39%, which is higher than the nationwide average of 1.22%, while the population growth rate of the other divisions is lower than the nationwide average. Population density by division is similarly significant, with the capital city of Dhaka having the largest population density of all divisions at 2,156 persons/km^2, a significant increase from 1,521 persons/km^2 in the last survey (see Table 2.1.3). Furthermore, comparison of district level population density (/km^2) in 2011, that of 2022 has increased 1,029 persons (2,914/ km^2) at Gazipur District, 1,404 persons (5,712 persons/km^2) at Narayanganj District, and 1,838 persons (10,067 persons/ km^2) at Dhaka District in Dhaka division. As this indicates a significant trend of concentration in the division



Source: BBS. 2022. Population & Housing Census 2022

Figure 2.1.1 Population in Bangladesh

Table 2.1.1 Population in Bangladesh

Unit: million

Division	1974	1981	1991	2001	2011	2022
Rangpur**	-	-	-	-	15.79	17.61
Rajshahi	17.37	21.12	26.25	30.20	18.48	20.35
Mymensingh*	-	-	-	-	-	12.23
Sylhet***	-	5.65	6.78	7.94	9.91	11.03
Dhaka	21.30	26.25	32.64	39.04	47.42	44.22
Khulna	8.79	10.64	12.65	14.71	15.69	17.42
Barishal	5.43	6.51	7.46	8.17	8.33	9.10
Chattogram	18.59	16.94	20.52	24.29	28.42	33.20
Total	**71.48**	**87.12**	**106.31**	**124.36**	**144.04**	**165.16**

Note: * Mymensingh division was established separately from Dhaka division in 2015 so that the population of the division before 2011 is included in the Dhaka division
** Rangpur division was established separately from Rajshahi division in 2010 so that the population of the division before 2001 is included in the Rajshahi division
*** The population of Sylhet in 1974 division is included in the Chattogram division

Source: BBS. 2022. Population & Housing Census 2022

Table 2.1.2 Average Annual Population Growth Rate

Division	2001	2011	2022
Rangpur	1.88%	0.86%	0.98%
Rajshahi	1.87%	0.76%	0.86%
Mymensingh*	-	-	-
Sylhet	1.60%	2.22%	0.96%
Dhaka	1.78%	1.94%	1.74%
Khulna	1.48%	0.65%	0.93%
Barishal	0.91%	0.18%	0.79%
Chattogram	1.69%	1.57%	1.39%
Average	**1.58%**	**1.46%**	**1.22%**

Note: * Mymensingh division was separated from Dhaka division in 2015, and is therefore taken into account in the population growth rate of Dhaka division

Source: BBS. 2022. Population & Housing Census 2022

Table 2.1.3 Population Density in Bangladesh

Unit: million

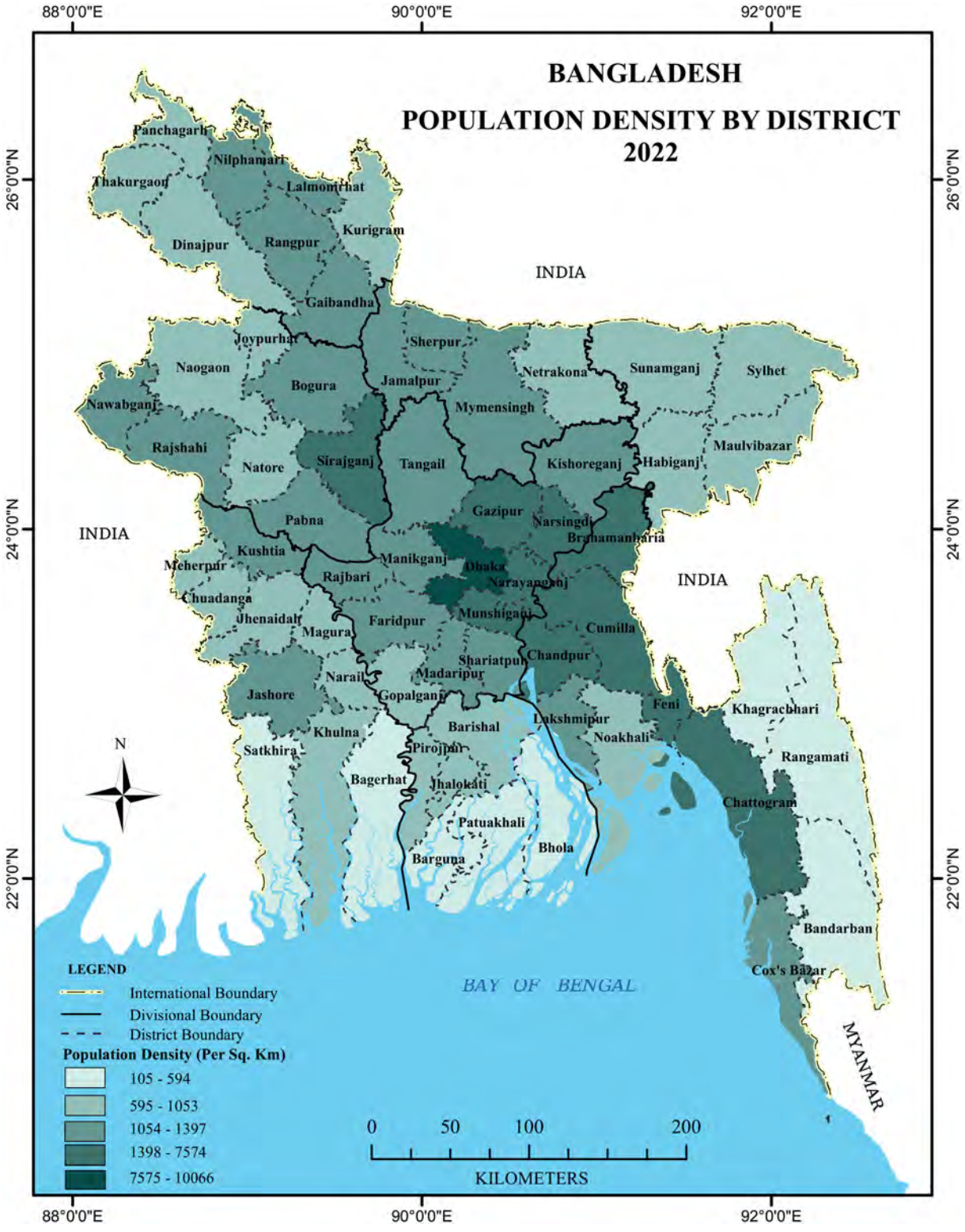
Division	1974	1981	1991	2001	2011	2022
Rangpur**	-	-	-	-	784	1,088
Rajshahi	502	612	759	875	1,018	1,121
Mymensingh*	-	-	-	-	-	1,146
Sylhet***	-	445	537	630	975	873
Dhaka	685	843	1050	1255	1,521	2,156
Khulna	394	478	570	660	704	782
Barishal	408	490	561	615	630	688
Chattogram	402	487	589	719	838	979
Total	**484**	**590**	**720**	**843**	**976**	**1,119**

Note: * Mymensingh division was established separately from Dhaka division in 2015 so that the population of the division before 2011 is included in the Dhaka division

** Rangpur division was established separately from Rajshahi division in 2010 so that the population of the division before 2001 is included in the Rajshahi division

*** The population of Sylhet in 1974 division is included in the Chattogram division

Source: BBS. 2022. Population & Housing Census 2022

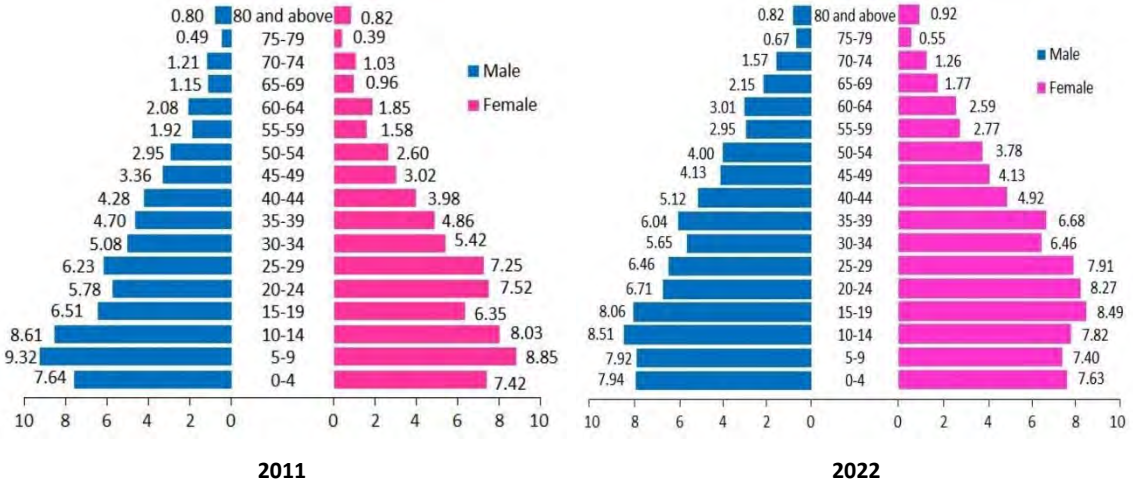


Source: BBS. 2022. Population & Housing Census 2022

Figure 2.1.2 Population Density in Bangladesh (2022)

The distribution of the population by age and sex, as shown in Figure 2.1.3, is a pyramid-shaped distribution, characterized by a very large number of young people under 20 years of age. The population of young people (aged 15-24), who will be responsible for further economic development, has increased from 18.16% (2011) to 19.11% (2022).

Unit: million



Source: BBS. 2022. Population & Housing Census 2022

Figure 2.1.3 Distribution of the Population by Age and Sex

(2) Economic Condition

Bangladesh has achieved significant economic growth in recent years (6.5% p.a.: 2010-2022 IMF). On the back of steady economic growth, Bangladesh became a low- and middle-income country in the World Bank classification in 2015, and achieved all three Least Developed Country (LDC) graduation criteria defined by UN in 2018. On 24 November 2026, graduation from the LDC is expected.

In September 2022, the Asian Development Bank (ADB) announced that Bangladesh's GDP growth forecast for FY2022 (July 2021-June 2022) was 7.2%. This is the second highest level in South Asia next the Maldives (8.2%) and higher than India (7.0%). It is noteworthy that Bangladesh is the only country in South Asia that continued to grow in 2020, despite the worsening economic situation in countries around the world due to the spread of the COVID-19.

Table 2.1.4 GDP Growth Rate of South Asian Countries

	2019	2020	2021	2022 (prediction)	2023 (prediction)
Afghanistan	3.9	-2.4	-	-	-
Pakistan	3.1	-0.9	5.7	6.0	3.5
India	3.7	-6.6	8.7	7.0	7.2
Nepal	6.7	-2.4	4.2	5.8	4.7
Bangladesh	7.9	3.4	6.9	7.2	6.6
Bhutan	5.8	-10.0	4.1	4.5	4.0
Maldives	6.9	-33.5	37.1	8.2	10.4
Sri Lanka	2.3	-3.6	3.3	-8.8	-3.3
Average of South Asia	**4.0**	**-5.2**	**8.1**	**6.5**	**6.5**

Note: - No data

Source: ADB. 2022. Asian Development Outlook (ADO)

The price inflation rates, also released by the ADB, for South Asian countries are shown in Table 2.1.5. Bangladesh's price inflation rate in 2022 is estimated at 6.2%, which is roughly same level with India and Nepal.

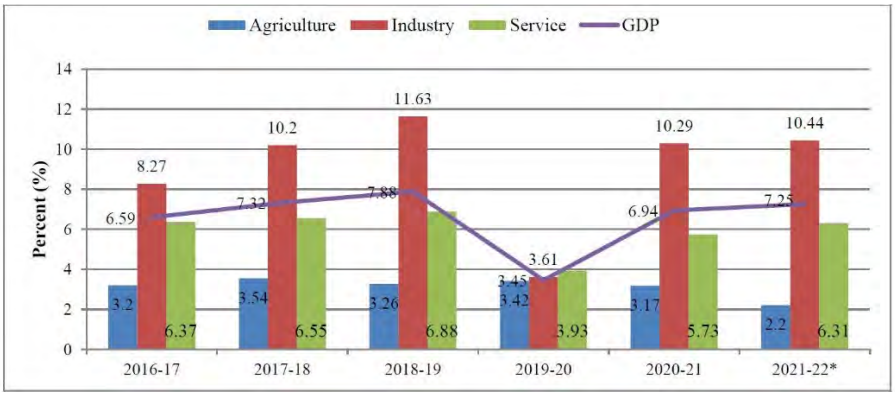
Table 2.1.5 Price Inflation Rate for South Asian Countries

	2019	2020	2021	2022 (prediction)	2023 (prediction)
Afghanistan	2.3	5.6	5.2	-	-
Pakistan	6.8	10.7	8.9	12.2	18.0
India	4.8	6.2	5.5	6.7	5.8
Nepal	4.6	6.2	3.6	6.3	6.1
Bangladesh	5.5	5.7	5.6	6.2	6.7
Bhutan	2.8	5.6	7.4	6.5	5.5
Maldives	0.2	-1.4	0.5	3.3	2.8
Sri Lanka	4.3	4.6	6.0	44.8	18.6
Average of South Asia	**5.0**	**6.5**	**5.8**	**8.1**	**7.4**

Note: - No data

Source: ADB. 2022. Asian Development Outlook (ADO)

According to the Bangladesh Economic Review 2022 published by the Bangladesh Finance Division, the sectoral GDP breakdown is 11.52% for agriculture, 35.47% for industry and 53.01% for service. The sectoral GDP growth rates are 2.20% for agriculture, 10.44% for industry and 6.31% for service. This indicates that the industry sector is particularly well developed. As shown in Figure 2.1.4, although the growth in the industry and services sectors slowed down in FY 2019-20 due to the spread of the COVID-19, it has been recovering since the following year. It is expected to further development of Bangladesh economy.



Source: Bangladesh Economic Review 2022

Figure 2.1.4 Sectoral GDP Growth Rate Breakdown

Although the spread of COVID-19 and Russia's attack on Ukraine have had a negative impact on the worldwide economy, the value of Bangladesh's exports has continued to grow. According to the Asian Development Outlook 2022 Update, exports in FY2022 will reach 49.2 billion USD, 33.4% increasing from the previous year. It recorded an increase of 82.5 billion USD, mainly due to the import of raw

materials for the demand for clothing. In addition, construction materials, pharmaceuticals, and agricultural fertilizers increased by 63.5% from the previous year, which is one of the reasons for the increase in import value.

Meanwhile, Bangladesh's finances may face a difficulty for payments for import and current account deficit by high energy and food prices due to Russia's attack on Ukraine. The Government of Bangladesh therefore requested a loan to IMF in 2022, and it has approved for a total of USD 4.7 billion in loans, an Extended Credit Facility (ECF) and Extended Fund Facility (EFF) of USD 3.3 billion and a Resilience and the Resilience and Sustainability Facility (RSF) of USD 1.4 billion in January 2023. The loans are not intended to support the fiscal crisis, but to help the government to promote macroeconomic stability and structural reforms to prepare for future uncertainties and to support steady growth. The further developments in Bangladesh's economic situation will need to be monitored closely.

(3) Economic Zone

In the Vision 2041, Bangladesh national strategic plan, the government has set a goal of becoming an upper middle-income country by 2031 and then becoming a developed country by 2041, and is promoting industrialization policies from a mid-term to long-term perspective. To this end, along with the further promotion and diversification of exports, the attraction of foreign direct investment is positioned as a priority measure, and in addition to the development of infrastructure such as electric power, ports, roads and railways, the development of industrial parks is being promoted.

Industrial parks in Bangladesh that attract foreign direct investment are divided into Export Processing Zone (EPZ) managed by the Bangladesh Export Processing Zones Authority (BEPZA) and Economic Zone (EZ) managed by the Bangladesh Economic Zone Authority (BEZA).

Table 2.1.6 Comparison between EPZ and EZ

	Export Processing Zone (EPZ)	Economic Zone (EZ)
Laws Related to Industrial Parks	Bangladesh Export Processing Zone Authority Act (1980)	Bangladesh Economic Zones Act (2010)
Implementing and Operating Bodies	Bangladesh Export Processing Zone Authority (BEPZA)	Bangladesh Economic Zones Authority (BEZA)
Lease Period	30 years	50 years

Source: Project for Development of Economic Zones and Capacity Enhancement of Bangladesh Economic Zones Authority (BEZA) (February 2017. JICA)

Currently, Bangladesh has eight EPZs, but the five EPZs are already crowded that locates at Dhaka and Chattogram. There are only three places with enough vacancies: Uttara, Ishwardi and Mongla. No new EPZs are planned to be established at this time.

Table 2.1.7 Status of EPZ

No.	Industrial Park Name		Location	Connecting National Road	Number of Company	
1	Dhaka Export Processing Zone	DEPZ	North West Dhaka	N5	92	(Japanese: 3)
2	Adamjee Export Processing Zone	AEPZ	South East Dhaka Near Kanchpur Bridge	N1	47	(Japanese: 5)
3	Cumilla Export Processing Zone	ComEPZ	Cumilla	N1	46	(Japanese: 4)
4	Chattogram Export Processing Zone	CEPZ	Near Chattogram Port	N1	153	(Japanese: 9)
5	Karnaphuli Export Processing Zone	KEPZ	Near Chattogram Port	N1	39	(Japanese: 1)
6	Ishwardi Export Processing Zone	IEPZ	Near Paksey Bridge	N6	22	(Japanese: 3)
7	Mongla Export Processing Zone	MEPZ	Near Mongla Port	N7	32	(Japanese: 2)
8	Uttara Export Processing Zone	UEPZ	Rangpur	N5	24	(Japanese: 0)

Source: BEPZA, JETRO

In contrast, there are currently 7 EZs across the country, and in addition to these, the construction of the Bangladesh Special Economic Zones is underway (see Table 2.1.8). Furthermore, the BEZA has plans to establish 100 EZs across the country to promote rapid economic development through industrial diversification and expansion of employment, production and exports. To date, government has approved 97 EZs, 68 government-run and 29 private-sector-run, and feasibility studies, land acquisition and environmental studies are underway in these approved EZs.

Table 2.1.8 Status of EZ

No.	Industrial Park Name		Location	Connecting National Road	Number of Company	
1	Bangladesh Special Economic Zone	BSEZ	Araihazar	N2	2	(Japanese: 2)
2	Sirajganj EZ		Near Jamuna Bridge	N405	11	(Japanese: 0)
3	Sonargaon EZ		Near Meghna Bridge	N1	10	(Japanese: 0)
4	Meghna EZ	MEZ	Near Meghna Bridge	N1	11	(Japanese: 0)
5	Abdul Monem EZ	AMEZ	Near Gumti Bridge	N1	2	(Japanese: 1)
6	Jamalpur EZ		Mymensingh	N4	3	(Japanese: 0)
7	Bangabandhu SheikhMujib Shilpa Nagar	BSMSN	North West Chattogram	N1	18	(Japanese: 1)
8	Mongla EZ		Near Mongla Port	N7	3	(Japanese: 0)
9	City EZ		North Rupshi	N2	8	(Japanese: 0)
10	Aman EZ		Sonargaon	N1	5	(Japanese: 0)
11	Meghna Industrial EZ		Sonargaon	N1	18	(Japanese: 1)
12	Bay EZ		Gazipur Sadar	N4	2	(Japanese: 0)
13	Moheshkhali EZ		Moheshkhali	N1	1	(Japanese: 0)
14	Shrihatta EZ		Sherpur Sada	N2	4	(Japanese: 0)
15	Hosendi EZ		Near Meghna Bridge	N1	4	(Japanese: 0)
16	East West SEZ				1	(Japanese: 0)

Source: BEZA, JETRO

"Data Collection Survey on SEZs in Bangladesh" by JICA in 2013 pointed out that in order to further promote foreign direct investment in Bangladesh, there is a need to strengthen infrastructure

development around EZs, with the following demand for road transport infrastructure development being identified.

- Improving the access roads connecting major arterial roads (national and regional highways) to EZs.
- Reducing traffic congestion in major cities such as Dhaka and Chattogram (e.g., improvement, widening and intersection upgrading of major arterial roads that provide commuting routes from residential areas in urban area to the EZs in the suburbs)
- Improving transport networks by building bridges and promoting industrial linkages on both banks of rivers
- Expansion of transport routes from production areas to international ports (e.g., bypass roads in major cities to improve and widen road networks and multi-level intersections)

In addition, some companies have recently started exporting products manufactured in Bangladesh to India. It is expected to strengthen road transport infrastructure connectivity between Bangladesh and India.

2.2 Traffic Conditions

The road network in Bangladesh consists of eight categories: National Highways, Regional Highways and district roads under the Road and Highways Department (RHD) under the Ministry of Road Transport and Bridges (MoRTB), upazila roads, union roads, village roads A and village road B under the Local Government Engineering Department (LGED), and municipal road under local government.

Until recently, the majority of roads were two lanes round-trip (one lane in each direction), but the condition of the roads has improved significantly, with steady progress on projects to convert major arterial roads to four or six lanes. Pavement condition of major roads has also improved, with the pavement coverage achieving 100 % in recent years though 62% in 1991. However, only national highways function as reliable intercity roads since regional highways or lower ranked roads are narrow and of low standard.

At the river crossing locations, bridges have been constructed at the missing link points on national highways such as the Padma and Kalna bridges and the connectivity of the national land network has been improving. However, the road network is still divided by large rivers such as the Padma, Jamuna and Meghna, and ferry crossing services are still provided.

The low substitutability of the road network causes severe traffic congestion on the main arterial roads. Separation of transit traffic and intra-regional traffic is a major challenge since the existence of slow-moving vehicles such as rickshaws and CNG (three-wheelers), and the reduction of road space due to the parking of long-distance buses are the reasons for the congestion.

(1) Road Length and Management Category

The road network in Bangladesh consists of 8 road categories: National Highways, Regional Highways and Zilla roads under the jurisdiction of the RHD, Upazila roads, Union roads, Village roads A and

Village roads B under the jurisdiction of the LGED, and municipal road under the jurisdiction of the local government.

As shown in Table 2.2.1, the total length of roads under RHD jurisdiction is 22,476 km, 3,991 km of National Highways, 4,898 km of Regional Highways and 13,588 km of Zilla Roads. The total length of roads under the jurisdiction of the LGED is 338,922 km, while the total length of the road network managed by the RHD is only 6% of the total road network in Bangladesh. The total length of road under jurisdiction of local government are not listed here since no statistical data is available.

Table 2.2.1 Road Network in Bangladesh

Category		Length (km)
Roads under RHD jurisdiction (as of May 2022)	National Highways	3,991
	Regional Highways	4,898
	Zilla Roads	13,588
	Total	**22,476**
Roads under LGED jurisdiction (as of September 2022)	Upazila Road	36,708
	Union Road	41,868
	Village Road A	122,416
	Village Road B	137,930
	Total	**338,922**
Total Length		**361,398**

Source: RHD Maintenance and Rehabilitation Needs Report 2022-23, LGED Road Database (2022.09)

Source: RHD Road Network

Figure 2.2.1 Road Network in Bangladesh

The highest administrative unit in Bangladesh is the division, of which there are eight, but the RHD divides the whole of Bangladesh into ten zones for administration. The basic divisions and names are similar to those used for the boundaries of the divisions, but the major difference is that the Dhaka Division is divided into the Dhaka Zone and the Gopalganj Zone, while the Chattogram Division is divided into the Cumilla Zone and the Chattogram Zone.

Table 2.2.2 Road Length by RHD Administration Zone

Zone	National Highways (km)	Regional Highways (km)	Zilla Roads (km)	Total (km)
Rangpur	667	542	1,811	**3,021**
Rajshahi	494	594	1,376	**2,463**
Mymensingh	286	579	1,745	**2,610**
Sylhet	357	478	784	**1,619**
Dhaka	469	690	711	**1,870**
Gopalganj	264	256	627	**1,147**
Khulna	479	643	1,756	**2,878**
Barishal	128	290	1,186	**1,604**
Cumilla	388	368	1,843	**2,599**
Chattogram	459	457	1,750	**2,666**
Total	**3,991**	**4,898**	**13,588**	**22,476**

Source: Maintenance and Rehabilitation Needs Report 2022-23 (RHD)

(2) Pavement Conditions of the Road

As shown in Table 2.2.3, until recently, the pavement coverage of the RHD road network was low, with 38% of road sections unpaved in 1991 and 20% in 2007. Currently, the pavement coverage has reached 100%. In addition, as shown in Table 2.2.4, the condition of road pavements based on measured IRI (International Roughness Index) value on the paved road has improved significantly, with approximately 90% of all roads now rated Good or Fair.

Table 2.2.3 Changes of the Pavement Coverage on the RHD Road Network

Road Category	1991			2007			2022		
	Paved	Unpaved	Total	Paved	Unpaved	Total	Paved	Unpaved	Total
National Highways	3,002	161	3,163	3,485	85	3,570	3,991	0	3,991
Regional Highways	2,262	649	2,911	4,117	206	4,323	4,898	0	4,898
Zilla Roads	4,440	5,156	9,596	9,719	3,959	13,678	13,588	0	13,588
Total	**9,704**	**5,966**	**15,670**	**17,321**	**4,250**	**21,571**	**22,476**	**0**	**22,476**

Source: Road Master Plan, Maintenance and Rehabilitation Needs Report 2022-23 (RHD)

Table 2.2.4 Comparison of Road Surface Conditions (FY 2020-21 and FY 2021-22)

Road Category	FY 2020-21					FY 2021-22				
	Good	Fair	Poor	Bad	Very Bad	Good	Fair	Poor	Bad	Very Bad
National Highways	69.1%	17.5%	6.1%	3.7%	3.6%	75.8%	17.2%	4.3%	1.6%	1.1%
Regional Highways	70.1%	18.2%	5.7%	3.4%	2.6%	80.9%	11.5%	4.1%	1.6%	2.0%
Zilla Roads	61.5%	19.4%	10.2%	4.8%	4.2%	74.5%	12.9%	6.7%	3.1%	2.8%
Total	**65.0%**	**18.8%**	**8.3%**	**4.3%**	**3.7%**	**76.3%**	**13.4%**	**5.6%**	**2.5%**	**2.3%**

Source: Maintenance and Rehabilitation Needs Report 2022-23 (RHD)

Table 2.2.5 Evaluation Criteria for Flatness of Pavement Surface

Road Category	IRI Value				
	Good	Fair	Poor	Bad	Very Bad
National Highways	0 – 3.9	4.0 – 5.9	6.0 – 7.9	8.0 – 9.9	≥ 10
Regional Highways	0 – 4.9	5.0 – 6.9	7.0 – 8.9	9.0 – 10.9	≥ 11
Zilla Roads	0 – 5.9	6.0 – 7.9	8.0 – 9.9	10.0 – 11.9	≥ 12

Source: Maintenance and Rehabilitation Needs Report 2022-23 (RHD)

In conjunction with the preparation of road repair plans for the next year, road maintenance and repair plans for the next five years are prepared using HDM-4, which is used as a pavement management system.

According to the plan, the condition (IRI value) of national/regional highways/zilla roads can be improved by carrying out full reconstruction and partial reconstruction on the targeted sections in the following year, after which the condition can be maintained through daily maintenance and regular repairs.

This plan is prepared based on the assumption that all routes identified by the system will be rehabilitated/repaired at the planned time and that there will be no increase or decrease in the number of routes to be managed. In reality, the reconstruction/repairs do not proceed as planned, e.g. budgets are not obtained as planned in the following year.

This means that the implementation of reconstruction/maintenance works is shifted to the following year or later, which means that annual adjustments are required. In order to improve the accuracy of the plan, work such as levelling future budgets and adjusting the timing of implementation is required, taking into account past budget amounts.

Table 2.2.6 Road Maintenance and Repair Plan

Road Category	Work Type	Road length (km)					
		2022-23	2023-24	2024-25	2025-26	2026-27	Total
National Highways	Routine Maintenance	153.0	310.5	309.2	359.3	377.5	**1,509.6**
	Periodic Maintenance	1,676.1	390.8	242.5	47.0	39.5	**2,395.8**
	Partial Reconstruction	141.2	15.1	0.1	1.1	0.0	**157.5**
	Full Reconstruction	47.9	0.0	0.0	0.1	0.0	**48.1**
	Subtotal	**2,018.2**	**716.5**	**551.8**	**407.5**	**417.0**	**4,111.0**
Regional Highways	Routine Maintenance	591.5	1,533.8	1,451.8	1,306.1	1,566.5	**6,449.8**
	Periodic Maintenance	1,918.7	557.5	683.3	876.8	509.0	**4,545.3**
	Partial Reconstruction	46.7	6.3	3.8	0.5	0.9	**58.2**
	Full Reconstruction	6.0	0.0	0.0	0.0	0.0	**6.0**
	Subtotal	**2,562.9**	**2,097.6**	**2,139.0**	**2,183.4**	**2,076.4**	**11,059.3**
Zilla Roads	Routine Maintenance	2,286.9	4,275.1	4,408.5	4,393.7	5,005.1	**20,369.2**
	Periodic Maintenance	4,012.2	1,196.7	1,407.0	1,006.8	221.2	**7,843.8**
	Partial Reconstruction	139.6	89.6	12.5	15.8	8.0	**265.4**
	Full Reconstruction	73.9	12.6	0.0	0.0	0.0	**86.5**
	Subtotal	**6,512.6**	**5,573.9**	**5,827.9**	**5,416.2**	**5,234.3**	**28,564.9**
Grand Total		**11,093.7**	**8,387.9**	**8,518.7**	**8,007.1**	**7,727.7**	**43,735.2**

Source: Maintenance and Rehabilitation Needs Report 2022-23 (RHD)

(3) Number of Lanes

Although the most of road sections were two lanes round-trip (one lane in each direction) until a few years ago, projects to convert major national highways to four lanes are steadily under way. However, the regional highways or other lower category roads are two lanes round-trip (one lane in each direction) in all section, narrow and of low standard. Only the national highways function as reliable intercity roads.

At present, the number of lanes on the major arterial national highways is as follows.

- N1 (Dhaka – Chattogram) : 4 lane works implemented (6 lane works under consideration)
- N1 (Chattogram – Cox's Bazar) : Currently 2 lanes, the timing of 4 lane work yet to be decided
- N2 (Dhaka – Sylhet) : 4 lane work to be carried out by ADB project
- N3 (Dhaka – Mymensingh) : 4 lane works implemented (BRT construction underway)
- N4 (Dhaka – Tangail) : 4 lane works underway by ADB project
- N5 (Dhaka – Bhatulia) : Currently 2 lanes, the timing of 4 lane work yet to be decided
- N8 (Dhaka – Mawa – Bhanga) : 4 lane works implemented (Including Padma Bridge))

(4) Road Missing Link (Ferry Crossing)

Although a number of road and bridge construction projects, including Japanese ODA loan projects, have been implemented over the past decade, significantly strengthening the country's connectivity, but there are still missing links at many river crossings on the road network under the jurisdiction of the RHD (see Figure 2.2.2).

On large rivers such as the Jamuna, Padma and Meghna, ferry crossing services operated by the Bangladesh Inland Water Transport Corporation (BIWTC) (see Table 2.2.7), and RHD also operates ferry crossing services at 41 missing link locations other than those large rivers (see Table 2.2.8).

In Bangladesh, where most of the country is low-lying and has many rivers, ferries are an important means of transport, with ferry services operating not only at these road missing link locations but also on the rivers themselves as travel routes. However, ferry accidents have been frequently occurred, such as overloading with passengers far exceeding capacity, sinking due to collision with other vessels, and personal injury due to fire on board, making safety management an issue. In addition, ferry crossings require a certain amount of travel time, including waiting time, and are easily affected by weather and environmental factors, so there is a strong need to develop bridges that is superior in terms of timeliness and safety.

In some locations, ferry services continue to operate depending on the demand for ferry crossings even after bridges have been constructed at the missing links where ferries are operating. For example, the Rupsya Bridge, which was built under Japanese ODA loan project, has a bypass road and bridge constructed approximately 2.5 km downstream from the ferry crossing location (at the missing link on National Highway No.7), but the ferry service is still in high demand as it is sometimes more convenient to travel from the center of Khulna city to towns on the other side. This could be a reason for the high demand for ferries. In addition, the ferry service in Padma (between Mawa and Charjanajat) will continue, as the Padma bridge (National Highway No.8), which opened in 2022, is in service as an expressway and ferries are used to meet the demand for light vehicles such as motorcycles to cross the river. It has been announced that the Padma (Mawa - Charjanajat) ferry service will continue.

On the other hand, RHD used to operate four or five ferries at the Kalna Bridge crossing (National Highway No.806), which was also built under a yen loan project, but after the Kalna Bridge opened, the ferry service was discontinued and the ferry itself was moved to another location.

Ferry operated by BIWTC (Paturia, Padma river)

Ferry operated by RHD (Bishnandi, Meghna)

Source: JICA Survey Team

Figure 2.2.2 Ferries connecting Missing Links

Table 2.2.7 List of Ferry Services operated by BIWTC

No.	Location	Road No.	Crossing River	Length (km)	Average Travel Time (Min)	Frequency (/day)	Note
1	Aricha/Paturia - Kazirhat	N5	Jamuna River	19			
2	Paturia - Dowladia	N7/N5	Padma River	3	60	12	
3	Mawa - Charjanajat	N8	Padma River	13	150	5	Padma Bridge Constructed
4	Chandpur - Shariatpur	R860/R140	Meghna River	10	110	6	
5	Bhola - Laxmipur	N809	Meghna River	28			
6	Laharhat - Vadutia	N809	Meghna River	10			
7	Charkalipur - Kalipur Bazar	Z1069	Meghna River Tributary	-			

Source: BIWTC
Average Travel Time, Frequency: Preparatory Survey on the Cross-Border Road Network Improvement Project (Bangladesh) (February 2016, JICA)

Table 2.2.8 List of Ferry Services operated by RHD

No.	Location	Road No.	Zone	Note
1	Baldha - Itna	Z3623	Mymensingh	
2	Barabari	Z3623	Mymensingh	
3	Chamraghat	Z3623	Mymensingh	
4	Balikhola	Z3603	Mymensingh	
5	Shantipur - Mithamain	Z3603	Mymensingh	
6	Deotukuna	Z3709	Mymensingh	
7	Raniganj	R241	Sylhet	
8	Chattak	Z2802	Sylhet	
9	Jokura	R711	Gopalganj	
10	Rasulpur - Gozaria	Z1063	Dhaka	
11	Panthasala	Z2041	Dhaka	
12	Boktaboli	Upazila Road	Dhaka	
13	Nabiganj	Z1066	Dhaka	
14	Bishnandi	R203	Dhaka	Bridge construction planned for South Korea – Bangladesh PPP Platform Project
15	Kalia	Z7502	Khulna	Kalia Bridge under construction
16	Arua	Z7040	Khulna	
17	Nagarghata	Z7040	Khulna	
18	Jelkhana	N7	Khulna	Lupsha Bridge already constructed
19	Jhopjopia	Z7606	Khulna	
20	Poddarganj	Z7606	Khulna	
21	Mongla	N7	Khulna	
22	Moralganj	R773	Khulna	
23	Charkhali	R870	Barishal	
24	Sonakur - Kawkhali	Upazila Road	Barishal	
25	Amrajhuri	Z8033	Barishal	
26	Sawarupkathi	Z7707	Barishal	
27	Banaripara	Z7710	Barishal	

No.	Location	Road No.	Zone	Note
28	Mirgonj	Z8034	Barishal	
29	Beltola	Z8043	Barishal	
30	Nehalganj	Z8910	Barishal	
31	Goma	Z8044	Barishal	
32	Laksmipasa	Z8044	Barishal	
33	Nalua-Baherchar	Z8044	Barishal	
34	Lebukhali	N8	Barishal	Payla Bridge already constructed
35	Boga	Z8806	Barishal	
36	Pairakunja	Z8052	Barishal	
37	Galachipa	Z8806	Barishal	
38	Amtali	R880	Barishal	
39	Baraitola	R880	Barishal	
40	Satpakhia	Z8709	Barishal	
41	Chandraghona	R161	Chattogram	

Source: HMD Circle, RHD

(5) Traffic Conditions on Intercity Roads

Due to the low substitutability of the road network, severe traffic congestion is caused on the main arterial roads. Additionally, the presence of slow speed vehicles such as CNGs (known as small three-wheelers) and rickshaws, and the reduction of road space due to the parking of long-distance buses, the separation of transit traffic and intra-regional traffic is a major challenge.

The RHD is currently promoting a project to widen a two-lane round-trip road to four lanes and install a slow-speed vehicle lane on the major arterial road, and has completed the construction on the N8 (between Dhaka and Mawa). However, even at the road widen to four lanes, due to poor understanding of traffic rules and driving etiquette of road users, buses are seen parking and pedestrians are crossing on the lanes for high-speed running. There is a need to conduct transport countermeasure considering the local features such as enforcing traffic rules, strengthening enforcement, and installing foot over bridge.

N8 (Dhaka – Mawa Highway)

N1 (Chattogram – Cox's Bazar)

Source: JICA Survey Team

Figure 2.2.3 Traffic Conditions on Intercity Roads

(6) Traffic Conditions on Inner-city Roads

Dhaka, the capital of Bangladesh, has faced to rapid urban expansion since independence in 1971. In addition to a high birth rate, the trend of moving to the capital has spurred population growth in Dhaka. This caused a concentration of economic activities such as commercial logistics, financial functions and industrial locations, as well as social and consumer activities such as healthcare and education. As a result, the population of the urban area (RAJUK[1] area) glowed to 15.9 million (2011), and estimated to exceed 25 million by 2035.

Urban traffic in Dhaka City has an overwhelmingly small number of arterial roads despite its heavy reliance on road traffic, and the mixture of cars, buses, auto-rickshaws, rickshaws and trucks on all roads has led to chronic traffic congestion, which is a serious problem. In addition to population growth in urban areas, the further spread of cars is expected to increase due to economic growth, drastic improvement of urban transport is an urgent issue.

According to the Dhaka Structure Plan 2016-2035[2], it is estimated that 5.5 million people per day use buses in the Dhaka Metropolitan Area (RAJUK area) at the time when the study conducted in 2016. However, the reality is that bus services are expanding in an unplanned and unregulated manner, approximately 80% of bus routes have no stops or other facilities, and buses stop on the lanes for running causing traffic congestion. In addition, as approximately 80% of the buses running are diesel-driven, pollution of the air by exhaust gases is considered a problem from the perspective of environmental protection. Furthermore, the quality of bus services is very low due to the aged and damaged fleet. For this reason, optimization and restructuring of bus routes, taking into account route overlaps, vehicle renewal, and the development of bus lanes and bus stops have been proposed.

(7) Traffic Accident

According to The Global Health Observatory by World Health Organization (WHO), the number of fatalities was estimated 25 thousand, fatalities per 100,000 people due to road traffic accidents in Bangladesh in 2019 was 15. Worldwide, there were 17 fatalities per 100,000 people in the same year, which is not extremely high, but the same statistic for Japan is 4, indicating a high rate of road traffic fatalities. In addition, the same statistics report the number of fatalities remains unchanged, and fatalities per 100,000 people are gradually decline in road traffic because of population growth in recent years.

On the other hand, according to the records of the Dhaka Metropolitan Police (DMP), there were 2,292 road accidents and 1,732 road fatalities in the Dhaka Metropolitan Area in the six years from 2010 to 2015, this statistics may not record all the accident in the Dhaka Metropolitan Area since the number of fatalities from WHO is significantly different. Analysis conducted by the Accident Research Institute (ARI) of the Bangladesh University of Engineering and Technology shows that buses are the most common perpetrators of road accidents, followed by trucks.

[1] RAJUK (Rajdhani Unnayan Kartripakkha): Agency responsible for urban planning and development and development management in Dhaka city and surrounding area.

[2] Guidelines prepared by RAJUK on the direction of Dhaka's development over the next 20 years.

Generally, Bangladeshi drivers have poor driving manners and low safety awareness. Reckless overtaking traffic exceeding the center line is frequently on roads with two lanes, and is one of the factors contributing to road accidents. In particular, drivers of buses, whose salary is directly from passengers' fare income, drive dangerously to get more passengers than other buses.

The Dhaka Metropolitan Area has a chronic traffic congestion with a mixture of pedestrians, cars and rickshaws in a narrow road space, and the average travel speed of cars in daytime is a very slow, 7 km/h. It is generally known that the fatality rate for traffic accidents between vehicles and pedestrians increases when the travelling speed exceeds 30 km/h. Although fatal accidents should be unlikely to occur at this average travelling speed, poor driving etiquette and pedestrian awareness of road safety are also considered to be major factors in road traffic accidents.

(8) Status of Vehicle Registrations

The Bangladesh Road Transport Authority (BRTA) manages vehicle registrations across the country, and its statistics show that the number of vehicles registered in Bangladesh has almost tripled over the past decade, from 1,615,000 (2011) to 5,014,000 (2021) (see Table 2.2.9).

As for the growth trend by vehicle category, passenger cars have increased 1.97 times from 337 thousands to 664 thousands (equivalent to an annual growth rate of 7.0%), while motor cycles (motorbikes) have more than quadrupled from 872 thousands to 3,501 thousands (equivalent to an annual growth rate of 14.9%) and auto rickshaws, which are originally prohibited in the city center of Dhaka, have more than doubled in the past decade (equivalent to an annual growth rate of 8.6%).

Thus, in Bangladesh, many vehicles of different speeds, including rickshaws and CNG, are mixed in the same road space, causing severe traffic congestion and numerous road accidents. In addition, though not only the number of buses as public transport but also the buses operated by companies for their employees' commuting has included, and, the number of registered buses has almost doubled in the past decade, indicating that the number of bus users and bus routes is increasing.

Table 2.2.9 Number of Vehicle Registration in Bangladesh

Vehicle Category	2011	2021	Average Annual Growth Rate
Tanker	2,915	6,183	7.8%
Truck	72,742	143,988	7.1%
Bus	25,138	49,358	7.0%
Microbus	66,436	108,369	5.0%
Minibus	23,341	27,545	1.7%
Van	31,486	90,144	11.1%
Passenger Car	337,208	663,535	7.0%
Auto Rickshaw	140,650	321,541	8.6%
Motor Cycle	872,048	3,500,905	14.9%
Others	43,440	102,340	8.9%
Total	**1,615,404**	**5,013,908**	**12.0%**

Note: "Van" includes "Cargo Van", "Covered Van", "Delivery Van" and "Ambulance"
"Passenger Car" includes "Private Passenger Car", Taxicab", "Special Purpose Vehicle", "Jeep" and "Pick-Up"
"Auto Rickshaw" includes "Auto Tempo" and "Auto Rickshaw"
"Others" includes "Tractors" and "Others"

Source: Bangladesh Road Transport Authority

(9) Road Maintenance

Road which are maintained by RHD is National Highways, Regional Highways, and Zilla Roads and the total length is 22,476 km (as of May 2022). These road networks are maintained by 2 wings of RHD. Pavement is done by Planning and Maintenance Wing and the bridges are by Bridge Maintenance Wing.

HDM Circle of Planning & Maintenance Wing executes the inspection of IRI every year and prepares the "Maintenance and Rehabilitation Needs Report" based on the analysis results of HDM-4. The Needs Report shows the plan of repair/rehabilitation/reconstruction of road sections with respective damages.

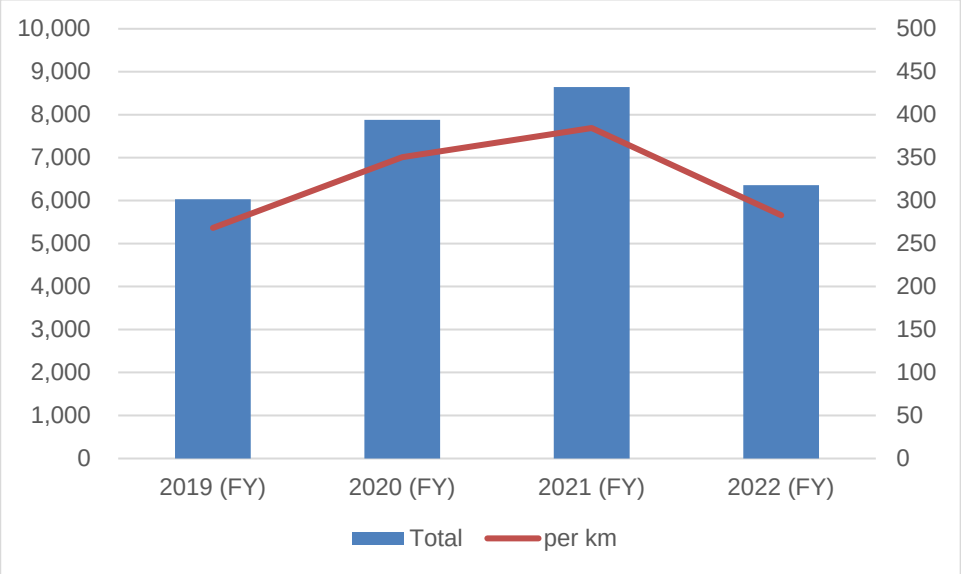
The Annual Maintenance Plan is prepared by Maintenance Circle based on the Needs Report and the result of actual site survey by the engineers/inspectors of Zone offices. The engineers/inspectors of Zone offices conduct the site inspection of the sections that are given high priority by HDM-4 analysis. In addition to this prioritization, traffic volume and importance of the routes are taken into consideration to finalize the prioritization. The Annual Maintenance Plan includes cost estimate of the repair/maintenance works of each section. The unit cost of the repair/maintenance works by regions are calculated/updated by Maintenance Circle every year.

Budgeting process starts with preparing the budget request based on the Annual Maintenance Plan. However, approved budget is reduced to 50 to 60% of the requested budget (past record of 2019 and 2020) so the allocation coordination of allocated budget will be required among zones/routes/sections. This coordination work is done by Maintenance Circle as well. This budget request is based on the results of the HDM-4 (pavement management system) analysis, excluding the routes that are going to be improved in the near future. In other words, the budget request is not leveled by referring to the past

fiscal year's budget size, or by postponing the repairs according to the importance of the route. Therefore, the budget amount requested is higher than the necessary.

Minor repair works is done with budget of minor repair allocated to the Zone offices and Division offices. They inspect the damage and decides how to deal with them by themselves using the budget for minor repair. This type of treatment is done to the most of Zilla road with small amount of traffic volume. Routine maintenance, such as removing the obstacle on the carriageway, repairing small facilities are done by Zone offices and Division offices by their own decision as they do with minor repairs.

The budgeted amount for road maintenance and management from FY 2019 to FY 2022 is shown in the below figure. Although the amount for FY2022 has been reduced from the previous year due to the impact of Covid 19 and other factors, there has been a steady increase up to FY2021, with activities being implemented to try and improve the condition of the road network. In fact, the number of routes rated second from the top of five or higher on the RHD's own index of road condition is set to exceed 80% of all routes by FY2019 and 90% by FY2025. In the interview with RHD, it was stated that this is expected to be achieved several years ahead of schedule.



	2019 (FY)	2020 (FY)	2021 (FY)	2022 (FY)
Total (M. BDT)	6,031	7,881	8,643	6,359
per km (K. BDT)	268	351	385	283

Source: RHD

Figure 2.2.4 RHD Road Maintenance Budget (FY2019 - FY2022)

The below table shows the budget allocated to each zone in 2022. Each zone has been allocated a budget due to repair activities. In addition, personnel costs (Labour) for devising the implementation of repair works have also been allocated. The amount allocated ER for emergency response varies from zone to zone and is allocated in response to requests from the zone offices.

Table 2.2.10 RHD Road Maintenance Budget (2022) (M. BDT)

2022 (FY)	PMP (Minor)	RM (Repair)	MP (Labor)	MP (Signal)	PMP (ER)	Total
Dhaka Zone	730	83	11	39	1	864
Mymensingh Zone	520	83	12	41	30	685
Chittagong Zone	499	84	11	46	50	690
Comilla Zone	464	74	10	36	0	584
Sylhet Zone	440	85	9	25	0	559
Rajshahi Zone	410	81	12	33	0	536
Rangpur Zone	635	132	17	58	40	882
Khulna Zone	580	117	13	66	2	778
Barisal Zone	290	78	8	25	6	406
Gopalganj Zone	250	68	7	38	12	375
Total	4,818	884	109	407	141	6,359

Note: PMP: Periodic Maintenance Program, RM: Routine Maintenance, ER: Emergency Repair
Source: RHD

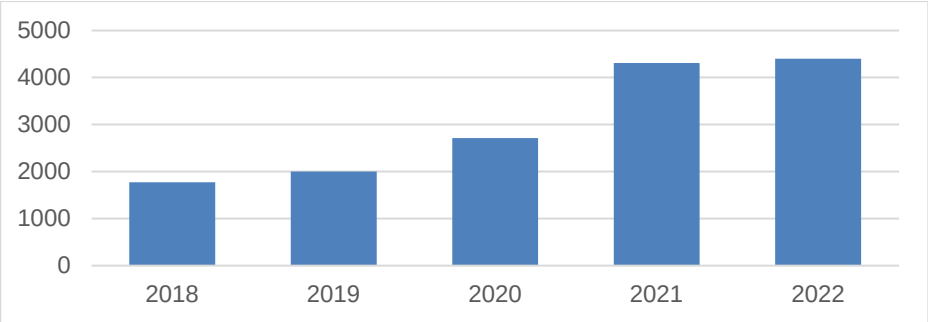
RHD's road (pavement) maintenance is carried out using IRI. Target IRI values are set for National, Regional and Zilla Roads, and improvements are being made. The achievement rate in 2015 was 63%, in 2019 increased to 81%, and is expected to reach 90% in the near future (the target of the 8th Five-Year Plan). Since progress towards the target set is observed, it can't say that the road conditions are poor due to budget shortfalls, especially considering that the target for the next five-year plan is also expected to be achieved ahead of schedule, therefore the current level of pavement maintenance and management is considered to be adequate. If high speed roads or expressway networks are constructed, the target IRI will be at a higher level, which will require a larger budget and higher technology.

(10) Bridge Maintenance

RHD manages more than 20,000 bridges and box culverts in their road network which is longer than 20,000km. Operation & maintenance of these bridge and box culverts are executed by Bridge Management Wing. There are three (3) circles under Bridge Management Wing, that are Bridge Construction and Maintenance Circle, Bridge Design Circle, and Planning, Monitoring & Evaluation Circle (Planning & Data Circle) respectively. Planning, Monitoring & Evaluation Circle executes the inspection/diagnosis/planning, Bridge Design Circle does the design of repair/reinforcement/ replacement, and Bridge Construction and Maintenance Circle repair/reinforcement/replacement works.

Zone offices and Division offices under Zone offices repair the damages which makes the road users face the dangerous situation, such as damages of potholes or railings etc. by their own budget for executing minor repairs. A certain amount of budget is allocated to each Zone offices and Division offices (also to Sub-division offices under Division offices) which they can decide how to spend it by themselves. Zone offices report on severer damages to headquarters based on the site inspection results by their inspector by issuing a letter. Site inspections are executed by their inspectors by checking "Site Inspection Side Book" which they carry to the site on hand.

The bridge maintenance budget for the period FY2018-FY2022 is shown in the below figure. The bridge maintenance budget has increased steadily over the last five years. In particular, there has been a significant increase since FY2021, when regular bridge inspections started. The budget of BDT 4.4 billion after the increase is not sufficient, considering that RHD manages not only bridges but also the entire large road structure, including all box culverts on the road network managed by RHD.



	2018 (FY)	2019 (FY)	2020 (FY)	2021 (FY)	2022 (FY)
Bridge Maintenance (M. BDT)	1,772	2,000	2,710	4,307	4,400

Source: RHD

Figure 2.2.5 RHD Bridge Maintenance Budget (FY2018 - FY2022)

Currently, BBA is maintaining three bridges including Bangabondhu Bridge (Jamuna Multipurpose Bridge) which was put into service in 1998. The maintenance of these bridges is outsourced to a private company under a five-year comprehensive maintenance contract. Bridges under construction or planned for construction that are under BBA's direct control or conventional ODA projects are also scheduled to be maintained under the same scheme after being open to service.

2.3 International Road Connectivity

Bangladesh is actively pursuing a free trade policy as a gateway between East Asia and South Asia due to its geographical advantage of facing the open sea. In addition to the Asian Highway Network, the South Asian Association for Regional Cooperation (SAARC) Corridors, the South Asian Subregional Economic Cooperation (SASEC) Corridors, the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) Corridors, and the Bangladesh-China-India-Myanmar (BCIM) Economic Corridor are recognized as the international Strategic Economic Corridors. The Government of Bangladesh is promoting road improvement projects along the corridors to strengthen connectivity with neighboring countries.

(1) Asian Highway

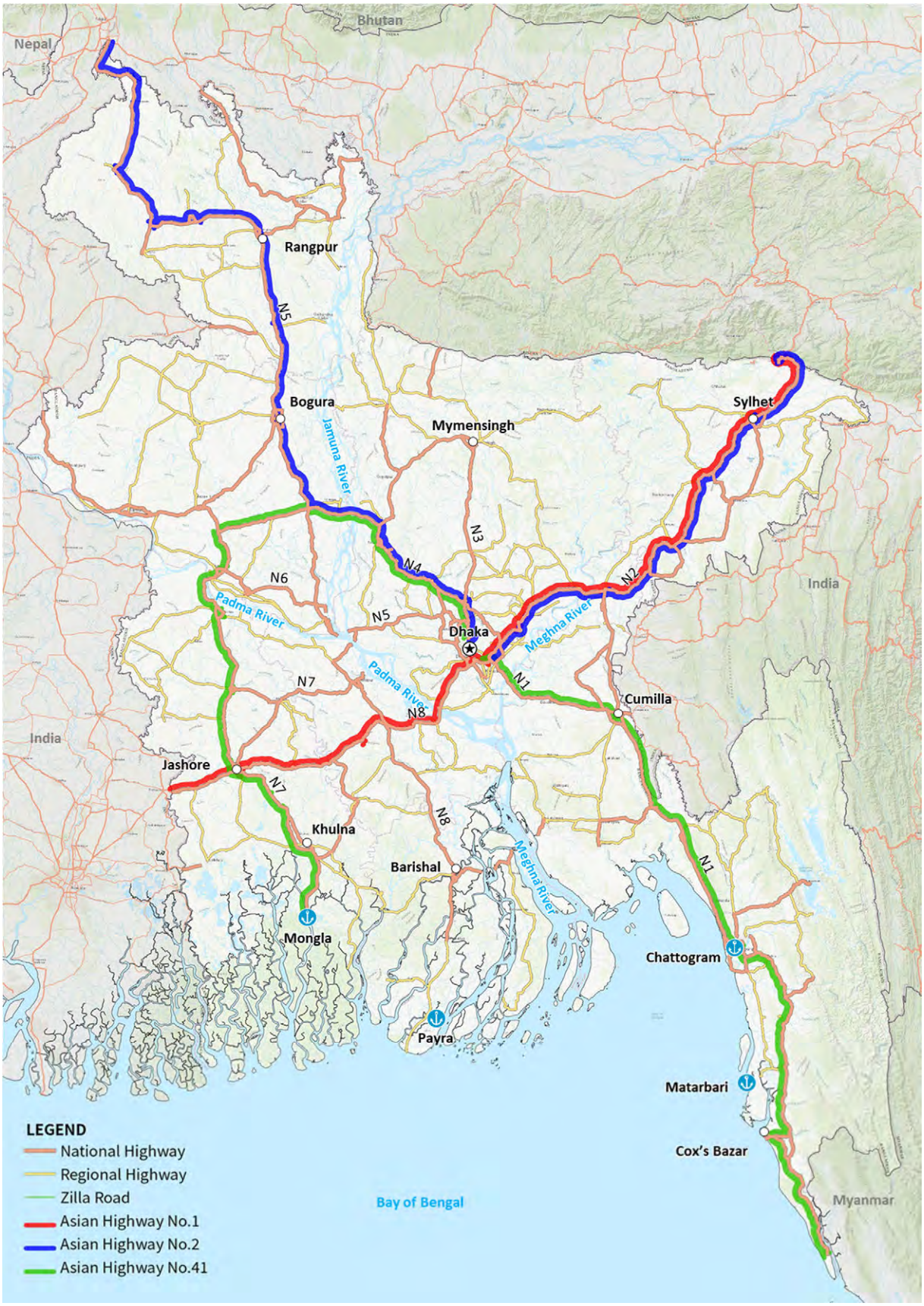
The Asian Highway Network is a regional transportation cooperation platform between Asian and European countries and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) for the efficiency and development of road infrastructure in Asia. Currently, more than 145,000 km of road networks in 32 countries have been designated as official routes.

The Asian Highway was first conceived in 1959 as an interconnected highway network in the ESCAP region and was officially designated in 2002. Subsequently, an Intergovernmental Agreement on the Asian Highway Network was established, adopted by the Commission on November 18, 2003, and entered into force on July 4, 2005.

The Agreement not only defines the network itself, but also establishes technical design criteria and classifications as standard specifications to ensure the quality of road infrastructure on the Asian Highway route, with the aim of facilitating international trade, promoting regional integration, and enhancing international cooperation. Initially, the main focus was on road design to accommodate increased freight and traffic volumes, but technical standards for road safety facilities were also added.

Within Bangladesh, three routes have been identified: Asian Highway No. 1 (AH1), Asian Highway No. 2 (AH2), and Asian Highway No. 41 (AH41), with specific route locations as follows.

- AH1 : Tamabil – Sylhet – Sherpur – Mirpur – Sarial – Nashingdi – Katchpur – Dhaka – Mawa – Charjanajat – Bhanga – Bhatiapara – Kalna – Narail – Jessore – Benapole (Length: 492 km)
- AH2 : Tamabil – Sylhet – Sherpur – Mirpur – Sarial – Nashingdi – Katchpur – Dhaka – Joydevpur – Kaliakoir – Elenga – Hatikamrul – Bogra – Gobindagonj – Ranjgpur – Beldanga – Panchagarh – Banglabandha (Length: 517 km)
- AH41 : Teknaf – Cox’s Bazar – Keranirhat – Chattogram – Feni – Moinamoti – Daudkandi – Katchpur – Dhaka – Joydevpur – Kaliakoir – Hatikamrul – Banpara – Dasuria – Paksey – Kushtia – Jhenaidah – Jessore – Khulna – Mongla (Length: 762 km)



Source: JICA Survey Team

Figure 2.3.1 Asian Highway Network

As Table 2.3.1 and Figure 2.3.2 show the current status of AH1, there remain many unimplemented sections of the road widening project, but the financing options for the road widening project have largely been decided. N2 (Dhaka - Sylhet - Tamavir) is expected to be improved soon by an ADB-supported project, while the unimplemented section of the road widening project in west of Banga will be implemented by India's Line of Credit Loan (LOC). However, the timing of the project implementation is not clear at present.

Table 2.3.1 Implementation Status of AH1

Starting point	End point	Road No.	Length (km)	Number of lanes	Remarks
Tamabil	Sylhet	N2	55	2	Installation of 4 lanes + SMVT lanes to be carried out under ADB-supported projects
Sylhet	Sherpur	N2	40	2	ditto
Sherpur	Mirpur	N2	43	2	ditto
Mirpur	Sarial	N2	61	2	ditto
Sarial	Nashingdi	N2	53	2	Ditto (Byelab Bridge has been maintained with four lanes.)
Nashingdi	Katchpur	N2	34	2	The installation of 4 lanes + SMVT lanes has just started under an ADB-supported project.
Katchpur	Dhaka	N1	8	6 / 4+SMVT	4 lanes + SMVT lanes are provided at major intersection sections, while six lanes are in operation on single road sections.
Dhaka	Mawa	N8	35	4+SMVT	Already maintained as the Dhaka-Mawa Expressway.
Mawa	Charjanajat	N8	6	4	Padma Bridge opened in 2022.
Charjanajat	Bhanga	N8	22	4+SMVT	Already maintained as the Dhaka-Mawa Expressway.
Bhanga	Bhatiapara	N805	38	2	The installation of 4 lanes + SMVT lanes will be carried out under the India LOC support project, but the timing of the project has not yet been decided.
Bhatiapara	Kalna	N806	3	4+SMVT	The Kalna Bridge and its attached road have been built under the yen loan project Cross Border Road Improvement Project.
Kalna	Narail	N806	24	2	The installation of 4 lanes + SMVT lanes will be carried out under the India LOC support project, but the timing of the project has not yet been decided.
Narail	Jessore	N806	32	2	ditto
Jessore	Benapole	N706	38	2	ditto

Source: JICA Survey Team

N2 (Dhaka-Sylhet)

N805 (Banga - Battiapara)

Source: JICA Survey Team

Figure 2.3.2 Status of Uncompleted Road Widening Sections (AH1)

As for AH2, Table 2.3.2 and Figure 2.3.3 show the current status of the road widening project, although there are still many sections where the road widening project has not yet been implemented. However, the financing options for the road widening project have largely been decided. All the sections from Joydeepur to Banglabanda are expected to be upgraded under the ADB-supported SASEC project, which is being implemented in phases under the project names SASEC-I, II and III.

Table 2.3.2 Implementation Status of AH2

Starting point	End point	Road No.	Length (km)	Number of lanes	Remarks
Tamabil	Katchpur	N2	286	2	See Table 2.3.1
Katchpur	Dhaka (South)	N1	8	6 / 4 + SMVT	4 lanes + SMVT lanes are provided at major intersection sections, while six lanes are in operation on single road sections.
Dhaka (South)	Dhaka (North)	-	20	-	-
Dhaka (North)	Joydevpur	N3	22	4	BRT Line-3 under construction
Joydevpur	Kaliakoir	N4	22	4 + SMVT	Installation of 4 lanes + SMVT lanes has been implemented under ADB-supported project (SASEC-I).
Kariakoir	Elenga	N4	49	4 + SMVT	ditto
Elenga	Hatikamrul	N405	41	2	Under construction of installation of 4 lanes + SMVT lanes in ADB-supported project (SASEC-II).
Hatikamrul	Bogra	N5	56	2	ditto
Bogra	Gonbindaganj	N5	34	2	ditto
Gonbindaganj	Rangpur	N5	66	2	ditto
Rangpur	Baliadanga	N5	73	2	Installation of 4 lanes + SMVT lanes to be implemented under ADB-supported project (SASEC-II).
Baliadanga	Panchagarh	N5	78	2	ditto
Panchagarh	Banglabandha	N5	56	2	ditto

Source: JICA Survey Team

N4 (Joyde Pool - Erenga.)

N4 (Elenga - Jamuna Bridge) Under Construction

Source: JICA Survey Team

Figure 2.3.3 Status of Uncompleted Road Widening Sections (AH2)

For the sections of AH41 that do not overlap with AH1 and AH2, Table 2.3.3 and Figure 2.3.4 show the current status of the road widening projects for N1 (Chattogram - Cox's Bazar) and N7 (Jessore - Mongla). The finance for the N1 (Chattogram-Cox's Bazar) and N7 (Jessore -Mongla) road widening projects have not yet been decided. For the N1 (Chattogram - Cox's Bazar), JICA plans to implement a bypass and intersection improvement project at five bottleneck points, but the widening of the remaining section is an issue. While four lanes have already been constructed on N1 (Dhaka - Chattogram), RHD is currently studying the possibility of widening the entire road to six lanes with ADB support.

The road improvement works between Hatikumrul and Josur, an unimplemented section of the road widening project, will be carried out under the World Bank-AIIB co-financing project (WeCARE).

Table 2.3.3 Implementation Status of AH41

Starting point	End point	Road No.	Length (km)	Number of lanes	Remarks
Teknaf	Cox's Bazar	N1	74	2	Not implemented
Cox's Bazar	Chakaria	N1	50	2	ditto
Chakaria	Chattogram	N1	99	2	A bypass improvement project at five bottlenecks will be implemented under a yen loan project. The timing of improvement work on other sections has not yet been determined.
Chattogram	Feni	N1	96	4	RHD plans to study 6-lane widening with ADB support
Feni	Moinamoti	N1	64	4	ditto
Moinamoti	Daudkandi	N1	44	4	ditto
Daudkandi	Madanpur	N1	18	4	ditto
Joydevpur	Elenga	N4	71	4 + SMVT	Installation of 4 lanes + SMVT lanes has been implemented under ADB-supported project (SASEC-I).
Elenga	Hatikamrul	N405	41	2	Under construction of installation of 4 lanes + SMVT lanes in ADB-supported project (SASEC-II).
Hatikamrul	Banpara	N507	51	2	Road improvement works are planned to be implemented under the WB-AIB co-financing project (WeCARE).
Banpara	Dasuria	N6	22	2	ditto
Dasuria	Paksey	N704	12	2	ditto

Starting point	End point	Road No.	Length (km)	Number of lanes	Remarks
Paksey	Kushtia	N704	24	2	ditto
Kushtia	Jhenaidah	N704	45	2	ditto
Jhenaidah	Jessore	N704	45	2	ditto
Jessore	Khulna	N7	63	2	Not implemented
Khulna	Mongla	N7	44	2	ditto

Source: JICA Survey Team

N1 (Chattogram-Cox's Bazar)

N7 (Jessore -Mongla)

Source: JICA Survey Team

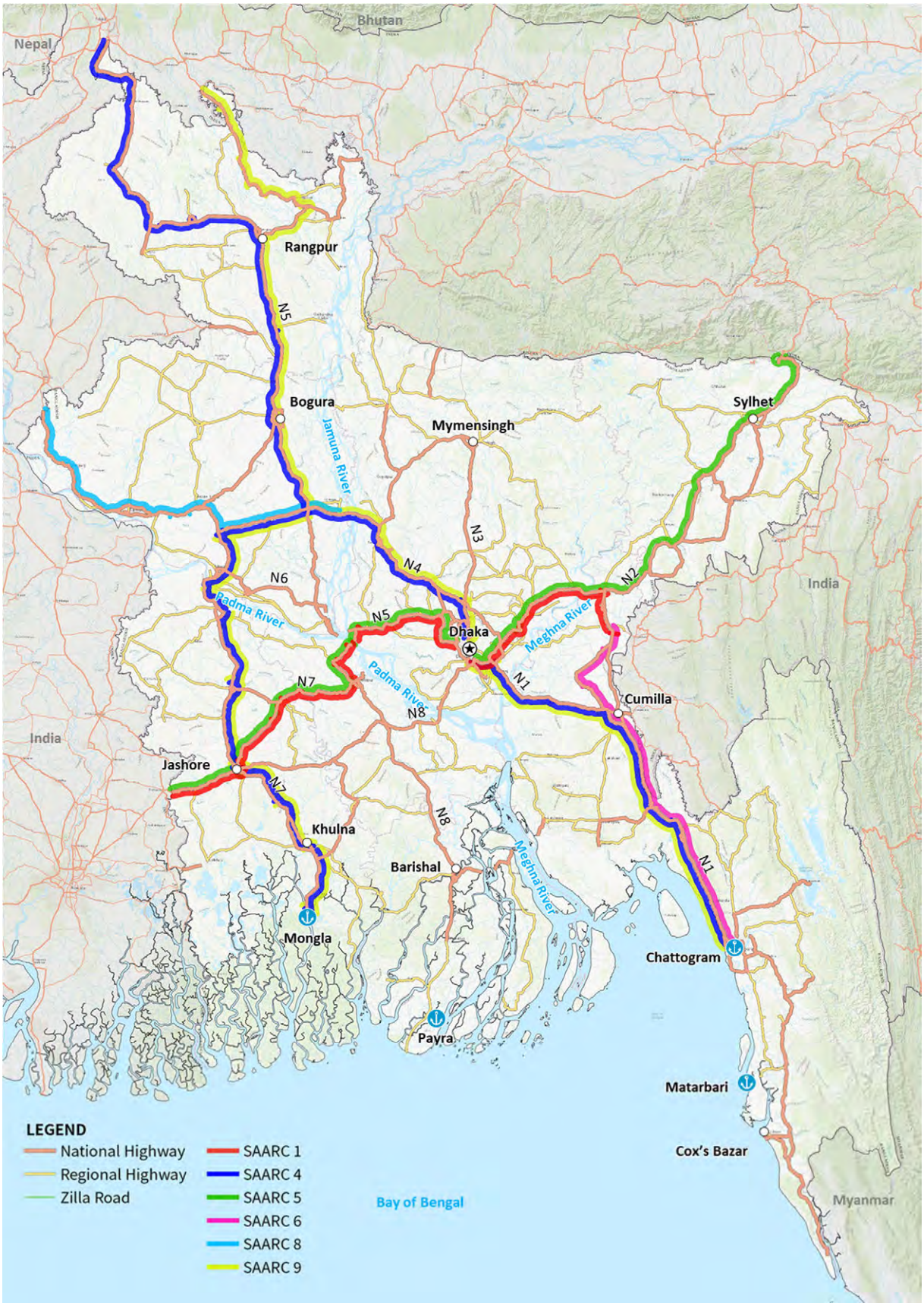
Figure 2.3.4 Status of Uncompleted Road Widening Sections (AH41)

(2) South Asian Association for Regional Cooperation (SAARC)

The South Asian Association for Regional Cooperation (SAARC) is an association of eight countries: Afghanistan, Pakistan, India, Nepal, Bangladesh, Bhutan, Maldives, and Sri Lanka, established in 1985. SAARC aims to promote cooperation at the regional level in the areas of transportation, traffic, and telecommunications.

According to the SAARC Regional Multimodal Transport Study conducted by ADB, 10 strategic road corridors were rated as having high importance at the regional level, of which the following 6 corridors are relevant to Bangladesh, and Bangladesh's role within this framework is (i) establishing smooth trade corridors between the two countries, (ii) ensuring landlocked countries to ports, and (iii) short distance connections to landlocked countries are expected.

- SAARC Road Corridor 1 : Lahore – New Delhi – Kolkata – Petrapole/Benapole – Dhaka – Akhaura/Agartala
- SAARC Road Corridor 4 : Kathmandu – Kakarvitta – Phulbari – Banglabandha – Mongla/ Chattogram
- SAARC Road Corridor 5 : Sandrup Jongkhar – Shillong – Sylhet – Dhaka – Kolkata
- SAARC Road Corridor 6 : Agartala – Akhaura – Chattogram
- SAARC Road Corridor 8 : Thimphu – Phuentsholing – Jaigon – Chengrabandha – Burimari – Chattogram/ Mongla
- SAARC Road Corridor 9 : Malda – Shibgonj – Jamuna Bridge



Source: JICA Survey Team

Figure 2.3.5 SAARC Road Corridors

(3) South Asian Sub-regional Economic Cooperation (SASEC)

The South Asian Sub-regional Economic Cooperation (SASEC) is an association of seven countries, consisting of India, Nepal, Bangladesh, Bhutan, Myanmar, Maldives, and Sri Lanka, established in 2001.

SASEC has been helping member countries improve cross-border connectivity and increase trade using a pragmatic, results-oriented framework focused on transport, trade facilitation, and energy. Priority areas include (i) improving international corridors to expand trade and commerce; (ii) modernizing customs operations, improving border facilities, and facilitating trade through transport; and (iii) improving cross-border power transmission to boost energy security and reliability.

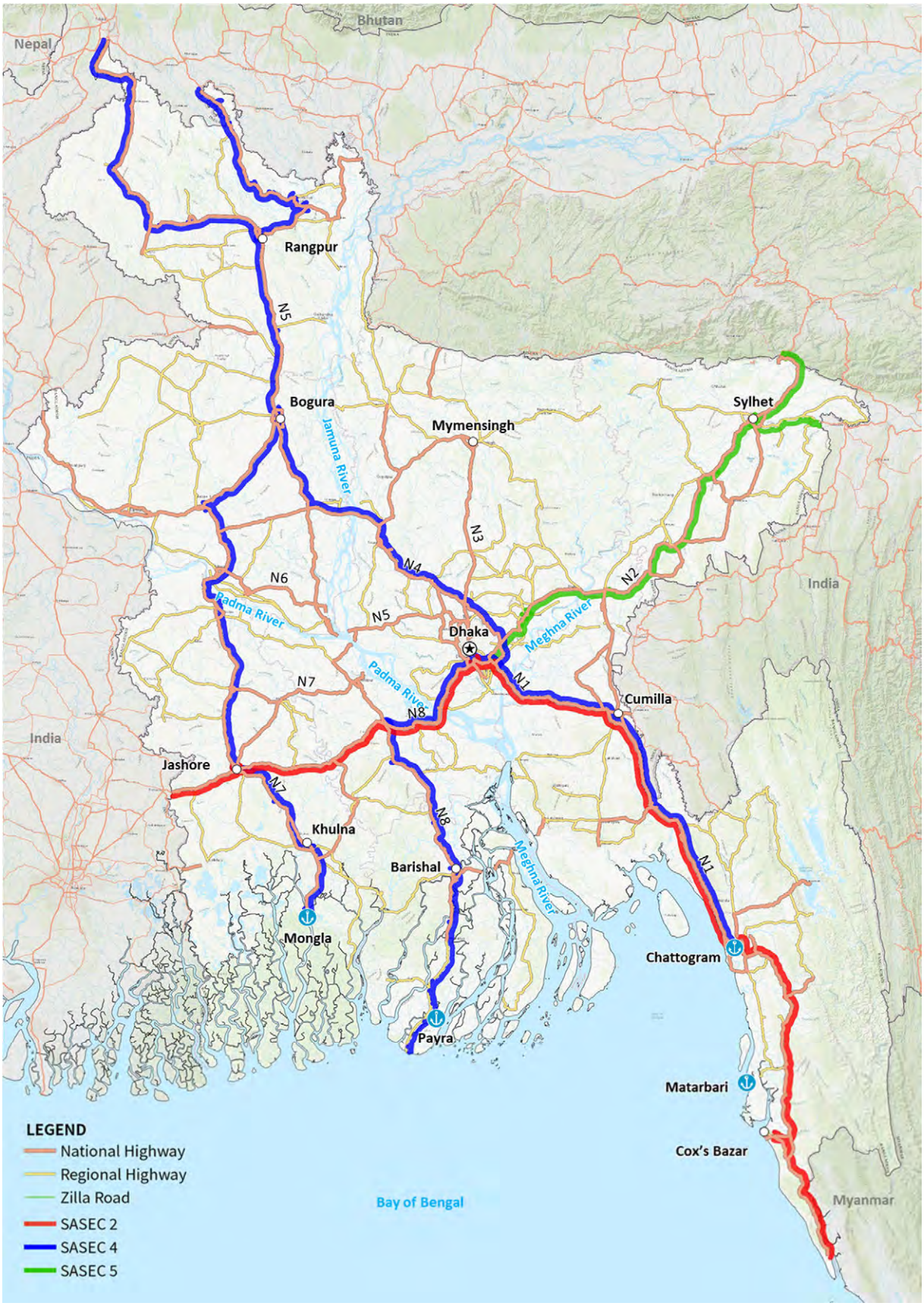
According to the Action Plan for SASEC Initiatives 2022-2024, 6 economic corridors are selected as SASEC program, and the following 3 corridors connect Bangladesh:

- SASEC Road Corridor 2 : Bay of Bengal Highway (Thoothukudi – Chennai – Visakhapatnam – Kolkata – Dhaka – Chattogram – Cox's Bazar – Teknaf)
- SASEC Road Corridor 4 : The Nepal/Bhutan – Bangladesh North-South Corridor (Kathmandu – Kakarvitta/Panitanki – Rangpur – Bogra – Dhaka – Chattogram, with spurs Rangpur – Burimari/Chengrabandha – Phuentsholing, Bogra – Mongla, Dhaka – Payra Port)
- SASEC Road Corridor 5 : The North Bangladesh – India Connector (Dhaka – Sylhet – Tamabil – Dawki – Shillong – Guwahati, with spur Sylhet – Sheola – Karimganj – Silchar)

As shown in Figure 2.3.6, the major ports in Bangladesh function as a gateway to the economic corridors. Currently, the SASEC economic corridors start from Chattogram, Mongla and Payra Ports in Bangladesh. In Bangladesh, the SASEC economic corridors have several bottlenecks such as existence of 2-lane sections and missing links across rivers. Therefore, improvement of the National Highways to 4-lane highways and construction of bridges are recognized as the major challenges under the SASEC program.

Initially, N4 (Dhaka to Paturia) and N7 (Daulatdia to Josore) were designated as SASEC corridors leading from Dhaka to Benapole. However, with the opening of Padma Bridge on N8 and Kalna Bridge on N806, this route was switched to the SASEC corridor as it was shorter and more convenient. Furthermore, with the opening of Payra Port, a new section of N8 (between Banga and Payra) was added to the SASEC corridor.

Much of the SASEC corridor and Asian Highway overlap, and the status of road improvement works on routes belonging to Asian Highway is described above. For the other road sections designated as SASEC Economic Corridors, ADB is expected to support road improvement on N509 (between Rompur and Burimari) and N8 (between Banga and Payra). N 502 (between Bogura and Natre) and N6 (between Natre and Bonpara) are the only routes where funding for road improvement works has not been decided.



Source: JICA Survey Team

Figure 2.3.6 SASEC Road Corridors

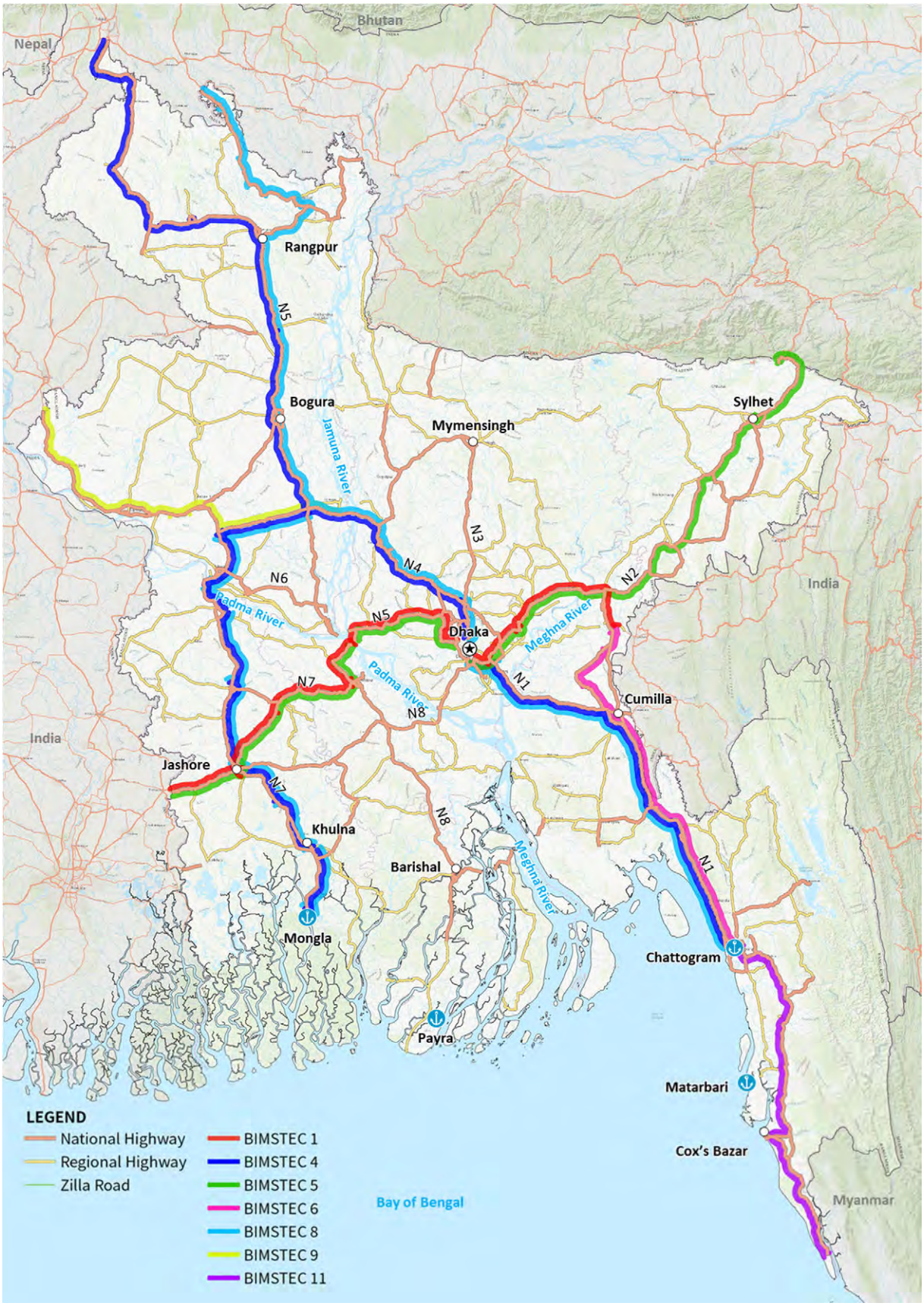
(4) The Bay of Bengal Initiative for Multi Sectoral Technical and Economic Cooperation (BIMSTEC)

The BIMSTEC is an international organization of seven countries of South Asia and South East Asia comprising Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka and Thailand aiming to accelerate economic growth and social progress in the sub-region by promoting free trade, increasing cross-border investment and tourism and technical cooperation. Bangladesh is expected to serve as a gateway to the large hinterland. Trade intensity and the transportation linkages are the two determinant regional integrations.

The region has 3 critical elements (i) missing- harmonization of railway network, (ii) all weather paved roads and (iii) modern port. This requires a sound infra-structure and transport base for movement of goods and people in the region. BIMSTEC underlines seamless connectivity in 5 areas: transport connectivity, trade connectivity, investment connectivity, energy connectivity, and people-to-people connectivity.

BIMSTEC Transport Infrastructure and Logistic Study (BTILS) identified 14 corridors of regional significance and 7 of them connect Bangladesh:

- BIMSTEC Road Corridor 1 : Kolkata – Petrapole / Benapole – Dhaka – Akhaura – Agartala
- BIMSTEC Road Corridor 4 : Kathmandu – Kakarvita – Phulbari – Banglabandha – Mongla / Chattogram
- BIMSTEC Road Corridor 5 : Samdrupjongkhar – Shillong – Sylhet – Dhaka – Kolkata
- BIMSTEC Road Corridor 6 : Agartala – Akhaura – Chattogram
- BIMSTEC Road Corridor 8 : Thimphu – Phuenthsholing – Jaigon – Chengrabandha – Burimari / Mongla
- BIMSTEC Road Corridor 9 : Maldha – Shibganj – Jamuna Bridge
- BIMSTEC Road Corridor 11 : Chattogram – Ramu (Cox's Bazar) – Teknaf – Maungdaw



Source: JICA Survey Team

Figure 2.3.7 BIMSTEC Road Corridors

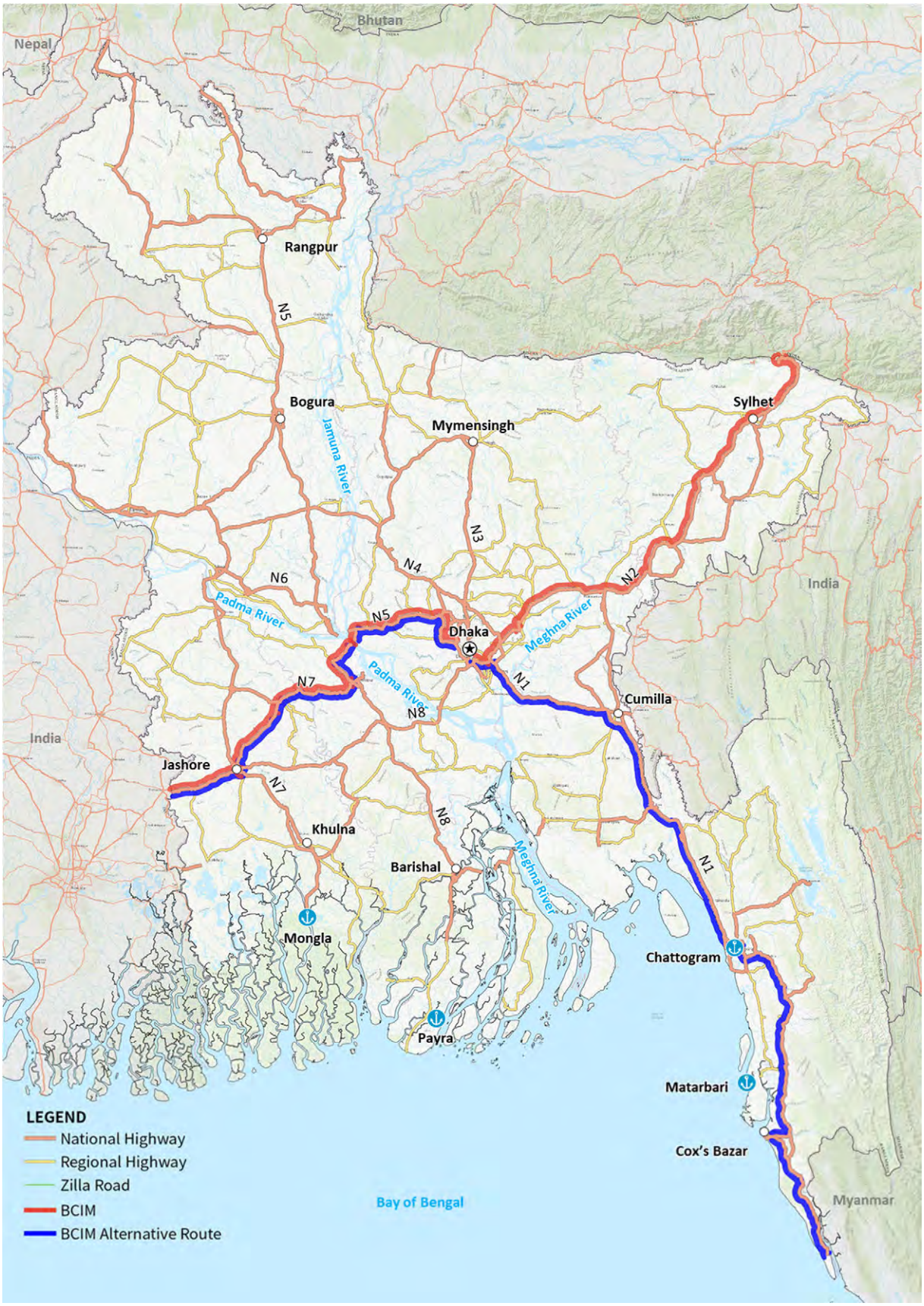
(5) Bangladesh-China-India-Myanmar (BCIM) Economic Corridor

The Bangladesh-China-India-Myanmar (BCIM) forum for regional cooperation aims to recapture the historic dynamism of the flows of goods, people and cultures over the famed "Southern Silk Route". The BCIM road corridor starts from Kolkata in India, through Dhaka and Sylhet in Bangladesh, Imphal in India and Lashio in Myanmar, and ends at Kunming in China.

At the BCIM Forum held in Kunming in 2011, the BCIM Corridor was selected as the corridor that starts in Kolkata (India), passes through Dhaka and Sylhet (Bangladesh), Imphal (India), and Lashio (Myanmar), and ends in Kunming (China). In addition, Bangladesh and Myanmar signed a Memorandum of Understanding (MOU) on alternative routes for the BCIM corridor in 2004 and 2007, respectively, as an agreement on road connectivity between the two countries.

- BCIM Corridor : Kolkata (India) – Petrapole (India) / Benapole (Bangladesh) – Jessore (Bangladesh) – Dhaka (Bangladesh) – Sylhet (Bangladesh) – Sheola (Bangladesh) / Sutarkandi (India) – Silchar (India) – Imphal (India) – Morreh (India) / Tamu (Myanmar) – Ka Lay (Myanmar) – Mandalay (Myanmar) – Mose (Myanmar)/ Ruili (China) – Tengchong (China) – Erhai Lake (China) – Dali (China) – Kunming (China)
- BCIM Alternative Corridor : Kolkata (India) – Jessore (Bangladesh) – Dhaka (Bangladesh) –Chittagong (Bangladesh) – Cox's Bazar (Bangladesh) – Ghundum (Bangladesh) – Taungbro (Myanmar) – Bawlibazaar (Myanmar) – Kyauktaw (Myanmar) –Mandalay (Myanmar) – Lashio (Myanmar) – Ruili (China) – Kunming (China)

To strengthen these international corridors and promote international trade, it is recognized that there is a need to improve the efficiency of customs clearance procedures at border facilities, and the Government of Bangladesh signed the Instrument of Accession to the Intergovernmental Agreement on Dry Ports in 2014. Projects are currently underway to improve the functionality and international standardization of the Benapole and Sheola border facilities.



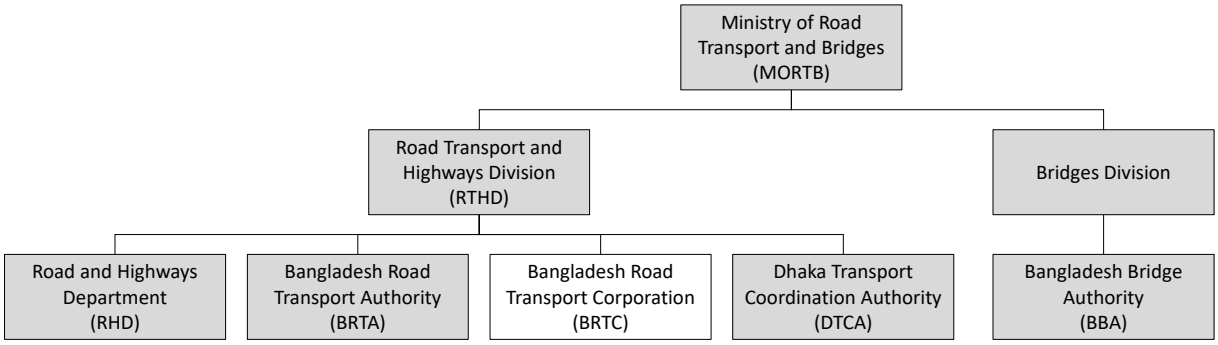
Source: JICA Survey Team

Figure 2.3.8 BCIM Corridors

2.4 Institutional Framework of Executing Agencies

Ministry of Road Transport and Bridges (MoRTB) and the Ministry of Local Government, Rural Development and Cooperatives are responsible government agencies for the road and bridge sector in Bangladesh. Roads and Highways Department (RHD) under the MoRTB manages the main arterial roads including bridges less than 1.5 km in length, while Bangladesh Bridge Authority (BBA) manages the bridges longer than 1.5 km.

As shown in Figure 2.4.1, the Road Transport and Highways Division (RTHD) and the Bridges Division (BBA) are the higher authorities of the implementing agencies of RHD and BBA, respectively, in charge of policy and planning, legislation, etc.



Source: JICA Survey Team

Figure 2.4.1 Organizational Chart of MoRTB

In addition to RHD and BBA, in the Chattogram Metropolitan Area (CMA), the Chattogram Development Authority (CDA) plans and develops infrastructure including roads and bridges, and acts as the implementing agency.

(1) Roads and Highways Department (RHD)

Roads and Highways Department (RHD) is the implementing agency established in 1962 when the former Construction & Building (C&B) Department was divided into two separate departments (the other being the Public Works Department (PWD), Ministry of Housing and Public Works), and is responsible for the construction and maintenance of major roads and bridges in Bangladesh.

RHD is organized into the following six (6) Wings:

- Planning and Maintenance Wing: Conducting surveys required for various plans such as new road maintenance, developing future plans for road maintenance, developing annual budget plans, conducting road surface condition surveys, updating inventory/inspection data in the Road Maintenance Management System (RMMS), developing road maintenance management plans using HDM-4, etc.
- Bridge Management Wing: Establishment of standards for design, carrying out regular bridge inspections and managing and updating information in BMS, development of bridge maintenance management plans, planning for bridge repair and replacement, design verification

for bridge construction projects, development of future plans for bridge maintenance, development of annual budget plans, etc.

- Technical Services Wing: Establishment of standards for studies, design, and construction of roads, pavements, bridges, and environmental and social considerations, implementation of road design and studies, updating and revision of RHD construction standard specifications, etc.
- Management Services Wing: Personnel management of RHD staff, operation of human resource management system, personnel evaluation, operation and management of intra-organizational intranet system (MIS: Management Information System), asset management, implementation of various training programs and seminars, office building management, etc.
- Mechanical Wing: Management of maintenance equipment and vehicles, ferry service planning and contract management, etc.
- Zone Offices: Dhaka, Chattogram, Comilla, Rajshahi, Rompur, Barisal, Sylhet, Gopalganj, Mymensingh

(2) Bangladesh Bridge Authority (BBA)

Bangladesh Bridge Authority (BBA), an implementing agency established in 1985 as the Jamuna Multipurpose Bridge Authority and later renamed BBA on December 19, 2007, is responsible for the implementation and maintenance of construction projects of bridges, elevated roads, and tunnels of 1,500 meters or more in length under the Bangladesh Bridge Authority Act (2016).

BBA has constructed long-span bridges such as the Jamuna Multipurpose Bridge (opened in 1998), the Mukhtarpur Bridge (opened in 2008), and the Padma Multipurpose Bridge (opened in 2022), and is currently constructing the Dhaka Elevated Expressway, the Karnaphuli Tunnel (Chattogram), the Dhaka Ashulia Elevated Expressway, the Dhaka BRT (elevated section), and the SASEC road connection project (Elenga - Htikamrul section) are currently under construction.

BBA consists of the following five departments.

- Planning & Development Wing: Development planning, preparation of project implementation (preparation of TPP, PDPP and DPP), preparation of annual budget plans, management of PPP project implementation
- Technical Wing: F/S implementation, preparation for project implementation (preparation of TPP, PDPP, DPP), design and costing, preparation of tender documents, procurement of consultants, etc.
- Operation and Maintenance Wing: formulation and implementation of maintenance plans, fee collection, etc.
- Finance and Accounting Wing: budget management, internal and external audits, etc.
- Admin Wing: personnel management of BBA staff, human resources development, asset management, office building management, etc.

(3) Chattogram Development Authority (CDA)

Chattogram Development Authority (CDA) was established in 1959 as the responsible organization of planning and development for the Chattogram Metropolitan Area (CMA).

The main role of CDA is to prepare and continuously review master plans for Chattogram city and the surrounding area, prepare short- and long-term development plans for the improvement and expansion of the city (construction of new roads, widening and improvement of major city roads, construction of shopping centers, industrial estates, residential areas, commercial zoned development, other necessary urban development, etc.), and planning and management of structures, in accordance with CDA bylaws and government-approved master plans.

The CDA is organized by five departments: Administration Department, Engineering Department, Account Department, Planning Department and Information Systems Management Department.

2.5 Japan's Cooperation

For road and bridge sectors, Japan's cooperation through Official Development Assistance (ODA) loans began in the mid-1990s. The first project was the "Jamuna Multipurpose Bridge Construction Project," for which a loan agreement was signed in 1994, and which opened on June 23, 1998, co-financed by the World Bank and the Asian Development Bank. Since then, JICA has focused on supporting the construction of bridges that connect countries divided by intricate rivers and create not only economic benefits but also a sense of unity among the country and its people.

ODA Loans were provided for the "Paksey Bridge Construction Project" and the "Rupsha Bridge Construction Project" and Grant Aids were provided for the "Project for the Construction of Portable Steel Bridges for Rural Roads", the "Project for Reconstruction of Small and Medium Bridges on Dhaka-Chittagong Highway", the "Project for the Provision of Portable Steel Bridges on Upazila and Union Roads" in the 2000s (see Table 2.5.1 and Table 2.5.2).

The cooperation for bridge construction has continued to the present, including "Eastern Bangladesh Bridge Rehabilitation Project," the "Kanchpur, Meghna and Gumti 2nd Bridges Construction and Existing Bridges Rehabilitation Project," "Western Bangladesh Bridge Improvement Project," "Cross Border Road Network Improvement Project (Bangladesh)" including the construction of Kalna Bridge, and the "Matarbari Port Development Project" including the construction of an access road with a total length of about 27 km. In 2003, JICA conducted a feasibility study on the Padma Bridge, which is a long span bridge.

Table 2.5.1 Project List (Japan's ODA Loan)

	Project Name	Date	Amount (mil. JPY)
1	Chattogram Cox's Bazar Highway Improvement Project (Phase 1)	2023.03	55,729
2	Matarbari Port Development Project (Phase 1)	2018.06	38,866
3	Matarbari Port Development Project (Phase 2)	2023.03	105,362
4	Cross Border Road Network Improvement Project (Bangladesh)	2016.06	28,698
5	Western Bangladesh Bridge Improvement Project	2015.12	29,340
6	Kanchpur, Meghna and Gumti 2nd Bridges Construction and Existing Bridges Rehabilitation Project	2013.03	81,675
7	Chittagong City Outer Ring Road Project	2010.03	9,096
8	Eastern Bangladesh Bridge Improvement Project	2009.03	7,824
9	Rupsa Bridge Construction Project	2001.03	8,300
10	Jamuna Bridge Access Roads Project	1997.07	6,206
11	Paksey Bridge Construction Project	1995.01	15,831
12	Jamuna Multipurpose Bridge Project	1994.06	21,290

Source: JICA's 50 Years in Bangladesh toward Sonar Bangla

Table 2.5.2 Project List (Japan's Grant Aid)

	Project Name	Date	Amount (mil. JPY)
1	The Project for the Provision of Portable Steel Bridges on Upazila and Union Roads	2005.11	-
2	The Project for Improvement of Steel Bridges for Roads in Rural Areas	2001.08	-
3	The Project for Improvement of Portable Steel Bridges for Feeder Roads	2000.06	-
4	The Project for Improvement of Revetment on the Bank of Meghna Bridge	1998.03	-
5	The Project for Reconstruction of Small and Medium Bridges on Dhaka-Chittagong Highway	1997.11	-
6	The Project for the Construction of Portable Steel Bridges for Rural Roads	1994.1	-
7	Project for the Procurement of Construction Equipment for Cyclone rehabilitation	1992.04	-
8	Meghna, Meghna-Gumti Bridges Construction Project	1991.01	-
9	Construction of the Meghna Bridge	1986.1	-
10	Road Improvement Project	1985.06	-
11	Meghna Bridge Construction Project	1985.04	-

Source: JICA's 50 Years in Bangladesh toward Sonar Bangla

Source: JICA Survey Team

Figure 2.5.1 BCIM Corridors

2.6 Private Sector Involvement

Since the government budget alone is insufficient to achieve the development goals set forth in the national policy "Vision 2041," infrastructure development through public-private partnerships (PPP) is considered one of the top priorities.

In Bangladesh, PPP projects are implemented through the identification of projects by ministries and the Public Private Partnership Authority (PPPA) or proposals from the private sector, through the preparation of a Preliminary Development Project Proposal (PDPP). After the PPPA is approved by the Cabinet Committee on Economic Affairs (CCEA), a feasibility study and evaluation of the government's Viability Gap Funding (VGF) are conducted for project implementation. All PPP projects are managed by the implementing agencies under the supervision of the PPP Agency.

2.6.1 PPP Projects in the Road and Bridge Sector

Table 2.6.1 shows the PPP projects proposed in the road and bridge sector and their implementation progress.

Table 2.6.1 Implementation Progress of PPP Projects (Road and Bridge Sector)

	Project Section	Type of Project	Project Progress	
1	Construction of Dhaka – Elevated Expressway (DEE)	New Road Construction	Implementing	Construction started in 2020 and is currently underway. One of the three construction sections is scheduled to be open at the end of 2022.
2	Upgrading of Dhaka Bypass to 4 Lane (Madanpur – Bhulta – Joydebpur)	New Road Construction	Implementing	Construction work started in 2021, with approximately 25% of the civil works completed at present. The overall construction period is expected to three years.
3	Improvement of Hatirjheel (Rampura Bridge) – Shekherjaiga – Amulia – Demra Road	New Road Construction	Implementing	Contracts with private operators were signed in early 2022, but loan terms have not yet been finalized. Part of construction work has already started.
4	Shantinagar to Dhaka – Mawa Road Flyover Project	New Road Construction	Cancelled	Project implementation was cancelled due to duplication of project effects with other proposed projects.
5	Dhaka – Chattogram Expressway	New Road Construction	Not Started	F/S and D/D were implemented with ADB support, but implementation of this project is being postponed as the completion of three Meghna bridge has eliminated traffic congestion on the N1.
6	Gabtoli – Nabinagar PPP Road R504 (Hemayetpur – Manikganj)	4-Lane Widening	Not Started	F/S work ordered by the PPP Authority has been completed and the tender process is expected to start by the end of 2022.
7	Chattogram – Cox's Bazar Highway Project (N1)	4-Lane Widening	Not Started	Under consideration by the Bangladesh-Japan Joint PPP Platform.
8	2nd Padma Multipurpose Bridge at Paturia – Goalundo.	New Road Construction	Not Started	The necessity for a second bridge will be assessed after the road traffic situation on the Padma Bridge (N8), which opened in June 2022.
9	Dhaka Outer Ring Road Project	New Road Construction	Not Started	Under consideration by the Bangladesh-Japan Joint PPP Platform.

	Project Section	Type of Project	Project Progress	
10	Construction of Bridge on Bhulta – Araihazar – Bancharampur road over the river Meghna (R203)	New Construction	Not Started	Under consideration by the Bangladesh-Korea Joint PPP Platform.
11	Improvement of Dhaka – Joydevpur – Mymensingh Road into Expressway with Service lane on Both Sides Through PPP	New Road Construction	Not Started	Under consideration by the Bangladesh-Korea Joint PPP Platform.
12	N5 Upgrading of Nabinagar – Manikgong – Paturia Road (N5) into Expressway Project	4-Lane Widening	Not Started	Under consideration by the Bangladesh-Japan Joint PPP Platform (pending CCEA approval).
13	Replacement of Steel Temporary Bridges & Maintenance Project	bridge replace/ maintenance	Not Started	Under consideration by the Bangladesh-Japan Joint PPP Platform

Source: JICA Survey Team

2.6.2 PPPA and other Related Organizations

(1) PPPA

PPPA (Public Private Partnership Authority) is founded in 2010 as PPPO (The Office for Public-Private Partnership) as an organization in Prime Minster Office. The purpose of it is the proactive realization of PPP projects which are socially demanded as one of the effective schemes of rapid implementation of the infrastructure. It provides a professional, transparent, centralized portal to high quality PPP Projects. It also provides effective information to the private firms who are interested in implementing the project as project operator. PPPO was reorganized as PPPA in 2015 when the PPP ACT was in effect.

PPPA's website opens the list of seventy-six (76) projects which are approved by Cabinet Committee on Economic Affairs (CCEA) as of Nov. 2022[3]. There are candidate projects of fourteen (14) sectors which are transport including Road & Bridge sector, Health, IT, Shipping, Zone, Industry, Civil Accommodation, Urban, Tourism, Social Infrastructure, Education, Energy, and Water/Sanitation & Hygiene.

The members of PPPA are leaded by CEO with nine (9) others as of Nov. 2022. There are three (3) Director Generals (DG) who manage Finance & Administration, Programme & Investment Promotion, and Legal respectively. Each DG has several directors such as Finance, Administration (Finance & Administration, DG), Programme, Investment & Promotion (Programme & Investment Promotion, DG), Engineer (Legal, DG). There is legal director under Legal DG. However, it is current vacant. Most of the members of PPPA are dispatched from relative ministries such as MOF and there are very few members who are employed by PPPA regularly. There are several consultants (Individual Consultants) who support the members of PPPA who are mentioned above. These individual consultants are employed directly by PPPA.

[3] http://www.pppo.gov.bd/projects.php

(2) MOF

There are offices in MOF which are involved in investing public funds to PPP project proactively. One is PPP Office which manages two (2) of three (3) schemes of Bangladesh Central Government offering their fund to the PPP projects. Those are PPP Technical Assistance Fund (PPPTAF), and Bangladesh Infrastructure Finance Fund Limited (BIFFL). There is VGF Office with Senior Assistant Secretary independently to PPP Office to manage Validity Gap Financing[4] (VGF). These two (2) offices related to the public fund to PPP projects belong Treasury and Debt Management (TDM) Wing, Finance Division in MOF as of Nov. 2022.

(3) Road & Bridge Sector

There is not any separated group (office, division, wing, etc.) both in RHD and BBA which manages PPP projects. The officers who belong to PPP project offices manages PPP projects or other officers prepare the PPP projects additionally to their own tasks.

BBA implements several PPP projects such as Dhaka Elevated Expressway which is under construction in the central area of Dhaka as of Nov. 2022. They execute survey/preliminary design/feasibility study normally unless the project is selected as G2G PPP project. If the project is judged that PPP is the best scheme to implement the project from the previous studies, specifically feasibility study, they start preparing the project as a PPP project. They refer to the result of transaction advisory study which is executed by private consultant firms selected by PPPA in principle to decide the financial scheme of the PPP projects. Transaction advisory study is executed for G2G PPP projects as well and the draft of financial scheme is proposed as the first draft of the contract between the implementing private firm(s) and Bangladesh government project managing organization, BBA in this case.

There are two (2) PPP projects which are managed by RHD and one is Dhaka Bypass as of Nov. 2022. RHD also execute survey/preliminary design/feasibility study normally unless the project is selected as G2G PPP project as BBA does. If the project is judged that PPP is the best scheme to implement the project from the previous studies, specifically feasibility study, they start preparing the project as a PPP project, especially when the project is listed on the PPP project list of PPPA. The leading officer of G2G PPP project with Japan, the Bangladesh-Japan Joint PPP Platform, is Mr. Shishir, ACE (Assistant Chief Engineer) of Bridge Management Wing. RHD also execute the transaction advisory study and prepares the draft of financial scheme similar to the procedure of BBA.

2.6.3 Legal Framework of PPP

(1) PPP ACT

Law of PPP projects in Bangladesh was established in 2015 as PPP ACT. Prior to this establishment Bangladesh central government, PPPO, has issued Vision 2021 (2006), Bangladesh Private Sector Infrastructure Guideline (PSIG, 2004), Invigorating Investment Initiative through Public Private

[4] https://mof.gov.bd/site/view/officer_list_all

Partnership (2009), Policy and Strategy for Public-Private Partnership (2010) to promote PPP projects. The main contents of PPP ACT are as follows,

- Power and functions of the PPP Authority — Article 9
- Taking up and Approval of the PPP project — Article 13 to 18
- Private partner selection process — Article 19
- Incorporation of a project company — Article 22
- Cases against corruption related offences — Article 24
- Conflict of interest — Article 25
- Terms and conditions of partnership contract — Article 26

(2) Other Guidelines, etc.

PPPA and PPPO, MOF has been issuing various policies, rules, guidelines, manuals, and formats for appropriate application of PPP ACT and smooth implementation of PPP projects. The following table shows the main documents and formats which are issued till present, Nov. 2022.

Table 2.6.2 Documents and Formants of PPP Projects

	policies, rules, guidelines, manuals	Year
1	Guideline for PPPTAF 2012 & Scheme for PPPTAF	2012
2	Guideline for VGF for PPP Project	2012
3	PPP Lifecycle Process Flow	2012
4	PPPTAF Fund Delegation of Financial Powers	2014
5	Procurement Guideline for PPP Projects and Guidelines for Unsolicited Proposals	2016
6	Policy for Implementing PPP Projects through Government to Government (G2G) Partnership	2017
7	PPP Authority's Fund Operating Procedure	2018
8	Procurement Guideline for PPP Projects	2018
9	Guidelines for Unsolicited Proposals	2018
10	National Priority Project Rules	2018
11	Rules for Viability Gap Financing for Public-Private Partnership Projects	2018
12	Rules for Public-Private Partnership Technical Assistance Financing	2018
13	Guidelines for Contractual Employment in PPP Authority	2018
14	PPP Screening Manual	2020
	Format	―
1	PPP Project Proposal Form	―
2	Guideline for PPP Project Proposal Form	―
3	PPP TAF Form	―
4	Viability Gap Financing (VGF) Proposal Form	―

Source: PPPA website (http://www.pppo.gov.bd/downloads.php)

(3) PPP Incentives

There are three (3) financial schemes to utilize public fund to promote PPP projects, such as PPP Technical Assistance Fund (PPPTAF), Validity Gap Financing (VGF), and Bangladesh Infrastructure Finance Fund Limited (BIFFL).

VGF is a scheme which Bangladesh Central Government funds particularly to the project so that the project will be feasibly as a PPP project. 40 % of the project investment is the maximum available amount, and the Bangladeshi implementation authority considers to utilize the maximum amount before the bidding process of selecting the private firm/project operator, as of Nov. 2022. There are some bidders that bids their proposal with lower amount of VGF than 40% of the projects' investment. Therefore, the VGF is not always utilized as much as it is prepared. Interviews with the person in charge also confirmed that there are cases where the content of the tender, which offers VGF at a fixed price, is a major factor in determining the successful bid.

PPPTAF is utilized for preparing the project after it is listed in the PPPA's PPP project list.

BIFFL is an organization which was founded by Bangladesh Central Government for funding the infrastructure PPP project. It funds the project with long term loan in Bangladesh Taka.

2.6.4 PPP Scheme

(1) Basic Scheme

As it is mentioned above, the feasibility of the projects of Road & Bridge sector are judged in the feasibility study based on the surveys and preliminary design executed prior to the feasibility study. If the project is judged that it that PPP is the best scheme to implement the project, the implementing agency conducts screening for PPP project, propose it as PPP project, and it will be listed in the PPP project list of PPPA. Then basically the PPPA executes transaction advisory study by listed consulting firm and prepares the first draft of financial scheme.

The basic financial scheme is financial independent scheme with toll rate apart from the 40% of project investment cost with VGF.

(2) VGF, MRG

VGF is, as mentioned above, a financial scheme that the private firm/project operator procures to secure the profitability of the project utilizing public fund. The implementation government organizations are obligated to prepare 40% of the project cost before the tender for selection private firm/project operator.

MRG (Minimum Revenue Guarantee) is also so a financial scheme to improve the profitability of the project utilizing public fund. It is applied to the Dhaka Bypass project managed by RHD. It guarantees the private firm/project operator's income up to the specific amount. The managing governmental

organization shall need to pay the difference when the income of the project is lower than the income which is agreed in the contract.

(3) Availability Payment

Availability payment is a PPP financial scheme which the managing government organization pays to private firm/project operator according to the performance of the project by private firm/project operator. It is independent from project income, toll income for instance. The project contract includes the method of measuring the performance of the project, determining the payment amount according to the performance. The demand risk is not taken by private firm/project operator and it makes private firms/project operators easier to start the PPP project. It also enables that the operational cost of toll collection will not be needed since the project road/bridge can be opened as non-toll road/bridge, or terminate the toll collection quickly after the opening. The project of Improvement of Hatirjheel (Rampura Bridge)-Shekherjaiga-Amulia-Demra Road which is managed by RHD will apply this scheme and it has already selected the private firm/project operator, as of Nov. 2022.

(4) G2G Platform

G2G (Government to Government) platform is prepared to apply PPP scheme to large-scale projects like railway or inter-city expressway. The minimum procurement amount for G2G PPP projects is 12 billion BDT.[5]

Bangladesh government has agreed with six (6) different foreign governments, such as Japan, South Korea, Singapore, Denmark, Saudi Arabia, and UAE to prepare the PPP project with G2G Platform. Japan and South Korea is preparing to apply this scheme to several projects of various sectors including road & bridge sector. Singapore, Saudi Arabia, and UAE applies to port projects. Demark has only signed MOU and has not started to prepare a specific project.

(5) Bangladesh-Japan Joint PPP Platform[6]

5th Bangladesh-Japan Joint PPP platform meeting was held in Tokyo on 4th of October 2022 in hybrid, face-to-face and online conference system. This platform was founded on 14th of December 2017 as 1st Bangladesh-Japan Joint PPP platform meeting. If the project is listed to this platform, Japanese private firm/project operator will be selected without bidding procedure. It is a joint platform to realize PPP projects with G2G scheme in collaboration between Bangladesh and Japan.

The 5th meeting added a new project to the list, “Replacement of Steel Temporary Bridges & Maintenance Project”. Four (4) among Severn (7) projects in the list are from the road and bridge sector.

[5] Policy for Implementing PPP Projects through Government to Government (G2G) Partnership, 2017 (Amendment), 2019
[6] https://www.mlit.go.jp/en/tochi_fudousan_kensetsugyo/tochi_fudousan_kensetsugyo_fr3_000001_00004.html

Table 2.6.3 List of Potential Projects of Bangladesh-Japan Joint PPP Platform (Road & Bridge Sector)

	Project Name	Sector
1	Chattogram-Cox's Bazar Highway Project	Road
2	Dhaka Outer Ring Road Project	Road
3	Upgrading of Nabinagar-Manikgong-Paturia Road (N5) into Expressway Project	Road
4	Replacement of Steel Temporary Bridge & Maintenance Project	Bridge

Source: Website of MLIT
(https://www.mlit.go.jp/report/press/tochi_fudousan_kensetsugyo03_hh_000001_00040.html)

ACE, Bridge Maintenance Wing RHD, says in the interview that the most critical, in demand, project among four (4) projects in above table is "Chattogram-Cox's Bazar Highway Project". The reason is that there are three (3) ongoing mega projects, such as Matarbari Ultra Super Critical Coal-Fired Power Project, Matarbari Port Development Project, and Matarbari Port Access Road Project, at the north of Cox's Bazar, and the access roads to these project sites are still weak and require rapid improvement. Matarbari Port will be a one of the major trading ports of Bangladesh and logistics flow would enter to the port from or exit from the port to other regions in Bangladesh. The Chattogram-Cox's Bazar Highway is a trunk road to access to the Matarbari project sites and it is desired to be improved as early as possible. Mr. Shishir requested that RHD and Bangladesh government expect that this project be implemented not only with PPP scheme but also together with ODA scheme as hybrid scheme with Japanese government's assistance.

"4. Replacement of Steel Temporary Bridge & Maintenance Project" is being studied by Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT). The department in charge of RHD is the Bridge Management Wing, which received a Japanese study team in February 2023 and conducted site visits/discussions, etc. According to interviews with the Bridge Management Wing, the project is not initially targeting the replacement of old and deteriorated small and medium-sized bridges with severe damage and bailey bridges, but rather a group of bridges with relatively long lengths where the technical and financial challenges to replacement/widening are high. The study will select project shortlist and the contents of the pre-F/S will be studied.

2.7 Technical Capability of Road & Bridge Construction in Bangladesh and Application of Advanced Technologies

2.7.1 Technical Capability of Road & Bridge Construction in Bangladesh

(1) Construction Technology

Construction companies in Bangladesh have a certain level of construction technology for general works such as construction of structures (concrete piers, concrete abutments, PC bridges, etc.) and embankments, although the level varies with the size of the company. They also have enough heavy machinery and vessels, such as bulldozers, compaction rollers, trucks, and dredgers. There are also

specialized companies that construct soft ground treatment works (e.g., PVD and sand piles. In addition, in many cases, Engineers at the foreman level speak English fluently.

On the other hand, there are several construction companies with experience in steel bridges and tunnels as subcontractors through Japanese ODA loan projects and projects funded by other countries, but they do not have the technology to implement them as main contractors and further technology transfer is needed.

(2) Project Schedule Management

In many construction projects in Bangladesh, schedule management is not enough and project schedule is sometimes delayed.

On the other hand, in Japanese ODA loan projects where Japanese construction companies are the main contractors, the construction plan is elaborated and implemented, the actual situation and the construction plan are compared/evaluated, and necessary measures are taken based on PDCA cycle to ensure that construction schedules are met. In some cases, workers and machinery are mobilized in a 24 hours/day operation.

(3) Quality Control

Quality control capacity needs to be improved at construction projects in Bangladesh, as there are scattered cases of crushed PC girders, concrete junkers and poor flatness in construction. Therefore, it may be difficult to guarantee quality without management by international engineers.

On the other hand, in Japanese ODA loan projects where Japanese construction companies are the main contractors, quality improvement is being carried out through repeated test construction to address problems such as air pitting of concrete and stains caused by defective stripping agents.

(4) Safety management

For the construction projects in Bangladesh, awareness of safety management is generally low. In many cases, labors don’t wear protective equipment (PPE). Materials for temporary works are sometimes not enough, and materials such as steel sheet piles, girders, cut beams, etc. are sometimes deforming and having to be redone. In many cases, the design of support works is not sufficiently implemented, and support works are installed based on the experience. Measures to prevent access to construction areas (hazardous work areas) are also insufficient.

In Japanese ODA loan projects, the Japanese construction company, the main contractor, provides adequate safety management and guidance, and the Bangladeshi construction company, the subcontractor, also implements adequate safety management, but adequate management has not been extended to the work of suppliers at the end of the project, and there have been confirmed cases of personal injury during crane dismantling.

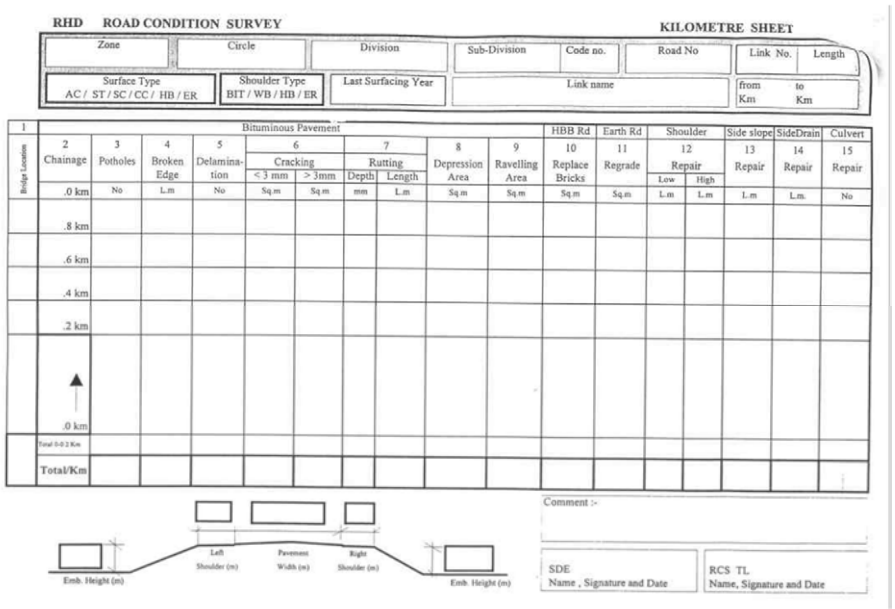
(5) Financial Capacity

Many construction companies in Bangladesh are cash-strapped. In the past, there have been cases where cash flow has affected the construction process, or where advance payments for construction work have been received and then used to fund working capital for other construction works.

(6) Maintenance and Repair

1) Road

Road inspections are mainly based on IRI surveys. The Road Condition Survey Manual was established in 2001, and inspection is carried out according to this manual. However, more than 20 years have passed since the manual was established and need to be updated.


RHD ROAD CONDITION SURVEY — KILOMETRE SHEET

Zone | Circle | Division | Sub-Division | Code no. | Road No | Link No. | Length

Surface Type AC / ST / SC / CC / HB / ER | Shoulder Type BIT / WB / HB / ER | Last Surfacing Year | Link name | from Km | to Km

1	Bituminous Pavement										HBB Rd	Earth Rd	Shoulder		Side slope	SideDrain	Culvert
Bridge Location	2 Chainage	3 Potholes	4 Broken Edge	5 Delamination	6 Cracking		7 Rutting		8 Depression Area	9 Ravelling Area	10 Replace Bricks	11 Regrade	12 Repair		13 Repair	14 Repair	15 Repair
					< 3 mm	> 3mm	Depth	Length					Low	High			
	.0 km	No	L.m	No	Sq.m	Sq.m	mm	L.m	Sq.m	Sq.m	Sq.m	Sq.m	L.m	L.m	L.m	L.m.	No
	.8 km																
	.6 km																
	.4 km																
	.2 km																
	.0 km																
	Total/Km																

Left Shoulder (m) | Pavement Width (m) | Right Shoulder (m) | Emb. Height (m) | Emb. Height (m)

Comment :-

SDE Name , Signature and Date | RCS TL Name, Signature and Date

Source: Road Condition Survey Manual (2001)/RHD

Figure 2.7.1 Format for Recording Road Surface Inspection

In terms of inspection equipment, RHD has two Roughometers for IRI measurements, which are used to measure IRI on all maintenance routes in an annual basis. As vehicles for carrying out more detailed surveys, RHD has a vehicle equipped with FWD (Pavement Structural Evaluation Device) (Swedish, 2018) and a pavement condition survey vehicle (New Zealand, 2021), which are used to carry out inspections. The FWD-equipped vehicles carry out 6-7 surveys (700-1000 km) per year.

The road condition measuring equipment on the road condition survey vehicles, which uses a laser to measure road surface properties, is not compatible with the asphalt road surface in Bangladesh and does not measure with the expected accuracy, the cause of which is currently under investigation.

Source: JICA Survey Team

Figure 2.7.2 Road Surface Condition Survey Vehicle

Particularly in severely damaged sections, the Zone Office conducts a detailed survey and submits a report to HQ when the damage is discovered in order to obtain a budget, and repair work is only carried out after approval. However, except in emergency situations such as disasters, the budget request process to MOF for approval is required instead of the reserve budget in RHD, resulting in a time lag between the discovery of damage and the implementation of repair works. There are no pavement repair manuals for dealing with minor damage (e.g., cracks, potholes, etc.). Therefore, in many cases, repairs are carried out by workers directly under the supervision of the zone office engineer. As for rutting and subsidence, in many cases the damage is repaired with an overlay after the damage has progressed to a certain extent.

National Highway No.1-No.8, the National Corridor, are considered to be particularly important routes, and repair work is carried out in many sections/periods to keep the road surface in good condition. Asphalt finishers are being imported from abroad and repair work is being carried out by contractors in Bangladesh.

Source: JICA Survey Team

Figure 2.7.3 Overlay Repair Work on National Highway No.1

The section where the main road crosses the local road is often congested due to the stopping of buses, which not only causes serious damage to the asphalt surface, but also results in rapid deterioration.

For this reason, in recent years RHD has replaced the asphalt pavement with concrete pavement in the section near the intersection. This is because RHD relies on imported aggregates and the difference in construction costs between asphalt and concrete is small, so that concrete pavement outperforms asphalt pavement in the sections with severe damage progression when lifestyle costs are considered.

Source: JICA Survey Team

Figure 2.7.4 Placing Concrete on National Highway No.1

2) Bridge

Inspections are being carried out in two zones using the Bridge Inspection and Assessment Manual developed under the Road Maintenance and Management Project, a JICA technical cooperation project completed in 2018.

Many of the bridges in Bangladesh do not have easy access to the underside of the superstructure or to the piers in the river, as water remains in the rivers even during the dry season. Therefore, the project provided and trained two robotic cameras with fixtures and high-precision cameras from the bridge face. They are now being used for regular inspections of many bridges, one of which has been damaged and is no longer available.

The Bridge Management Wing of RHD intends to actively use periodic inspections in other areas, but the deployment has been stalled because contracts cannot be awarded near underpasses or substructures in the river, and consultants bidding for inspection work do not have inspection equipment with the same performance as the robotic cameras. Deployment of the system has stalled. Progress on bridge inspections across the country continues to be very slow due to the frequency of robotic camera use.

Source: MLIT Website

Figure 2.7.5 Robot Camera

The Bridge Management System (BMS), also developed under the Road Maintenance and Management Project. Inputs the results of the inspections carried out in the two zones described above, and together with the inventory data, is used as a central database for managing bridge specifications/damage status. For bridges already entered, bridges to be replaced/repaired are selected and a long list of bridges to be replaced/repaired is selected according to the system's prioritisation criteria. It is hoped that the number of bridges entered will be increased and expanded nationally in the future.

Source: RHD Website

Figure 2.7.6 Bridge Maintenance Management System (BMMS)

In terms of repair design/construction, repair techniques are not enough because bridges have been used and replaced until the damage is severe, and there are only a few consultants who do everything from inspection to design, and a few contractors who do the repair work.

The Road Maintenance and Management Project has produced a manual on bridge repair and strengthening [construction methods], and the knowledge of the technology has been transferred, but it has not been disseminated to the engineers and others in the private sector who are in charge of the actual site.

Currently, BBA is maintaining three bridges including Bangabondhu Bridge (Jamuna Multipurpose Bridge) which was put into service in 1998. The maintenance of these bridges is outsourced to a private company under a five-year comprehensive maintenance contract.

The BBA itself may not have sufficient technology and experience in the maintenance of long-span bridges, however it compensates this weakness by outsourcing the maintenance to experienced contractors. Currently, no major damage has occurred and no problems have been observed, therefore maintenance has been carried out smoothly.

2.7.2 Application of Advanced Technologies

There is a possibility that advanced technologies as shown below can be applied for road and bridge projects in Bangladesh, considering above mentioned technical capability in Bangladesh.

(1) Steel Pipe Sheet Pile (SPSP)

SPSP has been applied in many bridge projects in Japan. This technology has been also applied in international projects such as Kanchpur, Meghna, and Gumti 2nd Bridges Construction and Existing Bridges Rehabilitation Project in Bangladesh. It is expected to shorten construction period, minimize foundation size, reduce construction cost, etc. by applying this technology. SPSP can be applied in deepwater conditions and soft soil area. In addition, by adopting press-in method, required construction space can be reduced.

Source: Nippon Steel

Figure 2.7.7 Steel Pipe Sheet Pile (SPSP)

(2) Steels for Bridge High Performance Structure (SBHS)

SBHS has been applied in Japanese domestic badge projects as well as international bridge projects. This technology was applied in Cross-Border Road Network Improvement Project (Kalna Bridge) in Bangladesh. This steel has high strength, high toughness and high weldability, thus preheating for welding is not necessary or can be reduced. It is also expected to save bridge weight and reduce construction cost by improving constructability.

Source: Cross-Border Project

Figure 2.7.8 Steels for Bridge High Performance Structure (SBHS)

(3) Corrosion Resistance Steel for Painting Cycle Extension

Corrosion resistance steel for painting cycle extension has been applied in many bridge projects in Japan. This steel has functions to inhibit coating degradation and corrosion at thin paint coating portions, thus this is effective particularly near the sea. Painting cycle can be extended by applying this steel, and it is expected to reduce maintenance cost.

(4) Steel Narrow Box Girder Bridge

Steel narrow box girder bridge has been applied in Japanese domestic badge projects as well as international bridge projects. This bridge type was applied in Kanchpur, Meghna, and Gumti 2nd Bridges Construction and Existing Bridges Rehabilitation Project in Bangladesh. It is expected to reduce construction cost and construction period because of simplified main girder structure and floor framing structure by applying this bridge type. Also, maintenance cost can be reduced because of reduction of painting area.

Source: Japan Bridge Association

Figure 2.7.9 Steel Narrow Box Girder Bridge

(5) Paint for Heavy Anticorrosion Coat

This paint is made of paint materials having high corrosion preventing performance such as zinc rich paint, epoxy resin paint, etc. It is expected to reduce life cycle cost including maintenance cost by applying this paint, although the initial cost is higher compared with ordinary paints.

Source: Nippon Steel

Figure 2.7.10 Steel Slag Base Course Material

(6) Steel Slag Base Course Material

This base course material is made of steel slag. This material has been applied in many road projects in Japan. This material has latent hydraulicity, thus it is expected to secure high strength as a base course material for long periods. This material is particularly useful in Bangladesh, as it is difficult to procure base course materials in Bangladesh.

Source: JFE Engineering

Figure 2.7.11 Sandwich-structured Immersed Tunnel

(7) Sandwich-structured Immersed Tunnel

Sandwich-structured immersed tunnel is an immersed tunnel construction method utilizing composite member of steel and concrete for all or a part of member of immersed tube. This method has 2 structure types, namely open-sandwich structure and full-sandwich structure. It

is expected to reduce construction cost as well as to increase constructability and construction safety by applying this method, as steel plate functions as waterproof plate and reinforcing steel in the steel-concrete composite structure, thus reduction of amount for reinforcing steel, formwork and timbering.

(8) Composite Segment for Shield Tunnel

This is composite segment of steel and concrete for shield tunnel which has high strength. Construction cost can be reduced by applying this segment because of the thinner segment width compared with ordinal segment. It is also expected to reduce life cycle cost, as this segment has high water stop performance, high resistant to destruction and high seismic capacity.

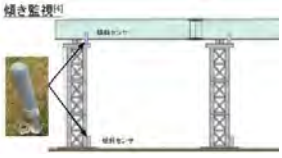
Source: Japan Shield Segment Engineer's Association

Figure 2.7.12 Composite Segment for Shield Tunnel

(9) Safety Enhancement Technologies by Utilizing ICT

It is expected to apply safety enhancement technologies as shown in Table 2.7.1 in the Project.

Table 2.7.1 Safety Enhancement Technologies

Monitoring of abnormal closing by total station	Monitoring of bent moving by sensor	Avoiding contact between crane and structure by ultrasonic sensor	Safety control of labors by app
			
Source: NETIS KT-140100-A	Source: NETIS HK-150012-A	Source: NETIS KT-140059-A	Source: Japan Bridge Association

(10) Materials for Coating and Repair of Penetrating Cracks

By repeatedly applying the penetrating epoxy adhesive, an application and penetration type crack repair material, to cracks, it penetrates the cracks by capillary action, blocking and repairing the cracks with the penetrating epoxy resin. It can be applied to cracks with a crack thickness of 0.2mm or less, where the conventional epoxy resin injection method cannot be applied and enables early repair of progressive cracks in the concrete structure towards the inside. It is a preventive maintenance repair method as it can deal with damage at an early stage, helping to extend the life of concrete structures and reduce life cycle costs. The method of application is by roller, which makes it very easy to apply.

Source: Alpha Industries Ltd Website

Figure 2.7.13 Materials for Coating and Repair of Penetrating Crack

It has been registered in the New Technology Information System (NETIS) of the Japanese Ministry of Land, Infrastructure, Transport and Tourism (NETIS Registration No. CB-130007-VE).

(11) Bag Materials for Scour-Prevention Bag-Type Rooting Method

The bag material for the scour prevention bag-type rooting method is a double-layer Raschel net bag material made of polyester fiber. It can be used as an infill material with locally sourced boulders, cobbles, crushed stone, or concrete blocks, and is sufficiently conformable to the riverbed variations required for rooting works and to the gaps in interlocking works. It can be used for revetments around piers and abutments. It also simplifies the installation process by eliminating the need to bag the crushed stone, and the construction time is short, especially when heavy machinery is used. The system has been registered with the NETIS (NETIS Registration No. KT-000028-VE).

Source: Maeda Kosen Corporation Website/Catalogue

Figure 2.7.14 Bag Materials for Scour-Prevention Bag-Type Rooting Method

2.8 Examples of DX Utilization

2.8.1 About DX

DX is an acronym for Digital Transformation. It aims to increase value through innovation, invention, customer experience or operational efficiency and labor savings by digitizing non-digital products, services, or operations. There are various definitions of DX, but Japanese Ministry of Economy, Trade and Industry (METI), in its DX Promotion Indicators and Guidance, defines DX as "the transformation of products, services and business models based on the needs of customers and society, as well as the transformation of operations themselves, organizations, processes, corporate culture and climate, through the use of data and digital technology, as companies respond to rapid changes in the business environment". The definition is that it is about creating competitive advantage by transforming operations, organizations, processes, culture and climate.

In the infrastructure sector, while the introduction of new technologies has been used to improve the efficiency of individual processes and the multifunctionality of construction equipment, DX is expected to take this a step further, transforming the business process itself and optimizing the entire construction production process by incorporating and combining the use of digital technologies such as AI, ICT, IoT, etc. It is expected to optimize the entire construction production process. This is an initiative to solve various problems currently facing the construction industry (e.g. labor shortages, operational inefficiencies, etc.) by changing the way work is done itself and turning it into a new strength.

In Japan, the promotion of sustainable industrialization in line with the SDGs is one of the key themes of Society 5.0 as defined in the Cabinet Office's Fifth Science and Technology Basic Plan, and the promotion of DX is needed to address labor shortages caused by declining birthrates and an ageing population. In addition, national initiatives for DX in the construction industry are progressing, such as the establishment of the Infrastructure DX General Promotion Office under i-Construction promoted by the Ministry of Land, Infrastructure, Transport and Tourism, which aims to improve productivity on construction sites through the use of IT technology. It can be said that DX in the construction industry is currently a focus of cooperation between the public and private sectors.

It is expected not only to make products and services more convenient, but also to transform operations themselves, organizations, processes and even cultures. In other words, DX is not about buying new software or using computers to automate parts of office work, but about rethinking the way work itself is done from the ground up, using digitalization to solve problems. The elementary technologies essential for DX in the infrastructure sector include the following.

- **BIM/CIM:** Initiatives to improve the efficiency and sophistication of a range of construction production and management systems by introducing three-dimensional models from the planning, surveying and design stages, and by linking and developing the three-dimensional models in the subsequent construction and maintenance stages to facilitate information sharing between stakeholders throughout the project.
- **Cloud Service:** A service that allows the use of resources such as virtual servers on internet. As long as there is an internet environment, the system can be used from anywhere, allowing, for example, head office and construction sites to share construction status, receive instructions and check progress in real time, regardless of distance. The system is maintained and serviced by the cloud provider, which also reduces costs.
- **Fifth Generation Mobile Communications System (5G):** Compared to conventional 4G, this system is characterized by ultra-high speed and high-capacity communication, high reliability and low rate of communication slowdown, and the ability to connect to a large number of devices simultaneously. Previously, in the 4G communication environment, problems such as insufficient communication capacity, communication delays and a limited number of simultaneously connected machines meant that operations were not smooth and the situation on the ground could not be grasped in real time. This will dramatically improve labor savings and productivity.
- **AI:** The abbreviation for Artificial Intelligence, which enables computers to 'learn' (machine learning) and has the advantage of being able to process large amounts of data quickly. Machine-learning AI can process information and make decisions in the same way as a human and can provide the best answer in less time than a human. For example, there are systems where AI analyses images from a construction site to determine the progress of construction work.
- **ICT:** The abbreviation for Information and Communication Technology, which refers to communication using communication technology. In the infrastructure sector, it is also used in technology that allows equipment to be operated remotely, and ICT technology is used to

automate work that is particularly dangerous and requires human intervention. Technology is also being developed to convert aerial images taken by drones into 3D survey data.

- **IoT:** The Internet of Things is an internet technology in which objects are equipped with communication technology and the data collected by sensors is used for various purposes. By connecting mobile devices (mobile phones, tablets, etc.) and 'things' such as household appliances, cars, factory equipment and construction machinery to the internet, remote control becomes possible and equipment can be operated from remote locations.

2.8.2 Examples of DX Utilization in Construction Sector

By using DX technology in the construction sector, the following can be achieved.

- The introduction of BIM/CIM will enable the centralized management of information in various work processes, from survey and design to construction and maintenance management; improve the efficiency of information sharing and reduce the time and errors involved in making changes; shorten construction times and save labor through the use of 3D printers; and enable the remote operation of heavy hazardous machinery (crushing, excavation, transport, installation, etc.) and the collective operation of multiple machines.
- Improvement of the working environment through the remote operation of heavy machinery involving hazardous work (crushing, excavation, transport, installation, etc.) (remote construction), labor saving through the collective operation of several machines and the reduction of hazardous work risks (improved safety), reduction of overtime, reduction of stress among workers, etc.
- Higher quality of construction (automation of work at the same level as skilled technicians) and faster speed of simple tasks through full automation of construction work by AI-equipped construction machinery.
- Automation and streamlining of construction progress management through 360° cameras and AI photo analysis.
- 3D surveying of areas using drones, smartphone-mounted laser scanners (LiDAR) and satellites.
- Digitization of the management status of structures using robots and sensors (reproduction in virtual space) and automatic detection of structural damage (concrete cracks, delamination, leaks) using AI image recognition.
- Automatic extraction of potential landslide hazard areas from topographic maps (visualization of the diagnostic logic of skilled engineers, previously tacit knowledge).
- Flexible control of traffic lights according to traffic conditions through AI analysis of images from live cameras installed on the road. Coordination of traffic lights to ensure that emergency vehicles are dispatched in the event of a traffic accident and arrive at the scene quickly. Managing street lighting according to traffic volume (reducing electricity costs).
- Operating automated vehicles in smart cities.

2.8.3 Status of DX implementation in Japan

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has set 2023 as a "breakthrough year" to further accelerate transformation through DX, and is promoting digital use in the infrastructure sector, including measures to generalize ICT construction and a policy to move to the "next stage" where ICT, which has been addressed through partial optimization by construction type, process and site as i-Construction, is developed into overall use. The policy is to move to the 'next stage' where ICT is developed from partial optimization by type of construction, process, and site to total utilization as i-Construction.

Currently, ICT construction is being implemented in about 80% of construction projects publicly notified by the Ministry of Land, Infrastructure, Transport and Tourism under its direct implementation, and the number of projects implemented in prefectural and municipal governments has increased from about 300 to about 2,500 over the past five years. In terms of company size, about 90% of large construction companies have implemented ICT construction, while small and medium-sized construction companies account for only about half of all contractors.

BIM/CIM is expected to improve operational efficiency and productivity by sharing data in the design, construction, and maintenance phases. For this reason, efforts are being made to use BIM/CIM design data for construction with ICT construction equipment and in road books.

In the future, technological innovations for the next stage are expected, such as the technological development towards automation and independence of construction equipment, and the improvement of overall construction productivity using ICT to monitor work status.

2.8.4 Status of DX Implementation in Bangladesh

In Bangladesh, with the support of the United Nations Development Programme (UNDP), the SMART Bangladesh Vision 2041, based on the UNDP Digital Strategy 2022-2025 (An ambitious strategic plan to transform the economy to achieve high-income country status by 2041 and in the process achieve the 2030 Sustainable Development Goals), aims to become a prosperous, developed, poverty-free and equitable nation through the promotion of DX.

The SMART Bangladesh Vision 2041 is based on four pillars - Smart Citizens, Smart Government, Smart Economy, and Smart Society - from which all citizens, regardless of socio-economic background or business size, can benefit. It aims to eliminate digital regional disparities by innovating and scaling sustainable digital solutions that can benefit all citizens, regardless of socio-economic background or business size.

The use of digital in the infrastructure sector is just beginning, with RHD having just launched an online mapping service (accessible only to RHD staff) for traffic and road conditions (IRI) and a Road Asset Management System (RAMS) for roads under its jurisdiction. There has been no implementation of BIM/CIM in the design or construction phase.

3. ROAD AND BRIDGE DEVELOPMENT PLANS

3.1 Road and Bridge Development Plans in Bangladesh

3.1.1 Vision 2041

"Vision 2041" is a long-term national policy of Bangladesh with the ultimate goal of "zero poverty," aiming to reach the Upper Middle-Income Country (UMIC) status by 2031 and the High-Income Country (HIC) status by 2041 through industrialization. In the transport sector, the following development strategies are outlined to "build an efficient and low-cost transportation network," including ensuring smooth freight transportation routes from production centers to airports and seaports.

- Strengthening long-term planning and priority setting: The targets of the transport sector are massive, which requires enormous financial resources and strong implementation capacity, both of which are in short supply in Bangladesh. Therefore, careful planning and priority setting are key elements of the transportation strategy in "Vision 2041". Bangladesh has an existing long-term transportation plan, but a new long-term Transportation Sector Master Plan 2041 (TSMP 2041) needs to be developed. A balanced, intermodal transportation system should be planned with reference to the excellent transportation planning and development in Japan, Korea, and China, and project priorities and a phased approach for its development should be developed.
- Creating balanced inter-modal transport facility: To reduce the concentration of traffic on roads, promote the development of a balanced transportation network of road, rail, and inland water transportation. Promote development of rail and inland water transportation, as both modes of transportation other than road are underutilized.
- Strengthening implementation capacity: Implementation constraints have delayed the implementation of many large transportation and transit projects, resulting in cost overruns and delays in project completion. Strengthen the capacity of implementing agencies to ensure that project implementation proceeds as planned. Adopt an international competitive bidding process for large and complex projects, with an emphasis on turnkey project contracts with strict monitoring and penalty clauses to deliver projects on time with agreed quality and price.
- Ensuring sustainable financing of transport infrastructure: Until now, government budgets have been used for the development of transportation infrastructure, but in many cases the funds have not been fully utilized due to limitations in implementation capacity. The scale of project

implementation required by Vision 2041 cannot be covered by the government budget alone, and therefore Public-Private-Partnership (PPP) is positioned as an important source of funding.

Based on the above, the development strategy for the road transport sector includes the following:

- To improve the national road network by converting existing national roads to multi-lane, service roads, and expressways with limited access
- To establish road continuity connecting special economic zones, transportation nodes such as airports and seaports, tourist destinations, etc.
- To improve continuity of the national road network connecting the central cities of all districts
- To establish roadside stations (rest facilities) along inter-city roads
- To improve Zilla Roads and Upazilla Roads to promote local industries
- To pave village roads to improve accessibility to rural areas
- To reinforce road and bridge maintenance system and secure funding through toll roads, etc.

3.1.2 8th Five-Year Plan (2021-2025)

In the 8th Five-Year Plan (2021-2025), the action plan of the national policy "Vision 2041", in addition to the above development strategies, emphasis is also placed on (1) strengthening axle load control to prevent road damage, (2) improving traffic safety, (3) rationalizing bus routes in Dhaka City, and (4) strengthening traffic control and reducing congestion through the use of ITS.

Until the 6th and 7th Five-Year Plans, the implementation plan was based on the RHD Road Master Plan, which focused on improving and widening existing roads rather than expanding the road network by constructing new routes. As the result, widening to 4-lane projects are being implemented on National Highway No. 1 (between Dhaka and Chattogram), No. 3 (between Dhaka and Mymensingh), and No. 8 (between Dhaka and Mawa). As for large-scale bridge projects, the Padma Multipurpose Bridge, Dhaka Elevated Expressway, BRT Line 3 (between Gazipur and Dhaka Airport), and Karnaphuli Tunnel in Chattogram are being constructed by BBA.

Table 3.1.1 RHD Physical Targets for the Five-Year Plans

Activities	7th Five-Year Plan		8th Five-Year Plan
	Plan	Actual	
Construction of multiple-lane Roads	300 km	393 km	550 km
Widening of Existing Roads	340 km	350 km	150 km
Improvement/ Rehabilitation of National Highways	2,500 km	4,925 km	1,800 km
Improvement/ Rehabilitation of Regional & Zilla Roads			12,700 km
Construction of Bridges/ Culverts	14,800 m	24,254 m	37,500 m
Reconstruction of Bridges/ Culverts	6,800 m	6,830 m	4,100 m
Construction of Flyover/ Overpass	7,000 m	7,580 m	11,000 m
Construction of Rigid Pavement Roads	-	-	375 km
Establishment of Weigh Bridge/ Axle Load Control Station	-	-	30 nos.

Source: 8th Five-Year Plan (2021-2025)

(1) Strategy for Road Transport (RHD)

The development strategy for the road sub-sector in 8th Five-Year Plan can be summarized as follows:

- To prevent project delays and cost overruns by strengthening project implementation capacity
- To improve national road network through multilaning of existing national roads, installation of side roads, and creation of expressways with limited access
- To prevent pavement damage through strict axle weight management
- To establish road continuity connecting special economic zones, transportation nodes such as airports and ports, and tourist destinations
- To improve continuity of national road network connecting central cities of all districts
- To establish roadside stations (rest facilities) along inter-city roads
- To improve Zilla Roads and Upazilla Roads to promote local industries
- To pave village roads to improve accessibility to rural areas
- To reinforce road and bridge maintenance systems and secure funding through toll roads, etc.
- To improve traffic safety
- To rationalize bus routes in Dhaka
- To enhance traffic control and reduce traffic congestion using ITS

(2) Strategy for Bridge (BBA)

The development strategy for the bridge sub-sector in 8th Five-Year Plan can be summarized as follows:

- To implement ongoing projects as planned: The construction of Padma Multipurpose Bridge, Dhaka Elevated Expressway, BRT Line 3 (between Ghazipur and Dhaka Airport), Karnaphuli Tunnel, etc. are all scheduled to be completed within FY2022, and steady implementation of these projects will be promoted.
- To prevent project delays and cost overruns due to the introduction of turnkey contracts (EPC contracts) in donor-funded projects.
- To Reinforce implementation capacity for PPP projects

3.1.3 National Land Transport Policy

The National Land Transport Policy (NLTP), formulated in 2004 by the Ministry of Communications, the predecessor of MoRTB, is a strategic development policy of the Government of Bangladesh designed to create a land transport system that is safe, affordable, modern, technologically reliable, environmentally friendly, and acceptable from a globalization perspective.

To underpin economic activities and social development, the following 10 strategic policies are presented from a long-term perspective of about 30 years in the transport sector.

(1) Expand participation of private investment
(2) Strengthen collaboration within the transportation sector

(3) Promote the role of transportation users
(4) Cost sharing by transportation users
(5) Subsidies for transportation services
(6) Publicize policy details to the public
(7) Promote effective use of transportation resources
(8) Integration with land and water transportation policies
(9) Improve accessibility and serviceability in rural areas
(10) Cross-sectional integration of different transportation modes

(1) Strategic Policy

1) Enhance private sector participation

- Private sector participation in the transport sector will be encouraged more. But the ownership of road and rail infrastructure, being national assets, will remain with the Government.
- Where the private sector is involved in infrastructure provision the Government will bring into practice long-term leases with appropriate terms to allow the private sector to recover its investment.
- The private sector will be positively encouraged to participate in infrastructure development where it brings finance, efficient operating techniques and technological innovation.
- Guidelines will be published setting out ways in which the above goals can be achieved. Further active participation of private sector in transport operations will be encouraged where it is beneficial for the public judging from financial or service standards.

2) Coordinate in transport

- The Government will establish better coordination between the Ministries and Departments under its control.
- Policy/rules & regulations will be formulated to achieve the goal of creating better working links between the Government and the public and private sectors. Discussion and consultation forums will be created for policy implementation.
- The Government will promote clearer objectives and responsibilities for each sector in order to create more integrated working relationships.

3) Promote the role of the transport users

- The Government will examine how best the interests of users can be represented within the existing national government and local authority system.
- The Government will establish a user role within its transport planning process.

4) Collect toll from transport users for the costs of services

- The Government will gradually introduce necessary arrangements to realize cost of transport operation and road maintenance from road users.
- The Government will move towards a taxation system for road users which ensures that users pay for the costs of transport operations and maintenance.
- To protect public interest, the Government will regulate tariffs for passenger and goods both in road and rail transport.

5) Subsidies for transport services

- The Government will require transparent and fair assessment and appraisal methods to be developed and applied in the allocation of public funds for social and economic reasons.
- The private sector may bid to provide those transport services which need a subsidy from Government so long as it competes openly and transparently, and that the cost of the subsidy is outweighed by economic or social benefits to the country.
- Public and private sector operators seeking subsidies will be expected to participate under the same conditions.

6) Create public awareness for the policy

- The Government will keep the public aware regarding the aims and objectives of the policy.
- Awareness will be created that the policy is being formulated to assist transport users and the whole of the society.
- A sense of responsibility regarding safety and the environment will be created among transport users.
- To implement the above policy Government will use a variety of media and techniques, ranging from seminars, conferences to mass media publicity.

7) Encourage proper utilisation of transport resources

- Use of appropriate economic tools will be made to encourage proper utilization of resources. These will apply to transport operations, the management and construction of infrastructure and transport.
- In rural areas, labor based contracting has proved very successful and will continue, as a means of assisting the rural poor.
- The Government will also continue to foster the national contracting industry with a view to decreasing dependence on overseas contractors.
- Proper employment standards will be encouraged throughout the transport industry in accordance with the International Labor Organization (ILO) core labor standards of employment.

8) Integrate with Inland Water Transport Policy

- Where tariff levels for passenger and freight are regulated, these will be reviewed across all modes of transport to ensure that costs to users are at a minimum consistent with other policy objectives.
- The Government will take steps to ensure that investment decisions across all modes of transport are subject to the same financial and economic criteria.
- Physical integration between water, road, and rail modes will be encouraged where there are benefits to users, costs reductions or environmental improvements.
- Financing systems for modal integration will be considered by Government so that schemes are not held back by the unwillingness of individual sectors to pay. The Government will establish a mechanism for aiding multi-modal schemes, and will publish advice on criteria for funding as early as possible.
- Services and infrastructure in the water sector will be studied so that an analysis can be made of potential opportunities for integration, and competition where appropriate. Investment decisions in the road and rail sector should take account of the inland water transport strategy, and vice versa.

9) Improve accessibility to transport and services in rural areas

- Paved connections between all the economic growth centers and the country's road network will be provided. The program of small bridge and culvert construction on the rural road network will be extended.
- Concurrent with the development of the road network, it will be necessary to foster a higher level of rural mobility and access to basic transport facilities. In the medium-term future many of these may continue to be non-motorized. A high diversity of vehicles and technologies will be encouraged through removing inappropriate regulations. Transport and rural development policies will be more closely linked so as to improve economic conditions through improved local markets, labor-based contracting on roads, transport hire facilities, and access to credit.
- Improved human skills will be encouraged in machine maintenance, driving, business enterprise, and animal welfare. Government will work with NGOs to achieve this.
- Needs of non-motorized transport will be considered in rural road design, including vehicle segregation and low gradient bridges.

10) Integrate transport policy, planning and appraisal across transport modes

- A Transport Co-ordination Wing will be created in the Planning Commission for the co-ordination of activities among the Ministries of Communications, Shipping, Civil Aviation and Tourism, and the Local Government Division which are involved in the transport sector of the country.

- Scheme appraisal capabilities will be strengthened in those service departments which have a responsibility for transport.
- The Government will treat long-term planning of transport as a priority. The Government's vision for transport needs to be translated into a long-term Multimodal Transport Strategy.

Based on these strategic policies, development policies for roads, road traffic, Non-Motorized Transport (NMT), railways, and traffic in Dhaka are provided as follows:

(2) Roads

With the vision of "developing and properly maintaining a Road Network which is able to fulfil the socio-economic needs of the country and is safe to use for all kinds of vehicles," the NLTP defines the roles of the implementing agencies (RHD and LGED) for road maintenance and makes the following recommendations.

- To introduce long-term network planning
- To maintain the road network at a level that protects the value of the investment
- To secure a sustainable means of funding road maintenance
- To improve the management of traffic
- To manage roadside activities
- To develop an integrated planning approach for road construction
- To promote private sector participation in infrastructure, services, and maintenance
- To protect the natural environment in road construction projects
- To construct bridges with appropriate design standards, toll collection, and navigational clearance
- To foster the contracting industry
- To foster international linkages
- To improve RHD's institutional capability

(3) Road Transport and Traffic

- To regulate vehicle weights
- To reduce pollution from vehicles
- To improve road safety
- To improve driving standards
- To improve the standard of bus services
- To ensure efficient operation in the freight industry
- To encourage better interchange facilities
- To develop parking policies
- To foster taxi industry
- To increase private sector participation
- To ensure the continued role of BRTC in setting good vehicle operating practices
- To modernize and strengthen BRTA's institutional capability

(4) Non-Motorized Transport (NMT)

- To foster safer non-motorized vehicle operations
- To create a better environment for pedestrian

(5) Railways

- To encourage greater private sector participation in the provision of services
- To enhance the operational capacity of railways
- To obtain a greater share of the freight market
- To manage the railway's assets in more efficient way
- To improve financial efficiency
- To provide more effective services for social needs
- To foster international railway rinkage
- To reduce involvement in non-rail activities
- To improve railway safety
- To improve institutional capability of Bangladesh Railway (BR)

(6) Transport in Dhaka

- To formulate and implement a medium- to long-term plan to improve public transportation, reduce traffic congestion, and improve the environment in Dhaka.
- To implement phasing out of restrictions on rickshaws on main roads
- To shift from the use of private cars to the use of public transportation
- To restrict inflow of trucks and secure cargo handling areas
- To establish a commuter rail line through Dhaka and development planning of an intra-city public transportation network
- To develop a traffic management plan that contributes to pedestrian traffic safety and introducing an advanced traffic control system
- To strengthen the capacity of the Dhaka Transport Coordination Board (DTCB), the predecessor of DTCA

3.1.4 National Integrated Multimodal Transport Policy

The National Integrated Multimodal Transport Policy (NIMTP) was developed by Ministry of Communications (current MoRTB) in 2013 as a policy that aims to organically link various modes of transport, such as rail and inland water transport, rather than relying only on road transport to ensure a long-term sustainable and environmentally friendly system.

In this context, the following development policies have been identified for the road transport sector:

- Strengthen the road maintenance system;
- Introduce reasonable user fees to provide road users with quality road transport;

- Improve traffic management and maximize the use of existing roads;
- Promote traffic capacity improvement measures to reduce traffic congestion on the road network;
- Appropriate planning and implementation of environmental mitigation measures in the implementation of road construction projects;
- Empower relevant agencies and ensure transparency in their activities;
- Prioritize the allocation of human resources to the Bangladesh Road Transport Authority (BRTA) and other relevant agencies;
- Promote private sector participation in road projects;
- Establish axle weigh stations, strictly control axle regulations, and ensure transparency in their operation;
- Promote an awareness of road safety among road users; and
- Introduce modern technology into the transportation system.

The NIMTP also addresses the need for road safety that prioritizes pedestrians, road development that takes into account Non-Motorized Transport (NMT), and appropriate traffic control (e.g., prohibiting NMT vehicles from entering arterial roads).

3.1.5 Road Master Plan (2009)

The RHD's Road Master Plan is a long-term road development plan covering National Highways, Regional Highways and Zilla roads, and was formulated in 2009. Improving poor accessibility to rural areas due to inadequate road and bridge construction was identified as the most critical issue, and improvement of existing roads was placed as the highest priority program in order of road hierarchy. In addition, measures to improve traffic safety and axle-load control are also mentioned.

Many of the priority road improvement projects recommended in the Master Plan have already been completed, are under construction, or are being prepared for construction, but large-scale projects requiring vast area of the right of way and the associated resettlement have not yet been implemented.

RHD is currently conducting a study to revise the road master plan with the support of ADB. The revised master plan is expected to be prepared in around March 2023. However, it is delayed and the completion date has not been determined yet.

The RHD's Road Master Plan is a long-term plan for road development in Bangladesh based on the aforementioned NIMTP's recommendations, and is a road development and maintenance plan with a target year of 2029. The master plan summarizes the challenges, objectives and key component of the plan as shown in Table 3.1.2.

At the time of the plan's formulation, the top issue recognized was the poor accessibility to rural areas due to the lack of road and bridge development, and the first priority was to improve existing roads in the order of road hierarchy. In addition, recommendation was also made of soft measures such as improving road traffic safety and axle load control.

Table 3.1.2 Challenges, Objectives and Key Components of Road Master Plan (2009)

Challenges	Objectives	Key Components
• Roads and bridges are continuously damaged from a lack of adequate maintenance and vehicle overloading. • Continuing traffic growth that will exceed the capacity of many National Highways in the next 20 years. • A mix of motorized and non-motorized traffic and encroachment onto roads, leading to high accident rates. • The country's rural centers are not fully connected with the main road network. • The large number of rivers that are still crossed by ferries hampers smooth movement of traffic.	• Protect the value of RHD's road and bridge assets. • Improve the connectivity of the road network. • Enhance and develop the strategic road network to meet economic and traffic growth targets. • Improve the Zila Road network to enhance connectivity to the county's growth centers. • Improve road safety and reduce road accidents. • Provide environmental and social protection. • Outline the institutional improvements required for RHD to deliver the above.	• Identification of the need for improvement of existing roads and implementation of improvement projects in planned manner. • Early implementation of improvement of National Highways, Regional Highways and Zilla Roads. • Program road and bridge improvement projects in accordance with the future traffic demand. • Phased implementation of bridge reconstruction and rehabilitation. • Enforcement of axle load control.

Source: RHD. 2009. Road Master Plan

Table 3.1.3 Road Sector Policy

Subject	Government Policy
• Integrated planning should be improved	• Development of the strategic road corridors will be planned in coordination with the development of the railway and inland waterway networks to ensure that the most appropriate mode is used for the movement of people and goods.
• Insufficient attention has been paid in the past to road maintenance. • Road maintenance must be given a higher priority, and enough resources allocated. • Road maintenance must be performed in a transparent and accountable way.	• Government to establish a "Road Maintenance Initiative" to direct development partners to focus their assistance on a single program for road maintenance and rehabilitation. • Government to create a High-Level Committee (headed by Minister) to oversee Road Maintenance Initiative, to ensure that targets are being met and adequate resources are provided. • Government will create Road Fund and autonomous Board to manage it. • Board may create a Technical Advisory Committee on the Road maintenance Initiative, comprising all stakeholders, including government, transport industry, road users, industry and commerce, agricultural sector, and construction industry. Technical Advisory Committee to ensure that initiatives are taken to improve road maintenance quality and to meet the agreed standards.
• There are no agreed standards and targets for the condition of the road network. • By setting targets the Government can expect road agencies to improve performance.	• Road network to be maintained to a set of agreed standards. Government will set standards for the quality of the road network and ensure that resources are made available to road agencies for targets to be met.
• Routine maintenance is not done properly in Bangladesh. It must have a higher priority.	• All roads under RHD to be placed under routine maintenance contracts. • Contractors will be asked to tender for 3-year contracts to provide all routine maintenance activities; vegetation control, culvert cleaning, slope protection, pothole filling and crack repairing, signage, lines etc. • Pilot schemes will be used to develop the most appropriate form of contract. • RHD to set performance standards for these contracts.
• Overloaded trucks and buses cause excessive damage to roads and cost the country around BDT 3 billion per year in additional maintenance needs. Axle loads need to be controlled.	• The Government will confer powers on, and allocate resources to road agencies to set and enforce limits on the weights of vehicles so as to protect the road network from damage caused by overloading. • Government to consult stakeholders on the issue of axle-load control in order to ensure understanding and compliance, before measures are introduced. • RHD to install 18 weight bridges across the country (First Phase) • Government to ban import of 2-axle trucks with an unladen weight of more than 5 tons from 1 January 2008, and encourage use of multi-axle trucks. Regulations to be enforced to ensure that vehicles are not physically modified from the registered specifications.
• Road building can damage the environment and cause social problems.	• Government to ensure that measures are introduced and adhered to that protect the physical and social environment from adverse effects of road construction. • Government will finalize and approve RHD's draft "Social Assessment Guidelines" and "Land Acquisition and Resettlement Guidelines". These and the already approved "Environmental Impact Assessment Guidelines" shall be followed for all road network. • Government shall develop a revised set of standard contract documents for maintenance and construction works that include environment and social protection clauses, and promotion of employment opportunities for local people.
• More than 20% of the Zila Road network is in a very poor condition due to a history of poor maintenance.	• The Zila Road network will be rehabilitated over the next ten years in order to achieve a minimum accessibility level on all Zila Roads. • Minimum accessibility levels will be defined in the Road Master Plan.

Source: RHD. 2009. Road Master Plan

Table 3.1.4 Road Sector Policy (Continuation)

Subject	Government Policy
• Road classification does not fully meet the hierarchy required to assist economic development	• The road hierarchy will be reviewed and roads re-classified where necessary to meet economic objectives. • Within the hierarchy, road functions will be determined to ensure that traffic is managed to improve safety and efficiency of travel.
• Design standards and quality can be improved to enhance safety and get better value for money.	• Design standards will be updated to meet international norms. • The quality of road infrastructure will be improved to higher standards.
• Road safety is a priority and needs to be improved	• On National Highways strict safety measures will be enforced to protect vulnerable road users from fast moving traffic. • Encroachment of roadside activities onto the main carriageway will be prevented, also to protect vulnerable road users in these locations. • Local committees will be involved in implementing necessary measures. • An integrated approach to road safety will be introduced with agencies and measures coordinated across areas of education, awareness, enforcement and physical improvements.
• Many level crossings are unsafe, and increased traffic will exacerbate this.	• Grade separation will be introduced where train frequencies and traffic levels warrant. • Unprotected road/rail crossings will be placed in a program for safety enhancement through manned gates. • RHD will coordinate with Bangladesh Railway on these issues.
• Bridges are an important asset for the road network. Their conditions must be improved and maintained.	• Bridges in poor condition (category “D”) will all be replaced or undergo major works to ensure safety and access over the next 10 years. • All Portable Steel Bridges (PSBs) will be replaced by permanent structures over the next 20 years. • Regular bridge maintenance will be introduced and enhanced. • All narrow bridges (less than 7.3 m) on national Roads will be replaced over the next 20 years by bridges having at least 7.3 m carriageway. • The Government will ask RHD to commission an independent study of the condition of all its bridges, by specialist consultants.
• Flooding undermines the investment in roads, and road building needs to take better account of flooding.	• The Government will take necessary steps to protect its investment in the strategic road network from the adverse effects of flooding. • All construction and rehabilitation work of National Highways will ensure that the road crest is at least 1 m above the highest flood level of 50 years. • For all other roads, the freeboard will be determined from time to time by the concerned agencies. • All new road construction and rehabilitation works will be subject to a full hydrological and morphological study.
• The proposed Padma Bridge is urgently needed to unlock the development potential of the south-west of the country.	• Feasibility studies have been undertaken and the Government is fully committed to the construction of the proposed Padma Bridge.
• More use should be made of Bangladesh’s geographical position to encourage trade	• The Government will seek to make bilateral transport agreements with neighboring countries to avoid trans-shipment, and reduce transport costs. • In order to facilitate sub-regional movement, the Government will encourage SAARC to adopt a Sub Regional Transport Facilitation Agreement (ATFA). • The Government will explore investment in additional and enhanced international infrastructure connections where there are clear economic benefits to Bangladesh. • The Government will ratify the Asian Highway Network Agreement. • The Government will Gazette the relevant part of the road network to be part of the Asian Highway. These roads will be upgraded to appropriate standards to accommodate the growth in traffic from international transit.

Source: RHD. 2009. Road Master Plan

The total cost of the investment program was estimated to be BDT 667.68 billion over 20 years. The expected sources for the programs and projects are funded by Road Fund (41%), private sector (14%), development partners (16%) and Government of Bangladesh (29%). The following are the major components of the action plans under the Master Plan:

- Overloading of trucks and buses causes excessive damage to pavements particularly on national and regional highways and thus, axle load control was urgently needed in Bangladesh. The Master Plan proposed installation of 27 weighbridges across the country.
- Lack of road safety on Bangladesh's road network was also emphasized in the Master Plan. Although in total 328 km-long sections on National Highways had been identified as having accident black spots on them, the lack of enforcement of existing laws was the critical issue. In order to cope with such situation, the Master Plan proposed to establish under law of an autonomous National Road Safety Agency.
- The Master Plan also made some suggestions onto the design standards for roads and bridges in order to meet the requirement of the Asian Highway standards.
- Depending on the type of encroachment and other constraints, the Master Plan proposed certain possible solutions as shown in the table below. Based on the basic concept, 15 bypass road projects were proposed.

Table 3.1.5 Types of Encroachments and Possible Solutions

Encroachments	Possible Solutions
Major haats and bazaars are located along the highway and sufficient vacant land is not available on the roadside within the RHD's right of way (ROW) for widening and straightening of the carriageway, or for creating service lanes for buses, trucks, NMTs, as well as for providing bus-bays/ stops, and for temporary parking of vehicles.	Provide separate bypass road with special design criteria, together with service lanes and well-planned intersections.
Sizeable encroachment exists on the highway, but land within the ROW can be restored through eviction of encroachments to provide service lanes for buses, trucks and NMTs or if enough land is not available within the ROW, additional land required can be procured with less hassle, through easy resettlement of original owners.	Provide service lanes for buses, trucks and NMTs, and also bays for loading/ unloading together with foot over bridge(s) and iron fencing barriers on both sides of the road prohibiting all entry into the main carriageways around bazaar area with requisite road furniture.
Railway crosses the national highway at the market place, and there is densely built-up area and homestead just outside the ROW (may be on the private land) and spread over wide area on both sides of the road in such a way that land for future road expansion becomes expensive.	Provide over bridges for through traffic, and separate lanes for NMTs, and bus stops at the ground level, with requisite road furniture and delineators.
There are certain inter-sections on the national highways, which are unable to cope with the present level of traffic. These should therefore be designed properly.	Need to improve designs of intersections, roundabouts and islands at critical road crossings, and wherever possible use traffic signals or other traffic management techniques.

Source: RHD. 2009. Road Master Plan

The Master Plan identifies the following projects as priority projects, which are primarily improvement of National Highways, Regional Highways, and Zilla roads. Some of the proposed projects have been completed or are in the implementation stage.

Table 3.1.6 Master Plan Priority Projects

No.	Project Name	Project Type	Project Implementation Status	
1	N1 (Dhaka – Chattogram)	Widening to 4-lane	Completed	
2	N3 (Dhaka – Mymensingh)	Widening to 4-lane	Completed	
3	N102 (Mynamati – Brahmanbaria)	Road Improvement	Partially completed	Bridges were reconstructed under JICA Loan (EBBIP) but road sections are not improved yet
4	R260 (Sylhet – Sunamganj)	Road Improvement	Partially completed	Ditto
5	Dhaka Eastern Bypass	New Construction	Not implemented	Under consideration as Dhaka Outer Ring Road in Japan – Bangladesh PPP Platform
6	Dhaka Western Bypass	New Construction	Ongoing	Under construction as a PPP project
7	Dhaka Outer Ring Road	New Construction	Not implemented	Different with No. 5
8	R750/Z5703 (Bhatiapara – Narial – Jessore)	Road Improvement	Partially completed	Bridges were constructed under JICA Loan (Cross Border Road Project) but road sections are not improved yet
9	Deep Sea Port to N1	New Construction	Ongoing	JICA Loan (Matarbari Port Development Project)
10	N1 (Chakaria-Chittagong)	Widening to 4-lane	Not implemented	Under consideration in Japan – Bangladesh PPP Platform
11	N8 (Dhaka-Mawa)	Widening to 4-lane	Completed	GOB Fund
12	N4 (Dhaka-Tangail)	Widening to 4-lane	Completed	ADB (SASEC-I)
13	N6 (Baneshwar-Belephur)	Widening to 4-lane	Not implemented	
14	N5 (Dhaka-Baniajuri)	Widening to 4-lane	Not implemented	Under consideration in Japan – Bangladesh PPP Platform
15	N2 (Bhairab-Moulvibazar)	Widening to 4-lane	Ongoing	ADB (Dhaka – Sylhet)
16	N2 (Dhaka-Bhariab)	Widening to 4-lane	Ongoing	Ditto
17	N2 (Habiganj-Sylhet)	Widening to 4-lane	Ongoing	Ditto
18	N8 (Jessore-Benapole)	Widening to 4-lane	Not implemented	India LOC (planned)
19	Chittagong Bypass	New Construction	Partially completed	
20	N1-Hatazari Link Road	New Construction	Not implemented	
21	N1 (2nd Meghna Bridge)	Bridge Widening	Completed	JICA Loan
22	N1 (2nd Meghna Gumti Bridge)	Bridge Widening	Completed	JICA Loan
23	N8 Padma Bridge	New Construction	Completed	GOB Fund

Source: RHD. 2009. Road Master Plan

As of March 2023, RHD, with the support of the ADB, is conducting a study to revise the road master plan and is in the process of developing a plan with a target year of 2041 in line with Vision 2041. The preparation of the draft revised master plan has been delayed and the completion date has not been determined yet. After the draft revised master plan is completed, it will be reviewed within RHD and approved as a formal master plan after approval by the MoRTB, according to the RHD.

3.1.6 Bridge Master Plan

Until now, BBA projects have been allocated individually through government initiatives, but comprehensive development plans such as master plans have not been formulated. Recognizing the need

to formulate a comprehensive development plan and implement projects systematically and steadily to meet development demands in the transportation sector toward the "Vision 2041" goal of "becoming a developed country by 2041," BBA is currently conducting a study to formulate its own bridge master plan for the next 30 years (2020-2050) with financial assistance from ADB (To be completed in November 2024)[1].

Considering that Bangladesh is a riverine country where the national land and road network is disconnected by various large and small rivers, and the low connectivity among regions is a critical issue on regional economic growth, the bridge master plan will be developed based on a comprehensive study and analysis of future transportation needs, taking into account the scenario of Bangladesh becoming a developed country by 2041. In order to identify not only sustainable modes of transportation within major cities, but also the missing links needed to develop a national transportation network, the following items are being considered in the master plan study.

- Guide the future development of the country's transportation network by ensuring that projects and higher-level plans are planned and operated in a coordinated manner.
- Improve connectivity between regions, such as industrial production areas and major cities, to promote regional economic activity and the convenience of the existing transportation system.
- Prioritize needed projects, calculate the scale of project costs, and identify financing options.
- Conduct pre-feasibility studies for high priority projects to be implemented within the next 10 years.
- Identify technical specifications required for bridges and roads in Bangladesh.
- Review the organizational structure of BBA and improve the technical capacity of BBA for transportation planning, etc. through technical training.
- Establish a sound policy framework to ensure sustainability of BBA's operations.

3.1.7 Strategic Transport Plan for Dhaka

In 2005, the Dhaka Transport Coordination Authority (DTCA), in cooperation with the World Bank, formulated the Strategic Transport Plan (STP) for the Dhaka Metropolitan Area. The STP developed an urban transport policy for the 20 years to 2024, and proposed the establishment of an organizational structure for project implementation and maintenance, a proposed urban public transport system network of 3 BRT and 3 MRT lines for a total of 110 km, and the development of a total of 330 km of urban expressways as priority projects.

In 2014, with the cooperation of JICA, the transportation-related studies were conducted and updated into the Revised Strategic Transport Plan for Dhaka (RSTP), and priority projects were selected and preliminary studies were conducted for materializing the project implementation. RSTP was approved by the Government of Bangladesh in August 2016.

[1] Feasibility study for Construction of Bridges over the river Meghna on Shariatpur-Chandpur road & Gazaria-Munshigonj road and preparation of Master Plan for Bangladesh Bridge Authority

RSTP aims to ensure that the living environment in the Dhaka metropolitan area remains good in the future, and to increase the competitiveness and attractiveness of the industrial sector and to lead international trade throughout Bangladesh. Under the vision of "ensure mobility and accessibility to urban services that are vital for the people and the society, by providing a transport system characterized by safety, amenity, and equity and sustained by an efficient public transport system," the following development strategies were presented, with the indicator of maintaining a public transportation share of at least 60%.

- Strengthen public transportation: develop a sustainable public transportation system using the current high share of public transportation trips.
- Improve Dhaka's competitiveness: develop an efficient transportation system that serves as a regional economic hub.
- Creating a well-managed, environmentally friendly city: building a world-class city that harmonizes transportation and living environments through the introduction of new operational management technologies.
- Adopt immediate congestion reduction measures: Implement low-cost congestion reduction measures that take effect quickly.

To achieve the above development strategies, RSTP recommended the following objectives.

- 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 Transport Demand Management (TDM)
- Comprehensive Development of Transport Space and Environment
- Enhancement of Traffic Safety
- Strengthening of Transport Sector Administrative and Management Capacities

RSTP proposes a development concept that considers the current Central Business District (CBD), including Motijheel, Panthapath, and Gulshan, as the center of development, while at the same time aiming for a hierarchical, multi-pole, decentralized core city (sub-centers) with high density and mixed land use in each sub-center, and with each sub-center connected to the others by mass transit. The proposed development concept is a Transit Oriented Development (TOD), which aims to realize high-density and mixed-use land use in each subcenter, and to connect the subcenters by mass transit.

For the road development plan, the following policies are recommended to realize the development concept.

- Separate intra-urban traffic from inter-urban traffic to prevent large vehicles, which cause traffic congestion, from entering the city, while at the same time enabling efficient inter-urban traffic flow.

- By establishing a clear radial and circular road system, provide road users with easy-to-understand directions and promote effective network development.
- In the development and management of roads and road space, consider the non-traffic functions of roads, such as space for residents' daily lives and urban activities along roads, landscaping, and urban design.
- Minimize negative social impacts associated with resettlement, reduce the cost of land acquisition for road improvement, and promote more effective land use and urban development by establishing effective development mechanisms for above-ground roads, such as zoning methods.

Based on these policies, the road network consists of a combination of radial and ring roads were proposed. Each of the radial roads are connected to the main roads between the suburban cities and will connect to the ring roads. With this road network, the intercity traffic will be separated from the urban traffic. RSTP proposes the following functional road classifications.

- 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.
- 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.
- 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.

In addition to these, RSTP emphasize the importance of traffic engineering (Engineering), traffic enforcement (Enforcement), and traffic safety education (Education), known as the 3Es, for the efficient use of existing traffic infrastructure as an important short-term component of the Master Plan. The following are some of the key points of the project.

- Road improvement projects: pavement repair, drainage improvement, introduction of median strip and street lighting, etc.

- Intersection improvements: improvement of intersection geometry, introduction of traffic signals and signal control, introduction of left-turn lanes, grade-separation of intersections, etc.
- Traffic control: introduction of roadside parking bans, truck entry bans, one-way street systems, improvement of traffic signs and markings, improvement of public transportation facilities and pedestrian environment, etc.

Table 3.1.7 shows the proposed priority road projects under RSTP. All of the projects are large-scale and thus most of the projects have not implemented yet.

Table 3.1.7 Priority Projects under RSTP

No.	Project Name	Project Type	Project Implementation Status	
1	Dhaka Elevated Expressway	New Construction	Ongoing	Construction work is in progress under the PPP scheme.
2	Dhaka – Ashulia Elevated Expressway	New Construction	Ongoing	Construction work is in progress under the PPP scheme.
3	Chaka – Chattogram Expressway	New Construction	Not implemented	Detailed design was completed under ADB's technical assistance. Due to easing of traffic congestion of N1 after widening of Meghna 3 bridges, the implementation of this project was suspended.
4	Dhaka – Sylhet Expressway	New Construction	Not implemented	
5	Dhaka – Mawa Expressway	New Construction	Completed	In 2020
6	Dhaka – Mymensingh Expressway	New Construction	Not implemented	Under consideration in Korea – Bangladesh PPP Platform.
7	Dhaka Inner Ring Road	New Construction	Not implemented	RHD conducted F/S in 2018.
8	Dhaka Middle Ring Road East Section (N1: Madanpur - N3: Gazipur)	New Construction	Ongoing	Construction work is in progress under the PPP scheme as Dhaka Bypass Project (commenced in 2021 and to be completed by 2024).
9	Dhaka Middle Ring Road West Section (N1: Madanpur - N3: Gazipur)	New Construction	Not implemented	Under consideration in Japan – Bangladesh PPP Platform as Dhaka Outer Ring Road Project.
10	Dhaka Outer Ring Road	New Construction	Not implemented	
11	R504 (Hemayetpur – Manikganj)	Widening to 4-lane	Not implemented	Tender will be announced soon as a PPP project (Gabtoli - Nabinagar PPP Road)
12	Jahangir Gate Underpass	Intersection Grade-separation	Not implemented	BBA conducted F/S in 2013.

Source: JICA. 2016. The Project on the Revision and Updating of the Strategic Transport Plan for Dhaka (RSTP)

DTCA is currently in the process of revising the RSTP with the cooperation of the ADB (To be completed in November 2024).

3.1.8 Detailed Area Plan for Chattogram

The Detailed Area Plan for Chattogram is a comprehensive development plan that includes land use plans for each of the 12 planning zones, a flood control plan with a target year of 2015, a transportation

plan, a plan for public services such as water, sewerage, and electricity, and an environmental conservation plan. It was formulated by the Chattogram Development Authority (CDA) in 2008.

Based on the population size of Chattogram (the population of the study area was about 2 million as of the 2001 census) and the uniqueness of having an international port, Chattogram Port, the following road development policies are recommended.

- Traffic distribution through the development of a two-layered ring roads
- Development of a grid-like arterial road network
- Functional classification of roads and application of design standards accordingly
- Traffic facilitation through the establishment of secondary roads (service roads) on trunk roads
- Securing space for utility facilities within the road right-of-way
- Removal of NMTs such as rickshaws from arterial roads
- Realignment of bus routes
- Improvement of major intersections
- Improvement of pedestrian space within the city center
- Securing parking space
- Reinforcement of traffic control

The highest priority project under the road transportation planning is the construction of ring roads, with the following proposed route locations:

- Inner Ring Road: New riverside road from Shah Amanat Bridge (3rd Karnaphuli Bridge) through National Highway No.1 (N1) to Barik Building circle and along the Karnaphuli River.
- Outer Ring Road: New bypass road from Salimpur on N1 to Kalurghat Bridge over the Karnaphuli River, and a new riverside road along the Karnaphuli River.

Other priority projects proposed under the Detailed Area Plan are the coastal road under construction under the JICA-financed Chittagong Ring Road Project and the construction of feeder roads connecting existing trunk roads with the above-mentioned ring roads and coastal road. The progresses of the projects are shown in Table 3.1.8.

Table 3.1.8 Priority Projects under Detailed Area Plan for Chattogram

No.	Project Name	Project Type	Project Implementation Status	
1	Inner Ring Road (CDA Avenue - 3rd Karnaphuli Bridge)	New Construction	Completed	Elevated Expressway was constructed
2	Outer Ring Road (N1 – 4th Karnaphuli Bridge)	New Construction	Partially completed	GOB Fund
3	Outer Ring Road (Right Bank of Karnaphuli River)	New Construction	Ongoing	GOB Fund
4	Coastal Road (Mouth of Karnaphuli River - N1)	New Construction	Ongoing	JICA Loan
5	Feeder Roads to Coastal Road	New Construction	Not implemented	
6	Feeder Roads to Ring Roads	New Construction	Not implemented	
7	N1 – N106 Connector Road (Hatazari)	New Construction	Not implemented	
8	N107 Karnaphuli Bridge	New Construction	Not implemented	

Source: CDA. 2008. Detailed Area Plan for Chittagong Metropolitan Master Plan

CDA is the implementing agency for road and bridge improvement projects within the scope of the Detailed Area Plan, except for roads under the jurisdiction of RHD.

Among the road projects proposed in the Detailed Area Plan, projects that have not yet been implemented are those for which it is difficult to secure land (ROW) for the road or for which CDA is not the implementing agency. For example, the N107 Karnaphuli Bridge, for which the RHD will be the implementing agency, has not been implemented due to its low priority among the projects to be implemented by RHD.

CDA is currently planning to conduct a study to revise and update the Detailed Area Plan. In addition to the existing development policies, it is expected to include new plans for the construction of the Bay Terminal and the development of undeveloped sites on the left bank of Karnaphuli River, as well as a revised transportation transportation plan based on the current traffic situation.

3.2 Road and Bridge Development Plans in Neighboring Countries

3.2.1 Road and Bridge Development Plans in India

(1) National Highways Development Project

The National Highways Development Project (NHDP) was launched in 1998 and is a seven-phase development plan to build a high-standard road network connecting major cities in India by improving existing roads and constructing new roads.

Phase I includes the construction of a golden quadrilateral network connecting Delhi, Mumbai, Kolkata, and Chennai with 4-lane roads. Phase II includes the construction of north-south and east-west corridors. And subsequent phases include further widening from 4 lanes to 6 lanes.

- Phase I: 4 lanes of the “Golden Quadrilateral (GQ)” (total length of 5,846 km) connecting the 4 major cities of Delhi, Mumbai, Chennai, and Kolkata. The total project cost was estimated in INR 300 billion (USD 6.8 billion), financed mainly by government special petroleum product tax revenues and government borrowings.
- Phase II: North-South and East-West corridors consisting of national highways connecting the four extreme points of the country. The North-South Corridor linking Srinagar in the north with Kanyakumari in the south, and the East-West Corridor linking Porbandar in the west with Silchar in the east. The total length of the network is 7,142 km.
- Phase III: Improvement of 12,109 km of national roads under the Build-Operate-Transfer (BOT) basis. High-density traffic, connectivity of state capitals, and connectivity to important economic centers are taken into consideration.
- Phase IV: Widening of 20,000 km of arterial roads not included in Phases I, II, and III. Upgrading of existing 2-lane arterial roads to 4-lane roads with paved shoulders.
- Phase V: Converting approximately 5,000 km of 4-lane roadways to 6-lane.

- Phase VI: Construction of approximately 1,000 km of expressways connecting major commercial and industrial townships. This includes the Vadodara (formerly Baroda) to Mumbai (about 400 km long), Chennai to Bangalore (about 334 km long), and Kolkata to Dhanbad (about 277 km long).
- Phase VII: Improvement of connectivity with national highways to major cities by constructing ring roads. This includes the construction of flyovers, bypasses, and the Chennai Port - Maduravoyal Elevated Expressway (approximately 19 km long).

The project was finished in 2018 and incorporated into the Bharatmala Pariyojana.

(2) Bharatmala Pariyojana

Bharatmala Pariyojana was developed in 2015 as a master plan to develop road connectivity to border areas, coastal roads including road connections to non-major ports, improve efficiency of national corridors, economic corridors, inter-corridors, feeder routes in integration with the Sagarmala Plan (Port-led logistic development Plan).

The total length of the planned economic corridors is about 26,000 km and includes the Golden Quadrilateral (GQ) and the North-South and East-West (NS-EW) corridors. In addition, approximately 8,000 km of inter-corridors and 7,500 km of feeder routes are planned to enhance the effectiveness of the economic corridors.

The construction of ring roads, bypasses, and elevated roads was planned to improve logistics efficiency by reducing traffic congestion in urban areas and creating a smooth traffic environment for through traffic. 28 cities have been identified as targets for the construction of ring roads, with 125 bottlenecks and 66 congestion points to be improved. In addition, 35 potential sites were identified for the development of logistics parks.

The budget to implement the plan includes cess collected from gasoline and diesel, road tolls, additional government funding, as well as private sector investment.

The first phase of Bharatmala Pariyojana includes the projects shown in Table 3.2.1.

Table 3.2.1 Development Target of Bharatmala

No.	Project Type	Total Road Length (km)	Phase I (km)
1	Economic Corridors	26,160	9,000
2	Inter-Corridors & feeder roads	15,400	6,000
3	National Corridor Efficiency improvement	13,049	5,000
4	Border & International connectivity roads	5,198	2,000
5	Coastal & port connectivity roads	3,298	2,000
6	Expressways	1,837	800
	Total	64,942	24,800

Source: Ministry of Road Transport and Highways, India

Construction of many new roads are planned as essential needs to connect the regions and maintain the smooth traffic flow.

- Development of multi-modal logistics parks and improving the efficiency of existing corridors by eliminating congestion bottlenecks.
- Improvement of connectivity in the northeast, taking into account synergies with inland water transportation
- Adoption of new technologies to improve efficiency in project implementation and asset management
- Delegation of authority to accelerate project implementation - Phase I to be completed by 2022
- Improvement of connectivity in the Northeast

Source: https://commons.wikimedia.org/wiki/File:India_roadway_map.svg

Figure 3.2.1 Road Network in India

(3) Strengthening Connectivity in India's Northeast

The road development in the northeastern region of India (Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Tripura and Mizoram) has delayed compared with other regions in India with a pavement coverage ratio of about 30% (national average: about 70%) and about 50% of 2 lanes or more (national average: about 80%). Many areas lack slope protection and roadside drainage for landslide countermeasures. This delay in road development is one of the bottlenecks for economic development, as it hinders the stable flow of people and logistics within the region and to neighbouring countries.

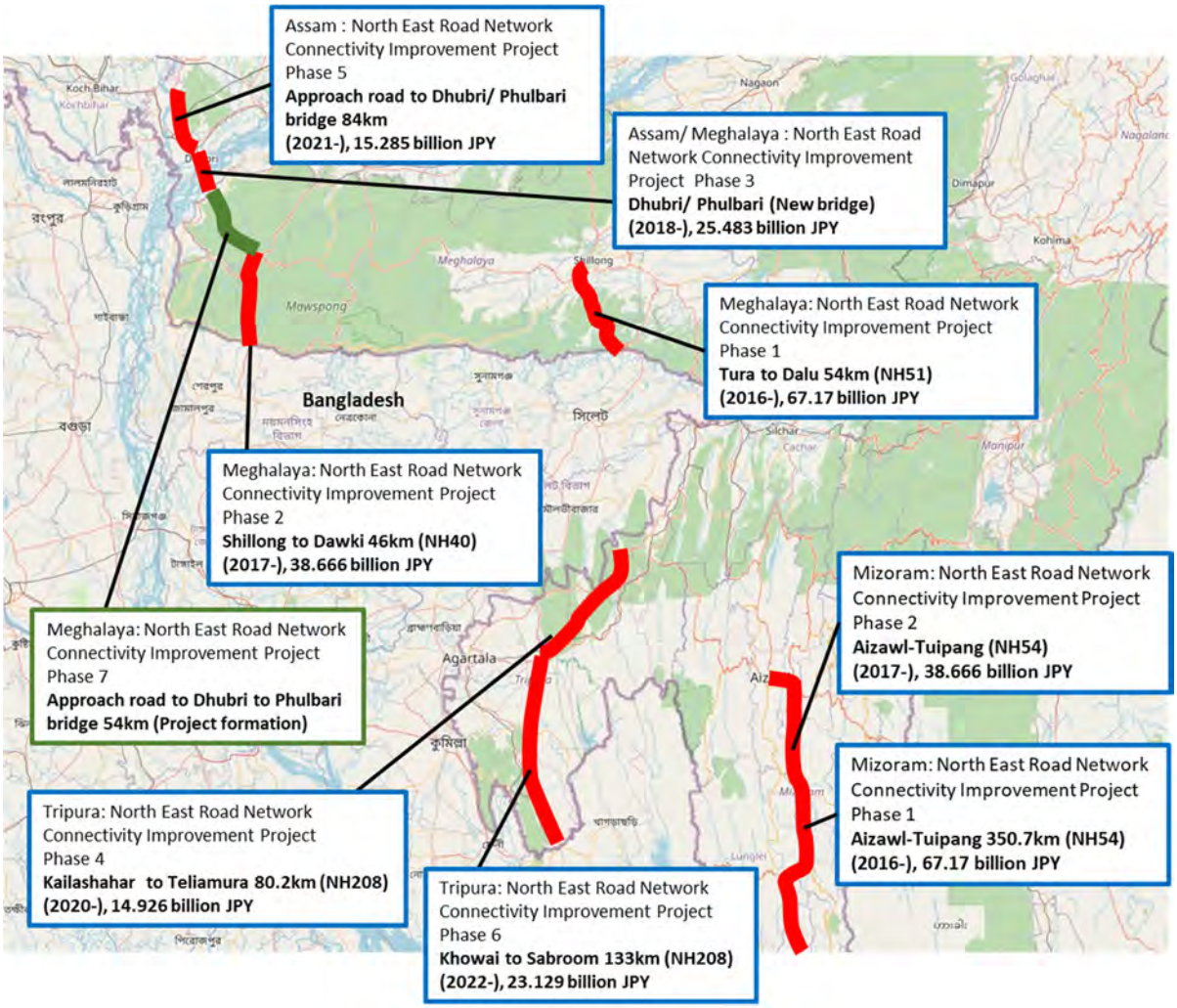
The importance of reducing regional disparities, including infrastructure development in the northeast region, was pointed out in India's 3-year Action Plan (2017) prepared by the National Institution for Transforming India (NITI Aayog). The Government of India established the Ministry of Development of North Eastern Region in 2001 to accelerate the northeast region's development for promoting socioeconomic development and reducing regional disparities. The Government of India has established the Special Accelerated Road Development Program for the North-East (SARDP) to improve road connectivity between major cities in the region.

In the Joint Statement by the leaders of India and Japan in September 2014, the Government of Japan affirmed its cooperation in promoting connectivity and development in the region and linkages between the region and other economic corridors in India and Southeast Asia as a catalyst for economic development and increased prosperity in the Northeast State of India. Following this statement, JICA has been promoting the North East Road Network Connectivity Improvement Project as shown in Table 3.2.2.

Table 3.2.2 Outline of North East Road Network Connectivity Improvement Project

Phase	Road Section	L/A	Amount (million JPY)
1	Mizoram: Road improvement on National Highway 54 (Tura – Dalu) (Total Extension: 350km, 2 lanes) Meghalaya: Road improvement on National Highway 51 (Aizawl – Tuipang) (Extension: 50km, 2 lanes)	2017.03	67,170
2	Meghalaya: Road improvement on National Highway 40 (Shillong – Dawki) (Total Extension: 81km, Widening into 2 or 4 lanes) Mizoram: New Bypass on National Highway 54 (Aizawl – Tuipang) (4 locations, Extension: 24km, 2 lanes)	2018.03	38,666
3	Assam/ Meghalaya: Construction of theDhubri-Phulbari Bridge etc. (Extension: 20km, Including access road, 4 lanes)	2018.10	25,483
4	Tripura: Road improvement on National Highway 208 (Kailashahar – Teliamura (Extension: 80km, 2 lanes) New Bypass and its maintenance in Khowai(Extension: 5km)	2020.03	14,926
5	Assam: Road improvement on National Highway 127B (Srirampur – Dhubri), Road widening into 4 lanes each way and 4 location of New Bypass (Total Extension: 54km)	2021.03	15,285
6	Tripura: Road improvement on National Highway 208 (Khowai – Sabroom), Road widening into 4 lanes each way (Extension: 140km, Including Bridge and Drainage etc.) and 7 location of New Bypass (Total Extension: 22km)	2022.03	23,129
7	Meghalaya: Road improvement on National Highway 127B (Fakirganj -Phulbari – Tura), Road widening into 4 lanes each way (Extension: 94km)	-	-

Source: JICA



Source: JICA Survey Team

Figure 3.2.2 Location Map of North East Road Network Connectivity Improvement Project

3.2.2 Road and Bridge Development Plans in Nepal

The Federal Democratic Republic of Nepal (hereinafter referred to as "Nepal") is a landlocked country, located in between two countries, India and China. It shares its border with China in the north and India in the east, south and west. Geographically, Nepal can be divided almost horizontally into three regions. Mountainous region (the Himalayas) in the north, hilly region in the middle and low land (Terai plains) in the south.

Transportation in Nepal consists of road, air, rail, inland waterway and ropeway. Due to geographical restrictions, road transportation is considered as the primary mode of transportation for passengers and cargo as well as air transport. Air transportation is, however, an important role, its expansion of use is restricted due to steep terrain of the country and inadequate operating and management capacity. Inland waterway and ropeway are minor, and rail network is being considered to expand by Indian and Chinese fund.

Approximately 90% of cargo and passenger transportation is occupied by road transportation, and this is the only mode of transportation in the Kathmandu Valley. In the "National Highway Statistics 2020/21" published in May 2021, Road network, which the road network had been classified into the Strategic Road Network (SRN) and the Local Road Network and SRN consisted of national highway and feeder, was reorganized into 80 National Highways and renamed the National Highway Network (NHN). Total extension of NHN is approximately 14,923km and governed by Department of Roads (DOR). Although NHN is important to ensure mobility in Nepal and with neighboring countries, more than half of the roads are still unpaved. Therefore, road maintenance becomes one of the big issue in Nepal.

As the upper level plans for the transportation sector, there are National Transport Policy, the Strategic Plan of the Ministry of Physical Infrastructure and Transport (MOPIT: Ministry of Infrastructure and Transport) (2016-2020), Sector Wide Road Programme and Priority Investment Plan (PIP), the 15th Five Year Plan (2020-2024) and the SASEC Operation Plan (2016-2025). DOR is currently conducting a study to develop a Master Plan for Road Connectivity, which is expected to be completed in June 2033.

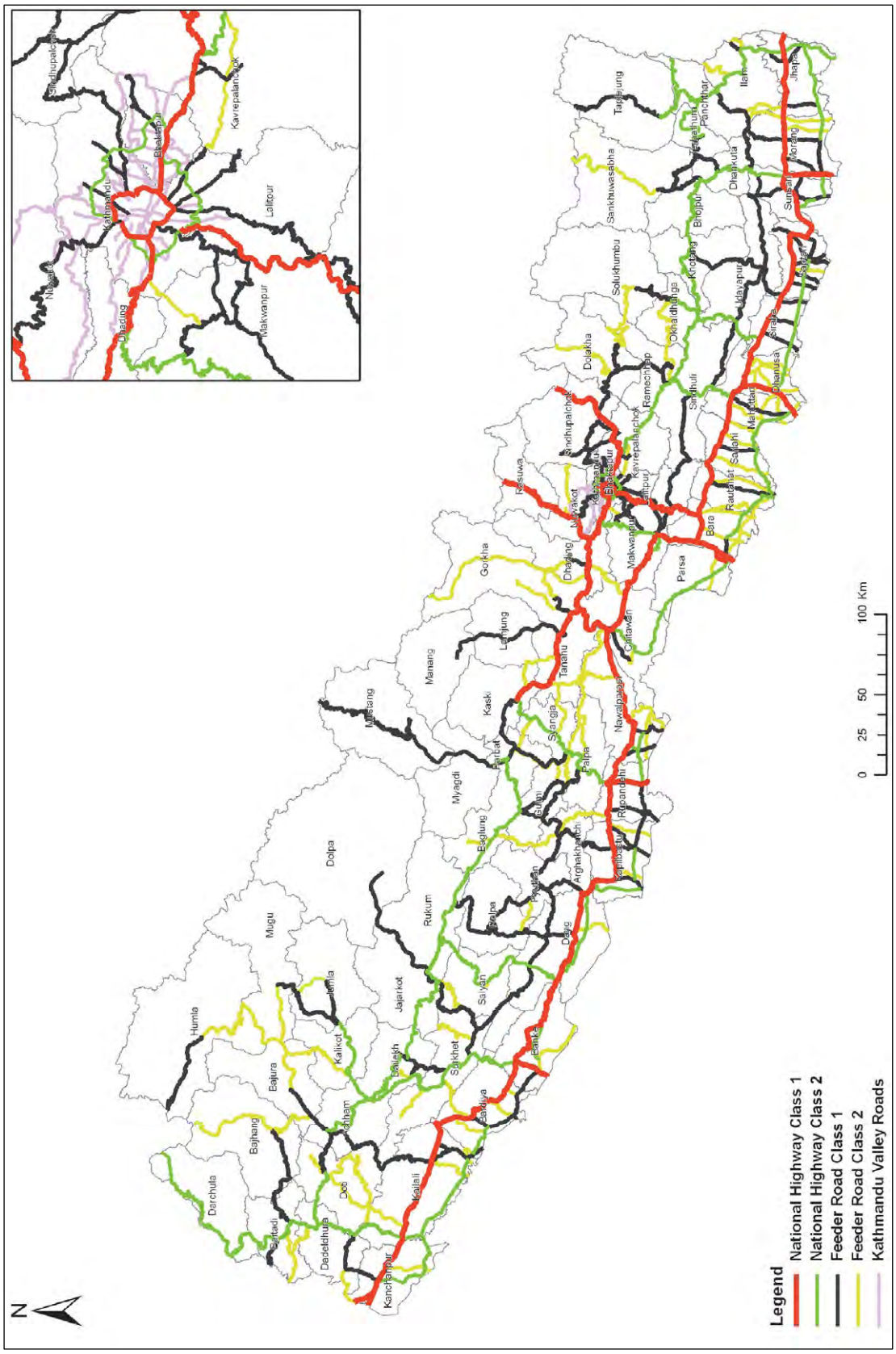
(1) Sector Wide Road Programme and Priority Investment Plan

PIP was established in 1995 and a road network of 15 national highways and 51 feeder roads was planned. The planed network is connected to all the central cities of the states to allow the balanced regional development. Routes of feeder road were added in 1997.

PIP was revised in 2007 and road development programme for 2017 was formulated. Then following revised in 2016, the program was reconsidered to complete by 2022.

(2) Road Master Plan

The Road Master Plan established by DOR will include road widening of national highway network and 10-year road development plan for 2033. Capacity building of road planning for DOR will be implemented with ADB’s assistance.



Source : DOR. 2016. Mid Term Review of Sector Wide Road Programme & Priority Investment Plan

Figure 3.2.3 Road Network in Nepal

3.2.3 Road and Bridge Development Plans in Bhutan

The Kingdom of Bhutan (hereinafter referred to as "Bhutan") is a mountainous and a landlocked country with a population of approximately 756,000. The elevation of southern border with Indian is about 100m, on the other hand, the capital, Thimphu, is 2,320m and the highest point in northern Himalayas reaches 7,500m above sea level.

Due to geographic and climatic conditions, transportation services and infrastructure are Inadequate. As available transportation in Bhutan, road transportation is dominant followed by air transportation. The number of registered vehicles increases by 30% from 88,227 in 2017 to 114,646 in 2021 (equivalent to 6.8% per year). Major vehicles are light vehicles (65%), followed by heavy vehicles (10%) and motorcycles (10%).

First national road (Thimphu – Phuntsholing) was constructed in 1968 and lead to expand the motorable road network. AS of 2020, road network in Bhutan is developed to the total extension of 18,355.62km which is consisted in agricultural roads (11,257.16 km: 61%), national roads (2,840.93 km: 15%) and dzongkhag (district) roads (2,072.86 km: 11%). Almost 90% of road is total 2 lanes and it's 30% is paved. 80% of the paved road is belong to national road and dzongkhag road.

Main national highways in Bhutan consist of National Highway 01 (NH01), which stretches from the capital Thimphu (west) to east, and National Highways connected between NH01 and Indian border, which stretches from North to South. The density of national highways is low and travel between east-west depends on NH01 or road in India.

Cargo and passenger transportation inside Bhutan and to neighbor countries are occupied by road transportation. 95% of international cargo is transported through the border between Bhutan and India via road and these 76% goes though Phuntsholing. The cargo in other border points, Gelephu, Samdrup Jongkar, and Samtse are much less amount compared to Phuntsholing, because of the distance from the major transit points leading to Kolkata in India and Burimari in Bangladesh or inadequate facilities.

Development pattern of national highways network in Bhutan differs from India and Bangladesh because of the existing narrow, sharp curves and steep gradient sections as the road is constructed along steep mountain terrain. The slopes are highly vulnerable to threats from climate change and natural disasters due to lack of proper protection works. Moreover, landslides occur after the long monsoon season and heavy snowfall in winter.

Department of Roads (DOR), implementing institution of road development under Ministry of Works and Human Settlement (MoWHS), established the guideline on design, construction, and maintenance of roads for climate change adaptation and disaster risk reduction in 2019 and proceed to develop a reliable and resilient road network.

The upper level plan for the transportation sector are Comprehensive National Development Plan for Bhutan 2030 (CNDP) implemented with JICA's assistance, Road Sector Master Plan 2007–2027

(RSMP), the 12th Five-Year Plan (2018–2023), Bhutan Transport 2040 (Integrated Strategic Vision), Road Classification and Network Information.

DOR is developing the Road Mater Plan with a target year of 2040 (Master Plan for National Highway Connectivity) with ADB's assistance. It will be completed in October, 2024.

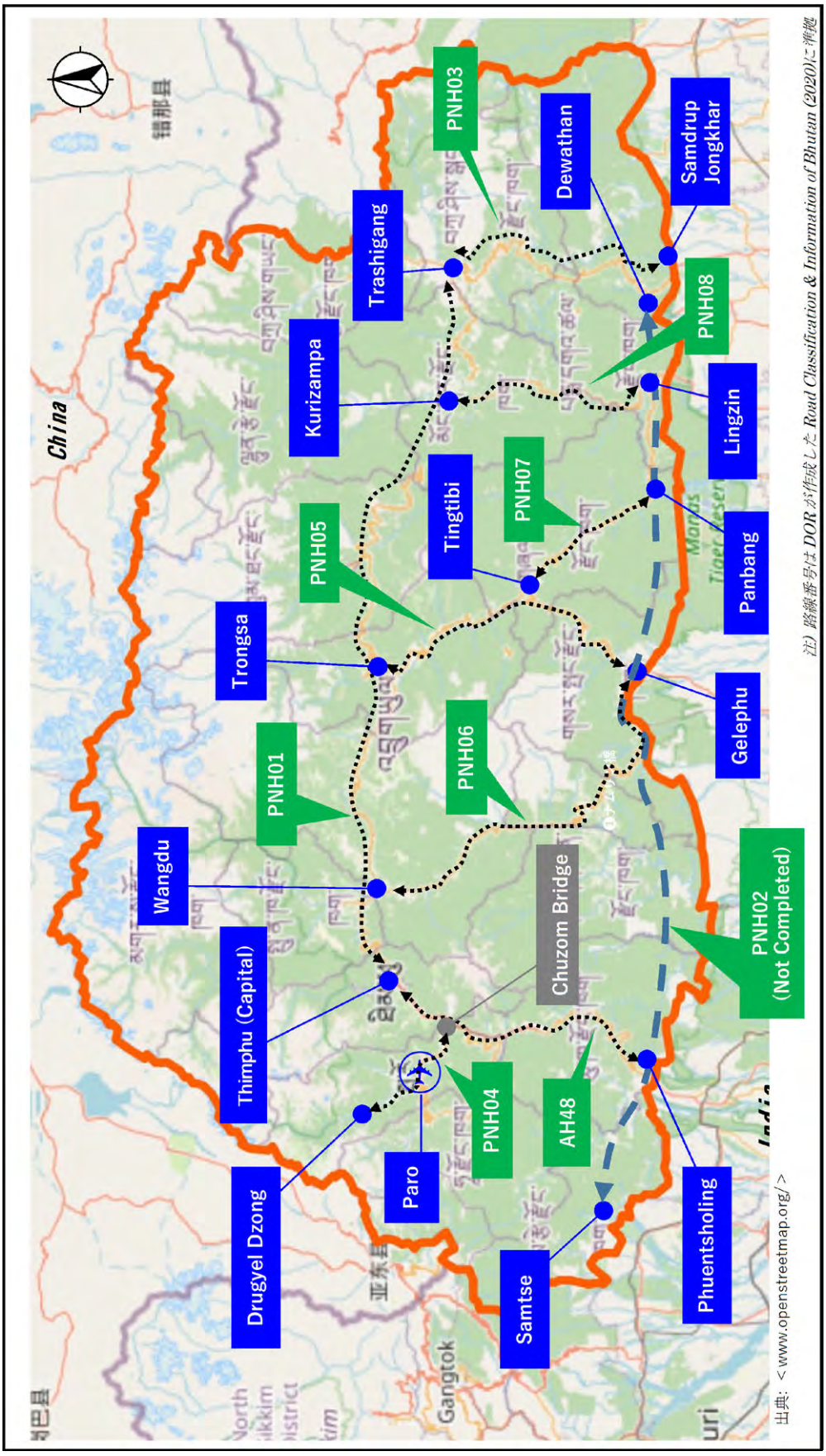


Figure 3.2.4 Road Network in Bhutan

Source：JICA Survey Team

3.2.4 Road and Bridge Development Plans in Myanmar

Maintenance of road network is conducted by three institutions, including Ministry of Construction (MOC), Ministry of Border Affairs and City Development Committee in Myanmar. MOC is responsible for the main highways and the most important institution on the road sector. The main highway network is, however, unreliable in terms of connectivity and accessibility due to the following conditions:

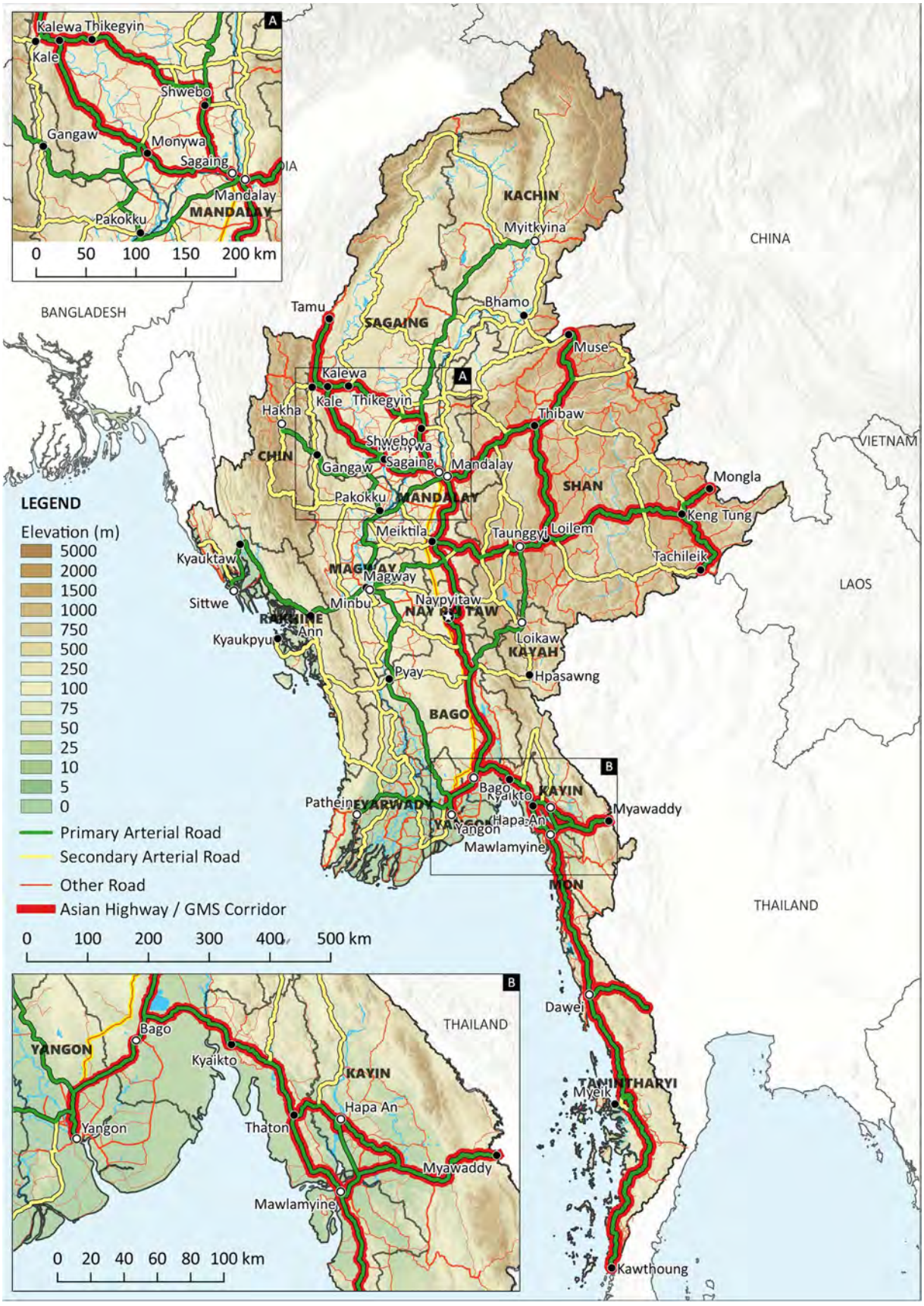
- Roads structure not meeting standards (Narrow width, difficulty in passing large vehicles or unpavement)
- Poor road conditions (Not accessible during the rainy season)
- Vulnerability to natural disasters (Landslide, flood)

According to "the Myanmar Transport Sector Policy Note (Highways)" conducted by ADB in 2015, nearly half (47%) of the highways in Myanmar are unpaved, and and state capitals in mountainous regions such as Rakhine, Tanintharyi, Kachin, and Chin states are not connected to other region by paved roads. 42% of paved roads and 74% of unpaved roads are not properly maintained and poor road condition.

Approximately 500 bridges which have more than 50m length exist in the MOC road network. Deterioration of structure and its poor maintenance are major problem. 40% of those structure was constructed before 30 years or more.

In 2013, JICA conducted the "The survey program for the national transport development plan in the Republic of the Union of Myanmar" and established Myanmar National Transport Development Plan with a target year of 2030. The development of 10 economic corridors and transportation networks are shown in the plan with the concept of "developing an efficient, modern, safe, and environmentally friendly transportation system for all Myanmar citizens in a sustainable manner and with planning coordination among transportation subsectors". The plan recommends a development strategy of road connectivity with classifying road function and resilience against natural disasters to build an efficient highways network.

Moreover, "Data collection survey on regional infrastructure in Myanmar" conducted in 2020 stated that function of road network was classified and prioritised with considered Asian Highway and International corridors as a strategy for road and bridge development in regional areas. (Refer to Figure 3.2.5)



Source：JICA. 2020. Data Collection Survey on Nationwide Road and Bridge Priority Projects

Figure 3.2.5 Road Network in Myanmar

3.2.5 BIMSTEC Transportation Master Plan

BIMSTEC Transportation Master Plan was established in 2018 by technical assistance from ADB to promote BIMSTEC regional integration and to enhance multimodal connectivity. The Master Plan provides a framework for organizing a series of policies, strategies and projects to achieve a common vision of peace, prosperity and sustainability.

The master plan is a 10-year comprehensive development strategy and action plan for the improvement of both hard infrastructure such as road, railway, port, inland waterway, airport, multimodal transportation and trade facilitation, and soft infrastructure such as services for international transportation. Substantial financial resources are required to achieve the goals of the Master Plan. Investment to major projects which exclude on-going project are estimated approximately $22 billion over the 10-year (2018 - 2028).

Road sector occupied nearly 70% of cargo transportation in BIMSTEC regions, only India and Thailand have first class road network of Asian Highway, while Bangladesh is still in the planning stage. As the main issues, (1) strengthening of highway connectivity into high trade volumes in BIMSTEC, (2) improving border connectivity including access to port facilities and (3) coordinating road programs to promote greater connectivity between membership countries or inside of the each country. Road transportation requires transshipment of cargo at the border, but an agreement for allowing vehicles to travel between two countries without transshipment expects to increase transportation efficiency and to reduce trade costs.

Based on these considerations, following development strategies in the road sector are indicated.

- To prioritize the development of major highways on main trade corridors in the regions
- To incrementally improve both side of cross border highways located in the BIMSTEC corridor.
- Improvement or new construction of port access road
- To develop tourist routes for Buddhism and temples
- To establish a system for sharing a national plan on road development and its relevant data between countries to promote the investment of road development
- To execute transportation access agreements and inter-regional transit transportation agreements

Table 3.2.3 Priority Project in BIMSTECMaster Plan (Bangladesh)

No.	Project Details	Type	Status	
BAN-RD-001	Improvement of Jatrabari intersection (N8 Dhaka – Mawa road and Pantchchar – Bhanga road)	Intersection improvement 4-lane widening	Completed	Local funds
BAN-RD-004	Padma Multipurpose Bridge	New Road	Completed	Local funds
BAN-RD-008	N4 Joydevpur – Chandra – Tangail – Elenga road	4-lane widening	On-going	ADB (SASEC-I)
BAN-RD-009	Road improvement of Elenga – Hatikamrul – Rangpur	4-lane widening	On-going	ADB (SASEC-II)
BAN-RD-010	The 2nd achipur-Meghna-Gumti Bridge	4-lane widening	Completed	Loan
BAN-RD-011	Dhaka –Chattogram Highway construction	New Road	Nil	
BAN-RD-014	4-lane widening of N2 Dhaka –Sylhet road	4-lane widening	On-going	ADB
BAN-RD-051	Bhanga – Bhatiapara – Kalna – Lohagora – Narail – Jashore – Benapole road	4-lane widening	Nil	India LOC (tentative)
BAN-RD-052	N1 Chattogram – Cox's Bazar – Teknaf	4-lane widening	Nil	
BAN-RD-054	Rangpur – Burimari road	4-lane widening	Nil	
BAN-RD-099	Chattogram Port Access Road	New Road	On-going	ADB

Source: BIMSTEC. 2022. Master Plan for Transport Connectivity

4. ENVIRONMENTAL AND SOCIAL CONSIDERATION

4.1 Environmental Impact Assessment

Laws, regulations and standards related to environmental and social considerations were investigated. For environmental licensing of road and bridge projects, projects for national and international roads and bridges over 100 m are classified as Red category. Those projects require EIA approval. The EIA process requires 45 days for LCC approval, 30 days for EIA approval and 30 days for ECC approval.

4.1.1 Plans for the Protection of the Natural Environment

(1) National Conservation Strategy

National Conservation Strategy (NCS) was developed in 1987 by the Bangladesh Agricultural Research Council (BARC) in collaboration with the International Union for Conservation of Nature and Natural Resources (IUCN). The NCS was drafted in late 1991 and submitted to the Government in early 1992. The strategy has two objectives:

- To analyze natural resource use patterns in the context of future needs and major development activities in order to formulate feasible and sustainable strategies that contribute to the effective use of limited natural resources; and
- To harmonize development and the environment to ensure the sustainable use of resources, species and ecosystems in the future. To pay particular attention to the importance of ecosystems in coastal areas, hill forests and the Sundarbans wetlands.

(2) National Environmental Management Action Plan

National Environmental Management Action Plan (NEMAP) is a broad-based, multi-disciplinary and multi-faceted plan that builds on national environmental policy and was developed to address the requirements for environmental management for the period 1995-2005. The objectives of the NEMAP are to:

- Identification of key environmental issues affecting Bangladesh,
- Identification of measures necessary to reduce or eliminate the rate of environmental degradation,

- Improvements to the natural and man-made environment,
- Conservation of biological habitats and diversity,
- Promotion of sustainable development,
- Improving people's quality of life.

(3) National Forest Policy

National Forest Policy (NFP: National Forest Policy) was formulated in 1977. It was subsequently revised in 1994 in line with the National Forestry Master Plan (NFMP: National Forestry Master Plan) of 1979. The policy aims to conserve existing forest areas and increase forest reserves by 10% by 2015.

(4) Bangladesh National Environmental Policy

Bangladesh National Environmental Policy (BNEP) provides a broader framework for sustainable development in Bangladesh. In addition, all road and bridge construction projects are required to carry out an IEE or EIA before the project is implemented. The approving authority for IEEs and EIAs is the Department of Environment (DoE) under the Ministry of Environment, Forest and Climate Change (MoEFCC).

BNEP's Environmental Action Plan (EAP), Section 3.7 'Forests, Wildlife and Biodiversity', requires the following:

- Conservation of wildlife and biodiversity, strengthening relevant research and supporting dissemination and knowledge exchange in these areas.
- Conservation and development of wetlands and protection of migratory birds.

(5) Eighth Five-Year Plan (2020-2025)

The development strategy set out in the current Eighth Five-Year Plan, in addition to the continuities from the Sixth and Seventh Plans, indicates a significant reduction in vulnerability to climate change and natural disasters by improving biodiversity and implementing mitigation measures to natural hazards and climate change.

A key focus of the Sustainable Development Strategy of the Eighth Plan is the integration of environmental and climate change considerations into the growth strategy, which will contribute to Bangladesh's green growth strategy.

Specific strategies, policies and institutional reforms include:

- Integrating environmental costs into a macroeconomic framework,
- Implementing the Delta Plan to build resilience and reduce vulnerability to climate change
- Reducing air and water pollution,
- Abolishing fuel subsidies,
- Adopting a green tax on fossil fuel consumption,

- Imposing a tax for emissions from industrial units,
- Preventing surface water pollution.

The first phase of plan implementation will prioritize continued efforts to reduce air and water pollution and enhance forest management, build institutional capacity, policies and regulations for the implementation of environmental finance reform (EFR) and the development of green growth strategies, and contribute to global climate change with appropriate coordination with global climate change programs.

4.1.2 Laws and Regulations on the Protection of the Natural Environment

(1) Environmental Conservation Act

Environmental Conservation Act (ECA) is an environmental protection law, enacted in 1995 and revised in 2000, 2002 and 2010. It aims to conserve and improve the environment, control and mitigate environmental pollution. By the enactment of this Act, the Environmental Pollution Control Ordinance 1977 was repealed.

The ECA's main strategies are as follows:

- Declaration of ecologically critical areas (Ecologically Critical Areas ECAs) and declaration of prohibited acts in ecologically critical areas,
- Regulations on vehicles emitting gases harmful to the environment,
- Setting environmental clearances,
- Regulation of emission permits for industrial and other development activities,
- Announcement of air, water, noise and soil quality standards,
- Promulgation of waste discharge standards,
- Development and declaration of environmental guidelines.

New projects are required to obtain an Environmental Clearance Certificate (ECC) in accordance with the Regulations. DoE is legally empowered to enforce the ECA. Developers who fail to obtain a permit are appealed, and if not complied, it may result in imprisonment for up to three years or a fine of up to 300 000 taka, or both.

The ECA contains the following rules:

- Responsibility for compensation in case of damage to ecosystems,
- Increased fines and other punitive measures; greater powers over the perception of crime.
- Pollution limits for motor vehicles,
- Restrictions on the sale and production of environmentally harmful items such as polyethylene bags,
- Law enforcement support for environmental action,
- Authority to lift penalties and try environmental cases.

(2) Environmental Conservation Rules

Environmental Conservation Rules (ECRs) were the first rules promulgated under the ECA and have been revised in 2002 and 2003. The Regulations define industry/business classifications and set out the environmental assessment required for them.

(3) Bangladesh Wildlife Preservation Act

Bangladesh Wildlife Preservation Act (BWPA), enacted in 1973 and amended in 1974, provides for the conservation, preservation and management of wildlife in Bangladesh. The Elephant Protection Act 1879, the Birds and Animals Protection Act, 1912, and the Rhino Conservation Act, 1932, have been repealed and their provisions properly incorporated into the BWPA.

The Act defines endangered species and animals/bird species of ecological value. It requires active participation and concrete action from local administration in the protection of wildlife. In addition, there is a seasonal ban on hunting and trapping of certain animals/birds.

(4) Bangladesh Forest Act

Bangladesh Forestry Act (BFA) was formulated in 1927 during the British rule. The Act provides for the conservation of forests under government ownership and prohibits the unauthorized use, destruction, etc. of forest produce. It also provides for the granting of forest reserve rights to rural communities.

It also empowers the concerned government agencies to prohibit the hunting and trapping of various birds, animals, and reptiles in forest reserves, either permanently or for a specified period. It should be noted that the Private Forest Ordinance 1959 was established for the protection of private forests or wastelands in Bangladesh.

(5) Protected Areas in the Wildlife Preservation Act and Forest Act.

Nature reserves under the jurisdiction of the Forest Department (DoFo) are classified as Table 4.1.1. All nature reserves registered at the present are shown in Table 4.1.2 and Figure 4.1.1.

Table 4.1.1 Nature Reserves under the Jurisdiction of the Forest Department and Applicable Legislation

number	Classification.	Legislation (Law)
1	National Park	Wildlife Preservation Act.
2	Wildlife sanctuary	
3	Bird and animal sanctuary	
4	Botanical gardens and eco-parks	
5	Marine sanctuary	
6	Reserve forests and forests protected under the Forest Act	Forest Act

Source: JICA Survey Team.

Table 4.1.2 Protected Area of Bangladesh

No.	Name of nature reserve	Location	Area (ha)	Official gazette publication number and date
1	Bhawal National Park	Gazipur	5,022.29	318, 11-05-1982
2	Madhupur National Park	Tangail/ Mymensingh	8,436.13	967, 24-02-1982
3	Ramsagar National Park	Dinajpur	27.75	347, 30-04-2001
4	Himchari National Park	Cox's Bazar	1,729.00	89, 15-02-1980
5	Lawachara National Park	Moulavibazar	1,250.00	367, 07-07-1996
6	Kaptai National Park	Chittagong Hill Tracts	5,464.78	769, 09-09-1999
7	Nijhum Dweep National Park	Noakhali	16,352.23	298, 08-04-2001
8	Medhakachhapia National Park	Cox's Bazar	395.92	356, 04-04-2004
9	Satchari National Park	Habigonj	242.91	1125, 10-10-2005
10	Khadimnagar National Park	Sylhet.	678.80	335, 13-04-2006
11	Baroiyadhala National Park	Chittagong	2,933.61	210, 06-04-2010
12	Kadigarh National Park	Mymensingh	344.13	512, 24-10-2010
13	Kuakata National Park	Patuakhali	1,613.00	509, 24-10-2010
14	Nababgonj National Park	Dinajpur	517.61	510, 24-10-2010
15	Singra National Park	Dinajpur	305.69	511, 24-10-2010
16	Altadighi National Park	Naogaon	264.12	378, 14-12-2011
17	Birgonj National Park	Dinajpur	168.56	379, 14-12-2011
18	Rema-Kalenga Wildlife Sanctuary	Hobigonj	1,795.54	371, 07-07-1996
19	Char Kukri-Mukri Wildlife Sanctuary	Bhola	40.00	883, 19-12-1981
20	Pablakhali Wildlife Sanctuary	Chittagong Hill Tracts	42,069.37	682, 20-9-1983
21	Chunati Wildlife Sanctuary	Chittagong	7,763.97	174, 18-03-1986
22	Fashiakhali Wildlife Sanctuary	Cox's Bazar	1,302.42	48, 11-04-2007
23	Dudpukuria-Dhopachari Wildlife	Chittagong	4,716.57	209, 06-04-2010
24	Hajarikhil Wildlife Sanctuary	Chittagong	1,177.53	211, 06-04-2010
25	Sangu Wildlife Sanctuary	Bandarban	2,331.98	212, 06-04-2010
26	Tengragiri Wildlife Sanctuary	Barguna	4,048.58	508, 24-10-2010
27	Sonarchar Wildlife Sanctuary	Patuakhali	2,026.48	380, 24-12-2012
28	Dhangmari Wildlife Sanctuary	Bagerhat	340.00	37, 29-01-2012
29	Chadpai Wildlife Sanctuary	Bagerhat	560.00	35, 29-01-2012
30	Dudhmukhi Wildlife Sanctuary	Bagerhat	170.00	36, 29-01-2012
31	Teknaf Wildlife Sanctuary	Cox's Bazar	11,614.57	492, 09-12-2009
32	Nagarbari-Mohanganj Dolphine Sanctuary	Pabna	408.11	203, 01-12-2013
33	Shilanda-Nagdemra Wildlife (Dolphin) Sanctuary	Pabna	24.17	204, 01-12-2013
34	Nazirganj Wildlife (Dolphin) Sanctuary	Pabna	146.00	205, 01-12-2013
35	Sundarban (East) Wildlife Sanctuary	Bagerhat	122,920.90	376, 29-06-2017
36	Sundarban (West) Wildlife Sanctuary	Satkhira	119,718.88	376, 29-06-2017
37	Sundarban (South) Wildlife Sanctuary	Khulna	75,310.30	376, 29-06-2017
38	Swatch of No-Ground Marine Protected Area	South Bay of Bengal	173,800.00	155, 27-10-2014
39	Char-muguria Eco-park	Madaripur	4.20	200, 25-08-2015
40	Special Biodiversity Conservation Area (Ratargul)	Sylhet	204.25	113, 31.05.2015
41	Altadighi water based Special Biodiversity Conservation Area	Naogaon	17.34	197, 09-06-2016

No.	Name of nature reserve	Location	Area (ha)	Official gazette publication number and date
42	National Botanical Garden	Dhaka	84.21	221, 27-01-2018
43	Tilagar Eco-Park	Sylhet	45.34	9, 08-01-2019
44	Madhabkundu Eco-Park	Moulavibazar	202.35	89, 02-05-2019
45	Sheikh Jamal Inani National Park	Cox's Bazar	7,085.16	15-Apr-19
46	Pankhali Wildlife (Dolphin) Sanctuary	Khulna	404.00	04-03-2020
47	Shibsha Wildlife (Dolphin) Sanctuary	Khulna	2,155.00	04-03-2020
48	Vadra Wildlife (Dolphin) Sanctuary	Khulna	868.00	04-03-2020
49	Padma Setu Wildlife Sanctuary	Madaripur, Shariotpur, Munshiganj, Faridpur	1,772.60	26-11-2020.
50	Dharmapur National Park	Dinajpur	704.41	147, 24-11-2021
51	Saint Martin Marine Protected Areas	Bay of Bengal	174,300.00	04-01-2022

Source: prepared by the research team based on the website of the Forestry Department, Ministry of Environment and Forests. http://www.bforest.gov.bd/site/page/5430ce33-561e-44f6-9827-ea1ebaa2c00d/-

Source: partly processed by the research team from the website of the Forest Department, Ministry of Environment and Forests. http://www.bforest.gov.bd/site/page/5430ce33-561e-44f6-9827-ea1ebaa2c00d/-

Figure 4.1.1 Protected Area of Bangladesh

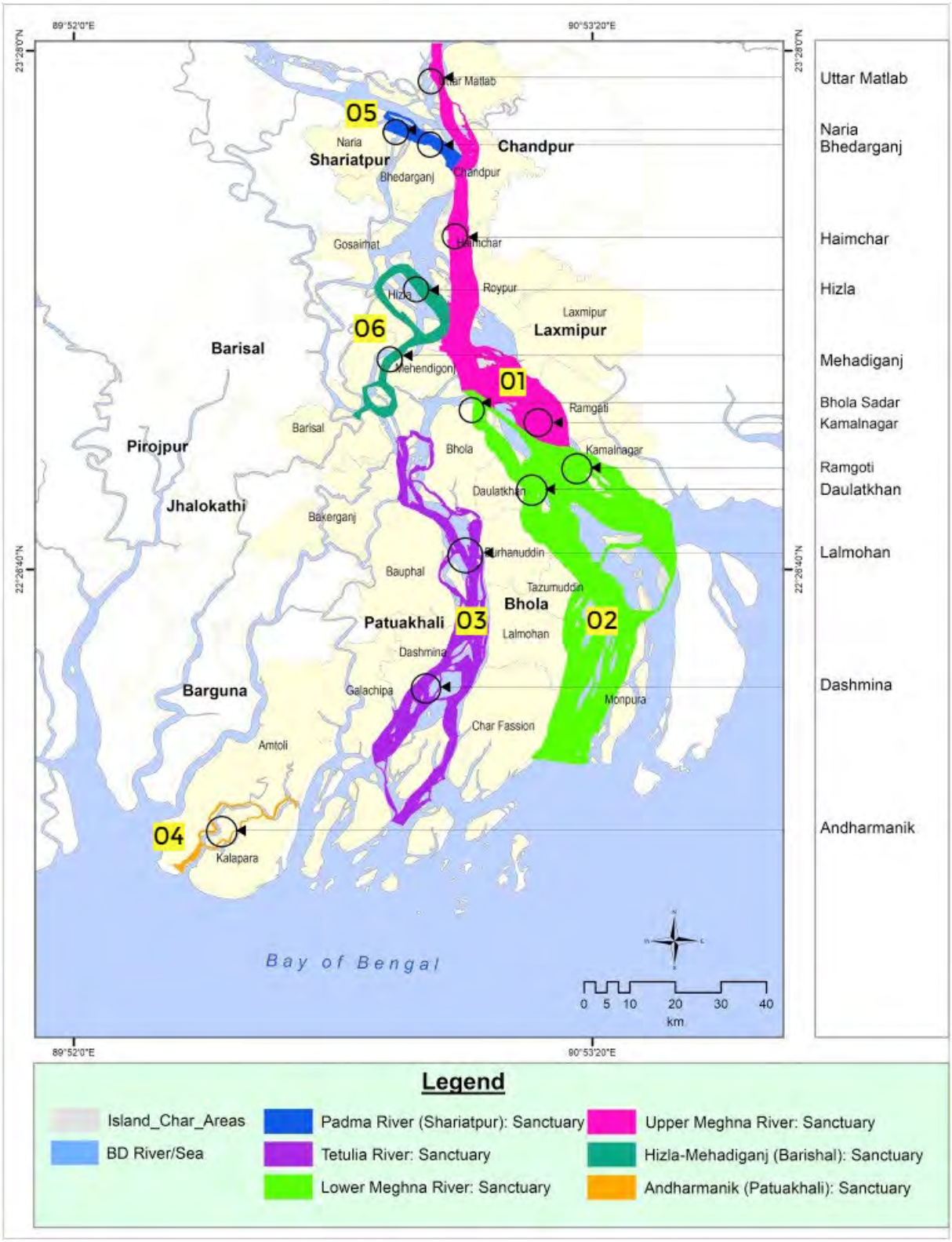
(6) Protection and Conservation Act for Fish (Hirsha)

The Fish (Hirsha) Protection and Conservation Act was formulated in 1950. It regulates the capture, transport, conveyance, provision, sale, exchange, exposure, and possession of Hilsha in certain areas (Hilsha conservation areas) and periods (mainly from March to April each year) shown in Table 4.1.3. Fish (Hilsha) protection and conservation areas are shown in Figure 4.1.2.

Table 4.1.3 Protection and Conservation Areas for Fish (Hirsha)

No.	Sanctuaries for Fish (Hirsha)	Period
1	From Shatnol of Chandpur to Char Alexander of Laxmipur (100 km Stretch of Lower Meghna River)	March-April every year.
2	Char Ilisha to Char pial of Bhola District (90 km stretch of Shahbazpur channel, a tributary of the Meghna River)	March-April every year.
3	Bheduria of Bhola district to Char Rustam of Patukhali (100 km stretch of Tetulia River)	March-April every year.
4	Whole 40 km stretch of Andhermanik River in Kalapara Upazila of Patuakhali.	November to January every year.
5	20 km stretch of Lower Padma River between Naria-Bhedorganj Upazila of Shariatpur in the north and Matlab Upazila of Chandpur and Bhedorganj Upazila of Shariatpur in the south.	March-April every year.
6	Total length of 82 km between three different river points of Barisal district. Three points are: Total 13.70 km stretch of the Kalabadar River between Habinagar point, Barisal Sadar Upazila and Bamnar Char point, Mehendigonj Upazila of Barisal.	March-April every year.
	Total 8.81 km stretch of the Gajaria River between Bamnar Char point of Mehendigonj Upazila and Hizla Launch Ghat point, Hizla Upazila Barisal.	
	Total 59.51 km stretch of the Meghna River between Hizla Launch Ghat point of Hizla Upazila and Dashkin-Paaschim jangalia point, Mehendigonj Upazila of Barisal.	

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1.2 Protection and Conservation Areas for Fish (Hirsha)

4.1.3 International Environmental Law

The followings are international conventions and declarations related to the environment that Bangladesh has signed/ratified:

- Convention relating to the Conservation of Animals and Plants in their Natural State, 1933,
- International Convention for the Protection of Birds, Paris, 1950,
- International Plant Protection Convention, Rome, 1951,
- Convention on Wetlands of International Importance as Waterfowl Habitat = Ramsar Convention (1971),
- UN Convention on the Law of the Sea (1982),
- Rio Declaration, Rio de Janeiro, 1992,
- Convention on Biological Diversity, Rio de Janeiro, 1992.

Key Biodiversity Areas (KBAs) are protected areas (terrestrial and inland waters) of key importance for biodiversity conservation, designated on the basis of the above relevant international legislation. They are managed by law or other effective means for the conservation of biodiversity and sustainable use of ecosystems.

The selection criteria for KBAs are based on the Important Bird Areas (IBAs) that the international NGO BirdLife International has been working on since the early 1980s. The KBA is an extension of this IBA to include taxa other than birds. All IBAs are therefore included in KBAs. In addition, areas with endangered species whose distribution is restricted to one place are identified worldwide as AZEs (Alliance for Zero Extinction), which also fulfil the conditions for KBAs. Other important plant areas, IPAs (Important Plant Areas), are also included in KBAs.

Table 4.1.4 and Figure 4.1.3 show protected areas registered as KBA/IBA.

Table 4.1.4 KBAs/IBAs in Bangladesh

No.	Name	Area (ha)	Classification.
1	Jamuna-Brahmaputra river	282,742	Terrestrial, Wetlands (inland)
2	Madhupur National Park	8,493	Terrestrial, Forest, Artificial - Terrestrial
3	Sundarbans (East, South and West Wildlife Sanctuaries)	157,330	Terrestrial, Marine, Forest, Wetlands (inland)
4	Ganges-Brahmaputra-Meghna delta	680,765	Terrestrial, Marine, Forest, Wetlands (inland)
5	Tanguar Haor and Panabeel.	6,979	Terrestrial, Freshwater, Wetlands (inland)
6	Aila Beel	1,195	Terrestrial, Freshwater, Wetlands (inland)
7	Hail Haor.	21,896	Terrestrial, Freshwater, Wetlands (inland)
8	Lawachara / West Bhanugach Reserved Forest	1,227	Terrestrial, Forest
9	Hakaluki Haor	19,310	Terrestrial, Freshwater, Wetlands (inland)
10	Rajkandi Reserved Forest	7,309	Terrestrial, Forest
11	Rema-Kalenga Wildlife Sanctuary	1,794	Terrestrial, Forest
12	Muhuri Dam	1,349	Terrestrial, Freshwater, Grassland, Wetlands (inland)
13	Hazarikhil Wildlife Sanctuary	1,544	Terrestrial, Forest
14	Pablakhali Wildlife Sanctuary	23,675	Terrestrial, Forest
15	Rampahar-Sitapahar Wildlife Sanctuary	6,277	Terrestrial, Forest
16	Sangu Matamuhari	76,729	Terrestrial, Forest
17	Himchari National Park	1,530	Terrestrial, Forest
18	Teknaf Game Reserve	11,498	Terrestrial, Forest, Artificial - Terrestrial
19	Sonadia Island	-	Terrestrial
20	Patenga Beach	404	Terrestrial, Marine, Forest, Wetlands (inland)

Source: JICA Survey Team based on i-BAT HP. https://www.ibat-alliance.org/free-visual-data-map

Source: partially processed by JICA Survey Team from i-BAT HP.
https://www.ibat-alliance.org/free-visual-data-map

Figure 4.1.3 KBA/IBAs in Bangladesh

4.1.4 Environmental Clearance

Table 4.1.5 shows the timeframes required for approval for each environmental category as defined by the Environmental Conservation Rules (ECR). The environmental categories for road and bridge construction projects are also shown in Table 4.1.6. Projects where the type of road is an international

trunk road or national road, and where the length of the bridge is more than 100 m, are classified as environmental category "Red" and both require EIA approval. The approximate number of days required for such procedures is 45 days for approval of a Location Clearance Certificate (LCC: Location Clearance Certificate), 30 days for approval of an Environmental Impact Assessment (EIA) and 30 days for approval of an Environmental Clearance Certificate (ECC).

Table 4.1.5 Time Required for Approval by Environmental Category

No	Environmental Category	Location Clearance (LCC)	EIA Approval	Environmental Clearance (ECC)
1	Green.	N/A	-	7 Days.
2	Orange-A.	15 Days.	-	7 Days.
3	Orange-B.	21 Days.	-	20 Days.
4	Red.	45 Days.	30 Days.	30 Days.

Source: Environmental Conservation Rules.

Table 4.1.6 Environmental Categories in the Road and Bridge Sector

Business Classification	Orange-B	Red
Road construction projects	Feeder Road, Local Road	Regional, National & International
Bridge construction projects	Bridge length less than 100 m	Bridge length 100 m or more

Source: Environmental Conservation Rules.

According to the ECR, Article 7(4), for industries and operations in the Orange-A, Orange-B and Red categories, an LCC is firstly issued, followed by an ECC. An Initial Environmental Examination (IEE) is required to obtain this LCC and an EIA report is required to obtain the ECC.

Generally, an IEE and EIA must be submitted to the DoE, although the Director of Environment may exempt an LCC from being issued if he or she considers it appropriate to issue an LCC certificate when applying for a project (i.e. an IEE is not required).

The requirements for operations classified as environmental category 'Red' are as follows:

- IEE, or where an IEE exemption has been granted, an Environmental Impact Assessment Report prepared in accordance with a TOR pre-approved by the DoE,
- No Objection Certificate (NOC) by local authority,
- Contingency plans relating to adverse environmental impacts and plans for the abatement of pollution,
- Resettlement overview, recovery plan (resettlement plan),
- Other necessary information.

With regard to EIA procedures in Bangladesh, Table 4.1.7 provides a comparison between the Bangladeshi legal system and the JICA Guidelines for Environmental and Social Considerations (January 2022 ver.).

Table 4.1.7 Comparison of JICA Guidelines and Bangladeshi Legal System in EIA Procedures

Item		JICA Guidelines	Laws and regulations relating to the country of Bangladesh.	Comparative analysis and proposed solutions
1	categorization	• Category A: Project proponent required to submit EIA report. EIA Report, RAP Report and Minority Report required 120 days prior to signing of agreement prior to environmental review. • Category C: Projects in this category, after classification • No environmental review required for. • Category FI: JICA will survey the relevant donor or implementing agency to confirm whether this category of project has appropriate environmental and social considerations in line with the Guidelines.	• Four categories - Green, Orange-A, Orange-B and Red - are classified according to their environmental significance and the location of the proposed development. • Green projects do not require either an IEE or an EIA. • Red category projects require both an IEE and an EIA.	• There is no equivalent category to JICA's FI category in Ba's legislation.
2	Scope of impacts to be investigated and considered.	• JICA will consider appropriate environmental and social considerations to be made by project proponents and others in order to avoid or minimize the impact of development projects on the environment and local communities and to prevent the occurrence of unacceptable adverse impacts.	• Assessments are carried out within the framework of obtaining an Environmental Clearance Certificate (ECC). • The environmental assessment begins when the project proponent starts the process of applying the ECC.	• In the Ba countries, there are classifications used to screen development projects. However, as they are carried out within the framework of ECC issuance, they are relatively vague in scope and are done by reference to the ranges given in the Guidelines.
3	Stakeholder and public consultation	• Project proponents and others will consult with a wide range of local stakeholders with a reasonable degree of public participation in order to reach an appropriate consensus, taking into account environmental and social factors in a way that best suits local circumstances.	• Information to local people, community consultation and public participation are recognized as important documents, but specific legislation to implement such processes has not yet been enacted.	• It can be said that there is almost no system in Ba country. Conduct meetings in line with the requirements of the Guidelines.
4	Disclosure of information on EIAs	• With regard to information on the environmental and social considerations of projects, JICA encourages project proponents and others to disclose and present information on environmental and social considerations to local stakeholders.	• No clear requirements for disclosure of information, including public hearings and comments. The Ba'ath government passed the Environment Act 2000 (Act No. 11 of 2000) to allow the public to prosecute non-compliance with the ECA (1995) and the ECR (1977).	• There are no legal requirements for disclosure of information in Ba'athist law, but some implementers have established clear recommendations/requirements for disclosure of information; there is a clear gap between the two, so the information is disclosed as required by the guidelines; the guidelines are not clear on the disclosure of information in the Ba'athist law, but there are clear recommendations/requirements for disclosure of information in the Ba'athist law.

Item		JICA Guidelines	Laws and regulations relating to the country of Bangladesh.	Comparative analysis and proposed solutions
5	EIA methods and tools	• JICA conducts environmental reviews according to the project category and refers to the corresponding environmental checklists for each sector, where applicable.	• Documents required include FS reports, IEE reports, EIA reports, Environmental Management Plans (EMPs), No Objection Certificates (NOCs), disaster management plans and relocation plans.	• There is no significant divergence between the two.
6	monitoring	• JICA shall confirm with the project proponent etc. the results of the monitoring of items with significant environmental impacts. The information necessary for JICA's confirmation monitoring shall be provided by the project proponent etc. by appropriate means (including in writing). JICA may conduct its own investigations as necessary. JICA will make the results of monitoring by the project proponent etc. available to the project proponent etc. to the extent that they are made publicly available.	• There is a process for updating the ECC that requires monitoring and evaluation. The DOE is responsible for following up and monitoring ECC conditions. The DOE prepares a compliance report for the endorser, which is published on its website. • There are no formal provisions for obtaining an independent assessment of EIA reports. There is also no formal mechanism or programme for independent audits of DOE-approved projects. Third party monitoring in approved laboratories is recommended.	• Monitoring methods and publication of results in guidelines, as no legal framework exists in Ba'ath government legislation, even though many countries define monitoring as part of their evaluation activities.

Source: JICA Survey Team

4.2 Land Acquisition and Resettlement

4.2.1 Legal Framework for Land Acquisition and Resettlement

The framework for land acquisition and resettlement and the rights pertaining to the affected persons are established based on the Acquisition and Requisition of Immoveable Property Act (ARIPA-2017. Acquisition and Requisition of Immoveable Property Act, 2017). The former law, the Acquisition and Requisition of Immoveable Property Ordinance of 1982 (ARIPO-1982), regulates the acquisition and requisition of lands (temporary acquisition) carried out by the Government. It was amended in 1993 and 1994. It should be noted that the amount of compensation for land acquisition has been increased since ARIPA-2017 came into force.

The legal process for land acquisition is initiated after a site acquisition plan based on the Mouza Map has been submitted to the Deputy Commissioner (DC) of the district concerned. If there is a difference between the compensation and the reacquisition price, the difference is paid by the implementing agency through the NGO.

4.2.2 Ordinance on the Acquisition and Seizure of Immovable Property (ARIPO-1982).

ARIPO-1982 gives the Deputy County Administrator (DC) powers over the permanent acquisition and temporary seizure of property and compensation of the affected persons (PAPs).

The DC assesses the amount of compensation after taking into account, among other things, land sales and purchases in the subject area during the past 12 months. The 1993 amendments to ARIPO increased the incentive amount for compulsory acquisition from 25% to 50% of the assessed value of the property. The 1994 amendments added provisions on compensation to the lessee for harvested goods. ARIPO does not provide for compensation for loss of wage income, nor does it provide for damages suffered by lessees, nor does it provide for damages suffered by people who are not registered holders (e.g., smallholders, informal residents, people in informal occupation of someone else's land).

In addition, the Acquisition of Immovable Properties Manual-1997 (Acquisition of Immovable Properties Manual-1997) was prepared for the acquisition and seizure of other real estate, considering previous laws, regulations and ordinances. This manual sets out guidelines for the acquisition and seizure of all types of property and provides for the payment of compensation for all types of losses.

4.2.3 Acquisition and Seizure of Immovable Property (ARIPA-2017).

ARIPA-2017 repealed the Acquisition and Seizure of Property Ordinance 1982 and changed the calculation rate of compensation.

The compensation received by the affected persons under ARIPA-2017 will be 200% above the average market price for the past year in the case of government land, and 300% above the average market price for land used by private companies. Compensation for damage to harvested goods, trees, etc., is 100% above the market price. The market price used to calculate compensation for land is the Mouza Rate (rate by administrative distinction) set by the DC Office. The market price used for building compensation is set by the Public Works Department (PWD).

ARIPA-2017 provides that land for religious institutions such as mosques, temples and cemeteries cannot normally be acquired, while it stipulates that the government may acquire land for any religious institution if it is unavoidable in the public interest. The acquisition process is similar to the previous law.

For land acquisition, the implementing agency of the project needs to conduct a survey on the affected houses and land and apply for site acquisition to the DC, which, based on the submitted land acquisition plan, conducts a joint verification (Joint Verification) after holding a District Legal Aid Committee Meeting (DLAC Meeting). The DC holds a public information meeting for the affected persons. After the verification, the Deputy District Administrator notifies the landowner of the land acquisition. At this time, the landowner can raise any objections. The deputy county administrator must hold a hearing in response to the objections.

4.2.4 Comparison of JICA Guidelines and the Bangladeshi Legal System in Resettlement and Land Acquisition.

Differences between the Resettlement and Land Acquisition Laws in Bangladesh and the JICA Guidelines on Environmental and Social Considerations (January 2022 ver.) are shown in Table 4.2.1.

Table 4.2.1 Differences between Bangladesh Legislation on Land Acquisition and Resettlement and JICA Guidelines on Environmental and Social Considerations

No.	JICA Guidelines	Acquisition and Requisition of Immovable Property Act-2017.	JICA Guidelines and ARIPA-2017. Gap	Examples of measures taken in past projects
1	Involuntary resettlement and loss of means of livelihood must be avoided by considering all possible means.	Avoidance is practiced as a matter of practice, but there is no legal provision.	Not prescribed by Bangladesh national legislation.	Impact avoidance where possible.
2	Where avoidance is not possible, effective measures must be agreed with the subject to minimize the impact and compensate for the loss.	Impact minimization is a practice, but there is no legal provision.	Not prescribed by Bangladesh national legislation.	Take measures to minimize impact.
3	Resettled residents are provided with compensation and assistance to improve or at least restore their living standards, income opportunities and production levels to what they were prior to their displacement.	No direct provisions. Some provisions on rebuilding livelihoods in addition to compensation.	There are no adequate provisions for livelihood restoration in Bangladesh national legislation.	Develop compensation and support measures to improve and restore living standards.
4	Compensation must be based on the reacquisition price as far as possible.	Government projects are compensated at three times the market price and private projects at four times the market price (*The mouza rate (rate by administrative distinction) set by the DC (Deputy County Administrator) office is applied to the market price used to calculate land compensation).	The price on the left may not meet the reacquisition price.	Compensation at three times market value or reacquisition price, whichever is higher.
5	Compensation and other assistance must be provided prior to physical relocation.	no stipulations (e.g. law)	There is no provision for prior compensation in Bangladesh national legislation.	Provide compensation and other assistance prior to physical relocation.
6	In the case of projects where large-scale involuntary resettlement will occur, a resettlement plan must be prepared and made publicly available.	no stipulations (e.g. law)	There is no provision in the Site Acquisition Act, but there are relevant provisions in the EIA legislation, which have been created in practice.	Create and publish a RAP.
7	In the preparation of resettlement plans, sufficient information must have been made available to the public in advance and consultation with affected people and communities must have taken place on this basis.	no stipulations (e.g. law)	There is no provision for community consultation in Bangladesh national legislation.	Consultation with affected people and communities based on this, with sufficient information made public in advance.

No.	JICA Guidelines	Acquisition and Requisition of Immovable Property Act-2017.	JICA Guidelines and ARIPA-2017. Gap	Examples of measures taken in past projects
8	During consultations, explanations must be provided in a language and style that is understandable to the affected population.	no stipulations (e.g. law)	There are no provisions on explanatory language in Bangladesh national legal regulations.	Explanations are given in the local official language.
9	Appropriate participation of affected people and communities must be promoted in the planning, implementation and monitoring of measures related to involuntary resettlement and loss of means of livelihood.	no stipulations (e.g. law)	There are no provisions on resident/community participation in Bangladesh national legal regulations.	Facilitate resident and community participation in the planning, implementation and monitoring of measures related to involuntary resettlement and loss of means of livelihood.
10	Treatment mechanisms for complaints from affected people and communities must be in place.	There are provisions for arbitration.	Bangladesh national legislation has no provision for a grievance mechanism available to the general population.	Establish a grievance redress mechanism (GRM) for complaints from affected people and communities.
11	Affected populations are identified and recorded through initial baseline surveys (including population censuses, asset and property surveys and socio-economic surveys) to establish entitlements to compensation and assistance. This should be done as early in the project as possible to prevent undue influx of people seeking compensation, assistance or other benefits.	Prior to notification of property acquisition, the current status and nature of the property to be acquired is compiled. A reference date for entitlement is declared before the start of the Joint Verification Survey.	In JICA projects, the declaration is usually made on the date of the start of the census at the preparatory survey stage, whereas in the Bangladesh country legislation, the declaration is made after the F/S, including the site acquisition plan, is submitted by the operator to the DC.	For formal residents, the cut-off date declared after the F/S is submitted by the operator to the DC and before the start of the Joint Verification Survey is the official entitlement reference date, but the census start date during the FS period is the provisional cut-off date The off-date shall be. For informal residents, the cut-off date declared on the census start date shall be the entitlement reference date.
12	The recipients of compensation or assistance shall be those with legal rights to the land, those who do not have legal rights to the land but whose rights would be recognized under the legal system of the country concerned if they claimed them, and those whose legal rights and claims to the land they occupy cannot be confirmed.	There is a provision for compensation in respect of land lessees.	Under Bangladesh national legislation, those with no or unknown land rights are not included among the beneficiaries.	(i) those with legal rights to the land, (ii) those who do not have legal rights to the land but whose rights would be recognized under the legal system of the country concerned if they claimed them, and (iii) those whose legal rights and claims to the land they occupy cannot be confirmed are the recipients of compensation and assistance.
13	Where the livelihoods of the relocated population are land-based, land-based relocation strategies are prioritized	There is no regulation, but in practice it is the responsibility of the implementing agency to provide alternative sites.	There are no provisions for legal assistance in Bangladesh national legislation.	Where the livelihoods of the relocated population are land-based, priority should be given to land-based relocation strategies.

No.	JICA Guidelines	Acquisition and Requisition of Immovable Property Act-2017.	JICA Guidelines and ARIPA-2017. Gap	Examples of measures taken in past projects
14	Provide support during the transition period	no stipulations (e.g. law)	There is no provision in Bangladesh legislation for the provision of support during the transition period.	Provide support during the transition period.
15	Special consideration is given to the socially vulnerable among the resettled population, especially the poor and landless, the elderly, women, children, indigenous peoples and ethnic minorities.	no stipulations (e.g. law)	Bangladesh national legislation does not contain provisions on the consideration of socially vulnerable groups.	Provide for vulnerable groups in society.

Source: JICA Survey Team

4.3 Relevant Organizations

4.3.1 Ministry of Environment, Forestry and Climate Change

The Ministry of Environment, Forest and Climate Change (MoEFCC: Ministry of Environment, Forest and Climate Change) is the government agency responsible for matters related to national environmental policy and regulatory issues, which was reorganized into its current structure in 2016 with the addition of the Bangladesh Climate Change Trust (BCCT). It is a standing body of the Executive Committee of the National Economic Council (NEC) and has the following subordinate bodies:

- Department of the Environment (DoE),
- Forestry Department (DoFo),
- Bangladesh Climate Change Trust Department (BCCT),
- Forest Industry Development Corporation (FIDC),
- Bangladesh Forest Research Institute (BFRI) and Institute of Forestry (IoF),
- Bangladesh Agricultural Research Council (BARC), Forest Division,
- National Institute of Medicinal Herbs.

4.3.2 Department of Environment (DoE)

Department of Environment (DoE) was established in 1989 under the MoEF and is responsible for the following activities. It is also the body responsible for planning and implementation related to other environmental issues.

- Reviewing environmental impact assessments and issuing environmental clearances (ECs) where necessary
- Conducting environmental monitoring programs and enforcement measures.
- Developing and maintaining environmental databases
- Coordinating international events with MoEF.

The DoE is led by a Director General (DG), with a Director, Deputy Director, Assistant Director and Engineer, supported by a team of other technical staff (e.g. chemists and laboratory staff). Also, DoE has regional offices, monitoring stations and several laboratories.

4.3.3 Department of Forest (DoFo)

Department of Forest (DoFo) is responsible for the protection and management of the country's forest reserves. The personnel of this organization are located in each region where forest reserves exist and are also responsible for the protection of wildlife in these reserves.

4.3.4 Bangladesh Climate Change Trust Division

The Bangladesh Climate Change Trust Division (BCCT) is a government trust established in 2010 to address issues caused by climate change. It works with government ministries, NGOs and the private sector to implement and evaluate climate change mitigation projects.

4.4 Gender

Key gender legislation and policies include Articles 27 and 28 of the Constitution, the National Women Development Policy (2011). In the transport sector, National Integrated Multimodal Transport Policy (2013) and Eighth Five Year Plan (FY2020 - FY2025) include the importance of transport access for women and vulnerable groups, cleaning of footpaths, mandatory introduction of bridges for road crossings and increased public transport.

4.4.1 Legislation and National Policy

(1) Constitution

Article 27 of the Constitution of Bangladesh provides that all citizens are equal under the law and are equally entitled to the protection of the law. Article 28 (1) states that the State shall not discriminate against any citizen on grounds of religion, race, class, sex and place of birth. Article 28 (2) states that women shall have equal rights with men in all areas of state and public life.

(2) National Women's Development Policy

National Women Development Policy was developed in 2011 to ensure the development and empowerment of women. The objectives of the National Women Development Policy are as follows:

- Establish equal rights for men and women in the state and public life in the light of the Constitution of Bangladesh,
- Ensure the security of women in the state, society and the family,
- Ensuring socio-economic, political, administrative and legal empowerment,
- Establishing women's human rights,

- Ensure the full and equal participation of women in mainstream socio-economic development,
- Develop women as educated and skilled human resources,
- Rescue women from the curse of poverty,
- Eliminate the existing gender gap,
- Give appropriate recognition to the contribution of women in the socio-economic sphere,
- Eliminate all forms of abuse of women and girls,
- Eliminate discrimination against women and girls,
- Establish gender equality in politics, public administration, socio-economic activities, education, culture, sport and all areas of family life,
- Innovate and introduce technologies that serve women's interests and prohibit anti-women technologies,
- Take appropriate measures to ensure women's health and nutrition,
- Ensure that women are prioritized in the provision of adequate shelter and housing,
- Prepare women to recover from natural disasters and armed conflict,
- Extend a holistic perspective to guarantee the rights of women with disabilities and women belonging to minority ethnic groups,
- Ensure the safety of women who are widowed, old, without guardians, abandoned by their husbands, unmarried or childless,
- Reflect gender perspectives in mass media, including positive images of women and girls,
- Help talented women to develop their creativity,
- Provide support services necessary for the development of women,
- Provide holistic support to ensure the growth of women entrepreneurs.

4.4.2 Gender Mainstreaming in the Transport Sector.

(1) National Integrated Multimodal Transport Policy

In the National Integrated Multimodal Transport Policy, one of the four strategies is 'Integrating education, health, economic development, gender and social equity policies with poverty reduction'. In addition, one of the priority policies is 'addressing the transport needs of women and girls', and a new approach to investment criteria in the 'cross-sectoral agenda' specifies 'social inclusion: addressing the needs of women, older people and people with disabilities and providing access to basic health and education facilities'. The specifics of social inclusion are as follows:

- Transportation for women, older people and disabled people: improving the quality of the walking environment: e.g. facilitating the mobility of women, children, older people and disabled people,
- Social equality and poverty reduction: planning future transport facilities and services, taking into account the special needs of women, children, older people and people with disabilities; all transport sector professionals, administrators and decision-makers develop plans to provide services that are attractive and accessible to women and girls.

(2) Eighth Five-Year Plan

The Eighth Five-Year Plan's vision for gender mainstreaming is to achieve 'a country where both men and women have equal opportunities and rights and where women are recognized as contributors in economic, social and political development'. For the transport sector, the plan states that.

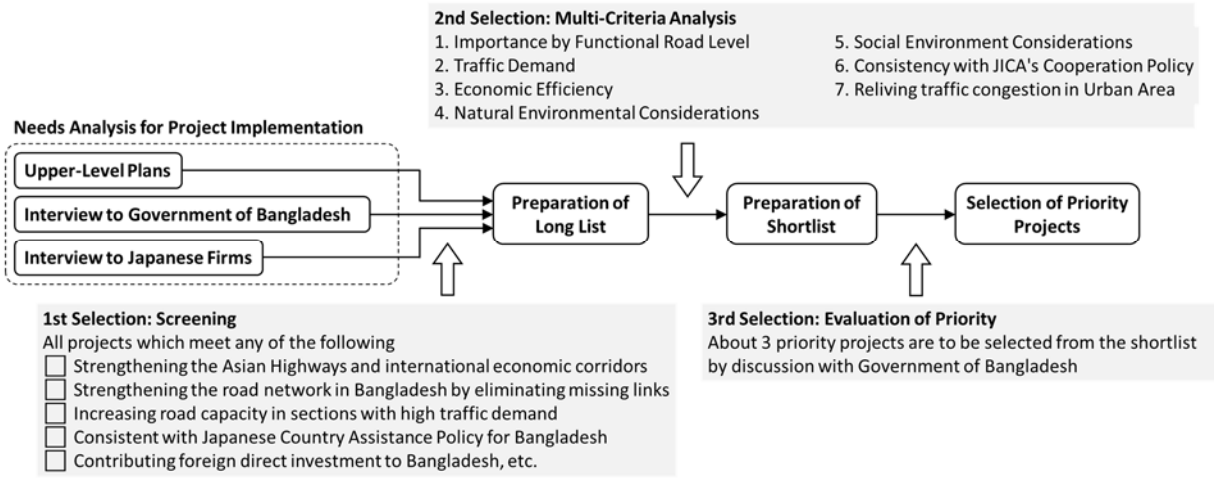
- Infrastructure and support services are needed to facilitate women's participation in the public sector, and safe and accessible transport systems are needed to increase women's mobility.
- Road safety is ensured through the enforcement of traffic rules and laws. To support women's mobility, footpaths are cleaned, the introduction of overhead bridges for road crossings is mandatory, and public transport is increased.

5. SELECTION OF PRIORITY ROAD AND BRIDGE PROJECT

5.1 Procedure of Priority Project Selection

Priority projects are selected in accordance with the procedure shown in Figure 5.1.1

In the 1st step, all possible projects are selected as the long list by the needs analysis for project implementation as well as screening criteria. In the 2nd step, candidate priority projects are selected as the short list by multi-criteria evaluation from the long list. Finally, in the 3rd step, priority projects are selected by discussion among Bangladesh related authorities, JICA and JICA Survey Team.



Source: JICA Survey Team

Figure 5.1.1 Procedure of Priority Project Selection

5.2 Needs Analysis for Project Implementation

5.2.1 RHD's Needs

Projects to be included in the long list were determined based on the analysis of Road Master Plan (2009) and discussion/interview with RHD. Priority project list according to the RHD's needs is shown in Table 5.2.1.

Table 5.2.1 Priority Project List according to RHD's Needs

No.	Project Type	Project	Length (km)	Number of Lane	Source
1	Road	Dhaka – Chattogram Expressway (Dhaka - Cumilla)	100	4	Road Master Plan (2009)
2		Dhaka – Chattogram Expressway (Cumilla - Feni)	45	4	
3		Dhaka – Chattogram Expressway (Feni - Chattogram)	72	4	
4		N5 Dhaka - Paturia	57	4	
5		N6 Natore - Sona Masjid	130	4	
6		N7 Daulatdia – Magura - Jashore	118	4	
7		N7 Jashore - Mongla	100	4	
8		N102 (N1: Moynamoti～N2: Kutta)	80	4	
9		Matarbari Port Access Road (Phase 2)	26	2	
10		Marine Drive (Mirsharai – Chattogram)	65	4	
11		Marine Drive (Chattogram – Matarbari)	50	4	
12		Marine Drive (Matarbari – Cox's Bazar)	50	4	
13		N8/R880/881 Barisal - Patuakhali - Kuakata Road	110	4	
14		N502/N6 Bogura - Natore - Bonpara Road	80	4	
15		Chattogram – Cox's Bazar Expressway (Chattogram - Chakaria)	85	4	
16		Chattogram – Cox's Bazar Expressway (Chakaria - Cox's Bazar)	47	4	
17		N1 Chattogram - Chakaria	85	4	
18		N1 Chakaria - Cox's Bazar	47	4	
19	Bridge	Jailkhana Ghat Bridge (Bhairab/ Rupsha River)	1.4	4	List provided by RHD in November, 2022
20		Phulbari Bridge (Bhodra River)	1.4	4	
21		Swarighat Bridge (Buriganga River)	1.3	4	
22		Delutia Bridge (Shibsa River)	1.3	4	
23		Jhopjhopia Bridge (Jhopjhopia River)	1.2	4	
24		Laxmikhola Bridge (Bhodra River)	1.2	4	
25		Shundarmohol Bridge (Gangrail River)	1.2	4	
26		Darulmollik Bridge (Shibsa River)	1.2	4	
27		Bishkhali Bridge (Bishkhali River)	2.0	4	
28		Shekirhat Bridge (Bhairab River)	1.2	4	
29		Kunda Bridge (Dhalweshwari)	1.1	4	
30		Atulnagar Bridge (Kaliganga River)	1.0	4	
31		Matubborhat (Karkhana River)	1.0	4	
32		Panthoshala Bridge (Meghna River)	1.0	4	
33		Charkhali Bridge (Kocha River)	1.0	4	
34		2nd Postogola Bridge (Dhalweshwari River)	0.9	4	
35		Postogola (Parallal to 1st Bangladesh China Friendship Bridge) (Burig	0.8	4	
36		Kamrangir Char (Buriganga River)	0.8	4	
37		AK khan Economic Zone Bridge/ Danga Bridge (Shitalakhshya River)	0.8	4	
38		Aatharobeki Bridge (Aatharobeki River)	0.8	4	
39		Rampal Bridge (Mongla River)	0.8	4	
40		Aamrajhuri Bridge (Gabkhan/Sandha River)	0.8	4	
41		Shreeramkathi Bridge (Kaliganga River)	0.7	4	
42		Swarupkathi Bridge (Shondha River)	0.7	4	
43		2nd Basila Bridge (Turag River)	0.7	4	
44		Shomeshwary Bridge (Shomeshwary River)	0.6	4	
45		Balikhola Bridge (Dhonu River)	0.6	4	
46		2nd Brahmaputra Bridge (Brahmaputra River)	0.6	4	
47		Mohajon Borodia Bridge (Nabaganga/ Madhumati River)	0.6	4	
48		Boktaboli Bridge (Dhalweshwari River)	0.5	4	
49		Boroibari Bridge (Dhonu River)	0.5	4	
50		Jayganj Bridge (Korotoa River)	0.5	4	

Source: JICA Survey Team

5.2.2 BBA's Needs

Projects to be included in the long list were determined based on the analysis of BBA Bridge Master Plan and discussion/interview with BBA. Priority project list according to the BBA's needs is shown in Table 5.2.2.

Table 5.2.2 Priority Project List according to BBA's Needs

No.	Project Type	Project	Length (km)	Number of Lane	Source
1	Bridge	Meghna Bridge (Shariatpur – Chandpur Road)	6	4	List provided by BBA in September, 2022
2		Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)	6	4	
3		Kalabador and Tetulia Bridges (Barisal – Bhola Road)	10	4	
4		Jamuna Bridge (Chilmari-Rowmari Road)	10	4	
5		Karkhana Bridge (Bakerganj – Bauphal Road)	2	4	
6		Jamuna Multimodal Road-Rail Tunnel (Balashi, Gaibandha)	12	4	
7		Payra Bridge (Patuakhali – Amtali – Barguna Road)	3	4	
8		Bishkhali Bridge (R880 Barguna – Kakchira Road)	3	4	
9		Cox's Bazar – Moheshkhali Bridge/Tunnel	3	4	
10		Megha-Dhonagoda River Bridge (Matlab Uttar-Gazaria Road)	2	4	

Source: JICA Survey Team

5.2.3 DTCA's Needs

Projects to be included in the long list were determined based on the analysis of RSTP (Revised Strategic Transport Plan for Dhaka) and discussion/interview with DTCA. Priority project list according to the DTCA's needs is shown in Table 5.2.3.

Table 5.2.3 Priority Project List according to DTCA's Needs

No.	Project Type	Project	Length (km)	Number of Lane	Source
1	Road	Dhaka Inner Ring Road (East: N3-N1)	31	4	Revised Strategic Transport Plan for Dhaka
2		Dhaka Inner Ring Road (04: N1 (R110 – Kanchipur Bridge)	9	4	
3		Dhaka Inner Ring Road (Western Section)	34	4	
4		Dhaka Outer Ring Road (North-1: N3-N5)	10	4	
5		Dhaka Outer Ring Road (North-2: N5)	15	4	
6		Dhaka Outer Ring Road (South-1: N5-N8)	21	4	
7		Dhaka Outer Ring Road (South-2: N8 – 3rd Shitalakhya Bridge)	20	4	
8		Dhaka Outer Ring Road (South-3: 3rd Shitalakhya Bridge – N1)	13	4	
9		N1 Grade-separation (Madanpur)	3	1	
10	Tunnel	Jahangir Gate Underpass	2	4	
11	Road	R504 (Hemayetpur～Manikganj)	32	4	

Source: JICA Survey Team

5.2.4 CDA's Needs

Projects to be included in the long list were determined based on the analysis of Detailed Area Plan and discussion/interview with CDA. Priority project list according to the CDA's needs is shown in Table 5.2.4.

Table 5.2.4 Priority Project List according to CDA's Needs

No.	Project Type	Project	Length (km)	Number of Lane	Source
1	Road	Chattogram Outer Ring Road	3	4	List provided by CDA in September, 2022
2		Riverside Road (branch of Karnaphuli River)	6	4	
3		Riverside Road (left bank of Karnaphuli River)	18	4	
4		N1-N106 Connector Road (Hatazari)	9	4	
5		Viaduct (Right bank of Karnaphuli River)	4	4	
6	Bridge	Karnaphuli Bridge (Barrik Building - Proposed Second Town)	1.3	4	
7		N107 Karnaphuli Bridge	0.8	4	

Source: JICA Survey Team

5.3 Project Long List

Long List was prepared based on the needs of Bangladesh project implementation agencies. It was also confirmed if each project meets the following screening criteria.

- Projects strengthening the Asian Highways and international economic corridors
- Projects strengthening the road network in Bangladesh by eliminating missing links
- Projects strengthening the road network by increasing road capacity in sections with high traffic demand
- Projects contributing to ensuring redundancy and to enhancing resilience of the road network in the event of disaster
- Projects relieving traffic congestion in urban areas
- Projects securing and strengthening linkages with national, urban and regional development areas
- Projects consistent with Japanese Country Assistance Policy for Bangladesh and having positive synergy with other Japanese ODA projects
- Projects promoting/contributing foreign direct investment to Bangladesh

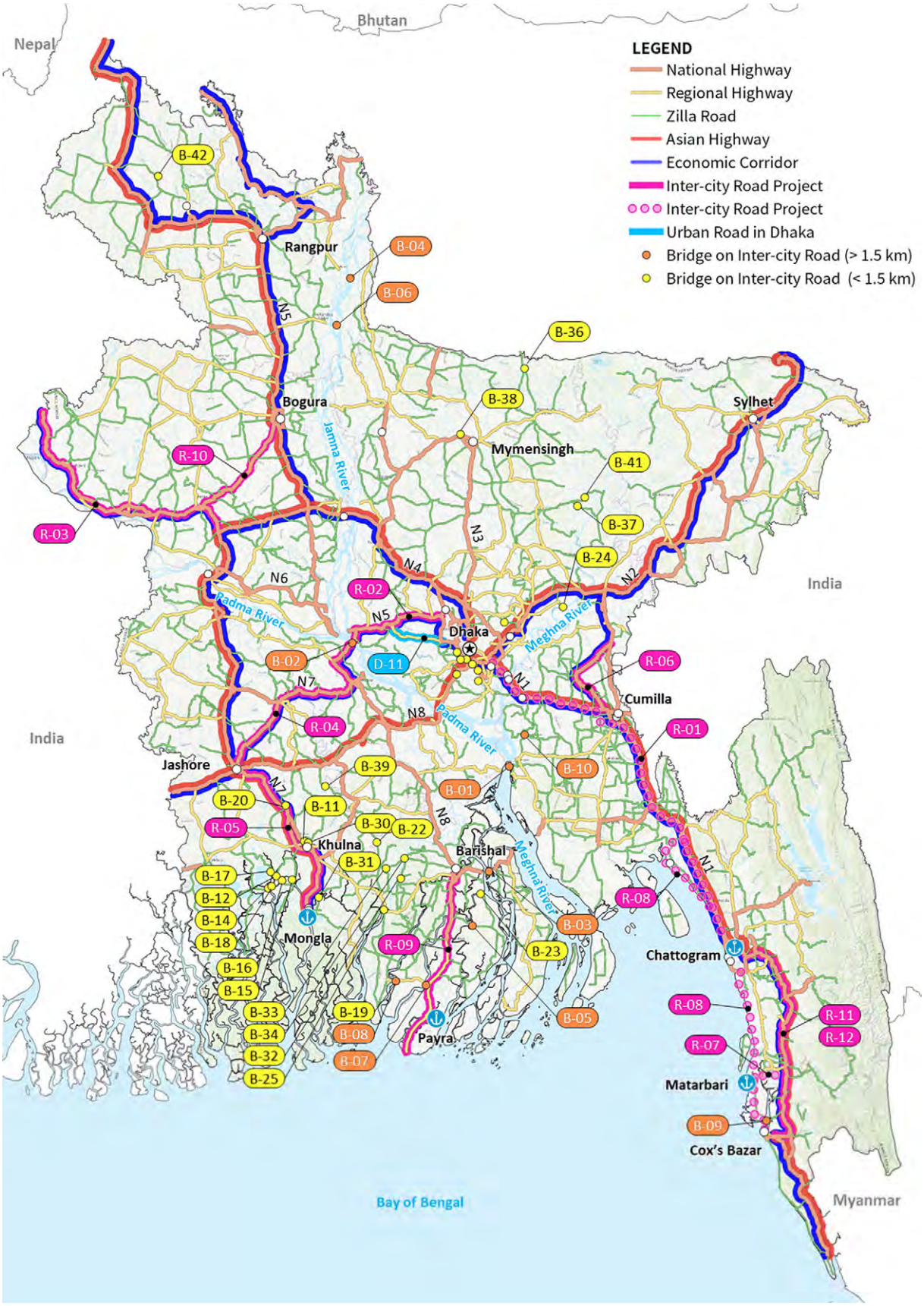
Project long list is shown in Table 5.3.1, and the location maps are shown in Figure 5.3.1, Figure 5.3.2 and Figure 5.3.3.

Table 5.3.1 Project Long List

No.	Project Type	ID	Project	Length (km)	Number of Lane
1	Inter-city Road	R-01 (1)	Dhaka – Chattogram Expressway (Dhaka - Cumilla)	100	4
2		R-01 (2)	Dhaka – Chattogram Expressway (Cumilla - Feni)	45	4
3		R-01 (3)	Dhaka – Chattogram Expressway (Feni - Chattogram)	72	4
4		R-02	N5 Dhaka - Paturia	57	4
5		R-03	N6 Natore - Sona Masjid	130	4
6		R-04	N7 Daulatdia – Magura - Jashore	118	4
7		R-05	N7 Jashore - Mongla	100	4
8		R-06	N102 (N1: Moynamoti～N2: Kutta)	80	4
9		R-07	Matarbari Port Access Road (Phase 2)	26	2
10		R-08 (1)	Marine Drive (Mirsharai – Chattogram)	65	4
11		R-08 (2)	Marine Drive (Chattogram – Matarbari)	50	4
12		R-08 (3)	Marine Drive (Matarbari – Cox's Bazar)	50	4
13		R-09	N8/R880/881 Barisal - Patuakhali - Kuakata Road	110	4
14		R-10	N502/N6 Bogura - Natore - Bonpara Road	80	4
15		R-11 (1)	Chattogram – Cox's Bazar Expressway (Chattogram - Chakaria)	85	4
16		R-11 (2)	Chattogram – Cox's Bazar Expressway (Chakaria - Cox's Bazar)	47	4
17		R-12 (1)	N1 Chattogram - Chakaria	85	4
18		R-12 (2)	N1 Chakaria - Cox's Bazar	47	4
19	Bridge on Inter-city Road	B-01	Meghna Bridge (Shariatpur – Chandpur Road)	6	4
20		B-02	Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)	6	4
21		B-03	Kalabador and Tetulia Bridges (Barisal – Bhola Road)	10	4
22		B-04	Jamuna Bridge (Chilmari-Rowmari Road)	10	4
23		B-05	Karkhana Bridge (Bakerganj – Bauphal Road)	2	4
24		B-06	Jamuna Multimodal Road-Rail Tunnel (Balashi, Gaibandha)	12	4
25		B-07	Payra Bridge (Patuakhali – Amtali – Barguna Road)	3	4
26		B-08	Bishkhali Bridge (R880 Barguna – Kakchira Road)	3	4
27		B-09	Cox's Bazar – Moheshkhali Bridge/Tunnel	3	4
28		B-10	Megha-Dhonagoda River Bridge (Matlab Uttar-Gazaria Road)	2	4
29		B-11	Jailkhana Ghat Bridge (Bhairab/ Rupsha River)	1.4	4
30		B-12	Phulbari Bridge (Bhodra River)	1.4	4
31		B-13	Swarighat Bridge (Buriganga River)	1.3	4
32		B-14	Delutia Bridge (Shibsa River)	1.3	4
33		B-15	Jhopjhopia Bridge (Jhopjhopia River)	1.2	4
34		B-16	Laxmikhola Bridge (Bhodra River)	1.2	4
35		B-17	Shundarmohol Bridge (Gangrail River)	1.2	4
36		B-18	Darulmollik Bridge (Shibsa River)	1.2	4
37		B-19	Bishkhali Bridge (Bishkhali River)	2.0	4
38		B-20	Shekirhat Bridge (Bhairab River)	1.2	4
39		B-21	Kunda Bridge (Dhalweshwari)	1.1	4
40		B-22	Atulnagar Bridge (Kaliganga River)	1.0	4
41		B-23	Matubborhat (Karkhana River)	1.0	4
42		B-24	Panthoshala Bridge (Meghna River)	1.0	4
43		B-25	Charkhali Bridge (Kocha River)	1.0	4
44		B-26	2nd Postogola Bridge (Dhalweshwari River)	0.9	4
45		B-27	Postogola (Parallal to 1st Bangladesh China Friendship Bridge) (Burig	0.8	4
46		B-28	Kamrangir Char (Buriganga River)	0.8	4
47		B-29	AK khan Economic Zone Bridge/ Danga Bridge (Shitalakhshya River)	0.8	4
48		B-30	Aatharobeki Bridge (Aatharobeki River)	0.8	4

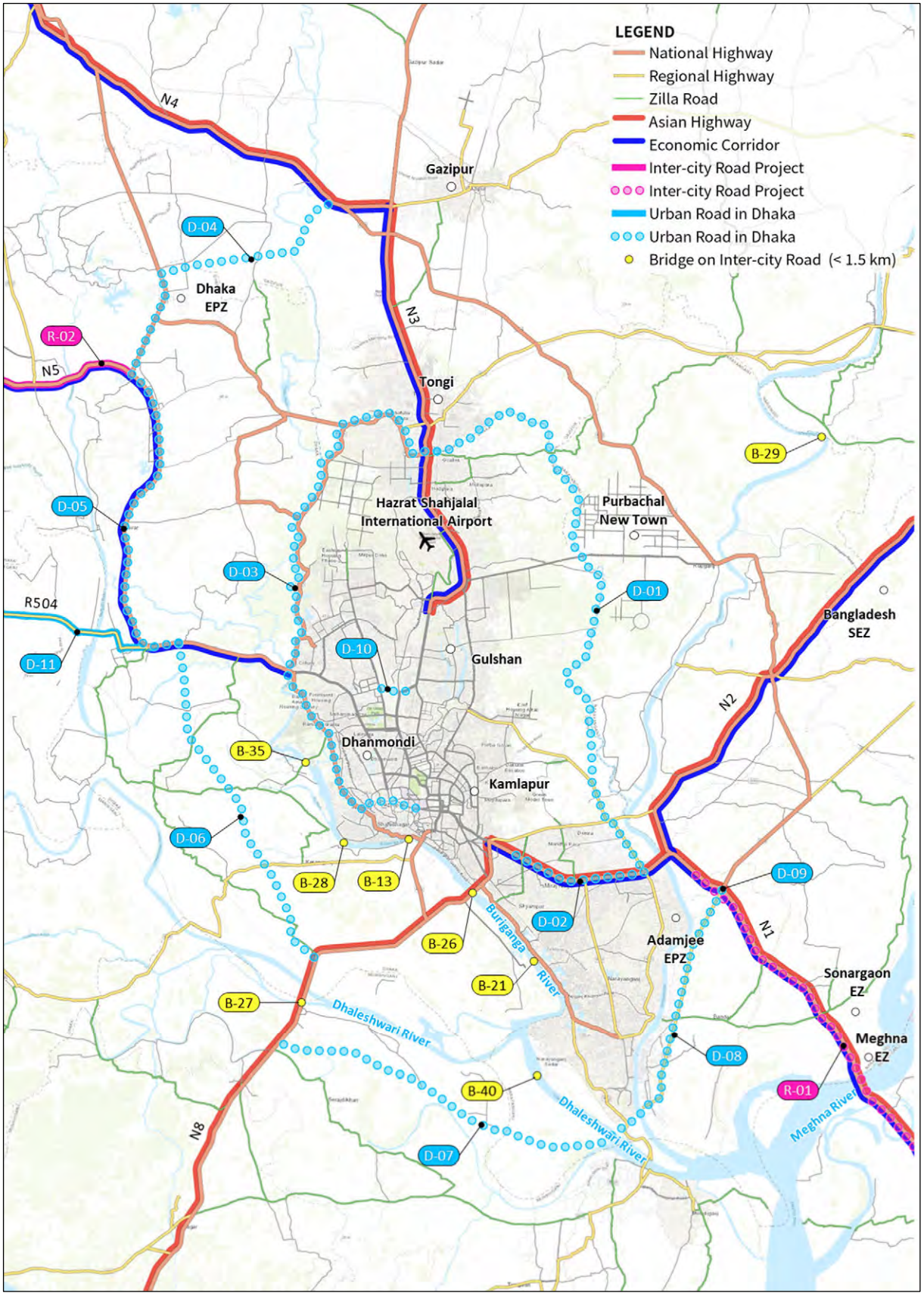
49	Bridge on Inter-city Road	B-31	Rampal Bridge (Mongla River)	0.8	4
50		B-32	Aamrajhuri Bridge (Gabkhan/Sandha River)	0.8	4
51		B-33	Shreeramkathi Bridge (Kaliganga River)	0.7	4
52		B-34	Swarupkathi Bridge (Shondha River)	0.7	4
53		B-35	2nd Basila Bridge (Turag River)	0.7	4
54		B-36	Shomeshwary Bridge (Shomeshwary River)	0.6	4
55		B-37	Balikhola Bridge (Dhonu River)	0.6	4
56		B-38	2nd Brahmaputra Bridge (Brahmaputra River)	0.6	4
57		B-39	Mohajon Borodia Bridge (Nabaganga/ Madhumati River)	0.6	4
58		B-40	Boktaboli Bridge (Dhalweshwari River)	0.5	4
59		B-41	Boroibari Bridge (Dhonu River)	0.5	4
60		B-42	Jayganj Bridge (Korotoa River)	0.5	4
61	Urban Road & Bridge in Dhaka	D-01	Dhaka Inner Ring Road (East: N3-N1)	31	4
62		D-02	Dhaka Inner Ring Road (04: N1 (R110 – Kanchipur Bridge)	9	4
63		D-03	Dhaka Inner Ring Road (Western Section)	34	4
64		D-04	Dhaka Outer Ring Road (North-1: N3-N5)	10	4
65		D-05	Dhaka Outer Ring Road (North-2: N5)	15	4
66		D-06	Dhaka Outer Ring Road (South-1: N5-N8)	21	4
67		D-07	Dhaka Outer Ring Road (South-2: N8 – 3rd Shitalakhya Bridge)	20	4
68		D-08	Dhaka Outer Ring Road (South-3: 3rd Shitalakhya Bridge – N1)	13	4
69		D-09	N1 Grade-separation (Madanpur)	3	1
70		D-10	Jahangir Gate Underpass	2	4
71		D-11	R504 (Hemayetpur～Manikganj)	32	4
72	Urban Road & Bridge in Chattogram	C-01	Chattogram Outer Ring Road	3	4
73		C-02	Riverside Road (branch of Karnaphuli River)	6	4
74		C-03	Riverside Road (left bank of Karnaphuli River)	18	4
75		C-04	N1-N106 Connector Road (Hatazari)	9	4
76		C-05	Viaduct (Right bank of Karnaphuli River)	4	4
77		C-06	Karnaphuli Bridge (Barrik Building - Proposed Second Town)	1.3	4
78		C-07	N107 Karnaphuli Bridge	0.8	4

Source: JICA Survey Team



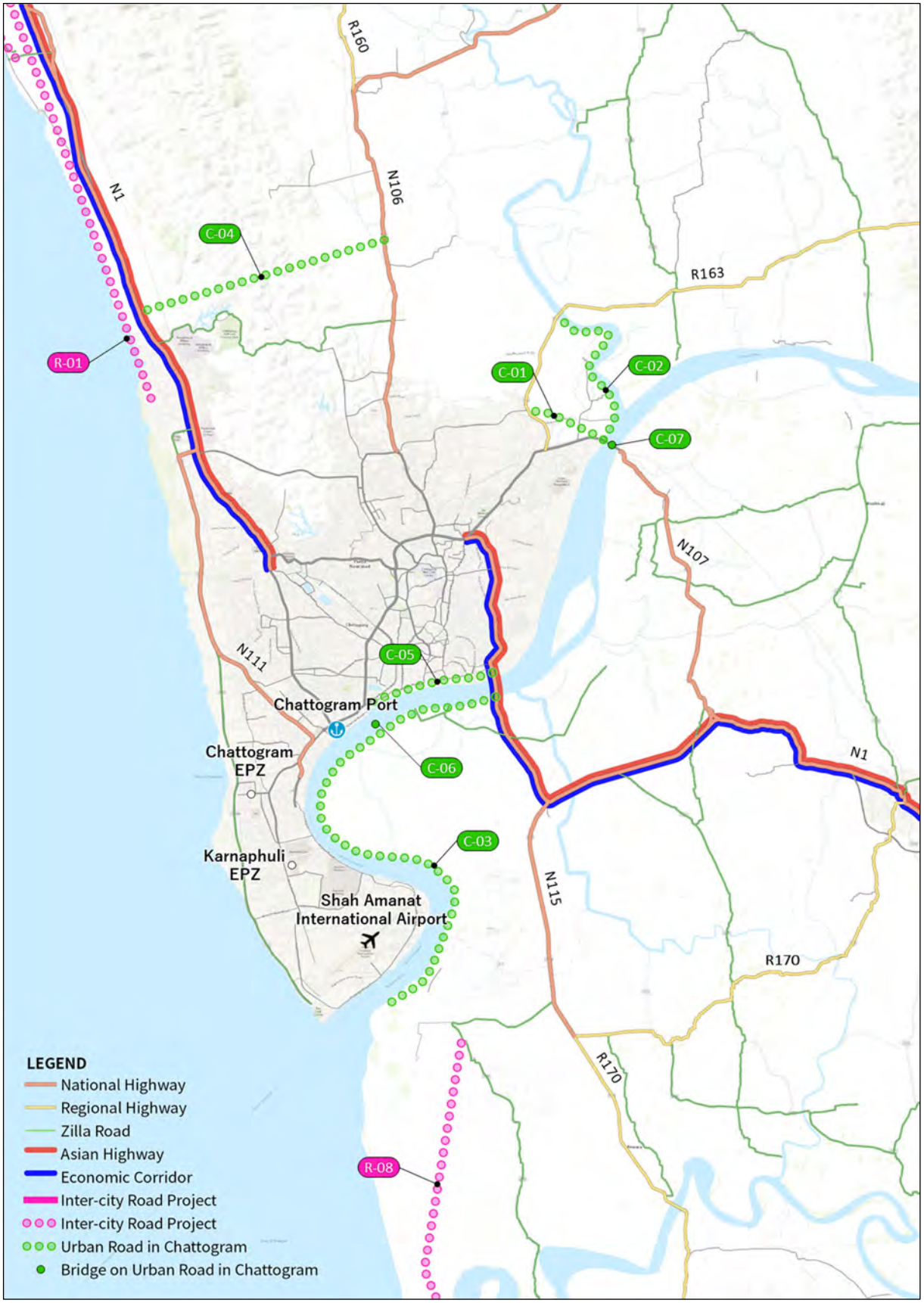
Source: JICA Survey Team

Figure 5.3.1 Location Map of the Long List (Nationwide)



Source: JICA Survey Team

Figure 5.3.2 Location Map of the Long List (Dhaka)



Source: JICA Survey Team

Figure 5.3.3 Location Map of the Long List (Chattogram)

5.4 Project Short List

5.4.1 Multi-criteria Evaluation

Each project in the long list was scored by the multi-criteria evaluation. Mult-criteria was prepared for both inter-city road / bridge project evaluation and urban road / bridge project evaluation, as inter-city road / bridge and urban road / bridge are required to have different functions. Mult-criteria for inter-city road / bridge project evaluation and those for urban road / bridge project evaluation are shown in Table 5.4.1 and Table 5.4.2, respectively.

Table 5.4.1 Multi-criteria Evaluation for Inter-city Road / Bridge Project

Evaluation Item	Evaluation Index	Point
1. mportance by Functional Road Level	Eliminating missing link, reliving traffic congestion or Ensuring redundancy & enhancing resilience of the following functional road level: A: Important Corridor B: National-level trunk Road C: Regional-level trunk Road D: District-level trunk Road E: Local-level Road	20
2. Traffic Demand	Future traffic volume in 2035 A: Over 60,000 PCU/day B: 40,000 - 60,000 PCU/day C: 20,000 - 40,000 PCU/day D: 10,000 - 20,000 PCU/day E: Less than 10,000 PCU/day	10
3. Economic Efficiency	Traffic volume (PCU/day) x Travel time saving (min) / Construction cost (million JPY) A: Over 40 PCU·min/day/mil.JPY B: 30 - 40 PCU·min/day/mil.JPY C: 20 - 30 PCU·min/day/mil.JPY D: 10 - 20 PCU·min/day/mil.JPY E: Less than 10 PCU·min/day/mil.JPY	20
4. Natural Environmental Considerations	Existence of Conservation Area in the project site such as ECA (Ecologically Critical Area), NP (National Park) and KBA (Key Biodiversity Area) A: No ECA, NP or KBA C: Located in KBA E: Located in ECA or NP	15
5. Social Environment Considerations	Scale of Affected House Holds (HHs) A: Less than 50 HHs B: 50 - 200 HHs C: 200 - 500 HHs D: 500 - 1000 HHs E: Over 1000 HHs	15
6. Consistency with JICA's Cooperation Policy	Number of matchings with following conditions 1. Application of advanced technologies 2. Contributing foreign direct investment to Bangladesh 3. Positive synergy with other Japanese ODA projects 4. Visibility of the project as bilateral cooperation project A: Match with 4 conditions B: Match with 3 conditions C: Match with 2 conditions D: Match with 1 condition E: No match	20
Total		**100**

Note: Total score = Point x Evaluation (A: 1, B: 0.75. C: 0.5, D: 0.25, E: 0)

Source: JICA Survey Team

Table 5.4.2 Multi-criteria Evaluation for Urban Road / Bridge Project

Evaluation Item	Evaluation Index	Point
1. Reliving traffic congestion in Urban Area	Type of project in urban area A: Elimination of Through Traffic from Urban Area C: Distribution of Local Traffic in Urban Area E: Spot Traffic Improvement	20
2. Traffic Demand	Future traffic volume in 2035 A: Over 60,000 PCU/day B: 40,000 - 60,000 PCU/day C: 20,000 - 40,000 PCU/day D: 10,000 - 20,000 PCU/day E: Less than 10,000 PCU/day	10
3. Economic Efficiency	Traffic volume (PCU/day) x Travel time saving (min) / Construction cost (million JPY) A: Over 40 PCU·min/day/mil.JPY B: 30 - 40 PCU·min/day/mil.JPY C: 20 - 30 PCU·min/day/mil.JPY D: 10 - 20 PCU·min/day/mil.JPY E: Less than 10 PCU·min/day/mil.JPY	20
4. Natural Environmental Considerations	Existence of Conservation Area in the project site such as ECA (Ecologically Critical Area), NP (National Park) and KBA (Key Biodiversity Area) A: No ECA, NP or KBA C: Located in KBA E: Located in ECA or NP	15
5. Social Environment Considerations	Scale of Affected House Holds (HHs) A: Less than 50 HHs B: 50 - 200 HHs C: 200 - 500 HHs D: 500 - 1000 HHs E: Over 1000 HHs	15
6. Consistency with JICA's Cooperation Policy	Number of matchings with following conditions 1. Application of advanced technologies 2. Contributing foreign direct investment to Bangladesh 3. Positive synergy with other Japanese ODA projects 4. Visibility of the project as bilateral cooperation project A: Match with 4 conditions B: Match with 3 conditions C: Match with 2 conditions D: Match with 1 condition E: No match	20
Total		**100**

Note: Total score = Point x Evaluation (A: 1, B: 0.75. C: 0.5, D: 0.25, E: 0)

Source: JICA Survey Team

Traffic volume, construction cost and travel time saving in the evaluation were calculated as follows.

(1) Traffic Volume

Where traffic volume for 2035 was forecasted in the existing feasibility studies from RSTP and BBA, those traffic volume was used for the multi-criteria evaluation.

Where traffic volume has not been forecasted for the project, traffic volume for each project was calculated based on the RHD traffic count survey result in 2021, population forecast by Divisions for 2035 and the relationship between increase of population and increase of trip stated in RSTP.

For new bridge construction projects, the traffic volume after bridge construction was calculated based on the relationship between traffic volume before project implementation and the forecast in 2035 of Padama Bridge Project.

(2) Construction Cost

Construction cost was calculated in reference to the unit price of major construction items such as civil work, concrete bridge, steel bridge, etc. shown in the recently prepared existing feasibility study for road / bridge development project, namely Preparatory Survey on the Matarbari Port Development (Access Road Development) (JICA, 2018).

(3) Travel Time Saving

Travel time saving for each project was calculated with the following assumptions.

- At present, vehicles can drive with average speed of 30 km/h in National Highway, 20 km/h in Regional Highway and 5 km/h at river crossing by using ferry.
- By implementing the project, vehicles can drive with average speed of 80 km/h in Expressway, 60 km/h in National Highway, 40 km/h in Regional Highway.

5.4.2 Scoring

Scoring by the multi-criteria evaluation for inter-city road / bridge project and urban road / bridge project is shown in Table 5.4.3 and Table 5.4.4, respectively.

Table 5.4.3 Scoring for Inter-city Road / Bridge Project

	Project		Importance by Functional Road Level	Traffic Demand	Economic Efficiency	Natural Environmental Considerations	Social Environmental Considerations	Consistency with JICA's Cooperation Policy	Score	Rank	Sector-wise Rank
		Point	20	10	20	15	15	20	100		
1	R-01 (1) Dhaka – Chattogram Expressway (Dhaka - Cumilla)	Evaluation	A	A	C	A	E	B			
		Score	**20**	**10**	**10**	**15**	**0**	**15**	**70**	**5**	**3**
2	R-01 (2) Dhaka – Chattogram Expressway (Cumilla - Feni)	Evaluation	A	B	C	A	D	B			
		Score	**20**	**7.5**	**10**	**15**	**3.75**	**15**	**71.25**	**4**	**2**
3	R-01 (3) Dhaka – Chattogram Expressway (Feni - Chattogram)	Evaluation	A	B	C	A	E	B			
		Score	**20**	**7.5**	**10**	**15**	**0**	**15**	**67.5**	**6**	**4**
4	R-02 N5 Dhaka - Paturia	Evaluation	A	C	C	A	E	E			
		Score	**20**	**5**	**10**	**15**	**0**	**0**	**50**	**23**	**9**
5	R-03 N6 Natore - Sona Masjid	Evaluation	A	C	D	A	E	E			
		Score	**20**	**5**	**5**	**15**	**0**	**0**	**45**	**33**	**12**
6	R-04 N7 Daulatdia – Magura - Jashore	Evaluation	A	C	C	A	E	E			
		Score	**20**	**5**	**10**	**15**	**0**	**0**	**50**	**23**	**9**
7	R-05 N7 Jashore - Mongla	Evaluation	A	C	D	A	E	D			
		Score	**20**	**5**	**5**	**15**	**0**	**5**	**50**	**23**	**9**
8	R-06 N102 (N1: Moynamoti～N2: Kutta)	Evaluation	A	D	D	A	E	E			
		Score	**20**	**2.5**	**5**	**15**	**0**	**0**	**42.5**	**39**	**13**
9	R-07 Matarbari Port Access Road (Phase 2)	Evaluation	A	D	E	A	A	B			
		Score	**20**	**2.5**	**0**	**15**	**15**	**15**	**67.5**	**6**	**4**
10	R-08 (1) Marine Drive (Mirsharai – Chattogram)	Evaluation	B	D	E	A	E	C			
		Score	**15**	**2.5**	**0**	**15**	**0**	**10**	**42.5**	**39**	**13**
11	R-08 (2) Marine Drive (Chattogram – Matarbari)	Evaluation	B	D	E	A	E	C			
		Score	**15**	**2.5**	**0**	**15**	**0**	**10**	**42.5**	**39**	**13**
12	R-08 (3) Marine Drive (Matarbari – Cox's Bazar)	Evaluation	B	D	E	A	E	C			
		Score	**15**	**2.5**	**0**	**15**	**0**	**10**	**42.5**	**39**	**13**
13	R-09 N8/R880/881 Barisal - Patuakhali - Kuakata Road	Evaluation	B	C	D	A	E	E			
		Score	**15**	**5**	**5**	**15**	**0**	**0**	**40**	**45**	**17**
14	R-10 N502/N6 Bogura - Natore - Bonpara Road	Evaluation	B	D	D	A	E	E			
		Score	**15**	**2.5**	**5**	**15**	**0**	**0**	**37.5**	**53**	**18**
15	R-11 (1) Chattogram – Cox's Bazar Expressway (Chattogram - Chakaria)	Evaluation	A	B	C	A	E	B			
		Score	**20**	**7.5**	**10**	**15**	**0**	**15**	**67.5**	**6**	**4**
16	R-11 (2) Chattogram – Cox's Bazar Expressway (Chakaria - Cox's Bazar)	Evaluation	A	C	D	A	D	B			
		Score	**20**	**5**	**5**	**15**	**3.75**	**15**	**63.75**	**13**	**8**
17	R-12 (1) N1 Chattogram - Chakaria	Evaluation	A	B	B	A	E	B			
		Score	**20**	**7.5**	**15**	**15**	**0**	**15**	**72.5**	**3**	**1**
18	R-12 (2) N1 Chakaria - Cox's Bazar	Evaluation	A	C	C	A	E	B			
		Score	**20**	**5**	**10**	**15**	**0**	**15**	**65**	**10**	**7**
19	B-01 Meghna Bridge (Shariatpur – Chandpur Road)	Evaluation	B	C	D	A	C	C			
		Score	**15**	**5**	**5**	**15**	**7.5**	**10**	**57.5**	**16**	**8**
20	B-02 Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)	Evaluation	A	A	A	A	B	B			
		Score	**20**	**10**	**20**	**15**	**11.25**	**15**	**91.25**	**1**	**1**
21	B-03 Kalabador and Tetulia Bridges (Barisal – Bhola Road)	Evaluation	B	C	C	A	D	C			
		Score	**15**	**5**	**10**	**15**	**3.75**	**10**	**58.75**	**15**	**7**
22	B-04 Jamuna Bridge (Chilmari-Rowmari Road)	Evaluation	C	B	C	C	B	C			
		Score	**10**	**7.5**	**10**	**7.5**	**11.25**	**10**	**56.25**	**17**	**9**
23	B-05 Karkhana Bridge (Bakerganj – Bauphal Road)	Evaluation	D	D	D	A	B	C			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**10**	**48.75**	**27**	**16**
24	B-06 Jamuna Multimodal Road-Rail Tunnel (Balashi, Gaibandha)	Evaluation	C	D	E	C	C	C			
		Score	**10**	**2.5**	**0**	**7.5**	**7.5**	**10**	**37.5**	**53**	**36**
25	B-07 Payra Bridge (Patuakhali – Amtali – Barguna Road)	Evaluation	D	C	C	A	B	C			
		Score	**5**	**5**	**10**	**15**	**11.25**	**10**	**56.25**	**17**	**9**
26	B-08 Bishkhali Bridge (R880 Barguna – Kakchira Road)	Evaluation	D	C	C	A	C	C			
		Score	**5**	**5**	**10**	**15**	**7.5**	**10**	**52.5**	**20**	**12**
27	B-09 Cox's Bazar – Moheshkhali Bridge/Tunnel	Evaluation	B	D	C	A	A	A			
		Score	**15**	**2.5**	**10**	**15**	**15**	**20**	**77.5**	**2**	**2**
28	B-10 Megha-Dhonagoda River Bridge (Matlab Uttar-Gazaria Road)	Evaluation	D	D	D	A	A	C			
		Score	**5**	**2.5**	**5**	**15**	**15**	**10**	**52.5**	**20**	**12**
29	B-11 Jailkhana Ghat Bridge (Bhairab/ Rupsha River)	Evaluation	D	D	D	A	B	D			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
30	B-12 Phulbari Bridge (Bhodra River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**
31	B-13 Swarighat Bridge (Buriganga River)	Evaluation	C	C	E	A	D	D			
		Score	**10**	**5**	**0**	**15**	**3.75**	**5**	**38.75**	**52**	**35**
32	B-14 Delutia Bridge (Shibsa River)	Evaluation	E	E	E	A	A	D			
		Score	**0**	**0**	**0**	**15**	**15**	**5**	**35**	**56**	**38**
33	B-15 Jhopjhopia Bridge (Jhopjhopia River)	Evaluation	D	D	D	A	A	D			
		Score	**5**	**2.5**	**5**	**15**	**15**	**5**	**47.5**	**28**	**17**
34	B-16 Laxmikhola Bridge (Bhodra River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**
35	B-17 Shundarmohol Bridge (Gangrail River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**

	Project		Importance by Functional Road Level	Traffic Demand	Economic Efficiency	Natural Environmental Considerations	Social Environmental Considerations	Consistency with JICA's Cooperation Policy	Score	Rank	Sector-wise Rank
		Point	20	10	20	15	15	20	100		
36 B-18	Darulmollik Bridge (Shibsa River)	Evaluation	E	E	E	A	A	D			
		Score	**0**	**0**	**0**	**15**	**15**	**5**	**35**	**56**	**38**
37 B-19	Bishkhali Bridge (Bishkhali River)	Evaluation	D	C	C	A	C	C			
		Score	**5**	**5**	**10**	**15**	**7.5**	**10**	**52.5**	**20**	**12**
38 B-20	Shekirhat Bridge (Bhairab River)	Evaluation	E	E	E	A	B	D			
		Score	**0**	**0**	**0**	**15**	**11.25**	**5**	**31.25**	**60**	**42**
39 B-21	Kunda Bridge (Dhalweshwari)	Evaluation	C	D	E	A	B	D			
		Score	**10**	**2.5**	**0**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
40 B-22	Atulnagar Bridge (Kaliganga River)	Evaluation	E	E	B	A	A	D			
		Score	**0**	**0**	**15**	**15**	**15**	**5**	**50**	**23**	**15**
41 B-23	Matubborhat (Karkhana River)	Evaluation	D	E	A	A	A	D			
		Score	**5**	**0**	**20**	**15**	**15**	**5**	**60**	**14**	**6**
42 B-24	Panthoshala Bridge (Meghna River)	Evaluation	D	D	D	A	A	D			
		Score	**5**	**2.5**	**5**	**15**	**15**	**5**	**47.5**	**28**	**17**
43 B-25	Charkhali Bridge (Kocha River)	Evaluation	C	C	C	A	A	C			
		Score	**10**	**5**	**10**	**15**	**15**	**10**	**65**	**10**	**4**
44 B-26	2nd Postogola Bridge (Dhalweshwari River)	Evaluation	A	A	D	A	C	C			
		Score	**20**	**10**	**5**	**15**	**7.5**	**10**	**67.5**	**6**	**3**
45 B-27	Postogola (Parallal to 1st Bangladesh China Friendship Bridge) (Buriganga	Evaluation	A	C	E	A	A	C			
		Score	**20**	**5**	**0**	**15**	**15**	**10**	**65**	**10**	**4**
46 B-28	Kamrangir Char (Buriganga River)	Evaluation	D	C	C	A	C	D			
		Score	**5**	**5**	**10**	**15**	**7.5**	**5**	**47.5**	**28**	**17**
47 B-29	AK khan Economic Zone Bridge/ Danga Bridge (Shitalakhshya River)	Evaluation	D	E	D	A	B	D			
		Score	**5**	**0**	**5**	**15**	**11.25**	**5**	**41.25**	**44**	**28**
48 B-30	Aatharobeki Bridge (Aatharobeki River)	Evaluation	D	C	C	A	A	D			
		Score	**5**	**5**	**10**	**15**	**15**	**5**	**55**	**19**	**11**
49 B-31	Rampal Bridge (Mongla River)	Evaluation	D	D	D	A	B	D			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
50 B-32	Aamrajhuri Bridge (Gabkhan/Sandha River)	Evaluation	D	D	D	A	B	D			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
51 B-33	Shreeramkathi Bridge (Kaliganga River)	Evaluation	D	E	E	A	B	D			
		Score	**5**	**0**	**0**	**15**	**11.25**	**5**	**36.25**	**55**	**37**
52 B-34	Swarupkathi Bridge (Shondha River)	Evaluation	D	D	D	A	C	D			
		Score	**5**	**2.5**	**5**	**15**	**7.5**	**5**	**40**	**45**	**29**
53 B-35	2nd Basila Bridge (Turag River)	Evaluation	D	D	E	A	C	D			
		Score	**5**	**2.5**	**0**	**15**	**7.5**	**5**	**35**	**56**	**38**
54 B-36	Shomeshwary Bridge (Shomeshwary River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**
55 B-37	Balikhola Bridge (Dhonu River)	Evaluation	D	D	D	A	A	D			
		Score	**5**	**2.5**	**5**	**15**	**15**	**5**	**47.5**	**28**	**17**
56 B-38	2nd Brahmaputra Bridge (Brahmaputra River)	Evaluation	D	D	E	A	A	D			
		Score	**5**	**2.5**	**0**	**15**	**15**	**5**	**42.5**	**39**	**27**
57 B-39	Mohajon Borodia Bridge (Nabaganga/ Madhumati River)	Evaluation	D	D	D	A	B	D			
		Score	**5**	**2.5**	**5**	**15**	**11.25**	**5**	**43.75**	**34**	**22**
58 B-40	Boktaboli Bridge (Dhalweshwari River)	Evaluation	D	E	E	A	C	D			
		Score	**5**	**0**	**0**	**15**	**7.5**	**5**	**32.5**	**59**	**41**
59 B-41	Boroibari Bridge (Dhonu River)	Evaluation	D	D	D	A	A	D			
		Score	**5**	**2.5**	**5**	**15**	**15**	**5**	**47.5**	**28**	**17**
60 B-42	Jayganj Bridge (Korotoa River)	Evaluation	D	E	E	A	A	D			
		Score	**5**	**0**	**0**	**15**	**15**	**5**	**40**	**45**	**29**

Note: R-12 (1) (2) will be implemented basically by widening of the existing road. However, construction of bypass will be required for some locations to avoid national parks along the road. “Natural Environmental Considerations” is evaluated as “A” considering the construction of bypass.

Source: JICA Survey Team

Table 5.4.4 Scoring for Urban Road / Bridge Project

Project			Importance by Functional Road Level	Traffic Demand	Economic Efficiency	Natural Environmental Considerations	Social Environmental Considerations	Consistency with JICA's Cooperation Policy	Score	Rank
		Point	20	10	20	15	15	20	100	
61 D-01	Dhaka Inner Ring Road (East: N3-N1)	Evaluation	A	A	C	A	D	C		
		Score	**20**	**10**	**10**	**15**	**3.75**	**10**	**68.75**	**9**
62 D-02	Dhaka Inner Ring Road (04: N1 (R110 – Kanchipur Bridge)	Evaluation	A	A	B	A	D	C		
		Score	**20**	**10**	**15**	**15**	**3.75**	**10**	**73.75**	**5**
63 D-03	Dhaka Inner Ring Road (Western Section)	Evaluation	A	A	B	A	E	C		
		Score	**20**	**10**	**15**	**15**	**0**	**10**	**70**	**7**
64 D-04	Dhaka Outer Ring Road (North-1: N3-N5)	Evaluation	A	B	B	A	C	D		
		Score	**20**	**7.5**	**15**	**15**	**7.5**	**5**	**70**	**7**
65 D-05	Dhaka Outer Ring Road (North-2: N5)	Evaluation	A	A	A	A	D	D		
		Score	**20**	**10**	**20**	**15**	**3.75**	**5**	**73.75**	**5**
66 D-06	Dhaka Outer Ring Road (South-1: N5-N8)	Evaluation	A	B	A	A	C	D		
		Score	**20**	**7.5**	**20**	**15**	**7.5**	**5**	**75**	**1**
67 D-07	Dhaka Outer Ring Road (South-2: N8 – 3rd Shitalakhya Bridge)	Evaluation	A	B	A	A	C	D		
		Score	**20**	**7.5**	**20**	**15**	**7.5**	**5**	**75**	**1**
68 D-08	Dhaka Outer Ring Road (South-3: 3rd Shitalakhya Bridge – N1)	Evaluation	A	B	B	A	D	D		
		Score	**20**	**7.5**	**15**	**15**	**3.75**	**5**	**66.25**	**10**
69 D-09	N1 Grade-separation (Madanpur)	Evaluation	E	A	A	A	D	C		
		Score	**0**	**10**	**20**	**15**	**3.75**	**10**	**58.75**	**11**
70 D-10	Jahangir Gate Underpass	Evaluation	E	B	E	A	A	C		
		Score	**0**	**7.5**	**0**	**15**	**15**	**10**	**47.5**	**13**
71 D-11	R504 (Hemayetpur～Manikganj)	Evaluation	C	D	D	A	D	E		
		Score	**10**	**2.5**	**5**	**15**	**3.75**	**0**	**36.25**	**17**
72 C-01	Chattogram Outer Ring Road	Evaluation	A	C	D	A	B	E		
		Score	**20**	**5**	**5**	**15**	**11.25**	**0**	**56.25**	**12**
73 C-02	Riverside Road (branch of Karnaphuli River)	Evaluation	C	C	D	A	B	E		
		Score	**10**	**5**	**5**	**15**	**11.25**	**0**	**46.25**	**14**
74 C-03	Riverside Road (left bank of Karnaphuli River)	Evaluation	C	E	E	A	C	E		
		Score	**10**	**0**	**0**	**15**	**7.5**	**0**	**32.5**	**18**
75 C-04	N1-N106 Connector Road (Hatazari)	Evaluation	A	E	E	A	B	E		
		Score	**20**	**0**	**0**	**15**	**11.25**	**0**	**46.25**	**14**
76 C-05	Viaduct (Right bank of Karnaphuli River)	Evaluation	C	E	E	A	C	D		
		Score	**10**	**0**	**0**	**15**	**7.5**	**5**	**37.5**	**16**
77 C-06	Karnaphuli Bridge (Barrik Building - Proposed Second Town)	Evaluation	C	C	A	A	A	C		
		Score	**10**	**5**	**20**	**15**	**15**	**10**	**75**	**1**
78 C-07	N107 Karnaphuli Bridge	Evaluation	C	C	A	A	A	C		
		Score	**10**	**5**	**20**	**15**	**15**	**10**	**75**	**1**

Source: JICA Survey Team

5.4.3 Project Short List

Projects shown in Table 5.4.5 are selected as the short listed project, as a result of scoring by the multi-criteria evaluation.

Table 5.4.5 Project Short List

No.	Project	Note
< Inter-city Road Project >		
R-01 (1)(2)(3)	Dhaka – Chattogram Expressway	New expressway connecting Dhaka and Chattogram
R-07	Matarbari Port Access Road (Phase 2)	Widening of Matarbari port access road (Japanese ODA Project) from 2 lanes to 4 lanes
R-11 (1)	Chattogram – Cox's Bazar Expressway (Chattogram - Chakaria)	New expressway connecting Chattogram and Chakaria
R-12 (1)	N1 Chattogram – Cox's Bazar (Chattogram - Chakaria)	Widening of N1 from 2 lanes to 4 lanes between Chattogram and Chakaria (Bypass for some locations)
< Inter-city Bridge Project >		
B-02	Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)	New bridge eliminating missing link at Padma River in N5
B-09	Cox's Bazar – Moheshkhali Bridge/Tunnel	New bridge / tunnel connecting Moheshkhali (Matarbari area) and Cox's Bazar
B-25	Charkhali Bridge (Kocha River)	New bridge eliminating missing link at Kocha River in regional road
B-26	2nd Postogola Bridge (Dhalweshwari River)	New bridge Parallel to existing bridge at Dhalweshwari River in N8
B-27	Postogola (Buriganga River)	New bridge Parallel to 1st Bangladesh China Friendship Bridge at Buriganga River in N8
< Urban Road / Bridge Project >		
D-02	Dhaka Inner Ring Road (R110 – Kanchipur Bridge)	New expressway (part of inner ring road in Dhaka)
D-05	Dhaka Outer Ring Road (North-2: N5)	New expressway (part of outer ring road in Dhaka)
D-06	Dhaka Outer Ring Road (South-1: N5-N8)	New expressway (part of outer ring road in Dhaka)
D-07	Dhaka Outer Ring Road (South-2: N8 – 3rd Shitalakhya Bridge)	New expressway (part of outer ring road in Dhaka)
C-06	Karnaphuli Bridge (Barrik Building - Proposed Second Town)	New bridge at Karnaphuli River running north-south in the east of Chattogram CBD
C-07	N107 Karnaphuli Bridge	Replacement of the existing bridge (narrow 1-way bridge) at Karnaphuli River in Chattogram

Source: JICA Survey Team

5.4.4 Outline of Short Listed Projects

Projects shown in Table 5.4.5 are selected as the short listed project, as a result of scoring by the multi-criteria evaluation.

(1) Dhaka – Chattogram Expressway

1) Project Summary

- This project is implemented to construct a new expressway connecting Dhaka and Chattogram which are 2 big cities in Bangladesh.

2) Road Length

- Package 1 (Dhaka - Cumilla): About 100 km
- Package 2 (Cumilla - Feni): About 45 km
- Package 3 (Feni - Chattogram): About 72 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Near the existing National Highway No.1 in Dhaka District, Narayanganj District, Munshiganj District, Cumilla District,Feni District and Chattogram District

5) Construction Cost

- Package 1 (Dhaka - Cumilla): About 272 billion JPY
- Package 2 (Cumilla - Feni): About 123 billion JPY
- Package 3 (Feni - Chattogram): About 196 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 1,000 ha
- Resettlement: About 4.200 households
- Protected Area: The Baroiyadhala National Park is located approximately 2km to the east. There might be no negative impact to the project. However, appropriate mitigation measures will be taken if necessary.

8) Existing Studies / Designs

- Feasibility study (F/S) and detailed design (D/D) were conducted by ADB in 2015. This F/S and D/D include topographic survey, geological survey, traffic survey and environmental & social survey.

(2) Matarbari Port Access Road (Phase 2)

1) Project Summary

- This project is implemented to widen 2 lanes of Matarbari Port Access Road (Phase 1), which will be constructed as Japanese ODA Project, to 4 lanes.

2) Road Length

- About 26 km

3) Number of Lanes

- Additional 2 lanes (Totally 4 lanes)

4) Project Location

- Cox's Bazar District

5) Construction Cost

- About 33 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: B
- Land Acquisition: 0 ha (Already acquired in Phase 1)
- Resettlement: 0 household (Already resettled in Phase 1)
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- It was decided in JICA Preparatory Survey in 2018 that this road is constructed with 2 lanes in Phase 1 and 4 lanes in Phase 2. Land acquisition and resettlement are conducted for 4 lanes in Phase 1. JICA Preparatory Survey include topographic survey, geological survey, traffic survey and environmental & social survey.

(3) Chattogram – Cox's Bazar Expressway (Chattogram - Chakaria)

1) Project Summary

- This project is implemented to construct a new expressway connecting Chattogram and Chakaria in the Chattogram – Cox's Bazar Expressway.

2) Road Length

- About 85 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Near the existing National Highway No.1 in Chattogram District and Cox's Bazar District

5) Construction Cost

- About 232 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 340 ha
- Resettlement: About 1,600 households
- Protected Area: Chunati Wildlife Sanctuary is located along N1, and alignment requires to avoid the protected area.

8) Existing Studies / Designs

- This project is being considered to be included in Bangladesh-Japan Joint PPP Platform.
- BUET conducted Feasibility Study (F/S) for RHD in 2022. "To utilize existing road as much as possible", "To construct fully access controlled expressway" and "To secure at least 6 lanes" ware recommended in the F/S.

(4) N1 Chattogram – Cox's Bazar (Chattogram - Chakaria)

1) Project Summary

- This project is implemented to upgrade existing National Highway No.1 between Chattogram and Chakaria.

2) Road Length

- About 85 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Along the existing National Highway No.1 in Chattogram District and Cox's Bazar District

5) Construction Cost

- About 121 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 255 ha
- Resettlement: About 1,900 households
- Protected Area: Chunati Wildlife Sanctuary is located along N1, and bypass is required in some sections to avoid the protected area.

8) Existing Studies / Designs

- Feasibility Study (F/S) was conducted by ADB-TA (Subregional Transport Project Preparatory Facility Program) in 2014.
- JICA Preparatory Survey was conducted for upgrading some intersections in N1 in 2022.

(5) Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)

1) Project Summary

- This project is implemented to construct a new bridge or tunnel across Padma River near Paturia.

2) Road Length (including bridge and access road)

- About 6 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Manikganj District and Rajbari District

5) Construction Cost

- About 102 billion JPY (In case of bridge construction)

6) Implementation Agency

- Bangladesh Bridge Authority (BBA)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 11 ha

- Resettlement: About 70 households
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- No study or design has been conducted for this project.

(6) Cox's Bazar – Moheshkhali Bridge/Tunnel

1) Project Summary

- This project is implemented to construct a new bridge or tunnel across Moheshkhali Channel to directly connect Matabai area and Cox's Bazar.

2) Road Length (including bridge and access road)

- About 3 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Cox's Bazar District

5) Construction Cost

- About 33 billion JPY (In case of bridge construction)

6) Implementation Agency

- Bangladesh Bridge Authority (BBA)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 1 ha
- Resettlement: About 40 households
- Protected Area: Sonadia Island (KBA) is located approximately 5km to the southwest and Himchari National Park approximately 4km to the south. There might be no negative impact to the project. However, appropriate mitigation measures will be taken if necessary.

8) Existing Studies / Designs

- Brief study was conducted for this project in Land Use and Development Planning Survey of Moheshkhali and Matarbari Area in Matarbari Port Development Project However, F/S level study has not been conducted to date.

(7) Charkhali Bridge (Kocha River)

1) Project Summary

- This project is implemented to construct a new bridge across Kocha River on the Regional Road.

2) Road Length (including bridge and access road)

- About 1 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Pirojpur District

5) Construction Cost

- About 10 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 1 ha
- Resettlement: About 40 households
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- No study or design has been conducted for this project.

(8) 2nd Postogola Bridge (Dhalweshwari River)

1) Project Summary

- This project is implemented to construct a new bridge parallel to the existing bridge across Dhalweshwari River on N8.

2) Road Length (including bridge and access road)

- About 0.9 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Dhaka District

5) Construction Cost

- About 9 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 3 ha
- Resettlement: About 200 households
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- No study or design has been conducted for this project.

(9) Postogola Bridge (Buriganga River)

1) Project Summary

- This project is implemented to construct a new bridge parallel to 1st Bangladesh China Friendship Bridge across Buriganga River on N8.

2) Road Length (including bridge and access road)

- About 0.8 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Dhaka District

5) Construction Cost

- About 5 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: B
- Land Acquisition: About 3 ha
- Resettlement: About 0 household
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- No study or design has been conducted for this project.

(10) Dhaka Inner Ring Road (R110 – Kanchipur Bridge)

1) Project Summary

- This project is implemented to construct a part of Dhaka Inner Ring Road between R110 and Kanchipur Bridge

2) Road Length

- About 9 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Dhaka District

5) Construction Cost

- About 48 billion JPY

6) Implementation Agency

- Bangladesh Bridge Authority (BBA)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 34 ha
- Resettlement: About 600 households
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- No study or design has been conducted for this project.

(11) Dhaka Outer Ring Road (North-2: N5)

1) Project Summary

- This project is implemented to construct a part of Dhaka Outer Ring Road (Notth-2 Section) along N5.

2) Road Length

- About 15 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Dhaka District

5) Construction Cost

- About 41 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 60 ha
- Resettlement: About 800 households
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- No study or design has been conducted for this project.

(12) Dhaka Outer Ring Road (South-1: N5-N8)

1) Project Summary

- This project is implemented to construct a part of Dhaka Outer Ring Road (South-1 Section) between N5 and N8.

2) Road Length

- About 21 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Dhaka District

5) Construction Cost

- About 56 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 82 ha
- Resettlement: About 300 households
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- Feasibility study (F/S) was conducted by RHD in 2020. This F/S includes topographic survey, geological survey, traffic survey and environmental & social survey.

(13) Dhaka Outer Ring Road (South-2: N8 – 3rd Shitalakhya Bridge)

1) Project Summary

- This project is implemented to construct a part of Dhaka Outer Ring Road (South-2 Section) between N8 and 3rd Shitalakhya Bridge.

2) Road Length

- About 20 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Dhaka District

5) Construction Cost

- About 53 billion JPY

6) Implementation Agency

- Roads and Highways Department (RHD)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 78 ha
- Resettlement: About 300 households
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- Feasibility study (F/S) was conducted by RHD in 2020. This F/S includes topographic survey, geological survey, traffic survey and environmental & social survey.

(14) Karnaphuli Bridge (Barrik Building - Proposed Second Town)

1) Project Summary

- This project is implemented to construct a new bridge across Karnaphuli River to connect Barrik Building and proposed second town.

2) Road Length

- About 1.3 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Chattogram District

5) Construction Cost

- About 14 billion JPY

6) Implementation Agency

- Chattogram Development Authority (CDA)

7) Environmental and Social Considerations

- JICA Category: B

- Land Acquisition: About 79 ha
- Resettlement: About 20 households
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- No study or design has been conducted for this project.

(15) N107 Karnaphuli Bridge

1) Project Summary

- This project is implemented to construct a new bridge parallel to the existing bridge across Karnaphuli River on N107.

2) Road Length

- About 0.8 km

3) Number of Lanes

- 4 lanes for both direction

4) Project Location

- Chattogram District

5) Construction Cost

- About 9 billion JPY

6) Implementation Agency

- Chattogram Development Authority (CDA)

7) Environmental and Social Considerations

- JICA Category: A
- Land Acquisition: About 76 ha
- Resettlement: About 40 households
- Protected Area: No protected areas within 5km from the project location.

8) Existing Studies / Designs

- No study or design has been conducted for this project.

5.5 Priority Projects

Following 3 projects were selected as priority projects from the short list based on the discussion among Bangladesh related authorities, JICA and JICA Survey Team.

(1) R-01(1)(2)(3): Dhaka – Chattogram Expressway

- This is a new expressway construction project connecting Dhaka and Chattogram which are the two largest cities in Bangladesh. It is expected to have a large volume of traffic, thus have a significant economic impact. It is also a project in the Bay of Bengal Industrial Growth Belt (BIG-B), which is in line with Japanese Government's policy of cooperation.

(2) B-02: Padma Bridge/Tunnel (N5 Paturia – Goalonda Point)

- This is a new bridge/tunnel construction project that eliminates the missing link of the Padma River on N5, which is a major trunk road in Bangladesh. It is expected to have a large volume of traffic, thus have a significant economic impact. By utilizing bridge or tunnel to cross the river that are currently crossed by ferries, it is possible to secure highly reliable transportation routes. In addition, the scale of resettlement are comparatively small and the project will be highly feasible.

(3) B-09: Cox's Bazar – Moheshkhali Bridge/Tunnel

- This is a new bridge/tunnel construction project at the Moheshkhali Canal river mouth between Moheshkari (Matarbari area) and Cox's Bazar urban area. In the Matarbari area, a power plant, port and access road projects are currently in progress as Japanese ODA projects. The implementation of this project will increase the effect of these projects. In addition, the construction cost and the scale of resettlement are comparatively small and the project will be highly feasible.

Although "R-12 (1): N1 Chattogram - Cox's Bazar (Chattogram - Chakaria)" was ranked the highest among the inter-city road projects in the project evaluation as shown in Table 5.4.3, this project is still being discussed in the Bangladesh-Japan Joint PPP Platform as "Chattogram-Cox's Bazar Highway Project (N1)". Therefore, this project was not further examined in this Data Collection Survey. Depending on the future discussions in the PPP Platform, this project may be considered as one of the priority projects with the same or higher priority than the above projects.

According to BBA, "B-01: Meghna Bridge (Shariatpur-Chandpur Road)" is the most important project. However, the project has not been selected as a short list and priority project in this survey, as this project will not be well effective without upgrading existing access roads to the bridge. However, if existing access roads are upgraded, the project effects will be increased and thus shoud be considered as a priority project.

6. NECESSITY OF OTHER PROJECTS

6.1 Intersection Improvement Project

In Bangladesh, cities and towns are generally located along inter-city trunk roads. However, trunk roads in Bangladesh have not enough connectivity and alternative routes, thus all traffic including through traffic and local traffic concentrate to these trunk roads. In particular, in cities around intersections between trunk roads, many people live there and traffic congestion occur. Main causes of traffic congestion are the concentration of shops near intersections and the stop of CNG and buses (passengers getting on and off). The separation of through traffic from local traffic is recognised as a challenge to ensuring smooth traffic flow on trunk roads. For this challenge, RHD has promoted projects for the installation of dedicated Slow-Moving Vehicle Traffic (SMVT) lanes along trunk roads, which are being implemented in many cities and towns. Figure 6.1.1 compares intersections on National Highway 1 (near Dhaka) where SMVT lanes are not installed with those where they are. SMVT lanes is clearly effective to alleviate traffic congestion.

Intersections where through traffic is not separated from local traffic.

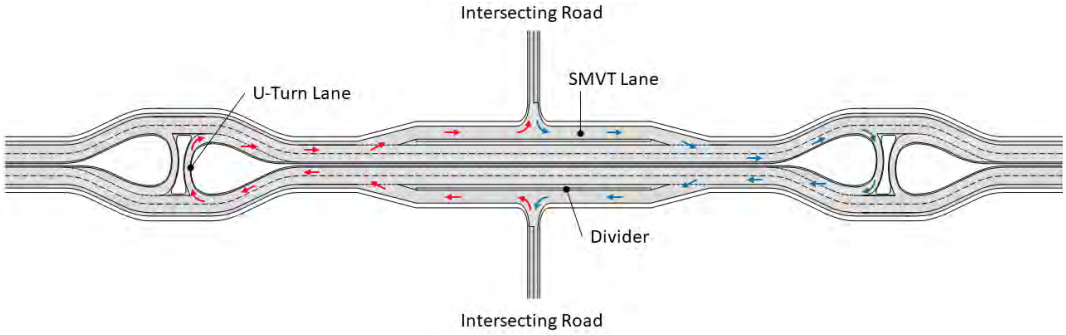
Intersections where through traffic and local traffic are separated.

Source: JICA Survey Team

Figure 6.1.1 Traffic Situation at Intersections

On the other hand, SMVT lanes cause issues for local traffic in some locations. As shown in Figure 6.1.2, where a median is installed, traffic who want to turn right from main line to crossing road, or who want to go straight from crossing road forces long travel for turnaround at a U-turn lane about 5 km away.

In order to improve such a situation, construction of flyovers or bypass roads would be a possible solution and there are many intersections which require to solve traffic congestion by constructing flyover on the trunk road network in Bangladesh.



Source: JICA Survey Team

Figure 6.1.2 Intersections Widely Adopted in Bangladesh in Recent Years

In this Data Collection Survey, priority road and bridge projects were selected from the long term plans prepared by each implementing agency. Selected priority projects are all large-scale projects, thus require a long period. On the other hand, the intersection improvement (flyover construction) project at congested intersections on trunk roads can be implemented relatively in short period, by small budget and with small impact on environmental and social issues. In addition, the number of project intersection locations can be adjusted according to the budget. From this perspective, RHD proposed to include this intersection improvement project as well as large scale road and bridge projects into the priority project.

With regard to the locations for intersection improvement, intersections on National Highway No. 2 and No.4 were excluded, as they are scheduled to be upgraded through ADB-supported projects. Considering the synergistic effects with other Japanese ODA projects as well as the perspective of strengthening the international trunk road network, the major intersections on National Highway No.1 (between Dhaka and Chattogram) can be considered as a candidate for the project. In addition, the following intersections were proposed by RHD as candidates for the project. Regarding the intersection on National Highway No.2 (ID No. 5 in the table), which has a relatively short distance between intersections of about 800 m and is prone to congestion, the ADB-supported project does not include the grade-separation of this intersection, which is expected to require high construction technology, and thus the adoption of advanced technology is expected.

Table 6.1.1 Candidate Locations for Intersection Improvement Projects

ID	Main Direction	Sub Direction	Number of Crossing Roads	Present Condition	Remarks
1	N1	R110	4	Separated by median strip	
2	N1	N105	4	At-grade intersection	Intersection between Dhaka Bypass and Dhaka Outer Ring Road
3	N1	Z1066	4	Separated by median strip	
4	N1	N102	3	At-grade intersection	
5	N2	N102/R220	3 + 3	Two consecutive at-grade intersections	N2 will be improved under Dhaka-Sylhet Road project but the grade-separation is not included in the scope of works.
6	N706	R765	3	At-grade intersection	R765 will be improved under WeCARE project
7	N706	N7	3	Roundabout	N7 will be improved under WeCARE project
8	N405	N4	3	At-grade intersection	N405 will be improved in SASEC II project
9	R370	R360	3	At-grade intersection	
10	R370	R371	3	Roundabout	

Source: JICA Survey Team

When flyovers are constructed, it is necessary to fully understand the traffic characteristics of Bangladesh and consider appropriate traffic management, paying particular attention to ruleless stop of buses at intersections.

Source: JICA Survey Team

Figure 6.1.3 Candidate Locations for Intersection Improvement Projects

6.2 Improvement of Existing Bridges

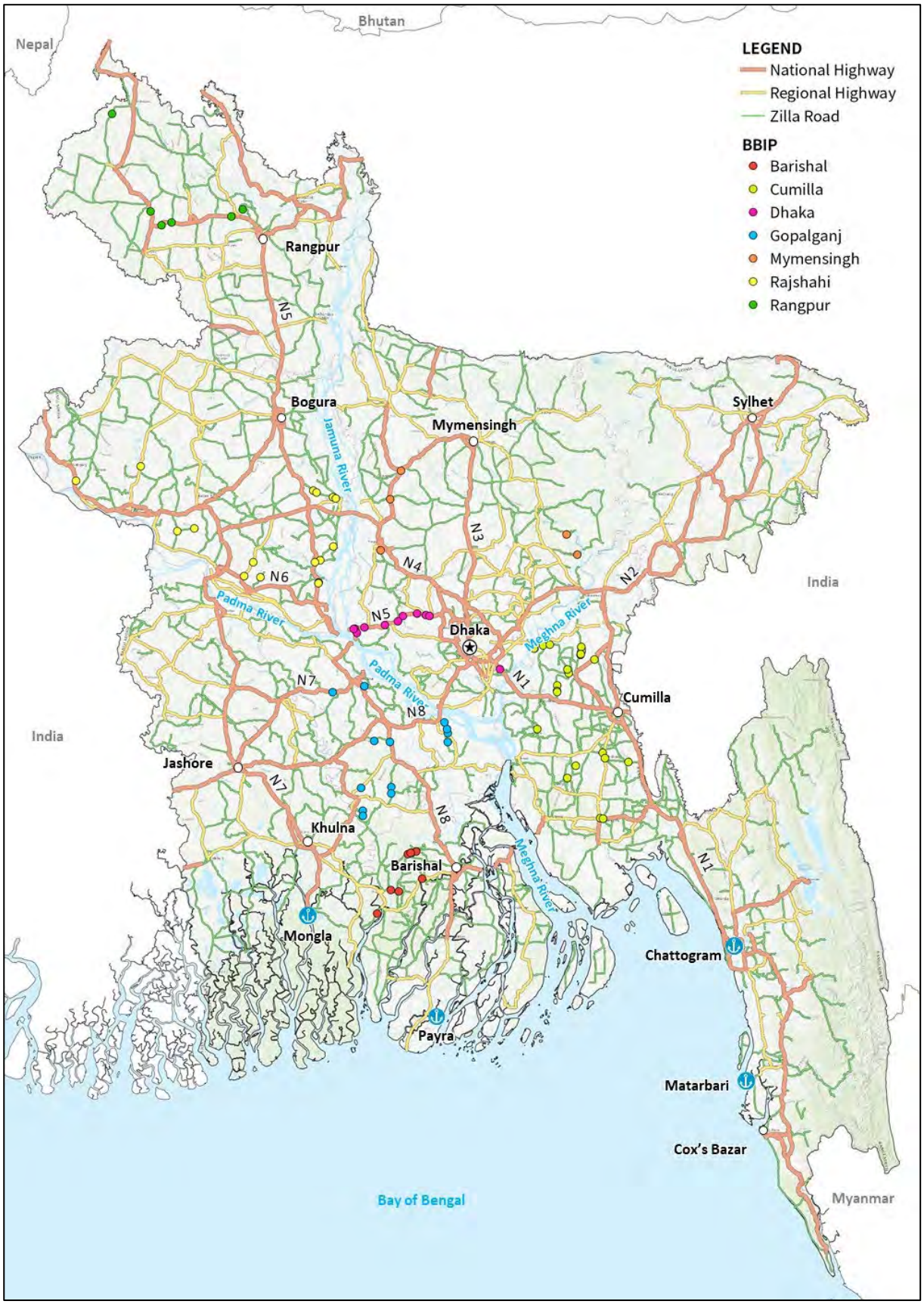
There are more than 20,000 bridges and culverts on the RHD's road network, and JICA has so far supported the "Eastern Bangladesh Bridge Rehabilitation Project (63 small and medium bridges)", "Western Bangladesh Bridge Rehabilitation Project (81 bridges), Kanchpur, Meghna, Gumti 2nd Bridges Construction and Existing Bridges Rehabilitation Project, and Cross Border Road Network Improvement Project (16 small and medium bridges and Kaluna Bridge). In addition to this, RHD has constructed 100 bridges in 25 districts with its own budget, which were opened to traffic on November 7, 2022.

However, there are still many ferry crossings on Regional Highway and Zilla Roads and many bridges on the roads needed to be rehabilitated. Therefore, RHD is currently planning to replace the existing small to medium-sized bridges shown in Figure 6.2.1. The Preliminary Development Project Proposal (PDPP) for this project has been prepared for the government's approval. RHD expects that this project will be conducted by a Japanese ODA Loan Project as a continuation of the "Eastern Bangladesh Bridge Improvement Project" and the "Western Bangladesh Bridge Improvement Project".

Table 6.2.1 Summary of the Proposed Bridge Improvement Project

Zone		Number of Bridge	Total Length (km)
1	Rangpur	12	1,399
2	Rajshahi	23	1,748
3	Mymensingh	25	1,941
4	Dhaka	11	1,894
5	Gopalganj	14	982
6	Barisal	14	818
7	Cumilla	30	1,580
	Total	129	10,310

Source: RHD. 2022. Preliminary Development Project Proposal (PDPP) for Bangladesh Bridges Improvement Project (BBIP)



Source: JICA Survey Team

Figure 6.2.1 Location of the Proposed Bridges for Improvement

6.3 Technical Assistant Project for Road and Bridge Sectors

Operation & Maintenance of Bridge is executed by Bridge Management Wing and they utilize BMS (Bridge Management System) which was implemented in JICA Technical Cooperation Project of "Bridge Management Capacity Development Project". Periodic inspection of bridges and other structures once every three years was carried out directly by RHD. However, last year the inspection works started to be outsourced to private consultant firm. The inspection works in two zones (Cumilla, Rangpur) has been already outsourced, and this year the private consultant for other four zones are under selection. In other hand, BBA Operation & Maintenance of Bridge is outsourced to a private company under a five-year comprehensive maintenance contract.

Operation & Maintenance of Road is executed by Planning & Maintenance Wing and they are preparing the scope of Performance Based Contract (PBC) to make a trial in a project. It is planned to be extended to other routes/sections of their road network.

Regarding PPP projects, two road/bridge projects are under construction by RHD and BBA. Four road/bridge projects are listed on the Bangladesh-Japan Joint PPP Platform, and pre-F/S have been or are being conducted.

In this section, three sectors for "Technical Cooperation Projects" were studied: Bridge Operation & Maintenance, Road Operation & Maintenance, and PPP. As result, it was confirmed that Bridge Operation & Maintenance sectors has the greatest need for technical assistance from Japan.

Regarding the Bridge Operation & Maintenance sector, the maintenance cycle hasn't been completed by RHD. The BMS tool developed during Technical Cooperation Project for Bridge Management Capacity Development in 2015-2018 hasn't been fully utilized; and almost no repair/reinforcement projects have been implemented in Bangladesh. The Dhaka attack incident occurred during the technical cooperation project implementation had a big impact, however further support is required to establish a maintenance cycle and to enable RHD and other institutions in Bangladesh to carry out an efficient Operation & Maintenance activities by themselves.

Regarding the Road Operation & Maintenance sector, a maintenance cycle of inspection, examinations, evaluation, planning, design, construction and recording has been established using HDM-4 (Pavement management software system introduced by the World Bank). In recent years, the pavement condition has been improving steady. Therefore, the need for technical assistance from Japan is the lowest among these three sectors.

Regarding the PPP sector, Bangladesh has already developed a legal system, rules and regulations for public assistance, guidelines and manuals to implement the law. Several new road projects are being carry out under those schemes. On the other hand, technical and financial support is still necessary to promote the projects from Japanese companies, including those listed in the Bangladesh-Japan Joint PPP Platform.

6.3.1 Bridge Operation & Maintenance

(1) Current Condition

1) RHD

RHD manages more than 20,000 bridges and box culverts in their road network which is longer than 20,000km. Operation & maintenance of these bridge and box culverts are executed by Bridge Management Wing. The contents of this clause is based on the interview to the JICA long-term expert who is dispatched to RHD, SE (Superintending Engineer) and EE (Executive Engineer) of RHD who are introduced by the JICA long-term expert, RHD's website and the related existing documents.

There are three (3) circles under Bridge Management Wing, that are Bridge Construction and Maintenance Circle, Bridge Design Circle, and Planning, Monitoring & Evaluation Circle (Planning & Data Circle) respectively. Planning, Monitoring & Evaluation Circle executes the inspection/ diagnosis/planning, Bridge Design Circle does the design of repair/reinforcement/replacement, and Bridge Construction and Maintenance Circle repair/reinforcement/replacement works.

Planning, Monitoring & Evaluation Circle has BMS (Bridge Management System) which was implemented in JICA Technical Cooperation Project of "Bridge Management Capacity Development Project" from 2015 to 2018. They collect inspection data, input the result of inspection and the diagnosis/evaluation to the database of the system, analyse the repair method by bridges.

Planning, Monitoring & Evaluation Circle outsources the periodic inspection of two (2) zones, which are Cumilla and Rangpur to a private consultant firm. They have collected the inventory and inspection data from 1094 bridges and 3890 box culverts and has input to the database as of 26th of Feb. 2023. They are planning to execute the periodic inspection in the other eight (8) zones in near future, and they are executing the bidding procedure to start the inspect in the following four (4) zones, Barizal, Khulna, Sylhet, Chattogram, in the first half or 2023. They are collecting the periodic inspection data at present. The result will be utilised to plan the bridge maintenance plan when they have collected a certain amount of the inspection results. The analysed result will be utilized as an evidence data in budgeting process.

Zone offices and Division offices under Zone offices repair the damages which makes the road users face the dangerous situation, such as damages of potholes or railings etc. by their own budget for executing minor repairs. A certain amount of budget is allocated to each Zone offices and Division offices (also to Sub-division offices under Division offices) which they can decide how to spend it by themselves. Zone offices report on severer damages to headquarters based on the site inspection results by their inspector by issuing a letter. Site inspections are executed by their inspectors by checking "Site Inspection Side Book" which they carry to the site on hand. However, the budget will be allocated only after the budget request is applied to MOF and the request is approved in most of the cases. Therefore, the budget for the repair works will not be allocated immediately the damage is found.

The result of periodic inspection of the bridges are only collected in two (2) Zones, the RHD headquarters (BMW) does not have the inspection results of the bridges in the rest of eight (8) zones. It is obviously not input to the BMS which are developed in the "(2) Technical Cooperation Project of Bridge Maintenance". In other words, they cannot prepare the longlist of bridge which requires repair/rehabilitation of the entire road network of RHD by BMS. Therefore, the headquarter make the budget request of the maintenance plan of the bridges of eight (8) zones without the inspection data based on the damage reports which are submitted by the correspondent zone offices of damaged bridges. They are not selected from the overall analysis of the entire network but from very fragmental data.

It happens the same situation when selecting the bridge for repair/rehabilitation project after the allocated budget is fixed by MOF. It should be selected after the prioritization process by rational criteria analyzing the inspection data of the bridge of the entire road network. However, it is way behind the ideal situation.

The selected bridge will be designed for repair/rehabilitation including the execution of the detailed inspection of the damage. It also be repaired/rehabilitated based on the repair/rehabilitation design. However, there are very few consultants and contractors who are able to perform the required works in sufficient technical level. It is very difficult to execute very complicated repair/rehabilitation works with multiple repair/rehabilitation methods, or the damage cannot be repaired/rehabilitated with proper method and the same damage occurs at the same location very frequently.

RHD has a training center to improve the technical level or its engineers/inspectors and provides lectures/computer skill trainings. However, there are not any facilities/equipment to train road/bridge maintenance skills, so they have to learn those skills at site by themselves. The lectures and computer skill training are not provided to the engineers/inspectors of private sector.

2) Technical Cooperation Project of Bridge Maintenance

The JICA Technical Cooperation Project of "Bridge Management Capacity Development Project" was executed from 2015 to 2018 to enhance the bridge management and improve bridge management capacity of RHD. The outputs and activities are described in the following table.

Table 6.3.1 Outputs and Activities "Bridge Management Capacity Development Project"

Output 1: Bridge Maintenance framework is developed.
Activity 1-1: Actual condition of bridge maintenance is reviewed.
Activity 1-2: Problems/issues on bridge maintenance cycle are identified.
Activity 1-3: Institutional framework of bridge maintenance is reviewed.
Activity 1-4: Documents of bridge maintenance procedure and standard of staff deployment is prepared.
Output 2: Bridge inspection/evaluation manual and Bridge rehabilitation/strengthening manual are developed.
Activity 2-1: Existing bridge maintenance manual is reviewed and issues/problems on the manual are analysed.
Activity 2-2: Bridge inspection/evaluation manual is updated.
Activity 2-3: Bridge rehabilitation/strengthening manual is prepared.
Activity 2-4: Manuals for Bridge maintenance are explained to RHD staff by Master Trainers (MT).
Output 3: Bridge management system is developed.
Activity 3-1: Existing BMMS is reviewed and analysed.
Activity 3-2: Utilization of BMS is examined together by RHD.
Activity 3-3: Function of BMS is defined and developed.
Activity 3-4: Data in existing BMMS is entered into BMS by RHD.
Activity 3-5: BMS manual for administrators and users is prepared.
Activity 3-6: BMS manual is explained to RHD staff by BMS administrators.
Output 4: Necessary knowledge of bridge management is enhanced by RHD staff.
Activity 4-1: On the job training (OJTs) on bridge inspection/evaluation in model area(s) are conducted with Bridge inspection/evaluation manual.
Activity 4-2: OJTs on prioritizing bridges to be repaired in model area(s) are conducted by utilization of BMS.
Activity 4-3: OJTs on selection of bridge rehabilitation/strengthening measures, cost estimation in model area(s) are conducted with Bridge rehabilitation/strengthening manual.
Activity 4-4: Advices on supervision of bridge rehabilitation/strengthening works are given by Expert.
Activity 4-5: Institutional capacity development plan is prepared.

Source: Project Completion Report, Bridge Management Capacity Development Project

The activities of the experts from the project were restricted due to the "July 2016 Dhaka attack". Their stay in Dhaka was limited to two (2) weeks, three (3) were the maximum numbers of the experts who could visit Dhaka at the same time, and they could only visit inside specific are in Dhaka. Therefore, they had to cancel all the inspection of and OJT at the bridges outside of Dhaka. The seminars were totally held in Dhaka.

The project provided RHD with two (2) Robot Cameras and Manuals which are listed below,

Table 6.3.2 Manuals prepared in "Bridge Management Capacity Development Project"

	Item	Manual
1	Bridge Maintenance Plan	Bridge Maintenance Management Standard Institutional Development Plan Part.1
2	Bridge Inspection, Bridge Evaluation, Detailed Survey	Bridge Inspection and Evaluation Manual
	Bridge Rehabilitation/ Strengthening	Bridge Rehabilitation and Strengthening Manual：Part 1 Method
	Cost Estimate	Bridge Rehabilitation and Strengthening Manual：Part 2 Cost Estimate
3	Bridge Management System	Bridge Management System (BMS) Manual: for System Administrators Bridge Management System (BMS) Manual: for Bridge Management Wing Bridge Management System (BMS) Manual: for Inspector & Evaluator Bridge Management System (BMS) Manual: for Public Users BMS Programme (DVD)
4	Institutional Capacity Development Plan	Institutional Development Plan Part.2

Source: Project Completion Report, Bridge Management Capacity Development Project

The capacity of RHD was improved remarkably in Inspection/Diagnosis/Evaluation/Record in the Bridge Maintenance Cycle by the execution of "Bridge Management Capacity Development Project", specifically in Bridge Management Wing. As a result of it, they are executing the periodic inspection, diagnosis of the inspection results, input of the inspection and diagnosis result to the BMS, and evaluation of the soundness of members/bridges of the bridges by zones.

3) BBA

There are three (3) major bridges which are opened to public and managed by BBA. The bridge managed by BBA is longer than 1.5km and these three bridges are all longer then 1.5km. BBA make contracts of 5-year comprehensive operation & maintenance outsourcing contract with private firms. They are planning to apply the same scheme to the bridges which are under construction or planning by both their own fund and ODA after their opening. The table below shows the bridges which are managed by BBA and operated & maintained by private firms.

Table 6.3.3 Bridges managed by BBA

	Name of Bridge	Open Year	Length	Private Firm
1	Bangabondhu Bridge (Jamuna Multipurpose Bridge)	1998	4,800m	CCCC (China)
2	Muktarpur Bridge (6th Bangladesh-China Friendship Bridge)	2008	1,521m	CNS (Bangladesh)
3	Padma Multipurpose Bridge Project	2022	6,150m	KEC (S. Korea) - MBEC (China) JV

Source:BBA

(2) Issues and Proposals

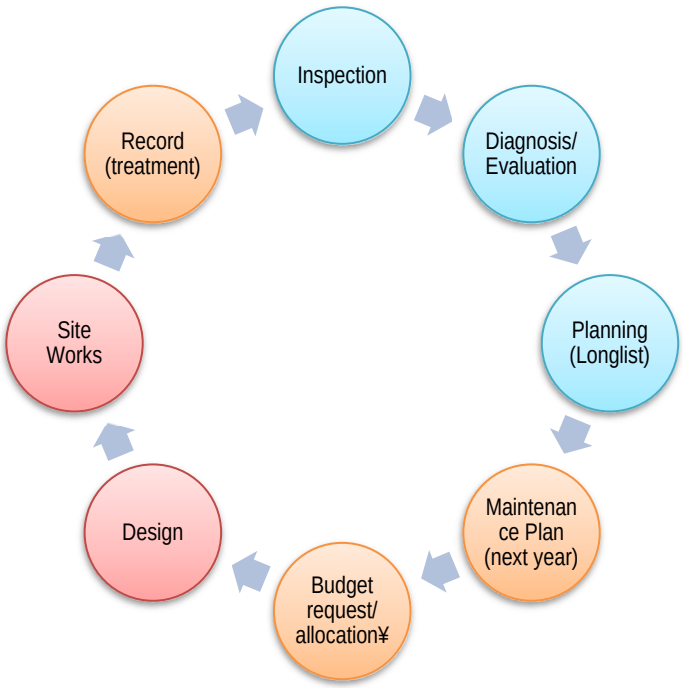
1) RHD

ISSUES

The biggest issue of RHD in bridge maintenance is they are not circulating the maintenance cycle. They are able to execute inspection/diagnosis/evaluation of maintenance cycle after the "Technical Cooperation Project of Bridge Maintenance" of JICA was completed and they are now executing the periodic inspection in two (2) zones. The inspection results of the bridges in two (2) zones are input to BMS and utilized in preparing the longlist of the bridges that require repair/rehabilitation. The maintenance cycle from inspection to planning (preparing longlist) is limited to those two (2) zones. However, even for those two zones, the repair/rehabilitation priority for bridges in the longlist isn't decided using a fair classification criteria. Therefore, BMS is not properly used to select the bridges to be repair/rehabilitate considering budget constraints and for budget request document preparation.

The current situation of the private sector (consultants and contractors) after the maintenance budget is actually allocated is confirmed in the interview to the JICA long-term expert in RHD who has executed the detailed survey of private sectors in bridge maintenance field. Currently, there are almost no consultants and contractors who are able to design or execute the repair works with sufficient effect. There are many international contractors who has rich experience in repair/rehabilitation of bridges in Bangladesh. However, they are much more interested in new implementation projects with large amount of contract and does not participate to the bidding. The Bangladeshi contractors which participate to the bidding does not have sufficient experience/capacity and are not able to complete the repair/rehabilitation works with sufficient quality. RHD and the correlated organizations does not execute the repair/rehabilitation works of the bridge with in-house consultants/workers as it is done by the bridge management organization in other developing countries and does not have the human resource and facilities/equipment even if they try to do it without outsourcing the activities.

The contractors which have the experiences in road repair works does the bridge repair works which can be done on the bridge surface, such as repair of potholes, replacing simple expansion joints, overlay of the waring course, repair of railing, etc. However, there are very few contractors which are able to repair the damage on the bottom surface of superstructure/girders (cracks and cross-section repair), abutments/piers (cracks and cross-section repair), and bearings (replacement and repaint). Judging from above, the bridge maintenance cycle is hardly executed in repair/rehabilitation planning, budget request/allocation, design, site works, and record of the treatment.



Legend: Blue: in operation, Orange: not in operation (RHD/Headquarters BMW), Red: not in operation (Private Sector), BMW: Bridge Management Wing

Source: JICA Survey Team

Figure 6.3.1 Current Situation of Bridge Maintenance Cycle in Bangladesh

There are remaining issues in the periodic inspection in the two (2) zones in which the periodic inspection is currently in operation. More specifically, it's considered difficult to inspect wide bridges and bridges with high piers. There are some bridge members which cannot be inspected due to the limited sight range of the "Robot Camera". There are many members which cannot be inspected in the bridges with wide width or/and high piers. It is very difficult to inspect the long bridges in detail because the boom of the "Robot Camera" is 10m long and does not bend to access the bottom surface of superstructure. There remain many members that the photos cannot be taken from close distance or not even in the sight of the camera. There remain many members which cannot be inspected to check the condition of concrete, existence/level of scour. Specifically, the scour is very critical to the bridge when the damage progresses since it can cause collapse of foundation or substructure's incline. Scour is very important damage of bridge which requires close and frequent inspection because it requires long time closure of the bridge when the damage is founded. However, RHD is not able to inspect the scour of the substructure at the moment.

The issue is described in 2.7.1. (6) that the slow implementation of periodic inspection is partly caused by the lack of number of "Robot Camera" and the lack of manufacturer repair support. RHD (Headquarters BMW) has inspection equipment for unreachable members such as bridge inspection vehicle (purchased in the KMG bridges implementation project), inspection vehicle with high deck, and UAV (drone) other than "Robot Camera". However, bridge inspection vehicles are limited to inspect the bridges with more than 4 lanes of carriageway to avoid traffic jam, inspection vehicle with high deck are limited to flyovers, and UAV (drone) cannot be utilized because the pilot

(conductor) has not been trained. RHD (Headquarters BMW) is not ready to utilize these equipments efficiently to cover their inspection needs.

There are also very limited numbers of consulting firms and also the individual consultants who can execute the inspection with very high quality and accuracy. Therefore, there are not enough numbers of consultant firms who passes the condition of bidding for the periodic inspection if the condition are high enough to secure the quality and accuracy. There is only one (1) consultant firm which can execute the inspection by themselves (without any instruction from RHD (Headquarters BMW)) according to the interview to RHD (Headquarters BMW). This consulting firm has an engineer who was hired as a local engineer in the "Technical Cooperation Project of Bridge Maintenance" by Japanese consultant firm which executed the project and found a job as a team leader in the periodic inspection project in the Bangladeshi consulting firm after the project completion. RHD (Headquarters BMW) is suggesting the consultant firms who are interested to participate in the bidding so that the knowledge/skills/technologies are spread to the private sector rapidly in the next bidding for the periodic inspection project other zones.

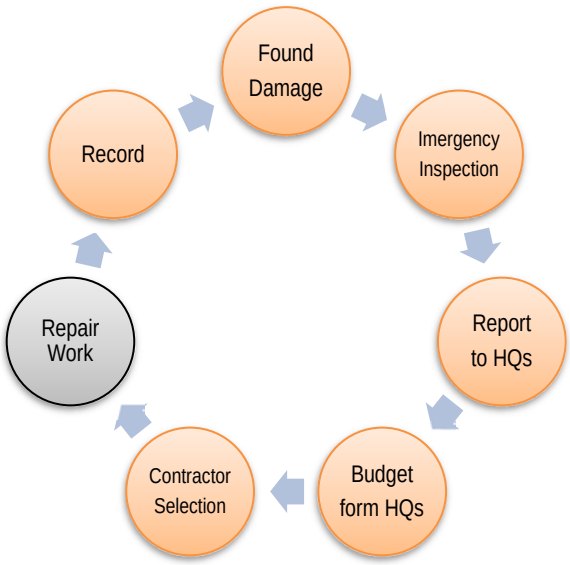
RHD (Headquarters BMW) will not complete the periodic inspection of their bridge in their entire road network and input the results to BMS for four (4) or five (5) years considering the numbers and working status of their "Robot Camera". The periodic inspection shall be done once every three (3) years according to the "Bridge Inspection Manual" developed in the "Technical Cooperation Project of Bridge Maintenance". However, it is very difficult for RHD (Headquarters BMW) to plan the periodic inspection schedule as it should be.

There are only two (2) zones which are ready to prepare the longlist of the candidate bridges of repair/rehabilitation for maintenance budget requesting. Therefore, the bridges in the other zone offices are repaired/rehabilitated after the damage report prepared by the zone office and reported to headquarters. These repair/rehabilitations are done by correcting maintenance method after the damages are severely deteriorated. Headquarters need to select the bridge which are reported from zone offices within the budget sealing. They only have the criteria to exempt the bridge with replacement/widening/rehabilitation project in near future for selection the damaged bridges to allocate the budget. There are not any other criteria for prioritization. They tend to select the bridges with severe damages but easy to repair, on the arterial road with many users crosses frequently. The bridges on the local road will hardly be selected. There is also a possibility of some bridges repair/rehabilitation priority to be changed in order to solve political issues.

Damages on the surface of the bridges are reported from zone offices to the headquarters more frequently than other damages below the surface. The delay period of budget allocation is a big issue in this situation when there is not enough budget for emergency repair. Many of these cases require budget requesting process to MOF and budget be allocated after the approval. If the report is submitted not long before the budget requesting to MOF, the delay could be short, but is the report is submitted just after the budget request is done to MOF, the delay would be around one (1) and a half year. Even for this budget request, the budget measures are not necessarily finalized, and reports

from zone offices nationwide and other repair candidates are compared and added to the list of budget requests. Usually, the approved budget is smaller than the budget requested, therefore it's not possible to allocate budgets for all the projects.

Current situation of bridge maintenance cycle for Zone Offices are shown below. After damage is found on the bridge surface, the Zone Office conducts an (emergency) inspection, focusing on cases of severe damage, and reports the damage and measures taken to the headquarters. After a budget is allocated from the headquarters, a contractor is selected. The contractors are mainly private companies. Work records of repairs are kept. The inspection results and repair records are kept in the Zone Office for the bridges that have been repaired, but not for all the bridges managed in Zone Offices. Therefore, the maintenance cycle in Zone Offices is not yet in operation.



Legend: Orange: not in operation (RHD/Zone Office), Gray: in operation (Private Sector)

Source: JICA Survey team

Figure 6.3.2 Current Situation of Bridge Maintenance Cycle in Bangladesh (Each Bridge by Zone Office)

On the other hand, RHD (Headquarters BMW) only prepares the budget request for the next fiscal year, allocates the approved budget and execute the repair/rehabilitation works of the selected bridges. It significates that the only prepare annual maintenance plan and not a mid-long term maintenance plan. It is difficult to prepare the repair work later than second year to realize the objected service level without any mid-long term maintenance plan. Moreover, it is very difficult to apply preventive maintenance method to minimize the life cycle cost of bridges and keep on executing the corrective maintenance method. Defining the objective service level and plan the schedule is the appropriate method to realize the better maintenance cycle and reduce the maintenance cost. The mid-long term maintenance plan should be planned with the currently collectible data/information to realize the extension of the service life and reduce long term maintenance cost of the bridges.

There are not any training course of maintenance skills/techniques at the site in the present training center. It only provides the lectures and computer lessons. There are not any facilities/equipment to train those skills/techniques either in the present training center. It is not utilized to level up the private sector's knowledge/skill/experiences at all. It is hardly used to improve the current status of bridge maintenance cycle, inspection, diagnosis, evaluation, design, site works.

Up until now, the improvement of the knowledge/skills/experience of engineers/inspectors has largely depended on the efforts of individual engineers/inspectors, and training has not been emphasized for the purpose of organizational improvement. As a result, a sufficient budget was not secured for training and improving the skills of the technicians/inspectors. In addition, there are no full-time specialized instructors to conduct training, and experts from other countries and external human resources [BUET (Bangladesh University of Engineering and Technology), etc.] are allocated when necessary.

PROPOSALS

The followings are the proposals to solve the issues mentioned above.

The biggest issue that the maintenance cycle is not completely formed are limited from inspection to planning (longlist). The extension of the periodic maintenance from two (2) zone to whole ten (10) zones does not improve the current situation of maintenance cycle. It is required to form the maintenance cycle rapidly by creating the structure of remaining steps of maintenance cycle, such as planning the maintenance schedule, budget requesting/allocation, design, site works, and record (treatment).

The orange circles of Figure 6.3.1, such as planning the maintenance schedule, budget requesting/allocation and record (treatment) are the steps which are done in RHD (Headquarters BMW) internally. Therefore, it can be improved by training the engineers/inspectors of RHD and applying new system. However, design and site works are not executed by RHD and requires the training to the engineers/inspectors of private sectors. It is indispensable that the knowledge/skills of the engineers/inspectors of the private firm be improved rapidly and the experience be accumulated. RHD should improve and expand the training center and start to train the engineers/inspectors to improve their knowledge/skills/experiences. There also should be qualifications for those engineers/inspectors that proves the eligibility of their knowledge/skills/experiences. These qualification/certificate can also be utilized to prove the private firms quality when they participate to the bidding. RHD should prepare specific qualifications for steps of maintenance cycle which the private sectors take important role, such as inspection, diagnosis, evaluation, design, and site works.

The issue that the number of "Robot Camera" for inspection can be solved by purchasing similar equipment. It also requires training of engineers/inspectors of private sectors, and those private sectors with the engineers/inspectors who has completed the training course shall execute the inspection of bridges. There should be training of operation of the equipment and not be left at the stockyard without using them like the UAV (drone). The training course of the equipment shall be

held by the supplier in Bangladesh so that many participants can learn the skill of operation. It shall be included in the purchase contract between RHD and the supplier. Also some of the trainees from RHD or BUIT shall get more skillful training so that they can be a trainer of the equipment to train more Bangladeshi engineers/inspectors in future. It contributes to level up the technical level of private sector effectively and rapidly.

The other issue of "Robot Camera" is the procedure to repair the damaged components. It can be solved by including guarantee period and secure supply chain for repair. However, damaged "Robot Camera" are not repaired due the purchase contract, contents of guarantee, lack or change in the repair supply chain, etc. Therefore, these issues shall be considered carefully and improve the operation condition by selecting the model which is easier to repair in Bangladesh, and make sure that the parts are supplied for certain period so that it could be repaired quickly.

The issue of the members which cannot be inspected by "Robot Camera" due to the form and size of the bridge member can be solved by installing the scaffoldings to the existing bridge just like how is done for periodic inspection in Japan. However, it costs huge amount and not realistic to apply in Bangladesh. Therefore, at this moment it is important to increase the bridge inspections range as maximum as possible utilizing drone, increase the bridge range that can be inspected with bridge inspection vehicle or lift platform vehicle. Scouring in the river flow can be investigated by underwater drone or inspection equipment with sonar. When the scouring is found and is enlarging, it shall be treated immediately before the bridge shows fatal damage. The traffic shall be stopped, for instance. Therefore, the procedure when the scouring is found shall be defined by level of scouring and by importance of the bridge.

Procedure for the selection of bridges to be carried out repair work has not been defined based on the clear criteria at present. In this regard, it is desirable to clearly define the criteria and to establish plans in accordance with those criteria in principle. The criteria should be quantified based on the inventory information and the evaluation of the inspection results, so that the reasons for selection are clearly understood to stakeholders. This is a necessary step to improve the current situation. It will also be important to develop criteria based on the trial and error. If the results of selection based on the criteria is not suitable, it will be important to make adjustments and improve the results.

Regarding the time lag issue from damage detection to budgeting, it is desirable to allocate a sufficient budget to Zone Offices and Division Offices to deal with the damage, and to establish a system that allow to carry out urgent repairs for much volume of damages. If the budget for repairs is still not sufficient. It's recommended a mechanism to allow the surplus budget from other Zone Offices or Division Offices to be reallocated in a systematic way. If it is difficult to delegate a large amount of authority to the Zone Office or Division Office, a similar budget should be secured for the Headquarters, so the budget for damage repair don't go through the MOF budget request process. As result, budget allocation for repair works will speed up.

With regard to activities for improving service levels and understanding the budget, it is necessary to develop a medium-term maintenance and management plan using current data, to monitor the current situation, and disseminate the information to stakeholders. Even if it is difficult to get the required budget, it is expected that the importance of maintenance budgets are recognized by informing required budget. Forecasts for target achievement timeframe and required budget, etc. will be improved by continuing to update the medium-term plan. Continuation of such work will be a means of achieving target service levels at an early stage.

Education by RHD is essential to improve bridge maintenance and management skills of engineers/inspectors, including those belonging to RHD and private sectors. It is also desirable to renovate/expand the current training centres so that engineers/inspectors, including those from private sectors, can undertake on-the-job training as well as classroom training. Currently, there are no full-time specialized instructors, so securing/developing them is required.

A major expansion plan for RHD training centre has been developed under the ADB-funded SASEC project. The plan includes the expansion of the current training centre facilities/equipment in three phases. It is hoped that this expansion plan will include facilities/equipment required to improve bridge maintenance and management techniques, so that more effective training content can be provided. The facility should also be used to educate engineers/inspectors, including those from the private sector, on the various knowledge/skills of the maintenance cycle. Furthermore, it is also very important that RHD trains a sufficient number of instructors (trainers) to be able to train technicians/ inspectors on a sustainable basis. Considering the current situation of not only RHD but also the Bangladeshi government organization, it is not easy to improve these issues. Especially in the Bridge Operation & Maintenance sector, it is necessary to implement long-term measures and make improvements by utilizing future support projects.

2) Technical Cooperation Project of Bridge Maintenance

ISSUES

The issue of the "Technical Cooperation Project of Bridge Maintenance" is that the maintenance cycle was not formed completely and only the steps from inspection to planning (longlist) were formed. In other words, to complete the maintenance cycle is the biggest issue. There are some steps in the maintenance cycle which cannot be improved just by training the engineers/inspectors who belong to RHD. It is to create and improve the private sector which can inspect, diagnosis, evaluate, design and repair/rehabilitate the bridges with required level of quality which is regulated in the standards/manuals of design and site works.

On the other hand, the inspection, diagnosis, evaluation which are done by the engineers/inspectors who belong to RHD (Headquarters BMW), has several issues such as lack of inspection equipment, damaged equipment cannot be repaired, etc. There are not enough specific criteria in selecting repair/rehabilitation bridges from longlist and most of the bridge are selected ad-hoc bases. The steps

of maintenance cycle which are executed by RHD itself also requires improvement in both qualitatively and quantitatively in parallel with the improvement of private sector.

PROPOSALS

The biggest issue is that the maintenance cycle will not be completed just by improving the knowledge/skills of engineers/inspectors who belong to RHD, accumulating the experiences of RHD, applying new system/equipment. The details are mentioned above in the clause 1) RHD. The more the private sectors are involved with better quality, the better and quicker the maintenance cycle be formed.

On the other hand, there should be additional procurement of inspection equipment, create the repair procedure of damaged equipment, systematic utilization of longlist, etc. in the step that RHD can improve themselves in the maintenance cycle. There are also some issues which requires time and experiences for improvement, such as preparing the criteria of prioritization, bidding of design/site works, quality control of design/site works. These improve the efficiency of the maintenance cycle but requires support from experts.

3) BBA

ISSUES

Maintenance by comprehensive contract like PBC (Performance Based Contract) requires for bridge management organization to confirm the level of maintenance condition of the bridges which are maintained by contractors, to monitor contractor's activities and its effects to the members of the bridge, and secure the reliability of the evaluation mechanism of contractor's performance. The contract shall secure the complete implementation of contractor's maintenance activities and also the service level of the bridge.

On the other hand, BBA shall prepare the situations when the contractor's performance is very low compared to the conditions defined in the contract, or when the natural disaster occurs. These risks do not frequently arise, but the loss is huge. Therefore, the risk management to these situations shall be regulated and obligations for both parties, BBA and contractor, shall be regulated in the contract.

The contractors manage the bridges of their contract with system and methods. They are basically free to use any kind of systems/methods as long as they satisfy the condition mentioned in the contract. However, the data/information of different contractors are often not compatible. Therefore, it is difficult for BBA to manage their bridges comprehensively.

PROPOSALS

BBA has long experience of operating comprehensive maintenance contracts and has methods of monitoring and evaluating the contractors' performance. The reliability of the monitoring and

evaluation shall be verified and evaluated from now on. For instance, it could be improved by applying the third party's monitoring and evaluation.

Risk management and allocation between BBA and contractors can be evaluated and improved when the contract is newly signed. It can also be improved by sharing and verifying the cost and other data/information from both parties when the incidents actually happen.

To have the availability of BBA to have the comprehensive management opportunity, the management system/method can be regulated in the contract. However, it has to be noted that it also restricts the contractors' activities and reduces the efficiency of their management.

6.3.2 Road Operation & Maintenance

(1) Current Conditions

1) RHD

The road, mainly the pavement, of RHD road network is operated and managed by Planning & Maintenance Wing. The descriptions in this section are prepared based on the interview to RHD, RHD website and existing reports.

HDM Circle of the Planning & Maintenance Wing conducts annual IRI measurements to inspect pavement conditions. The results are analyzed by HDM-4 and a Maintenance and Rehabilitation Needs Report is prepared. The results are used to develop an Annual Maintenance Plan for the next fiscal year's budget request, as well as to examine measures to be taken for each section and damage in the next fiscal year. At this stage, zone office technicians/inspectors actually inspect the road surface condition of the routes/sections indicated as high priority in the HDM-4 analysis results. Priority routes/sections are selected based on traffic volume, arterial roads, and other indicators of route importance, and the results are submitted to the Planning & Maintenance Wing.

The Annual Maintenance Plan is prepared by Maintenance Circle based on the Needs Report and the result of actual site survey by the engineers/inspectors of Zone offices. The engineers/inspectors of Zone offices conduct the site inspection of the sections that are given high priority by HDM-4 analysis. In addition to this prioritization, traffic volume and importance of the routes are taken into consideration to finalize the prioritization. The Annual Maintenance Plan includes cost estimate of the repair/maintenance works of each section. The unit cost of the repair/maintenance works by regions are calculated/updated by Maintenance Circle every year.

Budgeting process starts with preparing the budget request based on the Annual Maintenance Plan. However, approved budget is reduced to 50 to 60% of the requested budget (past record of 2019 and 2020) so the allocation coordination of allocated budget will be required among zones/routes/sections. This coordination work is done by Maintenance Circle as well.

Minor repair works is done with budget of minor repair allocated to the Zone offices and Division offices. They inspect the damage and decides how to deal with them by themselves using the budget for minor repair. This type of treatment is done to the most of Zilla road with small amount of traffic volume. Routine maintenance, such as removing the obstacle on the carriageway, repairing small facilities are done by Zone offices and Division offices by their own decision as they do with minor repairs.

Recently most of the routes/sections are maintained by conventional procurement procedure. However, RHD is trying to implement comprehensive maintenance management by PBC in a more efficient and cost-saving manner by outsourcing it to the private sector. Actually, for the ADB-financed SASEC project (Improvement of Joydevpur-Chandra-Tangail-Elenga Road (N-4)), a contract was signed to outsource comprehensive maintenance management by PBC to the private sector.

2) Projects funded by Other Donors

ADB is conducting technical assistance (TA) programme which is called "TA-6772 BAN: SASEC Dhaka–Sylhet Corridor Road Investment Project-Tranche 1 - Output 3 (Road Asset Maintenance) (53382-002)". It aims to improve technical level, institutional management, and also the capacity building of RHD road asset maintenance. It consists of the review, identifying the bottlenecks, and proposal of improvement plans of the entire maintenance cycle of pavement. It focuses of proposal of HDM-4 which RHD is not satisfied much with the analysis results. This project continues till Sep. 2024.

The project which World Bank is conducting is called "Consultancy Services on Building Stronger Institutions for Better Transport Sector Governance in Bangladesh". The tasks of this consultancy service are (i) Operationalization of Road Maintenance Fund through Road Transport Sector Integration and Coordination Platform (RTSICP), (ii) Technical Assistance on Enhancing Resilience of current Road Asset Management Practices, and (iii) Leveraging Technology and Geospatial Analyses to Monitor Transport and Logistics Investments. This project DFR is under revision, it will be completed soon.

Both projects of two (2) development banks aim technical transfer and capacity building of pavement management. RHD is requesting the consultants of both projects to cooperate in their projects.

(2) Issues and Proposals

1) RHD

ISSUES

Routine inspections are carried out only for IRIs. Pavement technical inspections (cracks, rutting, settlement, potholes, etc.) are carried out only in emergency situations after damage is detected and visual inspections for all routes aren't carry on a regular basis. Repair methods are selected on a

route-by-route, with major repair methods such as DBST, overlay, resurfacing, etc. As pavement damage is initially small, immediate repair can reduce overall repair costs. However, the large-scale repairs carried out by RHD require a large budget, as undamaged sections are repaired in the same way as damaged sections. If small repairs are carried out at initial stage, the implementation cycle for large-scale repairs such as overlay and resurfacing can be extended, leading to a reduction in maintenance and management costs.

The pavement maintenance cycles are not properly implemented due to: old inspection manual (formulated in 2001 and has not been updated), lack of periodical pavement technical evaluations, lack of understanding the current pavement damage situation. The pavement condition of the road network managed by RHD has shown significant improvement due to the management by utilizing IRI value, and the IRI is still decreasing. Considering the economic situation in Bangladesh, the natural conditions (high rainfall, soft ground, etc.) and the traffic situation (high number of overloaded vehicles), the direction regarding road maintenance implemented by RHD is said to be correct, as many works are required to maintain the pavement condition. However, considering the future increase in traffic/logistics volumes, there is a need to improve the service level of pavements, for example, by identifying more detailed pavement damage conditions, carrying out repairs within minor damage, and adopting materials that can delay the progress of damage.

HDM-4 cannot respond to small damage, as analysis and planning (long-listing) is carried out by IRI. In order to deal with small damage, it is necessary to establish a maintenance management system using other than HDM-4. Even in sections where large damage occurs in spots with high frequency, the measured IRI will be better if the pavement conditions around the large damage are good. Therefore, they are not included in the long list of HDM-4 analyses. This means that there is a large discrepancy between the results of the analysis and the actual feeling of users and managers (e.g., Zone Office) when they pass through the section. In particular, if the section where the user ascertains the damage is short, the discrepancy with the HDM-4 analysis results is large. In order to solve this problem, more detailed action is needed, utilizing maintenance cycles to address engineering damage to the pavement as described in the previous paragraph.

RHD's HDM-4 is outdated at version 1.3 (the latest is 2.1), and data processing is very complicated and inefficient, as multiple data converters are used for data input and PCs with different operating systems are used to run these converters. This requires not only upgrading the HDM-4 version, but also improving the overall computer environment for road maintenance and management planning, including updating data converters, introducing more powerful PCs, and utilizing the internet environment such as the cloud. The road surface condition measuring vehicle (ROMDAS) currently owned by RHD uses the LCMS (Laser Crack Measurement System) and is equipped with state-of-the-art measuring machinery. However, they are not compatible with road surfaces and are not able to measure with the expected accuracy. The use of road surface condition measuring vehicles is particularly effective on routes where manual inspection/measurement is not easily conducted, such as the National Corridor, which has a high volume of traffic. The system should be improved, as it

significantly increases operational efficiency. One measuring vehicle for a total length of more than 20 000 km is not sufficient, so the situation needs to be improved, e.g., by introducing new vehicles with equipment that can measure with sufficient accuracy.

In addition, maintenance plans are developed based on the long list, which is basically the result of the HDM-4 analysis. Therefore, the budget request does not cover sections that are not included in the long list. On the other hand, it is very effective that the long list is not adopted as a document for the budget request, but the sections included in the long list are checked with Zone Office and adjusted based on the opinions of Zone Office, such as adjustment of selected repair methods/costs. The issue for the future is how to deal with routes that are not included in the long list prepared by HDM-4, despite the Zone Office's judgement that the road surface is in poor condition.

When the budget is actually finalized and allocated to the various authorities, it is prioritized based on some abstract criteria (arterial roads, high traffic volumes, etc.). This process is not systemized and is carried out manually using Excel, which may be changed to solve political issues. In this process, sections with repair/improvement/widening projects scheduled to be implemented in the near future are excluded to avoid duplication of budgets and projects. Although this is a highly effective process, it is manual and omissions may occur. Therefore, a double-checking function by systemization is required.

The PBC, which is being considered for introduction mainly on trunk roads, will lead to a significant reduction in RHD's workload, as RHD will no longer be directly involved in the work. However, work items/procedures etc. related to future management by RHD, such as checking that contractual conditions are met on routes maintained by the contractor, checking what work is carried out and monitoring what effects it is having, need to be specified. In addition, the method dealing with the management of major risks, such as when the contractor's activities do not substantially meet the conditions stipulated in the contract, or the contractor's response when major damage occurs due to unforeseen events such as disasters, etc., also needs to be considered. Basically, preparations need to be made to minimize the recovery period after the occurrence and to ensure security for the continued implementation of the project.

When the number of maintenance routes under PBC increases, it is expected that the contractors will be different for each target route. Each contractor will use different road inventory information, inspection results, repair history records, etc., to utilize their strengths and to increase efficiency. Submission of this information to RHD headquarters will enable monitoring of the project, but it is expected to be difficult to centrally manage this information in the system used at the headquarters (currently HDM-4). In particular, the process of inputting the information into the system will be complicated, incurring additional costs and delaying the response.

PROPOSALS

With regard to the issue of dealing with engineering damage to pavements, the inspection manual should be updated and the manual should consider the current technical level materials & equipment

in possession. Training should then be provided to Zone Office and Division Office technicians/inspectors on how to use the manual. It will also be necessary to establish a system where inspections are mandated and carried out on a regular basis. The proposed improvements are studied and analyzed in the ongoing ADB-TA "TA-6772 BAN: SASEC Dhaka-Sylhet Corridor Road Investment Project-Tranche 1 - Output 3 (Road Asset Maintenance) (53382-002)". This TA is expected to provide some improvements as it will propose improvements and provide support for their implementation.

The improvement from the large-scale maintenance by utilizing IRI to a more detailed maintenance method will require improvements of the analysis software, HDM-4, and the establishment of a system for engineering damage. In particular, RHD (Headquarters BMW) wants to solve the discrepancy between the sense of Zone Office and the results of the analysis in HDM-4 as soon as possible. This is also the scope of the ADB-TA, so some improvement is expected.

Other issues, such as resolving the complexity of the current HDM-4, improving the condition of road surface condition measuring vehicles and studying how to formulate maintenance method different from IRI and management plans based on HDM-4 analysis results, will be discussed in the ADB-TA. Some improvement is also expected with regard to this issue.

With regard to the PBC, the direction regarding improvements is described together with the description of the issues. At present, it has only been decided to introduce this contracting method, and many problems will be identified through actual implementation. Ideally, the contract should be prepared in such a way that both the client and the contractor can take appropriate action, but this may be difficult to achieve in practice. In particular, detailed provisions, including arbitration, are needed on how to deal with claims from the contractors, as the interpretation of the contract may lead to a conflict between the client and the contractor.

With regard to centralized management at headquarters, it is desirable to require PBC contractors to submit the inspection results necessary for input into the system, and for the data to be accumulated at headquarters and managed in a database. The issue can be resolved by excluding PBC sections from the planning analysis.

6.3.3 PPP

(1) Current Conditions

The descriptions in this section were prepared based on interviews with the PPP Authority, JICA Expert dispatched to RHD, Additional Chief Engineer (ACE) in charge of PPP in Bridge Management Wing, as well as information from websites of PPP Authority and RHD.

1) Existing PPP Projects

In order to understand the trends regarding the PPP market in Bangladesh, the PPP projects listed in the Annual Report published by PPP Authority were studied. The table below shows the number of PPP projects by stage for the period 2016-2020.

Bangladesh's PPP Act was enacted in 2015, providing the basic legal framework for implementing PPP projects, while most of other guidelines, regulations and manuals were developed in the 2010s. Accordingly, the number of PPP projects increased. In 2016, there were already 43 projects. The trend has continued in the last five years, reaching 79 projects in FY2020. Although growth has slowed since FY 2019 due to the impact of the worldwide pandemic of CPVOD19, the growth rate since FY 2017 is still 84%.

Looking at the number of projects by stage, the increase in the early stages of projects (F/S not yet implemented / already implemented) is not as large, at 73% and 59% respectively. This is due to the fact that it is relatively easy for projects in the early stages to move to the next stage, that projects with no business potential are removed from the target projects in the early stage, and that the number of total projects was large in 2016 with 11 and 17 projects, respectively.

For projects in the procurement process to determine the project implementing company, the rate of increase is still 55%, which is lower than the rate of increase in the overall number of projects.

Due to the nature of PPP projects, companies acted from the conceptual phase have a lot of information and can participate in the bidding process, so it can be assumed that the process up to the stage of deciding PPP implementing company is proceeding relatively smoothly.

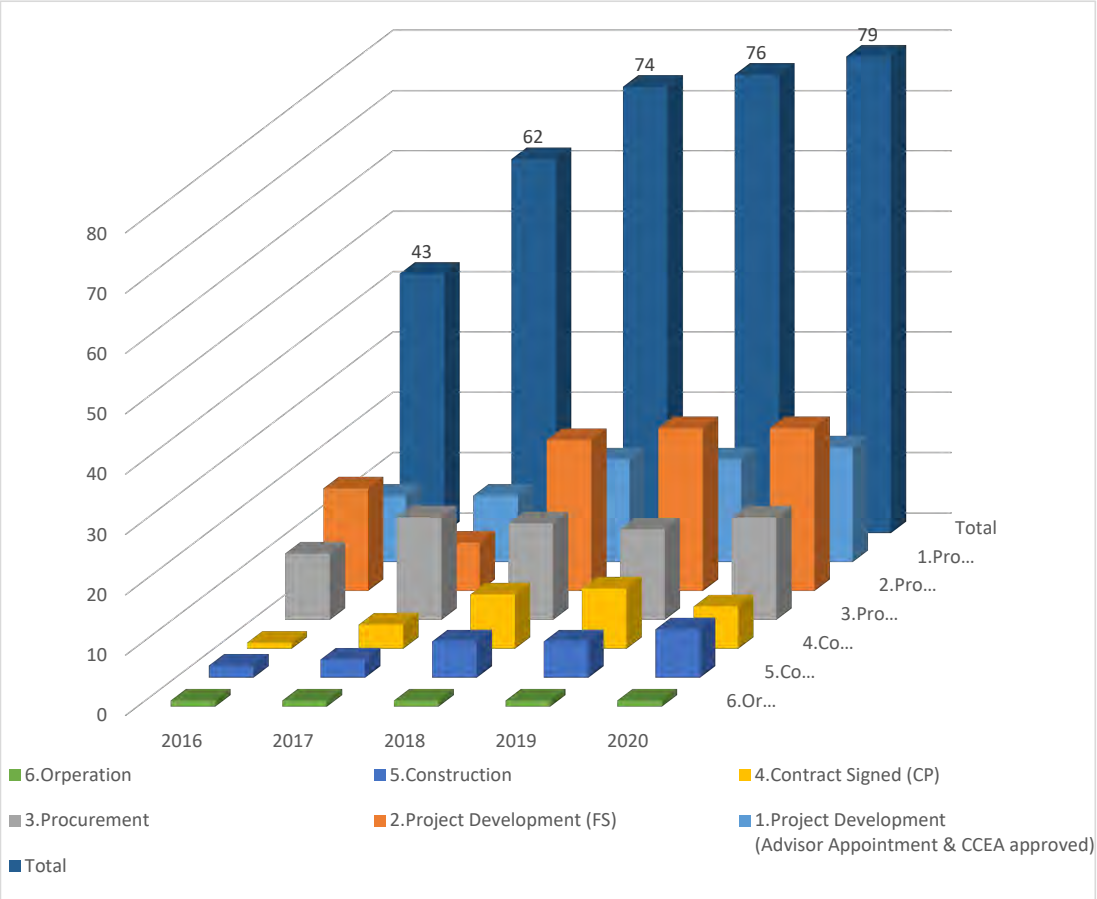
The rate of increase is very high at the next stage, i.e., at the time of contract signing and construction implementation. This is due to the fact that in 2017, a large number of projects were in the initial stages of the project, with only one and two projects having progressed to this stage respectively. The number of projects increased to six both at the time of contract signing and construction implementation.

Only one PPP project was in service from FY2017 to FY2021. Projects that were under contract or under construction in the past have not been put into service at all. PPP projects are usually earlier than normal public works projects. Delays in the start of service can lead to a deterioration in the profitability of the project, which is a very big loss for the implementing company. Scale of PPP projects are generally large, and it is understandable that each project has its own specific circumstances. However, the start of service is generally later than originally planned.

Table 6.3.4 Number of PPP Project in Bangladesh (by Stage)

Stage	2016	2017	2018	2019	2020	20/16 Increase (%)
1. Project Development (Advisor Appointment & CCEA approved)	11	11	17	17	19	73%
2. Project Development (FS)	17	8	25	27	27	59%
3. Procurement	11	17	16	15	17	55%
4. Contract Signed (CP)	1	4	9	10	7	600%
5. Construction	2	3	6	6	8	300%
6. Orperation	1	1	1	1	1	0%
N/A	2	18	0	0	0	-
Total	**43**	**62**	**74**	**76**	**79**	**84%**

Source: PPP Authority Annual Report (2016-2020)



Source: PPP Authority Annual Report (2016-2020)

Figure 6.3.3 Number of PPP Project in Bangladesh (by Stage)

The number of PPP projects by sector is shown in the table below. The largest increase between 2016 and 2020 is in the Industry sector, with 13 Textile Mill projects listed in 2018. Other sectors with increases of more than 100% are Transport, Urban and Energy. The Transport sector had 9 projects listed in 2016, increasing to 21 in 2020. The other 3 sectors, Shipping, Covil Accommodation and Zone, also show an increase of more than 50%. On the other hand, there is no increase or decrease in the Health, Social Infrastructure and Education Sectors, while the Truism Sector has decreased by

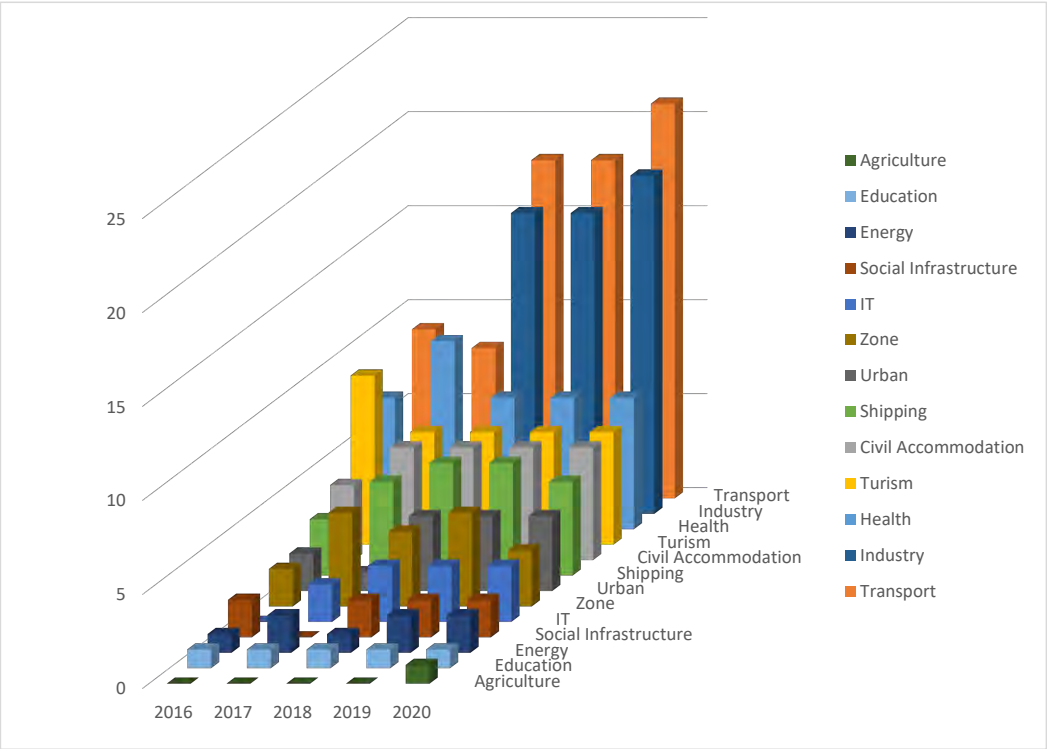
33%. The IT and Agriculture sectors, which did not have any eligible projects in 2016, have 3 and 1 projects listed in 2020 respectively.

Overall, the number of projects in each sector is either flat or increasing. In 5 years from FY 2016 to FY 2020, 4 sectors are found where the number of projects has increased and then decreased again. This shows that, although several projects have been listed, some projects have been removed from the list due to shrinking demand or increasing costs in the course of the implementation procedure of the PPP project. Only 2 sectors, Transport and Civil Accommodation, have more than five projects and show an increasing trend without any decrease at all.

Table 6.3.5 Number of PPP Project in Bangladesh (by Sector)

	2016	2017	2018	2019	2020	20/16 Increase (%)
Health	7	10	7	7	7	0%
Transport	9	8	18	18	21	133%
Civil Accommodation	4	6	6	6	6	50%
Truism	9	6	6	6	6	-33%
IT	0	2	3	3	3	-
Shipping	3	5	6	6	5	67%
Industry	3	2	16	16	18	500%
Social Infrastructure	2	0	2	2	2	0%
Urban	2	1	4	4	4	100%
Zone	2	5	4	5	3	50%
Energy	1	2	1	2	2	100%
Agriculture	0	0	0	0	1	-
Education	1	1	1	1	1	0%
N/A	-	14	-	-	-	-
Total	**43**	**62**	**74**	**76**	**79**	**84%**

Source: PPP Authority Annual Report (2016-2020)



Source: PPP Authority Annual Report (2016-2020)

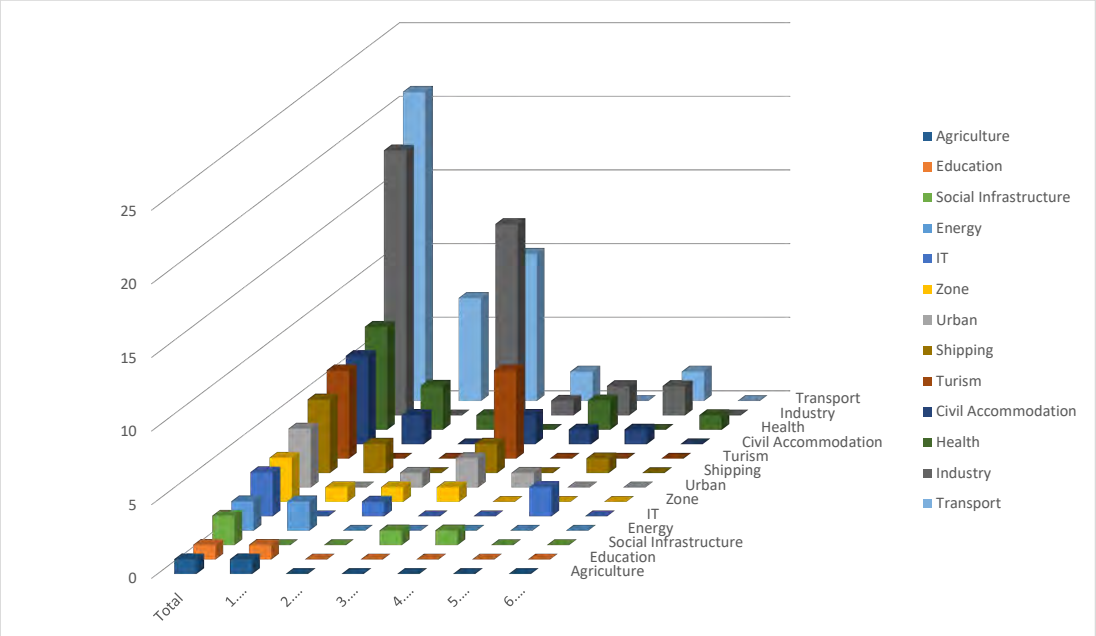
Figure 6.3.4 Number of PPP Project in Bangladesh (by Sector)

The following table confirms the distribution by sector and stage in FY2020. In most sectors, the majority of projects are in Stage 1 or 2, the project preparation stage, up to the implementation of the F/S. In 5 sectors (Health, Transport, Civil Accommodation, IT and industry), contracts with implementing companies have already been signed for several projects. There are 3 projects for only Health sector, while there are 2 projects for other sectors. As can be seen from this distribution, the fact that PPP projects have not reached the operation stage is not limited to the transport sector, but is a common situation in all sectors.

Table 6.3.6 Number of PPP Project in Bangladesh (by Sector and Stage, 2020)

	1. Project Development (before FS)	2. Project Development (FS)	3. Procurement	4. Contract Signed (CP)	5. Construction	6. Operation	Total
Health	3	1	-	2	-	1	7
Transport	7	10	2	-	2	-	21
Civil Accommodation	2	-	2	1	1	-	6
Truism	-	-	6	-	-	-	6
IT	-	1	-	-	2	-	3
Shipping	2	-	2	-	1	-	5
Industry	-	13	1	2	2	-	18
Social Infrastructure	-	-	1	1	-	-	2
Urban	-	1	2	1	-	-	4
Zone	1	1	1	-	-	-	3
Energy	2	-	-	-	-	-	2
Agriculture	1	-	-	-	-	-	1
Education	1	-	-	-	-	-	1
Total	**19**	**27**	**17**	**7**	**8**	**1**	**79**

Source: PPP Authority Annual Report (2016-2020)



Source: PPP Authority Annual Report (2016-2020)

Figure 6.3.5 Number of PPP Project in Bangladesh (by Sector and Stage, 2020)

2) National Credit Rating

The national credit rating of Bangladesh was examined. The South Asian countries to which Bangladesh belongs, the ASEAN countries with which Japan has close relations, and the BRICS countries, which previously showed high economic growth, were selected. The country ratings of the seven South Asian countries by the three major rating agencies (Standard & Poor's, Fitch Ratings and Moody's) are shown in the table below.

Bangladesh is recognized as the second most creditworthy country in South Asia from the top. The only country that falls behind is India, which is found to be very creditworthy compared to the other countries. The creditworthiness of the companies is rated on a scale of 22 by S&P's and Fitch and 20 by Moody's. Bangladesh is rated 13th from the top for all of them. According to Standard & Poor's definition, a BB rating, including the 13th BB-, is the least speculative of the speculative ratings (BB, B, CCC, CC, C). The BBB group of ratings for India is 'adequate financial strength to meet the relevant financial obligations, but there is a greater likelihood that deterioration in the business environment or economic conditions will reduce the ability to meet such obligations'[1].

Table 6.3.7 Credit Ratings by Three Major Rating Agencies (South Asian countries)

South Asia	S&P's		Fitch		Moody's	
	Rate	Rank	Rate	Rank	Rate	Rank
India	BBB-	10	BBB-	10	Baa3	10
Bangladesh	**BB-**	**13**	**BB-**	**13**	**Ba3**	**13**
Maldives	N/A	-	B-	16	B3	16
Pakistan	CCC+	17	CCC-	19	Caa1	17
Sri Lanka	SD	22	RD	22	Ca	20
Nepal	N/A	-	N/A	-	N/A	-
Bhutan	N/A	-	N/A	-	N/A	-

Source: https://tradingeconomics.com/country-list/rating

Comparisons were made with 9 ASEAN countries. The leading credit rating of ASEAN countries is Singapore, which has the highest rating from 3 rating agencies. Next in line is Malaysia, with A ratings from 2 rating agencies (the third highest as a group, the same as Japan) from 2 different rating agencies. Thailand, Philippines, Indonesia and Vietnam, known as middle-income countries, are in the same BBB group as India, one group higher than Bangladesh's credit rating. The remaining countries, Cambodia, Laos and Myanmar, either have no credit rating at all or only one. Bangladesh has a slightly lower rating as an investment destination for ASEAN countries than countries worthy of consideration.

[1] S&P Global Website
https://disclosure.spglobal.com/ratings/jp/regulatory/delegate/getPDF?articleId=2753061&type=COMMENTS&subType=RATING%20DEFINITION

Table 6.3.8 Credit Ratings by Three Major Rating Agencies (ASEAN countries)

ASEAN Countries	S&P's		Fitch		Moody's	
	Rate	Rank	Rate	Rank	Rate	Rank
Singapore	AAA	1	AAA	1	Aaa	1
Malaysia	A-	7	BBB+	8	A3	7
Thailand	BBB+	8	BBB+	8	Baa1	8
Philippines	BBB+	8	BBB	9	Baa2	9
Indonesia	BBB	9	BBB	9	Baa2	9
Vietnam	BB+	11	BB	12	Ba2	12
Bangladesh	**BB-**	**13**	**BB-**	**13**	**Ba3**	**13**
Cambodia	N/A	-	N/A	-	B2	15
Laos	N/A	-	CCC-	19	N/A	-
Myanmar	N/A	-	N/A	-	N/A	-

Source: https://tradingeconomics.com/country-list/rating

It is compared with the 5 participating countries of BRICS established in 2011 and Japan. BRICS includes five countries (Brazil, Russia, India, China and South Africa) that are rich in natural resources, have large populations and have shown high growth since the 2000s. However, only China and India have continued to show economic growth after the turmoil caused by the Covid19 epidemic. The other three countries have not been able to sustain economic growth as they did then. Reflecting this situation, China and India have higher ratings than Bangladesh. In particular, China has obtained a rating equal to that of Japan (one rank higher by Fitch).

Table 6.3.9 Credit Ratings by Three Major Rating Agencies (BRICS and Japan)

Other Countries	S&P's		Fitch		Moody's	
	Rate	Rank	Rate	Rank	Rate	Rank
China	A+	5	A+	5	A1	5
Japan	A+	5	A	6	A1	5
India	BBB-	10	BBB-	10	Baa3	10
Brazil	BB-	13	BB-	13	Ba2	12
Bangladesh	**BB-**	**13**	**BB-**	**13**	**Ba3**	**13**
South Africa	BB-	13	BB-	13	Ba2	13
Russia	NR	-	NR	-	NR	-

Source: https://tradingeconomics.com/country-list/rating

Bangladesh's national credit rating is exactly the same as South Africa's and almost equal to Brazil's. While the credit ratings of both these countries have fallen in recent years and their creditworthiness is classified as speculative, Bangladesh has managed to keep its credit rating at the level of both countries during the global turmoil of the last few years. Bangladesh has an overwhelming advantage as a destination for investment in South Asian countries other than India.

3) PPP Authority

There are only ten (10) staff including the leader, CEO who belong to PPPA. However, they execute the preparation of 76 projects in 14 sectors. Therefore, there is a chronic lack of human resources in PPPA and the progress of each project is very slow.

On the other hand, the majority of the staff consists of the officers from relative ministries, such as MOF. It makes the situation that there are very few officers who doesn't have enough knowledge/experiences not only of PPP but also of 14 sectors. PPPA hires individual consultants to solve their lack of human resources but the issues of human resources or knowledge/experience cannot be solved effectively. Moreover to accumulate the knowledge/experiences of the organization. It is causing the unfavorable situation that they cannot realize the smooth implementation of PPP project as it is mentioned in PPPA's objectives. It also making the coordination among relative ministries and relative organization difficult.

4) RHD

The contact person for PPPs is ACE of the Bridge Management Wing, who is also the contact person for the RHD of Japan Bangladesh Joint PPP platform. However, ACE is responsible for all other new bridge construction, replacement, widening and repair/reinforcement projects, and his involvement in PPP projects is only one of his many tasks.

5) Japan Bangladesh Joint PPP Platform

The following 4 projects are listed in Japan Bangladesh Joint PPP Platform (Oct. 2022). "Steel Bridge Replacement and Maintenance" was added in the 5th Meeting in Oct. 2022.

i) Chattogram-Cox's Bazar Highway Improvement.

Currently, priority is given to the widening of National Highway No.1 connecting Chattogram-Cox's Bazar. The progress of Dhaka-Chattogram Expressway Improvement Project, which is expected to generate more traffic demand, has made little progress, thus delaying the progress of this project.

ii) Dhaka Outer Ring Road.

This is parts of sections of Dhaka Outer Ring Road that is planned in the southern region on the outskirts of Dhaka city. It is planned in 3 sections. Both Japan and Bangladesh are discussing the priorities for implementation, taking into account land acquisition, resettlement, traffic demand, etc.

iii) National Highway No.5 (Navinagar to Paturia) Improvement and Operation

With the opening of Padma Bridge on National Highway No.8, traffic between Dhaka and north areas of Padma River and west area of Jamuna River (Rajshahi & Rangpur Division)

is being diverted to Padma Bridge, thus reducing traffic on National Highway No.5. This trend is expected to continue until a bridge is constructed between Aricha and Kazirhat where National Highway No.5 crosses the Jamuna River. As a result, the growth in traffic demand has been slower than originally expected, which has reduced the priority of the project.

iv) Steel Bridge Replacement and Maintenance

Study of the project is being conducted as a Pre-F/S by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). This project was newly added in October 2022 at Japan Bangladesh Joint PPP Platform 5th Meeting. As a result of discussion among RHD, JICA Expert and the study team during the study, the project scope was changed to a long bridge widening/replacement project instead of replacing damaged small and medium bridges, which was originally planned. A shortlist will be developed within the study and the contents of the F/S will be studied.

6) Projects funded by Other Donors

ADB and World Bank is planning projects to cope with the PPPA's issues, such as lack of human resources and the situation that preparation of the PPP projects in their list are not showing the proper progress. ADB is planning to execute TA and assign PPP Policy advisor. It is thirty-six (36) month long project starting from Dec. 2022. World Bank is planning to execute Constancy Service and assign four (4) experts of PPP, Procurement, Project Management, and Legal. The Bangladeshi government has issued No Objection Notice (NOC) to the bank. Both projects plan to assign PPP related experts, however, there will be no experts of 14 sectors which the candidate PPP projects belong.

(2) Issues and Proposals

1) PPP Authority

ISSUES

A fundamental issue for the PPP Authority is the lack of personnel. In terms of the progress of PPP candidate projects, no new projects have been put into service since 2016. Despite the fact that the number of candidate projects is increasing and the number of projects that have contracted with project implementing companies or started construction is increasing, no projects have started to be put into service. It appears that the project delay risk factors are more complex than initially assumed by the project implementing companies. It can also be assumed that the systems to support this progress are not sufficient.

Secondly, the staff in the PPP Authority are mainly seconded staff from MOF. Individual Consultants, who are employed on a fixed-term basis, are also specialists in PPPs and there is a lack of personnel with expertise/experience in project development in various sectors, including the road and bridge sector. This is thought to be a factor in the slow progress of the projects.

PPP projects are generally large-scale projects and involve many stakeholders. Coordination between stakeholders is necessary. Progress tends to be slow when the project implementing company carries out this coordination. The PPP Agency is in a position to provide support, particularly with regard to inter-ministerial coordination. However, capacity for coordination may be currently not enough, which is one reason for the slow progress of the projects. The PPP Authority has a large number of potential projects, but overall progress is slow and more capacity to manage progress will be needed.

PROPOSALS

The only drastic solution to the shortage of manpower in the PPP Authority is to fill the staffing needs. The lack of expertise can be addressed by dispatching experts in the target projects from the ministry in charge. It will also be necessary to increase the number of experts in charge and to speed up the progress of the target projects by hiring fixed-term experts not only in PPP-related areas but also in the target projects. Measures such as increasing the number of staff employed by PPP Authority and providing incentives to full-time employees, rather than only seconding staff from other ministries who return to their original body after a few years, could also be considered. Issues related to slow progress in target projects could be addressed by granting authority to PPP Authority or by setting up a permanent task force.

Support for PPP Authority from Japanese side could include the dispatch of experts on projects covered by the Japan Bangladesh Joint PPP Platform and the dispatch of PPP Authority staff to training in Japan, as PPP experts are being considered for deployment with the support of the World Bank and ADB.

2) RHD

ISSUES

The issues for PPP projects in RHD is that there is no dedicated department/person in charge of PPPs, although there are many target projects, including 4 projects listed on Japan Bangladesh Joint PPP Platform, G2G PPP projects with other countries (such as South Korea) and Dhaka Bypass project under construction. It is difficult for the person in charge to implement the project concurrently with other tasks due to workload/time constraints. This has resulted in longer time for decision-making within RHD and consultations with the relevant ministries, which has slowed progress.

In addition, unlike ordinal public works projects, PPP projects are not suited for project formation in a way that expands the project cost by incorporating necessary works. However, observing Japan Bangladesh Joint PPP Platform meeting, sometimes inclusion of various ancillary works in large-scale projects, adoption of landmark designs with excellent design features, implementation of large-scale projects with large procurement amounts, etc. are requested. This places a significant burden on the project implementing companies of the projects. Considering that G2G PPP projects are much more difficult to raise additional budget than ODA loan projects, the initial project formation should be minimal.

PROPOSALS

The implementation of projects through PPP is likely to increase in the future, which is also the policy of the Government of Bangladesh. Therefore, it is desirable to establish dedicated staff in charge of PPP project in Circle and other organizations that implement road/bridge improvement projects. In addition, a system should be established to support the current ACE tasks.

Table 6.3.10 Bridge Operation & Maintenance Sector Proposals

No.	Current Conditions	Issues	Proposals
RHD			
1	Regular inspections of bridges and box culverts are being carried out by consultants in two zones (Cumilla and Rangpur). Conventional method is still used in other areas, and the maintenance cycle is not adequate.	The maintenance cycle is not implemented. (Inspection/diagnosis/evaluation/repair plan (next year) other than plan (long list), budget request/allocation, design, repair work, record)	Establish a maintenance cycle as early as possible, by formulating a repair plan, budget request/ allocation, repair design, repair work and recording of repair.
2	Few private companies are able to carry out bridge repair design/construction.	There are few private consultants capable of designing effective repairs and few contractors with sufficient experience/capacity to successfully repair damage.	Expand the RHD training center, and use the facility to improve the knowledge and technical skills of private engineers/inspectors. Create a qualification system for inspection, diagnosis, evaluation, design, and repair works for private contractors responsible for the maintenance cycle. Use it as bidding condition for contractors to assure / improve work quality.
3	Almost no contractors with experience in bridge repair work, except the bridge surface.	The number of contractors who can satisfactorily perform repairs excepting the bridge surface is limited.	Renovate / expand the current training center, and conduct not only theatrical lectures but also practical training to engineers/inspectors, including those from the private sector.
4	Shortage of equipment to inspect the entire bridge.	Many bridge parts cannot be inspected, therefore the current situation cannot be properly evaluated.	Increase the bridge inspections as maximum as possible utilizing drone, extend the bridge area that can be inspected bridge inspection vehicle or lift platform vehicle.
5	Only two robot cameras to support bridge inspections.	The number of inspection equipment such as robot cameras is too imitated, so the progress of regular inspections is very slow.	Increase the number of inspection equipment, train private companies (consultants), and outsource the on-site work to the trained consultants' personnel.
6	One of the two robot cameras is broken and cannot be repaired.	The robot camera damage can't be repaired.	Negotiate the contract terms with the procured equipment manufacturer to provide repair inside Bangladesh and to supply essential replacement parts for a certain period of time.
7	Few consultants have experience in detailed inspection and repair design.	There are very few consultants who can perform inspection work with the required quality.	Renovate / expand the current training center, and conduct not only theatrical lectures but also practical training to engineers/inspectors, including those from the private sector.
8	All bridges inspections should be finished by 2024, but currently it hard goal to achieve.	All bridge inspections cannot be carried out once every three years.	Increase the number of inspection equipment, train private companies (consultants), and outsource the on-site work to the trained consultant's personnel.

No.	Current Conditions	Issues	Proposals
9	During budget request, target bridges aren't selected based on whole picture, but based on individual information.	No clear criteria to select the priority bridges to be repaired.	Define the selection standards and formulate the plans according to those standards. Grasp the condition of each bridge by quantifying the inventory information and inspection results.
10	Long time lag between reporting serious damage until budgeting/implementing repairs.	Report regarding series damage is submitted from the Zone office to the headquarters, after the budget application is submitted to the MOF, than budget is allocated for implementing repairs.	Allocate a sufficient budget to deal with bridge damage, create a scheme to urgently repair series damage without going through the MOF budget request process.
11	Bridge Operation & Maintenance plan is prepared only for the next year.	No medium to long-term maintenance plan.	Use existing data to formulate a medium-term maintenance plan. Grasp the current situation, and inform other stakeholders to ensure the necessary budget.
12	RHD training center is underutilized (lectures and computer training only)	It is necessary to teach engineers/inspectors including those in the private sector about knowledge/skills of the maintenance cycle.	Train a sufficient number of instructors (trainers) to create a sustainably learning environment.
Bridge maintenance project			
13	Maintenance cycle stopped at plan stage (P). (Long list creation)	Complete the maintenance cycle by establishing a system of steps from formulating a repair plan to recording the details of the work. Develop a base of engineers in Bangladesh who can carry out repair design/repair work at the level required by standards/manuals.	Involve private companies (consultants & contractors) to create enjoinment to improve technology skills and accumulate/share experiences.
14	Two robot cameras have already been procured, one of which is out of order.	There are issues such as lack of inspection equipment and inadequate handling of breakdowns.	Expansion of inspection equipment, prompt response to failures, training of private inspectors, etc.
15	The developed BMS is not utilized for prioritization.	There are no clear standards for how to use the long list prepared by BMS and how to allocate the budget, and decisions are made on case by case.	Promote the systematic use of long lists.
16	maintenance cycle (next year) repair plan, budget request/allocation, design, construction, record)	Increase the number of human resources capable of conducting inspection/repair design/repair work In parallel with raising the level of the private sector, turn the management cycle and improve both quality and quantity within RHD	Since there are many areas in which RHD needs to be improved, technical assistance and training by experts will be provided.
BBA			
17	A five-year comprehensive maintenance contract has been implemented.	Ensuring reliable implementation of comprehensive maintenance contracts	Adopt methods such as evaluation of maintenance work by a third party.
18	No experience in dealing with large risks.	Response when the activity of the contractor falls significantly below the conditions stipulated in the contract	Make improvements by updating risk management when contracts are renewed.
19	No established method of management for whole area.	No systematic and centralized management at headquarters	A unified management method is planned and the contractor records accordingly.

Source: JICA Survey Team

Table 6.3.11 Road Operation & Maintenance Sector Proposals

No.	Current Conditions	Issues	Proposals
1	Engineering pavement inspections are not performed regularly across the entire route.	It is a periodic inspection only for IRI, and engineering pavement inspection (inspection for physical damage such as cracks, ruts, subsidence, potholes, etc.) is only a post-mortem emergency inspection that is performed after the damage has progressed, visual inspections for all routes are not carried out regularly.	Regular engineering pavement inspections will be conducted along the entire route.
2	A maintenance plan has been formulated for each HDM-4 line segment.	Repair methods are also implemented for each line, and large-scale repair methods such as DBST, overlay, and pavement replacement are selected.	Improvement from the IRI maintenance method to a maintenance method that handles more detailed engineering damage
3	The inspection manual has not been updated since 2001.	Manuals/guidelines are outdated.	Early update of manuals/guidelines. Train manuals to Zone Office and Division Office technicians/inspectors
4	Technical inspection results are not accumulated.	No technical approach for pavement damage (maintenance cycle).	Build a system to utilize technical damage data.
5	HDM-4 is managed by IRI.	HDM-4 is analyzed and planned (long list formulation) by IRI, so it is not possible to deal with local damage.	Improvement from the IRI maintenance method to a maintenance method that handles more detailed technical damage
6	HDM-4 of RHD (headquarters: PMW) is an old version of 1.3, and the operation method is complicated.	Upgraded version of HDM-4, simplified operation	HDM-4 version upgrade, early realization of operation simplification
7	Road surface condition measurement vehicle (ROMDAS) not used.	Road surface condition measurement vehicle (ROMDAS) accuracy is low.	Improve accuracy and operating rate of Road surface condition measurement vehicle (ROMDAS)
8	The introduction of PBC is being considered mainly on arterial roads.	Supplier monitoring/evaluation method not established.	Check to what extent the routes maintained and managed by the contractor meet the contractual conditions, monitor what kind of work is being carried out and what effect it has, and maintain the contractor on a regular basis. We will define/improve work items/procedures related to future management by RHD (headquarters: PMW), such as guaranteeing certainty in evaluating management operations.
9		No experience with large risks.	Regarding the method of dealing with complaints from contractors, it is desirable to have detailed provisions including arbitration.
10		Centralized management of the system used at headquarters (currently HDM-4) will be difficult.	Data is accumulated at the headquarters and managed in a database by obligating acquisition and submission of inspection results necessary for system input from PBC contractors.

Source: JICA Survey Team

Table 6.3.12 PPP Sector Proposals

No.	Current Conditions	Issues	Proposals
PPP Agency			
1	The number of employees is small compared to the number of target projects.	Chronically understaffed. Insufficient systems/systems to support the progress of target projects.	Replenish personnel. In addition to the seconded staff from other ministries and agencies who will return to their original affiliation in a few years, we will increase the number of staff hired by the PPP agency and give incentives to regular staff.
2	Most of the staff are financial experts such as PPP.	Many of the staff belonging to the PPP Agency are mainly seconded from the MOF, and there is a shortage of personnel with specialized knowledge and project development experience in each sector.	An expert on the target project will be dispatched from the ministry in charge.
3	Lack of coordination among stakeholders and slow progress.	Coordination among many stakeholders is necessary, but capacity is poor.	Authorization of PPP agency and establishment of a permanent countermeasures committee
RHD			
4	Persons in charge of PPP projects carry out their duties concurrently with other duties.	There is no department dedicated to PPP.	Establish a dedicated department at an early stage.
5	Even in PPP projects, business bloat is large.	There is little understanding of the business feasibility of PPP projects.	Disseminate within the ministry the idea of the difference between conventional public works and PPP projects.

Source: JICA Survey Team

7. OUTLINE AND RECOMMENDATION FOR PRIORITY ROAD AND BRIDGE PROJECT

7.1 Outline for Priority Road and Bridge Project

Outline for priority road and bridge projects is shown below.

7.1.1 Dhaka – Chattogram Expressway (R-01(1)(2)(3))

(1) Basic Information

1) Country Name: Bangladesh
2) Project Location: Near the existing National Highway No.1 in Dhaka District, Narayanganj District, Munshiganj District, Cumilla District, Feni District and Chattogram District
3) Project Name: Dhaka – Chattogram Expressway Construction Project (Tentative)
4) Project Summary: This project is implemented to construct a new expressway connecting Dhaka and Chattogram which are 2 big cities in Bangladesh.

(2) Project Outline

1) Project Outline

(A) Objectives of the Project: To improve road network connectivity and transport capacity by construction of a new expressway connecting Dhaka and Chattogram which are 2 big cities in Bangladesh, and thereby to contribute economic growth.

(B) Project Component:
   (a) Construction of 4-lane expressway (Dhaka - Cumilla: about 100 km, Cumilla - Feni: about 45 km, Feni - Chattogram: about 72 km, Total: about 217 km)
   (b) Consulting Service (Detailed Design, Tender Assistance, Construction Supervision)

(C) Beneficiary of the Project:
   (a) Direct Beneficiary: Residents in 6 districts (about 37.3 million people)
   (b) Ultimate Beneficiary: All Bangladesh citizens (about 165.2 million people)

2) Project Cost

Project cost of this project is shown in Table 7.1.1. Precondition for the project cost estimation is as follows.

- Civil works cost was calculated in reference to the unit price of major construction items such as civil work, concrete bridge, steel bridge, etc. shown in the recently prepared existing feasibility study for road / bridge development project.
- It is assumed that price escalation is 2.06%/year for Japanese Yen and 9.07%/year for Bangladeshi Taka.
- Physical contingency is set as 10% of civil works and 5% of consulting services.
- Consulting services include detailed design, tender assistance and construction supervision.
- It is assumed that interest during construction is 1.2%/year for civil works and 0.01%/year for consulting services.
- It is assumed that front end fee is 0.2%.
- Land acquisition cost was calculated in reference to the unit price of land acquisition cost shown in the recently prepared existing feasibility study for road / bridge development project.
- It is assumed that administration cost is 5%.
- 7.5% of VAT for civil works, 15% of VAT for consulting services and 30% of import tax are included as taxes.

Table 7.1.1 Project Cost of Dhaka – Chattogram Expressway (R-01(1)(2)(3))

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million JPY)			Amount (million JPY)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
Civil Works Sub Total	119,011	119,011	0	472,886	472,886	0	591,898	591,898	0
Price Escalation	21,967	21,967	0	508,796	508,796	0	530,763	530,763	0
Physical Contingency	14,098	14,098	0	98,168	98,168	0	112,266	112,266	0
Consulting Services	17,459	17,459	0	13,812	13,812	0	31,271	31,271	0
Interest during Construction	66,329	0	66,329	0	0	0	66,329	0	66,329
Front End Fee	2,532	0	2,532	0	0	0	2,532	0	2,532
Land Acquisition	0	0	0	70,452	0	70,452	70,452	0	70,452
Administration Cost	0	0	0	66,833	0	66,833	66,833	0	66,833
VAT, Import Tax and Other Taxes	0	0	0	231,076	0	231,076	231,076	0	231,076
Total	**241,397**	**172,536**	**68,862**	**1,462,023**	**1,093,663**	**368,360**	**1,703,420**	**1,266,199**	**437,222**

Source: JICA Survey Team

3) Project Implementation Schedule

It is assumed that the Project is implemented by the following schedule.

- JICA Preparatory Survey : April, 2024 to March, 2025 (12 months)
- Procurement of Consultant : April, 2025 to March, 2026 (12 months)
- Detailed Design : April, 2026 to March, 2027 (12 months)
- Procurement of Contractor : April, 2027 to June, 2028 (15 months)
- Construction : July, 2028 to June, 2033 (60 months)

The project can be divided into 3 packages, namely Package-1: Dhaka-Kumilla, Package-2: Cumilla-Feni, Package-3: Feni-Chattogram, and each package is implemented by phase.

4) Implementation Agency

(A) Construction: Roads and Highways Department (RHD)
(B) Operation & Maintenance: Planning & Maintenance Wing of RHD will carry out operation & maintenance for this project. However, there is no expressway (fully access controlled toll road) at present in Bangladesh, thus the capacity for its operation & maintenance is not enough. Inspection and repair of pavement is mainly conducted for road maintenance currently in Bangladesh. There is no manual and equipment for operation & maintenance of expressway. Regarding the financials, only almost half of requested budget is normally approved, and sufficient budget has not been secured. It is recommended that operation & maintenance of expressway is carried out by outsourcing to private companies efficiently by toll fee income. It is also recommended to provide technical support from Japan such as training during detailed design and construction period.

5) Environmental and Social Consideration

(A) JICA Category: A
(B) Land Acquisition: About 1,000 ha
(C) Resettlement: About 4,200 households
(D) Protected Area: The Baroiyadhala National Park is located approximately 2km to the east. There might be no negative impact to the project. However, appropriate mitigation measures will be taken if necessary.

6) JICA Gender Category:

GI (Gender Informed) (Tentative)

7) Others:

- Feasibility study (F/S) and detailed design (D/D) were conducted by ADB in 2015. This F/S and D/D include topographic survey, geological survey, traffic survey and environmental & social survey.
- Regarding the construction cost, 298 billion JPY (mainly by earthwork) to 939 billion JPY (mainly by viaduct) was estimated according to the road structure type in ADB design, 2025, although 592 billion JPY (basically by earthwork) was estimated in this survey. As there is a big difference between Construction costs for both ADB design and this survey, construction cost should be estimated again based on the detailed design results in the project implementation.
- Regarding resettlement, number of resettlement was estimated by types in ADB design, 2025. ADB design shows that significant number of socially vulnerable group must be resettled.

Number of resettlement is significantly varied by road alignment and structure type. Therefore, road alignment and structure types, etc. should be determined considering impact on the residents

(3) Project Effects

1) Quantitive Effects

Indicator	Current Value (2022)	Value for 3 year after Operation
Annual average daily traffic volume	47,500 PCU	64,600 PCU
Reduction of travel time	7.2 hours	2.7 hours
Reduction of travel cost	-	13 billion BDT/year

2) Qualitative Effects

Traffic safety in towns and villages along the road is improved, as much through traffic can be eliminated from the existing National Highway No.1.

(4) Lessons Learned from Past Similar Projects

From the ex-post evaluation for East Bangladesh Bridge Improvement Project, lessons have been learnt that damages for some bridges constructed in the project have not been properly repaired. And it is important to conduct enough maintenance of bridges. Therefore, it is important in this project that operation & maintenance plan will be developed in the planning stage, and operation & maintenance by executing agency will be monitored.

(5) Others

1) Coordination with other Projects

It is scheduled that Feasibility Study (F/S) and Detailed Design (D/D) for upgrading existing National Highway No.1 are conducted by ADB. It is necessary for the study of both projects (this project and ADB project) to share the information such as traffic demand forecast, etc. and to clarify the roles for each project.

2) Other Considerations

It is not easy to construct whole sections of Dhaka - Chattogram Expressway at same tune from the budget constraint. Therefore, phased construction comprising Package-1: Dhaka-Kumilla, Package-2: Cumilla-Feni, Package-3: Feni-Chattogram should be considered based on the priority of each package.

Source: Feasibility Study and Detailed Design (Package-I) Under Technical Assistance for Detailed Study and Design of Dhaka-Chittagong Expressway on PPP Basis, 2015, ADB

Figure 7.1.1 Dhaka – Chattogram Expressway Construction Project (Tentative)

Source: JICA Survey Team

Figure 7.1.2 Intersection on the Existing N1

Source: JICA Survey Team

Figure 7.1.3 Town along the Existing N1

7.1.2 Padma Bridge/Tunnel (N5 Paturia – Goalonda Point) (B-02)

(1) Basic Information

1) Country Name: Bangladesh
2) Project Location: Padma River crossing near Paturia on National Highway No.5 in Manikganj District and Rajbari District
3) Project Name: Padma Bridge/Tunnel (N5 Paturia – Goalonda Point) Construction Project (Tentative)
4) Project Summary: This project is implemented to construct a new bridge or tunnel across Padma River near Paturia.

(2) Project Outline

1) Project Outline

(A) Objectives of the Project: To improve road network connectivity and transport capacity by construction of a new bridge or tunnel across Padma River near Paturia, and thereby to contribute economic growth.

(B) Project Component:
   (a) Construction of 4-lane bridge or tunnel and its approach road (Total Length: about 6 km)
   (b) Consulting Service (Detailed Design, Tender Assistance, Construction Supervision)

(C) Beneficiary of the Project:
   (a) Direct Beneficiary: Residents in Manikganj District and Rajbari District (about 2.8 million people)
   (b) Ultimate Beneficiary: All Bangladesh citizens (about 165.2 million people)

2) Project Cost

Project cost (In case of bridge construction) of this project is shown in Table 7.1.2. Precondition for the project cost estimation is as follows.

- Civil works cost was calculated in reference to the unit price of major construction items such as civil work, concrete bridge, steel bridge, etc. shown in the recently prepared existing feasibility study for road / bridge development project.
- It is assumed that price escalation is 2.06%/year for Japanese Yen and 9.07%/year for Bangladeshi Taka.
- Physical contingency is set as 10% of civil works and 5% of consulting services.
- Consulting services include detailed design, tender assistance and construction supervision.
- It is assumed that interest during construction is 1.2%/year for civil works and 0.01%/year for consulting services.
- It is assumed that front end fee is 0.2%.

- Land acquisition cost was calculated in reference to the unit price of land acquisition cost shown in the recently prepared existing feasibility study for road / bridge development project.
- It is assumed that administration cost is 5%.
- 7.5% of VAT for civil works, 15% of VAT for consulting services and 30% of import tax are included as taxes.

Table 7.1.2 Project Cost of Padma Bridge/Tunnel (N5 Paturia – Goalonda Point) (B-02)

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million JPY)			Amount (million JPY)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
Civil Works Sub Total	30,697	30,697	0	71,064	71,064	0	101,761	101,761	0
Price Escalation	5,459	5,459	0	72,567	72,567	0	78,026	78,026	0
Physical Contingency	3,616	3,616	0	14,363	14,363	0	17,979	17,979	0
Consulting Services	5,135	5,135	0	3,753	3,753	0	8,888	8,888	0
Interest during Construction	9,080	0	9,080	0	0	0	9,080	0	9,080
Front End Fee	413	0	413	0	0	0	413	0	413
Land Acquisition	0	0	0	775	0	775	775	0	775
Administration Cost	0	0	0	10,371	0	10,371	10,371	0	10,371
VAT, Import Tax and Other Taxes	0	0	0	41,724	0	41,724	41,724	0	41,724
Total	**54,400**	**44,906**	**9,493**	**214,618**	**161,747**	**52,871**	**269,018**	**206,654**	**62,364**

Source: JICA Survey Team

3) Project Implementation Schedule

It is assumed that the Project is implemented by the following schedule.

- JICA Preparatory Survey : April, 2024 to March, 2025 (12 months)
- Procurement of Consultant : April, 2025 to March, 2026 (12 months)
- Detailed Design : April, 2026 to March, 2027 (12 months)
- Procurement of Contractor : April, 2027 to June, 2028 (15 months)
- Construction : July, 2028 to December, 2032 (54 months)

4) Implementation Agency

(A) Construction: Bangladesh Bridge Authority (BBA)

(B) Operation & Maintenance: BBA will carry out operation & maintenance for this project. It is basically conducted by outsourcing to private companies for 5-year comprehensive contract. BBA's main task in this operation & maintenance is to monitor the private company's activities. BBA has know-how of its monitoring, as BBA has conducted it since Bangabondhu Bridge (Jamuna Multipurpose Bridge) was constructed in 1998. Enough capacity for operation & maintenance of this project can be secured as long as bridges to be operated are not increased significantly in short period. BBA itself may not have enough technologies for operation & maintenance of long bridge or tunnel. However, private company who has enough technologies is selected in the comprehensive operation & maintenance contract, thus significant issues have not occurred to date. Regarding the financials, required budget can be secured, as budget is requested based on the actual

conditions of past contracts for existing 3 bridges. Big issues in the future will be the repair of serious damages and large-scale updates, for example, after 50 years. However, even the oldest bridge, Bangabondhu Bridge (Jamuna Multipurpose Bridge), is less than 30 years old, so it is not an urgent issue.

However, capacity building may be needed, as BBA is newly established authority and has no enough experience for O & M of long bridge and tunnel.

5) Environmental and Social Consideration

(A) JICA Category: A
(B) Land Acquisition: About 11 ha
(C) Resettlement: About 70 households
(D) Protected Area: No protected areas within 5km from the project location.

6) JICA Gender Category:

GI (Gender Informed) (Tentative)

7) Others:

- No study or design has been conducted for this project.
- Traffic volume on N5 has been reduced after Padma Bridge on N8 was completed at the 60km downstream of the river in 2022. However, there are still much volume of vehicles using ferry at Padma River crossing on N5.

(3) Project Effects

1) Quantitive Effects

Indicator	Current Value (2022)	Value for 3 year after Operation
Annual average daily traffic volume	29,600 PCU	70,900 PCU
Reduction of travel time	72 minutes	6 minutes
Reduction of travel cost	-	4 million BDT/year

2) Qualitative Effects

Reliable transport route can be developed by construction of a new bridge or tunnel at the currently ferry crossing location on N5.

(4) Lessons Learned from Past Similar Projects

From the ex-post evaluation for East Bangladesh Bridge Improvement Project, lessons have been learnt that damages for some bridges constructed in the project have not been properly repaired. And it is important to conduct enough maintenance of bridges. Therefore, it is important in this project that

operation & maintenance plan will be developed in the planning stage, and operation & maintenance by executing agency will be monitored.

(5) Others

1) Coordination with other Projects

Upgrading of N5 (Nabinagar - Paturia) has been assigned as a candidate project of Bangladesh – Japan Joint PPP Platform. It is necessary to coordinate between both projects (this project and PPP project).

2) Other Considerations

Traffic volume on N5 has been reduced after Padma Bridge on N8 was completed at the 60km downstream of the river in 2022. It is necessary to consider proper implementation schedule of this project in consideration of future traffic volume.

According to the study report for N8 Padma Bridge Project as well as Jamuna Railway Bridge Project, bearing layer in Padma River is located at 60m depth, thus construction cost of bridge may become very expensive. It is necessary to determine the development policy (bridge or tunnel) considering the project cost based on the geological survey results in the study.

Source: JICA Survey Team

Figure 7.1.4 Padma Bridge/Tunnel (N5 Paturia – Goalonda Point) Construction Project (Tentative)

Source: JICA Survey Team

Figure 7.1.5 Padma River Crossing on N5

Source: JICA Survey Team

Figure 7.1.6 Ferry at Padma River Crossing on N5

7.1.3 Cox's Bazar – Moheshkhali Bridge/Tunnel (B-09)

(1) Basic Information

1) Country Name: Bangladesh
2) Project Location: Moheshkhali Channel crossing located between Moheshkhali and Cox' Bazar
3) Project Name: Cox's Bazar – Moheshkhali Bridge/Tunnel Construction Project (Tentative)
4) Project Summary: This project is implemented to construct a new bridge or tunnel across Moheshkhali Channel located between Moheshkhali and Cox' Bazar

(2) Project Outline

1) Project Outline

(A) Objectives of the Project: To reduce travel time between Matarbari area and Cox's Bazar by construction of a new bridge or tunnel across Moheshkhali Channel, and thereby to improve accessibility in this area and contribute economic growth.

(B) Project Component:
   (a) Construction of 4-lane bridge or tunnel and its approach road (Total Length: about 3 km)
   (b) Consulting Service (Detailed Design, Tender Assistance, Construction Supervision)

(C) Beneficiary of the Project:
   (a) Direct Beneficiary: Residents in Cox's Bazar District (about 2.8 million people)
   (b) Ultimate Beneficiary: All Bangladesh citizens (about 165.2 million people)

2) Project Cost

Project cost (in case of bridge construction) of this project is shown in Table 7.1.3. Precondition for the project cost estimation is as follows.

- Civil works cost was calculated in reference to the unit price of major construction items such as civil work, concrete bridge, steel bridge, etc. shown in the recently prepared existing feasibility study for road / bridge development project.
- It is assumed that price escalation is 2.06%/year for Japanese Yen and 9.07%/year for Bangladeshi Taka.
- Physical contingency is set as 10% of civil works and 5% of consulting services.
- Consulting services include detailed design, tender assistance and construction supervision.
- It is assumed that interest during construction is 1.2%/year for civil works and 0.01%/year for consulting services.
- It is assumed that front end fee is 0.2%.
- Land acquisition cost was calculated in reference to the unit price of land acquisition cost shown in the recently prepared existing feasibility study for road / bridge development project.

- It is assumed that administration cost is 5%.
- 7.5% of VAT for civil works, 15% of VAT for consulting services and 30% of import tax are included as taxes.

Table 7.1.3 Project Cost of Cox's Bazar – Moheshkhali Bridge/Tunnel (B-09)

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million JPY)			Amount (million JPY)		
	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others	Total Cost	JICA Portion	Others
Civil Works Sub Total	10,116	10,116	0	23,096	23,096	0	33,212	33,212	0
Price Escalation	1,755	1,755	0	22,828	22,828	0	24,583	24,583	0
Physical Contingency	1,187	1,187	0	4,592	4,592	0	5,780	5,780	0
Consulting Services	4,702	4,702	0	3,394	3,394	0	8,096	8,096	0
Interest during Construction	3,071	0	3,071	0	0	0	3,071	0	3,071
Front End Fee	143	0	143	0	0	0	143	0	143
Land Acquisition	0	0	0	70	0	70	70	0	70
Administration Cost	0	0	0	3,587	0	3,587	3,587	0	3,587
VAT, Import Tax and Other Taxes	0	0	0	15,308	0	15,308	15,308	0	15,308
Total	**20,975**	**17,761**	**3,214**	**72,875**	**53,910**	**18,966**	**93,851**	**71,671**	**22,180**

Source: JICA Survey Team

3) Project Implementation Schedule

It is assumed that the Project is implemented by the following schedule.

- JICA Preparatory Survey : April, 2024 to March, 2025 (12 months)
- Procurement of Consultant : April, 2025 to March, 2026 (12 months)
- Detailed Design : April, 2026 to March, 2027 (12 months)
- Procurement of Contractor : April, 2027 to June, 2028 (15 months)
- Construction : July, 2028 to June, 2032 (48 months)

4) Implementation Agency

(A) Construction: Bangladesh Bridge Authority (BBA)

(B) Operation & Maintenance: BBA will carry out operation & maintenance for this project. It is basically conducted by outsourcing to private companies for 5-year comprehensive contract. BBA's main task in this operation & maintenance is to monitor the private company's activities. BBA has know-how of its monitoring, as BBA has conducted it since Bangabondhu Bridge (Jamuna Multipurpose Bridge) was constructed in 1998. Enough capacity for operation & maintenance of this project can be secured as long as bridges to be operated are not increased significantly in short period. BBA itself may not have enough technologies for operation & maintenance of long bridge or tunnel. However, private company who has enough technologies is selected in the comprehensive operation & maintenance contract, thus significant issues have not occurred to date. Regarding the financials, required budget can be secured, as budget is requested based on the actual conditions of past contracts for existing 3 bridges. Big issues in the future will be the repair of serious damages and large-scale updates, for example, after 50 years. However, even the

oldest bridge, Bangabondhu Bridge (Jamuna Multipurpose Bridge), is less than 30 years old, so it is not an urgent issue.

5) Environmental and Social Consideration

(A) JICA Category: A
(B) Land Acquisition: About 1 ha
(C) Resettlement: About 40 households
(D) Protected Area: Sonadia Island (KBA) is located approximately 5km to the southwest and Himchari National Park approximately 4km to the south. There might be no negative impact to the project. However, appropriate mitigation measures will be taken if necessary.

6) JICA Gender Category:

GI (Gender Informed) (Tentative)

7) Others:

- Brief study was conducted for this project in Land Use and Development Planning Survey of Moheshkhali and Matarbari Area in Matarbari Port Development Project However, F/S level study has not been conducted to date.

(3) Project Effects

1) Quantitive Effects

Indicator	Current Value (2022)	Value for 3 year after Operation
Annual average daily traffic volume	7,200 PCU	17,000 PCU
Reduction of travel time	177 minutes	123 minutes
Reduction of travel cost	-	476 million BDT/year

2) Qualitative Effects

Traffic safety in towns and villages along the road is improved, as much through traffic can be eliminated from the existing National Highway No.1.

(4) Lessons Learned from Past Similar Projects

From the ex-post evaluation for East Bangladesh Bridge Improvement Project, lessons have been learnt that damages for some bridges constructed in the project have not been properly repaired. And it is important to conduct enough maintenance of bridges. Therefore, it is important in this project that operation & maintenance plan will be developed in the planning stage, and operation & maintenance by executing agency will be monitored.

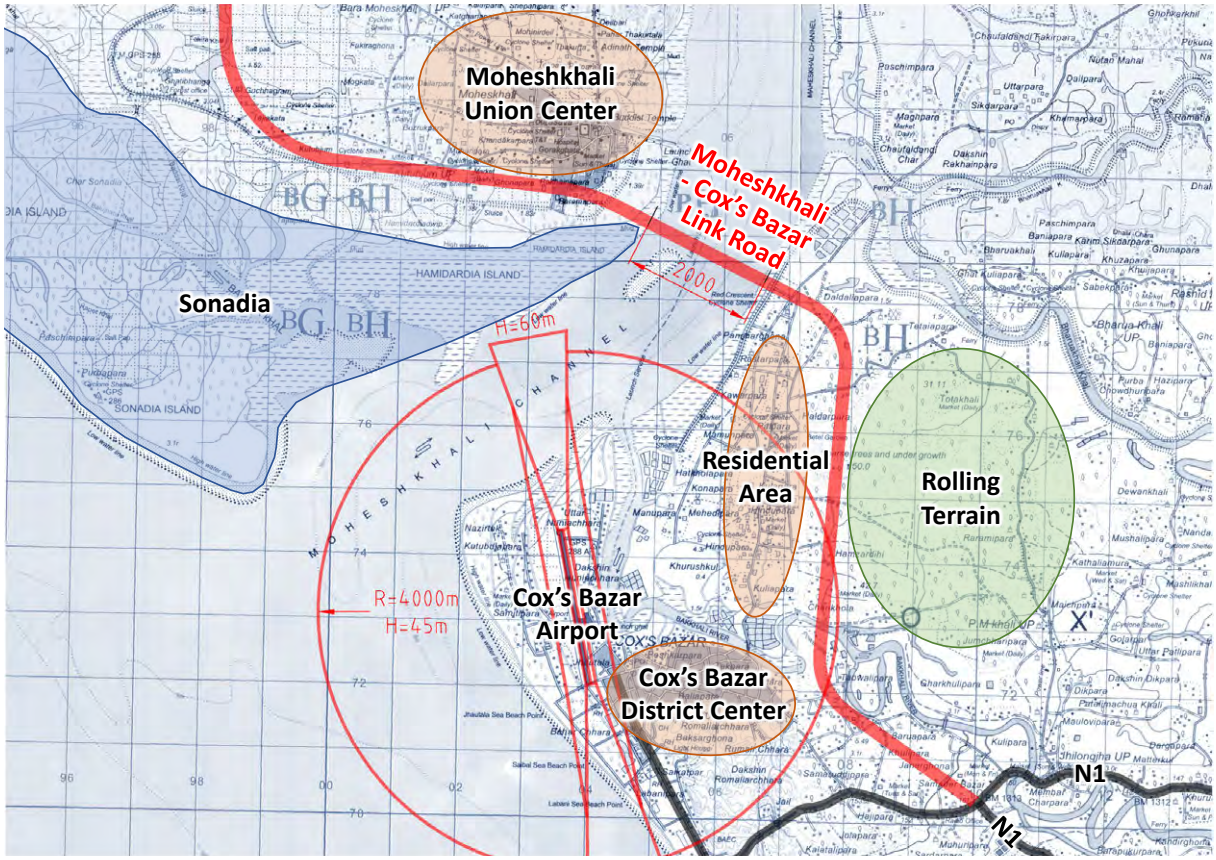
(5) Others

1) Coordination with other Projects

Some Japanese ODA projects such as power plant, port and road are under construction or preparation. Project effects of these projects can be increased by implementing this project.

2) Other Considerations

Access roads to the bridge/tunnel for both Moheshkhali and Cox' Bazar sides are Zilla Road. In order to increase project effects, these access roads should be upgraded together with bridge/tunnel construction.



Source: Land Use and Development Planning Survey of Moheshkhali and Matarbari Area in Matarbari Port Development Project

Figure 7.1.7 Cox's Bazar – Moheshkhali Bridge/Tunnel Construction Project (Tentative)

Source: JICA Survey Team

Figure 7.1.8 Moheshkhali Channel Crossing

Source: JICA Survey Team

Figure 7.1.9 Existing Jetty in Moheshkhali Channel

7.2 Recommendation for Priority Road and Bridge Project

7.2.1 Dhaka – Chattogram Expressway (R-01(1)(2)(3))

Major study items and key considerations in JICA Preparatory Survey of the Project are recommended as follows.

(1) Major Study Items

1) Study on Project Background and Upper Level Plans
   - Revised Road Master Plan which RHD is preparing with support of ADB is studied.

2) Understanding Project Site Conditions and Issues
   - Conditions and issues of related projects such as N1 Improvement Project are studied.

3) Traffic Survey and Traffic Demand Forecast
   - Traffic count survey, OD survey, travel time survey, axle weight survey, willingness to pay survey, etc. are conducted.

4) Selection of Optimum Route
   - Alternative routes are prepared, and optimum route is selected based on the comparison among alternative routes.

5) Natural Conditions Survey
   - The following natural conditions surveys are conducted. However, the survey results conducted in ADB F/S are utilized as much as possible.
     a) Meteorological and hydrological survey
     b) Topographic survey (aerial/drone survey, bathymetry survey, etc.)
     c) Geological survey (bridge location and soft soil area)

6) Social Survey (Baseline Survey)
   - Social survey for local community is conducted to understand population, number of households, income, means of livelihood, type of employment, public infrastructure development, education, health, transport means, willingness to pay, etc.

7) Study on Project Implementation Plan
   - Project packaging, priority of each package, etc. are studied.
   - Design conditions of major project component such as main road, interchange, intersection, bridge, etc. are planned. Also, contents and quantity of consulting services are planned.

8) Preliminary Design
   - Road design, intersection design, interchange design, pavement design, road facility design, bridge design, soft soil treatment design, etc. are conducted.

9) Study on Construction Plan

10) Preparation of Project Implementation Schedule

11) Study on Project Implementation Structure

12) Study on Operation & Maintenance

13) Study on Application of CIM (Construction Information Modelling)
    - 3D modeling is prepared to support selecting optimum route among alternatives. Also, image of the completed project is prepared by using 3D modeling.

14) Study on Application of DX (Digital Transformation)
    - 3D modeling (200 class detail) is prepared based on the preliminary design drawings. Other possibilities to utilize DX in the project is considered.

15) Cost Estimates

16) Environmental and Social Considerations

17) Preparation of Draft RAP (Resettlement Action Plan)

18) Preparation of Key Note
    - Key note necessary for smooth project implementation is prepared.

19) Economical and Financial Analysis and Preparation of Operational and Effectiveness Indicators
    - Annual average daily traffic volume, reduction of travel time, reduction of travel cost, improvement of access to important airport and port, etc. are applied as operational and effectiveness indicators.

20) Consideration for Climate Change

(2) Key Considerations

1) Coordination with Related Project
    - It is scheduled that Feasibility Study (F/S) and Detailed Design (D/D) for upgrading existing National Highway No.1 are conducted by ADB. Information such as traffic demand forecast, etc. is shared for both projects (this project and ADB project), and to clarify the roles for each project.

2) Application of Advanced Technologies
    - Application of advanced technologies is considered.

3) Consideration for Rainy Season
    - Rainy season (June to September) is considered for the natural condition surveys and Baseline surveys.

4) Assistance for Public Relations (PR)
   - Assistance for PR by JICA should be made, as this project is large-scale project related to the Bay of Bengal Industrial Growth Belt (BIG-B).

(3) Others

- The following support is gained from the Government of Bangladesh during the JICA Preparatory Survey.
  a) Assignment of counterparts for the survey
  b) Issuing support letters to gather information from various agencies.

7.2.2 Padma Bridge/Tunnel (N5 Paturia – Goalonda Point) (B-02)

Major study items and key considerations in JICA Preparatory Survey of the Project are recommended as follows.

(1) Major Study Items

1) Study on Project Background and Upper Level Plans
   - Revised Bridge Master Plan which BBA is preparing with support of ADB is studied.

2) Understanding Project Site Conditions and Issues
   - Conditions and issues of related projects such as N5 Improvement Project which is a candidate project of Bangladesh – Japan Joint PPP Platform are studied

3) Traffic Survey and Traffic Demand Forecast
   - Traffic count survey, OD survey, travel time survey, axle weight survey, etc. are conducted.

4) Selection of Optimum Implementation Policy
   - Alternative implementation policy (bridge, shield tunnel or immersed tunnel) are prepared, and optimum implementation policy is selected based on the comparison among alternatives
   - Where bridge is selected as optimum implementation policy, alternative bridge types are also prepared, and the optimum type is selected.

5) Natural Conditions Survey
   - The following natural conditions surveys are conducted.
     a) Meteorological and hydrological survey
     b) Topographic survey (center line survey, cross sectional survey, bathymetry survey, etc.)
     c) Geological survey (abutment location, pier location, approach road, etc.)

6) Social Survey (Baseline Survey)
   - Social survey for local community is conducted to understand population, number of households, income, means of livelihood, type of employment, public infrastructure development, education, health, transport means, willingness to pay, etc.

7) Study on Project Implementation Plan
   - Design conditions of major project component such as bridge, tunnel, approach road, intersection, etc. are planned. Also, contents and quantity of consulting services are planned.

8) Preliminary Design
   - Bridge design, tunnel design, approach road design, intersection design, etc. are conducted.

9) Study on Construction Plan

10) Preparation of Project Implementation Schedule

11) Study on Project Implementation Structure

12) Study on Operation & Maintenance

13) Study on Application of CIM (Construction Information Modelling)
   - 3D modeling is prepared to support selecting optimum implementation policy among alternatives. Also, image of the completed project is prepared by using 3D modeling.

14) Study on Application of DX (Digital Transformation)
   - 3D modeling (200 class detail) is prepared based on the preliminary design drawings. Other possibilities to utilize DX in the project is considered.

15) Cost Estimates

16) Environmental and Social Considerations

17)Preparation of Draft RAP (Resettlement Action Plan)

18) Preparation of Key Note
   - Key note necessary for smooth project implementation is prepared.

19) Economical and Financial Analysis and Preparation of Operational and Effectiveness Indicators
   - Annual average daily traffic volume, reduction of travel time, reduction of travel cost, etc. are applied as operational and effectiveness indicators.

20) Consideration for Climate Change

(2) Key Considerations

1) Coordination with Related Project
   - Upgrading of N5 (Nabinagar - Paturia) has been assigned as a candidate project of Bangladesh – Japan Joint PPP Platform. Coordination with both projects (this project and PPP project) including determination of project boundary, scheduling arrangement, etc. is considered.

2) Application of Advanced Technologies
   - Application of advanced technologies is considered.

3) Consideration for Rainy Season
   - Rainy season (June to September) is considered for the natural condition surveys and Baseline surveys.

4) Assistance for Public Relations (PR)
   - Assistance for PR by JICA should be made, as this project is large-scale project related to the Bay of Bengal Industrial Growth Belt (BIG-B).

(3) Others

- The following support is gained from the Government of Bangladesh during the JICA Preparatory Survey.
  a) Assignment of counterparts for the survey
  b) Issuing support letters to gather information from various agencies.

7.2.3 Cox's Bazar – Moheshkhali Bridge/Tunnel (B-09)

Major study items and key considerations in JICA Preparatory Survey of the Project are recommended as follows.

(1) Major Study Items

1) Study on Project Background and Upper Level Plans
   - Revised Bridge Master Plan which BBA is preparing with support of ADB is studied.

2) Understanding Project Site Conditions and Issues
   - Some Japanese ODA projects such as power plant, port and road are under construction or preparation. Improvement of some intersections on N1 (Chattogram – Cox' Bazar) is also scheduled to be conducted. Conditions and issues of these projects are studied.

3) Traffic Survey and Traffic Demand Forecast
   - Traffic count survey, OD survey, travel time survey, axle weight survey, etc. are conducted.

4) Selection of Optimum Implementation Policy
   - Alternative implementation policy (bridge, shield tunnel or immersed tunnel) are prepared, and optimum implementation policy is selected based on the comparison among alternatives
   - Where bridge is selected as optimum implementation policy, alternative bridge types are also prepared, and the optimum type is selected.

5) Natural Conditions Survey
   - The following natural conditions surveys are conducted.
     a) Meteorological and hydrological survey
     b) Topographic survey (center line survey, cross sectional survey, bathymetry survey, etc.)
     c) Geological survey (abutment location, pier location, approach road, etc.)

6) Social Survey (Baseline Survey)
   - Social survey for local community is conducted to understand population, number of households, income, means of livelihood, type of employment, public infrastructure development, education, health, transport means, willingness to pay, etc.

7) Study on Project Implementation Plan
   - Design conditions of major project component such as bridge, tunnel, approach road, intersection, etc. are planned. Also, contents and quantity of consulting services are planned.

8) Preliminary Design
   - Bridge design, tunnel design, approach road design, intersection design, etc. are conducted.

9) Study on Construction Plan

10) Preparation of Project Implementation Schedule

11) Study on Project Implementation Structure

12) Study on Operation & Maintenance

13) Study on Application of CIM (Construction Information Modelling)
   - 3D modeling is prepared to support selecting optimum implementation policy among alternatives. Also, image of the completed project is prepared by using 3D modeling.

14) Study on Application of DX (Digital Transformation)
   - 3D modeling (200 class detail) is prepared based on the preliminary design drawings. Other possibilities to utilize DX in the project is considered.

15) Cost Estimates

16) Environmental and Social Considerations

17) Preparation of Draft RAP (Resettlement Action Plan)

18) Preparation of Key Note
    - Key note necessary for smooth project implementation is prepared.

19) Economical and Financial Analysis and Preparation of Operational and Effectiveness Indicators
    - Annual average daily traffic volume, reduction of travel time, reduction of travel cost, etc. are applied as operational and effectiveness indicators

20) Consideration for Climate Change

(2) Key Considerations

1) Coordination with Related Project
    - Some Japanese ODA projects such as power plant, port and road are under construction or preparation. Improvement of some intersections on N1 (Chattogram – Cox' Bazar) is also scheduled to be conducted. Coordination with these projects such as scheduling arrangement, etc. is considered.

2) Application of Advanced Technologies
    - Application of advanced technologies is considered.

3) Consideration for Rainy Season
    - Rainy season (June to September) is considered for the natural condition surveys and Baseline surveys.

4) Assistance for Public Relations (PR)
    - Assistance for PR by JICA should be made, as this project is large-scale project related to the Bay of Bengal Industrial Growth Belt (BIG-B).

(3) Others

- The following support is gained from the Government of Bangladesh during the JICA Preparatory Survey.
    a) Assignment of counterparts for the survey
    b) Issuing support letters to gather information from various agencies.

Attachment: List of Interviewed Persons

Attachment: List of Interviewed Persons

Organization	Name	Affiliation, Position, etc.
BBA	Dr. Md. Moniruzzaman	Director (Planning & Development Wing)
BBA	Md. Abul Hossain	Superintending Engineer
BBA	Quazi Muhammad Ferdous	Chief Engineer
BBA	Md. Liaquat Ali	Superintending Engineer（BBA Master Plan）
BBA	Md. Liquat Ale	Project Director
BBA	Md. Ohidozzaman	Superintending Engineer
BMW	Shishir Kanti Routh	Additional Chief Engineer
BMW	MD Zikrul Islam	Superintending Engineer
BMW	Santane Plait	Executive Engineer
CDA	M. Zahirul Alom Dubash	Chairman
CDA	Kazi Hasan Bin Shams	Chief Engineer
CDA	A. A. M. Habibur Rahman	Superintendent Engineer
CDA	Md. Mahfuzur Rahman	Project Director (Elevated Expressway)
CDA	Md. Abu Issa Anshary	Deputy Chief Town Planner & Project Director
CDA	Md. Zahir Ahemed	Town Planner
CDA	Rajib Das	Executive Engineer & Project Director
CDA	Md. Shamim	Executive Engineer & Project Director
Dhaka Zone Office	Dr. Mohammad Najmol Haque	Superintendent Engineer
DTCA	Md. Rabiul Alam	Project Director、Updating RSTP
DTCA	Md. Nahmadul Hasan	Urban Planner
DTCA	Md. Rafiqul Hasan	Technical Consultant
Eclectic Limited	Abdullah Al Mamun	Deputy Team Leader,Bridge Inspection & BMS Upgradation Project, RHD
Eclectic Limited	Sultan Arif	Director (Technical & Marketing)
JETRO	Yuji Ando	Head of Office
MoEF	Masud Iqbal Md. Shameem	Director
PPPA	Md. Emtiazul Hassan Mazumder	Project Management Consultant
PPPA	Mr. A M Al-Amin	PPP Specialist
RHD	Syed Moinul Hasan	Additional Chief Engineer (Planning & Maintenance Wing)
RHD	Kazuhiko Sasaki	JICA expert ・Adviser on Road and Bridge Maintenance
WBBIP	Khan Md. Kamrul Ahsan	Project Director
WBBIP	Bikash Chandra Das	Additional Project Director