



**GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
LOCAL GOVERNMENT ENGINEERING DEPARTMENT**

**Important road development project of
Keraniganj upazila of Dhaka district**

Environmental and Social Impact Assessment (ESIA)

June 2020

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ABBREVIATIONS

LGED	Local Government Engineering Department
BBS	Bangladesh Bureau of Statistics
BCR	Building Construction Rules
BECA	Bangladesh Environmental Conservation Act
BECR	Bangladesh Environmental Conservation Rules
BWDB	Bangladesh Water Development Board
CSC	Construction Supervision Consultant
DCs	Deputy Commissioners
DGWT	Deep Ground Water Table
DoE	Department of Environment
EA	Environmental Assessment
ECC	Environmental Clearance Certificate
EHSG	Environmental, Health and Safety Guidelines
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESF	Environmental and Social Framework
ESP	Environmental and Social Policy
ESS	Environmental and Social Standard
FAO	Food and Agriculture Organization
FD	Forest Department
GOB	Government of Bangladesh
GHG	Greenhouse Gas
IEE	Initial Environmental Examination
IECs	Important Environment Components
IPPF	Indigenous Peoples Planning Framework
LGED	Local Government Engineering Department
LGRD &C	Local Government Rural Development and Cooperative
MOA	Ministry of Agriculture
MOC	Ministry of Communications
MOEF	Ministry of Environment and Forest
NCS	National Conservation Strategy
NEC	National Environmental Council
NEP	National Environmental Policy
NEMAP	National Environmental Management Action Plan
NGO	Non-Governmental Organization
PAP	Project Affected Persons
PDP	Project Displaced Persons

PPE

Personal Protection Equipment

PMU

Project Management Unit

EXECUTIVE SUMMARY

E-1. Background

This report is the Environmental and Social Impact Assessment (ESIA) report for important road development project of Keraniganj upazila of Dhaka district. The ESIA has been prepared in accordance with the requirements of the Government of Bangladesh (GoB) defined in the Bangladesh Environment Conservation Act (BECA), 1997 the format of the ESIA follows the ADB recommendations as outlined in the ADB Good Practice Source book.

In principle, the road is to be augmented and designed as width and length replacing the existing road, but in a few locations of the existing alignment there will be some resettlement issues like - acquisition of land, rehabilitation of shops and boundary wall/buildings, particularly at the proposed new bypasses. In addition to resettlement, there will be some environmental impacts like - loss of trees, use of agricultural land, changes to local drainage patterns etc

E-2. The Project Area

Total length of the keraniganj road construction project is 21.60 km. 1) Dhaka Mawa Road - Tegharia - Shaper Bazar via Mollar Hat (5.5 km) Road, 2) Jinjira - Konda Via Mirerbagh Bazar - Beyara Bazar - Banagram - Zindapir Mazar (4.075 km) Road, 3) Ruhitpur GC - Baluartech - Dhaka Mawa (6.03 km) road, 4) Dhaka Mawa - Khejurbagh (2.00 km) road and 5) Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullahpur Bishwaroad via Goista (4.00 km) road. These roads are connected to Dhaka – Mawa highway.

The construction of Padma Bridge is being considered as an important influencer in the development of Keraniganj. The Padma Bridge will serve as an important means of communication between the capital Dhaka and the southern region of the country and will open the door to immense potential as a bridge between the development of Keraniganj Dhaka and South Bengal.

Keraniganj Upazila, adjacent to Dhaka, has recently become the center of various development plans and activities. Apart from this, as an important region, various industrial plants are operating in the area, which is affecting various infrastructures of the area, especially the roads and drainage system, due to which most of the roads and drains in Keraniganj are severely damaged. As a result, local people and residents are constantly suffering from the lack of environmentally friendly and efficient roads and transport systems and drainage systems.

At present Dhaka Mawa Highway (Padma Bridge Link Road), RAJUK Jhilmil Residential Project, Central Jail, BSIC Industrial City, various large private residential projects, Pangaon Inner Container Port, Private Special Economic Zone at Pangaon, Professor Hamidur Rahman Stadium has been established. Ongoing projects include widening of Jagannath University, Dhaka-Dohar-Nawabganj road and setting up of Padma Bridge rail link. Besides, the government has proposed to build International Sports Complex and Academy, Inter-District Bus and Truck Terminal, BCS Admin Academy, Power Management Institute, Multi Modal Terminal and Solid Waste Power Plant under various development projects

Implementation of the above development plan and development and expansion of infrastructure in a planned way is required to ensure the overall economic and social growth of Keraniganj. In order to make the region a more livable and industrial area, various basic physical infrastructure facilities such as road widening, drainage and footpath construction and waterlogging removal should be developed on priority basis.

Road development, elimination of water logging and construction and development of other necessary infrastructures are the priority sectors of Keraniganj Upazila Administration. Therefore, five road development projects have been implemented in this upazila in view of the future prospects of Keraniganj and in order to be able to handle the growing population.

E-3. The Environmental and Social Impact Assessment

The ESIA for the road project of LGED has been prepared based on the Initial Environmental Examination (IEE) and the feasibility study of the project.

Government of Bangladesh (GoB) law requires that the environmental and social impacts of development project be identified and assessed as part of the planning and design process, and that action be taken to reduce those impacts to acceptable levels. This is done through the screening/impact assessment process, project development and implementation.

E4. Categorization

An environmental assessment using a Rapid Environmental Assessment (REA) checklist for Keraniganj Upazila Road was conducted. The Project is classified as Category “Orange-B” as per GOB guideline. This ESIA has been prepared in accordance with DoE requirements for a category “Orange-B” project and also provides mitigation and monitoring measures to ensure potential impacts because of the project. An ESIA with Environment and Social Management Plan (ESMP) is required to determine the environmental and social impacts.

E-5. Elements of Environmental and Social Impact Assessment

Considering the nature of the project, the Bank requires the client to undertake an environmental and social assessment as per DoE guidelines. The assessment considers project and detailed design alternatives to avoid or minimize physical and/or economic displacement and impacts on Indigenous People, and it includes an Environment and Social Management Plan. This project is in the Orange-B Category as per DoE of GOB, so it requires Environment clearance from DoE. LGED will submit the required documents and will apply for the Environment clearance from DoE as per Environment Conservation Rules, 1997.

E-6. Impacts, Mitigation and Management

The design of the road has included measures to minimize their environmental impacts. The road does not pass through any ecologically sensitive areas or areas of special habitat.

The majority of impacts during the construction period will be mitigated by good construction housekeeping measures implemented by the contractor. There will be standard procedures for the control and mitigation of emissions, such as dust, noise, exhaust fumes and liquid discharges from the construction sites, depots and work camps. All construction activities close to river will be controlled and the rivers will be protected from contamination. Wastewater from construction camps will be treated on site in settlement and aeration basins, where biological waste will be processed,

before discharge. Septic sludge from toilets will be trucked to existing water treatment plants. Solid Waste will be disposed offsite in approved and managed waste disposal sites. Groundwater is not expected to be impacted by the project, as no deep excavations or major cuts for new roads and other developments are necessary. Water for the construction activities as well as the camps will be extracted in relatively small quantities from existing wells or the public supply system. Generally, water availability is unconstrained in the project area.

Noise and exhaust emissions will be minimized by the requirement for Contractors to use modern equipment and machinery complying with modern emission standards, and to maintain the equipment in good working order throughout the project. This will be prescribed in the equipment specifications in the tender documents. Nuisance to the public will be minimized by limiting work hours, with no nighttime works near housing and other sensitive uses. Where works are carried out in close vicinity to existing residential areas, additional measures, such as noise barriers or the installation of insulating windows, will be considered in accordance with good practice and in consultation with the community.

Construction material (hardcore, sand, spoil etc.) will be obtained from a variety of borrow pits that are not operated by the Contractors. However, in accordance with the ESMP all borrow pits must be approved by the supervision consultants (who will ensure that international good practice is followed). Construction access routes will be agreed prior to construction start and will not disturb any sensitive uses.

There are no forest areas or other sensitive areas near the proposed alignment. However, there will be significant loss of roadside trees. There will be a major social reforestation program in line with standard LGED policies in close consultation with the Department of Forestry. Only replanting of indigenous species will be allowed within RoW of the road. Ecological impacts can be reversed by planting site specific tree species as per the directives of Social Forestry Act (2004).

E-7. Heritage sites

There are no significant sites and structures of historical and archaeological importance along the road alignment. Some mosques are close to or are within the proposed ROW and will need to be partially or completely relocated. Compensation for the same is considered in the Resettlement Framework. No known or recorded archaeological, historical or architectural structures or sites are affected by the road development. Any archeological remains discovered or unearthed during site preparation or construction is to be recorded by the Department of Archeology. Construction may need to be temporarily stopped for this to be carried out. In any case, a Chance Finds procedure will be adopted during construction.

E-8. Grievance Redress Mechanism (GRM)

A time bound grievance redress mechanism (GRM) will be implemented under the project to facilitate receiving and addressing complaints from local public and concerned stakeholders. The GRM will allow for receiving complaints at four levels starting at the project site specific level, local road project level, project management level and legal court level. A grievance redress committee (GRC) will be established at the LGED and PIU to resolve complaints.

E-9. Indigenous People Planning Framework

The project activities are located within the Upazila/Union areas and no ethnic communities/indigenous people's communities are anticipated. As a precaution, an Indigenous People Planning Framework (IPPF) will be prepared to ensure that any indigenous people encountered will receive culturally appropriate benefits.

E-10. Public Consultation

Initial consultation with the community was conducted during the development of the Resettlement Framework in 2019 during preparation of the Resettlement Action Plan (RAP). The stakeholders were involved in developing the IEE/ESIA through discussions on-site, Focus Group Discussions (FGD), and public consultation, after which views expressed were incorporated into the IEE/ESIA and in the planning and development of the project. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the IEE/ESIA to ensure any public grievances are addressed quickly.

E-11. Environmental and Social Management Plan (ESMP)

This ESIA has included an Environmental and Social Management Plan (ESMP) for the construction and operation periods which should be approved by the LGED. A monitoring program has also been prepared as part of the ESMP. The ESMP will be incorporated into the tender documents and will become part of the works contracts. The Contractors will be required to have permanent staff on site with the specific responsibilities of environmental and social management, reporting to the supervision engineers and their environmental and social specialist, and to the local authorities. During operation the noise, air pollution, water quality and other indicators will be regularly monitored in accordance with the monitoring plan of the ESMP. It is predicted that noise and air pollution impacts will not be significant at any sensitive locations.

For civil works, the contractor will be required to (i) establish an operational system for managing environmental and social impacts; (ii) carry out all of the monitoring and mitigation measures set forth in the ESMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this ESIA and ESMP. The contractor shall allocate a budget for compliance with these ESMP measures, requirements and actions.

E-12. Analysis of Alternatives

As referred to above, the principle of the Feasibility Study is to utilize the existing road alignment. Since most of the alignment has sufficient ROW, the proposed alignment largely follows the existing alignment. However, some changes to the alignment are proposed in a number of locations and these are referred to in Chapter 5 of the report. In general, these changes to the original alignment have environmental (as well as resettlement) advantages.

E-13. Implementation Arrangements

The Local Government Engineering Department (LGED) is the executing agency (EA) under the initiative of the Ministry of Local Government and Rural Development & Co-operative. LGED is responsible for providing support and guidance to the Contractor concerning performance criteria and road development planning. Implementation activities will be overseen by a Project

Management Unit (PMU). Consultant teams are responsible for (i) detailed engineering design, contract documents preparation and safeguards facilitation; (ii) project management and administration support; (iii) assistance in supervising construction; (iv) strengthening of local governance, conducting required studies/surveys and (v) awareness raising on behavioral change in water, sanitation and solid waste management activities.

E-14. Conclusion and Recommendations

The project will have several environmental and social impacts during the construction and operation periods. Assuming effective implementation of the mitigation measures and monitoring requirements as outlined in the Environmental and Social Management Plan, the Project is not expected to have significant adverse environmental or social impacts. It should also be pointed out that significant benefits are anticipated; an all-weather transport route will link major population and industrial centers in the middle of Bangladesh.

It is concluded that the project will have an overall beneficial impact after completion with respect to reducing transport cost and fuel consumption of vehicles and also improving socio-economic conditions along the length of project road. Construction of the civil works will have insignificant negative impacts on air quality, noise level, watercourses and soil during implementation, and impacts will be appropriately monitored and adequately mitigated. At present, this report has not identified any comprehensive, broad, diverse or irreversible adverse impacts caused by the proposed road.

Chapter One

INTRODUCTION

1.1 Background

- a) Bangladesh's exchange with South Asia and Southeast Asia has been on the ascent since the mid-2000s, and about 40% of complete exchange at present happens with these areas. The activity of the South Asian Free Trade Area (SAFTA) since 2006 and obligation-free market access for most items in the Indian markets since 2011 have made potential open doors for higher exchange with South Asia, especially with India. The improvement of cross-fringe network between these neighboring nations will open up chances to additionally upgrade exchange. Bangladesh can possibly turn into a Sub-Regional vehicle and trans-shipment focus, connecting the vigorously populated South Asian area to the thriving markets and nations toward the north and south-east of Asia
- b) Because the prevailing poor road connectivity limits development, some strategic transport corridors must urgently be developed so that this potential may be realized. Investment in sub regional road connectivity not only contributes to the development of Bangladesh's own economy, but also contributes to increasing sub regional trade - especially Bangladesh and Bangladeshi poor people will be benefited.
- c) The overall objective of the Project is to generate economic benefits, as follows (i) this will be achieved by the facilitation of faster, safer and more economic links to Keraniganj Upazila.
- d) The Local Government Engineering Department (LGED) is the project implementing agency and responsible for the Important road development project of Keraniganj upazila of Dhaka district, involving consultancy services for preparing the feasibility studies and detailed engineering designs of the proposed project. The project is defined as a 21.60km section of road from Keraniganj Upazila

1.2 Project Scope

Total Project length 21.60 km.(Upazila road 15.60 km, Village road 6 km and Bridge/Culvert 140m)

- 1) Dhaka Mawa Road - Tegharia - Shaper Bazar via Mollar Hat (5.5 km) Road
- 2) Jinjira - Konda Via Mirerbagh Bazar - Beyara Bazar - Banagram - Zindapir Mazar (4.075 km) Road
- 3) Ruhitpur GC - Baluartech - Dhaka Mawa (6.03 km) road
- 4) Dhaka Mawa - Khejurbagh (2.00 km) road and
- 5) Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullahpur Bishwaroad via Goista (4.00 km) road. These road are connected to Dhaka – Mawa highway.

To develop the overall communication system of the project area; Poverty alleviation through increased economic and trade activities; the projects in the area to create direct and indirect employment.

1.3 Purpose of the Report

The Environmental and social Impact Assessment (ESIA) aims to provide guidance on safeguard screening, assessment, institutional arrangement, and process to be followed for components of the project. This ESIA (i) describes the project and its component; (ii) explains the general anticipated environmental impacts and mitigation measures for the project; (iii) specifies the requirements that will be followed in relation to screening and categorization, assessment, and planning, including

arrangements for meaningful consultation with affected people and other stakeholders and information disclosure requirements; (iv) assesses the capability of the project proponents to implement national requirements, and identifies needs for capacity building; (v) specifies implementation procedures, institutional arrangements, and capacity development requirements; and (vi) specifies monitoring and reporting requirements. Moreover, this ESIA is to ensure, Environmental and Social Framework (ESF) that the National Highway project, in the entirety of its project cycle, will not deteriorate or interfere with the environmental sensitivity of the project area, but rather improve environmental quality.

1.4 Categorization

In accordance with the Environment Conservation Rules (ECR) of 1997, the Project is classified as a Orange-B Category, requiring a complete Environmental and Social Impact Assessment (ESIA) for LGED to obtain clearance for construction.

1.5 Scope of this report

The Project requires that any proposed development adhere to the laws and regulations of Bangladesh. The Project is then subject to approval under the Government of Bangladesh's Environment Conservation Act (1995) (ECA) and Environment Conservation Rules (1997).

1.6 Approach and Methodology

The study has been conducted in accordance with Environment Conservation Rules, 1997, Government of Bangladesh (GOB) EIA Guidelines, 1997, and the World Bank Environmental and Social Framework. The study is based on both primary and secondary data and information. The primary data includes data collected from field observations and secondary data includes the EIA and SIA and the review of the Bangladesh statistical and relevant information from Government Departments. For social baseline, discussions were held with stakeholders including government officials, community representatives and a wide range of road users and roadside dwellers. The main purpose of this approach was to obtain a fair impression on the people's perceptions of the project and its environmental impacts.

In order to establish the baseline biophysical conditions within the study area, relevant secondary and primary data was collected and reviewed, a comprehensive field visit was undertaken, and a number of consultations with local people were carried out. For better assessment, the data collection was planned as per the segmented contract packages. The data generated allowed to better understand the complex interplay between the various biotic and abiotic factors within the study area and to establish the baseline conditions. Once this baseline was established it was used as a reference point to identify potential changes to the environment that may occur as a result of the proposed Project activities, as well as to allow development of measures to prevent, mitigate or manage these potential impacts.

1.7 EIA Team

GREENBUD has prepared this report with its multidisciplinary team of EIA experts of having experience of conducting Environmental Impact Assessment of medium and large scale industrial projects. The name of the professionals' involved in the study is listed below:

Table 1: EIA Team Member

S/ I	Name	Educational Qualification	Responsibilities
1	Engr. Syed Tasnem Mahmood	B.Sc and M.Sc in Civil and Environmental Engineering, Shahjalal University of Science and Technology, Bangladesh	Team Leader
2	Engr. Kanak Kanti Kar	PGD in Climate and Geological Risk, University of Geneva, Switzerland M.Sc in Civil Engineering, Jeju National University, South Korea	Environmental Specialist
3	Thasnuba Sajjad	M.Ss. in Economics, University of Chittagong	Economist
4	Md. Akmal Hossain	B. Sc in Civil Engineering, University of Information Technology and Sciences, Bangladesh	Team Member
5	Md. Kamruzzaman Roman	B.Sc in Disaster Management, Patuakhali Science and Technology University & M Sc. in GIS for Environment and Development, Jahangirnagar University, Bangladesh	Team Member
6	Md. Shamim Shekh	B.Sc in Civil & Environmental Engineering, Fareast International University, Bangladesh	Team Member
7	Mahidul Islam Ratul	B.Sc in Civil & Environmental Engineering, Shahjalal University of Science and Technology, Bangladesh	Team Member
8	Bibhas Bhattacharjee Tanmoy	B.Sc in Civil & Environmental Engineering, Shahjalal University of Science and Technology, Bangladesh	Team Member
9	Yahya Al Sabet	B.Sc in Civil & Environmental Engineering, Shahjalal University of Science and Technology, Bangladesh	Team Member

1.8 Structure of This Report

The Report is structured as follows:

Chapter One

Introduction provides the background on the project, purpose of this report, approach and methodology

Chapter Two

Policy, Legal, and Administrative Framework presents a review of relevant national laws and policies, international environmental and Social obligations, and Bangladesh bank environmental requirements, procedure of environmental clearance, environmental categorization

Chapter Three

Description of the project provides a brief description of the Project, the location, size and need, description of project components

Chapter Four

Description of the Baseline Environment includes details on the baseline data for environmental conditions in the project area (current features and conditions, pre-project)

Chapter Five

Anticipated Potential Project Impacts identifies the potential Environmental, economic, and social impacts from pre-construction, construction, after completion of works and operation phase.

Chapter Six

Stakeholder Consultation and Information Disclosure discusses the issues raised during the consultations, proposed actions to address them, and the information needed to disclose to the public.

Chapter Seven

Grievance Redress Mechanism describes the process of addressing complaints

Chapter Eight

This chapter includes the environmental and social management plan that includes the impacts of the proposed project on environment and society is described. All the anticipated impacts in pre-construction stage, construction stage, after completion of works and operational stage are described here.

Chapter Nine

This chapter includes the conclusion and some recommendations are suggested here about the proposed project.

Chapter Two

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 Introduction

This section of the ESIA details the Administrative Framework for the Project, covering national requirements as well as applicable international treaties and conventions. The intent of this section is to lay out the regulatory and non-regulatory performance requirements for all stages of the project. For the purposes of this report, only those regulatory elements directly relevant to the proposed Project will be discussed. B. Environmental Legislation Framework.

2.1.1 Overview of the project Approval Process

Key legislation governing the environmental approvals process for the proposed project is the Bangladesh Environment Conservation Act, 1995 (BECA, 1995)¹ and the Environment Conservation Rules (ECR, 1997)².

2.1.2 Environmental Approval Framework

Key milestones in the approvals process are outlined in Figure II.1. These comprise:

- ✦ **Project Authorization Letter:** Formal authorization of the Project by the owner is required in order for the environmental approvals process to formally commence.
- ✦ **No Objection Certificate (NOC):** A NOC must be received from the Deputy Commissioner (DC) in the project area before the SCC application can be made.
- ✦ **Site Clearance Certificate (SCC):** DoE will issue a SCC upon approval of the IEE study (note that the IEE submission is to include the Project Authorization Letter, NOC, and SCC application form). The SCC will include a ToR for the IEE/EIA study, and typically provides authorization for site establishment works to commence.
- ✦ **Environmental Clearance Certificate (ECC):** DoE will issue the ECC upon approval of the IEE/EIA study (including associated ESMP). The ECC allows project construction to commence and contains specific approvals requirements for matters such as pollution control and environmental monitoring.

¹ The Act was amended by Act Nos 12 of 2000, 9 of 2002, and 50 of 2010

² The ECR was amended in 2002, 2005, 2010 and 2017.

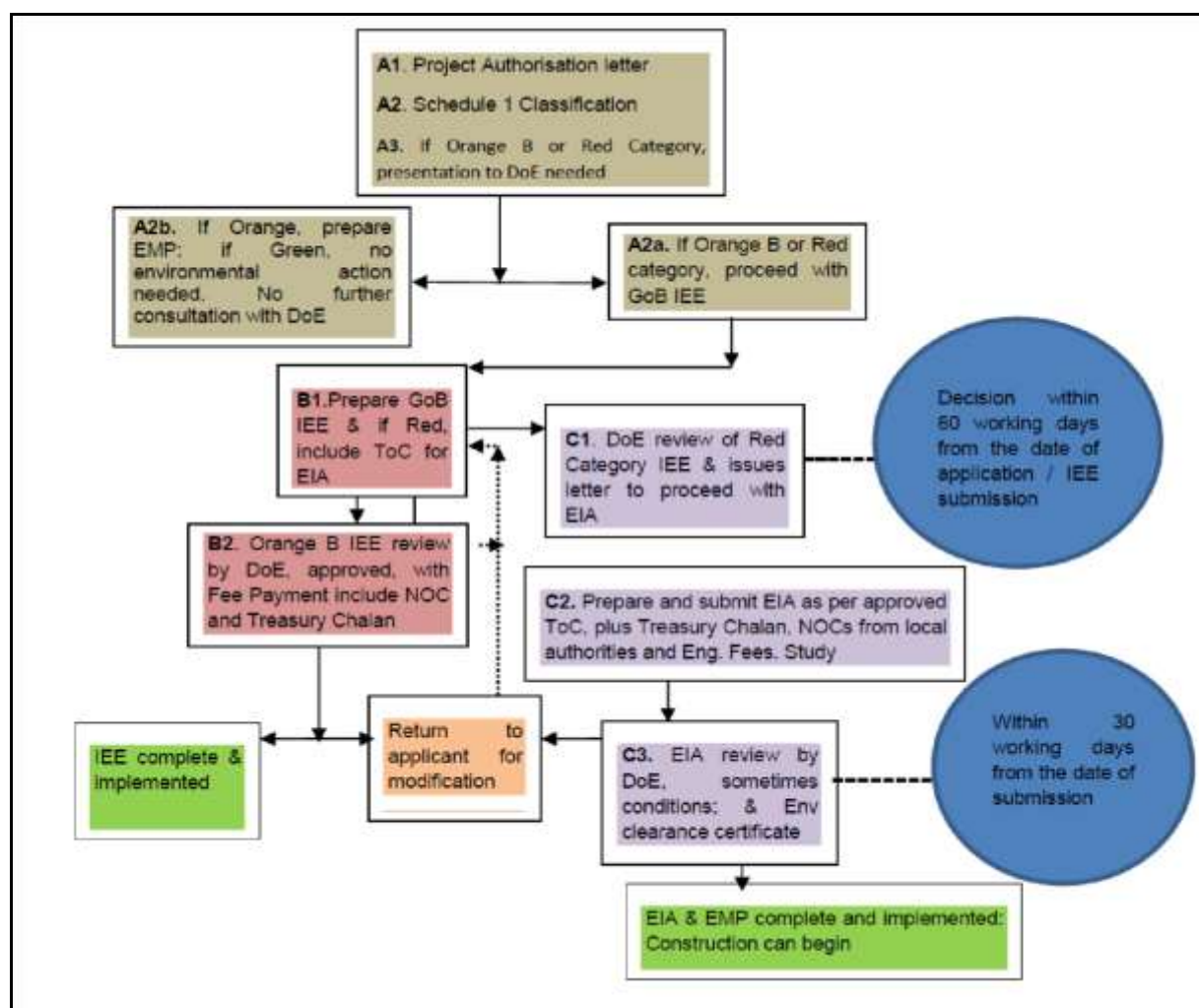


Figure 1: Government of Bangladesh Environmental Assessment Process

2.2 National Relevant Policies and Strategies

This section summarizes the National Laws and describes the procedure for obtaining environmental permits to allow project implementation. Over the years, the Government of Bangladesh has enacted environmental acts, rules, policies and regulation toward imposing restrictions facilitating minimization / mitigation of likely impacts due to development projects. The most important Act is Environmental Conservation Act, 1995 (ECA, 1995) and Environmental Conservation Rules (ECR, 1997).

2.2.1 National Environmental Policy

- a) The National Environmental Policy was adopted in 1992 and is now under revision. It embraces different sectors related to agriculture, forest, power, health, transport, housing etc. The central theme of policy is to ensure protection and improvement in environment. The policy gives a thrust to sustainable development and long-term use of natural resources. The National Environment Policy contains policy statements and strategic options with regard to population and land-use management, management and utilization of natural resources and other socio-

economic sectors, as well as the necessary arrangements for the implementation of the policy. The policy enables:

- I. the country to strike a dynamic balance between population and resources while complying with the balance of ecosystems;
- II. to contribute to sustainable and harmonious socio-economic development such that, both in rural and urban areas, and well-being in a sound and enjoyable environment; and
- III. To protect, conserve and develop natural environment and social.

2.2.2 Environmental Conservation Act (ECA), 1995

- The ECA is currently the main legislation relating to environment protection in Bangladesh. This Act is promulgated for environment conservation, environmental standards development and environment pollution control and abatement. The main objectives of ECA are:
 - ✦ Conservation and improvement of the environment; and
 - ✦ Control and mitigation of pollution of the environment.
- The main focuses of the Act can be summarized as:
 - Declaration of ecologically critical areas and restriction on the operations and processes, which can or cannot be carried out/ initiated in the ecologically critical areas (ECA);
 - Regulations in respect of vehicles emitting smoke harmful for the environment;
 - Environmental clearance;
 - Regulation of industries and other development activities' discharge permits;
 - Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes;
 - Promulgation of a standard limit for discharging and emitting waste; and
 - Formulation and declaration of environmental and social guidelines.
- Before any new project can go ahead, as stipulated under the ECA, the project promoter must obtain Environmental Clearance from the Director General (DG), DoE. An appeal procedure does exist for those promoters who fail to obtain clearance. Failure to comply with any part of this Act may result in punishment to a maximum of 5 years imprisonment or a maximum fine of Tk.100, 000 or both. The DoE executes the Act under the leadership of the DG.

2.2.3 Environmental Conservation Act (Amendment 2000)

- The Bangladesh Environment Conservation Act Amendment 2000 focuses on ascertaining responsibility for compensation in cases of damage to ecosystems, increased provision of punitive measures both for fines and imprisonment and the authority to take cognizance of offences.

2.2.4 Environmental Conservation Act (Amendment 2002)

- The 2002 Amendment of the ECA elaborates on the following parts of the Act:
 - Restrictions on polluting automobiles;
 - Restrictions on the sale, production of environmentally harmful items like polythene bags;
 - Assistance from law enforcement agencies for environmental actions; - Break up of punitive measures; and
 - Authority to try environmental cases.

2.2.5 Environmental Conservation Act (Amendment 2010)

This amendment of the act introduces new rules and restriction on:

- No individual or institution (Gov. or Semi Gov, / Non Gov. / Self Governing) can cut any Hill and Hillock. In case of national interest; it can be done after getting clearance from respective the department
- Owner of the ship breaking yard will be bound to ensure proper management of their hazardous wastes to prevent environmental pollution and Health Risk
- No remarked water body cannot be filled up/changed; in case of national interest; it can be done after getting clearance from the respective department; and
- Emitter of any activities/incident will be bound to control emission of environmental pollutants that exceeds the existing emission standards.

2.2.6 Environment Conservation Rules, 1997 (Amended in 2002)

These are a set of rules, promulgated under the ECA, 1995 and its amendments.

The Environment Conservation Rules provide categorization of industries and projects and identify types of environmental assessment required against respective categories of industries or projects.

The Rules set:

- ✦ The National Environmental Quality Standards (NEQS) for ambient air, various types of water, industrial effluent, emission, noise, vehicular exhaust etc.;
- ✦ The requirement for and procedures to obtain environmental clearance; and
- ✦ The requirement for IEE and EIA according to categories of industrial and other development interventions.

The Environment Conservation Rules, 1997 were issued by the GoB in exercise of the power conferred under the Environment Conservation Act (Section 20), 1995. Under these Rules, the following aspects, among others, are covered:

- ✦ Declaration of ecologically critical areas;
- ✦ Classification of industries and projects into four categories;
- ✦ Procedures for issuing the Environmental Clearance Certificate (ECC); and
- Determination of environmental standards.

Rule 3 defines the factors to be considered in declaring an 'ecologically critical area' as per Section 5 of the ECA (1995). It empowers the Government to declare the area as the Ecologically Critical Areas (ECA), if it is satisfied that the ecosystem of the area has reached or is threatened to reach a critical state or condition due to environmental degradation. The Government is also empowered to specify which of operations or processes may be carried out or may not be initiated in the ecologically critical area. Under this mandate, the Ministry of Environment, Forest and Climate Change (MoEFCC) has declared Sundarbans, Cox's Bazar-Tekhnaf Sea Shore, Saint Martin Island, Sonadia Island, Hakaluki Haor, Tanguar Haor, Marzat Baor and Gulshan-Baridhara Lake as ecologically critical areas and prohibited certain activities in those areas.

Rule 7 of the 1997 ECR provides a classification of industrial units and projects into four categories, depending on environmental impact and location. These categories are:

- ✦ Green;
 - ✦ Orange A; ▪ Orange B; and ▪ Red.
- I. The categorization of a project determines the procedure for issuance of an Environmental Clearance Certificate (ECC). All proposed industrial units and projects that are considered to be low polluting are categorized under "Green" and shall be granted Environmental Clearance. These are Orange B for work that requires Initial Environmental Examination (IEE) and Red for work that requires full environmental assessment (EA).

- II. A detailed description of those four categories of industries has been given in Schedule-1 of ECR'97. Apart from general requirement, for every Red category proposed industrial unit or project, the application must be accompanied with feasibility report on Initial Environmental Examination, Environmental Impact Assessment based on approved TOR by DOE, Environmental Management Plan (EMP) etc.
- III. Depending upon location, size, and severity of pollution loads, projects/activities have been classified in ECR, 1997 into four categories: Green, Orange A, Orange B, and Red respectively, to nil, minor, medium, and severe impacts on important environmental components (IECs).
- IV. **Relevance to the project** - In accordance with the Environment Conservation Rules (ECR) of 1997, the Project is classified as Red Category, requiring an Environmental Impact Assessment (EIA) to obtain clearance for construction from the Director General (DG) in the manner prescribed by the Rules'.

2.2.7 National Water Policy, 1999

The policy aims to provide guidance to the major players in water sector for ensuring optimal development and management of water. The policy emphasizes efficient and equitable management of water resources, proper harnessing and development of surface and ground water, availability of water to all concerned and institutional capacity building for water resource management. It also addresses issues like river basin management, water rights and allocation, public and private investment, water supply and sanitation and water need for agriculture, industry, fisheries, wildlife, navigation, recreation, environment, preservation of wetlands, etc. The policy has several clauses related to the project for ensuring environmental protection.

2.2.8 Other National Legal Instruments

The Ministry of Environment, Forests and Climate Change (MoEFCC) prepare the environmental policies. MoEFC also has formulated regulation toward clearance of projects from environmental angles based on environmental impact assessment report. The Department of Environment (DoE) is responsible for environmental issues while forest issues are looked after Forest Department (FD). Over the years the MoEFC has adopted number of legal instrument in the form Acts for the protection and conservation of the environment. Table-2 summarizes the Environmental Legislation applicable to the project.

Table 2: Summary of Environmental Legislations Applicable to the proposed project

No.	Environmental Legislation / Act	Objective	Relevance to the Project	Responsible Institution
1	National Environmental Policy, 1992	Ensure that development components do not pollute the environment or degrade resources. It sets out the basic framework for environmental action together with a set of broad sectoral action guidelines.	Restriction on operations which cannot be initiated in ecological critical areas Regulation on vehicles emitting smoke which is harmful to the environment Follow standards on quality of air, water, noise and soil Sets limits for discharging and emitting waste	Ministry of Environment and Forests, and Climate Change
2	National Environmental Management Action Plan (NEMAP), 1995	An action plan to identify key environmental issues affecting Bangladesh, identifies actions for reducing the rate of environmental degradation and improve quality of life.	Sectoral agencies to coordinate with MoEFCC in preparing environmental guidelines	Ministry of Environment and Forests, and Climate Change
3	Environment Court Act, 2000 and subsequent amendments in 2003	Establishment of Environment Court for trial of an offence or for compensation under environmental law, such as environment pollution.	Option to affected persons for grievances related to environment safeguards.	Ministry of Environment and Forests, and Climate Change
4	The Forest Act (1927) and Forest (Amendment) Act (2000, 2012)	Conservation of Reserve, Protected, Rural and Unclassified State Forests, Forest Ecology and Wildlife;	Requires clearances for any project within forest areas and clearances for any felling, extraction, and transport of forest produce.	DOE, MOEF and Forest Department
5	National Forest Policy (1994)	To conserve existing forests and bring about 20% of the country's land area under the Forestation Programme and increase reserved forests by 10% per year until 2015	Incorporate tree planting in the subproject Clearance for any felling, extraction, and transport of forest produce	Department of Forests

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No.	Environmental Legislation / Act	Objective	Relevance to the Project	Responsible Institution
6	The Bangladesh Wildlife (Conservation & Security) Act, 2012	To conserve and protect wildlife in Bangladesh including designation of protected areas. Conservation of wildlife, Wildlife Sanctuaries, National Parks, Eco-Parks in Forests and elsewhere.	Consultation and necessary permits required if the project would affect the Wildlife in the project area.	Forest Department, MOEF and Bangladesh Wild Life Advisory Board
7	Vehicle Act, 1927 Motor Vehicles Ordinance, 1983 Bengal Motor Vehicle Rules, 1940	Ensure that development components do not pollute the environment or degrade resources.	Road safety, Licensing, monitoring maintenance standard of vehicles, Pollution control	Bangladesh Road Transport Authority (BRTA)/ Police/ Civil Administration
8	Natural Water Bodies Protection Act (2000)	Conservation of natural and man-made wetlands	Secure clearance certificate on water resource development project	Ministry of Water Resources
9	Wetland Protection Act 2000	Advocates protection against degradation and resuscitation of natural water-bodies such as lakes, Haor's, ponds, beels, khals, tanks, etc. affected by man-made interventions or other causes. Prevents the filling of publicly owned water bodies and depressions in urban areas for preservation of the natural aquifers and environment. Prevents unplanned construction on riverbanks and indiscriminate clearance of vegetation on newly accreted land.	In case of impact on the natural water bodies within the project area	Ministry of Water Resources
10	Bangladesh Labor Law, 2006	It is a comprehensive law covering labour issues such as: conditions of service and employment, youth employment, benefits including maternal benefits, compensation for injuries, trade unions and industrial relations, disputes, participation of workers in company's profits, regulation of safety of dock workers, penalty procedures, administration and inspection.	Compliance to provisions on employment standards, occupational health and safety, welfare and social protection, labor relations and social dialogue, and enforcement. Prohibition of employment of children and	Ministry of Labor and Employment

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No.	Environmental Legislation / Act	Objective	Relevance to the Project	Responsible Institution
		This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable environment for working. It also includes rules on registration of labourers, misconduct rules, income and benefits, health and fire safety, factory plan	Adolescents.	
11	Bangladesh Labor Rules, 2015	Includes rules on registration of laborers, misconduct rules, income and benefits, health and fire safety, factory plan	Contractors to implement occupational health and safety measures Contractor will be liable for compensation for work-related injuries	Department of Labor
12	Removal of Wreckage and Obstructions in inland Navigable Water Ways Rules (1973).	Removal of Wrecks and Obstructions from inland Navigable Waterways.	Setting-up emergency response procedures	Bangladesh Inland Water Transport Authority (BIWTA)
13	Bangladesh Climate Change Strategy and Action Plan of 2009	Enhances the capacity of government ministries, civil society and private sector to meet the challenges of climate change	Integrate adaptation measures for buildings in consideration of extreme climatic events	Ministry of Environment, Forests and Climate Change
14	The Land Acquisition Act, (1894) and Amendments (1993, 1994, 2004) Acquisition and Requisition of Immovable Property Ordinance 1982. Amendments Acquisition and Requisition of Immovable Property Ordinance 2017.	Ensure that development components; relating land acquisition and compensation	Current GOB Act & guidelines, relating land acquisition and compensation	Civil Administration (Deputy Commissioner of the District), Revenue Department, LGRD and C, Ministry of Land.

No.	Environmental Legislation / Act	Objective	Relevance to the Project	Responsible Institution
15	National Disaster Management Act of 2012	Establishes a framework for managing disasters in a comprehensive way.	Setting-up emergency response procedures	Ministry of Disaster and Relief

2.3 Applicable International Agreements

- Aside from the legal framework on environment, Bangladesh is also a party to several international conventions, treaties, and protocols related to environmental protection. The applicable international conventions, treaties, and protocols are described in Table 3.

Table 3: International Conventions, Treaties, and Protocols Signed by Bangladesh

Conventions	Years	Ratified/Accessed (AC)/Accepted (AT)/Adaptation (AD)	Relevance
International Plant Protection Convention (Rome,) & Plant Protection Agreement for SE Asia and Pacific (1999 Revision)	1951	01.09.1978 04.12.1974 (AC) (Entry into Force)	Ensuring that the Project work or construction materials do not introduce plant pests
Convention on Wetlands of International Importance ("Ramsar Convention":1971)	1999	20.04.1992 (ratified)	Protection of significant wetland and prevention of draining or filling during construction
Convention on Biological Diversity, (Rio de Janeiro, 1992.)	1992	05.06.1992	Protection of biodiversity during construction and operation.
Convention on Persistent Organic Pollutants, Stockholm.	2001	In process	Restrict use of different chemicals containing POPs.
United Nations Framework Convention on Climate Change, (New York, 1992.)	1992	15.04.94	Reduction of emission of greenhouse gases.
Convention on Biological Diversity, (Rio De Janeiro, 1992.)	1992	03.05.94	Conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.
Kyoto protocol to the United Nations Framework Convention on Climate Change		21.8.2001 (AC) 11.12.1997 (AD)	Reduction of emission of greenhouse gases.
International Convention for Protection of Birds, Paris	1950	Signed	Protection of the birds in their wild state.
Convention Concerning the Prevention and Control of Occupational Hazards caused by Carcinogenic Substances and Agents, Geneva.	1974	Signed	To protect workers against hazards arising from occupational exposure to carcinogenic substances and agents.

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Conventions	Years	Ratified/Accessed (AC)/Accepted (AT)/Adaptation (AD)	Relevance
Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment due to Air Pollution, Noise and Vibration, Geneva	1977	Signed	Protection of workers' health against occupational hazards in the working environment due to air pollution, noise and vibration.
Convention Concerning Occupational Safety and Health and the Working Environment, Geneva.	1981	Signed	Ensuring occupational health and safety of workers in all branches of economic activity.
Vienna Convention for the Protection of the Ozone Layer, Vienna	1985	02.08.90 (AC) 31.10.90 (entry into force)	Preventing human activities that may have adverse effects on ozone layer.
Convention Concerning Occupational Health Services, Geneva.	1985		Convention Concerning Occupational Health Services, Geneva.
Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal.	1987	31.10.90 (entry into force)	Reduction of the abundance of the substances that deplete the ozone layer in the atmosphere, and thereby protect the earth's fragile ozone Layer.
Convention Concerning Safety in the Use of Chemicals at Work, Geneva.	1990	Signed	Regulating the management of chemicals in the workplaces in order to protect workers from the harmful effects of these substances.
London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London.		18.03.94 (AC) 16.06.94 (entry into force)	To strengthen the control procedure and extend the coverage of Montreal Protocol to new substances.
Preparedness, Response and Cooperation (London, 1990.) 30.11.90 United Nations Framework Convention on Climate Change, New York	09.06.92	15.04.94	Achieving stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.
Convention on Biological Diversity, Rio De Janeiro	05.06.92	03.05.94	Conservation of biological diversity (or biodiversity) and sustainable use of its components.
Agenda 21, UNCED, Rio de Janeiro	1992	Signed	Ensuring sustainable development.
Copenhagen Amendment to the Montreal protocol on Substances that Deplete the Ozone Layer, Copenhagen, 1992	1992	27.11.2000 (AT) 26.2.2001 (Entry into force)	Extending the coverage of Montreal Protocol to new substances

Conventions	Years	Ratified/Accessed (AC)/Accepted (AT)/Adaptation (AD)	Relevance
Montreal Amendment of the Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal		27.7.2001 (Accepted) 26.10.2001 (Entry into force)	Controls in the trade of ozone depleting substances and the use of licensing procedures to control the import and export of new, recycled and reclaimed ozone depleting substances.

2.4 Legislation relating to Health and Safety during Construction

- I. The legislations on Occupational Health and Safety (OHS) have provisions relating to the workers' safety, health and hygiene, occupational diseases, industrial accidents, protection of women and young persons in dangerous occupations, and also cover conditions of work, working hours, welfare facilities, holidays, leave, etc. The main legislations regarding the OHS during Construction stage of the project are;
- II. The Factories Act, 1965 (Act XXV of 1934) and the Factories Rules 1979: is generally applicable to any factory 'means any premises including the precincts thereof whereon 10 or more workers are working or were working on any day of the preceding twelve months and in any part of which a manufacturing process is being carried on with or without the aid of power, but does not include amine'. The Workmen's Compensation Act 1923 as amended in 1980 and 1983, Employment of Children Act 1938,
- III. The Bangladesh Labor Act, 2006: This is adopted by the Parliament replaced earlier legislation, including the Factories Act, 1965 and the Factories Rules, 1979, which had established a framework for safeguarding workers' rights and decent conditions of work in industrial establishments. The new Act codified 25 labor laws and reaffirmed the rights of workers to:
 - Proper wages and benefits that ensure an adequate standard of living for workers and their families;
 - Equal pay for equal work and non-discrimination;
 - Regulated time of work and prohibition on forced labor or slavery;
 - Safe, secure and healthy working environment;
 - Fair compensation in cases of work-related death or injury;
 - Right to organize trade unions for collective bargaining;
 - Freedom of children from exploitation;
 - Proper sanitation facilities, drinking facilities, maternity leave, childcare facilities and human resource development.
- IV. The Department of Inspection for Factories and Establishments under the Ministry of Labor and Employment administers and enforces the Labor laws, Factories Act and Factory Rules.

2.5 Environmental Categorization and Standards

2.5.1 Environmental Category: GOB

- I. For the purpose of issuance of Environmental Clearance Certificate, the industrial units and projects shall, in consideration of their site and impact on the environment, be classified into

the following four categories: (a) Green; (b) Orange- A; (c) Orange- B; and (d) Red. The Industries and projects included in the various categories are specified in sub-rule (1) have been described in Schedule-1. The ECA indicates that all industrial units or projects must obtain a Location Clearance Certificate (LCC) and Environmental Clearance Certificate (ECC) from the Department of Environment (DoE). No industrial unit or project shall be established or undertaken without obtaining environmental clearance from DoE in the manner prescribed by the rules.

- II. The environmental category of the project is not listed in Schedule-1 of ECR. However, the Construction/reconstruction/extension of feeder roads and local streets projects falls in Orange-B category. Table-4 describes DoE classification for road project.

Table 4: Likely GoB Classification of road sector projects including bridge construction

Project	Component	Equivalent in Schedule I of ECR	DoE Classification
Road & Bridge	Road provisions (include Road & drain Rehabilitation/ Improvement/ Construction, road resurfacing, road signs, intersection, Foot over bridge, Bridge, SMVT etc.)	Construction/reconstruction/extension of feeder roads and local streets. Construction/reconstruction/extension of bridges less than 100 meters long.	Orange-B

2.6 Institutional Arrangements/Framework

- i The Environmental and Social Management Plan (ESMP) implementation requires an organization support structure in the form of organizational requirements, training needs and plan, and information management system. The following section captures these institutional arrangements for ESMP implementation by concerned officials of LGED, their consultants and working contractors.
- ii The organizational structure of LGED is given in Figure 2. However, an organizational structure shall be developed at the corporate, regional and site level to aid effective implementation of the ESMP document. Various departments will be involved during implementation of the project. Contractor is responsible for implementation of ESMP during works and Construction Supervision Consultant (CSC) is primarily responsible for supervision of monitoring of the implementation of the ESMP. LGED will be supported by a Management Consultant (MC) to advise and assist LGED in quality and capacity enhancement and independent quality monitoring. Contractor will be responsible for implementation of ESMP during work activities stage. Relevant departments responsible for implementation and supervision of proposed mitigation and monitoring measures are given in the ESMP.
- iii CSC will be responsible to monitor all activities of all contractors procured under the project. As several contractors will be working simultaneously for timely and speedy implementation of the project, it is important that CSC has an environmental unit to effectively supervise and monitor the environmental activities being implemented in the field. The CSC is also responsible to update or make necessary changes to the ESMP if required based on the revised designs and locations
- iv A combined grievance redress committee is proposed to address grievances in both social and environmental issues. In addition, there will be NGOs working for plantation program and environmental awareness.

2.7 Institutional Roles and Responsibilities

- The Roads and Highways Department (LGED) is the Executing Agency (EA) for the LGED and will be responsible for ensuring that all the components of the ESF are complied with. The LGED has the responsibility to ensure that the investment follows the legal requirements for environmental assessment. The LGED has an Environmental and Social Circle (ESC) headed by the Superintending Engineer who is supported by the Executive Engineer, Subdivision Engineer, Assistant Engineer and Sub-Assistant Engineer.
- The APDs serve as the environmental focal persons under each PIU. One of Assistant Engineers serves as the environmental focal person at the site level and support the respective APD on environment safeguard matters. Further the Project Implementation Consultant (PIC) responsible for supervising the civil works contractor will provide support to the respective PIU for day to day monitoring and reporting on environment safeguards.
- The following elaborates the detailed responsibilities on environment safeguards: **a. LGED**
- As the EA for the investment program, LGED will be responsible for ensuring that all the environment safeguard requirements as provided in the Framework Financing Agreement (FFA), this ESF and the respective ESIA and ESMP are complied with.

2.8 LGED (Environment and Social Circle)

The LGED Environment and Social Circle (ESC) is responsible for managing environment and social safeguards including safeguards related capacity building for all LGED projects. They will not be involved in the day to day implementation of safeguards for specific projects such as this investment program. The respective PIU will seek their support and advise on an as needed basis. Their overall responsibilities are:

- Ensure that all LGED works and projects are executed in accordance with appropriate environmental and social standards and practices.
- Liaise with GOB organizations and other line agencies to ensure effective interagency cooperation on relevant projects.
- Ensure the provision or procurement of the necessary services for carrying out Environmental Assessment, Land acquisition and Resettlement studies.
- Disseminate the need for high social and environmental standards throughout LGED and to the concerned public through research, publicity, seminars and training.
- Coordination the preparation and implementation of environmental and RAPs for LGED projects as needed.
- Monitor long-term, cumulative environmental impacts and ensure mitigation measures for project sustainability.
- Conduct site inspections on selected LGED projects as needed
- Provide feedback on all environmental issues of existing and ongoing LGED projects and works.
- Review and preparation of Request for Proposal (RFP) and tender documents for procurement of Environmental Services (ESIA and ESMP) for LGED projects.
- Assist the Director of LGED Training Centre in providing training to LGED officers in Environmental and Resettlement issues.

- Review and approve the Environmental Assessment reports and Environmental Monitoring reports produced by consultants/experts under LGED projects as needed.
- Establish and maintain environmental standards, guidelines and manuals in LGED.
- Identify environmental issues and constraints at project planning stage, suggest alternatives, options.
- Establish a reference library, containing relevant environmental documents (hard and soft copies) of domestic and overseas sources.
- Monitor long term environmental impacts on relevant LGED Projects
- Liaise with Road Safety Circle, Arboriculture Head and maintain intra-departmental co-ordination.

2.9 PIU (Environmental Focal Persons at Project Head Quarter and Site level)

The Additional Project Directors under the respective PIU will serve as the Environmental Focal Person at the Project Head Quarter level. At the site level an Assistant Engineer supporting the Project Manager will serve as the environmental focal person. The PIU will be responsible for ensuring proper implementation of environment safeguards in their respective projects including implementation of the ESMP, timely reporting, and timely resolution of complaints and grievances. Their detailed responsibilities are:

- Prepare or engage consultants to prepare environmental assessment reports (ESIA, ESMP) for project components as necessary
 - Review and comment on the environmental assessment reports and environmental monitoring reports prepared by consultants and ensure they are prepared in accordance with requirements of LGED, DOE
 - Ensure that the consultants while carrying out work at site follow the environmental standards, guidelines and manual of LGED.
 - Take necessary steps to ensure timely receipt of DoE Environmental Clearance
 - Ensure that the ESMP and relevant environmental clauses are included in the contractors bidding documents
 - Conduct spot checks on-site to monitor contractor's compliance with the ESMP
 - Review and endorse quarterly monitoring reports prepared by the PIC
 - If there are any non-compliance issues or unanticipated environmental impacts ensure that necessary corrective actions are taken and ESIA and/or ESMP is updated as necessary
 - Ensure that all grievances and complaints received are addressed in a timely manner and properly documented
- Carry out all other activities on environment safeguards on behalf of the PIU as needed

2.10 Project Implementation Consultant (Environment Safeguards Team)

The proposed framework for implementation of the project shall utilize consultancy services from both international and national companies for the overall management and supervision of construction work on behalf of the EA. In addition to supervising the construction work of the contractor their role will be to check on conformity with the relevant clauses in construction contracts and national legislation and regulations. The following are the detailed responsibilities of the PIC

- Review the ESIA and ESMPs of respective subprojects to understand the context and environmental issues of the project

- Establish monitoring and reporting protocols within the environment safeguards team at the site level and project headquarter level
- Require the civil works contractor to prepare sub-plans on environment safeguards such as camp layout plan, borrow area management plan, construction debris management plan, traffic management plan etc. as needed
- Review and approve all sub-plans on environment safeguards submitted by the civil works contractor
- Conduct regular (minimum of weekly) onsite inspections on implementation of the ESMP by the contractor
- Ensure the contractor obtains all clearances, permits etc. related to environment safeguards on a timely basis
- Ensure the contract collects required environmental monitoring data (air, water, noise) as stipulated in the respective ESIA report
- Provide on-site technical advice and training to the contractor as needed
- Organize training workshops on implementation of environment safeguards for the project team including PIU, LGED site offices, members of the PIC and civil works contractor
- Facilitate proper functioning of the GRM and maintain records of all complaints received and actions taken for inclusion in the environmental monitoring reports
- If there are any non-compliance issues or unanticipated environmental impacts ensure that necessary corrective actions are taken and update the ESIA and/or ESMP as necessary
- Review and approve the monthly progress reports submitted by the contractor
- Based on monthly progress reports submitted by the contractor and site inspections prepare quarterly environmental monitoring reports for review and approval by the PIU
- Based on the quarterly monitoring reports prepare annual environmental monitoring reports for review and approval by the PIU and further submission to AIIB for disclosure on the AIIB website
- Provide necessary technical support to the PIU on implementation of environment safeguards.

2.11 Contractor (Environment Safeguards Team)

The tender for the construction of the project would be national/international competitive bidding contractors. The Contractor is legally mandated to implement the ESMP and obtain all environments related permits and clearances required for construction. The detailed responsibilities of the contractor on environment safeguards are the following:

- Recruit and appoint environmental focal persons and/or environmental health and safety officers on the construction site
 - The contractor shall comply with all statutes and regulations concerning the execution of works as mentioned in DoE and LGED environmental guidelines.
 - The contractor shall be responsible for familiarizing himself with all legislation relating to environmental protection that is relevant to his activities. Reference to rational environmental quality guidelines should be made.
- Implement the ESMP approved by the PIC
- Prepare all sub-plans related environment safeguards such as camp layout plan, borrow area management plan, construction debris management plan, traffic management plan etc. as needed and submit for approval by the PIC
 - Obtain all statutory clearances and permits on environment safeguards in a timely manner
 - Conduct environmental quality monitoring (air, noise, water) as stipulated in the Environmental Monitoring Plan of the respective ESIA report

- Take necessary measures to immediately address any complaints or grievances raised by local community or other stakeholders
- Prepare monthly progress reports on implementation of the ESMP for approval by the PIC
- The contractor shall be responsible for the costs of cleaning up any environmental pollution resulting from his activities if methods for doing so are available and effective.

2.12 Capacity Building

➤ In Bangladesh, the environmental assessment process is established, but environmental awareness and capability for implementation of ESMP in infrastructure projects are still developing. The project implementation unit (PIU) of LGED had some officers in the Environment and Social Circle Department (ESC) that are delegated environmental duties. The delegated officers have responsibility to bring environmental issues to the notice of senior management. Typically, the delegated officers have been moved to different departments due to promotions and operational needs after about every 3 years, and they move on to other engineering departments in LGED. The status quo is that ESC engineering officers are delegated to check environmental assessments prepared by consultants. The EIA and ESMP are referred to the DOE in the Ministry of Environment and Forests (MOEF) for approval. The ESC in LGED is not directly involved with project implementation but has more administrative responsibility to ensure environmental compliance and a general role to increase environmental awareness for LGED. It is therefore not clear if LGED/ESC has the capacity to check the adequacy of the developed ESMP for this project.

➤ The most significant challenge for environmental management on this project is the lack of human and financial resources and necessary infrastructure in PIU. To enhance the capacity of the LGED Environmental and Social Circle and PIU for effective implementation of proposed mitigation measures and monitoring the resultant effect, some training programs and awareness workshop are proposed. The detailed training plan is provided at Table 5.

Table 5: Training Plan

Target Group	Subject(s)	Method	Time Frame
Planning and Construction Stage			
All concerned PIU/LGED project staff	Environmental Overview: Environmental regulations, and national standards, process of impact assessment and identification of mitigation measures, importance of ESMP & monitoring, and monitoring methodology	Lectures	Before beginning of the implementation of the project
Environmental engineers, field officers, contractors, supervision consultants	Implementation of ESMPs: Basic features of an ESMP, planning, designing and execution of environmental mitigation and enhancement measures, monitoring and evaluation of environmental conditions – during construction and operation	Workshops and Seminars	Before the construction begins
Environmental Engineers, field officers, contractors, supervision consultants	Environmentally Sound Construction Practices: Waste management and minimization in construction, pollution control devices and methods for construction sites and equipment, Environmental clauses in contract documents and their implications, Environmental monitoring during construction	Seminars, Lectures and Site visits	Before the construction

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Target Group	Subject(s)	Method	Time Frame
Project staff dealing in social/lands matters	Social awareness: Monitoring consultants/organizations specializing in social management and monitoring can provide training on social awareness and land acquisition and resettlement issues	Lectures, Workshops and Seminars	Before the construction begins
Environmental engineers, field officers, contractors, supervision consultants	Monitoring Environmental Performance during Construction: Monitoring, Air, Water, Soil Erosion, Noise, and effect on wild life and fisheries, Evaluation and Review of results, Performance indicators and their applicability, possible corrective actions, reporting requirements and mechanisms	Lectures, Workshop and site visits	During initial phases of construction

It would be essential to understand the legislative framework and enhance capacity of Environmental and Social Unit of LGED and Field Officer (Environment) for analyzing the applicability of various environmental legislations and clearances, approvals and compliance monitoring requirements.

Chapter Three

DESCRIPTION OF THE PROJECT

3.1 The Study Area

Road development, removal of waterlogging, and construction and development of other necessary infrastructures are the priority sectors of Keraniganj Upazila. Five road development projects have been implemented in this Upazila because of the future potential of Keraniganj and to be able to handle the growing population. These roads are-

- 1) Dhaka Mawa Road- Tegharia- Shaper Bazar via Mollar Hat (5.5 km) Road, 23°38'6.54"N 90°25'19.86"E and 23°39'38.34"N 90°24'49.62"E
- 2) Jinjira- Konda Via Mirerbagh Bazar- Beyara Bazar- Banagram- Zindapir Mazar (4.075 km) Road 23°39'35.00"N 90°25'18.45"E and 23°40'31.27"N 90°25'11.48"E
- 3) Ruhitpur GC - Baluartech - Dhaka Mawa (6.03 km) 23°39'50.58"N 90°19'51.66"E and 23°39'8.40"N 90°20'59.52"E,
- 4) Dhaka Mawa - Khejurbagh (2.00 km) 23°41'42.24"N 90°24'36.71"E and 23°41'3.90"N 90°24'34.38"E
- 5) Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullahpur Bishwaroad via Goista (4.00 km)) 23°41'22.02"N 90°23'54.96"E and 23°40'10.86"N 90°22'56.58"E.

These will connect this road with the proposed multimodal terminal. Above all, the Dhaka-Munshiganj alternative direct link road will be established through this road so that Munshiganj can be reached from Dhaka in a smooth and fast manner. Therefore, it is essential to increase the width of the existing road for future development and to facilitate the smooth movement of the people.

3.2 The Project Cost

Construction cost, PBM cost and Other Element cost constitutes the per km cost which amounts to BDT 1020000. This cost includes the cost of land acquisition and resettlement as well as construction supervision cost.

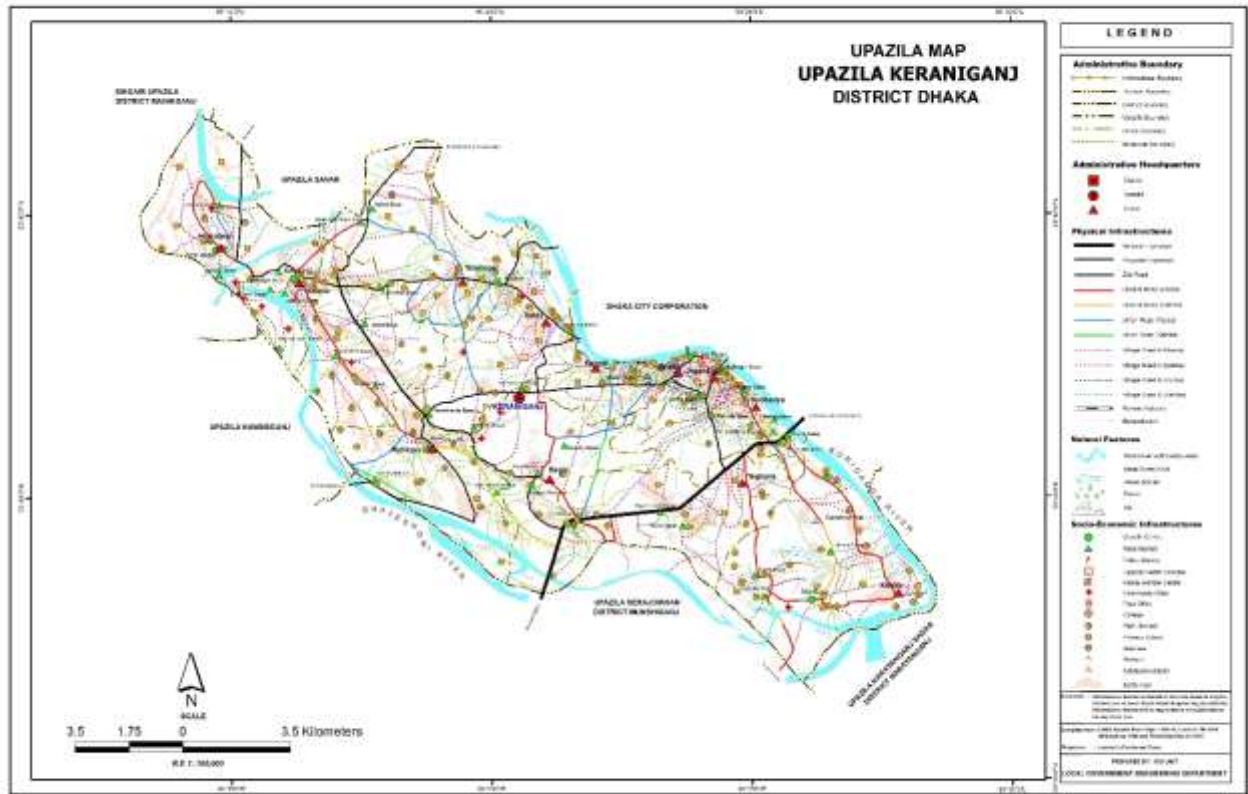


Figure 2 Location map of Keraniganj Upazila

3.3 Existing Condition and Need for the Project

The Project road passes through mostly low flat agricultural land and village site, Dhaka Mawa Road - Tegharia - Shaper Bazar Via Mollar Hat (5.5 km) Road, This road is known as Betka-Mawa link road which starts from Tegharia bus stop on Dhaka-Mawa highway and extends to Munshiganj via Alukanda Bazar-Mollar Hat. Various private residential projects are being developed along this road. Besides, Tegharia High School and Banagram Primary and High School are located along this road. The location of Professor Hamidur Rahman Stadium and the proposed sports complex and academy around this stadium is also on the side of this road. The proposed inter-district bus terminal at Keraniganj is located near this road. This road is connected with the outer ring road proposed in the structural road plan of Dhaka. This will connect this road with the proposed multimodal terminal. Above all, the Dhaka-Munshiganj alternative direct link road will be established through this road so that Munshiganj can be reached from Dhaka in a smooth and fast manner. Therefore, it is essential to increase the width of the existing road for future development and to facilitate the smooth movement of the people.

2) Jinjira - Konda Via Mirerbagh Bazar - Beyara Bazar - Banagram - Zindapir Mazar (4.075 km) Road Jinjira-Konda Via Mirerbagh Bazar-Beyara Bazar-Banagram-Zindapir Mazar road is divided into two parts. One part starts from Mirerbagh Bazar Jame Mosque and extends to Beyara Bazar by

Important road development project of Keraniganj upazila of Dhaka district

crossing the Ikuria intersection of Dhaka Mawa Highway and the other part starts from Banagram and ends at Zinda Pir Mosque. On both sides of the road, there are public-private schools, mosques, madrasas, cemeteries, community health care centers, Bashundhara River: residential areas and private residential projects called Basatvita Awasik. The shrine of Zinda Pir at the end of the road is a famous place in Keraniganj where a significant gathering of people takes place every day. The road needs to be widened considering all these aspects.

3) Ruhitpur GC - Baluartech - Dhaka Mawa (6.03 km) road another road that directly connects the Dhaka-Nawabganj-Dohar road with the Dhaka-Mawa highway is the Ruhitpur GC-Baluartek-Dhaka-Mawa road. This internal road of Rohitpur Union is the main road for the movement of millions of people in this area. Originally, this road started from Ruhitpur Bazar and passed through Ruhitpur and Basta Union and joined with Dhaka Mawa Highway near Dhaleshwari Bridge Toll Plaza. The location of the proposed inter-district truck terminal at Keraniganj is on the opposite side of the junction.

4) Dhaka Mawa-Khezurbagh (2.00 km) road, the road is originally known as Khezurbagh School Road which connects the Khezurbagh area with Dhaka Mawa Highway. The road starts from the Shubhadhya Union Parishad office and joins Dhaka Mawa Highway near Tegharia Bazar bus stop. This road crosses Gandaria, Muslimnagar, Hasnabad Mokampara, and also connects these areas with Dhaka Mawa Highway. In addition to the areas mentioned above, this road is one of the main means of transportation for the people of other areas in the vicinity with a government primary school, a high school, a Shubhadhya Union Parishad office and a major raw market on both sides.

5) Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullahpur Bishbrod via Gaista (4.00 km) Road, The Dhaka-Mawa link road is one of the major internal roads of Keraniganj. Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullahpur Bishwaroad via Gaista (known as Gaista - Shubhadya Old Road) is one of the important roads connecting Dhaka Mawa Highway and the Dhaka Mawa Link Road from Babubazar Bridge. The road is the main road for the people of Shubhadya Union, Gaista, and Baghai. The present Dhaka Central Jail is located at the junction of this road with Dhaka Mawa Highway. The road connects both the Jhilmil residential area of RAJUK and the private South Town residential area. As a result, the continuous increase in traffic pressure on this road in the near future is undeniable.

The above five roads are the most important roads in Keraniganj. With the successful implementation of these proposed road development projects, Keraniganj will be connected to several important roads and areas including Dhaka-Mawa Highway so that the growing number of people and vehicles will be able to move freely. Keraniganj Upazila, the focal point of various development projects, is gradually changing and modernizing as a result of which human activities and population are increasing rapidly which is putting increasing pressure on the existing road layout system of the region. So the implementation of these road development projects in a timely effort.

Under Government of Bangladesh DoE requirements all proposed road 21.60km in length are required to be covered by an IEE/EIA.

Important road development project of Keraniganj upazila of Dhaka district



Figure 3 Existing Condition of proposed road area



Figure 4 Existing Condition of proposed road area

Important road development project of Keraniganj upazila of Dhaka district

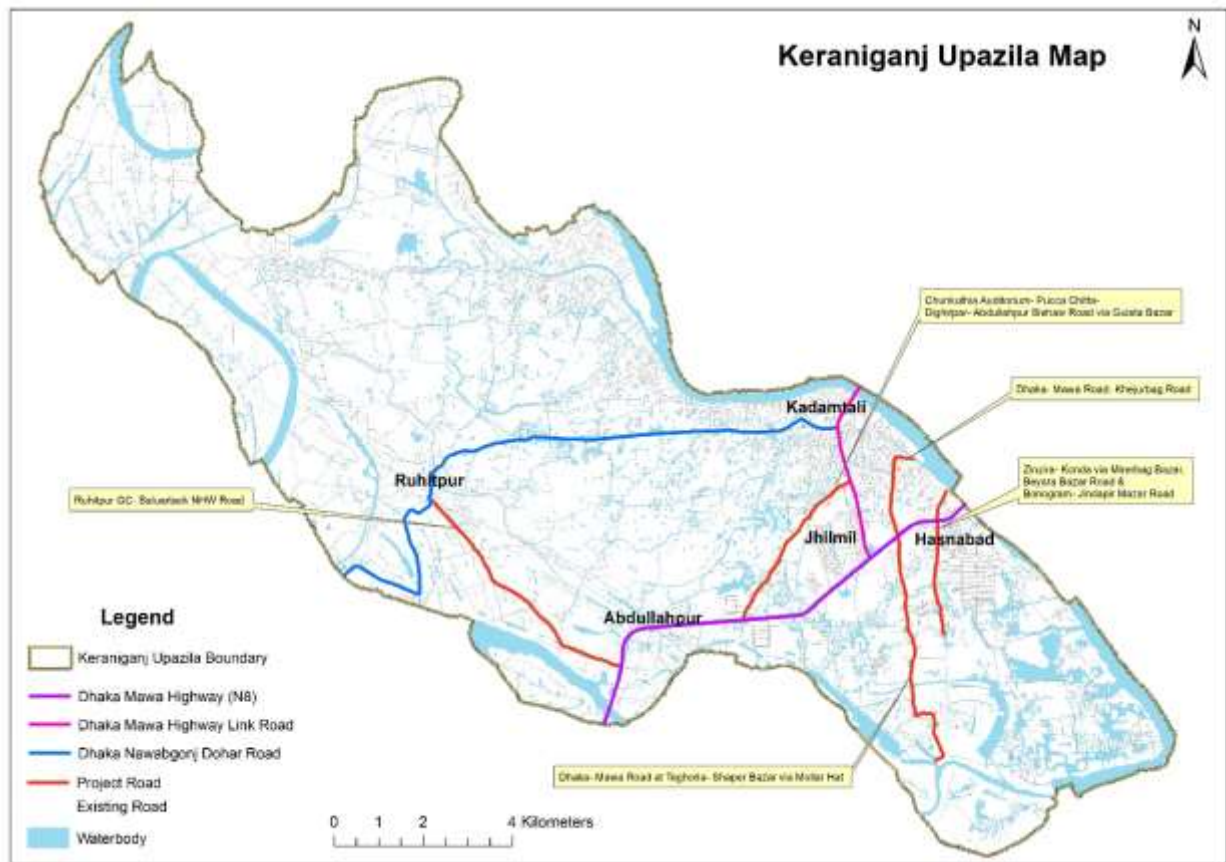


Figure 5: Location map of proposed road

Important road development project of Keraniganj upazila of Dhaka district

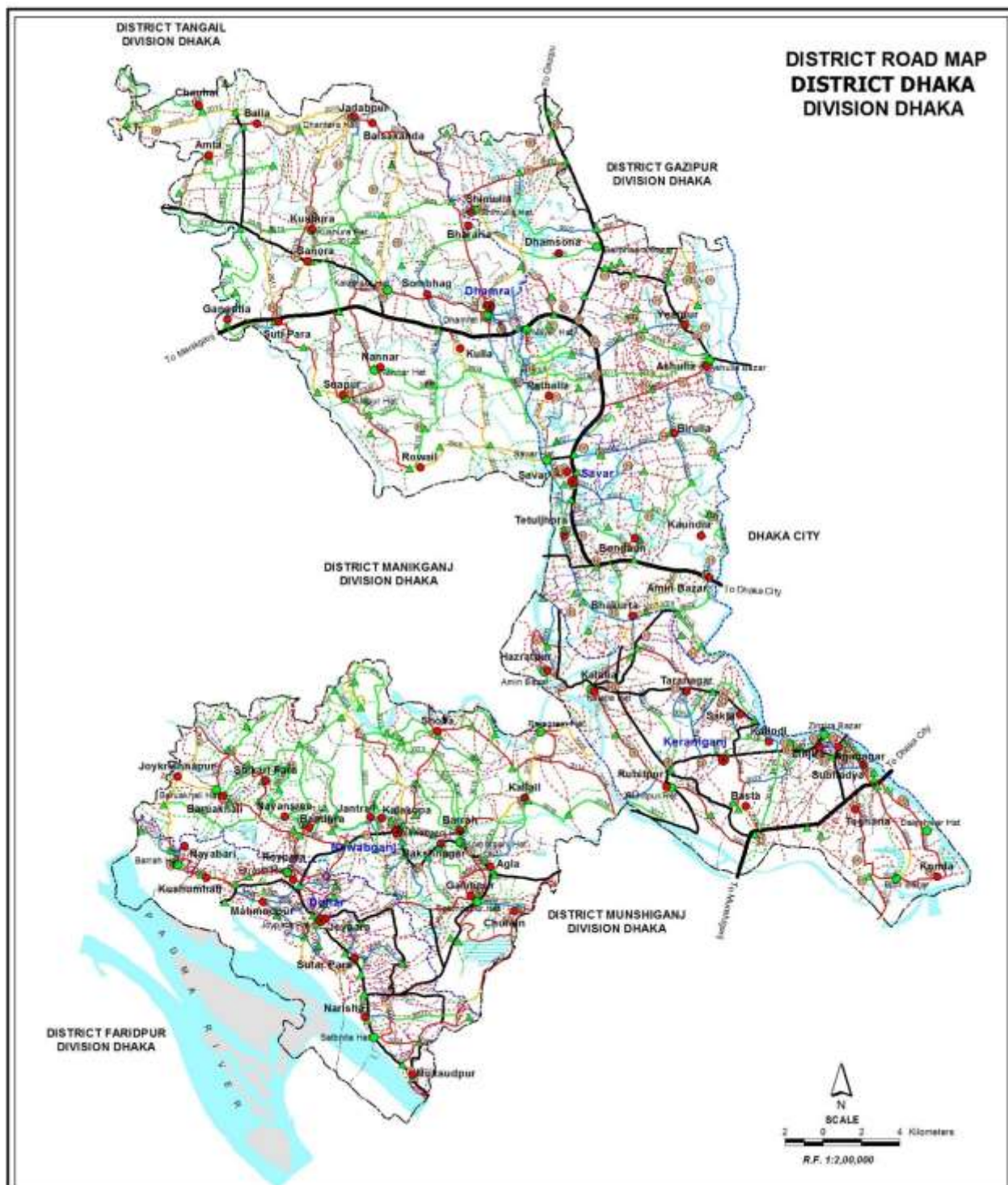


Figure 6 Dhaka District map

Important road development project of Keraniganj upazila of Dhaka district

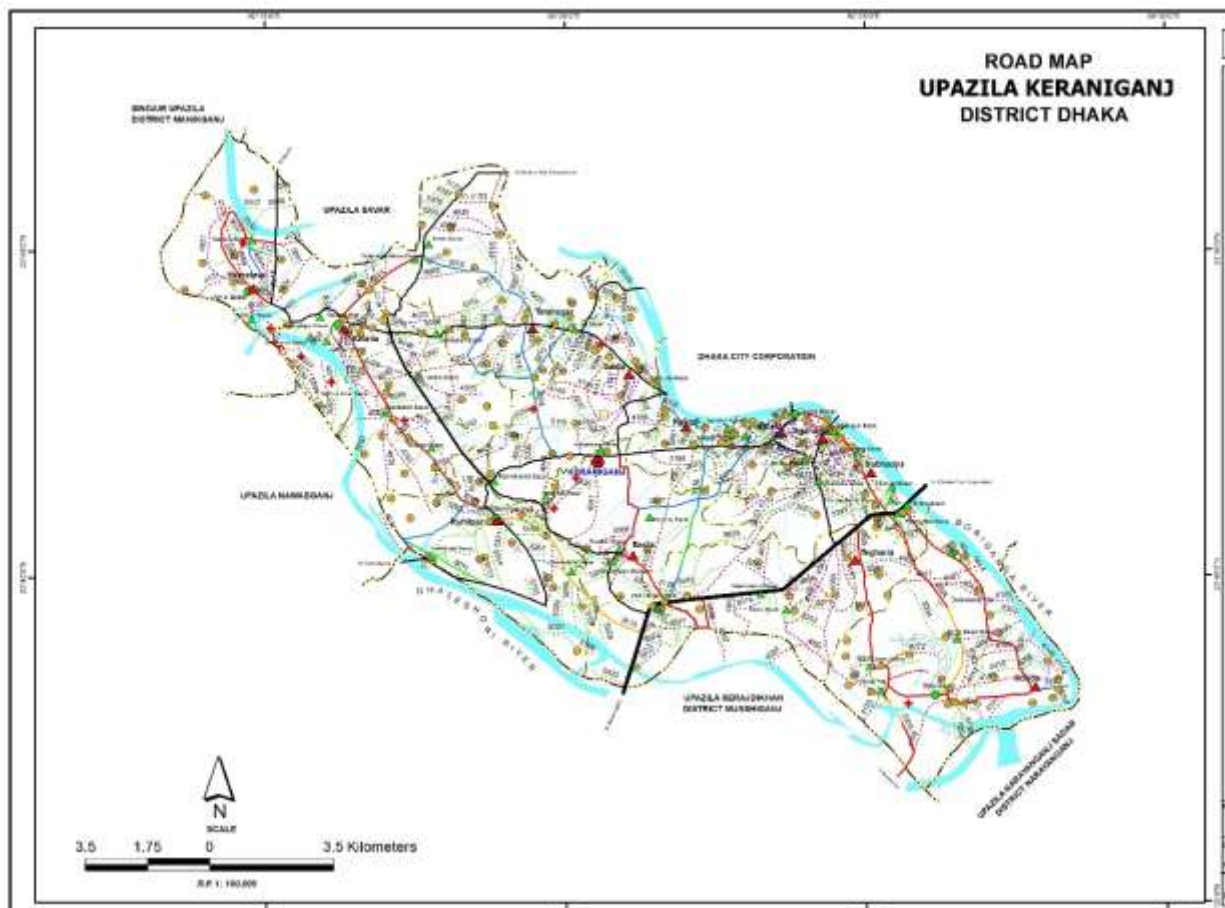


Figure 7 Keraniganj Upazila Road Map

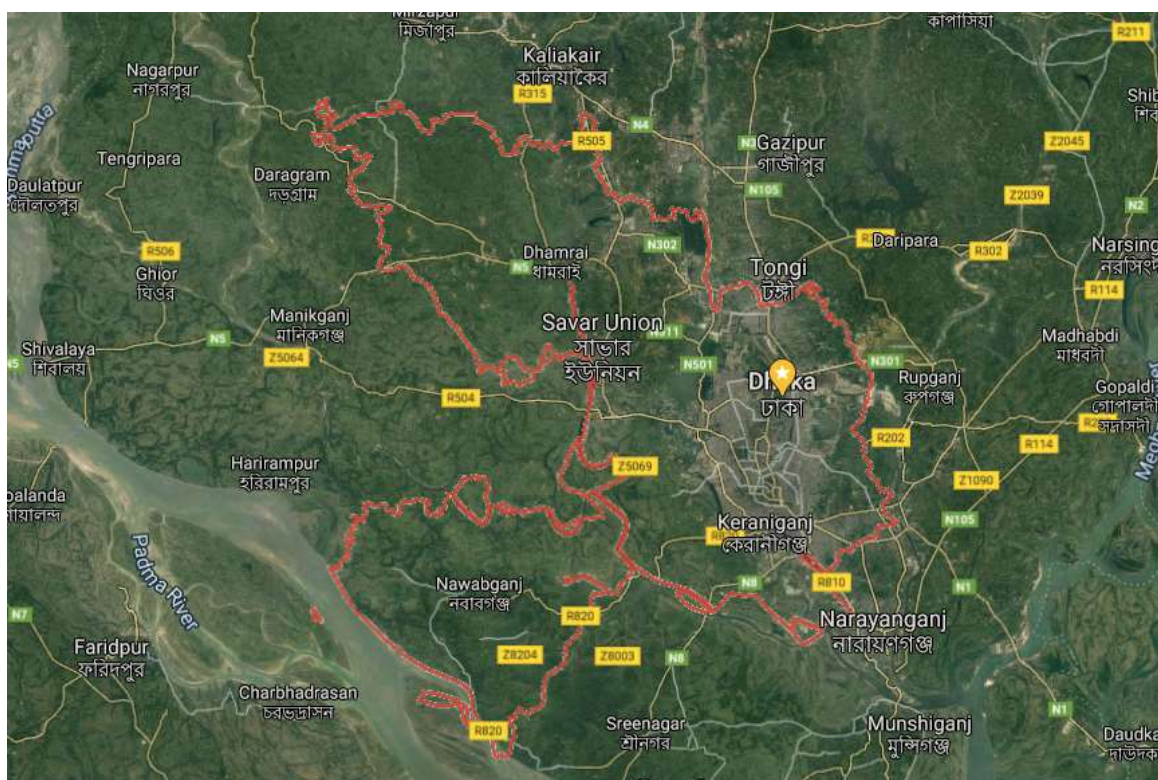


Figure 8: Dhaka district Google map

3.3 Proposed project

LGED has therefore commissioned the feasibility of improving the present road from the existing to extend roads to accommodate the present and potential growth in traffic flows in the future. Traffic volumes are moderate on keraniganj Upazila road which connects the Dhaka –Mawa highway.

Road development, removal of waterlogging, and construction and development of other necessary infrastructures are the priority sectors of Keraniganj Upazila. Administration and Hon'ble Local MP. Therefore, five road development projects have been implemented in this Upazila because of the future potential of Keraniganj and to be able to handle the growing population. These roads are- 1) Dhaka Mawa Road- Tegharia- Shaper Bazar via Mollar Hat (5.5 km) Road, 2) Jinjira- Konda Via Mirerbagh Bazar- Beyara Bazar- Banagram- Zindapir Mazar (4.075 km) Road, 3) Ruhitpur GC - Baluartech - Dhaka Mawa (6.03 km) road, 4) Dhaka Mawa - Khejurbagh (2.00 km) road and 5) Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullahpur Bishwaroad via Goista (4.00 km) Road.

- I. Dhaka Mawa Road - Tegharia - Shaper Bazar Via Mollar Hat (5.5 km) Road, this road is known as Betka-Mawa link road which starts from Tegharia bus stop on Dhaka-Mawa highway and extends to Munshiganj via Alukanda Bazar-Mollar Hat. Various private residential projects are being developed along this road. Besides, Tegharia High School and Banagram Primary and High School are located along this road. The location of Professor Hamidur Rahman Stadium and the proposed sports complex and academy around this stadium is also on the side of this road. The proposed inter-district bus terminal at Keraniganj is located near this road. This road is connected with the outer ring road proposed in the structural road plan of Dhaka. This will connect this road with the proposed multimodal terminal. Above all, the Dhaka-Munshiganj alternative direct link road will be established through this road so that Munshiganj can be reached from Dhaka in a smooth and fast manner. Therefore, it is essential to increase the width of the existing road for future development and to facilitate the smooth movement of the people.
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- III. Ruhitpur GC - Baluartech - Dhaka Mawa (6.03 km) road another road that directly connects the Dhaka-Nawabganj-Dohar road with the Dhaka-Mawa highway is the Ruhitpur GC-Baluarstek-Dhaka-Mawa road. This internal road of Rohitpur Union is the main road for the movement of millions of people in this area. Originally, this road started from Ruhitpur Bazar and passed through Ruhitpur and Basta Union and joined with Dhaka Mawa Highway near Dhaleshwari Bridge Toll Plaza. The location of the proposed inter-district truck terminal at Keraniganj is on the opposite side of the junction.
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Important road development project of Keraniganj upazila of Dhaka district

other areas in the vicinity with a government primary school, a high school, a Shubhadhya Union Parishad office and a major raw market on both sides.

- V. Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullapur Bishbrod via Gaista (4.00 km) Road, The Dhaka-Mawa link road is one of the major internal roads of Keraniganj. Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullapur Bishwaroad via Gaista (known as Gaista - Shubhadya Old Road) is one of the important roads connecting Dhaka Mawa Highway and the Dhaka Mawa Link Road from Babubazar Bridge. The road is the main road for the people of Shubhadya Union, Gaista, and Baghai. The present Dhaka Central Jail is located at the junction of this road with Dhaka Mawa Highway. The road connects both the Jhilmil residential area of RAJUK and the private South Town residential area. As a result, the continuous increase in traffic pressure on this road in the near future is undeniable.

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Table 6: Proposed components for Keraniganj Upazila

Length	21.60 km
Upazila road	15.60 km
Village road	6 km
Bridge/Culvert	140 m
Footpath development and Construction	21.60 km

3.4 Project Objectives

The objective the project are as follows:

- To enhance the overall communication in the project area
- Increasing the economic and business activities
- To open work opportunities for the villagers

Chapter Four

DESCRIPTION OF THE ENVIRONMENT

4.1 Introduction

The baseline environment of the study area along with environmental profile within the corridor of impact (COI) of the project roads are given in this section. The State of Dhaka is divided into the following broad regions for assessment of the baseline environment profile of the project districts as a whole and along the Corridor of Impact (COI) of the 21.60 km road.

The regions of influence of the project vary depending on the specific environmental parameters, and an attempt is made to give the reader information appropriate to the subject. For example, the region of influence for site-specific topics such as soil, topography, surface water, noise, recreational resources and cultural resources is usually limited to the immediate vicinity of the roadways, and the description of environment is limited to that vicinity. For other issues, such as geology, climate, transportation patterns, population, land use changes and public health, the description of the environment covers a broader geographic extent.

4.2 Baseline Environment

Upgrading five roads under the City Region Development Project (CRDP) will be done on the LGED of the existing road corridors as much as possible. The direct impacts due to the construction of the project will be confined mostly to the previously disturbed corridors (i.e. on the existing available LGED). Some adverse impacts may occur on the immediately adjacent areas where land acquisition is necessary for the geometrical design of the road.

Environmental issues or parameters that will be potentially affected by the Project's associated activities can be categorized under the following main headings.

- Physical
- Ecological Resources
- Economic Development and
- Social and Cultural

Brief descriptions of the receiving environment of the project area are presented in the ensuing section.

4.3 Physical Characteristics

4.3.1 Topography and Soil

The topography of the Dhaka district is flat with a little topographic relief. Elevations generally range between 6 meters above mean sea level along the western boundary of the district and 15 meters above msl in the eastern portion of the district, the elevation is about 10-msl. About 78% of land is agricultural, of which 24% of land is categorized as medium-high-lands. Dhaka stands on the banks of padma River surrounded by keraniganj upazila, in Dhaka district. The road mainly passes through flat terrain except for a few kilometers at from Jaintapur to Dhaka, where the road passes through undulating hills. The topographical features Figure IV-1 of Dhaka district are as follows:

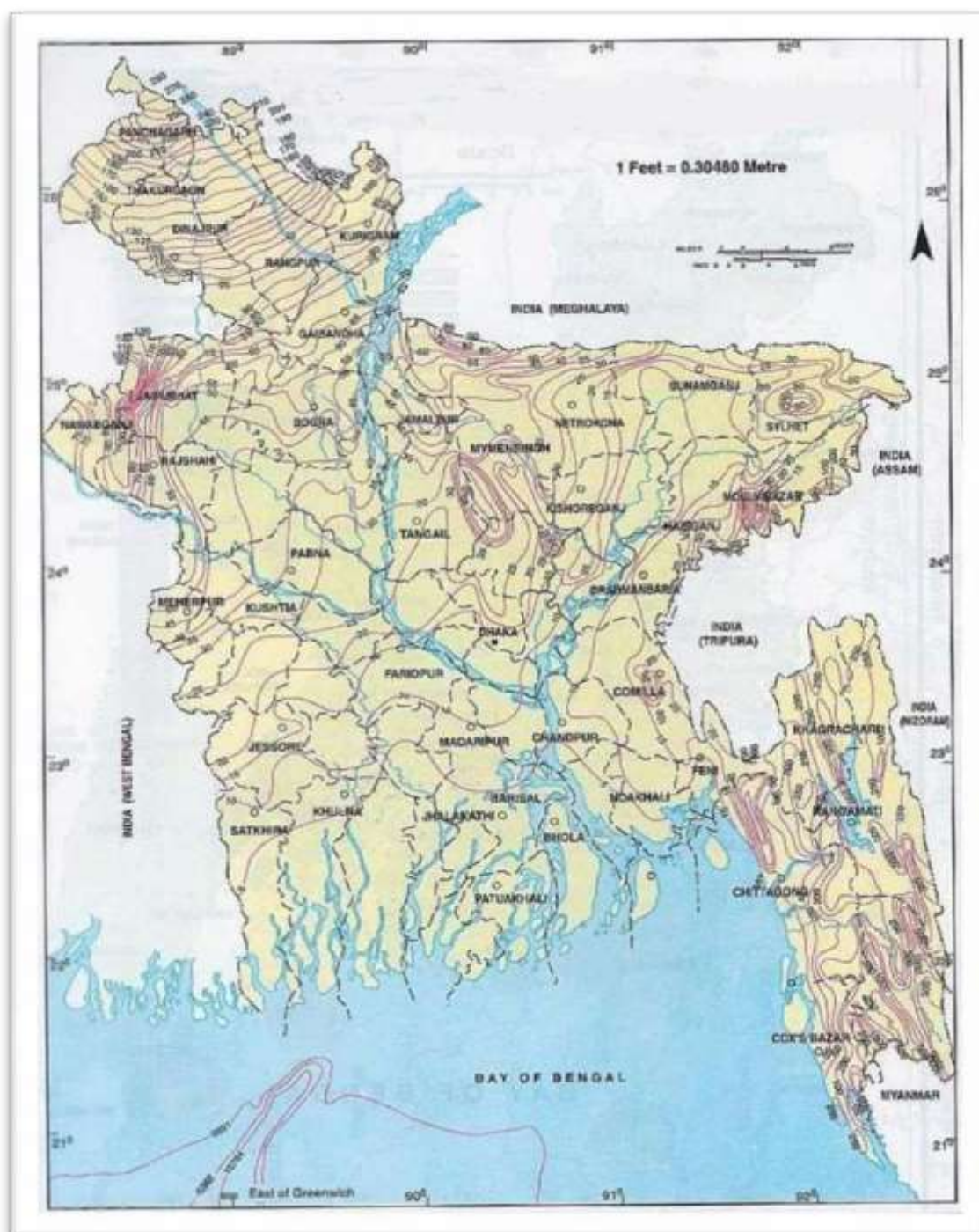


Figure 9: Topography Map of Project Area

The soil of the district is mainly formed in combination with the flood plain ridges and the sub recent piedmont basin. The northern part of the district contains the silty clay of the flood-plain. The central part is mainly dominated by soil of the grey sandy loam of the sub recent piedmont flood plain. The soil is well drained and shallow flooding and droughty in dry season. The basin centers (Haors) remain wet throughout the dry season. Surface deposits are mainly heavy clay. The soil of the eastern and central parts is excellent for vegetable and paddy.

4.3.2 Climatic Conditions

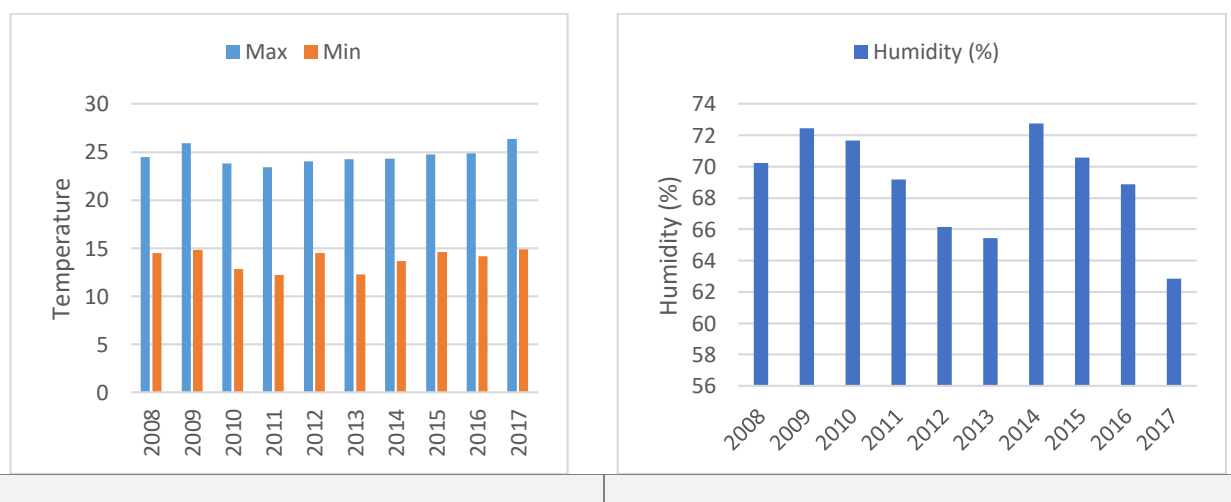
The climatic condition of the whole project area may be considered the same as reported in Dhaka meteorological station, since the stations are close to the project area. The maximum and minimum temperature and rainfall for ten years from 2008 to 2017 is presented in Table 7

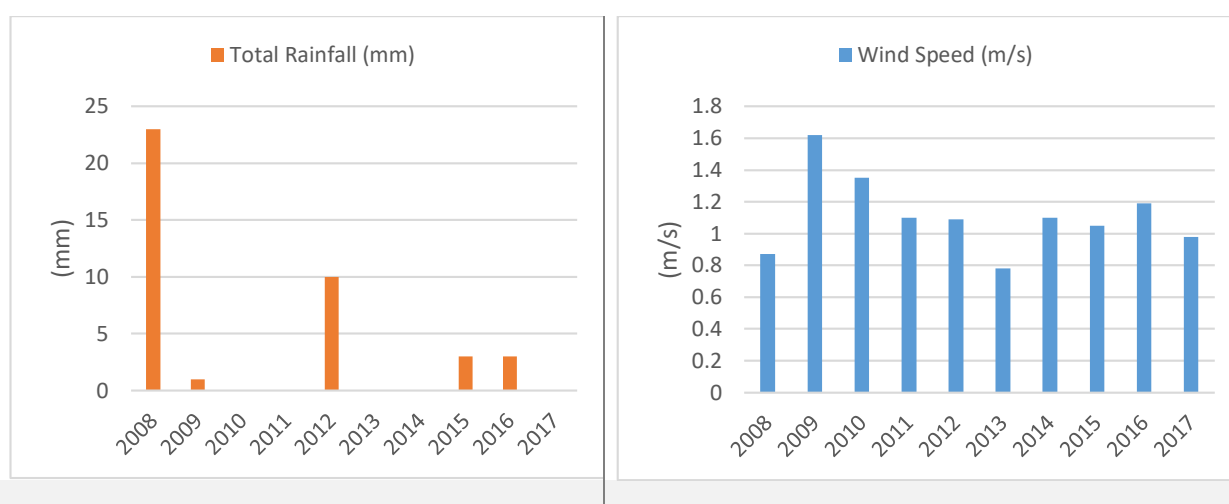
Table 7: Maximum and Minimum Monthly Avg. Temperature and Rainfall of Project Area

Years	Meteorological Data, Dhaka Station		
	Temperature		Rain fall
	Max (°C)	Mini (°C)	Total Annual (mm)
2008	24.46	14.48	23
2009	25.92	14.84	1
2010	23.82	12.81	0
2011	23.45	12.21	0
2012	24.05	14.49	10
2013	24.23	12.25	0
2014	24.29	13.67	0
2015	24.77	14.6	3
2016	24.87	14.15	3
2017	26.37	14.86	0

(Source: Statistical Yearbook of Bangladesh)

Generally, the climatic condition of Dhaka is humid subtropical with a predominantly hot and humid summer and a relatively cool winter. The city is within the monsoon climatic zone, with annual average highest temperatures of 23 °C (Aug-Oct) and average lowest temperature of 7 °C (Jan). Nearly 80% of the annual average rainfall of 3,334 mm occurs between May and September. The maximum temperature 32.9 °C in 2017 and minimum 14.2 °C in 2017 were observed in Dhaka during 2017. Annually highest 5947 mm rainfall was in 2017.





Source: www.meteoblue.com

Figure 10: Historical Temperature and Rainfall Record at Dhaka Region

The average monthly rainfall variation at Dhaka region (from 2008 to 2018) is shown in Figure 3. The hyetograph shows that the highest and lowest values of rainfall are observed during the months of December (23 mm) respectively.

4.3.3 Flooding Pattern

Every year during the rainy season, when there is excessive rainfall in dhaka the surplus water flows through these rivers and causes floods in the low-lying areas in whole project areas due to over-bank spillage of the rivers, such as Old Surma, Kapna and Kushiara etc. Furthermore, there are many water bodies such as small branch-rivers, *khal* (canal) located within the Dhaka district.

Normal monsoon flood originates from high upland flow beyond the national boundary but when it is associated with higher local rainfall, the flood becomes devastating, prolonged and inundates a vast area of the country as well as the project area. It is noted that some sections of the project road were submerged during the devastating flood in 2004.

To control the drainage congestion of the catchment areas, a number of culvert and bridges are in place on the 2-lane existing road. The total number of bridges and culverts are 90, of which 24 are large to medium type bridges, and 66 are culverts.

4.3.4 Surface Water and Other Water Bodies

As discussed earlier, BWDB recording stations are available in nine stations along the project road. Only one station is 5km away from the road alignment. The results of the frequency analysis of the available water level data for all the stations in the project area are compiled in Table-8 below. These are used to determine the road formation level.

Table 8: Surface Water test result

		ANALYSIS RESULT				
S/I	Geo-Location	Water Quality Parameters	Unit	Result	Bangladesh Standard for Surface Water (ECR'97)	Method of Analysis
1	23°39'35.8"N 90°25'16.4"E	pH	-	7.04	6-9	Electrometric (pH Meter)
2		Total Suspended Solid (TSS)	mg/L	18.9	≤ 150	APHA 2540 D
3		Total Organic Carbon (TOC)	mg/L	6.27	NYS	TOC analyzer

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		ANALYSIS RESULT				
S/I	Geo-Location	Water Quality Parameters	Unit	Result	Bangladesh Standard for Surface Water (ECR'97)	Method of Analysis
4		Total Phosphorus (TP)	mg/L	0.36	≤ 8	UV Spectrophotometer
5		Oil and Grease	mg/L	2.01	≤ 10	APHA 5520B
6		Dissolved Oxygen (DO)	mg/L	5.47	4.5-8	DO Meter
7		BOD	mg/L	27.1	≤ 50	5-Day BOD Test
8		COD	mg/L	107.10	≤ 200	Photometric
9		Temperature	$^{\circ}\text{C}$	26	$\leq 40\text{ }^{\circ}\text{C}$	Temperature Meter

Source: GREENBUD



Figure 11 Surface Water Sample Collection

Table 9 Surface Water Analysis Result

		ANALYSIS RESULT				
S/I	Geo-Location	Water Quality Parameters	Unit	Result	Bangladesh Standard for Water (ECR'97)	Method of Analysis
1	23°40'10.59"N 90°22'55.53"E	pH	-	7.06	6-9	Electrometric (pH Meter)
2		Total Suspended Solid (TSS)	mg/L	25.3	≤ 150	APHA 2540 D
3		Total Organic Carbon (TOC)	mg/L	0	NYS	TOC analyzer
4		Total Phosphorus (TP)	mg/L	0.32	≤ 8	UV Spectrophotometer
5		Oil and Grease	mg/L	ND	≤ 10	APHA 5520B
6		Dissolved Oxygen (DO)	mg/L	4.68	4.5-8	DO Meter
7		BOD	mg/L	22.1	≤ 50	5-Day BOD Test
8		COD	mg/L	78.11	≤ 200	Photometric
9		Temperature	°C	27	≤ 40 °C	Temperature Meter



Figure 12 Surface Water Sample Collection

4.3.5 Ground water

- Bangladesh is rich in groundwater (GW) reserves and the annual recharge rate is high. Groundwater is subject to over-exploitation during the lean season for domestic, agricultural and industrial uses. The groundwater table (GWT) in the seven districts as well a major portion of Bangladesh exists at a shallow to moderate (Generally below 3.0 m) depth with confined, semi-confined and unconfined aquifers. The aquifers are being recharged by the major river systems and by infiltration of the rain water. The groundwater table fluctuates with season approaching near ground level (within 1.0 m) over most of the country during the wet season (July-September).
- In Bangladesh, Arsenic (As) contamination in the groundwater extracted from the shallow aquifers is by far the worse in the world. It noted that, the groundwater extracts from Shallow Groundwater Table (SGWT) in the project areas is

contaminated, while the Deep Groundwater Table (DGWT) is free of contamination but contains soluble iron in some parts. The standard for drinking water quality according to the ECR is presented in Appendix-1. **f. Geology and Seismicity**

- The project area under the Dhaka region is geologically known as the · Ganges Basin and covers the north-eastern parts of the fore deep (flat terrain) and Folded-Belt (hilly terrain) division of the Bengal Basin which happens to be one of the most prominent tectonically-active sedimentary basins of the world. Thickness of the sedimentary pile with the fore deep area is in excess of 15 kilometers; the Folded Belt representing the uplifted parts of this sedimentary pile. This huge sedimentary body is dominantly composed of sand and mud with subordinated limestone which started depositing in a deep-basement basin about 50 million years ago with the gradual rise of the Himalayas due to collision between Indian and Burmese Plates and subsequent erosion.

Table 10: Ground Water test result

ANALYSIS RESULT						
Sl. No	Geo-Location	Water Quality Parameters	Unit	Result	Bangladesh Standard for Drinking Water (ECR'97)	Method of Analysis
1	23°40'05.2"N 90°25'11.1"E	pH	-	7.2	6.5-8.5	Electrometric
2		Turbidity	NTU	1.91	10	Nephelometric
3		Total Hardness as CaCO ₃	mg/L	49	200-500	EDTA Titrimetric
4		Total Dissolved Solids (TDS)	mg/L	115	1000	USEPA160.2;SM2540 B-D
5		Chloride (Cl)	mg/L	11	150-600	USEPA 325.6;SM4500-CL
6		Manganese (Mn)	mg/L	<MDL	0.1	USEPA200.9;SM3111B
7		Arsenic (As)	mg/L	<MDL	0.05	USEPA 206;SM9221E
8		Iron	mg/L	0.21	0.3-1.0	Phenanthroline
9		Total Coliform	CFU/100 mL	0	0	Membrane Filtration
10		Fecal Coliform	CFU/100 mL	0	0	Membrane Filtration
11		Color	Pt-Co	6	15	USEPA110.2;SM 2120 C



Figure 13 Ground Water Sample Collection

Table 11 Ground Water Analysis Result

ANALYSIS RESULT						
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2		Turbidity	NTU	2.6	10	Nephelometric
3		Total Hardness as CaCO ₃	mg/L	57	200-500	EDTA Titrimetric
4		Total Dissolved Solids (TDS)	mg/L	286	1000	USEPA160.2;SM2540 B-D
5		Chloride (Cl)	mg/L	26	150-600	USEPA 325.6;SM4500-CL
6		Manganese (Mn)	mg/L	<MDL	0.1	USEPA200.9;SM3111B
7		Arsenic (As)	mg/L	<MDL	0.05	USEPA 206;SM9221E
8		Iron	mg/L	0.22	0.3-1.0	Phenanthroline
9		Total Coliform	CFU/100 mL	0	0	Membrane Filtration
10		Fecal Coliform	CFU/100 mL	0	0	Membrane Filtration
11		Color	Pt-Co	8	15	USEPA110.2;SM 2120 C



Figure 14 Ground Water Sample Collection

4.3.6 Earthquake

The Bangladesh National Building Code (1996) sub-divided Bangladesh into three seismic zones based on tremor intensities, vulnerability to earthquakes and possible severity of damage, possible severity of damage

The districts in the project area are within northeast region Bangladesh and falls into Seismic Zone 2 (over 0.25 Richter) the highest risk hazard zone.

Dhaka is located in a seismic zone-2, referred to as the very severe zone for earthquake in the country. The most severe earthquake prone zone, Zone 4 is in the northeast which includes Dhaka and has a maximum PGA value of 0.36g. Seismic events in Bangladesh are relatively infrequent, but historically, have been severe, such as the earthquakes of 1930, 1950 and 2004. To address any potential impacts due to seismic activities, provisions of the Bangladesh National Building Code (BNBC) 1993 and 2006 shall be strictly followed in the detailed designs of project components, apart from consideration of seismic vulnerability in the specifications for the design and construction of the works, including the choice of materials and methods for construction work.

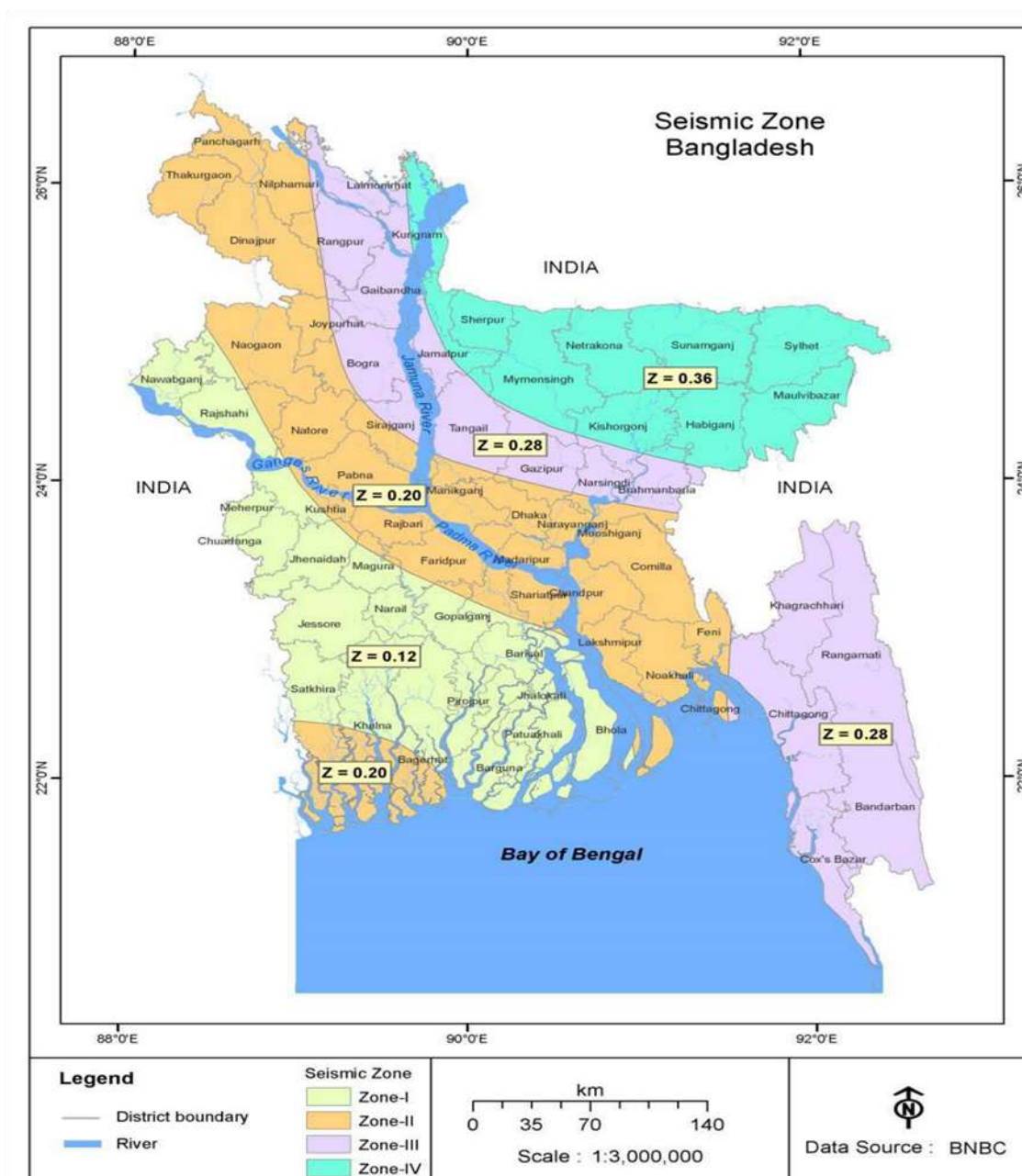


Figure 15 Seismic Zones in Bangladesh

4.3.7 Air quality

The project road mostly passes through the rural areas, including some growth centers, bazars (markets), and small townships of Upazilla/ Union. The atmosphere in both rural and urban areas is less polluted during the rainy season than during the dry season.

This is because air quality within the rural areas is generally good due to the absence of urbanization, some industrial pollution, and densely populated areas. Air pollution is caused by emission of greenhouse gases from agriculture lands, perennial wetland swamps, road transport, Boulder stone field, and brick fields due to blowing of dust, dirt and smoke. The main pollutants around the roadside are those emitted from vehicle exhaust, such as particulate matter (PM), carbon monoxide (CO), carbon dioxide (CO₂), nitrogen oxide (NO_x), and sulfur oxide (SO_x), etc. These emissions disperse widely into the atmosphere, and their concentration declines rapidly with the distance from the road edge. It is noted, that the highest concentration of CO, CO₂ and HC are encountered in congested slow-moving traffic,

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whereas the highest emission of NO_x is encountered with high speed vehicles. In urban areas with congestion, such as Keraniganj Upazila intersections, there is likely to be air pollution less rural areas. Ambient air quality measurements were carried out by separate sub consultants in June 2019 by consultants of GREENBUD

Table 12: Reference Standard for Ambient Air Quality

Parameters	SPM	PM _{2.5}	PM ₁₀	VOC	CH ₂ O	NO ₂	SO ₂	CO	CO ₂	O ₃
ECR, 1997 ³	200 (µg/m ³)	65 (µg/m ³)	150 (µg/m ³)	NYS (µg/m ³)	NYS (ppm)	100µg/m ³ (0.053 ppm)	365µg/m ³ (0.14 ppm)	9 ppm	NYS (ppm)	157µg/m ³ (0.08 ppm)

[NYS: Not Yet Set]

Table 13: Ambient Air Quality around the project area

Sl. No.	Inspection Area		SPM	PM _{2.5}	PM ₁₀	VOC	CH ₂ O	NO ₂	SO ₂	CO	CO ₂
	Point	Sample	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(µg/m ³)	(ppm)	(ppm)
1	23°38'6.54"N 90°25'19.86"E	Sample-01	60	7	40	0	0	0	0	0	568
2	23°39'38.34"N 90°24'49.62"E	Sample-02	63	9	42	0	0	0	0	0	615
3	23°39'35.00"N 90°25'18.45"E	Sample-03	62	7	41	0	0	0	0	0	442
4	23°40'31.27"N 90°25'11.48"E	Sample-04	38	5	25	0	0	0	0	0	580
5	23°39'50.58"N 90°19'51.66"E	Sample-05	53	15	35	0	0	0	0	0	452
6	23°39'8.40"N 90°20'59.52"E	Sample-06	63	26	42	0	0	0	0	0	455
7	23°41'42.24"N 90°24'36.71"E	Sample-07	32	8	21	0	0	0	0	0	561
8	23°41'3.90"N 90°24'34.38"E	Sample-08	68	10	45	0	0	0	0	0	456
9	23°41'22.02"N 90°23'54.96"E	Sample-09	65	16	43	0	0	0	0	0	652
10	23°40'10.86"N 90°22'56.58"E	Sample-10	81	5	54	0	0	0	0	0	615

Remarks* Highest value from the amended schedule-2, 2005 of (Air quality standard) ECR 1997 has been considered.

³ E.C.R (1997), "Environmental Conservation Rules, 1997" (amendment 2005), Schedul-02, Department of Environment, Govt. of Bangladesh



Figure 16 Ambient Air Quality Monitoring

4.3.8 Noise and Vibration

Generally, the main source of noise and vibration in and around the road is motorized traffic movement. Noise is generated from motor engines, vehicle transmission and exhaust systems, car horns and when heavy vehicles are unable to move freely. The noise level depends on traffic flow, speed and mode of transport, and road conditions, including the gradient and surface characteristics. Therefore, industrial and construction sites and road vehicles are the major sources of noise. Though the project area is mostly rural, the noise level may be high in some sections due to poor conditions of the existing road and the narrow passageway for heavy traffic.

Noise levels in urban areas can be high due to construction activities, road traffic and car horns. At construction sites, heavy trucks, bulldozers, excavators, cranes, ballast machines, concrete mixers, and rock crushing plants are the major sources of noise. The cumulative impacts of noise pollution at construction sites may affect public health. Noise measurements time June, 2020 and the results are shown below Table 14. Bangladesh standards on noise level at different categories of land use are presented.

Table 14: Noise Quality Measurement Results

Sl. No.	Inspection Area		Inspection Status				
			Reference of Relevant Standard		Obtained Result (dB)	ECR, 1997 Limit	WHO Limit
	Location	Sample	ECR, 97 (amend. 2005)[1] (dB)	WHO[2] Guide Line (dB)			
1	23°38'6.54"N 90°25'19.86"E	Sample-01	60	55	42	√	√
2	23°39'38.34"N 90°24'49.62"E	Sample-02	60	55	45	√	√
3	23°39'35.00"N 90°25'18.45"E	Sample-01	60	55	48	√	√
4	23°40'31.27"N 90°25'11.48"E	Sample-02	60	55	50	√	√
5	23°39'50.58"N 90°19'51.66"E	Sample-01	60	55	48	√	√

Sl. No.	Inspection Area		Inspection Status				
			Reference of Relevant Standard		Obtained Result (dB)	ECR, 1997 Limit	WHO Limit
	Location	Sample	ECR, 97 (amend. 2005)[1] (dB)	WHO[2] Guide Line (dB)			
6	23°39'8.40"N 90°20'59.52"E	Sample-02	60	55	43	✓	✓
7	23°41'42.24"N 90°24'36.71"E	Sample-01	60	55	52	✓	✓
8	23°41'3.90"N 90°24'34.38"E	Sample-02	60	55	41	✓	✓
9	23°41'22.02"N 90°23'54.96"E	Sample-03	60	55	44	✓	✓
10	23°40'10.86"N 90°22'56.58"E	Sample-04	60	55	50	✓	✓



Figure 17 Ambient Noise Level Monitoring

4.4 Ecological Resources

4.4.1 Fisheries

Fisheries are one of the main resources in Bangladesh. The fisheries sector contributed 4.43% to national GDP, 22.21% to the agricultural GDP, and 2.73% to foreign exchange earnings by exporting fish products in 2010-11. Fish provides 60% of national animal protein consumption and plays an important role in rural employment generation and poverty alleviation in the country. In 2010-11, the total fish production was 30.62 lakh Metric Ton (MT). Average annual growth rate of fish production in the last 3 years was 6.11%. The production from closed water bodies has increased sharply due to dissemination of adaptive technologies and needs-based extension services rendered by Department of Fisheries. There are 260 freshwater and 475 marine fish species in the country. About 12 exotic species are being cultured in the country. Fish for local consumption is generally of freshwater varieties. There are three categories of major fisheries resources in the country, as follows (Source: www.fisheries.gov.bd);

- i. **Inland Capture fisheries:** comprises of rivers, ponds, estuaries, beels, floodplains, haors, baors, brackish water etc. There are 260 fish and 24 prawn species in inland fresh water in the country. Fish production from aquaculture has increased to a great extent but open water fish production is in slow progress. Now only about 34% of total fish production comes from inland open water.
- ii. **Inland Culture fisheries:** About 12 exotic species are being cultured in the country. Indian major carps and exotic carp are largely cultured in the country. Beside Carp aquaculture, monoculture of Thi Pungus, Tilapia, Shorputi, Thai Koi are also practiced in the project area. Average fish production in the ponds is 3285 kg/ha/year. About 48% of total fish production comes from inland culture fisheries.
- iii. **Marine Capture (18%) Fisheries:** The Bay of Bengal is situated in the south of Bangladesh. There is a total of 166,000 sq. km. water area including Exclusive Economic Zone (EEZ). Fishing is only confined within 200-meter depth. Pelagic and deep-sea resources are still untapped. In the year 2010-11 total fish production from Marine source was 5.46 lakh metric MT (18%). There is no marine capture fishing in the project area.

4.4.2 Inland fishing undertaken in the project area includes:

- i. **River/Canal Capture fishing:** Fishes are caught year-round within the Branch Rivers crossed by the road. The fish catch tends to peak in May to June, with the mass migration upstream of different type of fish in October to November, when the floods subside and fish return from floodplain to the rivers. The fish species are mainly carps, catfish, small shrimp, miscellaneous small fish, etc.
- ii. **Floodplain Subsistence Capture fishing:** There is open access fishing across all flooded areas, *haors* and *beels* (seasonal freshwater lakes and marshes of the flood plains, which is bowl-shaped depression between the natural levees of a river) during the monsoon season. Subsistence fishing is generally undertaken by all most all rural households in the project area during this period. The common species available within the water bodies are catfish, snakehead, live fish and other smaller fishes.
- iii. **Culture fishing:** Generally, culture fishing undertaken by the rural households from their cultured ponds and tanks. There are some low-lying agricultural lands which are seasonally flooded and used for fish culture. Alongside the project road many ponds are found and some of them are cultured ponds.

4.4.3 Aquatic Biology

The wetland ecosystem plays an important role in rural economy and maintains ecological balance in Bangladesh. The highly productive wetlands are rich in floral and faunal diversities. Nearly 1.1 million Bangladeshis thrive on wetlands fisheries while many more fish to supplement income. Wetlands are rich in medicinal, food, fuel wood, timber, fodder, ethno-botanical and other economic floral species.

IUCN Status	Scientific Name	Common Name	Group
FAUNA			
CR	<i>Schisturapapulifera</i>	Cave Loach	Fish
EN	<i>Pillaiaindica</i>	Hillstream Spineless Eel	Fish
EN	<i>Tor putitora</i>	Putitor Mahseer	Fish
VU	<i>Danio jaintianensis</i>	Jaintia Daanio	Fish

IUCN Status	Scientific Name	Common Name	Group
VU	<i>Physoschisturaelongata</i>	Common Stone Loach	Fish
VU	<i>Schisturareticulofasciata</i>	Stone Loach	Fish
EN	<i>Bufoidesmeghalayanus</i>	Khasi hill rock toad	Amphibian
VU	<i>Ingerana borealis</i>	Rotung oriental frog	Amphibian
VU	<i>Liotelphusa quadrata</i>	Freshwater crab	Crustacean
VU	<i>Bayaderahyalina</i>	Dragonfly	Insect

Additional aquatic fauna in the project area include Shamu (*Anastemusoscitans*), Zhinuk (*Lamellideus marginalis*) and aquatic flora like Khudi Kachuripana (*Lemnaperpussilla*) are common.

4.4.4 Birds, Wildlife and Wetland Habitate

Bangladesh is rich in wildlife diversity and population; the different wildlife species are 388 avifauna, 110 mammals 109 reptiles, 22 amphibians, 266 fishes, 475 marine fishes, 66 corals and etc. The Integrated Biodiversity Assessment Tool (IBAT) identifies a number of threatened and endangered species that may occur within 25 km of the project RoW. Additional assessment of the habitat of each species was undertaken to eliminate those species which will not be impacted by the project. The tables below list the key species of concern for which mitigation measures have been included in the ESMP to avoid and minimize impacts.

IUCN Status	Scientific Name	Common Name (Bangla name)	Group
CR	<i>Axis porcinus</i>	Hog deer	Mammal
EN	<i>Aonyxcinereus</i>	Asian small-clawed otter	Mammal
VU	<i>Arctonyxcollaris</i>	Greater hog badger	Mammal
VU	<i>Lutrogaleperspicillata</i>	Smooth-coated otter	Mammal
VU	<i>Panthera pardus</i>	Leopard	Mammal
VU	<i>Prionailurusviverrinus</i>	Fishing cat	Mammal
VU	<i>Ursusthibetanus</i>	Asiatic black bear	Mammal
EN	<i>Cuoramouhotii</i>	Keeled box turtle	Reptile
EN	<i>Geoclemyshamiltonii</i>	Spotted pond turtle	Reptile
VU	<i>Ophiophagus Hannah</i>	King cobra	Reptile
VU	<i>Python bivittatus</i>	Burmese python	Reptile

- i. Several wildlife species have been eliminated from further consideration, as the project will not impact their known habitat (e.g. forested area). These include dhole, Asian elephant, Western hoolock gibbon, Indian pangolin, South Asian river dolphin, Phayres leaf monkey, binturong, sun bear, stump tailed macaque, northern pig-tailed macaque, sloth bear, Chinese goral, clouded leopard, Bengal slow loris, sambar, capped langur, elongated tortoise, Asian giant tortoise, and mugger. Justification for inclusion or exclusion of each species based on IUCN information.
- ii. Hakaluki Haor, located 25 km from the RoW, is an important site for wintering migratory birds. Every winter, tens of thousands of guest birds of about 150 species from Siberian and other cold regions flock to the haors. Based on the Integrated Biodiversity Assessment Tool (IBAT), 31 bird species that are threatened or endangered and which may occur within 25 km of the project RoW. Based on IUCN information related to species ecology, some species have been excluded from further consideration, as the project will not impact their known habitat. These include the

Steppe eagle, Rufous-necked hornbill, Dark-rumped swift, great hornbill, Wreathed hornbill, Beautiful nuthatch, and Tawny breasted wren babbler. The remaining key species of concern are below.

IUCN Status	Scientific Name	Common Name	Group
CR	<i>Ardea insignis</i>	White-bellied heron	Bird
CR	<i>Aythya baeri</i>	Baer's pochard	Bird
CR	<i>Emberiza aureola</i>	Yellow-breasted bunting	Bird
CR	<i>Gyps bengalensis</i>	White-rumped vulture	Bird
CR	<i>Gyps tenuirostris</i>	Slender-billed vulture	Bird
CR	<i>Houbaropsis bengalensis</i>	Bengal florican	Bird
CR	<i>Sarcogyps calvus</i>	Red-headed vulture	Bird
EN	<i>Asarcornis scutulata</i>	White-winged duck	Bird
EN	<i>Haliaeetus leucoryphus</i>	Pallas's fish-eagle	Bird
EN	<i>Laticillacinera scens</i>	Swamp grass-babbler	Bird
EN	<i>Leptoptilos dubius</i>	Greater adjutant	Bird
EN	<i>Perdiculamanipurensis</i>	Manipur bush-quail	Bird
EN	<i>Sterna acuticauda</i>	Black-bellied tern	Bird
VU	<i>Aythya ferina</i>	Common pochard	Bird
VU	<i>Chaetornis striata</i>	Bristled grass bird	Bird
VU	<i>Clanga clanga</i>	Greater spotted eagle	Bird
VU	<i>Clanga hastata</i>	Indian spotted eagle	Bird
VU	<i>Columba punicea</i>	Pale-capped pigeon	Bird
VU	<i>Francolinus vulgaris</i>	Swamp francolin	Bird
VU	<i>Gallinago nemoricola</i>	Wood snipe	Bird
VU	<i>Leptoptilos javanicus</i>	Lesser adjutant	Bird
VU	<i>Mulleripicus pulverulentus</i>	Great slaty woodpecker	Bird
VU	<i>Pellorneum palustre</i>	Marsh babbler	Bird

- iii. Additional bird species that occur in the area include Bright and Rose King-duck, Pati-duck, Bali Hash, Lenja, Chity, Sorali, Boikal, Nilshir Piyan, Pantamukhi, Pankouri, Butiduck, China, Rangamuri, Black-duck, Peributhi, Chokachoki, Giria, Khonjona, Patari, Dolpipi, Water-hen, North-Giria, Dahuk, Patibatan, Common-chill, Cotton-Chill, Gergini, Cottontail, Pintail, Toughed Duck etc.
- iv. Temporary impacts to wildlife will occur during construction due to the felling of large number of roadsides trees. Trees will be replanted at a 1:5 sapling ratio (impacted to replant).

4.4.5 Trees and Forest

Terrestrial ecosystem at the SRTPPF site included settlement planting, strip plantation and block plantations. Dominant tree species in strip plantation are rain tree (*Samanea saman*), krishnachura (*Cassia* spp.), debadaru (*Polyalthia longifolia*), mahogany (*Swietenia* spp.), raj koro (*Albizia richardiana*), babla (*Albizia nilotica*), eucalyptus (*Eucalyptus camaldulensis*), jack fruit (*Artocarpus heterophyllus*), mango (*Manifera indica*), etc. Settlement species are mango (*Manifera indica*), black berry (*Syzygium cumini*), and jack fruit (*Artocarpus heterophyllus*), coconut (*Cocos nucifera*), betel nut (*Areca catechu*), hijal (*Barringtonia acutangula*), mandar (*Erithrina indica*), bamboo and several fuel wood species.

No community forestry or reserved forest is located alongside the project road. But many roadside flora (trees and vegetation) are present within the ROW. There are many timber varieties and different fruit trees which will be partially and /or fully affected by the widening

of project road. Trees are identified in all sizes from mature trees to saplings. The terrestrial flora species are mainly mango, black berry, Jack fruit, mahogany, Akashmoni, Raintree, Battlenut, Bamboo bushes, etc.



Figure 18 Road Side tree plantation

A survey of roadside corridor of the existing carriageway was carried out by the Consultant team during the **field visit on September 2019 Inventory** Study of LGED project. Based on the survey, 19,800 mature trees out of a total of 162,077 are observed in the Keraniganj Upazila Road section (Table 15), though at this stage it is not possible to indicate the number of trees required to be felled for the construction of the road. If widening at one side of the existing road is done, then the felling of trees will be significantly less. Survey details are shown in Appendix-2.

4.4.6 Infrastructure

The major infrastructure includes road and railway connection in the Dhaka district. An airport is also found in dhaka. Historically, the important townships were connected by 4,053 km railway track that carried 44.5 million passengers (BBS 2007). The situation has changed since 1975, presently the length of RHD road is 251,610 km and RHD managed road is 20,878 km. As a result of the improved road transportation system, the district, subdistrict (Upazila), and town growth centers are connected by all-weather roads. District-wide length of roads under LGED by Road Classification in 2018 is shown in Table 15.

Table 15: District-wise Length of Roads under LGED by Road Classification

Name of Districts	National Highways (Km)	Regional Highways (Km)	Zila Road (Km)	Total Road (Km)
Dhaka	77.33	81.33	119.10	277.76

Source: Statistical Yearbook of Bangladesh 2017, BBS.

4.4.7 Transportation

The project road passes through Dhaka district and serves as a communication link with other parts of the country. Dhaka – Mawa is also connected by link road of Keranigonj.

The following information has been obtained from the Consultants Traffic survey carried out in September 2019 for the feasibility study of Keranigonj Upazila Road.

4.4.8 Agriculture

Agriculture in Bangladesh is based on rice production. This is supplemented by horticulture, livestock and fisheries in the farming system. The contribution of the subsistent agricultural economy is 21%. The majority of the Bangladesh population still depends directly or indirectly on traditional and subsistence agriculture. Surface water and ground water are both polluted due to leakage of agro-chemicals, seepage from poor sanitation systems, and rampant disposal of wastes and effluents. Bangladesh farmers still use several hazardous and internationally banned agro-chemicals like Parathion, BHC, Enduring and DDT for cultivation of paddy, horticultural crops and vegetables. These noxious agrochemicals pollute the surface water in open water bodies due to lateral movement of these chemicals through run-off. Many farmers, either due to ignorance or knowingly, do not maintain the gestation periods specified for each before harvest and/or marketing the fruit and vegetable after these noxious insecticides are applied. Thus, the Public health requirements are undermined. The cultivated land classification for Dhaka is presented in Table 16

Table 16: Areas Land type Classes within the Districts under Project Areas

Districts	Hill	Cultivated Lands Type Classification*						Miscellaneous land**	Total Lands
		HL	MHL	MLL	LL	VLL	Total		
Dhaka	--	10777	19198	43608	16773	2685	93041	19034	112075

Note: Lands Type Classification HL=High land, MHL=Medium high land, MLL=Medium low land, LL=Low land, VLL= Very lowland. Miscellaneous lands include settlement, ponds, water bodies, river, channel, brick field etc. (Source: Soil Resource Development Institute, BBS, 2018)*

Paddy is the main agricultural crop that will be impacted. Other crops are wheat, sugarcane, potato, and pluses etc., In addition, jute, mustard seed, linseed, sesame, sweet potato, produced in Dhaka district. Varieties of vegetables like carrot, cauliflowers, cucumber, beans, etc. Are also common in the project area.



Figure 19 Agricultural Lands at both sides of Project Road

4.5 Social and Cultural

4.5.1 Population and Composition

Bangladesh's population was 142.39 million in 2011 with average annual growth rate of 1.34% in 2010-2011 (Population & Housing Census 2011, Preliminary result, BBS July 2011). The total population of dhaka District and project area (Upazila and Union) are presented in Table 17, based on the population and households (HHs) census of the BBS (2019).

Table 17: Demography of Population Dhaka District

District	Total population	Male	Female	Both	Sex ratio
Dhaka	2786133	6555792	5488185	12043977	119.5

Source: Population and household Census, BBS, Preliminary Results July 2019)

4.6 Health and Education Facilities

The Health Service facilities like elsewhere in Dhaka district and project area are provided by public and private sector organizations, NGOs and individual medical practitioners. GoB is responsible providing health services, education and training, hospital management and health policies. The private sector came in recent years making commercial investment in Health and Education sectors or under PPP (Private Partnership Projects). The situation regarding health services and education facilities are shown Table IV13.

4.7 Economic Condition

The people in the area are traditionally dependent on agriculture, but many people in the region have changed their source of income to include the garments sector, transport industry, and other industries.

Bangladesh is a fast-moving developing country. Bangladesh's development challenges are: population density, geographical location and climate change. Bangladesh has a population of about 1148 people per square kilometer, making it one of the top ten countries in the world with high population density. However, considering the population density only in rural areas, Bangladesh is one of the first few countries in the world. About 80% of the population of Bangladesh lives in villages

Dhaka district like elsewhere in Bangladesh is prone to rapid urbanization that will be more accelerated due to the construction of the extension road. Implementation of the proposed project will encourage more urbanization and increase land prices.

i. Introduction

This section deals with four issues. These are:

- Socio-economic profile of all project displaced persons;
- Socio-economic profile of all female project displaced persons;
- Profile of the population in project displaced persons households / families; and
- Female involvement in income earning activities.

ii. Socio-Economic Profile of All Project Displaced Persons (PDPs)

Socio-Economic Profile of the Project Displaced Persons are discussed here under three Indicators: Demographic, Social and Economic Characteristics. Data required for meeting the requirements of various indicators were collected through the SES commissioned to all the PDPs during the months of July – August 2014. Data was collected through interviews and the answers were documented in a structured questionnaire. The RAP will include an updated census and is under preparation as of August 2019.

iii. Demographic Characteristics

Demographic characteristics of the Project Displaced Persons (PDPs) included in the survey were: Sex, Age, Ethnicity, Religion and Family Size. Of these five indicators, three (Sex, Age and Ethnicity) are relevant for determining compensation entitlements. Older PDPs, ethnic minorities and female PDPs are considered vulnerable. Distribution of the total 1948

Chapter Five

ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 General

Important road development project of Keraniganj upazila of Dhaka district will have many impacts on the environment. These impacts on the natural environment (physical and ecological resources) and social environment (economic development and social and cultural resources) will be either adverse or beneficial. These impacts may be as direct, indirect and cumulative impacts as follows;

- i. Direct Impacts – i.e. direct impacts include the impact of construction expenditures in the local economy.
- ii. Indirect Impacts – i.e. those resulting from activities to be carried out by the Project, but not directly attributable to it.
- iii. Cumulative Impacts - i.e. impacts in conjunction with other activities. The cumulative or additive effect could be large impacts on environment.

Implementation of the project will cause impacts that may be either short-term or long-term. Most of the short-term and long-term impacts for the improvement of Project road will be beneficial. Short-term positive impacts will include, for example, a reduction of traffic congestion, generation of employment opportunities during construction period. Long-term benefits will include alleviation of existing traffic congestion, improvement of transport services, easier access to commercial, residential and industrial facilities; faster communications and commodity transport; improved access to markets and commercial centers, increased services and enhancement of the national trade and economy.

The Rapid Environmental Assessment (REA) Checklist for LGED has been used to provide the first step of environmental assessment for the proposed road project. It is a screening exercise for the identification of likely impacts attributable to the upgrading of the Keraniganj Upazila road.

In detail, the REA checklist identified the following impacts:

- Disfiguration of landscape by road embankments on road widening;
- Risk of encroachment on precious ecology such as sensitive or protected areas.
- Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction sites.
- Creation of temporary breeding habitats for mosquito vectors of diseases.
- Dislocation or involuntary resettlement of people.
- Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials and loss of life.
- Increased noise and air pollution resulting from traffic, leading from increased traffic volume.
- Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road.
- Social conflicts between locals and migrant workers.
- Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation.
- Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning.

The completed REA checklist is provided, appropriate qualitative methods were applied for determining the likely direct and indirect impacts. The impacts have been predicted in terms of their magnitude (i.e. low, moderate and high), extent (i.e. local, regional, national and trans-boundary) and duration (i.e. short-term, medium-term and longterm) along with their nature (i.e., direct and indirect, reversible and irreversible).

Identification of the significant environmental indicators/parameters has been carried out based on the existing environmental condition into the following implantation phases of the project:

- Design Phase
- Construction Phase
- Operational Phase

The anticipated short-term and long-term adverse impacts of Project are as follows;

- I. **Short-term Impacts** –those that occur during the construction of the Project, which can have adverse effect on land use, pollution of air and noise, impacts to quality of surface water and groundwater and other social factors. Some of these will be short-lived and without long-lasting effects. Whereas, some effects could have relatively significant impacts, such as those to utilities services, if appropriate mitigation actions are not taken. Short-term potential negative impacts can be avoided or otherwise mitigated through application of environmentally appropriate construction methods.
- II. **Long-term Impacts**- these impacts include changes in land use and development patterns, local rainwater flooding and/or water logging if the Project is poorly designed. Acquisition of new lands is considered irreversible long-term adverse impacts.
- III. Some potential environmental and social impacts cannot be avoided but can be minimized.

5.2 Anticipated Adverse Impacts and Mitigation Measures

The anticipated potential adverse impacts on the existing physical environment, ecological resources, economic development and social and cultural aspects of the project area, and the mitigation measures to address them, are outlined below.

5.2.1 Impacts on Physical Environment Climate:

Bangladesh is one of the most vulnerable countries in the world in terms of global warming and climate change considerations. The most important factor relevant to the project is change to rainfall patterns. Due to global warming and greenhouse gas emissions, the trends of rainfall, temperature and humidity are changing. The design of the road will therefore need to take into account changes and potential increases in rainfall, temperature, and wind speed.

Project Design Phase:

More intensive and prolonged rainfall was considered during the design phase and special design measures have been included in the final design.

Mitigation Measures:

The road design incorporates features to withstand unusually high rainfall patterns. Design features include embankment height, pavement design, and increased size of drainage

channels, Bridges and culverts to accommodate additional rainfall and potential flooding. Bridge/culverts construction will be scheduled so that they are constructed during pre-monsoon season to avoid potential hazards resulting from excessive rainfall and consequent flooding.

5.2.2 Flooding and Drainage:

Flooding is a significant problem during the rainy season. Flooding or drainage congestion and water logging will occur in the project area during severe rainfall in the monsoon season. The construction of a wide road embankment may have impacts on the roadway corridor. Unless adequate drainage is allowed in the embankment, the potential exists for it to act as a dam, impounding rainwater in the vicinity of the roadside and settlement areas. Therefore, methods to reduce flooding caused by the road development will need to be incorporated into construction and operation phases of development.

Project Design Phase:

Design features have been incorporated into the final design to ensure that no flooding is worsened within the vicinity of the area and preferably reduces flooding. Construction of bridges and culverts will cause adverse impacts on the quantitative aspects of surface water hydrology as follows:

- Surface water drainage will be impeded by the construction of the bridge end body and approach roads embankment,
- Periods of flooding may last longer due to the impeded drainage and back water effect.

Mitigation Measures:

- i. To prevent any worsening of flooding, a detailed investigation on surface drainage/hydrology of catchment areas has been considered and accordingly drainage for the road has been designed to minimize the impact on drainage and flooding. Further detailed study will be conducted during implementation of the project
- ii. Regular cleaning of channels to avoid choking.
- iii. Provision of adequate cross drainage structures to easily drain off water to canals and other lowland areas;
- iv. Ensure that storm water drains and highway drainage systems are periodically cleared to maintain storm water flows during construction.
- v. Provide sufficient pipe culverts, box culverts and bridges on the road with adequate opening for cross drainage of the catchment area, so that they can safely handle a 50-year frequency of flood
- vi. All drains need to be designed so that runoff resulting from storms at a specified frequency of occurrence can be drained off immediately without overflowing or without being impounded in lower elevations of the project area.
- vii. The elevation of the road surface should be designed so that it can shed water as quickly as possible during heavy rain. Standing water is a serious hazard to traffic and would eventually penetrate through the surfacing into pavement and to the sub-grade layers reducing their stability and life.
- viii. Formation level of the

embankment for any large bridge should be above the 50 years flood level by a free board of at least 0.6m.

Project Construction Phase:

The existing surface water hydrology, ground water flow and water management practices are usually interrupted by major earthworks. During the construction, permanent and temporary works, such as construction site, labor camps, project office stack-yards, construction materials stockpiles and dredge spoil stockpiles, etc. may be built. These works could potentially disrupt the natural cross drainage and might be the cause of flooding, which may have localized or regional impacts. Furthermore, the excavation of fill materials for construction of road embankment will result in an increased extent of open water during monsoon.

Mitigation Measures:

- i. To prevent water logging of terrain surrounding fill areas, temporary drains should be constructed around the embankments to ensure water can flow (by gravity or pumped) to the river.
- ii. A drains and pipes should be designed so that they can safely handle a 50-year frequency of flood.
- iii. For bridges the river morphology should be examined to determine effects on river bed and banks erosion and etc.
- iv. To save the public and road users from this unwanted worsen situation of water logging, a proper maintenance of drainage system should be considered from beginning of the Project.

Project Operational Phase:

Proper maintenance and supervision of drainage infrastructure should be included into the executing agency activities.

5.2.4 Air Pollution:

Air pollution and dust pollution may arise from clearing and dismantling obstructing physical structures, earth works, vehicle emissions, and from other construction associated activities during the implementation phases of the project. The impacts become more significant in the urban areas where construction activities are more constrained and where more people may be detrimentally affected.

Project Construction Phase:

Air quality impact during the construction phase of the project will occur due to fugitive dust generation in and around the construction activities and from equipment such as plants for crushing rocks, hot mix, asphalt plants, etc. Dust generation will occur during dismantling or demolition of existing physical infrastructure, such as bridges/culverts divider/median, island, and other amenities developed on the roadsides within construction site.

During site preparation the project area will be affected by traffic emission from the existing traffic movement and movement of construction vehicles and equipment. Removal of trees and vegetation will create dust and more pollution at the site.

During the construction of the road local air quality in and around the construction site is likely to be degraded by exhaust emissions from operation of construction machinery, fugitive emissions from concrete, asphalt and aggregate plants, and burning of bituminous and other materials. In addition to this, dust is generated from excavation, exposed soils, earth works, material stockpiles, crushing and handling of aggregates which will all pollute the local air quality. Indiscriminate burning of solid waste during the construction period of the project will also deteriorate air quality at the construction site.

Mitigation Measures:

- Contractor should submit a dust suppression program to LGED prior to commencement of civil works.
- Ensure maintenance of construction material carrying vehicles is carried out to a high standard.
- Emissions of air pollutants from construction machinery can be prevented by proper maintenance of the machinery, construction equipment to a high standard.
- Spraying of water on the roadways and other dusty surfaces should be done during the dry season.
- Ensure asphalt and cement mixing activities are in compliance with Environmental Conservation Rules (ECR),1997.
- Cover stockpiles during dry and windy weather and cover vehicles/ trucks carrying construction materials when passing through market areas and urban and residential areas.
- Cutting of soil and subsoil must be undertaken in accordance with ECR, 1997.
- Ensure consultation with community and reporting and complaint system established.

The above mitigation methods will be included in the environmental specifications of the contractors' contract.

Project Operational Phase:

It is anticipated that there would not be significant impact on air quality during operational phase if proper mitigation measures are adopted.

Mitigation Measures:

- Roadside tree planting can limit some harmful impacts of dust and vehicle emissions.
- Ensure good quality paved road during the operational phase through proper maintenance to reduce vehicle emissions.

5.2.5 Noise Pollution:

The potential noise pollution will be generated during the construction activities and by vehicles operating on the road during the operation phase.

Project Design Phase:

Design Engineers can adopt some noise mitigation methods to reduce noise impacts to sensitive uses near the selected alignment.

Mitigation Measures

- i. Ensuring design avoids sensitive uses.
- ii. Permanent noise barriers have been designed and will be constructed at the noise sensitive receptors like roadside schools and religious places like Mosques identified during the environmental survey to reduce potential noise impacts at sensitive locations
- iii. Noise barriers should be incorporate in detail designed and the contractor as early as possible to reduce potential noise impacts to sensitive uses.
- iv. Locate rock crushing, hot mix plant, concrete mixing and material shipment yards away from residential areas, schools, colleges and hospitals.
- v. Install temporary noise barriers near sensitive locations such as schools, religious places and hospitals
- vi. Alternate construction methods or temporary barriers can also be constructed to lessen potential construction noise impacts (i.e. cast-in-place piles rather than driven piles during bridge construction, rubber-tired equipment rather than steel tracked equipment, etc.).

Project Construction Phase:

Due to the construction activities, the noise levels are likely to increase significantly in the Project area. Noise is generated primarily from the use of machinery such as excavators, rollers, rock crushing, and generators. Although the generation of noise levels in construction phase will be temporary, it can be detrimental to health and wellbeing.

Mitigation Measures:

- i. **Source Control**—use of new and well-maintained vehicles and equipment with appropriate noise abatement measures.

- ii. **Site Control-** measures to abate construction noise can modify the time, place, or method of operation for a particular noise source. The measure most often utilized is the limitation of work hours on a construction site. Careful project planning can aid in locating noisy construction activities as far as possible from sensitive receptors or in areas where natural shielding is possible. Building temporary noise barriers or special equipment enclosures is usually expensive and limited to use only in instances of severe construction noise impacts.
 - Noisy elements, i.e., compressors, stockpile operations, haul roads, etc., can be located in less sensitive areas.
 - Use of any existing natural or artificial features, such as stockpiles, that can shield the construction noise.
 - Limit working hours of construction and equipment machinery with acoustic shielding or mufflers. Limit noise at boundary of construction site to 60dB during day and 50 dB (A) at night. If these levels cannot be maintained, and if there are complaints from surrounding people, sound barriers should be built.
- iii. **Sensitive noise receptors-** Equipment producing high levels of noise should be suppressed when working within distances of 200 meters from any sensitive receptors, such as schools, religious buildings, mosques or other community facilities.
- iv. **Community Relations-** Early communication through consultations with the general public is vital. Inform the public of any potential construction noise impacts and measures that will be employed to reduce these impacts. Establish and publicize a responsive complaint mechanism for the duration of the project. The establishment of good rapport with the community can provide high benefits at a low cost.

Project Operational Phase:

It is anticipated that a good geometrically designed road with high quality pavement and smooth surfaces will reduce noise levels and reduce the need for regular use of horns.

Mitigation Measures:

Regular maintenance of the project roads will be undertaken. ii. Construction of noise reduction barriers at sensitive areas such as schools and mosques should be considered.

5.2.6 Topography and Soil Pollution:

Adverse impacts on the topography /landscape of the project area and deterioration soil quality may occur. The topography becomes undulating at Keraniganj Upazila road, where special design requirements may be needed. Extraction of construction materials and soil pollution will need to be considered.

Project Construction Phases: The local landscape may be disfigured through the excavation of spoil materials for the road construction and the construction of the 4-lane road itself.

Extraction of spoil for filling and other construction activities may cause soil pollution. If bentonite mud is used as a drilling fluid to stabilize the boreholes/ piles, the improper disposal of bentonite slurry may pollute the soil quality.

Mitigation Measures:

- i. During dismantling and demolition of physical structures existing land–use will be degraded. Contractors should be responsible for the restoration of lands /roadsides /footpaths to their original state.

- ii. Contractor to submit a spoil plan to LGED which will include reference to measures be undertaken during rehabilitation of landscape.
- iii. Oil and liquid waste must be disposed of in approved sites to ensure no soil contamination takes place.
- iv. Replanting of trees along the roadways should be carried out. Trees will enhance the landscape in the medium to long term and will make the roads into a positive feature once the trees and flowers are established.
- v. Proper disposal of bentonite slurry during boring the pile should be considered to protect the soil quality.

Project Operational Phase:

Improper disposal of waste can cause soil contamination.

Mitigation Measures:

Ensure all wastes from the road are disposed of in approved sites.

5.2.7 Surface Water Pollution:

The quality of surface water may deteriorate due to uncontrolled discharge of liquid effluents and solid wastes directly into the nearby surface water bodies during the construction phase of the project.

Project Construction Phase:

The surface water quality is liable to deteriorate if the effluents from the Project's offices, housing facilities and labour camp are improperly disposed of directly into nearby rivers or water bodies. Another cause of water quality deterioration may occur due to dredging activities for fill materials for road embankments. Dredging itself and the discharge of effluent from the hydraulic fill areas will cause an increase in the suspended sediment load of the river and increase turbidity, posing a potential threat to aquatic organisms downstream. Increased turbidity in water reduces light penetration, thereby interfering with the photosynthetic process. Dredging disturbs the thin layer of oxidized sediments at the river bottom; it will expose and disturb the deeper non oxidized layers. The removal of the un-oxidized material may result in high values for chemical and biological oxygen demand in the surrounding waters.

Sources and/or activities that may have impact on surface water quality are:

- discharge of wastewater and toilet effluent directly into the river and on the land without proper treatment,
- disposal of solid waste into river or nearby any water body,
- discharge of effluent from offices and labour camp,
- spilling of fuel, lubricants and other liquids used in the use of machinery,
- discharge of effluent from hydraulic fill and stockpiling of dredging spoil into river or wetlands.

Mitigation Measures:

- i. Disposal of solid and liquid wastes directly into surface water body should be prohibited and implement controls on handling the chemicals,
- ii. Dredged spoil should be reused as much as possible instead of being dumped in the river
- iii. If disposed in the river, the dredged material is to be released near the bottom, in order to minimize the spatial extent of increased turbidity and sedimentation.

- iv. The effluent of a hydraulic fill may contain high concentrations of suspended sediment, causing increased turbidity in the receiving waters. The concentration of suspended sediment in the effluent from the dredged material, discharged into natural or existing water courses, should not exceed 4,000 ppm.
- v. If bentonite mud is used as drilling fluid to stabilize the boreholes/ piles, the disposal of bentonite slurry should be done in such a way that the solution does not pollute soil or surface water. Direct disposal of this slurry into water body should not be allowed. Drainage of this wastage into water bodies should be controlled through the collection of bentonite slurry in confined storage drum /or preparation of small settling impermeable tanks near the site. The settled slag from the bottom of the drum/ tank should be taken off weekly and disposed of as sanitation land fill material or fill material for the road embankment. The decanted wastewater from the tanks can be allowed to pass into the surface water after testing the pollution level of the wastewater. More investigation to determine the actual pollution level of the bentonite solution should be carried out.
- vi. Care should be taken not to pollute river water during concrete work, from cement slag and from spills of oil / fuel, by providing diversions and other measures appropriate to the specific site.

5.2.8 Groundwater Pollution:

There are a range of anticipated impacts on groundwater quality which are directly related to the construction activities of the project.

Project Construction Phase:

Generally, the common impacts on groundwater are caused by the actual construction activities, labor camps (water and sanitation), haul routes, use of polluted water, waste generation, fuel storage etc. Accidental spillage of toxic chemicals such as fuel, lubricants, thinner and solvents may also contaminate the ground water system through infiltration. If soak pits are used in the waste water disposal system, the ground water quality is likely to be affected by the effluents. Also, leachate generated at the solid waste disposal site may contaminate the ground water system.

Mitigation measures:

- i. Provide sanitary latrines in the construction camps and sites and to be located at a safe distance from hand tube wells in the construction sites, camps and Project office.
- ii. Accidental spillage of toxic chemicals such as fuel, lubricants, thinner and solvents during construction works should be eliminated.
- iii. All wastes and effluents to be disposed of offsite in accordance with existing regulations.
- iv. All solid waste from project offices and labour camps should be disposed of at approved off site locations.

Project Operational Phase:

It is expected that in operational phase there will be no scope for deterioration of groundwater quality provided spillage from accidents are managed properly.

5.2.9 Seismology:

The Project roads pass through the Seismic Zone-2 of Bangladesh and there is a moderate risk some impacts.

Project Design Phase:

Although unlikely to occur, seismic activity could have a significant effect on structures located along the road, particularly bridges.

Mitigation measures:

- Earthquake resistant design parameters for roads, bridges and culverts should be carried out in accordance with the seismic zoning as set out in the Bangladesh National Building Code (BNBC).
- Ensure appropriate Design of the foundation of piers and superstructure of bridges and culverts according to consideration of earthquake hazards.

5.2.10 Borrow Pits and Haul Routes:

Borrow Pits:

Borrow pits will cause disturbance to local environment, particularly dust and noise. The excavation of borrow pits, if not refilled, will permanently increase of the extent of open water, resulting the loss of agricultural lands, creation of breeding ground for mosquitoes and water-borne and water related diseases. The impacts related to the creation of borrow pits can also have positive impact: there will be opportunities for aquaculture.

Mitigation Measures:

- i. Borrow pits should only be selected in full consultation with the local community and LGED.
- ii. Sites selected should preferably not be in agricultural use.,
- iii. After use the borrow pits should be filled in with dredged material or reclaimed in order that they can be used for aquaculture or recreational use;

Haul Routes:

The transportation of fill and other material from their source can cause significant impacts if long distances are involved. Even distances of a few seasonally will require large numbers of trucks and the use of existing or specially built roads.

Haul routes for fill and other material can cause

- Noise and air pollution,
- Danger to other road users, particularly pedestrians and non-motorized and farm vehicles,
- Disturbance to agricultural activities.

Mitigation Measures:

All borrow pits and haul routes to be agreed before start of work ii. Borrow pits closest to the construction sites should be selected.

5.2.11 Use of Construction Materials:

Filling materials:

Constructions of road embankments generally use earthen materials from borrow pits adjacent to the road alignment or are imported from nearby sites. The lands that are used for borrow pits become barren or abandoned and can no longer be used for agricultural production.

Mitigation Measures:

- i. Minimize the use of earth/ top soil as filling materials for road embankment.
- ii. Maximize the use of dredged materials as filling materials
- iii. Use clayey soil instead of top fertile soil from clearing and grabbing operation for using as cladding layer.
- iv. Borrow pits can be rehabilitated and used as cultured fish ponds after excavation.
- v. The detailed impact of the source of construction fill-materials such as soil and sand (course and fine) from different sources needs to be assessed.

Other materials:

Improper collection and use of other construction materials such as Rock/ Boulders (stone aggregated), Clay Bricks, Cement, Steel, Bituminous materials, Anti-stripping chemicals, etc. can cause significant impacts on the environment. The investigation on the sources, quality and available quantity of construction materials are being carried out by the consultants. The samples from the different sources of basic and major materials are being collected and laboratory tested, and yet to be decided for recommendation. The probable sources and impacts on the sources due to collection and uses of materials will be assessed in terms of environmental point of view during the detailed design stage.

5.2.12 Impacts on Ecological Resources Fisheries and Aquatic Biology:

- i. Rivers in Bangladesh are an important migration route for a wide variety of fish, between their spawning grounds upstream and the sea. Generally, fish tends to migrate laterally onto the floodplain to spawn and feed; this takes place during the periods of flood. The backwater effect may even cause more of the upstream floodplain to be flooded during the wet season, providing additional spawning grounds to fish.
- ii. Construction work on bridges, especially the pile driving, may affect this migration of fish. If pile driving continues over a prolonged period of time this may affect the migratory behavior of fish and other aquatic animals and plants or phytoplankton. During construction phase the use of oils, dispersants, lubricants or any other chemicals that may pose a threat to the fish resources, may require specific handling procedures.
- iii. Additionally, to ensure that there are no harmful impacts on the aquatic biology it will be essential that construction waste and effluent is not disposed of in exiting water bodies. Benthic organisms, if present, may be disturbed by piling activities in the river, canals and or any water body.

Project Construction Phase:

The pollutants may enter the river water and or other water bodies potentially from dredging operations, from accidental spills, and from the discharge of effluents from project offices, construction sites and from labor camps. During the construction of bridges, the increased turbidity in the river due to dredging activities (if necessary) and the discharge of dredge spoil effluent may affect aquatic life in the river. This could be detrimental to the fish and aquatic biology of the project area. Furthermore, due to locally increased turbidity in the water bodies, light penetration will be reduced, interfering with the photosynthetic process, which will affect the aquatic habitants.

Mitigation Measures:

- i. Fish migration route and spawn seasons should be considered during construction works to control the damage of the fish resources.
- ii. Attention should be given to adverse impacts on fisheries and monitor the fishing production, if possible, limit the construction works in the monsoon season.
- iii. Investigate alternatives for pile driving for the construction of the bridge's substructure (bored piles).
- iv. Control accidental spills and ensure proper discharge of effluents from project offices, construction sites and from labor camps into the surface water,
- v. Disposal of dredged material should only take place in the deepest section of the river, minimizing the impact on river transport and on aquatic benthos (organisms living in or at the river bottom).

5.2.13 Wildlife (Fauna) Including Rare and Endangered Species (Fauna):

- The project road does not pass through any natural forest or conservation areas but passes through urban, semi urban and rural areas. The works for the widening of roads, construction of bridge/ culverts and the subsequent operation of the transport system is not expected to create any additional threat to species diversity or the subsistence of (endangered) species. The baseline data pertaining to wildlife, specific for the road alignment, is not available at this moment. Loss of existing trees in the project area is likely to represent a loss of bird habitat in the short-term during construction phase.
- Therefore, the zones to be affected by the works are not known to accommodate any valuable or sensitive ecosystems. Although, most of the sections alongside the Project road are occupied by agriculture lands, borrow pits and or wetlands, and when widening the project roads will not be any significant impacts on wildlife, except some localized impact during construction phase.
- Project Construction Phase: There will be disturbance to birds and other small animals during the construction phase. This may affect breeding habits and significant movements of birds away from the construction sites.

Mitigation Measures:

- i. Hunting of birds and other animals should be banned at the construction sites
- ii. No disposal of construction and other waste allowed into forest areas.

5.2.14 Trees and Vegetation (Flora):

- The road width will extend and the existing planted roadside trees and homestead trees outside the road if realignment is necessary. Most of the trees and vegetation, now present in the affected stretches of lands are within the present road, but most will be outside of the road.
- Any loss of trees will impact on other flora and may affect wildlife, particularly birds and mammals that rely on trees for their food source. In addition, the loss of trees may increase soil erosion.
- Apart from trees and undergrowth, other vegetation affected will be agricultural crops, bamboo bush and other native vegetation. Excavation of borrow pits will add to the destruction of flora.

Project Construction Phase:

The local terrestrial ecosystem will be significantly affected by the removal of roadside trees. Dust produced by vehicle movement and construction-related activity (e.g. asphalt plant) will settle on plants and crops which will contribute to their deterioration. Also, emission from the construction material carrying vehicles' exhaust will settle on surrounding vegetation, which will create localized damage to terrestrial vegetation including disturbance of natural habitat environments. Aquatic vegetation will also be disturbed due to the pollution of surface water, mainly constriction of culverts and bridges, spillage of chemicals, runoff of wastewater, disposal of solid and liquid waste into the water body. Furthermore, pavement work may cause air pollution to the surrounding flora; this in turn may lead to decreased agricultural production during the execution of the works.

Mitigation Measures:

- i. No trees shall be felled unless they are directly in the path of the project road and clearly defined, or unless they created a safety hazard to the future operation of road.
- ii. Upon completion of embankment works, turfing and planting should be done on embankment and slopes. Dense and well-rooted growth of permanent grasses should be planted to eliminate dust and erosion.
- iii. Replanting along the roadway, should consist of a multi-species mix of local vegetation including fruit trees, fast-growing (fuel) trees and timber trees: see suggested replacement trees listed below.
- iv. Replanting of trees along the road side can be done through implementation of Social Forestation Program by LGED. It will offer a significant opportunity to bring benefits to the local community and to Project Affected Persons (PAP's), vulnerable groups, particularly women by direct involvement in the program.
- v. Forestation programmes should be initiated, covering the road RoW, any embankments, and land near bridges and culverts to compensate for the loss of vegetation, to reduce the risk of erosion of the banks, and finally as a noise-reducing wall.
- vi. Request the Contractors to protect the vegetation adjacent to the RoW to ensure that no wood is used as fuel wood for heating bitumen.

Replacement Trees:

The Department of Forest (DoF) recommended tree species e.g. mahogany (*Swietenia* spp.), silkoroi (*Albizia procera*), ipilipil (*Leucaena leucocephala*), neem (*Azadirachta indica*), sonalu

(Cassia fistula), raj koro (Albizia richardiana), khejur (Phoenix sylvestris) and others at road sides and bridge approaches will improve ecological condition at project command area.

- Species like kadam (Anthocephalus chinensis), jarul (Lagerstroemia speciosa), pitali (Trewia nudiflora), hijal (Barringtonia acutangula), mandar (Erythrina spp.), easo (Crataeva nurvala), karaj, simul (Bombax ceiba), palash (Butea monosperma) can be planted in lower part on road side. These species bear flower and flood tolerant hence, will improve road side beauty. Palmyra palm (Phoenix), date palm can be planted on lower part of road and/or approach road sides.
- The objectives of highway side tree planting are (i) to augment biological resources e.g. biomass energy, timber, medicinal plant, food and fodder and raw materials, (ii) to enhance aesthetic beauty of the highway, (iii) to ensure embankment protection from gully erosion during monsoon to (iv) augment raw materials production for industries including cottage industry, (v) to support biological diversity particularly for birds and (vi) create employment for the poor for poverty alleviation. Care should be taken that under no condition the road side trees obstruct traffic movement the main use of the highway.

Disruption of Agricultural Activities:

Within the Right of Way existing agricultural practice will be stopped permanently. As a result, agriculture production from the acquired lands will be lost for irreversibly. Agricultural land outside the existing designated areas (RoW) may be adversely impacted if new land acquisition or requisition (construction period) is required, the production reduced or temporarily stopped during the construction period. Earthworks and drainage works may temporarily affect production. Dust originating from the work site will also influence agricultural production in a negative way. In many cases a return to full production may take many seasons.

Mitigation Measures:

- i. Proper compensation should be provided to the PAPs.
- ii. Water logging should be controlled through maintaining the cross-drainage facility in the project area.
- iii. Arable lands not to be used for earth borrowing stock piling etc.
- iv. Control the dust nuisance through implementation of Dust Suppression Plan (See Air Quality section).

5.3 Impacts on Social and Culture

5.3.1 Displacement of Legal and Illegal Occupants within Row:

There will be significant displacement of legal and illegal occupation of the land required for these roads. An initial census was undertaken as part of the preparation of the Resettlement Framework in 2014, and the final census is currently underway as part of the preparation of the Resettlement Action Plan (RAP). Displacement or relocation of PDPs will lead to an enormous disruption of social life and livelihood in the local population.

Mitigation Measures

- i. Under the RAP, the PDPs (title and non-title holders) and vulnerable people will be properly addressed and compensated for their asset lost, loss of wage days etc. should be considered as per GOB Rules and Donor Agency Guidelines.
- ii.

According to the Resettlement Framework, proper compensation and rehabilitation of the vulnerable PDPs is needed.

- iii. Compensation entitlement matrixes for the directly affected persons will be formulated in the RAP, which will include loss of income from the tangible asset of legal and illegal occupants, loss of income from loss day-wages, street vendors, and footpath shops and other vulnerable business, etc.

5.3.2 Health and Education:

Some health and education uses are located within or close proximity to the existing RoW and will need to be partially or completely relocated. Full notification and compensation must be paid to these uses.

5.3.3 Occupational Health and Safety:

Apart from being exposed to the risk of accidents, the construction workers may also be at risk for occupational health hazards due to the materials handled and working conditions. Under occupational health hazards one can group several categories of working conditions impairing the health conditions of workers, though this impairment is slow. Safety relates more to health hazards that result from (sudden) accidents and cause an instantaneous impairment of the worker's health.

Usually, the labor camps will be constructed for accommodation for large number of workers. Given high concentration of people, the potential for diseases and illnesses to be transmitted will be increased. Poorly designed sanitary facilities may contaminate the soils and water quality, and improper disposal of garbage, rubbish and construction waste may pose a health threat and nuisance to the workers. Uncontrolled vending of food on the work site may also pose a risk with respect to the transmission of contagious diseases. Construction workers may be required to handle hazardous materials, therefore, increasing health risk. Additional impacts may arise from inadequate Health and Safety practices on site. This could impact on either construction workers and project personnel or the general public and is particularly significant given the labor-intensive construction methods that are employed. The excavation of borrow pits (if necessary) for the collection of filling materials of approach road embankment will result in a large extend of open stagnant water. This will lead to an increased extend of breeding ground for mosquitoes and other water-borne diseases. Furthermore, sexual practices and prostitution may cause the spread of sexually transmitted diseases.

The use of chemicals (e.g. paint, thinner and solvents) in the fabrication and finishing of the bridge may be carcinogenic, or detrimental in other ways. E.g. the use of industrial solvents can cause anemia, liver and kidney damage, cardiovascular diseases and neurological disorder. Benzene, phenols, and carbon tetrachloride are examples of products widely used, but which are also dangerous to health. Other Health problems can be caused by in halation of exhaust gases from vehicle sand machinery which can impact lungs, eyes and skin, etc.

The health effects of noise and vibration can be significant; noise contributes to hearing loss but also triggers physiological and psychological body changes. The cardiovascular, endocrine and neurological functions are the most affected. Vibration can be a serious form of stress, causing anemia and lesions in the gastrointestinal tract, resulting in internal hemorrhaging. These impacts are related to potential health problems, undesirable social conditions and pollution of the environment.

The activities causing the occupation health hazard and safety can be described as follows:

- ❖ Construction and functioning of labour camp, construction sites, and project offices
 - Poor living conditions of workers
 - Improper housing facilities for construction of labor camps
 - Lack of sanitation facilities in project office, construction site, and construction camps
 - Lack of drinking water facilities
 - Lack of proper solid waste collection and disposal system
 - Uncontrolled vending of food
 - Sexual behavior
- ❖ Storage of materials and equipment
- ❖ Handling of equipment and chemicals

Mitigation Measures:

Working Site:

- ii. A reduction of the risk of accidents can be achieved through strict rules and procedures for the execution of specific tasks, enforcement of these rules, discipline amongst, and proper training of the work force, maintenance of equipment and machinery used and by providing all gear or equipment that may enhance the safety of the workers.
- iii. Personal protective equipment (PPE) such as helmets, protective clothing, hand gloves, life vests for those working on or above the river, etc.). Should be provided to the all workers and personnel.
- iv. Where appropriate, strict work procedures and guidelines are to be defined for the different jobs; the laborers should be informed about these procedures and guidelines; regulations are enforced.
- v. Work with volatile toxic chemicals should be done in a well-ventilated place or in the open-air.
- vi. Labourers using aggressive toxic chemicals should be provided with and forced to use protective clothing.
- vii. Workers exposed to an excessive amount of noise should be provided with protective gear and be relieved frequently from their post.
- viii. Workers exposed to large amounts of dust should be provided with adequate protective gear.
- ix. Handling of volatile chemicals and dangerous/toxic substances is to be performed by well-trained staff only.
- x. Labourers should be trained in the proper performance of their job.
- xi. Employees should know the potential hazards facing them; workers have to be informed about the potential dangers/hazards, if any, related to their work.
- xii. Proper planning, provision of adequate facilities and strict compliance with procedures and guidelines could prevent, or at least minimize the adverse impacts.
- xiii. Adequate housing for labourers is to be provided with good facilities for washing, bathing, toilet and cooking.
- xiv. A safe and reliable supply of water is to be provided. The most suitable source for such a supply would probably be ground water from a deep tube well. The water

quality should meet the EQS for drinking water. Therefore, treatment of the water may be required, e.g. to reduce iron and/or arsenic concentrations.

5.3.4 Hygienic Condition

- i. Apart from occupational health aspects, also health aspects related to hygienic conditions and behavior are to be considered.
- ii. The execution of a large-scale project brings together a large number of people that do not always live under the most hygienic conditions. This may lead to the occurrence and spreading of contagious diseases.
- iii. The Employees are to be subjected to pre-employment and regular medical examinations, as well as tests and analyses necessary for the detection of a disease.
- iv. The adverse impact that may occur if insufficient precautions are taken is the development of slum conditions in the housing area of the labourers, with subsequent insalubrious living conditions, social stress and risks of polluting the surroundings by solid waste, effluent, drainage congestion/ Inadequate drainage, etc.
- v. Hygienic sanitary facilities and sewerage system are required. Each living unit should possess a water sealed toilet and bathing facility. Waste water is to be discharged by providing each cluster of living units with septic tanks, connected with soak pits or absorption trenches.
- vi. In planning the location of the living quarters of workers on the project, the houses should not be located in the direct vicinity of noise producing activities. For this aspect the standards as described in section on noise pollution should be taken as reference

5.3.5 Land Acquisition and Resettlement

In most locations along the road, the existing road is inadequate to accommodate the necessary design cross-section width of a road carriage with additional adjacent lanes. Additional land is therefore necessarily to be acquired for the upgrading of the road. A reasonable assessment has been made, as part of this Study, of the total land area necessarily to be acquired. Land acquisition plans with detailed plot schedules are included by the Consultant in the detailed design phase of the project road.

5.4 Cumulative, Indirect and Induced Impacts

5.4.1 Cumulative Impacts

- The ESIA has indicated that though there will be some manageable operational impacts, assuming effective implementation of the mitigation measures and monitoring requirements, the Project is not expected to have significant adverse environmental impacts during the operation phase. The most sensitive impacts are contamination of surface water, soil and groundwater during construction and operation and uncontrolled waste disposal that could affect adjacent areas. This must be regularly monitored, mitigated and managed to ensure no adverse impact within the road corridor.

- Since this road is a comparatively isolated road, no other major road developments occur in this road corridor. However, these will be completed prior to the construction and operation of the Keraniganj upazila, and cumulative impacts of major projects are unlikely to be an issue. The scale and nature of smaller urban development (public and private sector) is difficult to determine but is not likely to be significant.
- There may be some short- and medium-term reductions in noise and improvements in air quality. The widened road, particularly in the present more congested urban sections together with the improved road surface, will reduce congestion. This will have the impact of encouraging a more regular and uniform speed. With the same traffic flows at this increased speed, emission levels and noise levels will be reduced. However, the projected increase in tariff flows may have the impact of increasing the overall vehicle emissions and noise levels.

5.4.2 Induced and Indirect Impacts

- The improvement of a road from width and length is likely to have a significant impact on the development potential and opportunities along the road corridor. The improved vehicle speeds and travelling time along the road corridor from Keraniganj Upazila will encourage a growth in economic activities in various sectors. This growth in economic activities will encourage more development along the road and adjacent corridor. Commercial and residential development is likely to grow significantly as a direct result of the improved road and reduced travelling distance.
- Increased development is likely to result in increased effluents, solid waste, and noise and air pollution. At this stage, it is not possible to determine the scale of induced development. The potential adverse environmental impacts are also at this stage not possible to predict.

5.4.3 Minor Route Alternative

The present alignment between Keraniganj upazila roads will require numerous short distance straightening realignments to ensure the designed alignment is in accordance with the LGED standards. The selection of these minor realignments will need to ensure the minimum disturbance to the local environment (and to ensure minimum disturbance to the built environment, land acquisition and resettlement). This is particularly critical where the road passes through undulating minimal tree cutting, and disturbance to the local environment should occur.

5.4.4 Major Intersections

The road has several major junctions with National and Regional Highways. Most of these junctions were improved with channelized roundabouts keraniganj upazila Road during January, 2020-2025. There are also a number of road intersections. Besides these major junctions, there are several junctions with LGED roads. Latitudes and longitude of intersections and key location points are given in Table.

Table 18: Latitude and Longitude of Intersections and Key Location Points

Location	Distance	Northing	Easting
Dhaka Mawa Road - Tegharia - Shaper Bazar via Mollar Hat	5.5 km	23°41'22.02"N	90°23'54.96"E

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Location	Distance	Northing	Easting
Jinjira - Konda Via Mirerbagh Bazar - Beyara Bazar - Banagram - Zindapir Mazar	4.075 km	23°39'35.00"N	90°25'18.45"E
Ruhitpur GC - Baluarteck - Dhaka Mawa	6.03 km	23°39'50.58"N	90°19'51.66"E
Dhaka Mawa - Khejurbagh	2.00 km	23°41'42.24"N	90°24'36.71"E
Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullahpur Bishwaroad via Goista	4.00 km	23°41'22.02"N	90°23'54.96"E

Chapter Six

INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

6.1 Purpose of Public Participation

Public participation and community consultation have been taken up as an integral part of social and environmental assessment process of the project. Public participation has been viewed as a continuous two-way process, involving promotion of public understanding of the processes and mechanisms through which developmental problems and needs are investigated and solved. Consultation was used as a tool to inform and educate stakeholders about the proposed action both before and after the development decisions were made. It assisted in identification of the problems associated with the project as well as the needs of the population likely to be impacted. This participatory process enabled the participation of the local people in the decision-making process. The involvement of the various stakeholders ensured that the affected population and other stakeholders are informed, consulted and allowed to participate at various stages of project preparation.

6.2 Reconnaissance field visit

As a start-up activity for accomplishing the tasks assigned, Greenbud team made a reconnaissance visit over the entire length of the road to the project site particularly starting point from Keraniganj Upazila on June 9-14, 2020. The team visited each and every potentially affected location, prepared a preliminary list of potentially displaced properties indicating their nature and types such as house, shop, market, social institutions, cantonment area etc. They also identified the bottlenecks to be faced during project resettlement plan implementation of the existing right of way. The team also talked to the Potential affected people about problem project impact and upcoming activates.





Figure 20 Consultation with local people during reconnaissance visit 9-14, 2020

6.3 Questionnaire Development

Consultant has prepared different tools and techniques for updating the Resettlement Action Plan (RAP) for this project. Greenbud team has already developed the following questionnaires:

- Developed questionnaire for Socio-economic Census and IOL Survey,
- Developed questionnaire for Tenant Survey
- Developed questionnaire for Wage Labor Survey
- Developed questionnaire for Vendor Survey
- Developed questionnaire for Poverty Valuation Survey

Detailed questionnaires have been shared with the LGED for approval. The LGED has approved the questionnaires, now those questionnaires have been uploaded in electronic device /TAB. Below shows the sample of the feature of the questionnaire in TAB. The Census and IOL survey to be carried out through Mobile Device. If any field office needs to have its own deployment, provision for that will also be open. In that case, field or central office of greenbud will synchronize their data. We are proposing to use open source.

6.4 Stakeholders

The stakeholders of the Keraniganj upazila LGED improvement project include the (i) financing agencies e.g. GoB (ii) government organizations involved in planning ,design and implementation e.g., DoE, Department of Agriculture Extension (DAE), Bangladesh Water Development Board (BWDB), Civil Administration (DCs), Public Representatives, etc., (iii) Consultants and Contractor involved with feasibility study, detailed design and bidding document preparation and implementation phases and (iv) PAPs affected positively and/or negatively directly and/or indirectly.

6.5 Public Consultation at Keraniganj Upazila Project Sites

Public Consultation Meeting were conducted at Keraniganj Upazila Project sites from June 9-14, 2020. Officials from the local administration and local government institutions including

Upazila Chairman, Union Parishad Chairman, and Ward Members, and local influential people etc were present in the consultation meetings. The potential affected people including land owners, business men, tenant, community leaders, CPR management committee and different stakeholders took active part in the discussion. Detailed date, venue and time of public consultation are given in the Table 19

Table 19: Dates and venue and time of public consultation

Date	Public Consultation Venue	Time
14.08.2020	Teghoria- Mollar Hat, Keraniganj	1.30 to 2.30 PM
14.08.2020	Banagram- jinda pir-Mirerbagh- Ekuria, Keraniganj	03.00 to 5.00 PM
14.08.2020	Ruhitpur-Baluartek, Keraniganj	10.00 to 12.00 AM
14.08.2020	Dhaka-Mawa to Khajurbagh, Keraniganj	4.30 to 5.30 PM
14.08.2020	Chunkuthia Auditorium - Paka Chita - Dighirpar - Abdullahpur Biswaroad Via Gaista, Keraniganj	9.30 to 10.30 AM

6.6 Key findings of the consultation meeting;

- Local people are aware of the progress of activities including land acquisition and resettlement activities.
- Participants want to know about the appropriate Right of Way (how much land will be required in both sides)
- They understand that the project will have a visible impact on the improvement of transport system.
- Local people want adequate compensation for the affected properties.
- Community structures like religious institutions and school should be avoided.
- Compensation cheque would be handed over at their door step without hassle
- People wanted to save trees as much as possible and need more plantation along the road

6.7 Consultation Meetings after IEE submission

One-page document will be distributed to community members, local government, and other key stakeholders and directly to communities involved. Some selected focus group discussions will be held to determine some of the key issues and response to the alignment and to alternatives where relevant. All verbal and written comments will be responded where appropriate and incorporated into the DED where necessary and reported upon in the ESIA

6.8 Summary of Consultations Outcome

It will be essential to continue this consultation process to ensure that the community remains supportive and that they are fully informed of progress particularly before and during the construction period. It will be essential that the community is given information on the grievance redress mechanism and that regular meetings with the community are held in the future. Once the project has been approved and a construction program has been defined, the first of a number of community meetings must be held to provide details of the construction program and to give information on the grievance redress mechanism. A website should be

set up including all this information, however, many of the community may not have access to the internet, therefore face to face meetings and hard copy handouts must be provided to the whole community. A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate, and facilitate the resolution of PAP's concerns, complaints, and grievances about the social and environmental performance at the level of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project.

Chapter Seven

GRIEVANCE REDRESS MECHANISM

7.1 General

Land acquisition in Bangladesh allows landowners object in the beginning of the legal process. Once the objections are heard and disposed of, there is virtually no provision to attend complaints and grievances that individual landowners may bring in the later stages of the acquisition process. As the law does not recognize the non-titled users of land, there is no mechanism to hear and redress their grievance in the legal process. Again, project interventions and construction activities on site may raise environmental, social and public health concerns among the displaced persons and their communities. The communities may also be interested in transparency in procurement and quality of construction. Complaints and grievances may, therefore, range from land acquisition, resettlement, procurement and quality of works on site. Disputes over ownership and inheritance of the acquired lands of affected persons and assets missed by the census, joint verification; valuation of affected assets; compensation payment; and the like may arise in the process of resettlement.

7.2 Common GRM

A common GRM will be in place for social, environmental, or any other grievances related to the project; the Resettlement Action Plans (RAPs) and IEEs/ESIA will follow the GRM described below, which is developed in consultation with key stakeholders. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons' grievances related to the project. The multi-tier GRM for the project is outlined below, each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required.

A Grievance Redress Committee (GRC) will be established at the community level in each Upazila/Union to resolve complaints and grievances informally through community participation. The GRCs will be formed with representatives from Local Government Engineering Department, DPs, women DPs (if any), and appropriate local NGOs to allow voices of the affected communities to be heard and ensure a participatory decision-making process. GRC decisions will be on a majority basis and will be publicized among the local communities. Complainants are encouraged to use the GRC; however, they may access the judicial system at any time.

Project Affected Persons (PAPs) will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes that have already been installed by project area or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaint register in Local Government Engineering Department (LGED) offices. Careful documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken. The PMU safeguard officer will have the overall responsibility for timely grievance redress on environmental and social safeguards issues and for registration of grievances, related disclosure, and communication with the aggrieved party through the PIU designated safeguard focal person.

7.3 Grievance Redress Process

GRC meetings will be held in the respective Field Office of LGED or other location(s) as agreed by the Committee. If needed, GRC members may undertake field visits to verify and review the issues at dispute, including titles/shares, reason for any delay in payments or other

relevant matters. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor and CSC on-site personnel will provide the most easily accessible or first level of contact for quick resolution of grievances. Contact phone numbers and names of the concerned PMU of the LGED safeguard focal person and contractors; will be posted at all construction sites at visible locations.

7.3.1 1st Level Grievance:

The phone number of the PIU office should be made available at the construction site signboards. The contractors and PIU, PMU safeguard focal person can immediately resolve on-site in consultation with each other, and will be required to do so within 7 days of receipt of a complaint/grievance.

7.3.2 2nd Level Grievance

All grievances that cannot be redressed within 7 days at field/ward level will be reviewed by the grievance redress cell (GRC) headed by Project Director (PD) of the LGED with support from PMU designated safeguard focal person and CSC environment and resettlement specialists. GRC will attempt to resolve them within 15 days. The PIU designated safeguard focal person will be responsible to see through the process of redress of each grievance.

7.3.3 3rd Level Grievance

The PMU designated safeguard focal person will refer any unresolved or major issues to the PMU safeguard officer and CSC environmental and resettlement specialists. The PMU in consultation with these officers/specialists will resolve them within 30 days.

7.3.4 4th Level Grievance

- i. The Chief Engineer, LGED Should the resolution from the PMU fail to satisfy the aggrieved DPs, they will be facilitated to forward their case records for further review and settlement with the office of the Chief Engineer, LGED at Dhaka. The aggrieved DP will submit the petition with all documentary evidences of complaints and the resolution proceedings at Step 2 and 3 within 2 weeks after the decision from the PMU is received
- ii. Any decisions and proceedings of GRC meetings will be finally approved by the Project Director, PMU, LGED. The approved GRC decisions will be implemented on site within the framework of the resettlement plan.
- iii. Despite the project GRM, an aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

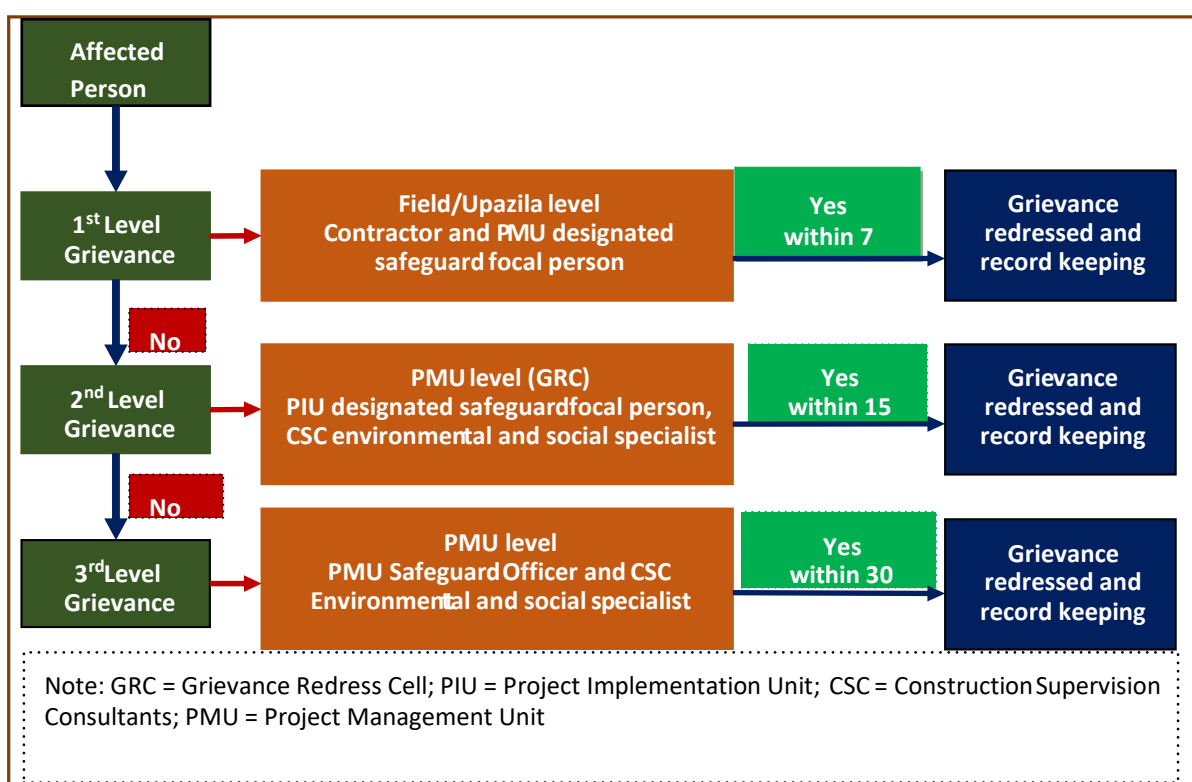


Figure 21: Project Grievance Redress Mechanism Record keeping

Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions, and the date these were affected and outcome will be kept by PMU of the LGED. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PMU office and on the web, as well as reported in monitoring reports submitted to Bangladesh Bank on a semi-annual basis.

7.4 Periodic Review

The PMU safeguard officer will periodically review the functioning of the GRM in each PMU and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances.

7.5 Costs

All costs involved in resolving the complaints (meetings, consultations, communication, and reporting/information dissemination) will be borne by the concerned PIU at PMU-level; while costs related to escalated grievances will be met by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

Chapter Eight

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Objectives of the ESMP

- a) The purpose of the environmental and Social management plan (ESMP) is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of: (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of Safeguard performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the Safeguard assessment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental and social impact of the project; and (iv) ensuring that safety recommendations are complied with.
- b) The PMU will ensure that the ESMP is made part of the contract documents. The
- c) Contractor will be responsible for preparing a specific Environmental and Social Management Plan (Contractor's Environmental and Social Management Plan) based on this ESMP, prior to the commencement of construction activities. The Supervising Engineer (SE) will be responsible for reviewing and approving the Contractor's ESMP as well as ensuring that contractors comply with its mandates. Public complaints regarding adverse environmental impacts arising from inadequate implementation of the ESMP will be captured through the proposed Grievance Redress Mechanism.
- d) A copy of the ESMP must be kept on work sites at all times. This ESMP is included in the bid documents and will be further reviewed and updated during implementation. The ESMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.
- e) They can only do this if the conditions listed in the ESMPs are transferred into the Contract Terms and Conditions and Contract Specification(s). Often generic Contract
- f) Specification(s), such as those prepared the Federation International des Ingenious Counsels (FIDIC), adopted by the GOB, have environmental clauses that should be used as the basic framework for environmental clause insertion. Under this LGED Road Up gradation Project, the FIDIC Contract Specification or other relevant Contract Specification may be adopted in Contract documents, which may need to be modified to better incorporate the environmental measures listed in the ESMP.
- g) For civil works, the contractor will be required to (i) establish an operational system for managing environmental and social impacts (ii) carry out all of the monitoring and mitigation measures set forth in the ESMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this ESIA and ESMP. The contractor shall allocate a budget for compliance with these ESMP measures, requirements and actions.

8.2 ESMP – Mitigation Measures

- a) Mitigation measures for each of the impacts listed in the Table VIII-1. Responsible institutions/departments for the implementation and supervision of each of the environmental and social issues have also been illustrated. Mitigation measures have been suggested based on the knowledge of the Environmental and Social Specialist,

suggestions of the stakeholders collected during public consultation, FGDs and opinions from other relevant specialists.

- b) The mitigation measures will be considered successful when comply with the Environmental Quality Standards (EQS), policies, legal requirements set by DoE and other relevant GoB organizations. In absence of DoE's own EQS, other relevant international or other recognized organization's quality standard will have to be followed.

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Table 20: Environmental and Social Management Plan – Mitigate Measures

Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
1.0 P re-construction Phase					
1.1	Obtaining of SCC/NOCs Impact of trees and vegetation	✦The proposed road will be constructed in LGED own land and private land new road networks, that’s why all necessary consents, permits, clearance, etc. Will be required to be obtaining before start of civil works (ensured from RAP report). ✦Obtain permission from concerned authority before commence of tree cutting ✦It will offer a significant opportunity to bring benefits to the local community and to Project Affected Persons (PAP’s), vulnerable groups, particularly women by direct involvement in the program. ✦Forestation programmes should be initiated, covering the road ROW, any embankments, and land near bridges and culverts to compensate for the loss of vegetation, to reduce the risk of erosion of the banks, and finally as a noise reducing wall. ✦Some long-term disturbance to roadside trees but these will all be replaced by 5 for each tree felled (Source; DOE)	LGED/DOE/ Contactor	CSC	Engineering cost
1.2	Climate (Impact of Climate change on Road) Increased and unusual rainfall patterns will increase potential for flooding Increased sea level rise; unlikely to be an issue in Keraniganj Road.	• FS and design to ensure increased road height ▪ Design to ensure that channels and culverts can accommodate increases in rainfall.	Design consultant	LGED	N/A
1.2	Seismic Hazards Impact of structures temporary and permanent	✦ Considered in deigning of all major structures like bridges, culverts and pavements ✦ All outstanding acquisition to be carried out in accordance with government regulations (Amendment, Acquisition and Requisition of Immovable Property Ordinance 2017). ✦ Ensure contractors act responsible and inform farmers in advance of loss of land and potential disruption.	LGED/Conta ctor	CSC	Engineering cost

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
1.3	Social/Economic • Increase in economic activity caused by better road communication • Loss of business to commercial areas where central barrier stops traffic crossing road; business comes from two way only, not four way • Some adverse impacts if some businesses lose some of trade	✦ Local communities need to be advised on how to best benefit from road improvement ✦ Additional crossing points added during construction if considered necessary	LGED	Monitoring of any adverse impacts on local community and farmers	Engine ering cost
1.4	Updating of ESMP based on necessary -Specific impacts will be identified as per design updating and construction works	✦ Update IEE and ESMP as per necessary of detail design and construction works ✦ Ensure updated ESMP is provided to contractors	LGED/ Consultant	CSC	Engineering cost
1.5	Existing Utilities Disruption of services (short term).	✦ Drawing from the consultant's visit, there was no utility or services found. Therefore, disruption in services is not expected. ✦ There is trees and vegetation alongside the existing ROWs and proposed alignment. In addition, there is water body nearby. ✦ Short-term impact is expected on flora and fauna. ✦ Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. Existing infrastructure (such as T & T Line, dweller, electric pole, and shop/boundary wall etc.) shall be relocated before construction starts at the project sites. ✦ Prior permission shall be obtained from respective local authority for use of water for construction. Use of water for construction works shall not disturb local water users.	LGED	LGED/CSC	Engineering cost
1.6	Construction Camps, & Stock Yards • Disruption to traffic flow and sensitive receptors • Water body and agricultural land may be disturbed	✦ Determine locations prior to award of construction contracts. ✦ Avoid nearby water body, educational institutes and agricultural land	Contactor	LGED/CSC	contractor

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
1.7	Sources of Materials Extraction of materials can disrupt natural land contours Air pollution and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	- Prepare list of approved quarry sites and sources of materials - Select authorized supplier	Contactor	LGED/CSC	contractor
1.6	ESMP Implementation Training and awareness Irreversible impact to the environment and social, contactor representative/ workers, LGED officials	Training will be required to undergo ESMP implementation including waste management, Standard operating procedures (SOP) for construction works; health and safety (H&S), core labor laws, applicable environmental laws, etc	Contractor	LGED/CSC	Engineering cost
2.0 Construction Phase					
A. Physical Environment					
2.1	Topography, Landforms, Geology Significant amount of gravel, sand, bitumen and cement will be required for this project. Extraction of construction materials may cause localized changes in topography and landforms. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Utilize readily available sources of materials. If contractor procures materials from existing burrow pits and quarries, ensure these conform to all relevant regulatory requirements. - All land should be restored to original state and contours after construction, tree planting to support this - Construction methods to reduce or eliminate pollution of soil and subsoil. - Soil plan to be submitted to LGED - All oil and liquid waste to be disposed of in approved sites to ensure no soil contamination. - All land used temporarily to be reclaimed and returned to agricultural use in accordance with government regulations.	Contractor	LGED/CSC	Engineering cost
	Flooding and Drainage - Potential for some temporary flooding of site and adjacent areas during rainy season - Flooding will only be short term and localized	- Good management of site to ensure no short-term flooding. - All surface water courses will be protected by settling ponds and filters. - Regular cleaning of channels to avoid choking. - Provision of adequate cross drainage structures to easily drain off water to canals and other lowland areas; - Ensure that storm water drains and highway drainage systems are periodically cleared to maintain storm water flows during construction.	LGED/Con tractor	LGED/CSC	contractor

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
2.2	Soil Quality - Leakages of oil and chemical materials from construction activity - Inappropriate disposal of waste - Exhaust gas and dust from vehicles	- Storage of oil and chemical materials in an appropriate storage site and method to prevent permeation into the ground. - Prohibit illegal dumping - Soil quality monitoring	Contractor	LGED/DOE/CSC	Engineering cost
2.3	Agricultural Activities - Loss of land/acquisition of land. - Disturbance to farmers access and activities - Loss of land for borrows pits or stockpiling. - Dust will affect crop production	- All outstanding acquisition to be carried out in accordance with Government regulations. - Ensure contractors act responsible and inform farmers in advance of loss of land and potential disruption.	Contractor	LGED/CSC	Engineering cost
2.4	Surface/Waste Water Quality - Improper discharge of effluents and liquid waste from construction and project/ labour camps will pollute surface water - Dredging for fill material may pollute surface water. Water body nearby the project area. However, only along the proposed road there is Rivers, Haors, Khals and ponds which might be impacted during the road improvement. However, the expected impacts are moderate negative but short term, site-specific within a relatively small area and reversible by mitigation measures.	General: - No disposal of liquid and solid wastes into surface water areas without appropriate treatment; - Dredged material only to be disposed at the base of river/stream - Disposal of effluents to be strictly controlled - Bentonite waste only to be disposed of in controlled settling ponds.. - Water quality will be tested pre-during-post construction by contractor. - Location for stockyards for construction materials shall be identified far away from watercourses. - Place storage areas for fuels and lubricants away from any drainage leading to water bodies. - Take precautions to minimize the wastage of water in the construction activities. - Take all precautions to prevent entering of wastewater into nearby watercourses. - Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in low lying areas. - Ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water	Contractor	LGED/DOE/CSC	Engineering cost

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
2.5	Ground water Quality • Pollution of groundwater from labour camps latrines • Pollution of groundwater by spillage of chemicals, fuel, lubricants etc • Pollution of groundwater by unregulated disposal of solid waste.	✦ Workforce camps will be located away from water resources. All practical measures such as provision of septic tanks, garbage bags, and other sanitation facilities will be implemented at the construction camps to prevent the wastewater and solid wastes from entering well and groundwater recharge areas. ✦ Wells used for drinking will be tested quarterly to ensure portability.	Contractor	LGED/DOE/CSC	Engineering cost
	Fish and Aquatic • Construction work may affect migration of fish and health of fish • Commercial fishing may be impacted • Will be significant near Main River at construction site.	✦ Fish migration routes to be considered during construction ✦ Manage all liquid waste disposal and ensure no accidental spills of liquid waste into river ▪ Disposal of dredged materials only to take place in deepest parts of rivers.	Contractor	LGED/CSC	N/A
2.6	Borrow pits and haul routes • Increase in open water and potential for breeding ground for mosquitoes • Disturbance to local environment and social, in particular dust and noise from equipment and vehicles; • Loss of agricultural land; • Haul routes of material and equipment • Noise and air pollution • Danger to other road users, particularly pedestrians and non-motorized and farm vehicles	✦ All borrow pits and haul routes to be agreed with LGED and community before start of work ✦ Sites should preferably not be in agricultural use ✦ Only approved borrow pits to be used with a plan for closure, remediation and re-cultivation: no use as waste areas	Contractor	LGED/CSC	N/A

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
2.7	Air quality Conducting works at dry season and moving large quantity of materials may create dusts and increase in concentration of vehicle-related pollutants (such as carbon monoxide, sulphur oxides, particulate matter, nitrous oxides, and hydrocarbons) which will affect people who live and work near the sites. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Water spraying to control dust as per necessary; - Use tarpaulins to cover soils, sand and other loose material when transported by trucks. - Unpaved surfaces used for haulage of materials within settlements shall be maintained dust-free. - Arrangements to control dust through provision of windscreens, water sprinklers. - Air quality will be tested pre-during-post construction by contactor	Contractor	LGED/DOE/CSC	Engineering cost
2.8	Noise & Vibration Temporary increase in noise level and vibrations may be caused by excavation equipment, transportation of equipment, construction materials and construction activity. The impacts are negative but short-term, site-specific within a relatively big area and reversible by mitigation measures.	- All vehicles and equipment used in construction to be modern and to be regularly maintained. - All mixing and other plants to be operated in accordance with manufacturers recommendations and to be located at a distance from all sensitive uses. - Restrict all night time activities near to sensitive sites and areas Restrict all construction traffic to 60km per hour - Noisy equipment must be screened near sensitive receptors - Locate rock crushing, concrete mixing and material shipment yards away from residential areas, schools, colleges and hospitals. - Install temporary noise barriers near sensitive locations such as schools, religious places and hospitals - Providing the construction workers with suitable hearing protection like ear cap, or earmuffs etc. - Monitor noise levels. Maintain maximum sound levels not exceeding 85 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. - If it is not practicable to reduce noise levels to or below noise exposure limits, the contractor must post warning signs in the noise hazard areas. - Workers in a posted noise hazard area must wear hearing protection. - Identify any buildings at risk from vibration damage and avoiding any use of	Contractor	LGED/DOE/CSC	Engineering cost

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
		pneumatic drills or heavy vehicles in the vicinity. Complete work in these areas quickly. ✦ Noise level will be tested pre-during-post construction by contractor			
2.9	Waste Pollution ✦ Construction waste from construction work ✦ Domestic waste from workers ✦ Hazardous waste	✦ Follow the 'Waste Management Plan' in Appendix 4. ✦ Conduct separate waste collection and promote recycling and reuse. ✦ Appropriate disposal of non-recyclable waste according to rules ✦ Hazardous waste should be treated under the related regulation	Contractor	LGED/CSC	Contractor
2.10	Trees and vegetation (Flora) • Loss of existing flora along roadside; trees and other planting. • Impact on all flora in vicinity of road construction	✦ It will offer a significant opportunity to bring benefits to the local community and to Project Affected Persons (PAP's), vulnerable groups, particularly women by direct involvement in the program. ✦ Forestation programmes should be initiated, covering the road ROW, any embankments, and land near bridges and culverts to compensate for the loss of vegetation, to reduce the risk of erosion of	Contractor	LGED/DOE/ CSC	Engineering cost
	• Dust from construction will impact on growth of trees and vegetation • Impact on aquatic vegetation	the banks, and finally as a noise reducing wall. • Protect the vegetation adjacent to the ROW to ensure that no wood is used as fuel wood for heating bitumen.			
	Wildlife and Endangered Species • Impact to local ecosystems and species, particularly endangered species and their continued health and sustainability • Loss of wildlife due to felling of trees • Disturbance to habitat due to construction activities.	✦ Hunting the birds and other animals should be banned at the construction sites ✦ Encroachment into forests and wooded areas should be properly regulated and enforced ✦ Protection should be given to any special species peculiar to the region and it should be bilateral and multilateral conventions on wildlife.	Contractor	LGED/CSC	Contractor
2.11	Biodiversity Activities being located in the Keranigonj Upazila Road built-up area of Dhaka. There are no protected areas in or around proposed site, and no known areas of ecological interest.	✦ If during construction period cutting of trees will be required, compensatory plantation for trees lost at a rate of 1:5 sapling ratio trees for every tree cut, in addition to tree plantation as specified in ESMP cost, will be implemented by the contractor, who will also maintain the saplings for the duration of his contract. ✦ All efforts shall be made to preserve trees by evaluation of minor design adjustments/ alternatives (as applicable) to	Contractor	LGED/CSC	Contractor

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
		save trees. ✦ Special attention shall be given for protecting giant trees and locally important trees (with religious importance) during implementation. ✦ Prevent workers or any other person from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body in the subproject vicinity. ✦ Prohibit employees from poaching wildlife and cutting of trees for firewood.			
2.12	Traffic Congestion Hauling of construction materials and operation of equipment on-site can cause traffic problems. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	✦ Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites. ✦ Maintain safe passage for vehicles and pedestrians throughout the construction period. ✦ Schedule truck deliveries of construction materials during periods of low traffic volume. ✦ Erect and maintain barricades, including signs, markings, flags and flagmen informing diversions and alternative routes when required. ✦ Notify affected sensitive receptors by providing sign boards informing nature and duration of construction activities and contact numbers for concerns/complaints. ✦ Provide walkways and metal sheets where required to maintain access across for people and vehicles. ✦ Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools. ✦ Consult businesses and institutions regarding operating hours and factoring this in work schedules. Ensure there is provision of alternate access to businesses and institutions during construction activities, ✦ Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.	Contractor	LGED/CSC	Contractor
	Physical Cultural Resources No record of any cultural resources in area.	✦ In accordance with government regulations, work to be immediately stopped to allow for investigation, recording and recovery. Sites not within alignment but within 500 meters of road must be protected from looting and destruction. ✦ Salvage dig to be carried out by approved company before works start on	Contractor	LGED/CSC	Contractor

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
		site in area.			
2.13	Socio-economic status Project components will be located in LGED and Private land and there is requirement for land acquisition or RAP. Manpower will be required during the construction stage. This can result to generation of contractual employment and increase in local revenue. Thus, potential impact is positive and long-term.	✦ Employ at least 50% of labor force from communities in the vicinity of the site. This will have the added benefit of avoiding social problems that sometimes occur when workers are imported into host communities, and avoiding environmental and social problems from workers housed in poorly serviced camp accommodation. ✦ Secure construction materials from local/foreign market ✦ To ensure engage women employee as per gender action plan	Contractor	LGED/CSC	Contractor
2.14	Community Health and Safety Construction works will impede the access of residents and businesses in limited cases. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures. Poor safety signage and lack of	✦ Provide safety signage at construction sites visible to public ✦ Provide safety barriers near any trenches, and cover trenches with planks during non-work hours. ✦ Contractor's activities and movement of staff will be restricted to designated construction areas. ✦ Consult with Dhaka local authority on the designated areas for stockpiling of, soils, gravel, and other construction materials. ✦ If the contractor chooses to locate the work camp/storage area on	Contractor	LGED/CSC	Engineering Cost

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
	Barriers at work site and trenches will create hazard to pedestrians and children.	Private land, he must get prior permission from the environment specialist and LGED. ★ Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged. ★ A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: (i) no alcohol/drugs on site; (ii) prevent excessive noise; (iii) construction staff are to make use of the facilities provided for them, as opposed to ad hoc alternatives (e.g. fires for cooking, the use of surrounding bushes as a toilet facility); (iv) no fires permitted on site except if needed for the construction works; (v) trespassing on private/commercial properties adjoining the site is forbidden; (vi) other than pre-approved security staff, no workers shall be permitted to live on the construction site; and (vii) no worker may be forced to do work that is potentially dangerous or that he/she is not trained to do. ★ Interested and affected parties need to be made aware of the existence of the complaints book and the methods of communication available to them. The contractor must address queries and complaints by: (i) documenting details of such communications; (ii) submitting these for inclusion in complaints register; (iii) bringing issues to the environmental and social specialist attention immediately; and (iv) taking remedial action as per environmental and social specialist instruction. ★ The contractor shall immediately take the necessary remedial action on any complaint/grievance received by him and forward the details of the grievance along with the action taken to the environmental specialist within 48 hours of receipt of such complaint/grievance.			

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
2.15	Workers Health and Safety There is invariably a safety risk when construction works such as excavation, sand filling, carrying of mixture materials, Shuttering, steel/wood work and earthmoving are conducted in urban areas. Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and major but reversible by mitigation measures.	✦ All fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest discovered on the site shall be the property of the government. ✦ Prevent workers or any other persons from removing and damaging any fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest. ✦ Stop work immediately to allow further investigation if any finds are suspected.	Contractor	LGED/CSC	Engineering Cost
2.16	Post-construction Clean-up Damage due to debris, spoils, excess construction materials	✦ Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and. ✦ All disrupted utilities restored ✦ All affected structures rehabilitated/ compensated ✦ The construction camp is to be checked for spills of substances such as used container/water bottles, paint, etc. and these shall be cleaned up. ✦ All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and regressed using the guidelines set out in the re-vegetation specification that forms part of this document. ✦ The contractor must arrange the cancellation of all temporary services. ✦ Request LGED to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.	Contractor	LGED/CSC	Contractor
2.17	Submission of ESMP Implementation Report Unsatisfactory compliance to ESMP	✦ Appointment of supervisor/Manager to ensure ESMP implementation ✦ Timely submission of Progress report/environmental monitoring reports including pictures	Contractor	LGED/CSC	Engineering Cost
3.0 operation Phase					

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Ref. No.	Issues & Impacts	Mitigation Measures	Responsible for		Cost Estimate (TK)
			Implementat ion	Supervision	
3.1	Air Quality ✦ Exhaust gas from vehicles used for mobilization of equipment and workers ✦ Dust from road and drain	✦ Provisions of LGED budget for operation & maintenance; ✦ Periodic monitoring;	LGED	LGED and DOE	LGED O & M budget
3.2	Noise Level ▪ Noise caused by vehicles moving along the road carrying passengers and goods.	✦ Provisions of LGED budget for operation & maintenance; ✦ Periodic monitoring;	LGED	LGED and DOE	LGED O & M budget
3.3	Surface/Waste Water Quality ▪ Surface water runoff to nearby lands ▪ Rivers/Ponds/Haors along the road ▪ Waste water to the khal/river /Haor	✦ Provisions of LGED budget for operation & maintenance; ✦ Periodic monitoring;	LGED	LGED and DOE	LGED O & M budget
3.4	Waste Management Clogging of drains.	✦ Provisions of LGED budget for operation & maintenance; ✦ Periodic monitoring;	LGED	LGED	LGED O & M budget
3.5	Road Accident Increase of road accident due to additional traffics	✦ Provide road safety signs and speed bumps/speed breaker at the densely populated/accident prone area such as school, college, commercial area etc. ✦ Provide training to community people to aware about road safety	LGED	LGED	RH D O & M budget
3.6	Seismic Hazards/ Flood/Land Slide/ Bridge/Drain/Culvert Road Blockage/ Traffic Congestion	✦ Periodic monitoring of PMU/CSC ✦ Periodic cleaning of bridge/culverts/ drain/ land slide area (if found during operation)	LGED	LGED	LGED O & M budget
3.7	Increased vehicular volume and speed ✦ Increased chances of accident ✦ Increase noise level	✦ Prepare and implement plan for minimizing vehicular accident i.e. providing necessary traffic signage, pavement marking, speed breaker etc. ✦ Prohibiting use of air horn in populated and sensitive areas	LGED	LGED	LGED O & M budget
3.8	Monitoring and Management of Plated Trees ▪ Survival Rate	▪ Water/Weeding/Training/Pruning/ Replanting/	LGED	LGED	LGED O & M budget

8.3 Environmental and Social Monitoring Plan

- a) Environmental and social monitoring is an essential tool for environmental and social management as it provides the basic information for rational management decisions. To ensure the effective implementation of mitigation measures and ESMP plan during construction and operation phase of the project, it is essential that an effective monitoring

plan be designed and followed. The effects monitoring will be undertaken to track and report the defined performance indicators and parameters as given in below.

- b) The aim of environmental and social monitoring during the pre-construction, construction, completion of works and operation phases of the road is to compare the monitored data against the baseline condition collected during the study period (particularly during the detailed design stage) to assess the effectiveness of the mitigation measures and the protection of environmental components (e.g. air, water, soil, noise etc.) based on the national environmental standards (e.g. ECR 1997). Since the project is likely to have impact on various components of the environment, a comprehensive monitoring plan covering soil erosion, drainage congestion, tree plantation, air quality, water quality, noise, and social psychological impacts, wildlife

Table 21: Environmental and Social Management Plan – Monitoring Actions

Ref. No.	Environmental Issues	Significant Impact	Purpose of the Monitoring	Monitoring Method			Responsibility	
				Method of Collecting and Reporting Data	Location	Duration and Frequency	Implementation	Supervision
1.0 P re-construction Phase								
1.1	Obtaining of SCC/NOCs	Failure to obtain necessary consents, permits, NOC’s can result in design revisions and/or stoppage of the Works.	Compliance to GoB and AIIB policies	Obtaining certificates	Project site	Prior to contractor mobilization	LGED/Contractor	LGED/Consultant
1.2	Updating of ESMP	Specific impacts will be identified as per design updating and construction works	Ensuring the compliance with construction schedule	Preparation of report	LGED	During the preconstruction period	Consultant	LGED
1.3	Existing Utilities	Disruption of services (short term).	Implementation of ESMP	Obtain record of implantation	In the work site	Prior to contractor mobilization	Contractor	LGED/Consultant
1.4	Construction Camps, & Stock Yards	Disruption to traffic flow and sensitive receptors Water body and agricultural land may be disturbed	Implementation of ESMP	Obtaining approval from Consultant/PMU	In the work site	Prior to contractor mobilization	Contractor	LGED/Consultant
1.5	Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	Compliance with GoB laws and Implementation of ESMP	Obtaining approval from Consultant/PMU	LGED	During the preconstruction period	Contractor	LGED/Consultant

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Ref. No.	Environmental Issues	Significant Impact	Purpose of the Monitoring	Monitoring Method			Responsibility	
				Method of Collecting and Reporting Data	Location	Duration and Frequency	Implementation	Supervision
1.6	ESMP Implementation Training	Irreversible impact to the environment and Social, contactor representative/workers, PMU officials	Implementation of ESMP	Obtain record of training	PMU	Prior to contractor mobilization	Consultant	LGED
2.0 Construction Phase								
2.1	Topography, Landforms, Geology	Significant amount of gravel, Bitumen, sand, rod, and cement will be required for this project. Extraction of construction materials may cause localized changes in topography and landforms. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	✦ Restoration of changes due to construction activities ✦ Visual amenity	▪ Visual inspection & consultation with local people	In the work site	During construction period	Contractor	LGED/Consultant
2.2	Soil Quality	Significant amount of soil will be required for this project. Extraction of construction materials may cause localized changes in topography and landforms. The impacts are negative but short-term, site-specific within a relatively small area and reversible by	✦ Restoration of changes due to construction activities ✦ Visual amenity	✦ Soil quality test report ✦ Parameters for testing are Organic Matter, Zn, Sulphur, Lead and Nitrate	Project Site	✦ During construction period ✦ Once during construction	Contractor	LGED/Consultant

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Ref. No.	Environmental Issues	Significant Impact	Purpose of the Monitoring	Monitoring Method			Responsibility	
				Method of Collecting and Reporting Data	Location	Duration and Frequency	Implementation	Supervision
		mitigation measures.						
2.3	Surface Water Quality	Trenching and excavation, run-off from stockpiled materials, and contamination from fuels and lubricants may result to silt-laden runoff during rainfall which may cause reduction in the quality of adjacent bodies of water. Water body nearby the road's alignment. However, only along the Rivers, ponds and Khals which might be impacted during the road improvement. However, the expected impacts are moderate negative but short term,	Evaluation of effect of the mitigation measure towards water pollution	- Visual inspection & consultation with local people - Water quality test report - Surface/Waste water parameters: pH, Temperature, ORP, DO, Phosphate, Alkalinity, Sulphate, Fe, EC, TDS, TSS, Nitrate, COD, and BOD	- In the work site - Surface Water from nearby Pond of RD-30 - Waste water from the outfall of drains	Once during construction - Three during construction period	Contractor	LGED/Consultant
2.4	Groundwater Quality	The potential exists for drinking water sources to be contaminated by the seepage of wastes from workers camps through the soil profile into the GW aquifer (particularly if wells access the shallow aquifer).	Evaluation of effect of the mitigation measure towards water pollution	- Record of water borne diseases - Water quality test report - Groundwater parameters: pH, DO, Lead, Fe,	Groundwater from construction camp	Once during construction - Three time during construction period	Contractor	LGED/Consultant

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Ref. No.	Environmental Issues	Significant Impact	Purpose of the Monitoring	Monitoring Method			Responsibility	
				Method of Collecting and Reporting Data	Location	Duration and Frequency	Implementation	Supervision
				EC, TDS, Nitrate, As, TC, FC, Cl, Ca, and Manganese				
2.5	Air quality	Conducting works at dry season and moving large quantity of materials may create dusts and increase in concentration of vehicle-related pollutants (such as carbon monoxide, sulphur oxides, particulate matter, nitrous oxides, and hydrocarbons) which will affect people who live and work near the sites. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	Evaluation of effect of the mitigation measure towards air pollution	Visual inspection & consultation with local people Air quality test report Parameters are PM10, PM2.5, Sox, Nox, and CO	▪ In the work site	✦ Once during construction ✦ Three during construction period	Contractor	LGED/Consultant
2.6	Noise & Vibration	Temporary increase in noise level and vibrations may be caused by excavation equipment, transportation of equipment, construction materials and construction activity.	Evaluation of effect of the mitigation measure towards noise pollution	Visual inspection & consultation with local people Noise level test report Laeq (Day & Night)	▪ In the work site	✦ Once during construction ✦ Three during construction period	Contractor	LGED/Consultant

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Ref. No.	Environmental Issues	Significant Impact	Purpose of the Monitoring	Monitoring Method			Responsibility	
				Method of Collecting and Reporting Data	Location	Duration and Frequency	Implementation	Supervision
		The impacts are negative but short & long term, site-specific within a relatively big area and reversible by mitigation measures.						
2.7	Waste Pollution	✦ Construction waste from construction work ✦ Domestic waste from workers ✦ Hazardous waste	Evaluation of effect of the mitigation measure for waste	Record of kinds and quantity of waste, and the disposal method	✦ Along the roads & drains ✦ Workers camp	During construction period	Contractor	LGED/Consultant
2.8	Aesthetics	The construction activities do not anticipate any cutting of trees but will produce excess excavated earth (spoils), excess construction materials, and solid waste such as	Evaluation of effect of the mitigation measure	Visual inspection & consultation with local people	In the work site	During construction period	Contractor	LGED/Consultant
		removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. The impacts are negative but short-term, site-specific within a relatively small area and reversible by						

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Ref. No.	Environmental Issues	Significant Impact	Purpose of the Monitoring	Monitoring Method			Responsibility	
				Method of Collecting and Reporting Data	Location	Duration and Frequency	Implementation	Supervision
		mitigation measures.						
2.9	Biodiversity	Activities being located in the built-up area of Project Site. There are no protected areas in or around existing project sites, and no known areas of ecological interest.	✦ Plantation of 10000 trees as per the design as enhancement measures. ✦ Confirm that this planting plan is following during the construction period. ✦ Also confirm that grass turfing and drainage system instalment is preventing surface runoff and erosion.	✦ Visual inspection ✦ Record of plant survival percentage	In the work site and nearby homestead vegetation	During construction period	Contractor	LGED/Consultant
2.10	Traffic Congestion	Hauling of construction materials and operation of equipment on-site can cause traffic problems. The impacts are negative but short-term, sitespecific within a relatively small area and reversible by mitigation measures.	Evaluation of effect of construction schedule	✦ Visual inspection & consultation with local people ✦ Record of accidents ✦ Record of numbers construction vehicles	In the work site	During construction period	Contractor	LGED/Consultant

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Ref. No.	Environmental Issues	Significant Impact	Purpose of the Monitoring	Monitoring Method			Responsibility	
				Method of Collecting and Reporting Data	Location	Duration and Frequency	Implementation	Supervision
2.11	Socio-economic status	project components will be located in LGED and Private land there will be requirement for land acquisition or RAP. This can result to generation of contractual employment and increase in local revenue. Thus, potential impact is positive and longterm.	Evaluation of effect of construction schedule	Consultation with local people	In the project area	During construction period	Contractor	LGED/Consultant
2.12	Community health and safety	Construction works will impede the access of residents and businesses in limited cases. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures. Poor safety signage and lack of barriers at work site and trenches will create hazard to pedestrians and children.	Evaluation of effect of the work safety plan	✦ Visual inspection & consultation with local people ✦ Record of accidents	In the project area	During construction period	Contractor	LGED/Consultant

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Ref. No.	Environmental Issues	Significant Impact	Purpose of the Monitoring	Monitoring Method			Responsibility	
				Method of Collecting and Reporting Data	Location	Duration and Frequency	Implementation	Supervision
2.13	Workers health and safety	There is invariably a safety risk when construction works such as excavation, sand filling, carrying of mixture materials, Shuttering, steel/wood work and earthmoving are conducted in urban areas. Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and major but reversible by mitigation measures.	Evaluation of effect of the work safety plan	★ Visual inspection & consultation with worker ★ Record of accidents	In the work site	During construction period	Contractor	LGED/Consultant
2.14	Postconstruction clean-up	Damage due to debris, spoils, excess construction materials	Evaluation the implementation of ESMP	★ Visual inspection & consultation with local people ★ Reporting	In the work site	At the end of construction period along with the ESMP implementation report	Contractor	LGED/Consultant
2.15	Submission of ESMP implementation report	Unsatisfactory compliance to ESMP	Evaluation the implementation of ESMP	Record of report submission	CSC/PMU	At the end of construction period	Contractor	LGED/Consultant
3.0 Operation Phase								

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Ref. No.	Environmental Issues	Significant Impact	Purpose of the Monitoring	Monitoring Method			Responsibility	
				Method of Collecting and Reporting Data	Location	Duration and Frequency	Implementation	Supervision
3.1	Air Quality	Movement of vehicle will create air quality	Visual inspection, and consultation with local people	▪ O&M budget for periodic monitoring	Project area	During operation period	LGED	LGED and DOE
3.2	Noise Level	Movement of vehicle will create noise level	Visual inspection, and consultation with local people	▪ O&M budget for periodic monitoring	Project area	During operation period	LGED	LGED and DOE
3.3	Surface/Waste Water Quality	The potential exists for surface water sources to be contaminated by the seepage of wastes from workers camps through the soil profile into the surface water	✦ Visual inspection and consultation with worker ✦ Waste water quality test	▪ O&M budget for periodic monitoring	Project area	During operation period	LGED	LGED
3.4	Health & Safety	Worker involved in cleaning and maintaining the drains and roads may get sick if not trained and provided the PPE adequately	Visual inspection and consultation with worker	▪ □ O&M budget for periodic monitoring	Project area	During operation period	LGED	LGED
3.5	Waste Management	Worker involved in waste management and maintaining the project may get sick if not trained/awareness adequately	Visual inspection and consultation with worker	▪ O&M budget for periodic monitoring	Project area	During operation period	LGED	LGED
3.6	Road Accident	Accidents due to movement of waste carrying vehicles with the road users.	Visual inspection, record of accidents and consultation with local people	▪ O&M budget for periodic monitoring	Project area	During operation period	LGED	LGED

8.4 Institutional Capacity Development Program

The Project is required to obtain an Environmental Clearance Certificate (ECC) from the Department of Environment (DOE) under the Ministry of Environment and Forest, according to Environmental Conservation Rules 1997 of Bangladesh. Beyond this requirement, Roads and Highways, the proponent of the Project, with the assistance of its Consultant, will also be responsible for ensuring that all environmental and social procedures and proposals are incorporated in the Detailed Engineering Design process and construction process, including the incorporation of appropriate provisions in the Project's Bid Contract Documents. The institutional requirement includes the following;

- **Tender Documents and Contract Preparation:** The environmental and social provisions recommended for inclusion in the tender documents and Contracts for the Keraniganj upazila road will be provided in the ESMP. This is essential provisions to be incorporated and enforceable if the goals of the Project are to be fully achieved.
- **Environmental and Social Management as an Integral Part of Construction Supervision:** Once Bids have been accepted and awarded, it will be necessary to monitor compliance with the environmental and social provisions of the Contract as an integral part of overall construction supervision. Supervision by the Construction Supervision Consultants (CSC) will include the following requirements:
 - Ensure that asphalt plants, pilling equipment, construction camps and other facilities are properly sited and installed in accordance with the Contract.
 - Determine the timing and exact locations of both baseline and routine air quality and noise level monitoring and all other monitoring is in accordance with the Contract provisions.
 - Undertake critically important routine visual monitoring of construction, waste disposal and overall environmental and social management practices by the Contractors. Effective environmental and social management during construction will require frequent site visits and observation skills. Adequate staffing of in conjunction with the services provided by its CSC will be required.

a. Institutional Arrangement

The Project is going to be implemented with funding from GoB competitive bidding and will provide for the services of a Construction Supervision Consultant (CSC) to assist. In addition, awarded Contractors and a number of national agencies will also be involved in executing and managing most aspects of this Project. These are Department of the Environment (DOE), Directorate of Land Records and District Deputy Commissioner offices if any land acquisition will be required, Zila Police Headquarters, and Bangladesh Water Board, etc. The overall responsibilities for implementing the environmental and social requirements outlined in this report are summarized in Table 22

Table 22: Responsibilities of Agencies for Safeguards Monitoring and Management

Project Activities Phase	Responsible Organization	Responsibilities
Preliminary Design in Feasibility stage	Construction Supervision Consultant (CSC)	Consideration of significant issues on environment and social aspects with mitigation measures into Engineering Designs of the Project

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Project Activities Phase	Responsible Organization	Responsibilities
Detailed Engineering Design	Construction Supervision Consultant (CSC)	Incorporation of appropriate mitigation measures into Detailed Engineering Design and technical Specification.
Detailed Design	DoE/Environmental & Social Circle, LGED/ Bangladesh Water Development Board	Review and approve environmental mitigation and management measures.
Detailed Design	DOE	Review the Project ESIA and provide Environmental Clearance Certificate for the Project.
Pre-construction stage: Land Acquisition and Resettlement (Amendment, LARIPO 2017)	District DC offices of the Project influential zone	Joint verification and payment of the Compensation money to the affected people
Construction - stage	Contractor's Environment, Health and Safety Officer and Construction Supervision Consultant (CSC)	Implementation of required environmental measures for occupational health and safety
	Site Engineer and Environmental Supervising Consultant of CSC	Supervision the implementation of Contractor's environmental measures under the ESMP on a daily basis. Enforce Contractual requirements.
	Environmental Supervising Consultant of CSC and site Engineer	Conduct the Environmental Audit during construction phase through environmental inspections and collection of monitoring data, submission of quarterly reports. Provision of training and technology transfer to staff.
	DOE	Ensure compliance with GOB legal requirements during construction.
Operation	CSC on behalf of LGED	Undertake environmental monitoring and prepare quarterly reports. Provide budget to undertake environmental monitoring for 1 year after completion of Project

8.5 Project Management Unit (PMU)

- A PMU has been established for the overall management of the project. The PMU is headed by Project Director (PD) supported by officials including others member. The PMU will receive support from environmental and Social specialist on the CSC team. Key tasks and responsibilities of the LGED Safeguard officer are as follows:
 - confirm existing ESIA/ESMP are updated based on detailed designs, and that new ESIA/ESMP are prepared in accordance with the ESRF and project selection criteria related to safeguards;

- confirm whether ESIAs/ESMPs are included in bidding documents and civil works contracts;
- provide oversight on environmental management aspects of project and ensure ESMPs are implemented by project implementation unit (PIU) and contractors;
- Site specific ESMP would be submitted by the contractor before start of the work” as a contract clause by PMU
- establish a system to monitor environmental safeguards of the project, including monitoring the indicators set out in the monitoring plan of the ESMP;
- facilitate and confirm overall compliance with all government rules and regulations regarding site and environmental clearances, as well as any other environmental requirements (e.g.,
 - location clearance certificates, environmental clearance certificates, etc.), as relevant;
 - supervise and provide guidance to the PIUs to properly carry out the environmental and social monitoring and assessments as per the ESMP;
 - review, monitor, and evaluate the effectiveness with which the ESMPs are implemented and recommend necessary corrective actions to be taken as necessary;
 - consolidate monthly environmental monitoring reports from PMUs and submit semi-annual monitoring reports to AIIB;
 - ensure timely disclosure of final ESIAs/ESMPs in locations and form accessible to the public; and
 - address any grievances brought about through the grievance redress mechanism in a timely manner.
 - Construction Supervision Consultants (CSC)
 - Consultants will be retained to oversee the construction of the Project. As part of this Consultancy Contract, the responsibility of environmental Consultant is to monitor the environmental effects of the Project and to supervise the implementation of environmental mitigation measures. The specific environmental consultancy services envisaged are:
 - The development of an environmental auditing protocol for the construction period, and the formulation of a detailed monitoring program;
 - The regular monitoring and submission of quarterly reports to LGED and the donor.

8.6 Monitoring and Reporting

- i. LGED and CSC will monitor and measure the progress of ESMP implementation. The monitoring activities will correspond with the project’s risks and impacts, and will be identified in the IEE/ESIA for the project road. In addition to recording information on the work and deviation of work components from original scope PMU, CSC will undertake site inspections and document review to verify compliance with the ESMP and progress toward the final outcome. Corrective actions to be taken quickly and reported in monitoring reports.
- ii. Contractor shall submit monthly Environmental and Social Monitoring Report covering the mitigation measures listed in this ESMP for all the project road to the CSC for approval.
- iii. CSC will submit monthly monitoring and implementation reports to PMU, who will take follow-up actions, if necessary. PMU will submit semi-annual monitoring reports to Bangladesh Bank. The suggested monitoring report format is in Bangladesh bank. Project budgets will reflect the costs of monitoring and reporting requirements. For projects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis. Monitoring reports will be posted in a location accessible to the public.

Chapter Nine

CONCLUSION AND RECOMMENDATIONS

- i. The proposed road is an existing alignment that will improve connectivity between offer continued access road of the entrance, bridge, culvert, plaza etc. However, the new alignment from Keraniganj Upazila, the proposed road is classified as an environment category “Orange B”.
- ii. The majority of impacts during the construction period will be mitigated by good construction housekeeping measures taken by the contractor. There will be standard procedures for the control and mitigation of emissions, such as dust, noise, exhaust fumes and liquid discharges from the construction sites, depots and work camps. All construction activities close to river will be controlled and the rivers must be protected from contamination. Wastewater from construction camps will be treated on site in settlement and aeration basins, where biological waste will be processed, before discharge. Septic sludge from toilets will be carried to existing water treatment plants. Solid Waste will be disposed offsite in approved and managed waste disposal sites. Ground water is not expected to be impacted by the project, as no deep excavations or major cuts for new roads and other developments are necessary. Water for the construction activities as well as the camps will be extracted in relatively small quantities from existing wells or the public supply system. Generally, water availability is unconstrained in the project area.
- iii. Noise and exhaust emissions will be minimized by the Contractors according to the requirements by using modern equipment and machinery by complying with modern emission standards, and to maintain the equipment in good working order throughout the project. This will be prescribed in the equipment specifications in the tender documents. Nuisance to the public will be minimized by limiting work hours, with no night time works near housing and other sensitive areas. Where works are carried out in close vicinity to existing residential areas additional measures, such as noise barriers or the installation of insulating windows will be considered in accordance with good practice and in consultation with the community.
- iv. Construction materials (hardcore, sand, spoil soil etc) will be obtained from a variety of borrow pits that are not operated by the Contractors. However, in accordance with the ESMP all borrow pit must be approved by the supervision consultants (who will ensure that international good practice is followed). Construction access routes will be agreed prior to construction start and will not disturb any sensitive uses.
- v. Flora and fauna will be impacted during the construction period but significant changes to the natural environment have already taken place close to the road and impacts to key species of concern are expected to be low. There are no forest areas or other sensitive areas near the alignment. However, there will be significant loss of trees, and there will be a major social reforestation program in line with standard LGED policies. No cultural or physical resources will be affected.
- vi. There will be some displacement of existing residents. Initial consultation with the community has taken place as part of the Resettlement Action Plan and this will continue during the Field visit and RAP stages. Consultation with the community will take place in connection with the preparation of the ESIA during the RAP stage.
- vii. This ESIA has included an Environmental and Social Management Plan (ESMP) for the construction and operation periods which should be approved by LGED. A monitoring program has also been prepared as part of the ESMP. The ESMP will be incorporated into the tender documents and will become part of the works contracts. The Contractors will be required to have permanent staff on site with the specific responsibilities of environmental and social management, reporting to the supervision engineers and their environmental and social specialists, and to the local authorities.
- viii. In summary, the project will have an overall beneficial impact after completion in terms of reducing transport cost and fuel consumption of vehicles and also improving socio economic conditions along the project road. It will have insignificant negative impact on air quality, noise level, watercourses and soil during civil works, which will be appropriately monitored and adequately mitigated. At present, this report has not identified any comprehensive, broad, diverse or irreversible adverse impacts caused by the proposed road project.

APPENDIX

Appendix 1: Existing Environmental Standards

ENVIRONMENTAL QUALITY STANDARDS IN BANGLADESH

(According to Bangladesh Conservation Rules, 1997)

1 AIR POLLUTION STANDARDS

1.1 Ambient Air Quality Standards for Different Categories of Environment

Parameters	SPM	PM _{2.5}	PM ₁₀	NO ₂	SO ₂	CO	O ₃
ECR, 1997	200 (µg/m ³)	65 (µg/m ³)	150 (µg/m ³)	100µg/m ³ (0.053 ppm)	365µg/m ³ (0.14 ppm)	9 ppm	157µg/m ³ (0.08 ppm)

Note: 1. Sensitive areas include national monuments, health resorts, hospitals, and archaeological, sport, and educational institutions

- Any industrial unit located not in a designated industrial area will not discharge such pollutants which can cause to exceed the ambient air quality prescribed above in the surrounding areas for the categories 'residential and rural' and sensitive'.
- Suspended particulate matter refers to airborne particulate of 10 µm or less in diameter
- The above values correspond to the maximum permissible amounts/concentrations to be present in randomly sampled air.

1.2 Standard Values for Motor Vehicle Exhaust

Parameters/Determinants	Unit	Standard value
- Black smoke ⁽¹⁾	Hatridge Smoke Unit (HSU)	65 (3)
- CO (2)	g/m ³ percent volume	24.4 (4)
- Hydrocarbon ⁽²⁾	g/m ³	2
	Ppm	180
- NO _x (2)	g/m ³	2
	Ppm	600

- Note:**
- (1) measured at two-thirds of maximum rotating speed
 - whichever is lower out of two values expressed in two different units
 - for vehicles more than 5 years old, or have completed 80,000 km the standard value is 75 HSU
 - two and three-wheeler vehicles with engine displacement less than 50 cm³ the standard value is 5 volume percentage, for other two and three wheelers 4.5 volume percentage.

(1) When measured, the motor vehicles should be stationary and engine conditions are as follows:

- For diesel engine: at maximum rotating speed
- For gasoline engine: no-load acceleration at ¾ of maximum rotating speed

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- For motor cycles: when maximum rotation speed is more than 5000 RPM, measure at $\frac{1}{2}$ maximum rotating speed, when less than 5000 RPM at $\frac{3}{4}$ of maximum rotating speed.

2 NOISE POLLUTION STANDARDS

2.1 Emission Standards set for Noise Pollution for the different Land Use

Areas Category (*)	Unit	Standard Value	
		Day Time	Night Time
A	dB(A) dB(A)	45	3
B	dB(A) dB(A)	50	5
C	B(A)	60	4
D		70	0
E		75	5

A: areas where quietness is specially required, such as where there is a concentration of convalescent facilities (hospitals) and educational institutions.

B: areas which are used mainly for residential purposes.

C: areas which are considerably used for residential purposes and which are also destined for commercial and industrial purposes.

D: commercial areas.

E: industrial areas.

Note

- The maximum allowable limit in the working place is 90dB(A) when working up to 8 hours per day. When working for more than 8 hours the maximum allowable limit is set at 85dB(A).

- Earplugs and ear muffs shall be provided by the plant manager/owner to workers who work in a work place with noise levels exceeding 85dB(A).

3 WATER QUALITY STANDARDS

3.1 Standard values for Wastewater Discharged from Industry or Project

Parameter/Determinant	Unit	Standard		
		Discharge into Inland Water	Value Discharge into Public Sewer	Discharge on Land/Irrigation
· Ammonia (NH ₃)	mg/l	5	5	15
· Ammonical nitrogen (as N)	mg/l	50	75	75
· arsenic	mg/l	50	250	500
· BOD	mg/l	2.0	2.0	2.0
· boron	mg/l	0.05	0.5	0.5
· cadmium	mg/l	3	5	na
· carbon dioxide(dissolved)	mg/l	600	600	600
· chloride	mg/l	0.5	1.0	1.0
· chromium (asCr ⁶⁺)	mg/l	0.1	1.0	1.0
· chromium(total)	mg/l	200	400	400
· chromium (6+)	mg/l	0.5	3.0	3.0
· COD	mg/l	4.5-8	4.5-8	4.5-8
· Copper	mho/	1200	1200	1200
· Dissolvedoxygen	cm	2	15	10
· electroconductivity	mg/l	1	2	1
· fluoride (asF ⁻)	mg/l	2	2	2
· hydrogensulphide	mg/l	100	100	100
· Iron	mg/l	0.1	0.1	0.1

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. Total Kjeldahl Nitrogen (N ₂)	mg/l	5	5	5
. Lead	mg/l	1.0	2.0	1.0
. Manganese	mg/l	10.0	na	10
. Mercury	mg/l	10.0	20	10
. Nickel	mg/l	1.0	5	1
. Nitrate (N ₂)	mg/l	8.0	8	15
. Oil and grease	mg/l	to be decided	8	1
. Dissolved phosphorus		6-9	6-9	6-9

na: no value established

3.2 Standard Values for (Domestic) Sewage Effluent

Parameters/Determinants	Unit	Standard
BOD	mg/l	40
Nitrate	mg/l	250
Phosphate	mg/l	35
Suspended solids	mg/l	100
TESMP erasure	°C n/100m1	30
Coli form count		1000

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3.3 Quality Standards for Surface Water

Use Class	Parameter/Determinant			
	PH	BOD (Mg/l)	DO (mg/l)	Total Coliform bacteria (No./100 ml)
1. Drinking Water Sources, only after supplied as bacteria free	6.5-8.5	2 or below	6 or above	50 or below
2. Use of water for Recreational Classes	6.5-8.5	3 or below	5 or above	200 or below
3. Drinking water source for supplied after traditional treatment	6.5-8.5	3 or below	6 or above	5000 or below
4. Use of water for fish	6.5-8.5	6 or below	5 or above	5000 or below
5. Use of water for different processing and cooling purposes in industries	6.5-8.5	10 or below	5 or above	-
6. Use of water for irrigation purposes	6.5-8.5	10 or below	5 or above	1000below

3.4 Water Quality Standards for Drinking Water

Parameter/Determinant	Unit	Standard
• Aluminium	mg/l	values0.2
• Ammonia	mg/l	0.5
• Arsenic	mg/l	0.05
• Barium	mg/l	0.5
• Benzene	mg/l	0.01
• BOD	mg/l	0.2
• Boron	mg/l	1
• Cadmium	mg/l	0.005
• Calcium	mg/l	75
Tin	mg/l	2
Turbidity	J.T.U	10
Zine	mg/l	5

not yet defined

* per 100ml in two consecutive samples

** desirable1 limit for drinking water

Note: where a range is mentioned the lower value may be used for warning and the higher value for initiation of corrective measures.

Appendix 2: Trees and Sensitive Use Survey Data

Results of roadside trees survey and land use survey of a corridor of approximately 20 meters from edge of existing Keraniganj Upazila Road carriageway, a, Road side Trees

Name of Trees	Size of Trees				Total
	Large	Medium	Small	Sapling	
Mahogany	5742	13402	26803	1915	47862
Supri	2820	4937	9873	0	17630
Bamboo	0	49109	0	0	49109
Coconut	779	645	332	196	1952
Banana	2675	3577	1573	0	7825
Boroi	136	240	480	0	856
Koroi	5673	6284	6892	1419	20268
Jack Fruit	797	631	613	0	2041
Mango	188	1523	843	164	2718
Akasmoni	577	1352	2703	194	4826
Debdaru	150	382	2516	763	3811
Banyan	1	4	8	0	13
Tamarind	4	26	11	2	43
Shishu	7	44	22	4	77
Guava	11	27	54	4	96
Babla	5	16	31	3	55
Other Timber	216	693	1030	40	1979
Papaya	2	292	409	27	730
Segun	1	30	15	2	48
Neem	3	0	12	6	21
Krishnochura	0	0	2	1	3
Date	10	25	50	4	89
jambura	3	7	14	1	25
Total	19800	83246	54286	4745	162077

Appendix 3: Rapid Environmental Assessment (REA)

Checklist

➤ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the LGED / CSC		
➤ This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.		
➤ This checklist focuses on environmental issues and concerns. checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.		
➤ Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. use the "remarks" section to discuss any anticipated mitigation measures.		
Name of District: Dhaka		
Project Title	:	Keranigonj Upazila Road Up-gradation Project
Sector Division	:	Keranigonj Upazila (N2) Road Local Government Engineering Department (LGED) , Ministry of Local Government, Rural Development & Co-operative

Field Survey on Environmental Questionnaire

Screening Questions	Yes	No	Remarks
A. Projects ting Is the project area adjacent to or within any of the following environmentally sensitive areas?			
CULTURAL HERITAGE SITE	√		Alongside the road some cultural heritage sites are located, such as mosque, religious institutes, graveyard, etc. Dislocation of these sites can be done through conducting Public/ community consultations and mutual understanding.
PROTECTED AREA		√	
WETLAND		√	
MANGROVE		√	
ESTUARINE		√	
BUFFER ZONE OF PROTECTED AREA		√	
SPECIAL AREA FOR PROTECTING BIODIVERSITY		√	
POTENTIAL ENVIRONMENTAL IMPACTS Will the Project cause...			
Encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?	√		A few physical structures may be partially encroached / affected by widening of existing road. Disfiguration of landscape by road embankments, cuts, fills, and quarries may occur.
Encroachment on precious ecology (e.g. sensitive or protected areas)?		√	

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Screening Questions	Yes	No	Remarks
Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?		√	
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	√		Deterioration may occur at construction camps and work site, if proper mitigation measures (under the ESMP) are not followed by contractors during construction stage of project.
Screening Questions	Yes	No	Remarks
Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	√		May occur during construction stage of project if proper mitigation measures (under the ESMP) are implemented by the contractors during construction stage of project.
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation during project	√		To avoid risks and vulnerability appropriate mitigation measures related to occupational and community health and safety need to be included in the ESMP and implementation.
Noise and vibration due to blasting and other civil works?	√		Noise attenuation and vibration preventive measures should be implemented by the Contractors during the civil works.
Dislocation or involuntary resettlement of people?	√		Proper implementation of Resettlement Action Plan is required.
Dislocation and compulsory resettlement of people living in right-of-way?	√		Proper implementation of Resettlement Action Plan is required.
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	√		Resettlement Action Plan should properly address impacts on the poor, women and children, Indigenous Peoples or other
Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?	√		Not significant
Hazardous driving conditions where construction interferes with pre-existing roads?	√		Proper traffic management is needed during civil works.
Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	√		Proper accommodation of labors, sanitation, safe drinking water and drainage facilities, and curative and preventive measures on health safety of the workers with awareness camping on transmission of communicable diseases should be considered in the labor camps and work sites.
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	√		If filling materials will collect from the borrow pits alongside the project road, which needs proper design for digging and maintenance during operation stage of project.
Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?	√		Implementation of Road safety design and good traffic management is needed to avoid accident risks and spill of toxic chemicals during operation stage of project

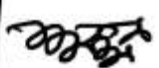
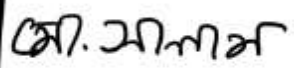
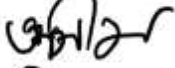
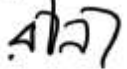
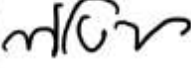
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Screening Questions	Yes	No	Remarks
Increased noise and air pollution resulting from traffic volume?	√		Insignificant. Good design of road pavement may reduce the noise and air pollution resulting from increased traffic volume during operation stage.
Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	√		Insignificant.
Social conflicts if workers from other regions or countries are hired?	√		Local people, especially project affected persons should be given priority to involve in the construction works at site.
Screening Questions	Yes	No	Remarks
Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	√		Insignificant. Mitigation measures under ESMP should be implemented properly
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	√		Insignificant. Mitigation measures under ESMP should be implemented properly
Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning.		√	
Climate Change and Disaster Risk Question The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.			
• Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix)	√		• Project area may subject to hazards such as earthquakes, floods and tropical cyclone winds. Climate change aspect should be considered in Road design, Pavement design of the project.
• Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., increased erosion or landslides could increase maintenance costs, permafrost melting or increased soil moisture content could affect subgrade).	√		• Insignificant
• Are there any demographic or socioeconomic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		√	

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Screening Questions	Yes	No	Remarks
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by encouraging settlement in areas that will be more affected by floods in the future, or encouraging settlement in earthquake zones)?		√	

Appendix 4: Public Consultancy

<u>Name</u>	<u>Profession</u>	<u>Impact</u>	<u>Signature</u>
1. Shukkur Ali	Tea seller	Positive	
2. Akbar Mia	Rickshaw Puller	Positive	
3. Rohim Islam	Rickshaw Puller	Positive	
4. Md. Barak	Cobbler	Positive	
5. Md. Salam	Veg. Hawker	Positive	
6. Rashed Mia	Croc. Hawker	Positive	
7. Jasim Ali	Icecream Seller	Positive	
8. Bina Begum	Tea seller	Positive	
9. Latif Mia	Rickshaw Puller	Positive	
10. Amonullah	CNG Driver	Positive	