GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
LOCAL GOVERNMENT ENGINEERING DEPARTMENT (LGED)

ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR RURAL TRANSPORT IMPROVEMENT PROJECT (RTIP-2)

FINAL REPORT

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Abbreviations

	Assistant Engineer
BDWS	Bangladesh Drinking Water Standard
BIWTA	Bangladesh Inland Water Transport Authority
BMD	Bangladesh Meteorological Department
BWDB	Bangladesh Water Development Board
CSC	Construction Supervision Consultant
DG	Director General
	Department of Environment
DPHE	Department of Public Health Engineering
DPR	Detailed Project Report
DSM	Design Supervision Management
DWQ	Drinking Water Quality
EA	Environmental Assessment
ECA	Environmental Conservation Acts
ECC	Environmental Clearance Certificate
ECP	Environmental Code of Practices
	Environment Conservation Rules
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EMRP	Environmental Management Regulatory Procedure
EMS	Environmental Management System
EMT	Environmental Management Team
FGD	Focus Group Discussions
GOB	Government of Bangladesh
GRC	Grievances Redress Committee
GWQ	Ground Water Quality
IDA	International Development Association
ICZMP	Integrated Coastal Zone Management Plan
IEE	Initial Environmental Examination
IRC	Independent Review Committee
LGED	Local Government Engineering Department
MOEF	Ministry of Environment and Forest
MSDS	Material Safety Data Sheets
NEMAP	National Environment Management Action Plan
NEQS	National Environmental Quality Standards
NGOs	on-Government Organizations
NOC	No Objection Certificate
NSC	National Conservation Strategy
OP	Operational Policy
PAPs	Project Affected Persons
PIC	Project Implementation Cell
PIU	Project Implementation Unit
PMU	Project Management Unit
PPE	Personnel Protective Equipment
RP	Resettlement Plan
RTIP	Rural Transport Improvement Project
SECs	Special Environmental Clauses
SPARSO	Space Research and. Remote Sensing Organization
SWQ	Surface Water Quality
WB	World Bank
WMS	Women Market Sections
XEN	Executive Engineer

Executive Summary

1.0 Introduction

The Local Government Engineering Department (LGED) with the financial assistance of the World Bank (WB) has been successfully implementing rural infrastructure development projects since early nineties of the last century. After successful implementation of previous three projects, the Government of Bangladesh (GOB) looked for financial assistances from the International Development Association (IDA) of the World Bank to improve and rehabilitate the high-priority rural infrastructure in 26 districts covering eastern parts of Bangladesh (excluding Chittagong Hill Tracts) under LGED. Responding the GoB's request, IDA agreed to extend its credit facilities of about US$ 300 million for the Second Rural Transport Improvement Project (RTIP-2). The GoB contribution for this project will be US$ 117 million.

This project will support rural transport related infrastructure including inland water transport and maintenance needs of the 26 contagious districts of Bangladesh comprising Pabna and Sirajgonj Districts (under Rajshahi Division),Tangail, Dhaka, Manikgonj, Gazipur, Munshigonj, Narayangonj, Narsingdi, Mymensingh, Jamalpur, Sherpur, Netrokona and Kishoregonj Districts (Under Dhaka Division), Comilla, B-Baria Noakhali, Laxmipur, Feni, Chittagong, Cox's Bazar and Chandpur Districts (under Chittagong Division) and Sylhet, Hobigonj, Sunamgonj and Moulvibazar Districts (under Sylhet Division). It is expected that improvement of physical infrastructure will help reduce rural poverty by providing people and communities with opportunities to enhance productivity and access to innovations and more gainful marketing facilities. To this end, the locations of the project's physical components, such as the rural road maintenance, rural waterways, and growth center markets will be selected to create transportation and socio-economic networks to maximize intra-rural as well as rural-urban interactions. The RTIP-2 bears potential risk on physical, biological, social and cultural environment in the project area. Because of weak geology, rich biodiversity, high dependency of people on natural resources and widespread poverty, the social and environmental impacts are visibly significant, particularly when construction works are undertaken in rural areas. Generally, the environmental and social risks triggered by RTIP-2 activities include erosion and slope instability; loss of plants, biodiversity and agricultural land; effect to water sources due to sedimentation, water logging and drainage congestion, displacement/damage of permanent assets and loss of land. So, proper consideration of all environmental and social factors during design and implementation is of utmost concern in RTIP II of LGED in Bangladesh.

This Environmental Management Framework (EMF) is required for the RTIP II to identify the required environmental management measures that need to be taken by the Project authorities during the planning, design, construction and operations of the rural road improvements, rural road maintenance, rural waterways, growth center markets, in order to ensure compliance with the Government of Bangladesh own requirements and those of the World Bank. All the major environmental impacts along with mitigation and management measures have been compiled in the form of EMF.

The project will include three components: Component A- Accessibility Improvement, Component B- Institutional Strengthening, Capacity Building and Governance Enhancement, and Component C- Rural Transport Safety.

a. Accessibility Improvement (US$ 377 million): It will comprise four sub-components:
    i. Rural Road Improvement (US$ 170 million)
    ii. Rural Road Maintenance (US$ 197 million)
    iii. Rural Waterways (US$ 4 million)
    iv. Growth Center Markets (US$ 6 million)
b. Institutional Strengthening, Capacity Building & Governance Enhancement Component (US$ 35 million): It will comprise two sub-components
    i. Institutional Development and Governance (US$ 9 million):
    ii. Project Implementation (US$ 26 million):
c. Rural Transport Safety Component (US$ 3 million): This component will consist of two sub-components focused on the safety of rural roads and rivers.
    i. Rural Roads Safety:
    ii. River Safety:

The EMF provides general policies, guidelines, codes of practice and procedures to be integrated into the implementation of the World Bank-supported RTIP-2. It defines the steps, processes, and

procedures for screening, alternative analysis, assessment, monitoring and management. In addition, the EMF will analyze environmental policies and legal regime of Bangladesh and safeguard policies of the World Bank as well as institutional and capacity assessment for environmental management. The physical intervention of the projects The EMF is intended to be used as a practical tool during program formulation, design, implementation, and monitoring in RTIP-2.

The EMF will be followed during project preparation and implementation for ensuring environmental integration in planning, implementation, and monitoring of project supported activities. For ensuring good environmental management in the proposed RTIP-2 program, the EMF will provide guidance on pre-investment works/studies (such as environmental screening, environmental assessment, environmental management plans, etc.), provide set of steps, process, procedure, and mechanism for ensuring adequate level of environmental consideration and integration in each investment in the project-cycle; and describes the principles, objectives and approach to be followed to avoid or minimize or mitigate impacts. The EMF contains the following:

- Environmental factors that needs to be considered while planning and design of different categories of activities under the RTIP-2.
- Environmental screening criteria: criteria, process, procedures, steps, time, and responsibility as well as necessary tools (format, checklist etc.) for environmental screening of the investment under the RTIP-2.
- Environmental assessment guidelines: Steps, process and procedures to be followed in different levels of environmental assessment (limited or full assessment). This includes guidance on the project level baseline information, impact identification, alternative analysis, assessment and designing mitigation measures, and in preparing Environmental Management Plan (EMP).
- The EMF includes project/ activity level environmental monitoring framework.
- The EMF includes the institutional arrangement for implementing EMF, environmental code of practices to be followed in project/activity level, capacity strengthening plan for environmental capacity of the involved parties in accordance with their role and functions, guidance on appropriate ways of holding consultations.

The EMF has been prepared through participatory process mainly based on open ended discussions, formal and informal interaction with stakeholders that lead to an understanding of the existing system from the perspectives of all the stakeholders. The work has been performed in close cooperation with the project team. This included collection of secondary data, related literatures, field surveys, public/stakeholder consultations, and desk studies.

The EMF is intended to define the process and outputs necessary to address the potential negative impacts of the physical works to be carried out under RTIP-2 for various sub-projects associated with the rural road improvements, rural road maintenances, rural waterways, and growth center markets. In order to safeguard against any unexpected serious impacts and to improve the general environmental management practices, this EMF outlines a screening/assessment process and actions to be taken in case there is any possibility that the IDA's environmental safeguards may be triggered.

The EMF clearly describes how the potential environmental impacts of all sub-projects will be managed during preparation, implementation and, in the post-implementation periods. The EMF incorporates a framework for implementation, monitoring, supervision, auditing and reporting of the EMF requirements. The EMF report also includes Environmental Codes of Practice (ECP) and sample Environmental Management Plan (EMP) for each type project subcomponent to assist the LGED/Design Supervision Management (DSM) Consultants in preparation of the necessary environmental specifications and/or sub-project specific EMP for integration of impacts avoidance/prevention/mitigation measures with the design and contract documents of the sub-projects. The applicability of the sample EMP/ ECP to a particular type of sub-projects under each project component and/or need for further EA and sub-project specific EMP has also been established in the EMF.

The EMF also defines required mitigation measures to be carried out by this contractor to minimize potential negative impacts during and after the execution of physical works. The minimum prevention /mitigation requirements to be implemented during the implementation of the sub-projects will be included in the bidding and contract documents. The EMF provides for integration of the environmental assessment and management process with the overall project preparation and implementation process.

2.0 Environmental Policy, Legal and Administrative Framework

Regulatory requirements toward protection and conservation of environment have been enunciated by the GOB as well as the WB and pertinent policies and regulations among these requirements are summarized as under:

- Relevant Government Policies, Acts, Rules, Strategies and Guidelines
  - Environmental Conservation Act (ECA), 1995 and Amendments
  - Environment Conservation Rules (ECR), 1997 and Amendments
  - Environmental Policy, 1992
  - Environmental Action Plan, 1992
  - National Environmental Management Plan (NEMAP), 1995
  - Bangladesh Wildlife (Preservation) Order, 1973 (Amended in 1994)
  - National Conservation Strategy (NCS), 1992
  - Wetland Policy, 1998 (Draft)
  - National Water Policy, 1999
  - National Water Management Plan, 2001 (Approved in 2004)
  - The National Fisheries Policy, 1999
  - The Protection and Conservation of Fish Rules, 1985
  - National Agricultural Policy, 1999
  - Coastal Zone Policy, 2005
  - Coastal Development Strategy, 2006
  - The Embankment and Drainage Act, 1952
  - Bangladesh Climate Change Strategy and Action Plan
  - DOE's IEE/EIA including EMP Guidelines for Industry, 1997
  - LGED's Strategy, Guidelines and Environmental Code of Practices
- World Bank's Environmental Safeguard Policy
  - OP/BP 4.01 Environmental Assessment
  - OP/BP 4.04 Natural Habitats
  - OP/BP 4.11 Physical Cultural Resources
  - OP/BP 4.36 Forestry
  - OP/BP 4.12 Involuntary Resettlement
  - IFC Environmental, Health and Safety Guidelines
- Implication of GOB Policies in RTIP-2
- Implication of Safeguard Policies of WB in RTIP-2

3.0 Description of Baseline Environment

The Project will be implemented in 26 districts out of 64 districts of Bangladesh. These districts are under four divisions of the eastern part of Bangladesh (except hill tracts districts). It will include 224 upazilla (sub districts) covering 61,000 sq.km (41% of Bangladesh's land area) and 60 million (48.60% of total population). The name of the districts are Pabna and Sirajganj, Sylhet, Hobiganj, Sunamganj and Moulavibaza, Dhaka, Tangail, Manikganj, Gazipur, Munshiganj, Narayanganj, Narsingdhi, Mymensingh, Jamalpur, Sherpur, Kishoreganj, and Netrokona, Comilla, B.Baria, Chandpur, Noakhali, Laxmipur, Feni, Chittagong and Cox's bazar.

Name & location of the subprojects under each project component have not yet finalized by the LGED. However, LGED has prepared an initial list for 1st year periodic maintenance work (**Annex 1**), which will be finalized before the project appraisal. The waterways subcomponent and some road improvement and growth center market locations are initially identified.

Since the project is covering around 41% of the country's area and the subproject are not finalized, it is not possible to prepare any project specific environmental baseline for the project. Alternatively, the EMF includes the environmental baseline of the each subproject type. In addition, the generic environmental baseline on the basis of national & divisional context is also described in **Annex 2**.

The baseline environment for the subproject of each project components of RTIP-2 has been described under this chapter regarding the project activities that relates to the area-specific conditions pertaining to Atmosphere and Climate, Topography, Physiography and Geology, Seismicity, Hydrology and Drainage, Air Quality, Noise Quality etc. under physical environment and Terrestrial Ecology, Aquatic Ecology, Biodiversity, National Conservation Site of Importance under Biological Environment, and Demography, Settlement Pattern, Land Use and Water Use Pattern, Water Supply and Sanitation, Fisheries Industries and Commerce, Cultural and Archeological Resources under Socio-economic Environment.

4.0 Potential Environmental Impacts and Mitigation Measures

This section details out the potential environmental impacts of the sub-projects funded by the WB under the Rural Transport Improvement Project (RTIP-2). The environmental impacts identified at this stage are preliminary in nature and will need to be further elaborated and potential for occurrence has to be ascertained during further stages of project design and implementation. The potential impacts will identified during various stages of the project preconstruction, construction and operation as their potential nature, extent, duration and severity differs between the nature of projects and stages.

An environmental impact will defined as any change to an existing condition of the environment. The impacts will be determined as significant, positive or negative, direct or indirect, long term or short term. The magnitude of environmental effects may be expressed quantitatively (where possible), but in most cases qualitative evaluations are made. Environmental impacts can broadly be classified as those taking place during pre-construction, construction and operational phases of the RTIP-2 activities. Activities/actions involved affecting environmental resources; values at different phases of the project implementation as well as potential/significant environmental impacts will list and should discussed detail in the EMP. The overall mitigation strategies will the following main components:

- Impact avoidance: changing project location, design and construction methods to avoid impacts.
- Impact minimization: where impacts cannot be avoided, implementing mitigation measures to reduce the impact to acceptable levels.
- Compensation: where impacts cannot be avoided or sufficiently mitigated, arranging compensation.
- Enhancement: measures, which, at little cost to the project, give appreciable social or developmental benefits.

The potential impacts and possible mitigation measures for a subproject under each of following component of the project: (i) rural road improvements; (ii) rural road maintenance; (iii) rural waterways; and iv) growth centre markets are described in **chapter 4** and subcomponent wise impacts and mitigation measures has been described in **Annex 3.**

5.0 Environmental Management System

The Environmental Management System (EMS) establishes the criteria to identify the level of Environmental Assessment (EA) and the processes involved, their sequence to conduct the EA studies for various components/phases of the rural road improvements, rural road maintenance, rural waterways, growth center markets including their legal requirements and implications (Figure 5.1). Comprehending the level of EA will help the RTIP-2 in assessing the requirement of external agency in the form of consultancy services and also the stage of such requirement, like Design Consultant at planning and design stages and Construction Supervision Consultant (CSC) at construction stage etc.

Once the need/justification of a project is finalized based on the engineering parameters (like traffic, economical and financial analysis), the process of Environmental Management System starts. First step in EMS is screening of the project components to ascertain the category of Environmental Assessment required.

The category of EA can be assessed by RTIP-2 or if desired can be offered to some agency or independent environmental expert. It is worth to mention here that any external agency or consultant or expert can help RTIP-2 in analyzing and reporting of environmental features and parameters, filing the application for clearance and approval, but ultimately the responsibility lies with RTIP-2. The RTIP-2 has to ensure that all legal rules and regulations set by the DOE through the Ministry of Environment and Forest (MOEF) are adhering with.

The Rural Transport Improvement Project (RTIP-2) will have four major sub-components under the accessibility improvement component. These are: (i) improvement of 1,060 km existing upazila and union roads; (ii) maintenance of 3,550 km existing rural roads; (iii) piloting rural waterways; and (iv) construction of Growth Center Markets. Although the project scope is mainly limited to improvement and maintenance of selected rural roads and construction of fifty growth center market in existing market place, the project classified as a Category A project due to the complexity of environmental issues associated with waterways improvements and also the uncertainty (lack of details at project preparation) of the most of the sub-projects to be implemented in widespread areas. The policies on environment assessment (OP/BP 4.01), natural habitats (OP/BP 4.04) and physical cultural resources (OP/BP 4.11) have been triggered for the proposed operation. The general principles of RTIP-2 is given below-

- The Project Director will be responsible for the environmental compliance monitoring and oversight to ensure overall project environmental compliance. The Consultants that would be hired by LGED would assist the project proponent to carry out this mandate.
- The implementing agency will follow the related government rules (laws, ordinances, acts etc.) and World Bank Operational Policies and Guidelines. This EMF would serve as the basis for ensuring this compliance.
- LGED will submit the EMF to the Department of Environment (DOE) for their review and concurrence.
- LGED will ensure the participation of local community in planning and implementation of sub-projects.
- LGED will be responsible for obtaining and ensuring clearance required from the DOE. The clearance procedure has been mentioned in Section 2.1.19 of Chapter-2.The LGED will be responsible for obtaining environmental clearance for the RTIP-2 components for which the EIA study is required. For the rest components of the RTIP-2, LGED will implement themselves without DOE clearance. No project activities will be carried out in and nearby the environmental protected and critical areas as well as in disputed lands or lands restricted for development.
- All the activities proposed under the project will abide by existing Environmental Code of Practices (ECP) prepared under RTIP-2.
- Ensure provision of First Aid Kit at camp site with proper drinking water and sanitation facilities. Worker's health and safety measures shall be ensured and use of personal protective equipment shall be at place.

The environmental assessment process of RTIP-2 components has been clearly described in section 5.2.3. The summary of the environmental assessment are given below:

- Rural Road Improvement
  - RTIP-2 will ensure that proper environmental screening will be done by the design consultant.
  - Design consultant will ensure Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) of the all rural road sub-projects.
  - Management Consultant will review and clear all screening and environmental assessment reports.
  - LGED will conduct verification of some screening and assessment.
- Rural Road Maintenance
  - Only for the first year subprojects, an individual consultant will carry out the environmental screening.
  - LGED will ensure that proper environmental screening will be done by the design consultant.
  - Management Consultant will review and clear all screening reports.
  - LGED will conduct verification of some screening.
- Rural Waterways
  - An individual consultant will prepare 2 separate screening, IEE and EIA report for the waterways.
  - LGED will ensure that Initial Environmental Examination (IEE) report will be prepared by the design consultant and site clearance will get from DOE.

- Management Consultant will review and clear the IEE and EIA reports before sending to DOE.
- The consultant will ensure that environmental considerations are given sufficient attention. To this end, it will carry out EIA with Environmental Management Plan (EMP) for all rural waterways subprojects based on the IEE. EIA report will be reviewed by the management consultant and will get clearance from DOE by LGED.

- Growth Center Markets
  - LGED will ensure that proper environmental screening will be done by the design consultant.
  - Management Consultant will review and clear environmental screening.

The guidelines for the environmental screening and environmental assessment for the RTIP-2 have been developed and incorporated in this document. The purpose of the environmental screening is to get relevant concerns addressed early on before further design of a project and to ensure that actions to mitigate environmental impacts or enhance environmental opportunities are budgeted for. The environmental screening will be the preliminary step to identify any potential impacts due to the project activities. Based on an extensive literature review and expert consultation, screening checklist have been developed and provided in the Annex 7. The Environmental Screening, Initial Examination and/or Impact Assessment will need to be carried out for sub-projects under RTIP-2. The environmental screening and assessment will be used by the implementing agencies as a decision-making tool to ensure that the project design and implementation of activities such as dredging are environmentally sound and sustainable. However, site specific environmental baseline, environmental analysis and management plan to be incorporated.

For each of the environmental components, the monitoring plan specifies the parameters to be monitored; location of the monitoring sites and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. There are two types of monitoring: Quantatitive & Qualatitive. The quantitative monitoring plan for the various environmental condition indicators of the subproject in construction and operation stages is presented in **Table 5.8 to Table 5.11.** Monitoring plan does not include the requirement of arising out of regulation provision such as obtaining NOC/ consent for plant site operation. LGED field level laboratories will be involved in the monitoring process.

6.0 Institutional Arrangement and Capacity Building

The Environmental Management Framework (EMF) 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 EMF implementation by concerned officials of LGED, their consultant and working contractors. An organizational structure shall be developed at the corporate, regional and site level to aid effective implementation of the EMF document. The organizational of the LGED flowchart are shown in Figure 6.1

The EMU to be strengthened to implement and manage the EMF will be structured to provide co-ordination, technical support and services during the environmental screening and preparation of EA, and implementation of the environmental mitigation measures. Functions and the staffing responsibilities of EMU are listed in Table 6.1. In order to effectively manage the EA process and EMP implementation, the EMU will be established and made operational as soon as possible. The XEN (Environment) and the two Assistant Engineers (Environment) could be selected from the existing GoB cadre and provided extensive training and exposure during the project implementation period to be able to undertake the assigned responsibilities effectively.

The Management Consultant will review and clear all screening and environmental assessment reports. LGED will conduct verification of some screening. The MS consultants will also review and update Environmental Supervision Manual incorporating the rural road improvements, rural road maintenance, rural waterways, growth center market improvement issues in the beginning of their contract to confirm the environmental supervision procedures and systems including inspection, monitoring and reporting mechanisms to be followed by each associated parties during the sub-project implementation. The manual will be continuously updated / modified throughout the implementation period so as to document the best operating / construction practices for future use by LGED as part of the agreed strategy or mainstreaming the environmental management process into all LGED works. The Environmental Specialist of the MS Consultants would primarily be responsible for providing technical assistance to the EMU, XEN, and Upazila Engineers.

The MS consultant shall assist LGED in quality control, monitoring, coordinating and implementation of EMF, supervising the measures necessary to mitigate the projects effects on the society and environment as outlined in the documents. The assistance will include review of social and environmental screening/assessment, plans and & budget and, where necessary, structuring and phasing implementation of the plans and identifying the specific agencies to be involved in the mitigation of social and environmental protection activities, particularly in cases where NGO participation needs to be arranged and coordinated.

The DS consultants will be based in the regional office and will be responsible for design and overall supervision of sub-project activities. The design consultants will ensure quality control and report to PD through the management consultant. The DS will also assist the EMU for ensuring environmental compliance and monitoring of progress including EMP and/or ECP implementation.

RTIP-2 will ensure that proper environmental screening will be done by the design consultant. Design consultant will ensure Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) of the all rural road sub-projects. LGED will conduct verification of some screening and assessment. LGED will ensure that proper environmental screening will be done by the design consultant.

The project will support two fulltime Junior Environment Specialist in Design and Supervision Consultancy. The specialists will prepare subproject specific environment screening/assessment report with EMP, supervise the implementation of EMP and support capacity building of the field level staff of LGED and contractor. A Senior Environment Specialist under the Management Support Consultancy will review the quality of the environmental screening/assessment with EMP. The project will implement an environmental monitoring program (i) to monitor the contractor's work during project implementation in order to check contractual compliance with specified mitigation measures, and subsequently (ii) to assess the actual environmental impacts of the project over the years following completion of the various project components. The Senior Environment Specialist will design the detailed monitoring plan of the project and prepare a routine monitoring report based on the monitoring results by LGED and the Junior Consultants. In addition, the environmental audit will be carried out before the mid-term evaluation and before project closing. The Bank would also supervise the environmental compliance as part of regular implementation support missions.

Only for the first year subprojects, an individual consultant will carry out the environmental screening. An individual consultant will prepare 2 separate screening, IEE and EIA report for the waterways. LGED will ensure that Initial Environmental Examination (IEE) report will be prepared by the design consultant and site clearance will get from DOE. Management Consultant will review and clear the IEE and EIA reports before sending to DOE.

The success of the project authorities may be attributed to vigorous and continuous monitoring of all its activities including environment and social issues. The is a dedicated department for monitoring entire project activities and reporting to the project director (PD). Regular monitoring of activities is carried out by district/upazila offices and supervision consultants at site and is being reviewed by the EMU on monthly basis. The EMU and Directors also take regular review of ongoing project activities including environment and social issues and corrective measures if required are implemented at site. For environmental and social components of a project, environmental and social monitoring plan is developed, based on baseline data and impacts predicted during the environmental and social assessment process.

Estimated budget for reviewing and updating of LGED EA Guidelines & Manuals, 2008; budget for the EIA study of waterways; and budget for environmental training under RTIP-2 are given in **section 6.11**. The monitoring plan and environmental mitigation budget for a sample of subproject of each project component is given in **Annex 4**.

7.0 Stakeholder Consultations

Participatory consultation is both an essential criteria and important strategy for an integrated environmental and social analysis process, the project design and its implementation. Views of the project affected persons and NGOs have been fully taken into account during the project preparation and continue to form as a basis for further design and implementation of the sub-project throughout the implementation period of the RTIP-2. The purpose of the stakeholder consultation is to identify the views of major institutional and project affected persons (PAPs) stakeholders to the roads and waterways being examined, and to identify issues of relevance to the study, as well as any impacts which the alignment may have on project planned by the stakeholders, and to assess any mitigation measures which may be undertaken to minimize any adverse impacts of the proposals under consideration. Subsequently, stakeholder consultation is one of the important parts of the environmental assessment to address the environmental aspects as well as socio-economic

issues from stakeholders' point of view. Project consultants were carried out a series of stakeholder consultations at different locations of the sub-project.

The EMF preparation includes 2 initial field level consultations in addition to follow-up consultations. One of the consultations was held at Mymensingh Sadar Upazilla, which was attended by was attended by about 30 community representatives including journalists, civil society organizations, contractors, truck drivers, bus drivers, members of transport workers associations, and local government institutions including one upazila chairman. The participants were overwhelmed to understand that the meeting was to consult them for designing the RTIP-2. The other consultation was held at Hatkhalir Bazar, Fulbaria Upazila of Mymensingh district and attended by around 60 persons from in and around the bazaar. The Fulbaria Upazila Engineer organized the meeting and the local Upazila Chairman facilitated. An Upazila Road has been nominated for the first year construction under RTIP-2. Only about 100-m of the road will need earth work and it has sufficient land for improvement. The local people including the elected representatives are yelling for long to get their road improved. They assured that if any additional strip of land is required for the improvement work, they are ready to organize by themselves. The participants in both consultations were happy to understand that social and environmental impacts will be addressed under the project to maximize project benefits. They did not foresee any major environmental issues from the project activities. In addition, the LGED field level staffs were consulted for effective environmental management considering the RTIP experience.

In addition, 6 meetings were held on end November 2011 on the sample project site. Total 50 participants from different locations have taken part in the consultations. The schedules, venues and the major feedbacks or queries from the participants for (i) rural road improvements; (ii) rural road maintenance; (iii) rural waterways; and iv) growth center market are summarized in **Annex 4.**

The environmental management of the proposed RTIP-2 was also discussed at a national consultation meeting on the project was held on October 10, 2011 and another consultation workshop involving the affected people, NGOs and relevant stakeholder is planned in mid-January 2012 to present the EMF and SMF and to receive their feedback.

A critical element in planning a participation and consultation program is associated with the selection of participation techniques to meet desired objectives. Considering the importance of effective participation and consultation in a wide spread project area along with the time and resource constraints in the present project, the following participation techniques were followed:

- Information dissemination and information sharing techniques will be used to inform the stakeholders regarding the action being taken in a program area through personal communication to make them aware about the project as well as to incorporate users input at different stages of the project.
- Information gathering techniques to gather quantitative and qualitative information about the individual schemes through questionnaires survey.
- Focused Group Discussions (FGDs) will be conducted covering different components of the project aims to increase local awareness about the forthcoming project as well as to incorporate their views, needs, priorities considering different positive and negative impact of the project.
- Key Informant surveys will be carried out among the knowledgeable and elderly people of the project area to incorporate their views and suggestions from their long experiences and knowledge.
- Hot Spot Consultation will be conducted in problematic locations of the schemes with participation of knowledgeable and affected people, local elite, public representatives, officials and NGO people to mitigate adverse impact considering their views suggestions from their practical experiences as per local needs and demands.
- Participatory workshops will be organized with the participation of different types of representative stakeholders.
- Public disclosure of the Draft EA Reports (including a non-technical summary) will be disclosed at the project districts, Project Headquarters and the World Bank.

Consultations with PAPs during project preparation will ensure that views of PAPs on compensation and resettlement assistance measures are fully incorporated while consultations conducted during resettlement plan (RP) implementation will identify necessary assistance required by APs during rehabilitation. Continuing involvement of those affected by sub-projects is necessary in the resettlement process. The municipality with support and guidance from the PMU consultants will ensure that PAPs and other stakeholders are informed and consulted about the sub-project, its

impact, their entitlements and options, and allowed to participate actively in the development of the sub-project. This will be done particularly in the case of vulnerable PAPs, who will be encouraged to choose options that entail the lowest risk. This exercise will be conducted throughout the sub-project-during preparation, implementation, and monitoring of sub-project results and impacts.

Under the harmonized safeguard policy, two public consultations will be required for the Project as part of the environmental assessment procedure. LGED guided the EMU in preparing the program of public meetings, presentations about the Project and drafting the comments sheet in English and Bengali. Information on the public consultation meetings will be published in national and regional newspapers 10 days prior to the consultations. Announcements on the commencement of the Environmental Assessment in the newspaper, the availability of the Background Information Document, the venue and the schedule of consultations and public opinion feedback processes will be published in the national newspapers.

The Environmental Assessment, documenting the mitigation measures and consultation process, will be made available for public review in both English and Bengali. The summary EA will be published on the LGED and WB websites, and the full environmental report will be available upon request from the WB and will be accessible in LGED website.

It is expected that through a participatory process, acceptance of the sub-projects and grievances can be minimized. However, it is necessary to establish an effective grievance redress mechanism to address complaints/grievances related to social issues that may arise. Any grievances and objections retarding the social aspects of the project will be referred to the project Grievances Redress Committee (GRC). The project GRC will be formed at central and district levels. The committee of the GRC at national level will have several members and connection with local authorities under headed by a chairperson.

The affected persons can register their grievances at the complaint cell established at central level and district level. All cases will be registered, categorized and prioritized by the district level authority and by the Environmental Specialist at central level. The GRCs will meet periodically to discuss the merit of each case and fix a date for hearing and notify the PAP to submit necessary documents in proof of her/his claim/case; resolve grievances within 4 weeks of receipt of complaint.

1.0 INTRODUCTION

1.1 Background

The Local Government Engineering Department (LGED) with the financial assistance of the World Bank (WB) has been successfully implementing rural infrastructure development projects since early nineties of the last century. After successful implementation of previous three projects, the Government of Bangladesh (GOB) looked for financial assistances from the International Development Association (IDA) of the World Bank to improve and rehabilitate the high-priority rural infrastructure in 26 districts covering eastern parts of Bangladesh (excluding Chittagong Hill Tracts) under LGED. Responding the GoB's request, IDA agreed to extend its credit facilities of about US$ 300 million for the Second Rural Transport Improvement Project (RTIP-2). The GoB contribution for this project will be US$ 117 million.

It is expected that improvement of physical infrastructure will help reduce rural poverty by providing people and communities with opportunities to enhance productivity and access to innovations and more gainful marketing facilities. To this end, the locations of the project's physical components, such as the rural road maintenance, rural waterways, growth center market will be selected to create transportation and socio-economic networks to maximize intra-rural as well as rural-urban interactions. The participatory approach in selection, operation and maintenance of these facilities is expected to bring together various stakeholder groups, especially those who are socio-economically vulnerable, into the decision-making process and be benefited by the development.

The RTIP-2 bears potential risk on physical, biological, social and cultural environment in the project area. Because of weak geology, rich biodiversity, high dependency of people on natural resources and widespread poverty, the social and environmental impacts are visibly significant, particularly when construction works are undertaken in rural areas. Generally, the environmental and social risks triggered by RTIP-2 activities include erosion and slope instability; loss of plants, biodiversity and agricultural land; effect to water sources due to sedimentation, water logging and drainage congestion, displacement/damage of permanent assets and loss of land. So, proper consideration of all environmental and social factors during design and implementation is of utmost concern in RTIP II of LGED in Bangladesh.

This Environmental Management Framework (EMF) is required for the RTIP II to identify the required environmental management measures that need to be taken by the Project authorities during the planning, design, construction and operations of the rural road improvements, rural road maintenance, rural waterways, growth center markets, in order to ensure compliance with the Government of Bangladesh own requirements and those of the World Bank. All the major environmental impacts along with mitigation and management measures have been compiled in the form of EMF.

1.2 Project Description

The project will include three components: Component A- Accessibility Improvement, Component B- Institutional Strengthening, Capacity Building and Governance Enhancement, and Component C- Rural Transport Safety.

d. Accessibility Improvement (US$ 377 million): It will comprise four sub-components:

v. Rural Road Improvement (US$ 170 million)

The project will finance improvement of about 700 km of Upazila (sub district) Roads through upgrading earthen roads to paved road standards and improvement of about 360 km of Union Roads. The sub-component will include land acquisition and compensation of persons affected by the project, environmental mitigation measures, road safety and activities by women's groups.

About 750 km of Upazila roads and 770 km of Union roads have been identified for improvement for planning purpose. However, the final list is to be refined following the methodology for Union Roads already agreed between LGED and the Bank and a methodology for Upazila Roads yet to be agreed. The annual work-programs will be revised annually based on surveys of road condition and traffic.

The engineering design has been prepared including BoQs for improvement of a program of 13 Upazila roads for a total of 120 km. The roads were initially included in a project funded by the Asian Development Bank but funds were insufficient to execute the works. The works on these roads will start in the second year of project implementation. Design of eight bridges remains to be carried out and is required to finalize the cost estimate for these

roads. Land acquisition plans and environmental impact assessments will be prepared during the first-year of project implementation.

The program of Union Roads is being identified based on agreed selection criteria. One selection criteria is that no land acquisition is required.

vi. Rural Road Maintenance (US$ 197 million)

Periodic Maintenance (US$185 million): The project will finance rehabilitation or periodic maintenance of about 3,550 km of roads. The works do not require land acquisition as the alignment remains the same than for the existing roads. The sub-component will include environmental mitigation measures, road safety and activities by women's groups. Roads to be included in the periodic maintenance sub-component will be eligible if they have gaps less than 6 meters. For rehabilitation works, structures will be limited to 30 m to take into account the time constraints during project implementation.

Performance—Based Maintenance (US$ 12 million): The project will support scaling—up the project funded by DANIDA to pilot performance—based maintenance contracts. The contracts will be executed on about 450 km of roads (120 km the first year, 160 km the second year and 170 km the third year) representing 2,250 km of roads maintained during the 5—year period of the contracts.

vii. Rural Waterways (US$ 4 million)

Dredging (US$ 2 million): The sub-component will pilot low-cost dredging using local technology. The project will also finance removal of temporarily constructed earthen bunds across waterways, protection works at erosion-prone and vulnerable points along bank lines, enhancing safety by installation of navigational aids, and provision of landing facilities. Two rivers have been identified: the first river is the Turag-Bansi River, 18.7 km long, from Kaliakoir to Mirzapur in Tangail district; the second river is the Titas River, 25 km long, from Kathalia to Batikandi in Comilla district. The environmental impact assessment will be carried out and bidding documents will be prepared for the first river during the first-year of the project for implementation during the second year. The contracts will cover capital dredging during the first year and maintenance dredging during two years.

River accessibility (US$2 million): The sub-component will finance improvement of accessibility and construction of river infrastructure (ghats, jetties) at about 20 locations including the rivers in the pilot dredging sub-component. During project preparation, 43 ghats have been identified which are currently leased out without major risk of erosion and a substantial level of traffic. Further analysis is required to reduce the number of ghats to 20 to be supported under this project. This analysis will include consultation with beneficiaries to confirm the priority given to the ghats to be included in the project.

viii. Growth Center Markets (US$ 6 million)

The project will support the improvement and development of 50 markets employing women. A final list of markets is yet to be finalized upon consultation with beneficiaries.

In addition to financing the market infrastructure, this project will aim at strengthening management and operation of GCMs by providing support to the markets committees, improving the selection process of women and enhancing their capacity to operate shops in WMS.

109 markets were identified which are yet to be developed and 43 markets which have been developed but still need improvements. A further analysis is required to reduce the number to 50, the target for construction under RTIP-2. This analysis should include consultation with beneficiaries to confirm the priority given to the markets included in the project.

e. Institutional Strengthening, Capacity Building & Governance Enhancement Component (US$ 35 million): It will comprise two sub-components

ii. **Institutional Development and Governance (US$ 9 million)**:

The sub-component will support implementation of the LGED action plan for strategic enhancements in the areas of capacity, effectiveness, governance and accountability, including via operationalization of a comprehensive IT-ICT supported Integrated Decision Support System (IDSS). The design of this sub-component incorporates the results and lessons of RTIP-I and are guided by the strategic priorities identified for LGED through the Operational Risk Assessment (ORA) carried out jointly by LGED and the World Bank in 2008-2009.

A high-level LGED Committee supported by six Working Groups have finalized an action plan for implementation of the main GOB-endorsed ORA recommendations falling within LGED responsibility, which will be used to harmonize future external assistance to LGED across its development partners. The proposed RTIP-2 will aim to support LGED as it faces a challenging period of growing demands and responsibilities, significant organizational evolution and staffing turnover. The project will provide funding for essential technical assistance (TA), consulting services, advanced staff training and 'exposure' activities (in Bangladesh and elsewhere), necessary software (IP) and advanced equipment procurement. The main areas to be covered under this support will be:

- Maintenance Policy & Operations
- Quality Assurance & Management (including ISO Certification program)
- Financial Management & Planning
- Environmental & Social (Impact) Management
- Performance Management including Monitoring & Evaluation
- IT-ICT-MIS Facilities & Capacity (including IDSS implementation), and
- Strategic Coordination & Development.

Assistance to be provided in these areas will interact directly with the respective LGED Working Groups to maximize LGED 'ownership', determination and absorption/operationalisation of planned outputs and the sustainability of the results in LGED operations and management beyond the period of project support. Wherever appropriate, the TA providers will be 'embedded' directly within the Working Groups and/or 'mainstream' LGED units (rather than being PMU-centered, as in RTIP-1) with close periodic monitoring of expected impacts and outcomes in relevant areas of LGED capacity and performance.

iii. **Project Implementation (US$ 26 million)**:

The sub-component will support services of the project management consultant, design and supervision consultants, integrated performance audit, socio-economic and monitoring surveys, equipment and cars, and operating costs of the Project Management Unit.

f. Rural Transport Safety Component (US$ 3 million): This component will consist of two sub-components focused on the safety of rural roads and rivers.

i. Rural Roads Safety:

The assessment of the implementation of the RTIP-I supported Rural Transport Safety (RTS) 'pilot' has confirmed the positive results in the three pilot districts in Bangladesh. As the road safety problems and challenges in the rural transport environment are acute and growing (e.g. due to ongoing rapid growth of road transport activities), the proposed RTIP-2 will provide support to the LGED for a more substantial Rural Transport Safety Improvement program, scaling up and evolved from the RTIP-I supported RTS 'pilot' and to be implemented by the relevant 'mainstream' HQ and field units of LGED. The proposed RTIP-2 will fund expert technical assistance, capacity building and training measures respectively for LGED units and participating Local Government Institutions, education/awareness program delivery, and procurement of associated goods/materials/equipment.

The main areas to be covered under this component will be:

- Capacity Building for Rural Road Safety (RRS) functions in LGED;
- Capacity building for participating LGIs for local RS responsibilities/actions;
- Facilitation of formation and sustainability of LGI-level RS oversight bodies;
- Integration of RRS factors in LGED design/construction/maintenance activities;
- Extended/intensified awareness and education campaigns;
- Program Monitoring & Evaluation (jointly between LGED and LGIs); and
- Strengthening sector capacity for RRS education, information and/or research.

This component will be managed primarily by the Central Road Safety Unit (CRSU) of the LGED, with periodic support from internationally-experienced TA, with specific progress milestones and LGI-monitorable results, such as rural road safety hazard and trauma incident reductions.

ii. River Safety:

The sub-component will pilot the installation of gearboxes in country boats to improve safety in their operation and reduce consumption of diesel.

1.3 Objectives of EMF

The EMF provides general policies, guidelines, codes of practice and procedures to be integrated into the implementation of the World Bank-supported RTIP-2. It defines the steps, processes, and procedures for screening, alternative analysis, assessment, monitoring and management. In addition, the EMF will analyze environmental policies and legal regime of Bangladesh and safeguard policies of the World Bank as well as institutional and capacity assessment for environmental management. The physical intervention of the projects The EMF is intended to be used as a practical tool during program formulation, design, implementation, and monitoring in RTIP-2.

The EMF will be followed during project preparation and implementation for ensuring environmental integration in planning, implementation, and monitoring of project supported activities. For ensuring good environmental management in the proposed RTIP-2 program, the EMF will provide guidance on pre-investment works/studies (such as environmental screening, environmental assessment, environmental management plans, etc.), provide set of steps, process, procedure, and mechanism for ensuring adequate level of environmental consideration and integration in each investment in the project-cycle; and describes the principles, objectives and approach to be followed to avoid or minimize or mitigate impacts. The EMF contains the following:

- Environmental factors that needs to be considered while planning and design of different categories of activities under the RTIP-2.
- Environmental screening criteria: criteria, process, procedures, steps, time, and responsibility as well as necessary tools (format, checklist etc.) for environmental screening of the investment under the RTIP-2.
- Environmental assessment guidelines: Steps, process and procedures to be followed in different levels of environmental assessment (limited or full assessment). This includes guidance on the project level baseline information, impact identification, alternative analysis, assessment and designing mitigation measures, and in preparing Environmental Management Plan (EMP).
- The EMF includes project/ activity level environmental monitoring framework.
- The EMF includes the institutional arrangement for implementing EMF, environmental code of practices to be followed in project/activity level, capacity strengthening plan for environmental capacity of the involved parties in accordance with their role and functions, guidance on appropriate ways of holding consultations.

1.4 Approach and Methodology

The EMF has been prepared through participatory process mainly based on open ended discussions, formal and informal interaction with stakeholders that lead to an understanding of the existing system from the perspectives of all the stakeholders. The work has been performed in close cooperation with the project team. This included collection of secondary data, related literatures, field surveys, public/stakeholder consultations, and desk studies.

In order to prepare the EMF, relevant secondary source of information were reviewed and limited field investigation has been carried out to explain the environmental concerns related to different subprojects. The specific tools and methods used to meet the desired scope of work are highlighted below:

a) Environmental review of overall program and preparation of preliminary baseline of RTIP-2.

In order to meet the above scope, the following strategies have been adopted:

- Review of program details available at the time of assessment;
- Collection of secondary information (periodic plans of participating districts, situation analysis of pre-feasibility study and its conformity with interaction with stakeholders); and
- Sample of different subproject of baseline information at larger stage by field visit to the different districts.

b) Review of relevant plan, policies and legislations of GOB and WB:

In order to meet the above scope, the following strategies were adopted:

- Review of plan, policies, government directives and legislations related to environment in the context of Bangladesh;
- Identification of environmental provisions that is applicable to the present project;

- Review of the World Bank's environmental safeguard policies and identifies provisions/requirements that need to be met by this project; and
- Review of similar documents being used in similar type of programs.

c) Review of existing environmental management practices of RTIP-I.

In order to meet the above scope, the methodologies adopted are as follows:

- Review of current environmental requirements and practices followed by RTIP-I;
- Study of the effectiveness of environmental provisions applied to similar project activities in Bangladesh;
- Discussion with LGED about their existing environmental management practices existing environmental problems;
- Review and "on the ground" verification of environmental management practices and its effectiveness followed by RTIP-I including review and record of good and bad environmental practices followed; and
- Environmental Practices in other projects (WB funded, etc.).

d) Institutional and capacity assessment

The following methodologies were adopted by the consultant to meet and its objectives:

- Review of institutional mechanisms for environmental management of institutional involved in proposed program and their environmental management practices. The assessment will be made to find out the institutional capacity in terms of existence of environmental management unit, environmental staff & work load, existence of environmental management practices, resources (manpower, budget, and equipment facilities), mandate, roles and responsibility of staff in environmental management, currently ongoing environmental programs and its effectiveness;
- The system, process, procedures in complying environmental mandate, guideline, framework and its effectiveness, (tools if any, such as screening format, checklist etc.); and
- Assessment of participating institutions in terms of their capacity with regard to their existing mandates, functions, human, and financial resources available for environmental management functions as well as assessment of their capacity considering incremental workloads from the proposed program.

Based on the above, the consultant has developed the necessary institutional and capacity building activities.

e) Stakeholder analysis, consultation and disclosures

The following methodologies were adopted to meet the above scope and its objectives:

- Plan for the stakeholder consultations at the national and district level with respect to the program and its environmental management. Based on the outcomes of the stakeholders analysis, policy review and capacity assessment, institutional mechanism for environmental management in the RTIP-2 program were developed;
- Share in LGED during the interaction about the likely environmental issues, environmental requirements of GOB and WB;
- During the preparation of EMF, interactions were also held with District LGED offices, and private sector for their views with regards to their opinions, their roles and responsibilities in the RTIP-2 program; and
- Assessment of stakeholder's impressions on environmental issues, causes, and in exploring ways to address it.

Based on the above outcomes, the EMF is prepared.

f) Preparation of Final EMF, and summarize EMF, and summarize EMF in Bengali on environmental approach of the RTIP-2 program.

1.5 Overview of the EMF

The EMF is intended to define the process and outputs necessary to address the potential negative impacts of the physical works to be carried out under RTIP-2 for various sub-projects associated with the rural road improvements, rural road maintenances, rural waterways, and growth center markets. In order to safeguard against any unexpected serious impacts and to improve the general environmental management practices, this EMF outlines a screening/assessment process and actions to be taken in case there is any possibility that the IDA's environmental safeguards may be triggered.

The EMF clearly describes how the potential environmental impacts of all sub-projects will be managed during preparation, implementation and, in the post-implementation periods. The EMF incorporates a framework for implementation, monitoring, supervision, auditing and reporting of the EMF requirements. The EMF report also includes Environmental Codes of Practice (ECP) and sample Environmental Management Plan (EMP) for each type project subcomponent to assist the LGED/Design Supervision Management (DSM) Consultants in preparation of the necessary environmental specifications and/or sub-project specific EMP for integration of impacts avoidance/prevention/mitigation measures with the design and contract documents of the sub-projects. The applicability of the sample EMP/ ECP to a particular type of sub-projects under each project component and/or need for further EA and sub-project specific EMP has also been established in the EMF.

The EMF also defines required mitigation measures to be carried out by this contractor to minimize potential negative impacts during and after the execution of physical works. The minimum prevention /mitigation requirements to be implemented during the implementation of the sub-projects will be included in the bidding and contract documents. The EMF provides for integration of the environmental assessment and management process with the overall project preparation and implementation process.

1.6 Environmental Code of Practices

The Environmental Code of Practices (ECP) for compliance with the World Bank's OP 4.01 is contained of this EMF. The requirements of these ECP and of the Bangladesh standard will be included in all sub project civil works contracts through a set of special environmental clauses (SECs) included in the Technical Specification of the bidding documents. These set of Special Environmental Clauses will be subject to revision for each sub project to ensure the relevant issues for each sub project are being adopted.

2.0 ENVIRONMENTAL POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 Relevant Government Policies, Acts, Rules, Strategies and Guidelines

2.1.1 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 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.

The Project will be undertaken in line with the aims and objectives of the Act by conserving the environment and controlling and mitigating potential impacts throughout the drilling program.

- ***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.

- ***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.

- ***Environmental Conservation Act (Amendment 2010)***

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

- No individual or institution (Gov. or Semi Gov, / Non Gov. / Self Governing) cannot 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.

2.1.2 Environment Conservation Rules (ECR), 1997 and Amendments

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 4 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 and Forest (MOEF) has declared Sunderban, 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.

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. For proposed industrial units and projects falling in the Orange-A, Orange-B and Red Categories, firstly a site clearance certificate and thereafter an environmental clearance certificate will be required. A detailed description of those four categories of industry/project is in Schedule-1 of ECR (1997). The Rules were essentially developed for industrial developments, but under Schedule 1 of the Guidelines (Clauses 63 and 64) the following falls into the Orange B Category.

All existing industrial units and projects and proposed industrial units and projects, that are considered to be low polluting are categorized under "Green" and shall be granted Environmental Clearance. For proposed industrial units and projects falling in the Orange- A, Orange- B and Red Categories, firstly a site clearance certificate and thereafter an environmental clearance certificate will be issued. 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.

The ECR'97 also contains the procedures for obtaining Environmental Clearance Certificates from the Department of Environment for different types of proposed units or projects. Any person or organization wishing to establish an industrial unit or project must obtain ECC from the Director General. The application for such certificate must be in the prescribed form (provided later in this

chapter) together with the prescribed fees laid down in Schedule 13, through the deposit of a Treasury Chalan in favor of the Director General. Rule 8 prescribes the duration of validity of such certificate (3 years for green category and 1year for other categories) and compulsory requirement renewal of certificate at least 30 days before expiry of its validity.

- Road Construction/reconstruction/extension (feeder roads, local streets etc.) and bridge construction reconstruction/extension (less than 100m in length).

2.1.3 Environmental Policy, 1992

The concept of environmental protection through national efforts was first recognized and declared with the adoption of the Environmental Policy, 1992 and the Environmental Action Plan, 1992. The importance of policies in beefing up the environmental regime is recognized in a number of international instruments including the World Conservation Strategy in 1980 and the Brundtland Commission Report, 1987. Paragraph 14 of Chapter 8 of Agenda 21 underscored the necessity of formulation of national policies as well as laws for environmental protection and sustainable development. The major objectives of Environmental Policy are to:

i) maintain ecological balance and overall development through protection and improvement of the environment;

ii) protect country against natural disaster;

iii) identify and regulate activities, which pollute and degrade the environment;

iv) ensure environmentally sound development in all sectors; and

v) ensure sustainable, long term and environmentally sound base of natural resources; and vi) actively remain associate with all international environmental initiatives to the maximum possible extent.

2.1.4 Environmental Action Plan, 1992

The National Environmental Action Plan,1992 recommended sector specific action plan to achieve the objectives and implement the policy recommendations of the National Environment Policy. The followings are water resources key recommended actions:

- Environmental audit on an emergency basis will be conducted for water resources development, flood control and irrigation projects. Steps to mitigate the adverse impact on the environment identified in the audit will be taken through appropriate modification of these projects.
- Environmental Impact Assessment will be incorporated in all new projects. Adverse impacts will be prevented through proper steps and adequate investments.
- Operation and maintenance will be ensured subsequent to execution of projects related to water resources development and management. Regular monitoring will be conducted to evaluate the impact of all projects.

2.1.5 National Environmental Management Plan (NEMAP), 1995

The National Environment Management Action Plan (NEMAP, 1995), based on a nationwide consultation program identified the main national environmental issues, including those related to the water sector which EA practitioners should note. The main related national concerns included flood damage, river bank erosion, environmental degradation of water bodies, increased water pollution, shortage of irrigation water and drainage congestion; various specific regional concerns were also identified.

2.1.6 Bangladesh Wildlife (Preservation) Order, 1973 (Amended in 1994)

The *Bangladesh Wildlife (Preservation) Order* makes provisions for the safety of wildlife, particularly those vulnerable to extinction. It has provisions for the establishment of 'wild life sanctuaries', banning hunting of certain species, banning 'game reserves' and provision for special permits to keep and care for certain types of animals. Schedule III to the statute includes a list of animals that are declared as protected animals, which shall not be hunted, killed or captured. The maximum penalty for any offence committed under this statute is two years imprisonment and a maximum fine of 10,000 taka.

The Government of Bangladesh under the provisions of the Act, has established three categories of protected areas being National Parks, Wildlife Sanctuaries and Game Reserves. In addition to these, the Government of Bangladesh has declared 14 protected areas and is considering declaring

more. Further, the Government of Bangladesh has recently declared six areas as Ecologically Critical Areas under the *Environmental Conservation Act* 1995.

One World Heritage Site, the Sundarban (North of Hiron Point) extends into the Western edge of PSC Block 7 area, however is approximately 110 km south west of the proposed Project Location..

Another conservation site is Nijhum Dwip located approximately 50 km east of the Project location. The nearest Wildlife Sanctuary is the Char Kukri-Mukri, which is approximately 22 km south-east of the proposed site (MoEF, 2001). Apart from Char Kukri-Mukri, National Park, there are no Environmental Conservation Areas, Reserve Forests, Protected Areas, Game Reserves, Wildlife Sanctuaries, or Wetland Protected Areas located within the wider project area.

Measures to reduce potential negative impacts on local wildlife species and populations will be incorporated into all stages of the Project. Further, due to the distance of reserved areas under the Act from the Project area, the potential for impacts is low.

2.1.7 National Conservation Strategy (NCS), 1992

The National Conservation Strategy (NSC) was drafted in late 1991 and submitted to the Government in early 1992. It was approved in principal; however the final approval of the document is yet to be made by the cabinet.

For sustainable development in the energy sector, the strategy document offered various recommendations, though there are none specifically relating to exploratory drilling or similar activities.

For 'Energy and Minerals' sector, the relevant strategy recommendations include:

- To use the minimum possible area of land in exploration sites;
- To take precautionary measures against Environmental Pollution from liquid effluent, condensate recovery and dehydration plants; and
- To apply technology assessment for selection of appropriate technology.

The Project aims to reduce the land required for the program where possible by implementing measures to reduce pollution risk and using appropriate technology.

2.1.8 Wetland Policy, 1998 (Draft)

The Policy is relevant to the Project because it seeks to:

- Conserve wetlands to sustain their ecological and socio-economic functions and further sustainable development;
- Establish key principles for wetland sustainability and unsustainable practices;
- Maintain existing levels of biodiversity;
- Maintain wetland functions and values; and
- Actively promote integration of wetland functions in resources management and economic development decision taking.

2.1.9 National Water Policy, 1999

The National Water Policy promulgated in 1999 with the intension of guiding both public and private actions in the future for ensuring optimal development and management of water that benefit both individuals and the society at large. The policy aims to ensure progress towards fulfilling national goals of economic developments, poverty alleviation, food security, public health and safety, decent standard of living for the people and protection of natural environment. According to the policy, *all agencies and departments entrusted with water resource management responsibilities (regulation, planning, construction, operation, and maintenance) will have to enhance environmental amenities and ensure that environmental resources are protected and restored in executing their tasks. Environmental needs and objectives will be treated equally with the resources management needs.*

The policy has several clauses related to the protection and prevention of the natural environment for ensuring sustainable development. Some of the relevant clauses are:

> **Clause 4.5b:** Planning and feasibility studies of all projects will follow the Guidelines for Project Assessment, the Guidelines for People's Participation (GPP), the Guidelines for Environmental Impact Assessment, and all other instructions that may be issued from time to time by the Government.

Clause 4.9b: Measures will be taken to minimize disruption to the natural aquatic environment in streams and water channels.

Clause 4.9e: Water development plans will not interrupt fish movement and will make adequate provisions in control structures for allowing fish migration and breeding.

Clause 4.10a: Water development projects should cause minimal disruption to navigation and, where necessary, adequate mitigation measures should be taken.

Clause 4.12a: Give full consideration to environmental protection, restoration and enhancement measures consistent with National Environmental Management Action Plan (NEMAP) and the National Water Management Plan (NWMP).

Clause 4.12b: Adhere to a formal Environmental Impact Assessment process, as set out in the EIA guidelines and manuals for water sector projects, in each water resources development project or rehabilitation program of size and scope specified by the Government from time to time.

Clause 4.12c: Ensure adequate upland flow in water channels to preserve the coastal estuary eco-system threatened by intrusion of salinity from the sea.

Clause 4.13b: Only those water related projects will be taken up for execution that will not interfere with aquatic characteristics of those water bodies.

2.1.10 National Water Management Plan, 2001 (Approved in 2004)

The National Water Resources Council approved on March 31, 2004 a 25-year National Water Management Plan. The plan provides a framework within which all concerned with the development, management and use of water resources water services in Bangladesh can plan and implement their own activities in a coordinated and integrated manner. The planned activity programs have been presented in the eight sub-sectoral clusters: i) Institutional Development, ii) Enabling Environment, iii) Main River, iv) Towns and Rural Areas, v) Major Cities; vi) Disaster Management; vii) Agriculture and Water Management, and viii) Environment and Aquatic Resources. Each cluster comprises of a number of individual programs, with overall a total of 84 sub-sectoral programs identified and presented in the investment portfolio. It was planned to implement in three phases. It was approved at the seventh meeting of the National Water Resources Council. It calls for a coordinated approach of concerned ministries and departments to stop water-logging and to incorporate the issues of arsenic mitigation, river administration, and dredging and fisheries resources. To mitigate the environmental risks of water sector project development, the plan suggested for a holistic view, which includes the environment itself as an important water sector stakeholder with an entire cluster of programs devoted to it. Furthermore, programs within the environment cluster are strategically timed in order that public awareness raising, the establishment and enforcement of regulatory mechanisms and long term planning are addressed as priority. Water Resources Planning Organization (WARPO) was assigned to monitor the national water management plan.

2.1.11 The National Fisheries Policy, 1999

The National Fisheries Policy, 1999 was formulated following review and intent of the *East-Bengal Protection and Conservation of Fish Act* 1950, which was updated by the *Protection and Conservation of Fish (Amendment) Ordinance* 1982 and further refined by the *Protection and Conservation of Fish (Amendment) Act* 1995. These Acts and ordinance provide provisions for the protection and conservation of fish in fresh water and brackish water bodies.

The Fisheries Policy highlights the need to conserve fish breeding grounds and habitats, especially in the development of water management infrastructure. It intends to promote fisheries development and conservation in all water bodies.

The Project should consider these policies to protect the habitats, migration and connectivity of fish and fisheries resources around the Project area. Measures to reduce any potential negative impacts on local fish populations will be incorporated into all stages of the Project.

2.1.12 The Protection and Conservation of Fish Rules, 1985

The *Protection and Conservation of Fish Rules* 1985 are a set of rules in line with the overall objectives of the *East-Bengal Protection and Fish Conservation Act*. The Rules require that "*no person shall destroy or make any attempt to destroy any fish by explosives, gun, bow and arrow in inland waters or within coastal waters".* Further, the Rules states *"…no person shall destroy or make*

any attempt to destroy any fish by poisoning of water or the depletion of fisheries by pollution, by trade effluents or otherwise in inland waters".

The Project will comply with these rules by enacting appropriate mitigation measures to reduce the potential for pollution of waterways, depletion of fisheries or disturbance of fish populations within the Project area.

2.1.13 National Agricultural Policy, 1999

The overall objective of the National Agriculture Policy is to make the nation self-sufficient in food through increasing production of all crops including cereals and ensure a dependable food security system for all. One of the specific objectives of National Agricultural Policy is to take necessary steps to ensure environmental protection as well as „environment-friendly sustainable agriculture. Through increased use of organic manure and strengthening of the integrated pest management program. The policy also suggests creating awareness so that the chemical fertilizers and pesticides used for increased crop production do not turn out to be responsible for environmental pollution. Water logging and salinity are identified as one of the serious problem in some parts of the country including the coastal areas for agricultural activities and environmental damage. The policy recommends for crop rotation and salt tolerant crop varieties.

2.1.14 Coastal Zone Policy, 2005

Coastal zone policy initiated as a harmonized policy that transcends beyond sectoral perspectives. The policy provides general guidance so that the coastal people can pursue their livelihoods under secured conditions in a sustainable manner without impairing the integrity of the natural environment. The policy framework underscores sustainable management of natural resources like inland fisheries & shrimp, marine fisheries, marine fisheries, mangrove and other forests, land, livestock, salt, minerals, sources of renewable energy like tide, wind and solar energy. It also emphasis on conservation and enhancement of critical ecosystem- necessary measures will be taken to conserve and develop aquatic and terrestrial including all the ecosystems of importance identified by the *Bangladesh National Conservation Strategy* (Mangrove, coral reef, tidal wetland, sea grass bed, barrier island, estuary, closed water body, etc.).

2.1.15 Coastal Development Strategy, 2006

Coastal Development Strategy has been approved by the Inter-Ministerial Steering Committee on Integrated Coastal Zone Management Plan (ICZMP) Project on February 13, 2006. The strategy is based on the Coastal Zone Policy and takes into account the emerging trends: increasing urbanization, changing pattern of land use, declining land and water resources, unemployment and visible climate change impacts. The strategy has 9 strategic priorities and the following 3 are relevant priorities with proposed type of interventions:

- Safety from man-made and natural hazards - i) Strengthening and rehabilitation of sea dykes; and ii) reduction of severe vulnerability in the coastal zone through multi-purpose cyclone shelters-including coping mechanism.
- Sustainable management of natural resources - i) environmentally and socially responsive shrimp farming; ii) introduction of renewable energy in coastal areas; and iii) development of marine fisheries and livelihood.
- Environmental conservation – i) Marine and coastal environmental development; and ii) strengthening of Coast Guard for improvement of coastal safety and security in coordination with other law enforcing agencies.

2.1.16 The Embankment and Drainage Act, 1952

The *East Bangle Act No. 1,* 1953 was amended in 1953 which has been adapted by the People Republic of Bangladesh, by the Bangladesh Order (adaptation of Existing Laws), 1972 (President's Order No. 48 of 1972). The Act consolidates the laws relating to embankments and drainage providing provision for the construction, maintenance, management, removal and control of embankments and water courses for the better drainage of lands and for their protection from floods, erosion or other damage by water.

The specific Sections and Articles relevant to the Project are mentioned below:

- Section 4 (1) of the Act states that the embankment, water-course, and tow-path, earth, pathways, gates, berms and hedges of the embankments shall vest in the Government of the Authority (BWDB).

- Section 56 (1) states that, person will be subject to penalty (500 taka or imprisonment… if he erects, or causes of willfully permits to be erected, any new embankment, or any existing embankment, or obstructs of diverts, or causes or willfully permits to be obstructed or diverted, any water course.
- Section 15 allows for the engineer (engineer in charge of Divisional level BWDB) for constructing new embankment or enlarging, lengthening or repairing existing embankments.
- The other sections of the Act give powers and access to the Government or Authority or Engineers to commence necessary Project activities, for land acquisition (through the Deputy Commissioner), and site clearing activities including removal of trees or houses (if necessary).

2.1.17 Bangladesh Climate Change Strategy and Action Plan

The GOB also prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008 and revised in 2009. This is a comprehensive strategy to address climate change challenges in Bangladesh. Bangladesh Climate Change Strategy and Action Plan built on and expanded the NAPA. It is built around the following six themes:

- **Food security, social protection and health** to ensure that the poorest and most vulnerable in society, including women and children, are protected from climate change and that all programs focus on the needs of this group for food security, safe housing, employment and access to basic services, including health.
- **Comprehensive disaster management** to further strengthen the country's already proven disaster management systems to deal with increasingly frequent and severe natural calamities.
- **Infrastructure** to ensure that existing assets (e.g., coastal and river embankments) are well maintained and fit for purpose and that urgently needed infrastructure (cyclone shelters and urban drainage) is put in place to deal with the likely impacts of climate change.
- **Research and Knowledge management** to predict that the likely scale and timing of climate change impacts on different sectors of economy and socioeconomic groups; to underpin future investment strategies; and to ensure that Bangladesh is networked into the latest global thinking on climate change.
- **Mitigation and low carbon development** to evolve low carbon development options and implement these as the country's economy grows over the coming decades.
- **Capacity building and Institutional strengthening** to enhance the capacity government ministries, civil society and private sector to meet the challenge of climate change.

There are 44 specific programs proposed in the BCCSAP under the above six themes.

2.1.18 DOE's IEE/EIA including EMP Guidelines for Industry, 1997

The IEE/EIA Guidelines is a handbook for procedures for preparing the IEE/EIA including EMP and for reviewing them for the benefit of the development partners, environmental consultants, reviewers, and academicians. While preparing these guidelines, the present environmental status as well as the need for rapid economic development of Bangladesh has been kept in view. These considerations have essentially resulted in simpler procedures to be followed for preparing the IEE/EIA including EMP and their review. This guideline is also applicable for the other projects.

2.1.19 LGED's Guidelines and Environmental Code of Practices

In response to the Environmental Conservation Act (1995) and Rules (1997), and recognizing the need of its donors to ensure sound environmental practices, LGED has developed guidelines and code of practices to ensure that its activities sustain, and where feasible enhance the environment. The LGED aims to implement all its projects in an environmentally sound and sustainable manner that meets all the requirements of the GOB and its financing partners. This approach is embodied in the LGED document:

- Environmental Assessment Guidelines for LGED Projects, Environmental Unit of LGED, October, 2008.

Two documents have been prepared under RTIP which provide a sound basis for defining the environmental management procedures and arrangements for RTIP-2:

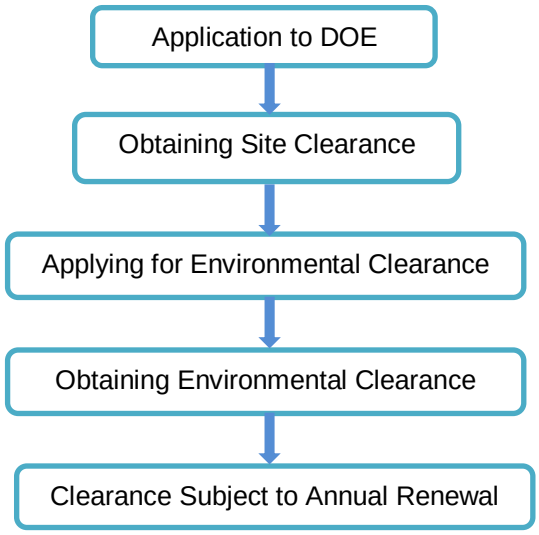
- Manual for Environmental Supervision and Monitoring and Guidelines for Environmental Screening and Categorization of Sub-project, EMU, RTIP (RDP -26), September, 2004.
- Environmental Code of Practices (ECP), EMU, RTIP (RDP -26), September, 2004.

2.1.20 Environmental Clearance Procedure

Legislative bases for the EIA in Bangladesh are the Environmental Conservation Act 1995 (ECA'95) and the Environmental Conservation Rules 1997 (ECR'97). The Department of Environment (DOE), under the Ministry of Environment and Forest (MOEF), is the regulatory body responsible for enforcing the ECA'95 and ECR'97. It is the responsibility of the proponent to conduct the EIA of development proposal, the responsibility to review EIA for the purpose of issuing Environmental Clearance Certificate (ECC) rests on DOE. The procedure for "Red" Category includes submission of:

- Initial Environmental Examination (IEE)
- Environmental Impact Assessment (EIA)
- Environmental Management Plan (EMP)

Environment clearance has to be obtained by the respective implementing agency from the Department of Environment. The environmental clearance procedure for Red Category projects can be summarized as follows:



The environmental impact assessment and subsequent environmental clearance for sub-projects having minor environmental impacts will be waived taking into consideration of significant nature of the project and the immediate local needs. However, if IEE indicates that there are significant environmental impacts from the sub-projects, the implementing agency will conduct the EIA. The concerned implementing agency will provide environmental screening report to the DOE on quarterly/half-yearly basis highlighting the possible impacts from the sub-projects and measures taken for possible impacts. The DOE will review all the screening reports of civil works and may decide to cross check some of the interventions. However, the report will have separate location specific baseline information, environmental analysis and EMP for each sub-project.

2.2 World Bank's Environmental Safeguard Policy

2.2.1 OP/BP 4.01 Environmental Assessment

The Bank requires Environmental Assessment (EA) of projects proposed for Bank support to ensure that they are environmentally sound and sustainable, and thus to improve decision making. The EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. The EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. The EA takes into account the natural environment (air, water and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples and physical cultural

resources); and transboundary and global environmental aspects. The borrower is responsible for carrying out the EA and the Bank advises the borrower on the Bank's EA requirements.

The Bank classifies the proposed project into three major categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

- *Category A*: The proposed project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.
- *Category B*: The proposed project's potential adverse environmental impacts on human population or environmentally important areas-including wetlands, forests, grasslands, or other natural habitats- are less adverse than those of Category A projects. These impacts are site specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than Category A projects.
- *Category C*: The proposed project is likely to have minimal or no adverse environmental impacts.

2.2.2 OP/BP 4.04 Natural Habitats

The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. The Bank promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats. The Bank does not support projects that involve the significant conversion or degradation of critical natural habitats.

2.2.3 OP/BP 4.11 Physical Cultural Resources

Physical cultural resources are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Their cultural interest may be at the local, provincial or national level, or within the international community. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices. The Bank assists countries to avoid or mitigate adverse impacts on physical cultural resources from development projects that it finances. The impacts on physical cultural resources resulting from project activities, including mitigating measures, may not contravene either the borrower's national legislation, or its obligations under relevant international environmental treaties and agreements. The borrower addresses impacts on physical cultural resources in projects proposed for Bank financing, as an integral part of the environmental assessment (EA) process. The following projects are classified during the environmental screening process as Category A or B, and are subject to the provisions of this policy: (a) any project involving significant excavations, demolition, movement of earth, flooding, or other environmental changes; and (b) any project located in, or in the vicinity of, a physical cultural resources site recognized by the borrower. Projects specifically designed to support the management or conservation of physical cultural resources are individually reviewed, and are normally classified as Category A or B. When the project is likely to have adverse impacts on physical cultural resources, the borrower identifies appropriate measures for avoiding or mitigating these impacts as part of the EA process. These measures may range from full site protection to selective mitigation, including salvage and documentation, in cases where a portion or all of the physical cultural resources may be lost.

2.2.4 OP/BP 4.36 Forestry

The Policy envisages the protection of forests through consideration of forest-related impact of all investment operations, ensuring restrictions for operations affecting critical forest conservation areas, and improving commercial forest practice through the use of modern certification systems.

In the process of forest conservation interventions, especially the local people, the private sector and other pertinent stakeholders should be consulted.

In general, the Policy aims at reducing deforestation and enhancing the environmental and social contribution of forested areas. Experience with the Bank reveals that the Bank does not support commercial logging in primary tropical moist forest.

2.2.5 OP/BP 4.12 Involuntary Resettlement

This Policy is based on assisting the displaced persons in their efforts to improve or at least restore their standards of living.

The impetus of this Policy is that development undertakings should not cause the impoverishment of the people who are within the area of influence of the undertakings. In cases where resettlement of people is inevitable, or in cases where loss of assets and impacts on the livelihood of the PAPs is experienced, a proper action plan should be undertaken to at least restore, as stated above, their standard of life prior to the undertakings.

Concerning public consultation, resettlers as well as the host communities should be consulted for the successful implementation of the resettlement process. The views of the consulted resettles and the host communities should be incorporated into the Resettlement Action Plan (RAP) including the list of their choices.

2.2.6 IFC Environmental, Health and Safety Guidelines

The Environmental, Health and Safety (EHS) Guidelines of the International Finance Corporation (IFC), 2008 is the safeguard guidelines for environment, health and safety for the development of the industrial and other projects. They contain performance levels and measures that are considered to be achievable in new facilities at reasonable costs using existing technologies.

2.3 Implication of GOB Policies in RTIP-2

Except ECA'95 and ECR'97, all other policies, strategies and legal instruments do not explicitly require any environmental assessment. However, most of the policies, strategies and legal instruments emphasized the need for environmental consideration along with the project planning and implementation. Again, there is no straight forward environmental categorization for the proposed RTIP-2 as per ECA'95 and ECR'97. However, depending on the extent of the subprojects, the road improvement and waterways subcomponent will fall under the Red or Orange-B category as per ECR'97. The Growth Center Markets and road maintenance should be marked as Orange–A category. All the proposed pilot rural waterways with ancillary facilities and improvement of road networks will require IEE or EIA including EMP (depend upon the impacts). But for the GC markets, need IEE or limited Impact Assessment including EMP and for the maintenance of roads need EMP. LGED will ensure that the Environmental management will be integral part of the components of project planning, designing, implementation and operation and maintenance (O&M). LGED will screen and monitor the environmental issues in both construction, and operation & maintenance phases and it will ensure the implementing the project keeping all environmental parameters in control. Considering the number of subprojects spread over large area and developing a mechanism for environmental due diligence at LGED level, the subprojects only requiring Environmental Impact Assessment i.e., water ways and road improvement with culverts more than 100 m will be sent for DOE clearance. Other subprojects having limited environmental impacts will be reviewed and cleared at LGED.

2.4 Implication of Safeguard Policies of WB in RTIP-2

The project has been considered as a Category **A** project, due to the complexity of environmental issues associated with waterways improvements and also the uncertainty (lack of details at project preparation) of the most of the sub-projects to be implemented in widespread areas. The policies on environment assessment (OP/BP 4.01), natural habitats (OP/BP 4.04) and physical cultural resources (OP/BP 4.11) have been triggered for the proposed operation. Each subproject will require environmental screening/assessment before processing. As per Bank requirement, the borrower needs to consult project-affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects and takes their views into account. The borrower initiates such consultations as early as possible. Since this is Category A project, the borrower will consult groups at least twice: (a) shortly after environmental screening and before the terms of reference for the EA are finalized; and (b) once a draft EA report is prepared. In addition, the borrower consults with such groups throughout project implementation as necessary to address EA-related issues that affect them.

3.0 DESCRIPTION OF BASELINE ENVIRONMENT FOR SAMPLE SUBPROJECT

3.1 General

The Project will be implemented in 26 districts out of 64 districts of Bangladesh. These districts are under four divisions of the eastern part of Bangladesh (except hill tracts districts). It will include 224 upazilla (sub districts) covering 61,000 sq.km (41% of Bangladesh's land area) and 60 million (48.60% of total population). The name of the districts along with the division names are provided in Table 3.1. Figure 3.1 shows the project districts.

Table 3.1: Name of 26 Districts under Project

Sl. No	Divisions	Districts
1	Rajshahi	Pabna and Sirajganj
2	Sylhet	Sylhet, Hobiganj, Sunamganj and Moulavibazar,
3	Dhaka	Dhaka, Tangail, Manikganj, Gazipur, Munshiganj, Narayanganj, Narsingdhi, Mymensingh, Jamalpur, Sherpur, Kishoreganj, and Netrokona.
4	Chittagong	Comilla, B.Baria, Chandpur, Noakhali, Laxmipur, Feni, Chittagong and Cox's bazar

Name & location of the subprojects under each project component have not yet finalized by the LGED. However, LGED has prepared an initial list for 1st year periodic maintenance work (**Annex 1**), which will be finalized before the project appraisal. The waterways subcomponent and some road improvement and growth center market locations are initially identified.

Since the project is covering around 41% of the country's area and the subproject are not finalized, it is not possible to prepare any project specific environmental baseline for the project. Alternatively, the EMF includes the environmental baseline of the each subproject type. In addition, the generic environmental baseline on the basis of national & divisional context is also described in **Annex 2**.

Figure 3.1: Project Location (RTIP-2) Map

3.2 Environmental Baseline Upazila Improvement Subproject (Example: Hatubhanga – Kaliakoir - Fulbaria via Khatiar Hat Upazilla Road)

3.2.1 Description of the Subproject

The 14.25km long Hatubhanga – Kaliakoir - Fulbaria via Khatiar Hat Upazila Road is one of the potential roads to be included in the road improvement subcomponent. The road is located in Upazila Mirzapur, District Tangail. Location of the road is shown in **Figure 3.2.**

The road was constructed in 1985. Of the total 14.25km, about 11km road is earthen and rest 3.25km is bituminous paved road. Total average crest width of the existing road is only 3.05m which will be widened (about 3.75m) at one side (right side) during construction. For widening of the road, land (about 5.5ha) is to be required to acquire, as reported by Mr. Shamsul Hoq, Upazila Engineer, Mirzapur. The road runs over almost plain agricultural land, canals and river. The road is submerged during high floods such as 1987, 1988, 1998, 2004 & 2007. Total 16 gaps (without bridges/culverts) and 5 bridges and 8 culverts are located on the road. Inventory of these structures and gaps are given in **Table 3.2:**

3.2.2 Physical Environment

3.2.2.1 Atmosphere and Climate

The mean annual temperature in Mirzapur Upazila is about 2 °C. The temperature varies from maximum 33.3°C, minimum 12°C; annual rainfall 1467 mm. In the area, on an average there is less than 3% of annual rainfall during December-March, less than 20% of annual rainfall during the pre-monsoon period (March-May) and the remainder during the period June-October

3.2.2.2 Topography

The sub is situated in the Young Brahmaputra Flood Plain. The natural drainage pattern is away from the Brahmaputra (Jamuna) and Dhaleswari rivers towards low-lying land in the southeast. The average ground elevation of the project area is about mPWD. Although the overall topography is rather flat, local landscapes are very diverse. The topography will not be an environmental issue for this subproject area**.**

3.2.2.3 Physiography and Geology

Most of the subproject area falls within Pleistocene terrace of North Central region of Bangladesh. It is locally known as Madhupur tract. It is a semi urban area site and representative of Jamuna Flood plain. Topographically the sub is a steep sided valley surrounded by many low-heights soil hills make the area undulated. Two major land types are predominant, high and low land. Locally Tan Jomi (highland), Pachot Jomi (medium) and Dopa Jomi (lowland) to indicate the suitability of their land for different agricultural practices. Degraded forest and settlement primarily occupy high land. On the other hand Dopa Jomi area is use mainly for agriculture

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3.2.2.4 Seismicity

Bangladesh itself is divided into three seismic zones**,** based on the ranges of the seismic coefficient[1]. Zone 3 is in the most seismically active area with a seismic coefficient on 0.25, and Zone 1 is the least active with a significantly lower seismic coefficient of 0.075.

one I is the severe .

3.2.2.5 Hydrology and Drainage

The subproject area consists of a portion of the Turag-Bangshi River and their adjacent wetlands within Mirzapur Upazila of Tangail District. The Turag-Bangshi River runs through numerous ditches on either side of the river. At the beginning of the rainy season, as floodwaters enter the upstream portions of the Bangshi, water spills over the riverbanks through canals/khals that connect the river to those adjacent beels. Fish, for the most part, move from the rivers to the beel/floodplain areas for spawning or nursing and then into the deeper perennial portions of the beels or back into the river as water recedes after the rains. Dry season water level reduction in khal and ditch is caused by the

[1] *Note: the seismic coefficient is a measure of how strong an earthquake has the potential to be based on a combination of the mass of the plate and the seismic forces acting on it, as well as how frequently these quakes are likely to occur.*

ground and surface water extraction for boro rice irrigation, and reduced flows due to deforestation in local and upper-watershed areas

Table 3.2: Inventory of Structures and Gapes on Hatubhanga – Kaliakoir - Fulbaria via Khatiarhat Road

SL. No	Type of Existing STR/Gaps	Chainage	Length (m) of Existing STR & Gaps	Construction Year	Condition of Existing STR	Remarks
1	RCC Girder Bridge	0+460	7.00	1988	Average	
2	UD	1+300	1.00	1987	Bad	To be replaced by 1m BC
3	BC	1+580	7.00	1998	Good	
4	BC	1+610	7.00	1995	Good	
5	PC	2+130	0.90 dia	1989	Bad	To be replaced by 1m BC
6	PC	2+380	0.90 dia	1989	Bad	To be replaced by 1m BC
7	EG	3+380	6.00			New 6m BC
8	EG	3+610	4.00			New 4m BC
9	EG	3+ 820	4.00			New 4m BC
10	EG	4+000	0.90			New 1mBC
11	BC	5+180	5.00	1996	Good	
12	EG	5+700	1.00			New 1mBC
13	EG	5+900	1.00			New 1mBC
14	BC	6+210	6.00	1985	Average	
15	RCC Girder Bridge on Canal	6+600	26.00	1987	Average	Canal is stable
16	EG	7+150	8.00			New 8m BC
17	EG	7+650	7.00			New 7m BC
18	EG	7+965	1.00			New 1m BC
19	EG	8+150	1.00			New 1m BC
20	EG	8+600	8.00			New 8m BC
21	EG	9+000	4.00			New 4m BC
22	Light Traffic Bridge on Small River	10+850	55.00	1997	Average	To be replaced by 55m bridge with navigation clearance for country boats. River is stable.
23	EG	11+050	1.00			New 1m BC
24	EG	11+900	1.00			New 1m BC
25	EG	12+530	1.00			New 1m BC
26	EG	12+845	1.00			New 1m BC
27	BC	13+160	5.00	2002	Good	
28	RCC Girder Bridge on Canal	13+660	10.00	1998	Average	Canal is stable
29	RCC Girder Bridge on Canal	13+985	12.00	1999	Good	Canal is stable

Note: STR- Structure, EG- Existing Gap, UD- U Shaped Drain, BC- Box Culvert and PC-Pipe Culvert

3.2.2.6 Air Quality

There is no official record of secondary air quality data due to non-availability of a regular air quality monitoring program for ambient conditions or emissions. The main sources of air pollutant emissions in brick kilns, industries and domestic biomass burning (such as wood, dung, and straw) responsible for most air emissions Other contributors to air pollution include vehicular and rail traffic, re-suspended road dust to make bricks, and small industries. Tempo, taxi, votvoti, motorcycles etc. move on the subproject road which pollute air.

3.2.2.7 Noise Quality

Noise is another threat (but not serious) to the quality of the environment .
Noise pollution in the subproject area occurs mainly due to movement of vehicles such as tempo, taxi, votvoti, motorcycles etc. & crossing of rail.

3.2.3 Biological Environment

3.2.3.1 Terrestrial Ecology

The terrestrial floral habitats in the project area include various types of trees and natural vegetation in common, fairly common and frequent distributions in and around homesteads, along and in open spaces as well as in non-cultivated highlands that support a wide range of wildlife species. The tree species within the PIA include: jackfruit (*Artocarpus heterophylla*), bamboo (*Bambusabalcoona*), fanpalm (*Borassusflabellifer*), coconut, eucalyptus (*Eucalyptus sp.*), banyan tree (*F. religiosa*), mango (*Mangifera indica*), banana (*Musa sapientum*), guava (*Psidiumguajava*), mahogany (*Swieteniamahogoni*), tamarind (*Tamarindus indica*), shajna (*Moringaoleifera*), etc. Natural vegetations occurring in the subproject site areas include: dholpata (*Commelinabenghalensis*), junjhuni (*Crotalaria saltiana*), grasses (*Axonopuscompressus*, *Cynodondactylon*, *Dicanthiumannulatum*, *Digitariasanguinalis*, *Eleusineindica*, *Oplismenusburminii,* *Veteveriazizanioides*, etc.), kantamehdi (*Durantareppens*), matkila, datmajon (*Glycosmispentaphylla*), dulkalmi (*Ipomoea crassicaulis*), dhanchi (*sesbaniacanabina*), pakur (*Ficuscomosa*). Due to widening of the road at one side (about 3.75m), the following total 16,236 trees including bamboo may be affected directly **(Table 3.3):**

Table 3.3: Affected Tree Species

Name of Tree Species	Large Size (No.)	Medium Size (No.)	Small Size (No.)
Gozari		994	426
Eucalyptus	43	3979	1706
Mahogoni		1991	853
Akashmoni		1847	791
Jackfruits		939	403
Bamboo	450	1206	608
Total:	493	10,956	4,787

The terrestrial faunal species: mongoose (*Herpestes auropunctatus*), field mouse (*Musboodga*), wild cat (*Felischaus*), jackal (*Vulpesbengalensis*), frog (*Ranacyanophyctis*), etc. Bird species include crow, woodpecker, kite, sparrow, weaver bird, robin, bulbul, pigeon, dove, hawk, cuckoo, black cormorant, owl, etc.

Photograph 1: Homestead Forest along the Road

3.2.3.2 Aquatic Ecology

Aquatic flora in the wetland ecosystem within the PIA include aquatic vegetation species, like ghechu (*Aponogetonappendiculatus*), wild paddy (*Hygrorizaaristata*), water lily (*Nymphaeanouchali)*, panchuli (*Nymphoidesindica and Nymphoidescristata*), kuchkola (*Otleliaalismoides*), water hyacinth (*Eichhomiacrassipes*), floating grass (*Echinocloacolonum*), water chestnut (*Trapabispinosa*), spiral algae (*Spirogyra sp.*), reeds/sedges, etc., within and along the banks of ponds, channels and floodplain lands. The fish species include: prawn (*Macrobrachiummalcolmsoni, M. dyanus, M. birmanicus, M. lamenii, Leander styliferus, etc.*), perch (*Anabas testudineus*), catfish (*Mystusvittatus, Mystustengara, Clariusbatrachus, Wallagoattu, Heteropneustesfosslis, Ompokbimaculatus, etc*.), major carp (*Labeorohita, Catlacatla, etc*.), minor carp (*Puntiussophore, Puntiusticto, Amblypharyngodonmola, Pseudeutropicusatherinoides, etc*.), shads (*Gudusiachapra, Coricasoboma*), snakehead (*Channapucntatus, Channastriatus, Channamanulius*), eel (*Mastacembelusarmatus, Xenentodoncancila*), etc.

The faunal species present in the terrestrial ecosystems are the common kingfisher (*Alcadoathis*), openbill stork (*Anastonusoscillans*), great egret (*Egretta alba*), small egret (*Egrettagazetta*), intermediate egret (*Egrettaintermedia*), fish eagle (*Ichthyophagusichthyaetus*), snipe (*Gallinagohenura*), kite (*Haliasterindus*), water snake (*Enhydrisenhydris*), monocellate cobra (*Najanaja*), and others.

3.2.3.3 National Conservation Site of Importance

No any Environmentally Protected Areas (EPAs) is located in the PIA. Nearest EPA is called Modhupur Forest and National Garden which are located at about 50km and 30km far from the subproject area.

3.2.4 Socio-economic Environment

3.2.4.1 Land Acquisition

The road runs over almost plain agricultural land, canals and river. The existing crest width of road is 3.05m which needs to be widened. For widening the road at one side, about 5.5 ha land needs to be acquired.

3.2.4.2 Settlement Pattern

It is certain that, over the next to years, the density of rural settlement in Mirzapur UZ will markedly increase. This will increase the absolute number of people at risk from climatic variations

and extremes. It is clear that densities in rural and urban areas will increase, exposing settlements to the full range of climatic extremes.

This subproject area was historically a prime rice growing area but the number of industries locating there has steadily grown over the past 15 years. There are now several types of industry in the area. Three small industries are located within the project influence area

3.2.4.3 Land Use Pattern

Most of the surrounding areas are developing rural in nature. Some scattered small houses, vacant & low lands with paddy fields, commercial activities are found around the project site. Proper use of land can bring prosperity in production & growth. The productivity of land is very high & present agricultural production can be increased to a large extent with intensive cultivation.

3.2.4.4 Fisheries

-

3.2.4.5 Industries and Commerce

Three small industries and five village bazars/markets are located within the project influence area of the road **(Table 3.4).**

Photograph 2: Bazzar along the Road

3.2.4.6 Socio-cultural, Religious, Health Centres and Archeological Sites

There are several cultural (5 schools) and religious (4 mosques) structures and 4 health centers within the project influence (PIA) that have been incorporated in **Table 3.4**.

There are no archaeological structures / monuments or sites that are of significance in the vicinity of the subproject locations.

3.2.4.7 Environmental Hotspots (Features)

Such site could be termed as Environmental Hotspots in relation to project activities and, hence, need to be dealt carefully during the construction phase. The project influence area (PIA) for the proposed road improvement site of RTIP-2 was confined within a radius of 1 km from the Right of Way (ROW) of the subproject road since the nature of the project is such that most of the potential

impacts are likely to occur within this area **(Figure 3.2).** Locations of major environmental hotspots along the road are shown in the **Table 3.4**.

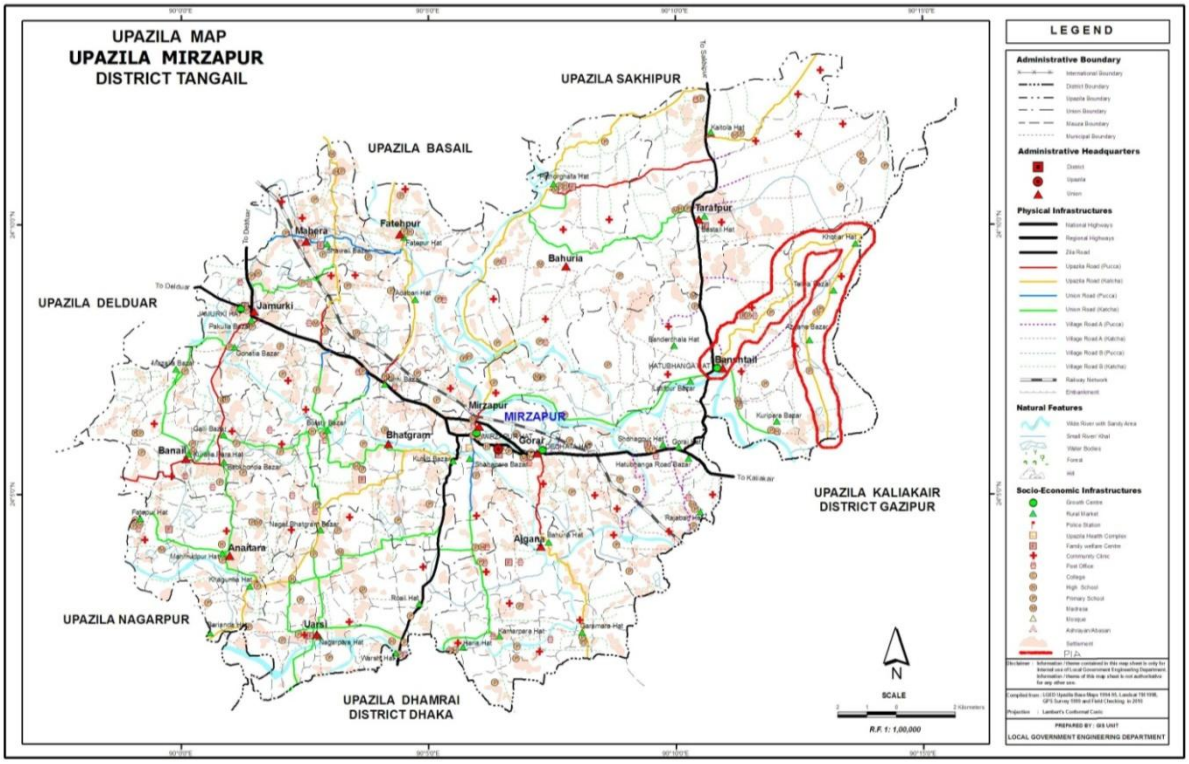

Figure 3.2: Location of Hatubhanga-Kaliakoir-Fulbari via Khatar Hat Road Improvement Subproject

Table 3.4: Important Environmental Features (IEFs) at the Road Sides along the Hatubhanga – Kaliakoir - Fulbaria Road Improvement Sub-project

Chainage (km)	IEFs	Road Side	Comments
0+000	House	R	Two tin shed houses at 70m far from the CL of the road,
0+000	Cold Storage	L	Located at 400m far from the CL.
0+010	Community Clinic	R	About 950m far from the CL of the road
0+800	House	R	Two tin shed houses at 9m far from the CL of the road,
0 to 1+300	Trees	L/R	Akashmoni, eucalyptus and gozari,trees along the road on both side slopes of the road.
1+830	House	L	A semi pucca house at 50m far from the CL of the road.
1+840	House	R	A tin shed house at 30m far from the CL of the road
1+9000	House	L	A tin shed house at 10m far from the CL
1+000	House	L	Tin shed house at 60m far from the CL
1+000	Trees	L/R	Bamboo bushes on the road side slopes.
1+200	House	R	A semi pucca house at 30m far from the CL of the road
1+300	Houses	R	6 semi-paca and tin shed houses at 10m far from theCL.
1+500	Community Clinic	L	About 600m from the CL.
1+500	House	R	A tin shed house at 40m from the CL.
1+500 to 1+580	Trees	L	Jackfruit trees on the road side slope
1+600	Ditch	R	200m far from the CL of the road
1+700	House	L	A tin shed house at 10m far from CL
2+000	House	R	2 houses at 10m and 4 houses at 30m far from the CL
2+000	House	L	2 houses at 10m and 3 houses at30m far from the road
2+000	Pond	L	Beside the road and is used for fish culture
2+000	Trees	L	Bamboo bushes on road side slope
2+100	Mosque	L	It is 10m far from the CL

Chainage (km)	IEFs	Road Side	Comments
2+500	House	R	It is 100m far from the CL of the road
3+010	House	L	Three semi pucca houses at 50m far from the CL of the road
3+500	House	R	Two tinshed houses at 10m far from the CL
3+600	House	L	Seven houses at 12m far from the CL.
3+800	Mosque	L	100m far from the CL of the road
4+000	Matikhola bazaar		16 shops on the both road side slopes of the road
4+000	Madrasha	R	Located at about 15m far from the CL
4+000	Mosque	R	Located at about 15m far from the CL
4+100	House	L	There are about 10 no of houses at 100m far from the CL.
4+400	Community Clinic	L	380 m far from the CL of the road
4+400	House	L	4 no of houses at 20m far from the CL of the road
4+450	Mosque	R	At 100m far from the CL.
5+000	Canal (Telina Khal)	R	Stable canal is located beside the road
5+000- 5+500	House	L	There are 50 no of houses at 500m far from the CL
5+500	Noise Bazaar	L/R	There are 14 small shops on the both sides of the road.
6+000	House	L/R	3 houses on the left side and 4 houses on the right side at 12m far from the CL.
6+100	Electric post	R	10m far from the CL
6+800	Network Tower	L	20m far from the CL
7+000	Khatiarhat Bazaar		There are 12 shops on the both sides of the road.
7+000	Mosque	L	About 100m far from CL.
7+400	High & Primary School	L	About 350m far from the CL
7+600	Canal	R	This khal is passed beside the road
7+600	House	L	No of houses are 7 and about 50m from the CL.
7+600	House	R	No of houses are 4 and about 50m from the CL of the road
7+800	Tree Garden	R/L	Mainly gozari trees at about 200m from the CL of the road.
8+000	House	L	There are about 10 houses along the road at 10m far
8+600	House	L	There are about 20 houses which are more than 10 m far from the CL. .
8+600	Pond	R	About 20m far from the road.
9+000	Khal	R	Beside the road & is stable
9+500	Ditch	R	15 m far from the CL of the road
10+000	Community clinic	L	900m from the CL
10+000	Pond	R	Seasonal and just beside the road
10+400	Sawmill (wood mill)	L	Just beside the road.
10+500	House	L/R	There are about 10 houses on both sides of the road.
10+600	House	L/R	About 10 houses at left and 10 at right side at 22 m far from the CL..
10+700	Bazaar		The road passes on the bazaar with 16 smalll shops on both sides.
10+700	Primary School	R	About100m far from the CL.
10+750	Rice mill	L	About 100m far from the CL
10+850	55m RCC Bridge	L/R	55m river crosses the road.
11+000	Madrasha	L	About 200 m far from the CL of the road
13+300	Village Hat	L/R	There are 14 shops on both side of the road
13+300	Cow hat	L	About 12m far from the CL
13+400	High School	L	About 15m from the CL
13+500	House	L/R	There are 10 houses at 20m far the CL of the road
13+700	Madrasha	R	10m from the CL of the road
13+700	Azguna Bazaar		About 8 Pucca and 10 semi-pucca shops at the road sides
13+700	Primary School	L	300m far from the CL of the road
13+850	Mosque	L	300m far from the CL of the road
14+200	Pond	R	About 12m far from the CL of the road

Note: From Chainage: 8+000 to end densely trees have been observed at both sides of the road; L=left side, R=right side, CL=center line

3.3 Baseline Environment for Maintenance of Road (Example: Mowchak – Fullbari Road Maintenance)

3.3.1 Subproject Description

About 21km long Mouchak – Fullbari Road Maintenance has been identified as one the roads, which will be maintained under the project. The road is located in Upazila Kaliakoir, District Gazipur. Location of the road is shown in **Figure 3.3.**

The road was constructed in 1980. The entire road is bituminous paved road. Total average crest width of the existing road is about 5.5m of which paved width is 3.05m. The overall condition of the road is good. The road runs over the undulated high land, canals and river. The road is not submerged even during high floods such as 1987, 1988, 1998, 2004 & 2007. A 105m bridge over the Turag River & many other small bridges/culverts are located on this road. Major Road Maintenance Works are: Repairing of potholes, slopes, crack pavement, earth shoulders & bridge parapet.

3.3.2 Physical Environment

3.3.2.1 Atmosphere and Climate

The project location has a humid sub-tropical climate with large variations between summer and winter temperatures. The cluster has a tropical monsoon climate. It has three main seasons: Summer/Pre-monsoon (March to May), Rainy Season/monsoon (June to October), and winter season (November to February). The rainy season is hot and humid having about 90 percent of the annual rainfall. The winter is predominately cool and dry. The summer is hot and dry interrupted by occasional heavy rainfall. The annual average temperature maximum 36^0C and minimum temperature is about 12.7^0C. Annual rainfall is about 2,376 mm.

3.3.2.2 Topography

Topographically the cluster project location is almost flat, with some undulations, natural khals, bounded by the Turag River. There are many vacant low lands on the bank of the Turag River, where many brick manufacturing industries exist. The depressions and canals are dominated by organic clay and peats. The cluster lies on the Madhupur Clay with its average thickness of about 10 meters consists of over-consolidated clayey slit and is underlain by the Pleistocene Dupi Tila formation. Most depression and canals are tectonically controlled. The average ground elevation of the project area is about 13mPWD.

3.3.2.3 Physiography and Geology

The project area lies in the deep geosynclinals part. It is characterized by a huge sedimentary sequence of mostly tertiary age testified high tectonic instability or mobility. The stratigraphy of the deep basin including fore deep and fold belt to the southeast is characterized by an enormous thickness of tertiary sedimentary succession. The rocks encountered here are much younger in geologic age and ranges between Oligocene and Recent time. The basin has got the record of rapid subsidence and sedimentation.

The height of the land gradually increases from the east to the west. The southern part of the project area is composed of the alluvium soil of the Turag River. The land feature of the project area bears uneven elevation. Once, the area was covered with green vegetation. Now, due to the rapid growth of population and industrialization, the area is being used for establishing buildings, mills and factories.

3.3.2.4 Seismicity

The project area remains in the seismic zone II which is vulnerable for earthquake. In the medium risk zone, shocks of moderate intensity are possible, with a probable maximum magnitude of 6 to 7 on the Richter scale.

3.3.2.5 Hydrology and Drainage

The project road crosses a number of water bodies such as 150m wide Turag River and several canals **(Table 4.4).** There are 23 fish ponds are available along the ROWs of the road. The surface areas size of the ponds varies from 250 to 11,000 square meters (m2). All the ponds are man-made, often located in former borrow pits, and are used for fishing, water supply, and domestic use (e.g., washing clothes, and bathing).

3.3.2.6 Air Quality

Several Small and medium industries such as the Aftab industrial park, various textiles dyeing and other industries are located at both sides of the road which pollute air of subproject area (Table 4).. The brick kilns located on the banks and flood plains of Turag River in the periphery of Konabari-Kashimpur cluster are a major source of air pollution. Most of the internal roads within the industrial and residential clusters of Konabari-Kashimpur are unpaved, and vehicular movements on these, especially heavy vehicles (buses, trucks etc.) generates dust and impair the air quality. While dust impacts are significant due to the poor road conditions, vehicular air pollution impacts are not envisaged to be significant due to the widespread use of Clean Natural Gas (CNG) vehicles.

Photograph 3: Aftab Industrial Park

3.3.2.7 Noise Quality

Noise is another threat to the quality of the environment . Many heavy vehicles such as trucks, buses, cars, tempo, votvoti move on the road during day & nights and these vehicles generate high noise in this subproject area.

3.3.3 Biological Environment

3.3.3.1 Forest and Natural Habitats

There are few natural terrestrial habitats in and around inhabited areas, because in most cases vegetation was cleared many years ago to provide land for development, and for agriculture in the suburbs. The project area is similar to the character to many areas of alluvial delta in Bangladesh with mixed crop vegetation. Rice, other grains and seasonal vegetables are the main crops in this area. Terrestrial plants are now mainly limited to trees, shrubs and flowers grown alongside roads and in parks and gardens, and the crops and fruit trees planted in agricultural areas. The composition of plant community includes low growing grasses and herbaceous vegetation as well as other flora. No wild animals inhabit and endangered species are present in this area. The common birds like crow, sparrow, mayna, etc and some domestic cattle, no other wild animals inhabit the area. No forestland is involved in this area are found surrounding the proposed subproject locations.

Photograph 4: Homestead Forest along the Road Side

3.3.3.2 Aquatic Flora and Fauna

The main aquatic flora in this area is Kalmilata (*Ipomoea reprans*), Shapla (*Nymphaea lotus*) Helencha (*Alternathera philoxeroides*), Kuchuripana (*Eihhcormia crassipes*). The main aquatic fauna in this area are different types of fishes. The fresh water fishes are carp (Rui, Catla, Mrigal, Ghania, Kalibaus, etc.) catfish (Boal, Bacha, etc.) and live fish (Koi, Singh, Magur, etc.). The stretch of that rivers provide a habitat for a wide variety of fishes and shellfish species which include carp (Rui, Catla, Mrigal, Ghania, Kalibaus etc) catfish (Boal, Pangas, Shilong, Bacha etc) and live fish (Koi, Singh, Magur etc). The other fauna is tortoise, frogs, water snake etc.

3.3.4 Socio-economic Environment

3.3.4.1 Demography

The project location has been experiencing rapid industrial growth and urbanization since 2000. With the growth of industry and demand for housing in the area, agricultural land has largely disappeared in the core industrial areas. Kaliakair (Town) consists of 4 mouzas with an area of 5.37 sq km. It has a population of 10374; male 57.61%, female 42.39%; density of population is 1932 per sq km. Literacy rate among the town people is 51.2%. According to data, the sex ratio of the Upazilla is males per females. The decadal population growth ratio is and annual compounded growth rate is BBS 2006)

3.3.4.2 Settlement Pattern

The town is gradually expanding cent ring round Talibabad Satellite Ground Centre, Bangladesh Adventist Seminary and College It is certain that, over the next to years, the density of rural settlement in will markedly increase. This will increase the absolute number of people at risk from climatic variations and extremes. It is clear that densities in rural and urban areas will increase, exposing settlements to the full range of climatic extremes.

is an industrial site where rapid industrial expansion has led to serious local pollution. This area was historically a prime rice growing area but the number of industries locating there has steadily grown over the past 15 years. There are now several types of industry in the area but it is dominated by textile manufacturers, including dyeing and printing units, as well as poultry farms, some pharmaceutical industries.

3.3.4.3 Land Use and Water Use Pattern

Most of the surrounding areas are developing industrial & rural in nature. There are many industries operating in the area. Some scattered small houses, vacant & low lands with paddy fields,

commercial activities are found around the project site. Proper use of land can bring prosperity in production & growth. The productivity of land is very high & present agricultural production can be increased to a large extent with intensive cultivation.

3.3.4.4 Fisheries

Fresh water fish habitat such as river, pond (23 nos. fish ponds) and ditches exist in and around the cluster, which provide shelter, feeding, and spawning ground for different types of fresh water fish species. Large-scale human intervention for catching fresh water fishes from their natural habitat/Turag River has been observed. The reproduction, breeding and multiplication of aquatic fishes are very finely tuned and adjusted to the rhythm and amplitude of monsoon flooding in and around the proposed cluster. There are many fishermen within the cluster whose income source is mainly fishing from the Turag River as well as natural canals. Due to river water pollution by industries fish resources are decreased, as reported by local fishermen. Main fisfes are rui, bain, tengra, baila, taki, boal, mrigel etc.

3.3.4.5 Industries and Commerce

Ten industries & 7 bazars/markets have been identified within the project influence area of the subproject **(Table 3.4).**

3.3.4.6 Socio-cultural, Religious and Archeological Sites

There are several cultural, religious and medical structures (6 schools, 1 graveyard, 7 mosques and 2 medical centres); have been identified within the project influence area (**Table 3.4)**.

There are no archaeological structures / monuments or sites that are of significance in the vicinity of the subproject locations.

3.3.4.7 Important Environmental Features/Hotspots

The project influence area (PIA) for the proposed road maintenance site of RTIP-2 was confined within a radius of 1 km from the center of the road since the nature of the project is such that most of the potential impacts are likely to occur within this area **(Figure 3.3).** Locations of major environmental hotspots/features along the road are shown in the **Table 3.5**.

Table 3.5: Important Environmental Features (IEFs)/Hotspots at the Road Sides along the Mouchak to Fulbaria Road Maintenance Sub-project

Chainage (km)	IEFs	Road Side	Comments
0+010	Police Station	LS	It is located at about 20m far from the CL of the road
0+000 to 2+300	Markets	LS/RS	Several Markets are located along the both sides of the road
0+020	School	LS	Mowchak Gov. Primary School is located at about 20 m far from the CL of the road
0+030	Hospital	LS	Sufia Hospital is along the road
0+600	Mosque	RS	Along the road
0+800	Industry	LS	Marico industry is along the road
0+900	Industry	LS	Likko knitting industry is along the road
1+100	Industry	LS/RS	Remo industry (big industry)/Sandip textile
1+200	Industry	RS	Along the road
1+500	Industry	LS	Aftab industrial park is located close to road
1+600	Industry	LS	Aftab global textile is located close to road
1+800	Industry	RS	DAF Accessories ltd.
1+950	Rail crossing	CL	Dhaka –Tangail Railway line crosses the road
2+100	Community Clinic	R	About 800m far from CL of thr road
2+250	Industry	LS	BEO apparel ltd.
2+400	Bazar	LS/RS	Bhannara bazar
2+400	Mosque	RS	Mosque at Bhannara bazar
3+100 to 5+500	Nursery	LS/RS	Nursery garden is located both sides of the road
4+500	Mosque	RS	Along the road at 5m far
5+000	Madrasha and small bazar	LS/RS	Madrasha is located left side of the road

Chainage (km)	IEFs	Road Side	Comments
5+900	Mosque	LS	Close to project road maintenance
6+000	Pond	LS	Beside the road and is used for fish culture
6+100	Bazar	LS/RS	Lasker bazar is established at Thakurpara
6+800	Chicken farm	LS	It is 15 m far from the CL of road
6+750	Madrasha	LS	It is 20 m far from the CL of road
7+200	Union Parishad Office	RS	Along the road at 10m far
7+6500	Bashundhara Housing Society	RS	It is situated right side of the road
7+750	Graveyard	LS	Along the road at about 10m far
7+800	Pond	LS/RS	Beside the road and is used for fish culture.
8+300	Industry	LS	Beside the road
8+400	School	LS	Located at about 20m far from the CL
8+600	Mosque	LS	Along the road at 10m far from the CL
8+800	Pond	RS	Beside the road and is used for fish culture
9+000	Tower	RS	Tower is located 20m far from the CL of the road
9+100	Mosque	RS	At about 12m far from CL
9+500	Pond	RS	Fish culture at ditches and it is almost 200m far from the road
11+100	RCC Bridge	CL	105 m long single lane bridge over the Turag River. The Turag is stable but almost meandering river. Structural and hydrological condition of the bridge is good. Turag is navigable river.
11+150	School	RS	It is 50m far from the road
11+500	Chicken farm	LS	It is 20 m far from the road
11+550	Pond	LS	Beside the road
11+650	Pond	LS	Beside the road
11+900	Pond	LS	Beside the road
12+900	Bazar	LS/RS	Sonatala Bazar
13+000	Graveyard	RS	About 50m far from the road
13+500	Mosque	LS	About 5m from the road side.
13+600	Industry	LS	Beside the road
14+400	Community Clinic	L	250m far from CL
15+600	Bazar	LS/RS	Gachbari Bazar is located along the road
15+600	Tower	RS	Mobile tower is located at Gachbari bazar
16+600	Box Culvert	CL	5mX5m box culvert over a canal
18+000	School	RS	Along the road at about 6m far.
19+100 to 20+000	16 ponds	RS/LS	16 big fish cultured ponds are located. At both sides of the road.
20+400	Industry	RS	Wood Mills
20+700	Bazar	LS/RS	Fulbaria bazar is mainly located along the road side (L/S)
20+800	Union Parishad Office	LS	It is 10m far from the road alignment

Note: From Chainage: 1+000 to end densely trees were observed at both sides of the road; LS=left side, RS=right side, CL=center line.

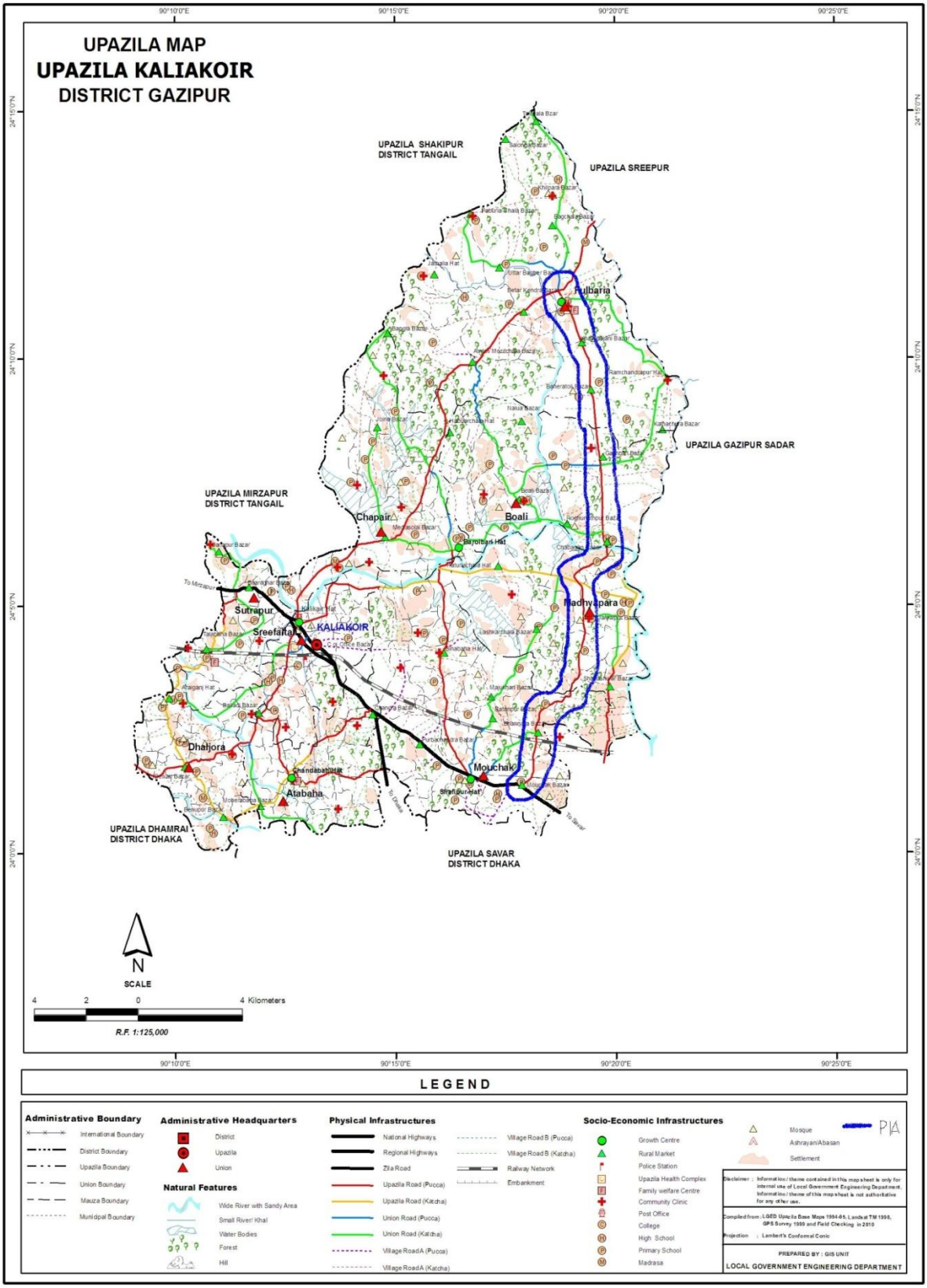

Figure 3.3: Location of Mouchak-Fulbaria Road Maintenance

3.4 Baseline Environment for Waterways (Mirzapur-Kaliakoir Waterways)

3.4.1 Description of Subproject

Under the project, 2 waterways will be rehabilitated and Mirzapur-Kaliakor is the first highway that will be rehabilitated in the second year of the project implementation. Approximate length of the Mirzapur-Kaliakoir rural is about 17km waterways through the Turag River (**Figure 3.4**). The average bank to bank width and depth of the Turag River is 120m and 10m respectively. The water depth during dry period varies from 0.5m to 5m. The flow velocity during monsoon is very high (3m/sec) and during dry period is very low (alomost 0m/sec). The river is meandering but almost stable. However bank erosion and siltation occur at some locations. There are three ghats are located on the river banks at Ch: 0+000 (Vill. Mirzapur), 2+000 (Chabagan) & 15+600 (Nama Shoila). The main activities of the subproject are: shallow river bed dredging, protection works and ghat development works.

3.4.2 Physical Environment

3.4.2.1 Atmosphere and Climate

The subproject location has a humid sub-tropical climate with large variations between summer and winter temperatures. The cluster has a tropical monsoon climate. It has three main seasons:

- Summer/Pre-monsoon (March to May),
- Rainy Season/monsoon (June to October), and
- Winter season (November to February).

The rainy season is hot and humid having about 90 percent of the annual rainfall. The winter is predominately cool and dry. The summer is hot and dry interrupted by occasional heavy rainfall. The annual average temperature maximum 36^0C and minimum temperature is about 12.7^0C. Annual rainfall is about 2,376 mm.

3.4.2.2 Topography

This project is located on the flood plain of the Turag River. The ground elevation of the sub-project area is about 13mPWD. Topographically the cluster project location is almost flat, with many depressions, natural khals, bounded by the Turag River. There are many vacant low lands on the bank of the Turag River, where many brick manufacturing industries exist. The depressions and canals are dominated by organic clay and peats. The cluster lies on the Madhupur Clay with its average thickness of about 10 meters consists of over-consolidated clayey slit and is underlain by the Pleistocene Dupi Tila formation. Most depression and canals are tectonically controlled.

3.4.2.3 Physiography and Geology

The project location lies on the southern corner of Madhupur Tract along the Old Brahmaputra, Turag, Bangshi and Sitolakkhya Rivers. This tract is made of sediments of Pleistocene age which is underlain by the Plio-Pleistocene Dupi Tila Formation. The project area lies in the deep geosynclinals part. It is characterized by a huge sedimentary sequence of mostly tertiary age testified high tectonic instability or mobility. The stratigraphy of the deep basin including fore deep and fold belt to the southeast is characterized by an enormous thickness of tertiary sedimentary succession. The rocks encountered here are much younger in geologic age and ranges between Oligocene and Recent time. The basin has got the record of rapid subsidence and sedimentation.

Geological structure in Kaliakoir is delineated mainly based on geophysical survey named as Titas structure. This is an anticlinal fold, which has no surface geomorphic expression and is covered by Titas-Meghna River floodplain deposits. Titas anticline is a north-south elongated semi-domal structure influenced by tectonically positive element from the deep subsurface. Titas anticlinal closure is one of the largest (168 km) in Bangladesh. The structure is asymmetric in nature with steeper dip in the eastern flank and gentler slope in the western flank. There has been indication of faulting in the deeper level in the eastern flank, as shown by seismic reflection discontinuities.

3.4.2.4 Seismicity

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3.4.2.5 Hydrology and Flood

The “Turag-Bangshi” river basin is located in the North Central “Hydrological Region” of Bangladesh. This region is bounded by the Jamuna, Padma, Old Brahmaputra and the Sitalakha river system; Jamuna being on the west, Old Brahmaputra on the north and northeast, and Sitolakha on the east. Other important waterways are the Dhaleswari-Kaliganga River, which crosses the southwestern part of the region. Besides these main rivers, the region is drained by many small rivers such as, Bangshi, Pungli, Banar etc. The study area consists of a portion of the Turag-Bangshi River and their adjacent wetlands within Gazipur District.

Typical of most low-lying floodplains of Bangladesh, the Turag-Bangshi River runs through numerous beels on either side of the river. At the beginning of the rainy season, as floodwaters enter the upstream portions of the Bangshi, water spills over the riverbanks through canals/khals that connect the river to those adjacent beels. Fish, for the most part, move from the rivers to the beel/floodplain areas for spawning or nursing and then into the deeper perennial portions of the beels or back into the river as water recedes after the rains. Dry season water level reduction in khal and beel is caused by the ground and surface water extraction for boro rice irrigation, and reduced flows due to deforestation in local and upper-watershed areas (MACH, During this period, fish remain only in river pools (called 'kum's) and in the deepest portions of the beels (called 'doha').

The hydrology of the Turag-Bangsi Flood Plain, like those of similar areas of Bangladesh, is determined principally by the monsoon occurring from May-October followed by a dry period from November-April. Approximate length of the Mirzapur-Kaliakoir rural is 17km waterways through the Turag River. The average bank to bank width and depth of the Turag River is 120m and 10m respectively. The water depth during dry period varies from 0.5m to 5m. The flow velocity during monsoon is high (about 2.5m/sec) and during dry period is very low (alomost 0m/sec). The river is meandering but stable. However bank erosion and siltation occur at some locations slightly. The availability of water determines fish production, agriculture cycle and life style of the people in the area.

3.4.2.6 Air Quality

The brick kilns located in the banks and flood plains of Turag River in the periphery of Konabari-Kashimpur cluster are a major source of air pollution **(Table 3.5).** There is no official record of secondary air quality data due to non-availability of a regular air quality monitoring program for ambient conditions or emissions. The main sources of air pollutant emissions in
brick kilns, industries and domestic biomass burning (such as wood, dung, and straw) responsible for most air emissions Other contributors to air pollution include vehicular and rail traffic, re-suspended road dust to make bricks, and small industries.

Photograph 5: Brick Field beside the Turag River at Vill. Mirzapur, UZ.:Kaliakoir

3.4.2.7 Quality

The subproject area is enclosed in the Turag River. Like other inland waterways, these rivers support a fish fauna that includes carp, catfish, and loach, plus a variety of invertebrates and insects that have been little studied. In the absence of effluent treatment plants in the various industries functioning in the project area, there is direct discharge of the effluents from the textile industries into the river. The Ministry of Environment and Forests estimates that 80% of the sewage produced by the 15 million people in Dhaka and surrounding areas enters the rivers untreated, and most of the 7,000 industries dispose of their waste to drainage ditches and rivers without treatment (Dhaka Environment Programme, 2005).

As other parts of the country, this cluster also receives sufficient amount of rainfall (average annual rainfall is 2376 mm). Turag River is the major surface water body in the Konabari-Kashimpur cluster under the Gazipur district. It receives discharges from the industries situated along the Joydebpur-Tangail road and Konabari-Kashimpur Industrial Zone, which include textiles, footwear, food, chemical, pharmaceutical, detergent, etc. Some of the industries have got their own effluent treatment plant (ETP) and many of them have got no ETP, as a result the surround surface water bodies are polluted, which is a major concern of environmental degradation of the cluster. Two textiles industries are located from the river bank at about 500m far within the subproject area **(Table 3.5).** During site visit it was observed that Effluent from these industries were directly dischaged into the Turag River through canals & as result, river water was polluting.

There is a good availability of ground water that is being used by hand pumps for drinking and domestic purposes. Some industries are using deep tube wells within their premises to meet the requirement of quality water for various purposes. The scattered homesteads are using hand tube well (HTW) to meet their domestic demand. No data is presently available on pumping rate. Iron and arsenic are the major water quality concern for drinking purposes in project cluster.

Photograph 6: Waste Water discharge from industries through Canal

3.4.2.8 Noise Quality

Noise pollution is not significant in the subproject area. Noise in the subproject area generates mainly due to movement of engine country boats. About 200 boats ply on this river/day during dry period but it increases during flood season up to 400 nos as reported by the boatmen.

3.4.2.9 Soil Quality

The soil of the subproject area mainly consists of silt and clay. The river bed soil of the Turag River is mainly sandy clayey soil.

3.4.3 Biological Environment

The ecological settings of the cluster are mostly with wetland, homestead and roadside vegetation etc. The homestead vegetation has a positive effect on improvement of soil moisture through shading and mulching process. The trees growing at homesteads also ensure for easy access to the fuel wood, fodder and other products. A large number of multipurpose trees such as jackfruits, mango, shilkoroi, shimul, shisso, mehegoni, banana, pappya, coconut, bamboo etc are grown in the cluster. The most common among them are jackfruit, mango, lemon, banana etc. Two major types of fauna viz., terrestrial and aquatic fauna have been identified in and around the cluster.

3.4.3.1 Flora

Wetland flora plays a vital role for biodiversity conservation. The wetland habitat is characterized by anaerobic conditions, which inhibits normal plant growth. The cluster supports two types of wetland e.g., (a) Permanent wetland and (b) Seasonal wetland. The permanent wetland includes rivers and perennial water bodies. This wetland provides refuge and shelter for the most of the aquatic flora. The seasonal wetland serves as the cultivated land. Aquatic flora in the cluster can be divided into communities based on a set of environmental conditions. The communities are as follows:

- Free-floating plants
- Sub merged floating plants
- Rooted floating plants
- Sedges and meadows
- Marginal vegetation

Photograph 7: Denuded riverbank with Gajari forest on the right bank

3.4.3.2 Fisheries

Fresh water fish habitat such as river, pond and ditches exist in and around the cluster, which provide shelter, feeding, and spawning ground for different types of fresh water fish species (such as carp,catfish, mrigel, taki, shoel, tengra, bain, baila, boal etc.),. Large-scale human intervention for catching fresh water fishes from their natural habitat/Turag River has been observed. The reproduction, breeding and multiplication of aquatic fishes are very finely tuned and adjusted to the rhythm and amplitude of monsoon flooding in and around the proposed cluster. There are many fishermen within the cluster whose income source is mainly fishing from the Turag River as well as natural canals. Due to pollution of river water by the industries, fish resources are being reduced as reported by the fishermen during site visit.

Photograph 8: Fisherman catching fish from the Turag River

3.4.3.3 Forest and Protected Areas

There is no ETA nearby the subproject area. Bhawal National Forest and Bhawal National Park are the biggest forest and protected area which are located at about 10km far from the subproject area.

3.4.4 Socio-economic Environment

3.4.4.1 Demography and Socioeconomic Conditions

Kaliakair (UZ Town) consists of 4 mouzas with an area of 5.37 sq km. It has a population of 10374; male 57.61%, female 42.39%; density of population is 1932 per sq km. Literacy rate among the town people is 51.2%. According to data, the sex ratio of the Upazilla is males per females. The decadal population growth ratio is and annual compounded growth rate is BBS 2006).

The Average literacy is 36.25% (male 43.2% and female 29.3%). The major sources of income within the population of this cluster are agriculture, agricultural labour, wage labour, industrial labour, commerce, small shops, small shops in the markets, service, transport, construction, fisheries, hawker, house renting out, land renting out for the Brick field and others.

3.4.4.2 Settlement Pattern

The town is gradually expanding cent ring round Talibabad Satellite Ground Centre, Bangladesh Adventist Seminary and College It is certain that, over the next to years, the density of rural settlement in will markedly increase. This will increase the absolute number of people at risk from climatic variations and extremes. It is clear that densities in rural and urban areas will increase, exposing settlements to the full range of climatic extremes.

is an industrial site where rapid industrial expansion has led to serious local pollution. This area was historically a prime rice growing area but the number of industries locating there has steadily grown over the past 15 years. There are now several types of industry in the area but it is dominated by textile manufacturers, including dyeing and printing units, as well as poultry farms, some pharmaceutical industries and a tannery.

3.4.4.3 Land Use Pattern

Like other parts of Bangladesh agricultural crops dominate within the area and there are many “Brick fields” within the cluster. The main crops are rice, wheat, potatoes, garlic, chilli, onion and other vegetables. There are many industries located within the cluster. There are many seasonal fruits e.g. Jackfruit, mango, etc. Some lands are used for seasonal cultivations.

3.4.4.4 Industries and Commerce

There are about 2 textile industries & 16 brick fields are located on the river banks within 850m from the river bank. In the area, most textiles and dying industries have 5 -10 tons capacity per day. There are also 5 bazars/markets are located on the river banks **(Table 3.6).**

3.4.4.5 Socio-cultural, Religious and Archeological Sites

Several cultural and religious structures (4 mosques, 5 schools & 1 graveyard) have been identified within the project influence (PIA) that is incorporated in **Table 3.6.**

There are no archaeological structures / monuments or sites that are of significance in the vicinity of the subproject locations.

Photograph 8: Turag River Ghat and Mosque at Right Side

3.4.4.6 Important Environmental Features (IEFs)/Hotspots

Such site could be termed as Environmental Hotspots in relation to project activities and, hence, need to be dealt carefully during the construction phase. The project influence area (PIA) for the proposed rural waterways site of RTIP-2 was confined within a radius of 1 km from the bank of the river since the nature of the project is such that most of the potential impacts are likely to occur within this area **(Figure 4.3)**. Locations of major environmental hotspots/IEFs along the rural waterways are shown in the **Table 3.6.**

Table 3.6: Important Environmental Features (IEFs) /Items at Both River Banks of the Turag River from Mirzapur to Kaliakoir Waterway Sub-project

Location (Approximate Chainage)	IEFs	Side	Comments
0+000	RCC Bridge	CL	125 RCC bridge with navigation clearance under construction.
0+000	Small bazar	LS/RS	Beside the river bank
0+000 to 0+600	Brickfields	RS	About 16 brickfields are located within the 500 meter PIA and close to the river bank. Black smoke from these brick fields pollutes air.
0+700	Canal/Khal	LS	A small khal/canal which is seasonal water body connects with the river.
1+100	Erosion prone area	LS	During monsoon river bank erodes but insignificant
1+150	Siltation	LS	Insignificant
1+400	Erosion prone area	LS	During monsoon river bank erodes but insignificant.
1+700	Fishing area	CL	Fisherman is capturing fish from the river
1+750	Mosque	LS	400m far from the river bank
1+800	Textile Mill	R/S	Textile mill (at about 0.8km far) effluent is being discharged directly into the river through canal & as a result, river water is polluted severely.
1+900	School	RS	500m far from the river bank
2+000	RCC Bridge	CL	105m bridge with navigation clearance on Mowchak-Fulbari road and at east side of bridge Chabagan bazar and at west side sand stock piling are located.

Location (Approximate Chainage)	IEFs	Side	Comments
2+000	Chabagan Bazzar	RS	It's close to river bank
2+050	Siltation	LS	Insignificant
2+400	School	LS	900m far from the river bank
2+500	LLP	RS	Low lift pump is being used for irrigation from river water
3+400	LLP	RS	Low lift pump is using for irrigation from river water
3+800	LLP	RS	Low lift pump is using for irrigation from river water
3+700	Canal/Khal	LS	Dry up. Water flow during monsoon. This seasonal water body connects with the river..
4+000	Canal	RS	A canal (30m wide and 4m depth) named after Guila Khal. 40m bridge is located over this canal. This seasonal water body connects with the river.
4+500	Canal	RS	50m wide and 4.5m depth canal connects with the river. Seasonal.
4+800	Mosque	RS	600m far from the river bank
4+900	Rughunathpur Bazzar	RS	It's close to the riverbank about 300m far
5+800	Graveyard	RS	About 20m far from the river bank at Bhati Guadaghata village
6+100	Canal/Khal	LS	10m wide & 2m depth small canal (Seasonal) connects with the river.
6+400	Erosion prone area	RS	About 150m long river bank erosion along the river bank (not severely) was occurred during high flood due to high flow velocity as reported by the local people.
7+100	School	RS	800m far from the river
9+800	Textile & Canal	LS	Textile mill (at about 1km far) effluent is being discharged in to the river through a canal at village: Gobinpur & as a result, river water is polluted severely.
10+600	Graveyard	RS	About 5m far from the river bank
10+700	Boroibari Hat	RS	600m far from the river bank
10+700	School	RS	900m far from the river
10+800	Mosque	RS	Boroibari bazar pucca mosque (20m far from the river bank)
11+000	RCC Bridge	CL	Boroibari Bridge with navigation clearance (105m length)
11+500	Canal	RS	Small Canal at Vill. Goya Ashirabari in UZ: Kaliakoir. Seasonal water body.
12+200	Primary School	LS	It is located at about 20m far from the river bank.
12+300	Canal/Khal	LS	Seasonal small canal
13+100	Canal/Khal	LS	Seasonal small canal
13+300	Community clinic	RS	800m far from the river bank
14+300	Mosque	LS	About 30m far from the river bank
14+400	Electric line	RS	Crossed the river
14+800	Community clinic	RS	600m far from the river bank
14+900	Madrasha	RS	900m far from the river
15+400	Protection wall	RS	About 20m long protection works by whole bricks (done by house owner to protect his house)
15+600	Bazar/Ghat	RS	A big Ghat named after Nama Shoila and poultry firm
16+200	Canal/Khal	LS	Seasonal small canal
16+600	Infrastructure	LS	Household establishment
16+900	Kaliakar Hat	LS	400m far from the river
17+000	Bridge	CL	Mirzapur steel narrow bridge with navigation clearance.

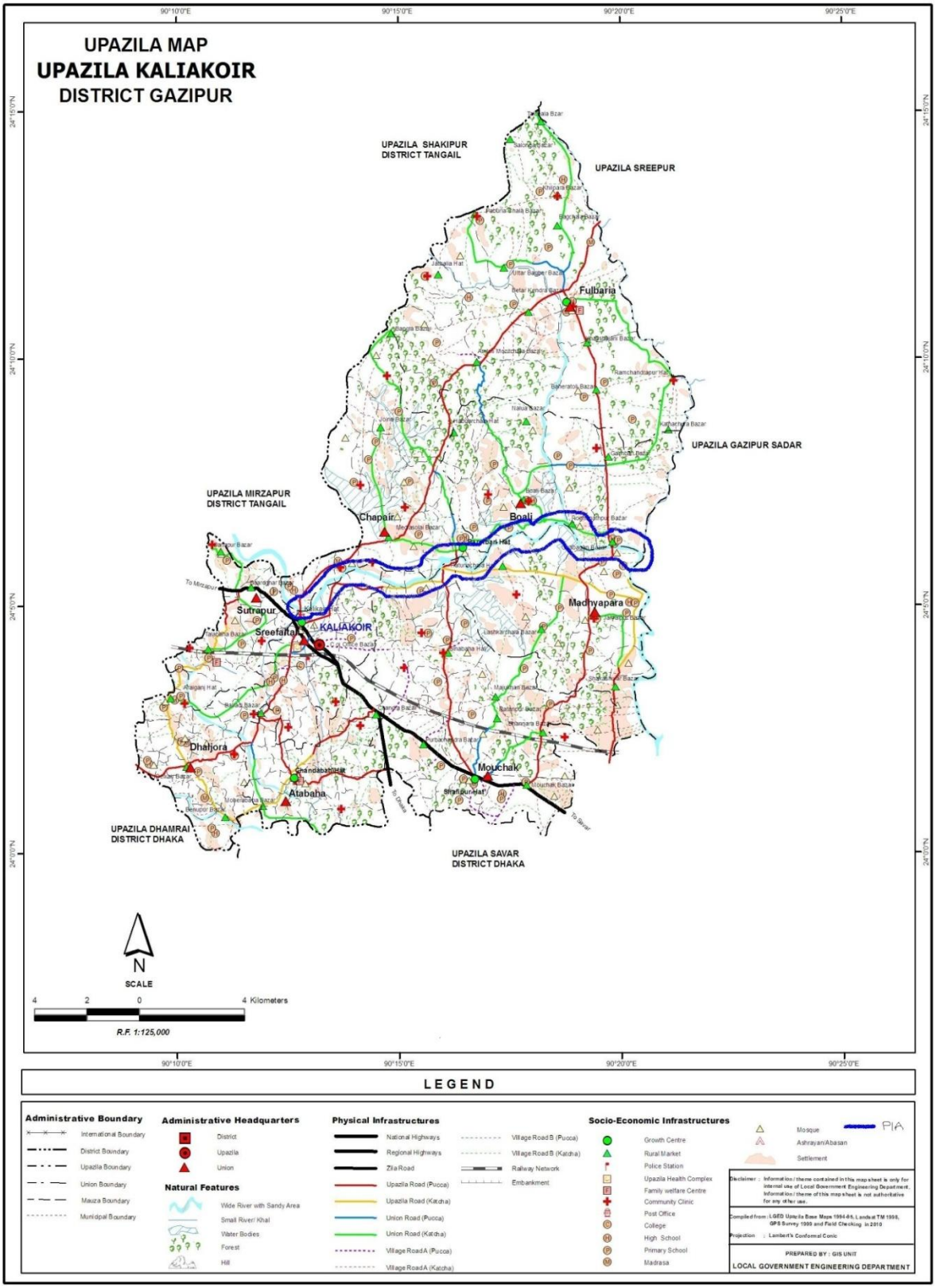

Figure 3.4: Location of Mirzapur-Kaliakoir Rural Waterways

3.5 Baseline Environment for Growth Centre Market (Example: Fulbaria Growth Center)

3.5.1 Description of Subproject

This GC market is located at the road side of the Mouchak-Fullbari road at Fullbari in UZ: Kalikoir (**Figure 3.5**). Total area of the GC is about 5ha of which cattle market area is about 0.5ha. The entire infrastructure for this market has already been constructed except cattle market. The cattle market is low lying area and as a result during any floods, it is inundated. Therefore needs to rise above high flood level. Other facilities such as shed, 2 toilets, 2 tubewell, drains, internal roads etc. are to be required.

3.5.2 Physical Environment

3.5.2.1 Atmosphere and Climate

The mean annual temperature in is about 2 °C. The temperature varies from 1 ° C to 39° C. In the area, on an average there is less than 3% of annual rainfall during December-March, less than 20% of annual rainfall during the pre-monsoon period (March-May) and the remainder during the period June-October

3.5.2.2 Topography

The topography will not be an environmental issue for this project**.** This project is located on the flood plain of the Turag River. The ground elevation of the sub-project area is about 13mPWD. T Kaliakoir Upazila generally more deeply flooded than those in the other parts of the .

3.5.2.3 Physiography and Geology

The river Turag divides the project area into two parts, north and south. Aowla and Mokesh Beel are located in the northern and southern side of the Turag River respectively. Topographically the eastern Kaliakair Upazila is a steep sided valley surrounded by many low-heights red soil hills make the area undulated. Two major land types are predominant, high and low land. Locally high land known as Chala and low land is known as Baid. Degraded forest and settlement primarily occupy high land. On the other hand Baid area is use mainly for agriculture.

3.5.2.4 Seismicity

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3.5.2.5 Hydrology and Drainage

The GC market area is located on the flood plain of the Turag River. The Turag flows at about 800m far from the GC market area. During high floods like 1988, 1998, 2004 and 2007, it is inundated. The existing drainage facilities of the market is good and as a result no drainage congestion in the market. The proposed cattle market adjacent to the main market is low lying area and is under water during whole flood season.

3.5.2.6 Water Quality

Water quality data of the project area was not available. But villagers reported that quality of ground water is not good. According to local people surface water is polluted due to human excreta, fertilizer, pesticides etc.. This contaminated water causes skin disease, eye irritation etc. of the people who use this water either for fishing or other purposes.

3.5.2.7 Air Quality

During site visit it was observed that the ambient air quality of the project area was quite good. The main reason of this is that there are no such big industrial activities around the project site which can deteriorate ambient air quality of the project area. The main sources of air pollutant emissions in brick kilns, small industries and domestic biomass burning (such as wood, dung, and straw) responsible for most air emissions Other contributors to air pollution include vehicular and rail traffic, re-suspended road dust to make bricks, and small industries.

3.5.2.8 Noise Quality

Noise pollution occurs mainly due to rice mill, sawmill and movement of vehicles at nearby the road. Due to too much population gathering during bazar & hat day, noise pollution also occurs.

3.5.3 Biological Environment

3.5.3.1 Terrestrial Ecology

The terrestrial floral habitats in the project area include various types of trees and natural vegetation in common, fairly common and frequent distributions in and around homesteads, along and in open spaces as well as in non-cultivated highlands that support a wide range of wildlife species. The tree species include: jackfruit (*Artocarpus heterophylla*), bamboo (*Bambusabalcoona*), coconut (*Cocos nucifera*), eucalyptus (*Eucalyptus sp.*), banyan tree (*F. religiosa*), mango (*Mangifera indica*), banana (*Musa sapientum*), guava (*Psidiumguajava*), mahogany (*Swieteniamahogoni*), tamarind (*Tamarindus indica*), etc. Natural vegetations occurring in the subproject site areas include: dholpata (*Commelinabenghalensis*), junjhuni (*Crotalaria saltiana*), grasses (*Axonopuscompressus, Cynodondactylon, Dicanthiumannulatum, Digitariasanguinalis, Eleusineindica, Oplismenusburminii, Veteveriazizanioides, etc.*), kantamehdi (*Durantareppens*), matkila, datmajon (*Glycosmispentaphylla*), dulkalmi (*Ipomoea crassicaulis*),

The terrestrial faunal species: mongoose (*Herpestes auropunctatus*), field mouse (*Musboodga*), rodent (*Musmusculus*), wild cat (*Felischaus*), jackal (*Vulpesbengalensis*), frog (*Ranacyanophyctis*), lizard (*Hemidactylusflaviviridis*), monitor (*Varanusbengalensis*), etc. Bird species include crow, woodpecker, kite, sparrow, weaver bird, parakeet, robin, bulbul, pigeon, dove, hawk, cuckoo, black cormorant, owl, etc.

3.5.3.2 Aquatic Ecology

Aquatic flora in the wetland ecosystem within the project divisions include aquatic vegetation species, like ghechu (*Aponogetonappendiculatus*), wild paddy (*Hygrorizaaristata*), water lily (*Nymphaeanouchali*), panchuli (*Nymphoidesindica and Nymphoidescristata*), kuchkola (*Otleliaalismoides*), water hyacinth (*Eichhomiacrassipes*), floating grass (*Echinocloacolonum*), water chestnut (*Trapabispinosa*) etc., within and along the banks of ponds, lakes, rivers, channels and floodplain lands. The fish species include: prawn (*Macrobrachiummalcolmsoni, M. dyanus, M. birmanicus, M. lamenii, Leander styliferus, etc.*), perch (*Anabas testudineus*), catfish (*Mystusvittatus, Mystustengara, Clariusbatrachus, Wallagoattu, Heteropneustesfosslis, Ompokbimaculatus, etc*.), major carp (*Labeorohita, Catlacatla, etc*.), minor carp (*Puntiussophore, Puntiusticto, Amblypharyngodonmola, Pseudeutropicusatherinoides, etc*.), shads (*Gudusiachapra, Coricasoboma*), snakehead (*Channapucntatus, Channastriatus, Channamanulius*), eel (*Mastacembelusarmatus, Xenentodoncancila*), etc.

The faunal species present in the terrestrial ecosystems are the common kingfisher (*Alcadoathis*), openbill stork (*Anastonusoscillans*), great egret (*Egretta alba*), small egret (*Egrettagazetta*), intermediate egret (*Egrettaintermedia*), fish eagle (*Ichthyophagusichthyaetus*), snipe (*Gallinagohenura*), kite (*Haliasterindus*), water snake (*Enhydrisenhydris*), monocellate cobra (*Najanaja*), and others.

3.5.4 Socio-economic Environment

3.5.4.1 Land Use

Most of the surrounding areas are developing rural in nature. Some scattered small houses, vacant & low lands with paddy fields, commercial activities are found around the project site. Proper use of land can bring prosperity in production & growth. The productivity of land is very high & present agricultural production can be increased to a large extent with intensive cultivation.

3.5.4.2 Water Supply and Sanitation

The static ground water level is very low at 18 m to 24 m; groundwater is not however afflicted by iron and arsenic problems. As a result normal pumps are ineffective and Tara shallow pumps and submersible pumps are being used within housing premises to access drinking water. There is no piped water supply in the project area and access to safe water is not assured. Of the total population in the Cluster more than 50% are in-migrant workers who share water and latrines with others. Communities with a high concentration of lower middle class workers and residents need improved access to water and sanitation.

3.5.4.3 Socio-cultural, Religious and Archeological Sites

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3.5.4.4 Important Environmental Features (IEFs)/Hotspots

The project influence area (PIA) for the proposed growth center site of RTIP-2 was confined within a radius of 1 km from the center of the center point since the nature of the project is such that most of the potential impacts are likely to occur within this area (**Figure 3.5**). Locations of major environmental hotspots along the road are shown in the **Table 3.7**.

Table 3.7: IEFs/Hotspots within the Fubaria Growth Center Market Sub-project

IECs	Location	Comments
Cattle market	West side	Lowland area
Family welfare center	Southeastern side	600m far from the Fulbaria growth centre
Madrasha	South side	500m far from the market and close to union parishad office
High School	East side	300m far from the market
Union parishad office	South side	400m far from the growth centre and close to Fulbaria market
River	West side	800m far from the growth centre
Household	East side	Close to growth centre market

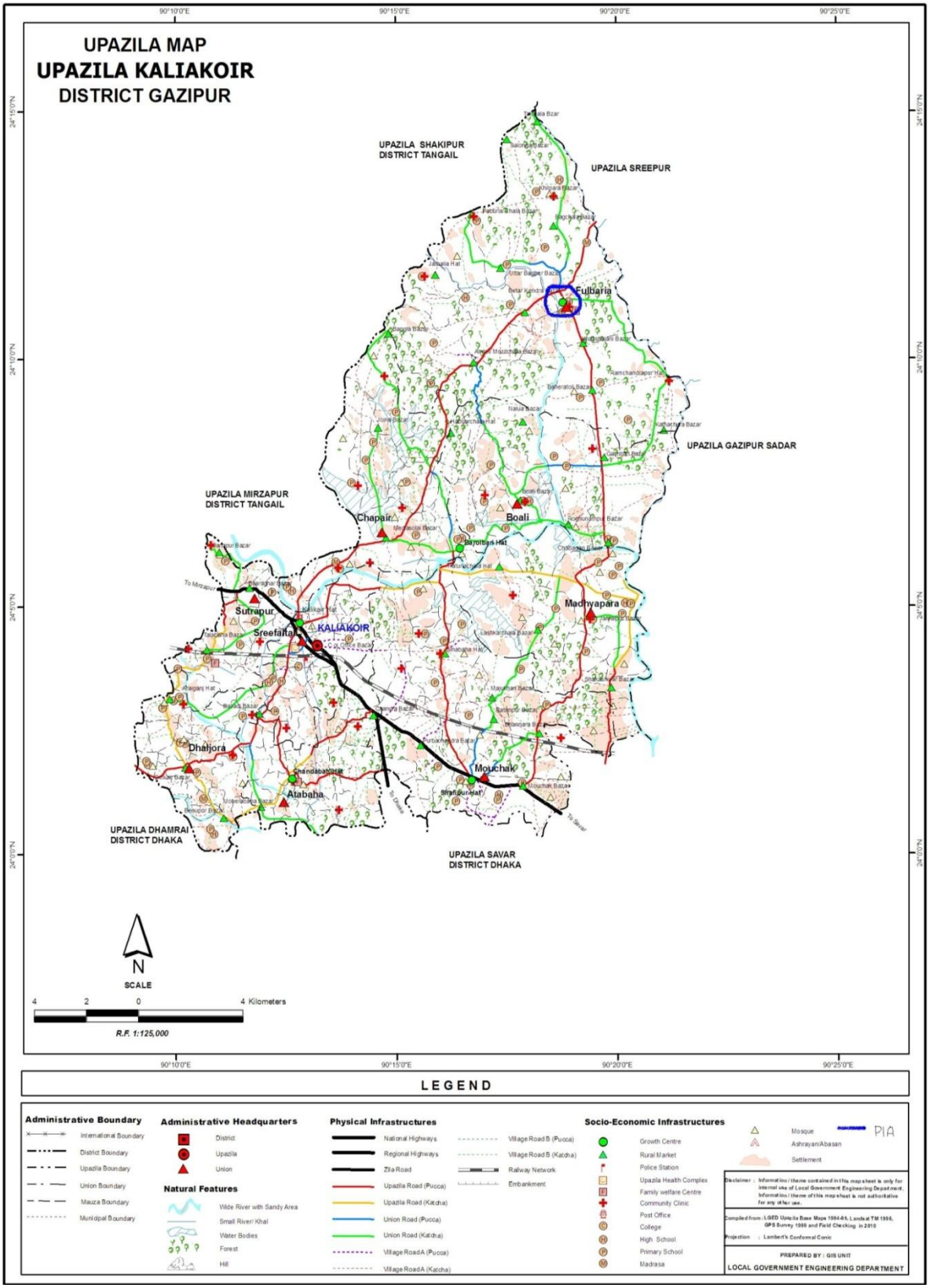

Figure 3.5: Location of Fulbari Growth Centre Market

4 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES FOR SAMPLE SUBPROJECTS

4.1 General

The environmental impacts identified at this stage are preliminary in nature and will need to be further elaborated specifically (subproject wise) and potential for occurrence has to be ascertained during further stages of subproject design and implementation. The potential impacts will identify during various stages of the subprojects: preconstruction, construction and operation as their potential nature, extent, duration and severity differs between the nature of subprojects and stages.

The potential impacts and possible mitigation measures for a subproject under each of following component of the project: (i) rural road improvements; (ii) rural road maintenance; (iii) rural waterways; and iv) growth centre markets are described below and subcomponent wise impacts and mitigation measures has been described in **Annex 3.**

4.2 Impacts and Mitigation Measures for Hatubhanga – Kaliakoir - Fulbaria Road via Khatar Hat Road Improvement

The main activities of the subprojects are as follows:

- Site clearance (removal of trees from one side, assets etc.);
- Construction yard & Labor Camp;
- Earth works (cutting & filling);
- Bridges/Culverts;
- Bituminous pavement works;
- Slope protection works for road (by grass turfing) & Bridge/culvert (by blocks);
- Removal of construction waste.

The potential impacts along with possible mitigation measures due to the above subproject activities are given below. The potential impacts will identify during various stages of the project: pre-construction, construction and operation as their potential nature, extent, duration and severity differs between the nature of projects and stages.

4.2.1 Preconstruction Phase

Impacts- Due to implementation of the subproject the following potential negative impacts will be occurred:

- loss of land including commercial & homestead (about 5.5ha);
- loss of income;
- loss of about 16,246 trees due to widening of road.

Mitigation- To minimize the above impacts, the possible mitigation measures are recommended:

- To ensure that adverse impacts on the community will be avoided, mitigated or compensated.
- To ensure similar or better living conditions for project affected persons (PAPs) for the limited period of time their livelihood may be interrupted.
- Formulate a comprehensive Compensation Plan with due consideration to the 'Social Safeguard Framework for RTIP-2 in LGED as agreed between WB and Government of Bangladesh to be implemented whenever community along the road is affected adversely.
- Replantation of suitable trees (wood 50%, fruit 30%, fuel 10% & medicine 10%) on the road side slopes (min. 32,000 nos.) during operation stage.
- Conduct public consultations on the compensation package and implement the Compensation Plan where necessary.

4.2.2 Construction Phase

Environmental impacts of the construction phase will expected to be temporary. Construction impacts will consider being minimal as all the construction works will be carried out within the site boundary of the acquired land and will be controlled via the mitigation measures.

- **Construction Camp**

Impacts-The civil works will be a major undertaking, and will bring with them construction camps and itinerant workers. The road improvement process will take quite time, with the result that the

camps will take on a semi-permanent appearance. The people and the changes they bring will have significant impacts on the local communities and social structures. Substantial numbers of workers will inhabit the area in temporary camps loading local infrastructure and causing ambient social influence.

Mitigation Measures- To minimize the above impacts, the possible mitigation measures are recommended:

- Conducting special briefing and/or on-site training for the contractors and workers on the environmental requirement of the project activities.
- To ensure that the contractors and the workers understand the environmental requirements of the RTIP-2 and implementation of mitigation measures.
- Identify location of work camps in consultation with local community; where possible, camps shall not be located near settlements or near water supply intakes.
- The Contractor shall organize and maintain a waste separation, collection and transportation system.

- **Earthworks**

Impacts-The earthworks for the road embankment improvement for Hatubhanga-Kaliakoir-Fulbaria Road via Khatar Hat Road sub-project activities might affect crop production, hinder drainage and modify local hydrology within the command area and in the vicinity. Direct impacts of embankment improvement are erosion on embankment slopes, deposition of silt on crop fields, dust blowing, noise and vibration to disturb the local people. The contractors if permitted to collect fill materials by scraping the topsoil from agriculture lands for road embankment construction would affect the natural fertility of soil severely.

Mitigation Measures- Cutting and filling of land for the improvement of the Hatubhanga-Kaliakoir-Fulbaria Road via Khatar Hat Road sub-project will be done in such a way that the slope of the area or toe of the road embankment should be within right of way and will not disrupt crop production as well as there will be no water logging or drainage problems.

- Road embankments will be provided with chutes and drains to minimize soil erosion;
- Stone pitching and retaining walls will be made on steep road embankments in critical areas;
- Turfing of low road embankments and planting of shrubs and trees will be done to protect slopes; and

- **Topography, Geology, and Soils**

Impacts-The main impacts generating activities during improvement will be clearing of right-of-way, cutting and filling, blasting, and dismantling damaged pavements and borrows pits. The topography along the project roads will change to some extent because of filling and cutting of soil, filling and improvement of project related structures.

Mitigation Measures-To avoid landslides, land stabilization will be included in the project road improvement. Visual changes to the landscape will have no mitigation measures, but the project improvement should consider aesthetic concerns. Tree planting along the Hatubhanga-Kaliakoir-Fulbaria Road via Khatar Hat Road sub-projectarea should be properly planned.

- **Surface Water Quality**

Impacts- Surface water quality of the water bodies such as (small, 55m river and canals) in close proximity to the Hatubhanga-Kaliakoir-Fulbaria Road sub-project construction sites may deteriorate if construction material including borrowed fill material and sand, construction waste, water used in construction activities and domestic effluent from work camps will allowed to reach the receiving water bodies. Surface water quality in the rivers and other water bodies could be affected due to rise of suspended solids that could affect the living conditions of aquatic flora and fauna. The sources of the contamination could be:

- removal of vegetation cover could cause local erosion; and
- movement of heavy building machinery can cause the rise in amounts of suspended solids in the surface water.

Mitigation Measures - Proper construction management including, training of operators and other workers to avoid pollution of water bodies by the operation of construction machinery and

equipment. Temporary construction facilities including structures and material stockpiles shall be located at least 50 m away from water bodies. Construction of small bridges and culverts should be done during dry season as much as possible.

- **Ground Water Quality**

Impacts-Impact on ground water will anticipated due to seepage of untreated waste from workers' camps, discharges from the service facilities, storage depots, etc

Mitigation Measures-Proper sanitary conditions and treatment facilities and regular monitoring need to be ensured toward making such wastes and effluents correspond to acceptable standards.

- **Air Quality**

Impacts-Construction works involve breaking up, digging, crushing, transporting, and dumping large quantities of dry material. It will inevitably lead to an increase in suspended particulate matter (SPM) in and around the construction zones. Possible sources of air pollution will be dust due to construction activities, machinery movement and other sources.

Mitigation Measures- Spraying of water is the main way of controlling dust. Water is, in any case, required to be added to fill material during the construction of the road base. Spraying of road surfaces, including haul roads from borrow pits and quarries, should be undertaken regularly during construction, particularly in the vicinity of villages. Excessive exposure should be avoided; therefore, the asphalt and crushing plants should not be placed near residential areas or social infrastructure such as mosques, schools, markets etc. At least 0.5-1 km should be placed between these facilities and residential areas or social infrastructure.

- **Noise and Vibration**

Impacts-A significant increase in noise is expected during construction specially during driving of piles at the 55m bridge site. Noise and vibration levels in and around the construction sites could increase as a result of operating construction machinery and during unloading and loading of material. The main sources are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, drills, and stone crushers.

Mitigation Measures-All powered mechanical equipment and machinery shall be fitted with noise abating gear such as mufflers for effective sound reducing, in full compliance with the DOE regulations. Prior to the blasting the elementary precautions should be undertaken. Also, health and safety equipment, such as helmets, masks, ear plugs, hand gloves and boots should be used. The visual and audible warnings should be presented to the people. The noisiest operations should be performed during daytime. Proper equipment maintenance and restricted operation between 0700 to 1800 hours will reduce noise.

- **Hydrology/ Drainage Congestion**

Impacts-The potential risk of river erosion will increase during Hatubhanga-Kaliakoir-Fulbaria Road improvement if the bridge crossings improvements are provided with waterway width less than the regime width of the river. The portion of the road that is in contact with river will be provided with slope protection measures. Adequate drainage structures as mentioned in **Table 3.1 (section 3.2.2.5)** need to be provided at appropriate location of the road.

Mitigation Measures-Provision of adequate waterway opening of the bridges/culverts should be included in the design and implement accordingly. River bank revetment works should be done to protect the roads from river bank erosion. In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion, flood damage and rainfall. Drainage facilities need to be provided in the diversion road at the bridge/culvert construction sites to avoid temporary drainage congestion.

- **Occupational Health and Safety**

Impacts-Construction workers may be affected adversely due to hazardous working environments where high noise, dust, unsafe movement of machinery etc. may be present. The construction of a high-speed road can lead to severance issues.

Roads in good condition will reduce traffic blocks, engine idle time and damage to motor vehicles. The ensuing benefits to public health and economy though marginal will also add to the main benefit of smooth and faster traffic flow.

Mitigation Measures-Residents must be able to cross the road safely and particular attention must be given to vulnerable groups such as children, the elderly, and animals. All vehicles should observe speed limits and load restriction.

The contractor shall instruct his workers in health and safety matters, and requires the workers to use the provided safety equipment. The scope will need to include transmittable diseases establish all relevant safety measures as required by law and good engineering practices. Arranging for provision of first aid facilities, rapid availability of trained paramedical personnel, and emergency transport to nearest hospital with accident and emergency facilities. Arranging for regular safety checks of vehicles and material, and allocation of responsibility for checking. The contractor will responsible for ensuring that all construction vehicles observe speed limits on the construction sites and on public roads.

- **Flora, Fauna and Livestock**

Impacts-Wildlife and livestock of the area will be affected by the activities during the construction. There is number of trees in area of influence. These trees and bushes are at high risk of being cut for the construction or the heating or cooking in the camps. The natural and planted vegetation in the area of influence, especially in the immediate vicinity of the Hatubhanga-Kaliakoir-Fulbaria Road sub-project area, will be subjected to disturbance and removal during the construction. The plant cover should be repaired after the construction, especially with fast growing species on suitable sites on embankment slopes.

Mitigation Measures-Try to avoid using trees/bushes as fuel for the construction & general purposes. Special care should be taken to preserve the lives and health of all animals that cross the road. All construction related disturbances will be expected to be temporary and the situation will be restored after the construction is over.

- **Socio-economic**

The number of households and small business and shop owners on either side of the Hatubhanga-Kaliakoir-Fulbaria Road sub-project area may be affected adversely during the construction. During the construction phase could also result from, construction workers developing conflicts with local community, spread of vector borne and communicable diseases from labour camps, and disruption of services and shifting of utilities as Hatubhanga-Kaliakoir-Fulbaria Road via Khatar Hat Road sub-project will pass several villages.

The project when implemented will (i) reduce travel time; (ii) ensure uninterrupted traffic and; (iii) increase economic activities in the region. The social development outcomes of the project will include increased employment due to augmentation of the regional trade and thereby reduce poverty in the long run.

Implementing the Hatubhanga-Kaliakoir-Fulbaria Road via Khatar Hat Road sub-project will bring in economic and social benefits to the people in Tangail and Gazipur Districts and other parts of the country as well. The road will provide better connectivity between upazila in the different district. The project will thus contribute to economic growth from the improved road through increased employment, industrialization and overseas trade. Improved connectivity with increased capital inflow for promoting industrial and commercial activities and increased economic and employment opportunities for the local populations. During construction activities, local unemployed people will get employment and increased income.

Mitigation Measures-All the above adverse impacts of construction phase are localized in spatial extent, temporary and short in duration and can be mitigated by good standard construction practices. To ensure that adverse impacts on the community are avoided, mitigated or compensated. Provide alternative sites for vendors/micro businesses and houses using or are in the right of way. These sites should be selected to facilitate equal or enhanced income/living conditions. Schedule the construction activities to avoid or minimize impact on road side shops, businesses and houses.

The project authorities might employ local people wherever possible, hopefully with preference to the qualified landless and jobless poor of the project areas ensuring socio-economic enhancement in the real terms. Women from PAPs' families could be offered the project created facilities.

4.2.3 Operation Phase

Due to increased activities and efficient operational systems, there will be some potential impacts on the environmental set-up in the Hatubhanga-Kaliakoir-Fulbaria Road sub-project area, which are discussed hereunder. In order to achieve sustainability of the development works, it is necessary to

ensure the effectiveness of mitigation measures even after construction, as some adverse environmental impacts may result from the operation of the project facilities. As the Hatubhanga-Kaliakoir-Fulbaria Road via Khatar Hat Road sub-project improvement will facilitate smooth flow of traffic it is expected that exhaust emissions and noise emanation from vehicular traffic will not increase significantly.

- **Air Quality**

Impacts-Levels of air pollutants could increase marginally as more vehicles would use the roads after improvement of the Hatubhanga-Kaliakoir-Fulbaria Road via Khatar Hat Road sub-project. Impact on the air quality due to operational activities after completion of the project would be minimal. The number of vehicles would increase but due to improved road quality and openness of the area the overall increase in air pollution will be miniature. Due to the improvement of the road there will be less dust affecting the people and animals.

Mitigation Measures- Awareness building and administrative measures should be taken to ensure proper maintenance of vehicles. Training and measuring equipment need to be provided to law enforcement authority to enable them to enforce smoke emission standards.

- **Noise and Vibration**

Impacts-During operation, passing vehicles will generate noise. Noise levels may also marginally increase as more vehicles use the road at higher speeds. In open areas, traffic noise will disperse and will create a minor impact. Impact on the traffic noise due to operational activities after completion of the Hatubhanga-Kaliakoir-Fulbaria Road via Khatar Hat Road improvement would be minimal. The number of vehicles would increase but due to improved road quality and openness of the area the overall increase in noise and vibration will be minor.

Mitigation Measures-In sensitive areas such as schools, mosques, bazzar, settlement areas etc., sound barriers including berms and tree linings may be required. Awareness building and administrative measures should be taken to ensure proper maintenance of vehicles.

- **Surface and Ground Water Quality**

Impacts- Impacts due to the operational activities after the completion of the Hatubhanga-Kaliakoir-Fulbaria Road via Khatar Hat Road improvement will be mainly of indirect nature:

- The increase traffic will induce development of traffic-related infrastructure such as filling stations, repair-shops that can cause risks to the water quality.
- The increased industrial activities, such as local industries can cause harmful effects to the surface water and gradually can affect also the groundwater.

Mitigation Measures-Traffic related infrastructure should be managed properly through local administration. Drainage is an important part of road improvement. Unless road drainage is maintained properly, drains and culverts can block, causing localized flooding and damage to the road itself. A commitment to regular monitoring and maintenance will be a requirement under the LGED.

- **Flora, Fauna and Livestock**

Impacts-The operation of improved road causes additional direct disturbance to the wildlife. Better accessibility increases directly hunting pressure and exploitation of few forest resources in the area. Also by increasing general development in the area affected by road development the pressure to the wildlife resources would increase. About 16246 trees will be affected due to widening of road.

Mitigation Measures-The proper wildlife monitoring system should be applied along the road area, especially in the vicinity of larger settlements. In formerly forested areas reforestation should be considered. About 32,000 various suitable trees need to be replanted on the road side slopes.

- **Socio-economic**

Impacts-Improved roads also increase the incidence of social problems such as drugs, crime, privacy etc. The improved road socio-economical positive impacts will be as follows:

- The better accessibility will create more jobs due to general economical development and increasing tourism; and
- Increase accessibility to the markets, schools, and social and health services.

Mitigation Measures-The project road will pass several villages. Planting or roadside barriers should be constructed to shield the view of the village from passing vehicles.

- **Road Accidents**

Impacts- The construction of a high-speed road can lead to severance issues. Road accidents may increase due to higher number of vehicles using the roads at increased speeds. The road after completion of construction will attract settlements and undesired structures including commercial facilities particularly near the community. Growth of settlement on vacant ROWs near the community increase accident risk.

Mitigation Measures-If control measures are not adopted this could become a hazard to pedestrians, too. Residents must be able to cross the road safely and particular attention must be given to vulnerable groups such as children, the elderly, and animals. All vehicles should observe speed limits and load restriction. Traffic signs, speed breaker especially nearby the cultural/health centres should be installed. Drivers should follow BRTA rules& regulations.

4.3 Impacts and Mitigation Measures for Mouchak-Fulbaria Road maintenance

The main activities of the subprojects are as follows:

- Construction Camp;
- Earth works for filling of deep potholes;
- Repairing of bridges/culverts;
- Bituminous pavement works for pothole & crack repairing;
- Slope protection repairing works for road & bridge/culvert
- Removal of construction waste.

The potential impacts along with possible mitigation measures due to the above subproject activities are given below.

Road maintenance does not lead to substantive degradation of the environment or have tangibly negative effects on people living sideways the road. Maintenance work may result, nevertheless, in frequent minor damage to existing conditions (e.g. tree-cutting, dust, landscape damage) at the length of the entire network. To prevent the gradual deterioration of the environment or to improve existing conditions, it is important therefore to include environmental considerations in the preparation and implementation of road maintenance programs.

4.3.1 Construction Phase

Construction impacts on road maintenance will consider being negligible as all the construction works will be carried out within the site boundary and will be controlled via the mitigation measures.

- **Earthworks**

Impacts-The earthworks for the road for Mouchak-Fulbaria Road sub-project activities might affect crop production; hinder drainage etc. within the area and in the vicinity. Direct impacts of embankment improvement are erosion on embankment slopes, deposition of silt on crop fields, dust blowing, noise and vibration to disturb the local people.

Mitigation Measures- Cutting and filling of land for the improvement of the Mouchak-Fulbaria Road sub-project will be done in such a way that the slope or toe of the road embankment should be within right of way and will not disrupt crop production as well as drainage problems.

- **Dust**

Impacts- Possible sources of air pollution will be dust due to maintenance activities, machinery movement and other sources. Construction works involve breaking up, digging, crushing, transporting, and dumping small quantities of dry materials.

Mitigation Measures- Spraying of water is the main way of controlling dust. Water is, in any case, required to be added to fill material during the construction of the road base. Spraying of road surfaces, including haul roads from borrow pits and quarries, should be undertaken during construction, particularly in the vicinity of villages.

- **Occupational Health and Safety**

Impacts- Roads in good condition will reduce traffic blocks, engine idle time and damage to motor vehicles. The ensuing benefits to public health and economy though marginal will also add to the

main benefit of smooth and faster traffic flow. Construction workers may be affected adversely due to hazardous working environments where high noise, dust, unsafe movement of machinery etc. may be present. The construction of a high-speed road can lead to severance issues.

Mitigation Measures-The contractor shall instruct his workers in health and safety matters, and requires the workers to use the provided safety equipment. Arranging for provision of first aid facilities, rapid availability of trained paramedical personnel, and emergency transport to nearest hospital with accident and emergency facilities. The contractor will responsible for ensuring that all construction vehicles observe speed limits on the construction sites and on public roads.

- **Socio-economic**

The project Mouchak-Fulbaria will (i) reduce travel time; (ii) ensure uninterrupted traffic and; (iii) increase economic activities in the region. The social development outcomes of the project will include increased employment due to augmentation of the regional trade and thereby reduce poverty in the long run.

Mitigation Measures-All the above adverse impacts of construction phase are localized in spatial extent, temporary and short in duration and can be mitigated by good standard construction practices. Provide alternative sites for vendors/micro businesses and houses using or are in the right of way. These sites should be selected to facilitate equal or enhanced income/living conditions. Schedule the construction activities to avoid or minimize impact on road side shops, businesses and houses.

The project authorities might employ local people wherever possible, hopefully with preference to the qualified landless and jobless poor of the project areas ensuring socio-economic enhancement in the real terms.

4.3.2 Operation Phase

- **Road Accidents**

Impacts- After maintenance, road accidents may increase due to higher number of vehicles using the roads at increased speeds. The road after completion of construction will attract settlements and undesired structures including commercial facilities particularly near the community. Growth of settlement on vacant ROWs near the community increase accident risk.

Mitigation Measures-
school, mosques, industries, to avoid accidents. Traffic signs should be installed in the right place.

- **Noise Quality**

Impacts-During operation, passing vehicles will generate noise. Noise levels may also marginally increase as more vehicles use the road at higher speeds. In open areas, traffic noise will disperse and will create a minor impact. Impact on the traffic noise due to operational activities after completion of the Mowchak-Fulbaria Road maintenance would be minimal.

Mitigation Measures-In sensitive areas such as schools, mosques, bazar, settlement areas etc., sound barriers including berms and tree linings may be required. Awareness building and administrative measures should be taken to ensure proper maintenance of vehicles.

4.4 Impacts and Mitigation Measures for Mirzapur-Kaliakoir Rural Waterways

The main activities of the subprojects are as follows:

- Site clearance;
- Construction yard & camp;
- Dredging and disposal of dredged materials;
- Eroded river bank protection;
- Improvement of ghat;
- Removal of construction waste.

The potential impacts along with possible mitigation measures due to the above subproject activities are given below. The potential impacts will identified during various stages of the project pre-construction, construction and operation as their potential nature, extent, duration and severity differs between the nature of projects and stages.

4.4.1 Construction Phase

- **Construction Camp**

Impacts-The civil works will be a major undertaking, and will bring with them construction camps and itinerant workers. The will take quite time, with the result that the camps will take on a semi-permanent appearance. The people and the changes they bring will have significant impacts on the local communities and social structures. Substantial numbers of workers will inhabit the area in temporary camps loading local infrastructure and causing ambient social influence.

Mitigation Measures- To minimize the above impacts, the possible mitigation measures are recommended:

- Conducting special briefing and/or on-site training for the contractors and workers on the environmental requirement of the project activities.
- To ensure that the contractors and the workers understand the environmental requirements of the RTIP-2 and implementation of mitigation measures.
- Identify location of work camps in consultation with local community; where possible, camps shall not be located near settlements or near water supply intakes.
- The Contractor shall organize and maintain a waste separation, collection and transportation system.

- **Dredging & Dredged Materials**

Impacts- A considerable quantity of dredged materials will be generated from dredging works of the river bed and direct disposal of the dredged materials (sand) in the river will influence the river water quality and aquatic wildlife; and direct disposal of dredged materials on land will influence the soil quality. Improper disposal of these water may cause water logging in the surrounding area. Dredging of sand from the river may trigger siltation at downstream & river bank erosion.

Mitigation Measures- Dredged materials and river water should be tested prior to start dredging. Outflow from hydraulic fill should have maximum retention time to enhance settling at the dredged materials dumping site and avoid water congestion. Dredged sand will be sold quickly to the people for developing town/city area. Surrounding the dumping site area should not be damaged by spillage of dredged soils. Dredging location should be far away from the river bank to avoid erosion.

- **Surface Water Quality**

Impacts- The river water quality may be deteriorated due to dredging of the river bed materials. Movement of heavy dredging machinery can cause the rise in amounts of suspended solids in the river water.

Mitigation Measures - Proper construction management including, training of operators and other workers to avoid pollution of water bodies by the operation of construction machinery and equipment. River water should be tested prior to start dredging.

- **Erosion/Scour**

Impact- Dredging of sand from the river may trigger river bank erosion.

Mitigation Measures- Dredging location should be far away from the river bank to avoid erosion.

- **Air Quality**

Impacts-Construction works involve breaking up, digging, crushing, transporting, and dumping large quantities of dry material. It will inevitably lead to an increase in suspended particulate matter (SPM) in and around the construction zones. Possible sources of air pollution will be dust due to construction activities, machinery movement and other sources.

Mitigation Measures- The dredging and others equipment should not be placed near residential areas or social infrastructure such as mosques, schools, markets etc.

- **Noise**

Impacts-A significant increase in noise is expected during construction. Noise and vibration levels in and around the river sites could increase as a result of operating construction machinery and during

unloading and loading of material. The main sources are heavy machinery such as dredging machinery, etc.

Mitigation Measures-All powered mechanical equipment and machinery shall be fitted with noise abating gear such as mufflers for effective sound reducing, in full compliance with the D E regulations. Also, health and safety equipment, such as helmets, masks, ear plugs, hand gloves and boots should be used. The visual and audible warnings should be presented to the people. The noisiest operations should be performed during daytime. Proper equipment maintenance and restricted operation between 0700 to 1800 hours will reduce noise.

- **Occupational Health and Safety**

Impacts-Construction workers may be affected adversely due to hazardous working environments where high noise, unsafe movement of machinery etc. may be present.

Mitigation Measures-The contractor shall instruct his workers in health and safety matters, and requires the workers to use the provided safety equipment. Arranging for provision of first aid facilities, rapid availability of trained paramedical personnel, and emergency transport to nearest hospital with accident and emergency facilities. Arranging for regular safety checks of vehicles and material, and allocation of responsibility for checking. The contractor will responsible for ensuring that all construction vehicles observe speed limits on the construction sites and on public roads.

- **Flora & Fauna**

Impacts- of the area will be affected by the activities during the river dredging. There are different types of fauna species living in the river water. These fauna species are at high risk of being river dredging for the rural waterways. The natural and planted vegetation in the area of influence, especially in the immediate vicinity of the Mirzapur-Kaliakoir sub-project area, will be subjected to disturbance and removal during the river dredging.

Mitigation Measures- Special care should be taken to preserve the faunal species and health of all animals that living in the Turag River. All river dredging related disturbances will be expected to be temporary and the situation will be restored after the river dredging is over.

- **Socio-economic**

The number of households and small business on either side of the Mirzapur-Kaliakoir rural waterways sub-project area may be affected indirectly during the river dredging. During the construction phase could also result from, construction workers developing conflicts with local community, spread of vector borne and communicable diseases from labour camps, and disruption of services and shifting of utilities as Mirzapur-Kaliakoir rural sub-project will pass several villages.

If the Mirjapur-Kaliakoir rural waterways when implemented will (i) reduce travel time from Dhaka to Kaliakoir; (ii) ensure uninterrupted transportation and; (iii) increase economic activities in the region. The social development outcomes of the project will include increased employment due to augmentation of the regional trade and thereby reduce poverty in the long run.

Implementing the Mirjapur-Kaliakoir rural waterways sub-project will bring in economic and social benefits to the people in Kaliakoir Upazila and Gazipur Districts as well. The project will thus contribute to economic growth through increased employment, industrialization and overseas trade. Improved connectivity with increased capital inflow for promoting industrial and commercial activities and increased economic and employment opportunities for the local populations. During construction activities, local unemployed people will get employment and increased income.

Mitigation Measures-All the above adverse impacts of construction phase are localized in spatial extent, temporary and short in duration and can be mitigated by good standard construction practices. To ensure that adverse impacts on the community are avoided, mitigated or compensated. Schedule the construction activities to avoid or minimize impact on river side businesses shops and houses. The project authorities might employ local people wherever possible, hopefully with preference to the qualified landless and jobless poor of the project areas ensuring socio-economic enhancement in the real terms.

4.4.2 Operation Phase

Due to increased activities and efficient rural waterways operational systems, there will be some potential impacts on the environmental set-up in the Mirjapur-Kaliakoir rural waterways sub-project area, which are discussed hereunder. In order to achieve sustainability of the development works, it

is necessary to ensure the effectiveness of mitigation measures even during operation, as some adverse environmental impacts may result from the operation of the project facilities.

- **Air Quality**

Impacts-Levels of air pollutants could increase marginally as more water transport would use the river after implementation of the Mirjapur-Kaliakoir rural waterways sub-project. Impact on the air quality due to operational activities after completion of the project would be minimal. The number of water transport would increase but due to improved rural waterways and openness of the area the overall increase in air pollution will be miniature. Due to the improvement of the river transport there will be no dust affecting the people and animals.

Mitigation Measures- Awareness building and administrative measures should be taken to ensure proper maintenance of river transportation. Training and measuring equipment need to be provided to law enforcement authority to enable them to enforce smoke emission standards.

- **Noise**

Impacts-During operation, passing river transport will generate noise. Noise levels may also marginally increase as more waterways transportation use the river at higher speeds. In open areas, traffic noise will disperse and will create a minor impact. Impact on the traffic noise due to operational activities after completion of the Mirzapur-Kaliakoir rural would be minimal. The number of water transportation would increase but due to river transport and openness of the area the overall increase in noise and vibration will be minor.

Mitigation Measures-In sensitive areas such as schools, mosques, bazzar, settlement areas etc., sound barriers including berms and tree linings may be required. Awareness building and administrative measures should be taken to ensure proper maintenance of river transport.

- **Surface Water Quality**

Impacts- Impacts due to the operational activities after the completion of the Mirzapur-Kaliakoir rural will be mainly of indirect nature:

- The increased industrial activities, such as local industries can cause harmful effects to the surface water; and
- Different kind of liquid waste discharge could be effect in surface water quality during river transportation operation.

Mitigation Measures-Traffic related infrastructure should be managed properly through local administration. A commitment to regular monitoring and maintenance will be a requirement under the LGED.

- **Flora and Fauna**

Impacts-The operation of Mirzapur-Kaliakoir rural causes additional direct disturbance to the . Better accessibility increases directly hunting pressure and exploitation of few in the area.

Mitigation Measures-The proper monitoring system should be applied along the area, especially in the vicinity of larger settlements.

4.5 Impacts and Mitigation Measures for Fulbaria Growth Centre Market

The main activities of this subproject are as follows:

- Construction Camp;
- Earth works for cattle market;
- Internal HBB roads along with drains in the cattle market;
- Toilet & HTW at Cattle market ;
- Slope protection for side slopes by grass or blocks/retaining works; and
- Removal of construction waste.

The potential impacts along with possible mitigation measures due to the above subproject activities are given below.

4.5.1 Construction Phase

- **Earthworks**

Impacts-The earthworks for the growth centre market activities might affect crop production, hinder drainage in the vicinity. Direct impacts of activities dust blowing, noise and vibration to disturb the local people. The contractors if permitted to collect fill materials by scraping the topsoil from agriculture lands for road embankment construction would affect the natural fertility of soil severely.

Mitigation Measures- Cutting and filling of land for the growth centre will be done in such a way that the slope of the area should be within the location and will not disrupt crop production as well as there will be no water logging or drainage problems.

- **Loss of Productive Soils**

Impacts- Loss of productive soil, albeit during the construction stage only, is envisaged at locations of workers camps, storage, go downs etc. (for the duration of construction) if these are located on fertile areas. The EMP can ensure that no productive areas are used for these purposes and avoid adverse impact. In any case, though it would be a direct impact, it would be reversible as the soil can be stockpile and replace after the construction is complete and the worker camps etc. are closed.

Mitigation Measures- In the selection of borrow areas for the project, productive agricultural areas have been avoided for borrowing of materials. The workers camps, storage and godowns will not be established at agricultural land. In case productive areas are taken for storage or workers' camp, the post construction rehabilitation will be ensured.

- **Air Quality**

Impacts- Impacts on air quality during construction are due to generation of dust due to earth moving activities on growth centre market, generation of dust due to excavation and handling of construction materials and vehicle movements. The area will be impacted to some extent by air pollution during construction stage only. Construction stage impacts will be of short term and may have adverse impacts on the construction workers as well as on the settlements adjacent to the growth centre market, especially those in the downwind direction.

Mitigation Measures- Spraying of water is the main way of controlling dust. Water is, in any case, required to be added to fill material during the construction of the growth centre market base. Spraying of growth centre market surfaces, should be undertaken regularly during construction, particularly in the vicinity of markets

- **Noise**

Impacts-A significant increase in noise is expected during construction. Noise and vibration levels in and around the construction sites could increase as a result of operating construction machinery and during unloading and loading of material.

Mitigation Measures-All powered mechanical equipment and machinery shall be fitted with noise abating gear such as mufflers for effective sound reducing, in full compliance with the DOE regulations.

- **Occupational Health and Safety**

Impacts-Construction workers may be affected adversely due to hazardous working environments where high noise, dust, unsafe movement of machinery etc. may be present. Growth centre market in good condition will reduce dust pollution in the project location.

Mitigation Measures-The contractor shall instruct his workers in health and safety matters, and requires the workers to use the provided safety equipment. Arranging for regular safety checks of vehicles and material, and allocation of responsibility for checking.

- **Socio-economic**

Impact- Implementing the Fulbaria growth centre sub-project will bring in economic and social benefits to the people in the fulbaria village of kaliakoir upzila. The project will thus contribute to economic growth from the improved growth centre market through increased employment, industrialization and overseas trade. During construction activities, local unemployed people will get employment and increased income.

Mitigation Measures-The project authorities might employ local people wherever possible, hopefully with preference to the qualified landless and jobless poor of the project areas ensuring socio-economic enhancement in the real terms. Women from PAPs' families could be offered the project created facilities.

4.5.2 Operation Phase

- **Air Quality**

Impacts- Dust is the important air pollutant that is generated due to more peoples will be use this market, accumulation of wastes on growth centre market etc. Impact during operation phase is continuous and to some extent unavoidable.

Mitigation Measures- Compensatory plantation to be taken up will also screen the dust and other emissions.

- **Noise and Vibration**

Impacts-During operation, noise levels may also marginally increase as more people use the market Impact on the people noise due to operational activities after completion of the growth centre market would be minimal.

Mitigation Measures-In sensitive areas such as union parishad office, bazzar, settlement areas etc., sound barriers including berms and tree linings may be required. Awareness building and administrative measures should be taken to ensure proper maintenance of vehicles.

- **Socio-economic**

Impacts- The improved growth centre market socio-economical positive impacts will be as follows:

- The better accessibility will create more jobs due to general economical development and increasing tourism; and

Mitigation Measures- Planting should be constructed to shield the view of the marker.

5. ENVIRONMENTAL MANAGEMENT SYSTEM

5.1 Introduction

The Environmental Management System (EMS) establishes the criteria to identify the level of Environmental Assessment (EA) and the processes involved, their sequence to conduct the EA studies for various components/phases of the rural road improvements, rural road maintenance, rural waterways, growth center markets including their legal requirements and implications (Figure 5.1). Comprehending the level of EA will help the RTIP-2 in assessing the requirement of external agency in the form of consultancy services and also the stage of such requirement, like Design Consultant at planning and design stages and Construction Supervision Consultant (CSC) at construction stage etc.

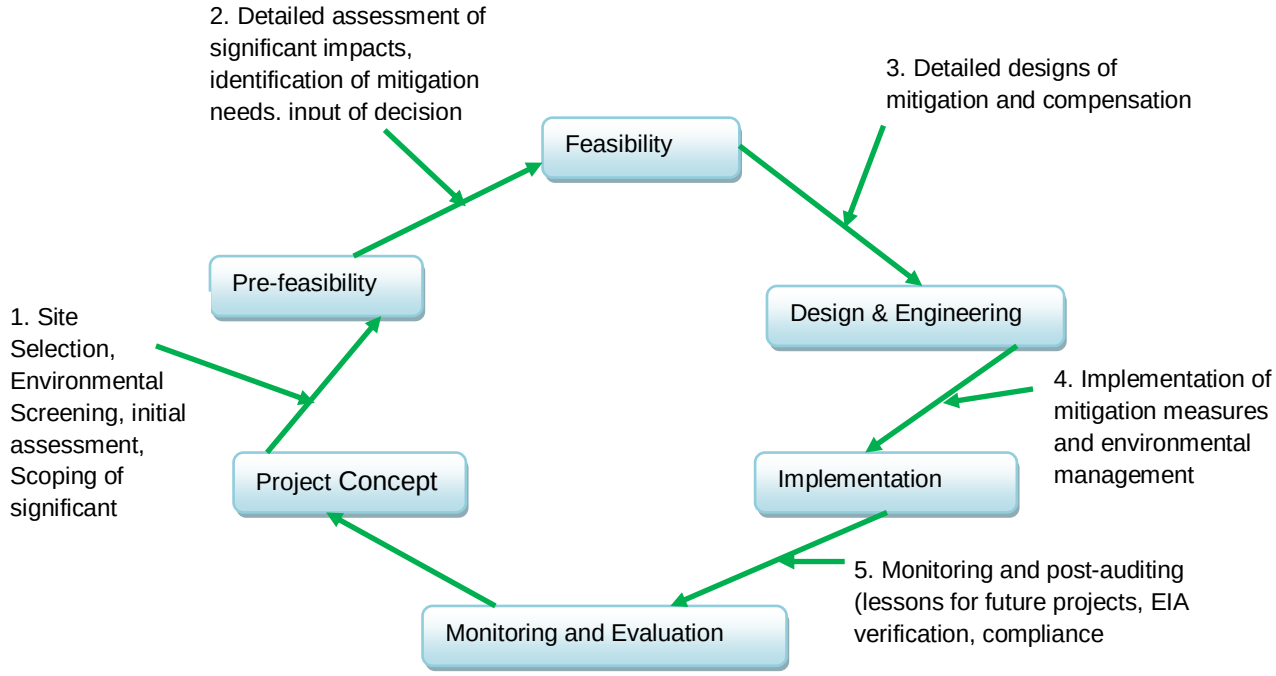

Figure 5.1: Environmental Management System in Project Life Cycle

Once the need/justification of a project is finalized based on the engineering parameters (like traffic, economical and financial analysis), the process of Environmental Management System starts. First step in EMS is screening of the project components to ascertain the category of Environmental Assessment required.

The category of EA can be assessed by RTIP-2 or if desired can be offered to some agency or independent environmental expert. It is worth to mention here that any external agency or consultant or expert can help RTIP-2 in analyzing and reporting of environmental features and parameters, filing the application for clearance and approval, but ultimately the responsibility lies with RTIP-2. The RTIP-2 has to ensure that all legal rules and regulations set by the DOE through the Ministry of Environment and Forest (MOEF) are adhering with.

5.2 General Principles for Environmental Management

5.2.1 Introduction

The Rural Transport Improvement Project (RTIP-2) will have four major sub-components under the accessibility improvement component. These are: (i) improvement of 1,060 km existing upazila and union roads; (ii) maintenance of 3,550 km existing rural roads; (iii) piloting rural waterways; and (iv) construction of Growth Center Markets. Although the project scope is mainly limited to improvement and maintenance of selected rural roads and construction of fifty growth center market in existing market place, the project classified as a Category A project due to the complexity of environmental issues associated with waterways improvements and also the uncertainty (lack of details at project preparation) of the most of the sub-projects to be implemented in widespread areas. The policies on environment assessment (OP/BP 4.01), natural habitats (OP/BP 4.04) and physical cultural resources (OP/BP 4.11) have been triggered for the proposed operation.

5.2.2 General Principles of RTIP-2

- The Project Director will be responsible for the environmental compliance monitoring and oversight to ensure overall project environmental compliance. The Consultants that would be hired by LGED would assist the project proponent to carry out this mandate.
- The implementing agency will follow the related government rules (laws, ordinances, acts etc.) and World Bank Operational Policies and Guidelines. This EMF would serve as the basis for ensuring this compliance.
- LGED will submit the EMF to the Department of Environment (DOE) for their review and concurrence.
- LGED will ensure the participation of local community in planning and implementation of sub-projects.
- LGED will be responsible for obtaining and ensuring clearance required from the DOE. The clearance procedure has been mentioned in Section 2.1.19 of Chapter-2.The LGED will be responsible for obtaining environmental clearance for the RTIP-2 components for which the EIA study is required. For the rest components of the RTIP-2, LGED will implement themselves without DOE clearance. No project activities will be carried out in and nearby the environmental protected and critical areas as well as in disputed lands or lands restricted for development.
- All the activities proposed under the project will abide by existing Environmental Code of Practices (ECP) prepared under RTIP-2.
- Ensure provision of First Aid Kit at camp site with proper drinking water and sanitation facilities. Worker's health and safety measures shall be ensured and use of personal protective equipment shall be at place.

5.2.3 Environmental Assessment Process of RTIP-2 Components

5.2.3.1 Rural Road Improvement

- RTIP-2 will ensure that proper environmental screening will be done by the design consultant.
- Design consultant will ensure Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) of the all rural road sub-projects.
- Management Consultant will review and clear all screening and environmental assessment reports.
- LGED will conduct verification of some screening and assessment.
- Design consultant will ensure that environmental considerations are given sufficient attention, weight and influence over design decisions of cross drainage works. To this end, it will carry out IEE or EIA with Environmental Management Plan (EMP) for all rural road subprojects based on screening criterion.
- Bid documents will prepare by the design consultant and EMP implementation should be done by Contractor.
- RTIP-2 road improvement works will be supervised by the design consultant and monitoring should be done by management consultant.
- All the activities of road improvement will follow existing Environmental Code of Practices (ECP) prepared under RTIP-2.
- The design will ensure that proposed improvement works of the rural roads will not result in the creation or exacerbation of drainage congestion and water logging and to the extent possible incorporate cost-effective measures to mitigate existing water logging and drainage congestion problems at the site.
- The project will ensure that environmental assessment addresses all potential environmental direct and indirect impacts of the sub-project throughout its life: pre-construction, construction and operation stages and mitigation measures have been taken for it.
- The Environmental Assessment Process is presented in Figure 5.2.

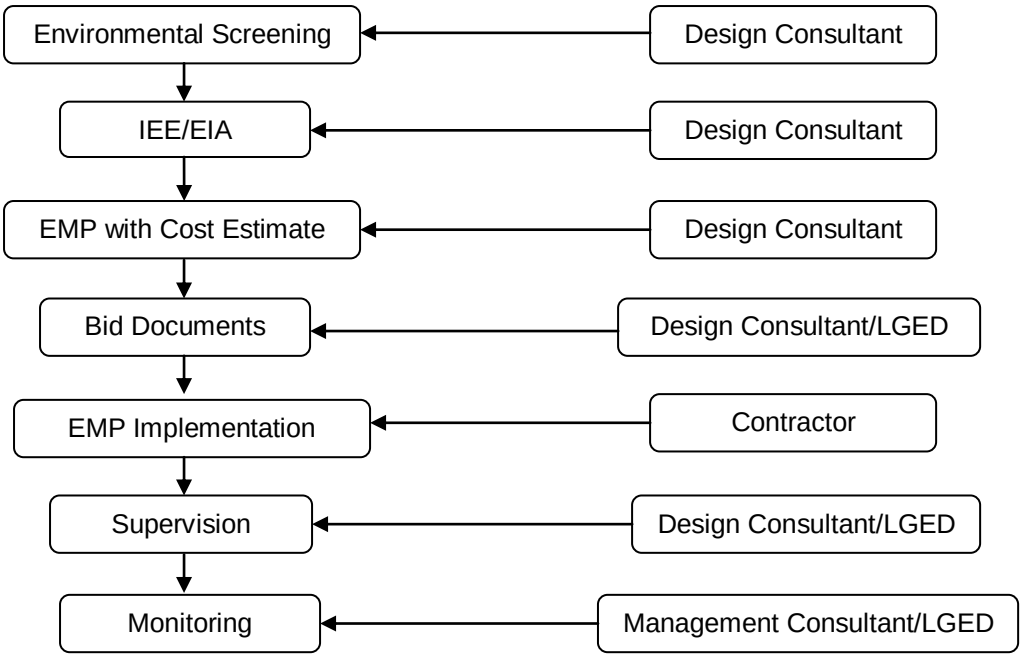

Figure 5.2: Environmental Assessment Steps for Rural Road Improvement

5.2.3.2 Rural Road Maintenance

- Only for the first year subprojects, an individual consultant will carry out the environmental screening.
- LGED will ensure that proper environmental screening will be done by the design consultant.
- Management Consultant will review and clear all screening reports.
- LGED will conduct verification of some screening.
- Design consultant will ensure that environmental considerations are given sufficient attention. To this end, it will carry out Environmental Management Plan (EMP) with cost estimate for all rural road maintenance subprojects based on screening criterion.
- Bid documents will prepare by the design consultant and EMP implementation should be done by Contractor.
- RTIP-2 road improvement works will be supervised by the design consultant and monitoring should be done by management consultant.
- The project will ensure that environmental assessment addresses all potential environmental direct and indirect impacts of the sub-project throughout its life: pre-construction, construction and operation stages and mitigation measures have been taken for it. All the activities of road maintenance will follow existing Environmental Code of Practices (ECP) prepared under RTIP-2.
- The Environmental Assessment Process is presented in Figure 5.3.

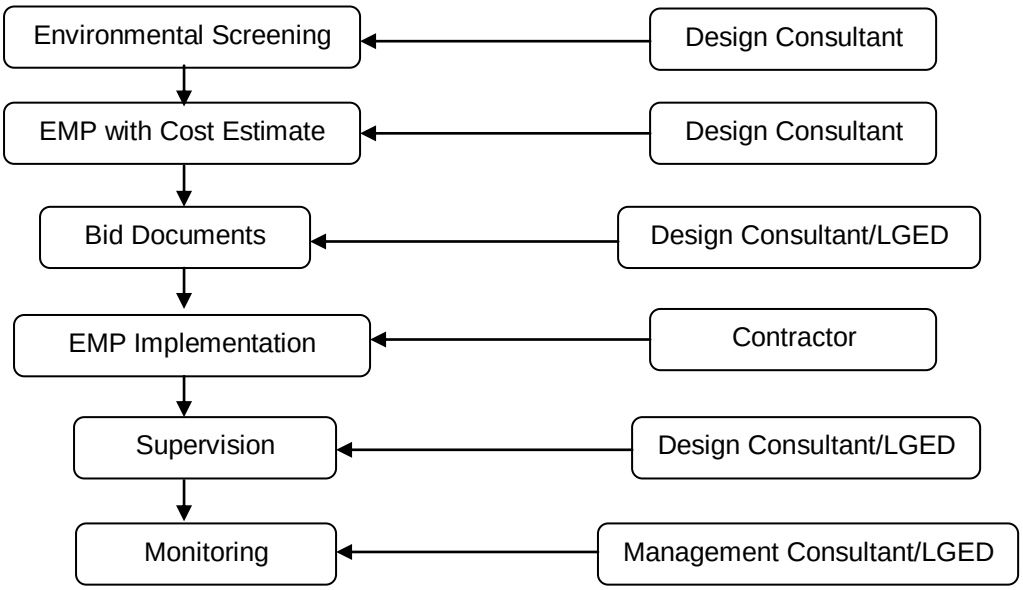

Figure 5.3: Environmental Assessment Steps for Rural Road Maintenance

5.2.3.3 Rural Waterways

- An individual consultant will prepare 2 separate screening, IEE and EIA report for the waterways.
- LGED will ensure that Initial Environmental Examination (IEE) report will be prepared by the design consultant and site clearance will get from DOE.
- Management Consultant will review and clear the IEE and EIA reports before sending to DOE.
- The consultant will ensure that environmental considerations are given sufficient attention. To this end, it will carry out EIA with Environmental Management Plan (EMP) for all rural waterways subprojects based on the IEE. EIA report will be reviewed by the management consultant and will get clearance from DOE by LGED.
- LGED will ensure Environmental Impact Assessment (EIA) of the sub-projects as per Environmental Conservation Rules.
- Bid documents will prepare by the design consultant and EMP implementation should be done by Contractor.
- RTIP-2 road improvement works will be supervised by the design consultant and monitoring should be done by management consultant.
- All the activities of waterways dredging will follow existing Environmental Code of Practices (ECP) prepared under RTIP-2 project.
- The design will ensure that proposed rehabilitation and improvement works of the waterways (dredging of river bed and river bank protection) will not result in the creation of the morphological change of the river and to the extent possible incorporate cost-effective measures to mitigate existing siltation problems of the river.
- The subproject will ensure that environmental assessment addresses all potential environmental direct and indirect impacts of the sub-project throughout its life: pre-construction, construction and operation stages and mitigation measures have been taken for it.
- The Environmental Assessment Process is presented in Figure 5.4.

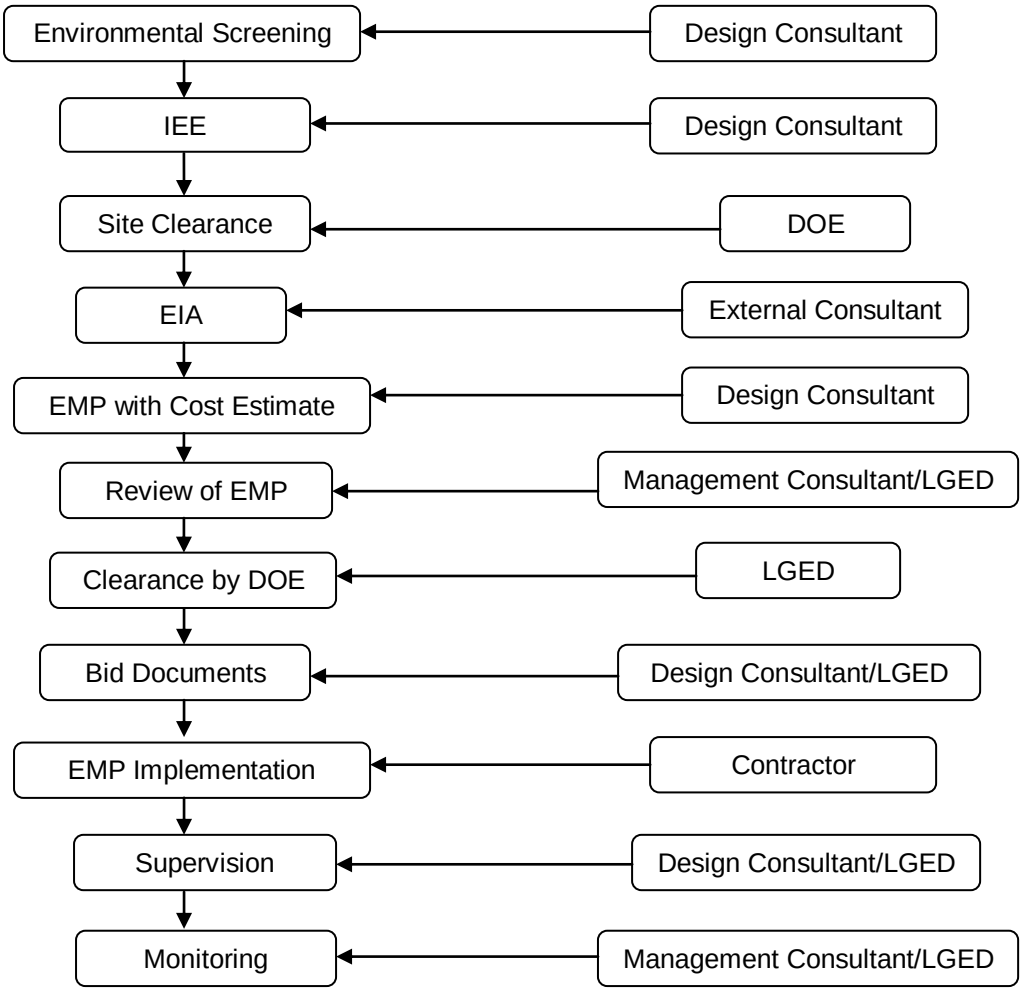

Figure 5.4: Environmental Assessment Steps for Rural Waterways

5.2.3.4 Growth Center Markets

- LGED will ensure that proper environmental screening will be done by the design consultant.
- Management Consultant will review and clear environmental screening.
- Design consultant will ensure that environmental considerations are given sufficient attention. To this end, it will carry out Environmental Management Plan (EMP) with cost estimate for all growth centre market subprojects based on screening criterion.
- Bid documents will prepare by the design consultant and EMP implementation should be done by Contractor.
- RTIP-2 growth centre market works will be supervised by the design consultant and monitoring should be done by management consultant.
- The project will ensure that environmental assessment addresses all potential environmental direct and indirect impacts of the sub-project throughout its life: pre-construction, construction and operation stages and mitigation measures have been taken for it. All the activities of road maintenance will follow existing Environmental Code of Practices (ECP) prepared under RTIP-2.
- The Environmental Assessment Process is presented in Figure 5.5.

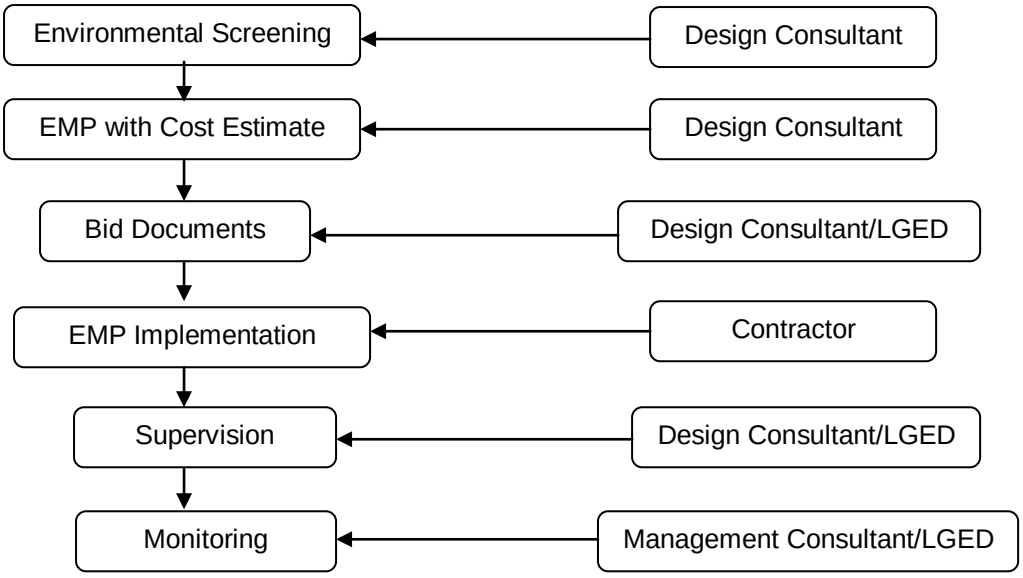

Figure 5.5: Environmental Assessment Steps for Growth Centre Markets

5.3 Environmental Assessment Procedure

5.3.1 Screening

Screening is the process by which the appropriate level and type of EIA is determined for a given project on the basis of its likely environmental impacts **(Annex 6).** The methodology for screening includes desk study, reconnaissance survey and literature available.

Desk Study: To collect the secondary information and choking out the methodology for carrying out the EA study and fixing of responsibilities of the EA team members for preparing a complete, addressing all issues, Environmental Management Plan.

- Gathering and reviewing existing environmental data (secondary data) relevant to the proposed development, in the form of topo sheets, physical maps, thematic maps showing details of soil type, geology, seismic activity, hydrology etc.
- Collect all the earlier carried out environmental and engineering studies in project influence area.

Reconnaissance survey: to collect the first hand information about the project area and develop a perspective of the entire team and revise the methodology and work programme.

- Verifying the data collected during desk study, assessing the likely impacts, identifying the major/main issues and preparing the methodology for detailed investigation.

Screening Statement: compiles the primary & secondary data thus collected, and checking with the legal framework of Bangladesh Government thus suggesting the requirement/category of the Environmental Assessment Required. There are usually three possible outcomes (categories) of a screening process:

i. Where significant concerns exist or where there is a lot that is unknown about project impacts, a full EIA study is necessary.
ii. If environmental impacts of a project are known and can be easily mitigated, a limited environmental study and mitigation plan may be all that is necessary.
iii. If screening identifies no concerns, further environmental analysis is unnecessary, and the project may proceed without the EIA study.

The Environmental Assessment (EA) process will incorporates a number of key steps. A complete EA cycle is presented here, based on the categorization of EIA require RTIP-2 (with the assistance of Environmental Expert if desired) should finalize the Term of Reference, TOR to start the EA process.

5.3.2 Initial Environmental Examination (IEE)

In addition, the sub-projects will require initial environmental assessment (IEE) based on the requirement of DOE. Based on the extent of environmental impact obtained from the environmental

screening, the decision for further environment impact assessment will be taken. In general, rural road improvements with minor environmental impact under RTIP-2 will require only IEE. Environmental screening is part of the IEE. IEE is considered as the first level of assessment applied project identification and pre-feasibility stage. The IEE addresses the issues at project (sub-project) identification and pre-feasibility planning stage. The main objective at this stage is to help define the project (sub-project) in terms of locations, components and designs. The main activities of are to:

- assess regional resources and the effects of past interventions;
- examine the likely project-environment interactions;
- establish an effective people‟s participation program;
- identify the key environmental issues and the range and potential severity of impacts;
- compare the environmental consequences of project alternatives; and
- prepare an initial EMP.

5.3.3 Environmental Impact Assessment (EIA)

EIA, where applicable, will be used by the implementing agencies as a decision-making tool to ensure that the project design and implementation of activities such as improvement/dredging are environmentally sound and sustainable. During the preparation phase, the objective of the EIA is to provide inputs to the feasibility study; preliminary and detailed design of the project including institutional capacity needs and barriers to be addressed. During the implementation phase, environmental management plans (developed as a part of the EIA during the preparation phase) serve as a framework for strengthening the mitigation, enhancement and environmental monitoring measures and system in the RTIP-2. In the preparation phase, the EIA shall achieve the following objectives:

- To establish the environmental baseline in the subproject area, and to identify any significant environmental issue;
- To assess these impacts and provide for measures to address the adverse impacts by the provision of the requisite avoidance, mitigation and compensation measures;
- To integrate the environmental issues in the project planning and design;
- To develop appropriate management plans for implementing, monitoring and reporting of the environmental mitigation and enhancement measures suggested.

Considering the emergency nature of the project, the implementing agency should start dialogue with the Department of Environment (DOE) and agree on the environmental clearance procedure. For the purpose of simplifying the process, the implementing agency can propose to prepare EIA on “Procurement Package‟ basis, if necessary, consisting of few numbers of sub-projects. However, the EIA report should clearly spell out the site specific environmental issues and their mitigation measures.

5.3.4 Environmental Assessment

5.3.4.1 Quality Assurance

Soon after the commencement of planning and design process, based on desk study, reconnaissance survey and experience of earlier projects, detailed methodology and schedule should be prepared for the effective and timely execution of the Environmental Assessment.

Desk Study: To collect the secondary information and choking out the methodology for carrying out the EA study and fixing of responsibilities of the EA team members for preparing a complete, addressing all issues, Environmental Management Plan.

Reconnaissance survey: to collect the first hand information about the project area and develop a perspective of the entire team and revise the methodology and work programe.

Experience Gained from Earlier Projects:

- **Focus on the main issues.** It is important that the EA does not try to cover too many topics in too much detail. Effective scoping can save both time and money by focusing the EA studies on the key issues.
- **EA requires the formation of a multidisciplinary team and the leadership of a strong EA coordinator.** The range of effects considered in the EA requires the skills of RTIP-2 mix of

technical experts to be employed on an assessment team, lead by a Team Leader/EMU. Already taken care of in RFP.

- **Involve the appropriate persons and groups in the EA study.** It is important to involve the right people (e.g., scientists, engineers, policymakers, government representatives, representatives of public interest groups and the local community) and agencies (e.g., the developer, the aid agency, regulatory authorities and politicians) in the EA process. Selection will be made through consultation at different stages.
- **Make maximum use of existing information before engaging inexpensive field studies.** Already taken care of in RFP, submission of quality assurance in the form of Inception Plan.
- **It is important to consider effects not only at the project site but also in the area surrounding a site.** For this based on reconnaissance survey and desk study, will finalize a project influence area.
- **Present clear and appropriate options for mitigation of impacts and for sound environmental management.** Mitigation is an integral part of impacts assessment. Application of appropriate mitigation can eliminate or reduce negative impacts, and improve the net overall environmental performance of a project. Hence public consent, practical viability will be considered in proposing the mitigation measures.
- **Post-EIA audits and monitoring programs are essential to ensuring that EA commitments are carried out and that future EA improve.** An effective monitoring plan will proposed in consultation with the client and the World Bank. Proper budgeting will be ensured for smooth functioning of monitoring plan proposed. Proposal for preparation of the Environmental Management Framework is covered in RFP, highlighting client's commitment to continue with the process of the EA improvement.
- **To be effective, the EA process requires the support of a defined institutional framework and commitment to inter-agency cooperation.** A detailed capacity building plan will be prepared including institutional framework and training mechanism.

5.3.4.2 Scoping

The next step in the EA will be to define the RTIP-2 activities and the natural, regulatory (i.e. legal) and environment of the area in which development will occur. This will be achieved through scoping. Scoping will identifies which of the activities has a potential to interact with the environment. Scoping will be conducted early in the EA process so that a focus on the priority issues (i.e. those that have the greatest potential to affect the natural and/or environment) can be established for the rest of the EA process.

Key elements/inputs to the scoping exercise will be as follows:

- Gathering and reviewing existing environmental data like atmosphere, climate, topography, congestion area, alternative requirement, land use pattern, hydrology and drainage pattern, major river and waterways, religious, cultural and archaeological sites and sensitive areas.
- Identifying project stakeholders; including PAPs, Government and non-government agencies (utilities) Forest Department, Agricultural Department, Department of Environment (DOE) etc.
- Assemble and review relevant legislative requirements, environmental standards and guidelines (national and international) associated with the proposed development as well as the World Bank's operational policies and standards.
- Gathering existing information sources and local knowledge;
- Informing stakeholders of the project and its objectives and get input on the EA;
- Identifying the key environmental concerns (community and scientific) related to a project and the relative importance of issues;
- Defining/preparing the EA work program, including a plan for public and stakeholder involvement;
- Carrying out monitoring of natural environment including air, water, soil, noise etc.
- Defining the range of project alternatives to be considered.
- Obtaining agreement/consensus on the methods and techniques to be used in EA studies and document preparation;
- Determining/freezing the spatial and temporal boundaries for the EA studies.

Focus of scoping will be on the collection and analysis of pertinent data and the assessment of significant environmental attributes. The end result will be a work program which is well focused and cost-effective. The following issues will be addressed through scoping, but will not be limited to.

- To improve the quality of EA information by focusing scientific efforts and EA analysis on truly significant issues;
- To ensure environmental concerns identified and incorporated early in the project planning process, at the same time as cost and design factors are considered;
- To ensure research efforts are not wasted on insignificant issues, rather focused on core issues.
- Reducing the likelihood of overlooking important issues;
- Thinning the chance of prolonged delays and conflicts later in the EA process by engaging stakeholders in a constructive participatory process early in the EA process.

5.3.4.3 Environmental Impact Assessment

Following scoping, assembled legislative requirements, engineering, environmental and socio-economic data will be assessed in greater detail to ensure that all of the RTIP-2 activities and their consequences/likely impacts are considered in full.

a. Existing Environmental Conditions

In order to identify any potential impact on and potential change to the natural and socioeconomic environments, the existing baseline environmental data are to be collected. Baseline will include but not limited to following:

- Primary data/monitoring to define characteristics of the existing environmental condition including soil, water, air, noise, land use, cultural properties and flora and fauna.
  - Monitoring to be carried at critical locations;
  - Identification of residential, commercial, industrial and forest areas for monitoring;
  - Air and noise monitoring at significant location, major settlements, mosque, school and hospitals etc.;
  - Water monitoring at river/canal/pond and ground water sources near major settlements;
  - Soil monitoring at major settlements, near surface water bodies;
  - Tree inventory to be carried out, in consultation with the Forest Department; and
  - Inventory of cultural, religious and archeological sites will be done along with measurements, details and photographs, consultation will be done for gathering public opinion.
- Secondary data to define meteorological, geology, seismicity, quarries, borrow areas, disposal sites etc.
  - Details of quarry and borrow areas to be used will be collected (photographs, measurements and public opinion) and a comprehensive plan for extracting material will be prepared.
  - Meteorological data from Bangladesh Meteorological Department (BMD), topographic sheets and maps from Survey of Bangladesh (SOB), geological and soil data from Bangladesh Soil Resources Institute, Seismic data from Space Research and Remote Sensing Organization (SPARSO).
- Social data including ownership pattern, identification of tribals, vulnerable social groups, land estimates etc.

b. Impact Prediction / likely impact

Impacts prediction being the challenging and controversial stage of the EA process will be dealt with carefully. Reliable methods available for predicting some environmental parameters, e.g. air quality impacts should be used, whereas other predictions can be based more on professional judgment, e.g. impacts of construction activity on animals/cattle. For true impacts prediction following questionnaire will be attempted to answer:

- How will a particular project activity give rise to an impact?
- How likely is it that an impact will occur?
- What will be the consequence of each impact?

- What will be the spatial and temporal extent of each impact?

c. Analysis of Alternatives

- With or without the project.
- Analysis criteria to include environmental, social, technical/design and economic options.
- Alignment options within existing ROWs.
- Other engineering alternatives.

d. Stakeholder Consultation at all Stages of Project

- Identification of stakeholders primary as well as secondary.
  - Primary stakeholders include people having direct impact.
  - Secondary stakeholders include village representatives, women's group, voluntary organizations NGOs, field level officers and staff, other government officials.
- Structured Consultation
  - Consultation at Village Level
  - Consultation at Upazila and District Level
  - Consultation at Divisional level

Consultation at Village Level

- Along with preliminary inventory and survey information dissemination will be done along the RTIP-2 area by one by one canvassing about the project. Date and venue for detailed consultation will be fixed.
- Pictorial method (Pamphlet) will be adopted to explain proposed improvements and possible environmental impact in the concerned villages.
- Public consensus would try to be arrived for and mitigation proposed.
- Public suggestion and graveness will be addressed at appropriate level.

Consultation at Upazila and District Level

- Consultation with officers of Agricultural Department, Forest Department, Soil Department, Fisheries Department, Department of Public Health Engineering (DPHE), etc.
- Consultation with the elected representatives and other stakeholders.

Consultation at Divisional level

- Consultation with senior department officers, like DOE office, District Commissioner Offices, Settlement offices etc. and mechanism of regulatory clearance, utility shifting, land acquisition etc.

5.3.4.4 Environmental Impact Identification

Identification of Environmental Impacts

Based on base line data collected along with engineering and social inputs, a comprehensive study will be taken to identify the possible impact on environmental attributes. The impacts will be defined in terms of their temporal and spatial implication.

The EIA document should typically include:

- **Project Description**: describing about the existing as well as proposed scenario with a mention on right of way, rural road improvements, rural road maintenance, rural waterways, growth center markets, cross drainage structures, community facilities, traffic projections etc.
- **Environmental Regulatory Framework:** presents the legal and administrative framework of the Government of Bangladesh and World Bank environmental guidelines. This section underlines various clearances applicable for the project at the Department of Environment.
- **Analysis of Alternatives** to be presented carried out during feasibility stage, covered in Environmental screening and scoping report, and the approved alternative to be discussed in detail along with environmental attributes under impact.
- **Baseline Environmental** Status, the existing environmental conditions along the RTIP-2 to be ascertained by conducting a recognizance survey along with collection of secondary

information pertaining to the RTIP-2. Primary data for various environmental parameters to be generated using suitable monitoring devises. The methodology to be strictly adhered to the Department of Environment stipulated guidelines.

- **Environmental Impacts,** addressing all the anticipated impacts on the physical and social environment of the RTIP-2. The quanta of all the impacts on natural environment and social/cultural environment are presented in the forming Table 5.1 to 5.4 respectively.
- **Public Consultation** to be carried out in order to know the reactions of local population and the project affected people (PAP). Meetings to be held with the stakeholders to record their views on the impacts caused and the suggested remedies to be adopted for the RTIP-2 activities.

Table 5.1: Possible Impacts for Rural Road Improvements

Project Activity	Planning & Design Phase	Pre-construction Phase		Construction Phase					Operation	Indirect effect of operation of induced development
Env. Component affected	Land acquisition	Removal of structures	Removal of trees and vegetation	Earth works including quarrying	Laying of pavement	Vehicle & machine operation & maintenance	Concrete & crusher plants	Sanitation & waste (labor camps)	Project operation	
Air		Dust generation during dismantling	Reduced buffering of air and noise pollution, hotter, drier microclimate	Dust generation	Dust due to aggregates	SPMs, NOx, SOx	Dust pollution	Odour / smoke	SPMs, NOx, SOx	Other pollution
	Loss of productive land	Generation of debris	Erosion and loss of top soil	Erosion and loss of top soil		Contamination by fuel and lubricants compaction	Contamination compaction of soil	Contamination from wastes	Spill from accidents deposition of lead	Change in land use
		Siltation due to loose earth	siltation due to loose earth	Alternation of drainage break in continuity of ditches siltation, stagnant water pools in quarries	Reduction of ground Water recharge area	Contamination by fuel and lubricants	Contamination by leakage or fuel	Contamination from wastes overuse	Spill contamination by fuel, lubricants	Increased contamination of ground water
			Noise pollution due to machinery	Noise pollution		Noise pollution	Noise pollution		Noise pollution	Noise pollution
				Vibration					Vibration level increase	May impact the surrounding structures
		Loss of biomass		Lowered productivity loss of ground for vegetation		Removal vegetation	Lower productivity use as fuel wood	Felling trees for fuel	Impact of pollution on vegetation lowered productivity toxicity of vegetation	
			Disturbance habitat loss	Disturbance		Disturbance	Disturbance	Poaching	Collision with traffic	Distorted habitat
Buildings and built structures		Loss of structures, debris generation		Noise, vibration may cause damage structures		Noise, Vibration may cause damage to structures	Dust accumulation on building and structures		Vibration and noise	Change in building use and characteristics

Project Activity	Planning & Design Phase	Pre-construction Phase		Construction Phase					Operation	Indirect effect of operation of induced development
Env. Component affected	Land acquisition	Removal of structures	Removal of trees and vegetation	Earth works including quarrying	Laying of pavement	Vehicle & machine operation & maintenance	Concrete & crusher plants	Sanitation & waste (labor camps)	Project operation	
People and community		Displacement of people psychological impact on people loss of livelihood	Loss of shade and community trees, loss of fuel wood and fodder, loss of income	Noise and Air pollution	Odour and dust	Noise and air pollution, collision with pedestrians livestock and vehicles	Air and noise pollution and discomfort	Community clashes with migrant labor	Noise pollution, risk of accident	Induced pollution
Cultural assets		Displacement loss of structure from RoW	Loss of scared trees	Noise, vibration may cause damage to structure		Damage from vibration and air pollution	Dust accumulation		Damage from vibration and air pollution	
Utilities and amenities		Interruption in supply				Damage to utility and amenities	Dust accumulation on water bodies	Pressure on existing amenities		
Worker's health and safety				Increase of stagnant water and disease	Asphalt odour and dust	Collisions with vehicles, pedestrian and livestock	Impact on health due to inhale of dust	Increase in communicable diseases	Collisions pedestrians and livestock	

Table 5.2: Possible Impacts for Rural Road Maintenance

Project Activity	Construction Phase					Operation	Indirect effect of operation of induced development
Env. Component affected	Earth works including quarrying	Laying of pavement	Vehicle & machine operation & maintenance	Concrete & crusher plants	Sanitation & waste (labor camps)	Project operation	
Air	Dust generation	Dust due to aggregates	SPMs, NOx, SOx	Dust pollution	Odour / smoke	SPMs, NOx, SOx	Other pollution
			Noise pollution			Noise pollution	Noise pollution

Project Activity	Construction Phase					Operation	Indirect effect of operation of induced development
Env. Component affected	Earth works including quarrying	Laying of pavement	Vehicle & machine operation & maintenance	Concrete & crusher plants	Sanitation & waste (labor camps)	Project operation	
	Lowered productivity loss of ground for vegetation		Removal vegetation	Lower productivity use as fuel wood	Felling trees for fuel	Impact of pollution on vegetation lowered productivity toxicity of vegetation	
	Disturbance		Disturbance	Disturbance	Poaching	Collision with traffic	Distorted habitat
Worker's health and safety	Increase of stagnant water and disease	Asphalt odour and dust	Collisions with vehicles, pedestrian and livestock	Impact on health due to inhale of dust	Increase in communicable diseases	Collisions pedestrians and livestock	

Table 5.3: Possible Impacts for Rural Waterways

Project Activity	Construction Phase					Operation	Indirect effect of operation of induced development
Env. Component affected	Eroded river bank protection	Dredged materials	Dredging Machine and Vehicle operation	Concrete & crusher plants	Sanitation & waste (labor camps)	Project operation	
Air		Dust due to Dredging sand	SPMs, NOx, SOx	Dust pollution	Odour / smoke	SPMs, NOx, SOx	Other pollution
			Contamination by fuel and lubricants compaction	Contamination compaction of soil	Contamination from wastes	Spill from accidents deposition of lead	
	Alternation of drainage break in continuity of ditches siltation		Contamination by fuel and lubricants	Contamination by leakage or fuel	Contamination from wastes overuse	Spill contamination by fuel, lubricants	Increased contamination of surface water
			Noise pollution	Noise pollution		Noise pollution	Noise pollution
			Removal vegetation	Lower productivity use as fuel wood	Felling trees for fuel		

Project Activity	Construction Phase					Operation	Indirect effect of operation of induced development
Env. Component affected	Eroded river bank protection	Dredged materials	Dredging Machine and Vehicle operation	Concrete & crusher plants	Sanitation & waste (labor camps)	Project operation	
	Disturbance	Disturbance	Disturbance	Disturbance	Poaching	Collision with traffic	Distorted habitat
People and community		Odour and dust	Noise and air pollution	Air and noise pollution and discomfort	Community clashes with migrant labor	Noise pollution	Induced pollution
Worker's health and safety	Increase of stagnant water and disease	Odour and dust	Noise and air pollution	Impact on health due to inhale of dust	Increase in communicable diseases	Noise pollution	

Table 5.4: Possible Impacts for Growth Centre Market

Project Activity	Pre-construction Phase		Construction Phase					Operation	Indirect effect of operation of induced development
Env. Component affected	Removal of structures	Removal of trees and vegetation	Earth works including quarrying	Laying of pavement	Vehicle & machine operation & maintenance	Concrete & crusher plants	Sanitation & waste (labor camps)	Project operation	
Air	Dust generation during dismantling	Reduced buffering of air and noise pollution, hotter, drier microclimate	Dust generation	Dust due to aggregates	SPMs, NOx, SOx	Dust pollution	Odour / smoke	SPMs, NOx, SOx	Other pollution
		Noise pollution due to machinery			Noise pollution			Noise pollution	Noise pollution
	Loss of biomass		Lowered productivity loss of ground for vegetation		Removal vegetation	Lower productivity use as fuel wood	Felling trees for fuel	Impact of pollution on vegetation lowered productivity toxicity of vegetation	
		Disturbance habitat loss	Disturbance		Disturbance	Disturbance	Poaching	Collision with traffic	Distorted habitat
Worker's health and safety			Increase of stagnant water and disease	Asphalt odour and dust	Collisions with vehicles, pedestrian and livestock	Impact on health due to inhale of dust	Increase in communicable diseases	Collisions pedestrians and livestock	

Determining Degree of Impact

Once all project environmental aspects will be identified, the level of impact that may result from each of the activity-receptor interactions will be assessed. In assessing the level of impact that an activity may cause, two key elements are considered namely:

- **Consequence:** the resultant impact (positive or negative) of an activity's interaction with the legal, natural and/or socio-economic environments; the categorization for consequence is presented in **Table 5.5** below.

Table 5.5: Consequence Categories and Rankings

Consequence Category	Addressed
Significant	Most sever, alternative will be proposed through environmental hazard risk management
Major	Sever, alternative/avoidance will be proposed through environmental hazard risk management
Moderate	Less severe, measures will be proposed to minimize impact
Minor	Lesser sever, mitigation measures will be proposed
Negligible	Less sever, mitigation and enhancement measures will be prepared
None	No impact, enhancement measures will be proposed
Positive	Positive impact

- **Likelihood:** the likelihood that an activity will occur. The categorization for likelihood is presented in **Table 5.6** below.

Table 5.6: Likelihood Categories and Rankings

Likelihood Category	Definition
Certain	The activity will occur under normal operating conditions.
Very likely	The activity is very likely to occur under normal operating condition.
Likely	The activity is likely to occur at some time under normal operating condition.
Unlikely	The activity is unlikely to but may occur at some time under normal operating condition.
Very unlikely	The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.

5.3.4.5 Mitigation and Management Plan

- **Mitigation Measures**

Mitigation measures will be considered starting with Environmental Assessment process. Impacts identified severe in consequence category and or likelihood category will be further analyzed to identify additional mitigation measures that are potentially available to eliminate or reduce the predicted level of impact. Potential mitigation measures will include:

- habitat compensation program
- species specific management program
- engineering design solutions
- alternative approaches and methods to achieving an activity's objective
- stakeholders participation in finalizing mitigation measures

- construction practice, including labour welfare measures.
- operational control procedures
- management systems

- **Environmental Management Plan Proposal**

If identified impacts "Physical/Social/Cultural", i.e. are significant and/or important, it is necessary to identify and implement mitigation measures. Mitigation measures are selected to reduce or eliminate the severity of any predicted adverse environmental impacts and improve the overall environmental performance and acceptability of the project. Where mitigation is deemed appropriate, a proponent should strive to act upon effects, in the following order of priority, to:

- Eliminate or avoid adverse impacts, where reasonably achievable.
- Reduce adverse impacts to the lowest reasonably achievable level.
- Regulate adverse impacts to an acceptable level, or to an acceptable time period.
- Create other beneficial impacts to partially or fully substitute for, or counter-balance, adverse effects.

Mitigation is an integral part of impact evaluation. It looks for better ways of doing things so that the negative impacts of the proposal are eliminated or minimized and the benefits are enhanced. As soon as significant adverse impacts are identified, discussions should be held to see if they can be 'designed out' through changes in project design, location or operation. It is important therefore, that there is good integration between the EIA team and project design engineers.

Project specific environmental construction guidelines should be developed. These guidelines should specify precautions and mitigation measures for construction activities, and to be included with the EMP. Good Environmental Construction guidelines has been compiled in **Annex 8: Environmental Code of Practice (ECP).**

The EMP should be developed so as to counter the impacts assessed during the EIA process and also the likely impacts during the construction and operational phase. Based on the past experience, a generic EMP has been presented in **Table 5.7** below for reference. This can be used as a reference material for comprehending the scope of the EMP.

Table 5.7: Generic Environmental Management Plan

Sl. No.	Environmental Parameter	Specification
Effective Implementation of Environmental Management Measures		
1. SOIL/Aggregate		
	Disposal of Debris and Other Wastes	No-objection from land owner / Revenue Authorities as may be applicable. **Disposal Areas** ▪ No residential areas are located downwind side of these locations; ▪ Dumping sites are located at least 1000 m away from sensitive locations such as all notified forestlands, all water bodies, and productive lands ▪ Available waste lands are given preference. **Specifications for Waste Disposal** ▪ In case of bituminous wastes, debris are to be disposed in a minimum 60cm thick clay lined pits so as to eliminate any chances of leaching and top layer shall be covered with soil/good earth so as to enable natural re-vegetation of the disposed area/site. Care should be taken not to dispose these wastes near farmland and water bodies. ▪ In case of filling of low-lying areas with wastes, it needs to be ensured that the level matches with the surrounding areas. In this case care should be taken that these low lying areas are not used for rainwater storage ▪ In case oil and grease are trapped for reuse in a minimum 60cm

Sl. No.	Environmental Parameter	Specification
		thick lined pit, care shall be taken to ensure that the pit should be located at the lowest end of the site and away from the residential areas. ▪ All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary will be planned and implemented as approved and directed by the Engineer.
	Borrowing of Earth (in case of opening of new borrow areas)	**Borrow Area Selection** Borrowing within the ROW is prohibited. However, earth available from excavation for road side drains as per design, may be used as embankment material (if necessary and applicable), subject to approval of the Engineer, with respect to acceptability of material. Borrowing to be avoided on the following areas: ▪ Lands close to toe line and within 0.5 km from toe line. ▪ Irrigated agricultural lands (In case of necessity for borrowing from such lands, the topsoil shall be preserved in stockpiles. ▪ Grazing land. ▪ Lands within 1km of settlements. ▪ Environmentally sensitive areas such as reserve orests, protected forests, sanctuary, wetlands. Also, a distance of 500 m should be maintained from such areas. ▪ Unstable side-hills. ▪ Water-bodies (only if permitted by the local authority, and with specific pre-approved redevelopment plans by the concerned authority and engineer-in-charge) ▪ Streams and seepage areas. ▪ Areas supporting rare plant/ animal species; **Documentation of Borrow Pit** The contractor must ensure that following data base must be documented for each identified borrow areas before commencing the borrowing activity that provide the basis of the redevelopment plan. ▪ Chainage along with offset distance; ▪ Area (Sq.m); ▪ Photograph and plan of the borrow area from all sides; ▪ Type of access/width/kutcha/pucca etc. from the roadway; ▪ Soil type, Slope/drainage characteristics; ▪ Water table of the area or identify from the nearest well, etc; ▪ Existing land use, for example barren / agricultural / grazing land; ▪ Location/name/population of the nearest settlement from borrow area; ▪ Quantity excavated (likely and actual) and its use; ▪ Copy of agreement with owner/government; and ▪ Community facility in the vicinity of borrow pit. ▪ Rehabilitation certificate from the land owner along with at least four photograph of the rehabilitated site from different angles.
	Contamination of Soil by Fuel and Lubrican	Location of fuel storage and refilling areas at least 500m from all cross drainage structures and important water bodies and storing of fuel and lubricants on a sand flooring of at least 6” thick, done on brick edge flooring lined with polyethylene sheet
	Quarry Operations and Management (if new quarries are	To minimize the adverse impact during excavation of material following measures are need to be undertaken: ▪ Adequate drainage system shall be provided to the excavated

Sl. No.	Environmental Parameter	Specification
	opened)	area ▪ At the stockpiling locations, the Contractor shall construct sediment barriers to prevent the erosion of excavated material due to runoff. ▪ Construction of offices, laboratory, workshop and rest places shall be done in the up-wind of the plant to minimize the adverse impact due to dust and noise. ▪ The access road to the plant shall be constructed taking into consideration location of units and also slope of the ground to regulate the vehicle movement within the plant. The followings precautions shall be undertaken during quarry operations. ▪ Overburden shall be removed. ▪ During excavation slopes shall be flatter than 20 degrees to prevent their sliding. ▪ In case of blasting, the procedure and safety measures shall be taken as per DOE guidelines. ▪ The Contractor shall ensure that all workers related safety measures shall be taken. ▪ The Contractor shall ensure maintenance of crushers regularly as per manufacturer's recommendation. ▪ During transportation of the material, measures shall be taken to minimize the generation of dust and to prevent accidents.
2. Water		
2.1	Labor Camp, Sanitation and Waste Disposal in Construction Camps	Construction labor camps shall be located at least 500m away from the nearest habitation complying all relevant legal requirements.
3. Air Pollution		
3.1	Generation of Dust	▪ All vehicles delivering materials should be provided with tail guard and shall be covered to avoid spillage of materials. ▪ No fugitive dust emission at settlement sites arising from maintenance activities shall be allowed. All such operation leading to dust pollution in settlement areas shall be performed with necessary dust suppression by adequate water sprinkling to keep the dust below visible limit. Such measures shall be taken to ensure no dust pollution arises from construction stock piles
3.2	Concrete Mix Plants and Batching Plants	▪ Concrete mix plants to be used at least 1000m from the nearest habitation in the cross wind direction. ▪ In case if new Concrete mix plants/Batching plants are set up, the conditions of DOE shall be strictly adhered
3.3	Odor from Construction Labor Camps.	▪ Construction worker's camp shall be located at least 500 m away from the nearest habitation. ▪ The waste disposal and sewerage system for the camp shall be properly designed, built and operated so that no odour is generated.
3.4	Pollution from Crusher	All crushers used in construction shall confirm to relevant dust emissions control stipulated as per DOE norms
4. Noise Pollution		
4.1	Noise from Vehicles, Plants and Equipment	▪ Any activities related to road maintenance operations and/or associated facilities near settlements shall not be carried out during night time (10:00 PM to 6.00 AM). ▪ Workers in vicinity of strong noise, and workers working with or

Sl. No.	Environmental Parameter	Specification
		in crushing, compaction, batching or concrete mixing operations shall wear earplugs.
5. Flora and Fauna		
	Loss or Damage of Vegetation	▪ All works shall be carried out in a fashion that ensures minimum damage or disruption to the flora. Prior tree felling permission under Forest Act will be obtained before felling any tree. Trees or shrubs will only be felled or removed that impinge directly on the permanent works or necessary temporary works with prior approval from the Engineer. ▪ The Engineer shall approve such felling; only when the proponent secures receives a "clearance" for such felling from the DOF, as applicable.
	Loss, Damage or Disruption to Fauna	▪ All works shall be carried out in a fashion to ensure minimum damage to the fauna. ▪ Construction workers shall be instructed to protect natural resources and fauna, including wild animals and aquatic life, Hunting and unauthorized fishing are prohibited.
6. Disruption to Users		
6.1	Loss of Access	▪ At all times, the Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property accesses connecting the project corridor. Work that affects the use of side roads and existing accesses shall not be undertaken without providing adequate provisions to the prior satisfaction of the Engineer. ▪ The works shall not interfere unnecessarily or improperly with the convenience of public or the access to, use and occupation of public or private roads, and any other access footpaths to or of properties whether public or private.
6.	Traffic Jams and Congestion in Road Crossing Areas	▪ Detailed Traffic Management Plans (TMP) shall be prepared and submitted to the Engineer for approval 5 days prior to commencement of maintenance works on any cross-section with road. The traffic control plans shall contain details of temporary diversions, details of arrangements for construction under traffic and details of traffic arrangements after cession of work each day. ▪ Temporary diversion for road traffic (including scheme of temporary and acquisition) will be constructed with the approval of the Engineer. ▪ Special consideration shall be given in the preparation of the traffic control plan to the safety of pedestrians and workers at night ▪ The contractor shall ensure that the running surface is always maintained within diversion guidelines, particularly during the monsoon so that the traffic flow is smooth at all times. ▪ The temporary traffic detours in settlement areas shall be kept free of dust by frequent application of water.
6.	Traffic Control and Safety	▪ The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required by the Engineer for the information and protection of traffic approaching or passing through the cross section. ▪ All signs, barricades, pavement markings shall be as per road

Sl. No.	Environmental Parameter	Specification
		specification.
7. WORKERS' ACCIDENT RISKS		
	Risk from Operations	The Contractor is required to comply with all the precautions as required for the safety of the workmen as per the International Labor Organization (ILO) convention. The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, books, etc., to the workers and staff. The contractor has to comply with all regulation regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.
	Risk from Electrical Equipment	Adequate precautions will be taken to prevent danger from electrical equipment. No materials on any of the sites will be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights will be provided to protect the public. All machines to be used in the construction will conform to the relevant Bangladesh Standards (BS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per BS provisions and to the satisfaction of the Engineer.
	Risk at Hazardous Activity	All workers employed on mixing material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Stone-breakers will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals.
	Malarial Risk	The Contractor shall, at his own expense, conform to all anti-malarial instructions given to him by the Engineer and the EMU, including filling up any borrow pits which may have been dug by him.
8. WORKERS' RESIDENCE AND HEALTH CONCERNS		
	First Aid	▪ Medical facilities shall be provided to the labor at the construction camp. Visits of doctor shall be arranged twice a month wherein routine checkups would be conducted for women and children. A separate room for medical checkups and keeping of first aid facilities should be built. Workplaces remote and far away from regular hospitals will have indoor health units with one bed for every 250 workers. Suitable transport will be provided to facilitate take injured or ill person(s) to the nearest approachable hospital. ▪ First Aid Box will be provided at every construction campsite and under the charge of a responsible person who shall always be readily available during working hours.
	Payment of Wages	▪ The payment of wages should be as per the Minimum Wages Act, Department of Labor, and Government of Bangladesh for both male and female workers. ▪ Display of the minimum wages board at camps and major construction sites should be done in local languages at the construction and labor camp sites. ▪ Wages should be paid to the laborers only in the presence of RTIP-2 staff; ▪ Contractor is required to maintain register for payment of labor wages with entry of every labor working for him. Also, he has to produce it for verification if and when asked by the Engineer, EMU and/or the concerned RTIP-2 staff/Engineer's

Sl. No.	Environmental Parameter	Specification
		representative.
	Rehabilitation of Labor and Construction Camp	At the completion of construction, all construction camp facilities shall be dismantled and removed from the site. The site shall be restored to a condition in no way inferior to the condition prior to commencement of the works. Various activities to be carried out for site rehabilitation include: ▪ Oil and fuel contaminated soil shall be removed and transported and buried in waste disposal areas. ▪ Soak pits, septic tanks shall be covered and effectively sealed off. ▪ Debris (rejected material) should be disposed of suitably. ▪ Underground water tank in a barren/non-agricultural land can be covered. However, in an agricultural land, the tank shall be removed. ▪ If the construction camp site is on an agricultural land, preserve top soil and good earth can be spread back for a minimum 30cm for faster rejuvenation of the land. ▪ Proper documentation of rehabilitation site is necessary. This shall include the following: - Photograph of rehabilitated site; - Land owner consent letter for satisfaction in measures taken for rehabilitation of site; and - Undertaking from contractor; In cases, where the construction camps site is located on a private land holding, the contractor would still have to restore the campsite as per this guideline. The rehabilitation is mandatory and should be include in the agreement with the landowner by the contractor. Also, he would have to obtain a certificate for satisfaction from the landowner.
9. DAMAGE AND LOSS OF CULTURAL PROPERTIES		
9.1	Conservation of Religious Structures and Shrines	▪ All necessary and adequate care shall be taken to minimize impact on cultural properties which includes cultural sites and remains, places of worship including temples, mosques, churches and shrines, etc., graveyards, monuments and any other important structures as identified during design and all properties / sites / remains notified. No work shall spill over to these properties, premises and precincts. The design options for cultural property relocation and enhancement need to be prepared. ▪ All conservation and protection measures will be taken up as per design. Access to such properties from the road shall be maintained clear and clean.
9.2	Chance found Archaeological Property	▪ During earth excavation, if any property is unearthed and seems to be culturally significant or likely to have archaeological significance, the same shall be intimated to the Engineer. Work shall be suspended until further orders from the PD. The Archaeological Department shall be intimated of the chance find and the Engineer shall carry out a join inspection with the department. Actions as appropriate shall be intimated to the Contractor along with the probable date for resuming the work. ▪ All fossils, coins, articles of value of antiquity and structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government,

Sl. No.	Environmental Parameter	Specification
		and shall be dealt with as per provisions of the relevant legislation.
10. ENVIRONMENTAL ENHANCEMENT		
10.1	RTIP-2 Landscape	Protect all the trees, re-vegetation of RTIP-2 project embankments and other slopes, edge treatment of water bodies shall be taken up as per either detailed design or typical design guidelines given as part of the bid documents.

5.3.4.6 Bid Document

- Prepare cost estimates, to be incorporate in Bid Documents.
- Environmental Management Plan along with the good environmental construction guidelines to be incorporated in the bid document's work requirements.
- Preparation of work requirement (addendum/corrigendum to road specifications) and
- Corrigendum / Addendum to road specification as special provisions to be incorporated in bid document. Penalty clauses for not complying with EMP requirements to be incorporated. Indicative penalty clauses proposed in the RTIP-2 are presented below (Addendum to Clause 17.2 Contractor's Care of the Works of FIDIC).
  - The contractor has to follow all traffic safety measures as defined in the technical specification. Damage shall be levied at the rate Tk. 3000/- per day per location for non – conformity of traffic safety measures as per the decision of the engineer.
  - The contractor has to follow all environmental mitigation measures as defined in the technical specification read along with the Environmental Management Plan for the specific RTIP-2 activities. Damage shall be levied at the rate Tk. 3000/- per day per location for nonconformity of Environmental Management Plan measures as per the decision of the Engineer.
  - The contractor has to ensure that prior to every monsoon season, during the construction period; all the temporary and permanent cross drainage structures are free from debris as defined in the Technical Specifications read along with the Environmental Management Plan. Damage shall be levied at the rate of Tk.3000/- per day per location for non-conformity as per the decision of the Engineer.
  - The contractor has to ensure that sufficient numbers and good quality Personnel Protective Equipment (PPE), should be provide to staff and labor all time as defined in the labor codes read along with the Environmental Management Plan (EMP). Damage shall be levied at the rate of Tk. 1000/- per day for non-conformity as per the decision of the Engineer.

5.3.4.7 Monitoring Plan

For each of the environmental components, the monitoring plan specifies the parameters to be monitored; location of the monitoring sites and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. There are two types of monitoring: Quantatitive & Qualatitive. The quantitative monitoring plan for the various environmental condition indicators of the subproject in construction and operation stages is presented in **Table 5.8 to Table 5.11.** Monitoring plan does not include the requirement of arising out of regulation provision such as obtaining NOC/ consent for plant site operation. LGED field level laboratories will be involved in the monitoring process.

Table 5.8: Environmental Monitoring Plan for Rural Road Improvement

Environmental Items	Parameters/ Units	Location	Means of Monitoring	Frequency	Responsibility	
					Implementation	Supervision
Construction Stage						
Air Quality	Measurement of dust and vehicular emissions such as SPM, etc.	Close to School/ Madrasha, Hospital & Villages	Test	once	Contractor	D&SC & LGED

Environmental Items	Parameters/ Units	Location	Means of Monitoring	Frequency	Responsibility	
					Implementation	Supervision
Surface Water Quality	Monitoring of water such as PH, DO, BOD, COD, etc.	River (if any)	Test	once	Contractor	D&SC & LGED
Flora and fauna	Monitoring of flora, fauna and other resources.	in vicinity of construction camp	Inspection	Monthly	Contractor	D&SC & LGED
Traffic movements	Monitoring of traffic control devices	Construction areas	Inspection	Daily	Contractor	D&SC/LGED
Waste management (including construction wastes)	Monitoring of collection, transportation and disposal of solid waste. Inspection of waste disposal sites and construction camps	Construction Yard/Labor Camp	Inspection	Daily	Contractor	D&SC/LGED
Health and safety	Monitoring of health and safety of workers	Construction Site/ Labor Camp	inspection	Daily	Contractor	D&SC/LGED
Reporting and Documentation	Regular reporting	Along the road	Reporting	Daily	Contractor	D&SC/LGED
Operation Stage						
Air Quality	Measurement of dust and vehicular emissions such as SPM, etc.	Close to School/ Madrasha, Hospital & Villages	Test	Once	LGED	LGED
Traffic Safety	Monitoring of traffic control devices	Along the road	Inspection	Once	LGED	LGED
Tree re plantation	Two tree seedlings to be planted for each tree felled	Road side slope	Inspection	Monthly	FD/NGOs	LGED

Table 5.9: Environmental Monitoring Plan for Rural Road Maintenance

Environmental component	Location	Means of Monitoring	Frequency	Responsibility	
				Implementation	Supervision
Construction Stage					
Dust Management	Dust Generating place Close to School/Madrasha, Hospital, etc.	Observation	As & when required	Contractor	LGED
Worker facilities	Proper sanitation facilities should be provided at construction camp	Observation	As & when required	Contractor	LGED
Health and Safety	Construction Site and Camp sites	Inspection	As & when required	Contractor	LGED

Table 5.10: Environmental Monitoring Plan for Rural Waterways

Environmental component	Parameters/ Units	Location	Means of Monitoring	Monitoring Period/ Frequency	Responsibility	
					Implementation	Supervision
Pre-construction/Design Stage						
Air Quality	PM, SO_x and NOx	Along the river at Ghat, School & Hospital & Village	Test	Once	D&SC	LGED
Noise Level	dB(A)	Along the river at Ghat point and close to School, Hospital & Village	Mesurement	Once	D&SC	LGED
Surface water	pH, TDS, DO, BOD,COD, Oil & Grease	Upstream and downstream location	Test	Twice (one each during lean flow and high flow seasons)	D&SC	LGED
RBM	Heavy Metals (Zn, Hg, Cd, Cr, As, Pb&Cu)	Dredging location of River	Test	once	D&SC	LGED
Construction Stage						
Air Quality	PM, SO_x and NOx	Along the river at School & Hospital & Village	Test	Quarterly	Contractor	LGED
Noise Level	dB(A)	Along the river at Ghat, School & Hospital & Village	Measurement	As & when required	Contractor	LGED
Surface water	pH, TDS, DO, BOD,COD, Oil & Grease	Upstream and downstream location	Test	Twice (one each during lean flow and high flow seasons)	Contractor	LGED/D&SC
RBM	Heavy Metals (Zn, Hg, Cd, Cr, As, Pb&Cu)	Dredging location of River	Test	once	Contractor	LGED/D&SC
Wastes (including construction wastes)	Different kind of wastes such as dredging debris, camp site waste etc.	Labor Camp & Const. Yard	Inspection	Daily	Contractor	LGED
Wildlife	Aquatic Wildlife habitat and movement	Along the River	Observation	Weekly	Contractor	LGED/D&SC
Health and safety	Monitoring of health and safety of workers	Construction Site/ Labor Camp	Inspection	Daily	Contractor	LGED/D&SC
Operation Stage						
Air Quality	PM, SO_x and NOx	Along the River at Ghat, School & Hospital & Village	Test	Once	LGED	LGED
Noise Level	dB(A)	Along the River at Ghat, School & Hospital & Village	Measurement	Once	LGED	LGED
Surface water	pH, TDS, DO, BOD,COD, Oil & Grease	Upstream and downstream location	Test	Twice (one each during lean flow and high flow seasons)	LGED	LGED

Table 5.11: Environmental Monitoring Plan for Growth Centre Markets

Environmental component	Location	Means of Monitoring	Frequency	Responsibility	
				Implementation	Supervision
Construction Stage					
Dust Management	Dust Generating place Close to School/Madrasha, Hospital, etc.	Observation	As & when required	Contractor	LGED
Worker facilities	Proper sanitation facilities should be provided at construction camp	Observation	As & when required	Contractor	LGED
Health and Safety	Construction Site and Camp sites	Inspection	As & when required	Contractor	LGED

In addition to the critical locations selected during design stage, the environmental monitoring will also be done at the construction camp site and any other plant site during construction stage. List of critical locations for caring out monitoring should be presented in the IEE/EIA report.

5.3.4.8 Monitoring and Post Auditing

Construction Monitoring, including field inspections and surveys, should be carried out by an environmental expert (to be employed by RTIP-2 on regular basis) to ensure that environmental protection requirements are being met. It is important to plan and budget for environmental construction monitoring as part of the project. If construction is to be contracted out, RTIP-2 to reconfirm that specific environmental requirements during construction (as already specified) are built into construction bidding documents and contracts to ensure, they are met (e.g. requirements for local hiring, penalty for not adhering to the EMP clause requirements etc.).

Post Construction Monitoring is used to identify environmental changes resulting from the implementation of the project. In the context of EIA, post construction monitoring programs are carried out to achieve the following results:

- to ensure that the facility is meeting all environmental regulatory requirements, and that commitments made in the EIA document and/or the conditions of approval are being met;
- to test impact hypotheses, and to verify the predictions and assessment of environmental impacts, thus contributing to better assessments in the future;
- to evaluate the performance effectiveness of mitigation;
- to compare actual and predicted changes to the environment, so that immediate actions can be taken to mitigate unanticipated impacts;
- to strengthen confidence by both government and the public in the EIA process, the decisions made the road design etc.

The monitoring programs to be carried out during the construction and operation of the undertaking are normally described in the EIA document.

5.4 Indicating checklist of information to be collected

(Information to be prepared in the form of soft and hard copies by the RTIP-2)

A. Project Brief

1. Tile of the Project
2. Project Location (attach map to scale)
3. Project
4. Development and Implementation Schedule (including details on current status)
    a. Technical closure
    b. Financial closure
    c. Implementation commencement
    d. Implementation completion

B. Environmental Settings, Regulatory Clearances, and Applicable World Bank Safeguard Policies

1. Brief on environmental settings of the project
2. Provide information if any of the following sensitive environmental features are present within the project site/corridor and an influence zone of about 5km, including a brief on the sensitive features:

Sl. No.	Sensitive Environmental Features
1	Biosphere reserves
2	National park and wildlife sanctuaries and reserves
3	Natural lakes, swamps, seismic zones, tribal settlements
4	Notified areas of habitat for migratory birds
5	Areas of scientific and geological interests
6	Religious, heritage, historic sites and cultural properties
7	Notified archaeological monuments/sites
8	Scenic areas, water bodies and areas of tourism importance
9	Hill resorts/mountains/ hills
10	Presence of resorts (beach resorts, health resorts, etc.)
11	Coastal areas rich in corals, mangroves, breeding grounds of specific species, estuaries
12	Defense installations, especially those of security importance and sensitive to pollution
13	Border areas, and local waterways

3. Regulatory Clearance Requirements and current status of the same (furnish copies of all clearances):
    a. Is Environmental Clearance from the Department of Environment, Ministry of Environment and Forests, Government of Bangladesh? If so, under what category
    b. Does Project require any type of Forest clearance? If so provide the details including current status and relevant documents
    c. Status of No Objection Certificate (NOC) from the Department of Environment with supporting documents
    d. What is the project arrangement (like contract provisions, concession arrangements, etc.) for required construction stage environmental permits/clearance (e.g. quarries, borrow pits, tube wells for construction water, construction camps etc.). Provide the current status
4. Which of the World Bank Safeguard Policies are applicable for the project and how does the project comply with these arrangements (refer www.worldbank.org/safeguard)

C. Environmental Assessment and Environmental Management Plan (Provide all the documents**)**

1. Information on Detailed Environmental Assessment carried out for the proposed project:
    a. EA is whose responsibility under the project agreements? (concessioner or concessionaire)
    b. Information on analysis of project alternatives (e.g. alternative project sites, alternative road alignments, bypasses, etc.) including no project scenario.
    c. Details of public consultations conducted, at what stage, and how the public concerns are addressed.

d. If any of the “Sensitive Environmental Features” referred under B 2 are encountered in the project influence area, how the impact assessment has addressed related issues (provide substantial references in addressing the issues).

e. Are there any public protests about the project (provide all the details including any pending litigations, etc.).

f. Evidence of public disclosure of findings of EA, including EMP.

g. Provide EMP budget details.

2. Environmental Management Plan (EMP document, executed under the project agreements to be furnished):

   a. EMP measures proposed to be implemented during construction phase of the project – Provide specific reference to construction contracts, technical specifications, and bill of quantities (BOQ) items which includes EMP measures.

   b. What are the environmental enhancement measures proposed for implementation as part of the project implementation.

   c. What are the environmental management measures proposed during operational phase of the project (such measures should be provided with detailed account of measures to address operation phase impacts) – Detailed documentation shall be provided.

3. What is the EMP implementation, supervision, and monitoring mechanism:

   a. Detailed documentation on institutional structure to implement EMP, including staffing (specific to environmental management) and organizational capacity.

   b. What is the third party (independent supervision or lender’s engineer) arrangement for supervising implementation of EMP? (provide a details of staffing arrangements, including job responsibility details).

   c. What is the environmental monitoring and reporting arrangement made by RTIP-2 to report the progress of implementation of EMP to lenders?

   d. What is the grievance redress mechanism established to address local environmental impacts (such as impacts on community assets, environmental nuisance during construction phase, etc.)?

4. What is the arrangement for compensatory afforestation and provide the necessary documentation on the same.

6.0 INSTITUTIONAL ARRANGEMENT AND CAPACITY BUILDING

6.1 Introduction

The Environmental Management Framework (EMF) 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 EMF implementation by concerned officials of LGED, their consultant and working contractors. An organizational structure shall be developed at the corporate, regional and site level to aid effective implementation of the EMF document. The organizational of the LGED flowchart are shown in Figure 6.1

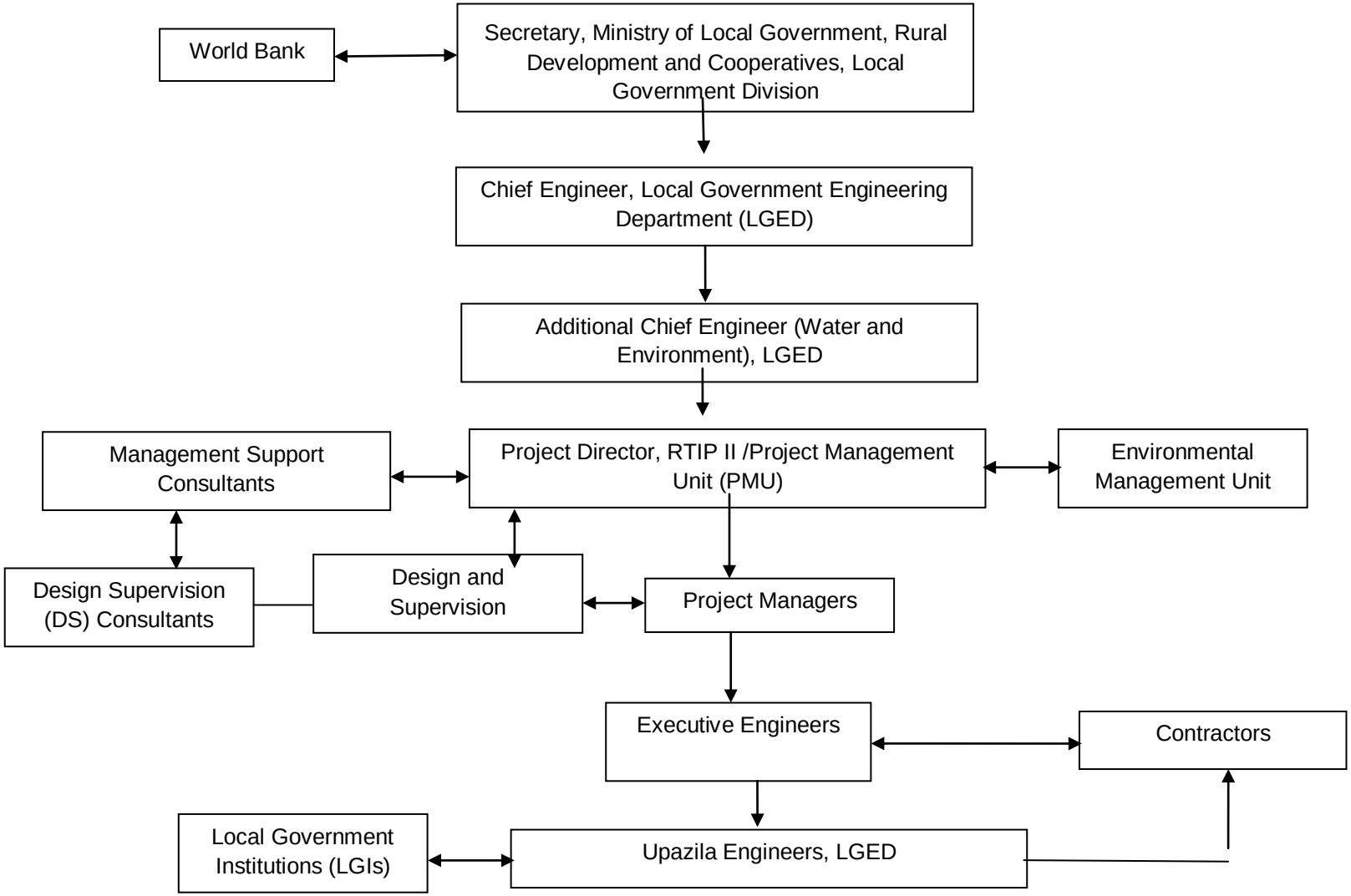

Figure : LGED Organizational Arrangement for Implementation of RTIP-2

6.2 EMU - Functions and Staffing Responsibilities

The EMU to be strengthened to implement and manage the EMF will be structured to provide co-ordination, technical support and services during the environmental screening and preparation of EA, and implementation of the environmental mitigation measures. Functions and the staffing responsibilities of EMU are listed in Table 6.1. In order to effectively manage the EA process and EMP implementation, the EMU will be established and made operational as soon as possible. The XEN (Environment) and the two Assistant Engineers (Environment) could be selected from the existing GoB cadre and provided extensive training and exposure during the project implementation period to be able to undertake the assigned responsibilities effectively.

Table 6.1: Functions and Responsibilities of the EMU

Designation	Function / Responsibilities
EMU	- Assist the PD in conducting environmental screening and categorization of the sub-projects; - Assist the PD in the preparation of Environmental Assessment; - Assist the PD in implementation of the EMF during the project implementation period; - Ensure integration of the EA and resulting EMP into the sub-project design and implementation plans (contract documents); - Ensure compliance of the mitigation measures by the Contractors; - Ensure incorporation of appropriate environmental specifications (on the basis of screening and ECP) into the respective bidding & contract documents; - Assist the LGED Engineers at site by providing appropriate environmental advice, and developing appropriate environmental mitigation measures for the sub-projects; - Documenting the experience in the implementation of the environmental process; - Assist MS/DS consultant's and LGED community organizer to carryout participatory consultation during planning, design and implementation of the sub-projects; - In collaboration with the Environmental Specialist or the MS and DS Consultants, prepare and conduct training programs for the LGED Engineers and Contractors by incorporating standard construction practices and sound environmental management of the sub-projects; and - prepare periodic progress reports on the implementation of the EMF for transmission to the World Bank throughout the project implementation period.
Executive Engineer (Environment)	- Assist the PD in the proper and timely implementation of EMF. - Assist the PD in screening and categorization process of sub-projects - preparation of EA and finalization of the same in close co-ordination with the MS and DS Consultants and the World Bank; - Ensure compliance of the respective ECP and EMP during sub-projects design and implementation including post construction; - Assist the PD in obtaining Environmental Clearances from the DOE; - Assist in development of training programme for the key stakeholders (LGED, contractors, public representatives and local government institutions/ NGOs, in collaboration with the Environmental Specialist; - Review and approve the Contractor's Implementation Plan for the environmental measures, as per the EMP; - Liase with the Contracts, MS and DS Consultants and the PPC the Implementation of the EMP; - Liase with the DOE on environmental and other regulatory matters; - Interact with the NGOs and Community based organizations to be involved in the

Designation	Function / Responsibilities
	project for EMP implementation; - Dialogue with the project affected persons (PAPs) and ensure that the environmental concerns and suggestions are incorporated and implemented in the project; - Undertaking environmental monitoring and reporting to the Project Director and follow-up activities; - Document the standard construction practices in the project on incorporation and integration of environmental issues into engineering design and on implementing measures in the road construction and maintenance programs; - Assist the PD to arrange for the Environmental Auditing and follow up action on the Audit recommendation. - Report to the PD on the environmental aspects pertaining to the project. - To guide and assist the PD and the LGED to strengthen the environmental management practices in rural infrastructure development projects base on the experiences gained in the implementation of the RTIP II.
Assistant Engineers (Environment)	- Assist the MS and DS Consultants in Environmental screening process - Assist the PMU in Environmental Assessments for the projects; - Assist PMU in obtaining of requisite Environmental Clearances for the project; - Assist the Executive Engineer (Environment) and the Environmental Specialist of the MS and DS consultants in preparation of the training materials and in conducting training; - Review the contractor's Implementation Plan for the environmental measures, as per the EMP with assistance from the Environmental Specialist of the MS and DS consultant; - Liase with the contractors and MS and DS Consultants on the implementation of the EMF and EMP; - Carry out consultations with the NGOs and Community groups to be involved in the project; - Establish dialogue with the affected communities and ensure that the environmental concerns and suggestions are incorporated and implemented in the project; - Carry out site inspections, check and undertake periodic environmental monitoring and initiate necessary follow-up actions; - Document the good practices in the project on incorporation and integration of environmental issues into engineering design; - Report to the Executive Engineer (Environment) / Project Director on the environmental aspects pertaining to the project; - Assist in the preparation of periodic reports for dissemination to the PMU, World Bank, etc.

6.3 Management Support (MS) Consultants

The MS Consultants are to be selected through International Competitive Bidding (ICB) and are expected to have in-house capacity to prepare EA, to advise on and to supervise the implementation of the EMF and the EMPs including making the decisions regarding environmental categorization of the sub-project, to assess the applicability of relevant ECP to the sub-projects, preparation of site specific environmental designs and modifications to the mitigation and enhancement measures, as necessary, during the sub-projects' implementation. For this purpose the MS Consultants will deploy a full time Environmental Engineer. The prime duty of the Environmental Engineer would be to:

- review the screening and categorization of the sub-projects;
- prepare the EA, as required by the EMF;

- assist the XEN & AE to supervise the implementation or the EMP by the contractors; and
- ensure that day to day construction activities are carried out in an environmentally sound and sustainable manner.

Management Consultant will review and clear all screening and environmental assessment reports. LGED will conduct verification of some screening.

The MS consultants will also review and update Environmental Supervision Manual incorporating the rural road improvements, rural road maintenance, rural waterways, growth center market improvement issues in the beginning of their contract to confirm the environmental supervision procedures and systems including inspection, monitoring and reporting mechanisms to be followed by each associated parties during the sub-project implementation. The manual will be continuously updated / modified throughout the implementation period so as to document the best operating / construction practices for future use by LGED as part of the agreed strategy or mainstreaming the environmental management process into all LGED works. The Environmental Specialist of the MS Consultants would primarily be responsible for providing technical assistance to the EMU, XEN, and Upazila Engineers.

The MS consultant shall assist LGED in quality control, monitoring, coordinating and implementation of EMF, supervising the measures necessary to mitigate the projects effects on the society and environment as outlined in the documents. The assistance will include review of social and environmental screening/assessment, plans and & budget and, where necessary, structuring and phasing implementation of the plans and identifying the specific agencies to be involved in the mitigation of social and environmental protection activities, particularly in cases where NGO participation needs to be arranged and coordinated.

6.4 Design and Supervision (DS) Consultants

The DS consultants will be based in the regional office and will be responsible for design and overall supervision of sub-project activities. The design consultants will ensure quality control and report to PD through the management consultant. The DS will also assist the EMU for ensuring environmental compliance and monitoring of progress including EMP and/or ECP implementation.

RTIP-2 will ensure that proper environmental screening will be done by the design consultant. Design consultant will ensure Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) of the all rural road sub-projects. LGED will conduct verification of some screening and assessment. LGED will ensure that proper environmental screening will be done by the design consultant.

The project will support two fulltime Junior Environment Specialist in Design and Supervision Consultancy. The specialists will prepare subproject specific environment screening/assessment report with EMP, supervise the implementation of EMP and support capacity building of the field level staff of LGED and contractor. A Senior Environment Specialist under the Management Support Consultancy will review the quality of the environmental screening/assessment with EMP. The project will implement an environmental monitoring program (i) to monitor the contractor's work during project implementation in order to check contractual compliance with specified mitigation measures, and subsequently (ii) to assess the actual environmental impacts of the project over the years following completion of the various project components. The Senior Environment Specialist will design the detailed monitoring plan of the project and prepare a routine monitoring report based on the monitoring results by LGED and the Junior Consultants. In addition, the environmental audit will be carried out before the mid-term evaluation and before project closing. The Bank would also supervise the environmental compliance as part of regular implementation support missions.

Job Descriptions for Senior Environment Specialist

The Senior Environmental Specialist, an Environmental Science/Environmental Engineering/Civil Engineering, preferably with the post-graduation specialization in environmental Science/engineering /relevant field, shall have at least 10 years of working experience related to preparation of EA, integration of environmental and social issues in the design, implementation and operation of rural infrastructure projects. Experience in construction and maintenance management of rural road projects, rural waterway improvement and road construction and Environmental management is preferred.

The specific roles and responsibilities of the Senior Environmental Specialist or the MS Consultant shall include, but not limited to the following:

- Supervise the implementation of the EMP by the Contractors;
- Monitor and review the screening and categorization process for each sub-project;
- Develop, organize and deliver environmental training programmes and workshops for the staff of the PMU, Contractors (of both up gradation and maintenance routes), Field Supervision Staff, LGED officials (responsible for the supervision of the Maintenance works) and the Quality Auditors;
- Review and approve site specific environmental enhancement/mitigation designs worked out by the Contractor Review and approve site specific environmental enhancement/mitigation designs worked out by the Contractor;
- Hold regular construction meetings with the Environmental management unit in the PMU;
- Review the Contractors Environmental Implementation Plans to ensure compliance with the Environmental Management Plan (EMP Review the Contractors Environmental Implementation Plans to ensure compliance with the Environmental Management Plan (EMP);
- Develop good practice construction guidelines to assist the contractors in implementing the EMP;
- Monitor tree plantation programmes and the periodic environmental monitoring programmes to ensure compliance with the EMP & GOB requirements;
- Prepare and submit regular environmental monitoring and implementation progress reports;
- Assist Environmental Management Unit to prepare good practice dissemination notes based on the experience gained from site supervision;
- Develop and detail out an implementation plan for the Environmental Provision as envisaged in the EMP, and get it approved by the EMU / PMU;
- Continuously interact with the Environmental Engineers/Environmental specialist of the EMU of the PMU regarding the implementation of the environmental provisions;
- Identify suitable locations for sitting of labour camps, construction waste disposal locations, construction and vehicle parking/maintenance sites and obtain the approval of the Environmental Specialist of the MS/DS Consultant of the same;
- Ensure that the brickkilns from where the Contractors procure the bricks are licensed ones and do not use firewood as fuel;
- Ensure the implementation of the various mitigation measures proposed for the protection of bio diversity etc, prior to the commencement of construction activities at that particular sub-section of the project road;
- Ensure that proper environmental safeguards are being maintained at all ancillary sites such as brick fields, borrow areas, brick crushing area, materials storage yards, worker's camps etc. from which the contractor procures material for construction;
- Supervise the proper construction and maintenance of the facilities for the labour camps, including the provisions for the safety and health of workers and their families;
- Ensure that proper facilities are available for the monitoring of water quality and vehicular emissions as provided for in the environmental monitoring plan during the construction period;
- Assist Upazila Engineers in carrying out the measurement of quantities for environmental management activities, prepare the site-specific designs and bills of quantities for the works for environmental enhancement.

6.5 Individual Consultant

Only for the first year subprojects, an individual consultant will carry out the environmental screening. An individual consultant will prepare 2 separate screening, IEE and EIA report for the waterways. LGED will ensure that Initial Environmental Examination (IEE) report will be prepared by the design consultant and site clearance will get from DOE. Management Consultant will review and clear the IEE and EIA reports before sending to DOE.

6.6 Contractor

The Contractor will be responsible for implementation of all environmental related activities under the project. In addition, the contractor shall be responsible for familiarizing themselves with “Chance Finds Procedures” in the IEE/EIA’s Report Chapter 8: Environmental Management & Mitigation Plan incase

culturally valuable materials are uncovered during excavation or any project activities. Chance-Find Procedures for Physical Cultural Property

The Contractor will be responsible for familiarizing themselves with the following "Chance Finds Procedures" in case culturally valuable materials are uncovered during excavation or any project activities, including:

- Stop work immediately following the discovery of any materials with possible archeological, historical, paleontological, or other cultural value, announce findings to project manager and notify relevant authorities;
- Protect artifacts as well as possible using plastic covers, and implement measures to stabilize the area, if necessary, to properly protect artifacts;
- Prevent and penalize any unauthorized access to the artifacts; and
- Restart construction works only upon the authorization of the relevant authorities.

6.7 Monitoring

The success of the project authorities may be attributed to vigorous and continuous monitoring of all its activities including environment and social issues. The is a dedicated department for monitoring entire project activities and reporting to the project director (PD). Regular monitoring of activities is carried out by district/upazila offices and supervision consultants at site and is being reviewed by the EMU on monthly basis. The EMU and Directors also take regular review of ongoing project activities including environment and social issues and corrective measures if required are implemented at site. For environmental and social components of a project, environmental and social monitoring plan is developed, based on baseline data and impacts predicted during the environmental and social assessment process. The concerned forest department staffs, as part of their duties monitor impacts on ecological resources through which the transport line traverses. The project authority appoints concerned officials for timely implementation various activities such as compensatory afforestation, ROW maintenance, prevention of fire hazards, natural regeneration of vegetation etc. The environmental and social monitoring plan for each project will be integrated with construction, operation and maintenance and shall be monitored by the EMU on a monthly basis in association with the LGED monitoring group. The higher management is apprised through a monthly report.

6.8 Capacity Building

Since the effectiveness of the Environmental Assessment & implementation depends considerably on the understanding and preparedness of their Engineers and in particular their Environmental Team (Consisting of LGED Environmental specialist,). It is important that the project authority makes effort to sensitize the Engineers and Environmental Team on management of environmental issues, provides guidance, and encourages them to build requisite capacities. Capacity building can be achieved by two prong strategy.

- Training programme for existing staff.
- Technical Assistance: knowledge sharing with consultants, having requisite expertise.

6.9 Institutional Development

The component b i.e., **Institutional Strengthening, Capacity Building and Governance Enhancement Component** will support implementation of the LGED action plan for strategic enhancements in the areas of capacity, effectiveness, governance and accountability, including via operationalization of a comprehensive IT-ICT supported Integrated Decision Support System (IDSS). The project will provide funding for essential technical assistance (TA), consulting services, advanced staff training and 'exposure' activities (in Bangladesh and elsewhere), necessary software (IP) and advanced equipment procurement. The main areas to be covered under this support will be:

- Maintenance Policy & Operations
- Quality Assurance & Management (including ISO Certification program)
- Financial Management & Planning
- Environmental & Social (Impact) Management

- Performance Management including Monitoring & Evaluation
- IT-ICT-MIS Facilities & Capacity (including IDSS implementation), and
- Strategic Coordination & Development.

Under the environmental and social management, a TA consultancy service will be provided to review and update of the LGED guidelines on E&SM to take up Environment Management System requirements and process. Under another TA consultancy services, technical (EMS) training and capacity building expertise for roll out of EMS requirements in LGED units and via Workshops for contractors, consultants and other external stakeholders will be undertaken. In addition, the project will support piloting full EMS process in other LGED project.

In addition, the component c (Safety component) will contribute the safe transportation in the rural roads.

6.10 Training Programme

6.10.1 Purpose of Training

All the issues discussed in previous chapters, will at some stage require a certain element of training in the process of developing capacity within the organization. A number of the identified issues will be new to the existing environmental team and their staff members. It is therefore vital that a major programme of training is developed and implemented by the project authority. Before commencing any training, there are a number of activities which needs to be completed. The first step is to ensure that all procedures in the environmental management system have been properly worked out. As part of this process, there is a need to closely evaluate the existing organizations both at central and local level in relation to their suitability and current capacity to take on the new responsibilities. This exercise needs to clearly identify the performance requirements of the various officials involved. Duties and responsibilities need to be clearly defined for the institutions as a whole and individually for each category of staff. It is only on this basis that the new staff performance requirements can be established, and the training required for existing and new staff can be determined. When developing a training programme of this nature, it is important to acknowledge that this is not a one-time event. It is rather the start of a long term training service which not only strengthens capacity, but also contributes to sustain this capacity within the organization.

6.10.2 Training Strategy

A key concept in training programs for any organization is to provide training through a combination of formal classroom training and practical on-the job sessions. Technical assistance should be made available to provide training, guidance and advisory support in all aspects of works implementation in order that the key players (environmental as well as technical team) become fully conversant with, and capable of carrying out their respective duties. Training for the various categories of staff needs to be carried out with varying durations and through different approaches, such as on-site and classroom training, workshops, seminars and practical on-the-job training.

6.10.3 Concept of Training

Training is always an effective up-front quality assurance measure. Experience shows that there is a great demand for training in technical subjects for the government staff in charge of work supervision. Effective training programs involve both the introduction of new technology as well as in-depth studies of the particular skills required in each position in the works organization. As the training content for these reasons relate to practical hands-on skills, the training often consists of dissemination of best practices and work methods which have been proved most effective in projects with similar tasks and working conditions i.e. neighboring districts, projects, etc.).

6.10.4 Training Methods

The most effective way of addressing such training needs is by carrying out the training in an environment which to the extent possible resembles the real situation in which the trainees will eventually operate.

6.10.4.1 Classroom Sessions

Although training needs to focus on practical skills, which are best, taught in the field, there is always a demand for a certain theoretical foundation on which the practical skills are placed. For example,

experience shows that it is useful to review basic methodology and regulations, which in turn is explained in the context of environmental management system in civil works. Also for technical subjects such as impact categorization, selection of mitigation measures, EMP as part of bidding document and others, there is a demand for an introduction to the subjects in a class-room environment, during which (i) the theory is reviewed, and (ii) a general briefing of the field exercises is conducted, before the field sessions commence.

After the initial classroom training and skills development sessions, further practical training should be carried out in a full-scale demonstration situation. This includes establishing training/demonstration sites fully equipped with the same type of tools and equipment that contractors will be using.

6.10.4.2 On-the-job Training

It has been proved that on-the-job training is the most effective method of training most categories of government staff. This involves the extensive use of practical demonstrations and skill training at full-scale training sites. This approach is very effective for the training of managers, engineers and supervisors with the on-site training being supported by classroom components tailored for the various categories of staff.

6.10.4.3 Workshops

Intensive refresher courses for periods of one to three days are useful for addressing specific problem areas. Such workshops are organized to supplement on-the-job training for some of the technical and administrative staff. Short workshop can either be arranged through the provision of technical assistance, an in-house training facility, or by contracting other training institutions within the country.

6.10.4.4 Seminars

Seminars are useful as a means for disseminating data and information, in particular for senior government officials at central and local level, as well as representatives of other government agencies. Seminars can be an effective platform for policy makers, planners and administrators to review the importance of an Environmental Management System. Equally important, this type of seminar is important in terms of creating awareness of the potential of utilizing new organizational arrangements, work methods, and involvement of the private sector, beyond the boundaries of a particular program.

6.10.4.5 Training Module

A comprehensive training program should be planned for the project by the Project Implementation Unit (PIU) intended to address all components of the project. Developing a comprehensive idea about the Environmental requirements, PIU will fix the role/responsibility to effectively manage the environment components involved. As discussed earlier PIU may or may not take the services of external agency. In general the training program is proposed by the planning consultant, during the design stage of project.

The program should be intended for all Contractors, Construction Supervision Consultants and the project staff. As and when found necessary PIU in consultation with EMU will select appropriate modules for the training of contractors and for the training of engineers responsible for supervision and maintenance work. List of appropriate training modules and their time frames is discussed in subsequent paragraphs

The training components may be broadly divided into the following categories:

- Principles and policies for (natural and social) environmental mitigation in development projects;
- Legal and institutional aspects; project mandates;
- Probable (natural and social) environmental impacts and losses in road strengthening and widening; and waterways projects;
- The EMP consisting of
  - The construction stage environmental concerns;
  - The environmental designs and implementation plans;
  - The project entitlement framework;
  - Types and aspects of vulnerability of the EPs;
  - Counseling and grievance redress methods and mechanisms and

- Financial control mechanisms;

- Monitoring, evaluation and reporting methods and mechanisms and,
- Inter-sectoral and inter-agency collaboration, etc.

6.11 Estimated Budget

6.11.1 Budget for Reviewing and Updating of LGED EA Guidelines & Manuals, 2008

Estimated budget for reviewing and updating of LGED EA Guidelines & Manuals, 2008 is Tk 2000,000 (Two million taka only).

6.11.2 Budget of EIA Study for Waterways

Estimated budget for the EIA study of waterways is Tk 2000,000 (Two million taka only).

6.11.3 Budget for Environmental Training Programme

Estimated budget for the RTIP-2 environmental training is Tk. 800,000 (Eight Lac taka only)

6.11.4 Budget for Sample Sub Projects

Summary environmental mitigation cost for a sample of Subproject of each project component is given below (Table 6.2) and details have been incorporated in **Annex 3**.

Table 6.2: Environmental Mitigation Cost for a Sample of Subproject

Sample Subprojects	Amount (USD)
Hatubhanga – Kaliakoir - Fulbaria Road via Khatar Hat Road Improvement	118,200
Mowchak – Fullbari Road Maintenance	10,000
Mirzapur- Kaliakoir Rural Waterways	26,120
Fulbaria Growth Centre Markets	10,000

6.11.5 Costing for Institutional Development

The estimated funding allocation on Institutional development and Governance Components is given below Table 6.3.

Table 6.3: Costing for Institutional Development

Form of Technical Assistance (TA), Consulting Services, Goods / Materials &/or Funding Support	Assistance Period	Estimated Cost (US$)	Estimated Cost (B-TK)*
Environmental & Social (Impact) Management			
TA / Consultancy Services: review / updating of LGED guidelines on E&SM to take up Environment Management System requirements and processes	9 months	0.06 M	Tk 4.5 M
TA / Consultancy Services: technical (EMS) training and capacity building expertise for roll-out of EMS requirements in LGED units and via Workshops for contractors, consultants and other external stakeholders	8 months	0.05 M	Tk 3.75 M
TA / Consultancy Services: facilitation on selected LGED 'pilot' project(s) of full EMS processes	12 months	0.15 M	Tk 11.25 M

7.0 STAKEHOLDER CONSULTATIONS

7.1 Introduction

Participatory consultation is both an essential criteria and important strategy for an integrated environmental and social analysis process, the project design and its implementation. Views of the project affected persons and NGOs have been fully taken into account during the project preparation and continue to form as a basis for further design and implementation of the sub-project throughout the implementation period of the RTIP-2. The purpose of the stakeholder consultation is to identify the views of major institutional and project affected persons (PAPs) stakeholders to the roads and waterways being examined, and to identify issues of relevance to the study, as well as any impacts which the alignment may have on project planned by the stakeholders, and to assess any mitigation measures which may be undertaken to minimize any adverse impacts of the proposals under consideration. Subsequently, stakeholder consultation is one of the important parts of the environmental assessment to address the environmental aspects as well as socio-economic issues from stakeholders' point of view. Project consultants were carried out a series of stakeholder consultations at different locations of the sub-project.

The EMF preparation includes 2 initial field level consultations in addition to follow-up consultations. One of the consultations was held at Mymensingh Sadar Upazilla, which was attended by was attended by about 30 community representatives including journalists, civil society organizations, contractors, truck drivers, bus drivers, members of transport workers associations, and local government institutions including one upazila chairman. The participants were overwhelmed to understand that the meeting was to consult them for designing the RTIP-2. The other consultation was held at Hatkhalir Bazar, Fulbaria Upazila of Mymensingh district and attended by around 60 persons from in and around the bazaar. The Fulbaria Upazila Engineer organized the meeting and the local Upazila Chairman facilitated. An Upazila Road has been nominated for the first year construction under RTIP-2. Only about 100-m of the road will need earth work and it has sufficient land for improvement. The local people including the elected representatives are yelling for long to get their road improved. They assured that if any additional strip of land is required for the improvement work, they are ready to organize by themselves. The participants in both consultations were happy to understand that social and environmental impacts will be addressed under the project to maximize project benefits. They did not foresee any major environmental issues from the project activities. In addition, the LGED field level staffs were consulted for effective environmental management considering the RTIP experience.

In addition, 6 meetings were held on end November 2011 on the sample project site. Total 50 participants from different locations have taken part in the consultations. The schedules, venues and the major feedbacks or queries from the participants for (i) rural road improvements; (ii) rural road maintenance; (iii) rural waterways; and iv) growth center market are summarized in **Annex 4.**

The environmental management of the proposed RTIP-2 was also discussed at a national consultation meeting on the project was held on October 10, 2011 and another consultation workshop involving the affected people, NGOs and relevant stakeholder is planned in mid-January 2012 to present the EMF and SMF and to receive their feedback.

Consultation Meeting Held on October 10, 2011

7.2 Consultation and Information Disclosure

7.2.1 Public Consultation

A critical element in planning a participation and consultation program is associated with the selection of participation techniques to meet desired objectives. Considering the importance of effective participation and consultation in a wide spread project area along with the time and resource constraints in the present project, the following participation techniques were followed:

- Information dissemination and information sharing techniques will be used to inform the stakeholders regarding the action being taken in a program area through personal communication to make them aware about the project as well as to incorporate users input at different stages of the project.
- Information gathering techniques to gather quantitative and qualitative information about the individual schemes through questionnaires survey.
- Focused Group Discussions (FGDs) will be conducted covering different components of the project aims to increase local awareness about the forthcoming project as well as to incorporate their views, needs, priorities considering different positive and negative impact of the project.
- Key Informant surveys will be carried out among the knowledgeable and elderly people of the project area to incorporate their views and suggestions from their long experiences and knowledge.
- Hot Spot Consultation will be conducted in problematic locations of the schemes with participation of knowledgeable and affected people, local elite, public representatives, officials and NGO people to mitigate adverse impact considering their views suggestions from their practical experiences as per local needs and demands.
- Participatory workshops will be organized with the participation of different types of representative stakeholders.
- Public disclosure of the Draft EA Reports (including a non-technical summary) will be disclosed at the project districts, Project Headquarters and the World Bank.

7.2.2 Modes of Future Consultations

A range of formal and informal consultative methods will be carried out for all subprojects including, but not limited to: focus group discussions, public meetings, community discussions, and in depth and key informant interviews; in addition to the censuses and socio-economic surveys. Consultations will be held with special emphasis on vulnerable groups. Encouraging public participation in consultations informs the public and serves as a venue for the public to express their opinion on priorities which the Project should address.

The key stakeholders to be consulted during sub-project preparation and program implementation includes:

- all project affected persons (PAPs), including vulnerable households;
- project beneficiaries;
- host populations in resettlement sites (if any);
- political party representatives, community leaders, and representatives of community based organizations;
- local NGOs;
- Officials of municipalities and relevant government agency representatives.

Consultations with PAPs during project preparation will ensure that views of PAPs on compensation and resettlement assistance measures are fully incorporated while consultations conducted during resettlement plan (RP) implementation will identify necessary assistance required by APs during rehabilitation. Continuing involvement of those affected by sub-projects is necessary in the resettlement process. The municipality with support and guidance from the PMU consultants will ensure that PAPs and other stakeholders are informed and consulted about the sub-project, its impact, their entitlements and options, and allowed to participate actively in the development of the sub-project. This will be done particularly in the case of vulnerable PAPs, who will be encouraged to choose options that entail the lowest risk. This exercise will be conducted throughout the sub-project-during preparation, implementation, and monitoring of sub-project results and impacts.

Under the harmonized safeguard policy, two public consultations will be required for the Project as part of the environmental assessment procedure. LGED guided the EMU in preparing the program of public meetings, presentations about the Project and drafting the comments sheet in English and Bengali. Information on the public consultation meetings will be published in national and regional newspapers 10 days prior to the consultations. Announcements on the commencement of the Environmental Assessment in the newspaper, the availability of the Background Information Document, the venue and the schedule of consultations and public opinion feedback processes will be published in the national newspapers.

7.2.3 Plan for Continued Participatory Consultation

While the same process as was followed during the project preparation will also be followed during further selection, planning and design of the sub-project, the Figure 7.1 shows the consultation process to be followed during the implementation stage.

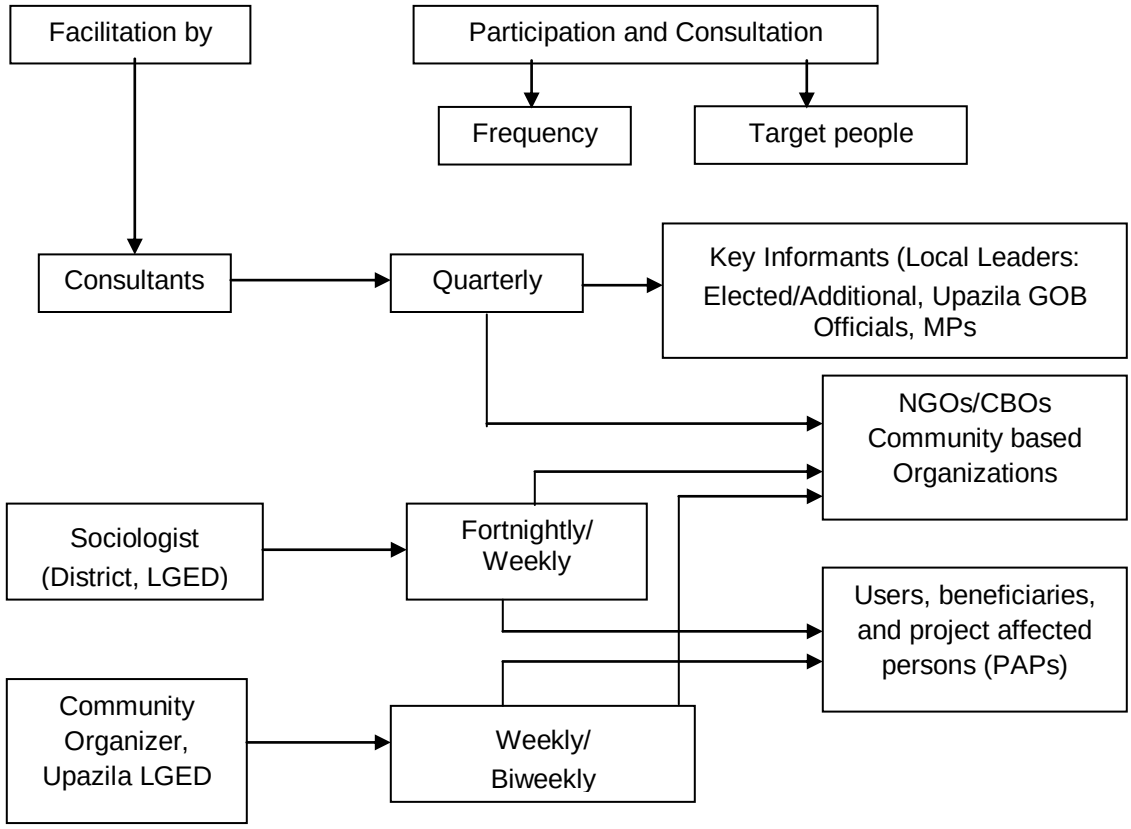

Figure 7.1: Flow Chart for Participatory Consultation during Project Implementation

7.2.4 Information Disclosure and Dissemination

The Environmental Assessment, documenting the mitigation measures and consultation process, will be made available for public review in both English and Bengali. The summary EA will be published on the LGED and WB websites, and the full environmental report will be available upon request from the WB and will be accessible in LGED website. The relevant information prior to these consultations in a timely manner and in a form that is meaningful for, and accessible to, the groups being consulted, has been disseminated. The framework for the information disclosure that has been adopted for the project is shown in Table 7.1. The Table also includes the framework for further information dissemination during the future design and implementation of the sub-projects.

Table 7.1: Information Disclosure Framework

Stage of Consultation	Information dissemination tools
Initial Consultation	Documentation of a summary of the project description and objectives, and potential adverse effects of the proposed project.
Draft Environmental Reports	A non-technical summary of the findings comprising of conclusions of the environmental analysis in the local language (Bangla) as well as the draft Environmental Reports have been made available at places freely accessible to affected groups and local NGOs for their review and comment. The venue for this information dissemination has been District and Project headquarters levels. These have also been posted on the Project web-site
Environmental Screening and Assessment of sub-projects under RTIP-2	The Executive Summary of the EMF and potential impacts of individual subprojects.

7.3 The Information and Consultation Framework

It is intended to layout the way in which information will be provided to the project implementers and beneficiaries and also how consultations will be held during project implementation. Its purpose is to ensure social and environmental issues are effectively addressed by the project and subprojects through a transparent and participatory manner (Table 7.2).

Table 7.2 Information and Consultation Framework

Stages of a subproject	Consultation and Information steps
Pre-project planning stage	STEP 1: Proposal and Feasibility (Information Role) Once a project is identified the RTIP-2 should undertake a feasibility study determining the feasibility of the project in view of the adverse social impacts it may pose. This study is an important source of information to the executing and implementing agencies and also to the community for whom the project has been proposed. The feasibility study should address the following: ▪ Are the proposed goals of the sub-project valid ▪ Who is the public for whose benefit the sub project is being introduced ▪ How is the sub-project going to serve them and is it in their interests ▪ The alternatives to the sub-project and whether the alternatives are cost affective ▪ Will there be any adverse social impacts due to the implementation of the sub-project ▪ What would be the implementation strategy of the sub-project etc. ▪ The information will be provided to stakeholders through both print and electronic media.
	STEP Initial Public Consultation (Consultation Role) The findings of the project feasibility, its benefits and impacts need to be discussed with the community for whom the project is proposed. This would help the implementing agency in taking the opinion of people, make them understand the pros and cons of the project, alternatives examined and the project finalized.
Planning and grounding	STEP Environmental Review, Assessment (Information and

Stages of a subproject	Consultation and Information steps
stage	Consultation Roles) In this stage it is important to ensure that there are no adverse environmental impacts of the project. The project may be passed if it has no impacts and implementation can be initiated, Category A type projects are not entitled for support. However, if the project triggers any environmental impacts then such requirements shall be meet. Such requirements and study objectives, methodologies shall be discussed with stakeholders. This environmental studies/assessment shall be carried along with project feasibility study and completed prior detailed project report (DPR). The environmental findings shall be part of DPR. All the EAs shall be completed and included as integral to DPR.
	STEP Detailed Project Report (Information Role) Initial consultations, feasibility and EAs on the project will pave the way for the preparation of the DPR. The DPR should constitute information on various components for successful project implementation. The DPR will constitute: ▪ A final design of the proposed project after examining the various alternatives to reduce the environmental impact on the people ▪ EA report ▪ The cost of the project construction ▪ The time frame the completion of the project ▪ The institutional arrangements for implementing the project ▪ Plans and proposals covering R&R issues ▪ Design to ensure community participation in the sub-project (Beneficiaries, PAPs, NGOs, community organizations) ▪ Plan for external help wherever needed (Experts, Advisors, Consultants) ▪ Grievance redress mechanisms.
	STEP Preparing for project implementation and sharing information (Information and Consultation Role) Once all the documents like prepared list of PAPS affected, the type of entitlements, plans for reconstruction of public utility infrastructures, details of land acquisition etc., steps have to be taken to disseminate the information among the PAPs and prepare agencies for project implementation. Following tasks will be carried out in this step: ▪ Announcement of the project ▪ Displaying the layout of the project affected area ▪ Disclosure of EMF ▪ Consultations with the affected people and public hearing ▪ Involving NGOs/community in EMF implementation.
Implementation stage	STEP Addressing issues that arise during implementation (Consultation Role) In this stage there may be many issues that the project-implementing agency may face during the implementation of the project such as: ▪ Ensuring EMF compliance during implementation ▪ Problems pertaining to compensations & allowances ▪ Unexpected reactions from the PAPs with regard to the entitlements ▪ Conflicts between the displaced community and the host community etc. To overcome these problems the RTIP-2 would adopt a consensual

Stages of a subproject	Consultation and Information steps
	approach and address the grievances and queries of the people affected.
Monitoring and evaluation stage	STEP Monitoring Process through participation (Information and consultation Roles) The process of participatory monitoring and evaluation (M&E) is the logical extension of the activities. Beneficiary committees can be formed for monitoring and supervision of the project works. The process should also ensure that the project benefits have properly reached the affected people and the execution of the project sticks its original designs so that social compliance is achieved. Following tasks are essential in this stages: ▪ Ensuring the implementation of the EMF and timely delivery of entitlements (Consultation Role) - Ensuring that the EMF is implemented according to a designed plan ▪ Reporting (Information Role) - Reporting is an important aspect of the M&E process. Periodical reporting is important to generate information on the progress of the work undertaken. The status of the implementation of the EMF and progress has to be documented

7.4 Grievances Redress Mechanism

It is expected that through a participatory process, acceptance of the sub-projects and grievances can be minimized. However, it is necessary to establish an effective grievance redress mechanism to address complaints/grievances related to social issues that may arise. Any grievances and objections retarding the social aspects of the project will be referred to the project Grievances Redress Committee (GRC). The project GRC will be formed at central and district levels. The committee of the GRC at national level will have several members and connection with local authorities under headed by a chairperson.

The affected persons can register their grievances at the complaint cell established at central level and district level. All cases will be registered, categorized and prioritized by the district level authority and by the Environmental Specialist at central level. The GRCs will meet periodically to discuss the merit of each case and fix a date for hearing and notify the PAP to submit necessary documents in proof of her/his claim/case; resolve grievances within 4 weeks of receipt of complaint.

ANNEX 1: LIST OF ROAD TO BE MAINTAINED UNDER SECOND RURAL TRANSPORT IMPROVEMENT PROJECT (RTIP-II) 1ST YEAR

SL No	DISTRICT	UPAZILA	ROAD CODE	ROAD NAME	TOTAL LENGTH (Km)	REMARKS
1	PABNA	SANTHIA	176722002	Santhia Upazila H/Q - Bonogram GC road.	11.95	
		ISHWARDI	176393002	Sahapur UP - Charkurulia hat(End of Al - Haj more) road.	5.60	
		CHATMOHAR	176223003	Mulgram U.P. - Failzana U.P. road.	12.2	
		BERA	176162001	Bera Upazila H/Q - Nakalia GCM road	5.18	
		PABNA-S	176552008	Upazila H.Q. - Bauikula RHD Via Pustigacha Road	8.50	
		SUJANAGAR	176833005	Manikhat UP Office at Raipur-Manikhat Hat via Daspara Bicramaditta road	5.50	
				Sub-Total :	**48.93**	
2	SERAJGANJ	KAZIPUR	188502001	Simanta bazar RHD-Sonamukhi GC.	12.05	
		TARASH	188892003	Tarash-Katagari hat GCC Rd.	11.90	
		RAIGANJ	188613007	Dubil UP to Amsara Hat Via Maltinagar	7.00	
		BELKUCHI	188112002	Mukundagati (Sohagpur GC/Upazila H/Q)-Daulatpur GC	7.20	
				Sub-Total :	**26.10**	
3	DHAKA	DOHAR	326182001	Kartikpur RHW-Barrah Hat GC Road	5.85	
		KERANIGANJ	326382001	Kalatia-Baluartack Bishaw Road via Ramerkanda, Ruhitpur Sonakanda.	14.00	
		KERANIGANJ	326382002	Hasnabad Power Station-Mollarhat Road via Bibir Bazar,Mawa,Paina Bazar, purbadi Ghoshbar.,,	12.00	
		SAVAR	326722009	Yearpur UP (Zirabo Bazar)-Kashimpur Rd. via Tajpur Road	6.20	
		NAWABGANJ	326622014	Paragram hat GC (Mashail)-Tulshikhali ferryghat (RHD) road.	6.38	
		NAWABGANJ	326623027	Shikaripara U.P office-Jamsha Bazar via Bishompur road.	6.20	
		TEJGAON CIRCLE	326733014	Matuyal Mirdha Bari Bamoil-Shiddirgonj-Rosulbagh via Golakata Bridge road.	7.00	
		TEJGAON CIRCLE	326733014	Dhokkinkhan UP-Haji Camp Bazar via Taltola Road & Anawara degree College-Askona	4.25	

SL No	DISTRICT	UPAZILA	ROAD CODE	ROAD NAME	TOTAL LENGTH (Km)	REMARKS
				Bzazar Main road.		
				Sub-Total :	**61.88**	
4	MANIKGANJ	SHIVALAYA	356783001	Teota UP Office-Jhafargonj GC (Poila) Road.	5.60	
		MANIKGANJ-S	356463016	Dhaka-Aricha NHW at Kaliani-Garpara U.P via Doutia Bazar	6.53	
		SATURIA	356703001	Dhankora UP Office-Dhulla via Khonirtek bazar road.	5.00	
		HARIRAMPUR	356282001	Jhitka G.C-Machain G.C. road.,,	9.00	
				Sub-Total :	**26.13**	
5	MUNSHIGANJ	TONGIBARI	359943001	Tongibari-Hashail Road.	8.06	
		MUNSHIGANJ-S	359563005	Makahati-Chardumuria.	3.45	
		LAUHAJONG	359442003	Kolma GC-Baligaon R&H road. (Louhajong Portion.3.88Km)	3.88	
		SREENAGAR	359842001	Sreenagar-Tantar GC-Noapara GC road.	8.60	
				Sub-Total :	**23.99**	
6	GAZIPUR	GAZIPUR-S	333302004	Hotapara-Perojali Hatkhola bazar Road.	6.70	
		KALIGANJ	333342002	Kaliganj-Kapasia Rd.	16.01	
		KAPASIA	333362008	Giaspur GC-Rayed GC Rd.,,	11.82	
		KALIAKOIR	333322001	Kaliakoir-Fulbaria Rd	4.27	
				Sub-Total :	**38.80**	
7	NARAYANGANJ	RUPGANJ	367682004	Kanchan GC-Atlapur bazar-Danga RHD Road.	10.28	
		RUPGANJ	367682001	Porshi G.C.-Rupganj-Kayetpara-Demra RHD Road.	18.00	
		NARAYANGANJ-S	367583004	Kutubpur UP Office (Tatkhana) to Dhaka-Narayangonj link Road via Bhuighar bus stand bazar.	4.00	
		SONARGAON	367043009	Sanmandi UP Office-Kikertek bazar Road via Darikandi,Sonakhali, Pachpir Darga.	8.60	
				Sub-Total :	**40.88**	
8	NARSHINGDI	SHIBPUR	368763001	Putia UP - Noadia Bazar.	4.10	
		PALASH	368632007	Charnagardi GC-Ghorashal GC	7.90	
		RAIPURA	368642001	Sreerampur Rail gate R&H-Monipura Gc	16.41	
				Sub-Total :	**28.41**	
9	TANGAIL	BASAIL	393092006	Basail-Shakhipur (Nalua) Road.	6.08	

SL No	DISTRICT	UPAZILA	ROAD CODE	ROAD NAME	TOTAL LENGTH (Km)	REMARKS
		KALIHATI	393472011	Suruz G.C.-Dhalapara G.C. Road	17.10	
		DHANBARI	393962001	Dhanbari-Kendua Rd	7.80	
		GOPALPUR	393382001	Gopalpur-Nalin Hat	9.58	
		BHUAPUR	393192003	Tepibari R&H-Gopalpur via Falda Bazar Road[Bhuapur portion]	5.45	
		BHUAPUR	393193003	Falda UP Office-Sanukbayra Bazar Road.	4.74	
		NAGARPUR	393762006	Nagarpur HQ-Louhati GC Via Khamardhalla Road	4.96	
				Sub-Total :	**55.71**	
10	**SHERPUR**	**JHENAIGATI**	389372001	Jhenaigati-Gobindaganj.	10.57	
		SHERPUR-S	389882003	Sherpur-Chandrakona Road	10.70	
		SREEBORDI	389902002	Sreebordi-Karnajhora GC	14.50	
				Sub-Total :	**35.77**	
11	**NETROKONA**	**ATPARA**	372042007	Teligati G.C.-Modan HQ. road via Dewsree Road. (Atpara part)	10.66	
		MADAN	372562001	Madan-Fatepur (Hatshira) GC Road	13.31	
		KENDUA	372472001	Kendua-Chirang Bazar	5.39	
				Sub-Total :	**29.36**	
12	**MYMENSINGH**	**PHULPUR**	361812006	Bhaitkandi R&H. Road-Narayankhula G.C. Bhaitkandi G.C.	5.85	
		BHALUKA	361132007	Dhaka-Mym. H/Way (Seed Store GC)-Shakhipur	9.00	
		GOURIPUR	361232001	Ramgopalpur RHD to Shyamgonj GC via Gouripur.	8.00	
		FULBARIA	361202003	Fulbaria-Hat kalirbajar Road.	9.30	
		DHOBAURA	361162002	Dhobaura Upazila H/Q-Goatola Gc Rd	10.03	
		TRISHAL	361942001	Bailor-Fulbaria Road.	5.10	
		HALUAGHAT	361242002	Pabiajuri Bailly Bridge (Nalitabari)-Dara Road(Mymensingh part).,,	9.80	
				Sub-Total :	**57.08**	
13	**JAMALPUR**	**SARISHABARI**	339853015	Doail U/P-Shaincherpar Road	6.55	
		JAMALPUR-S	339363002	Rashidpur U. P to Jamtala bazar.	6.70	
		MADARGANJ	339582001	Madergonj-Melandah (J-7) Rd.(Madergonj Part)	7.78	
		DEWANGANJ	339152001	Dewanganj-Sanandabari viaTaratia Rd.	21.60	

SL No	DISTRICT	UPAZILA	ROAD CODE	ROAD NAME	TOTAL LENGTH (Km)	REMARKS
		MELENDAH	339612007	Melandah GC - Gobindagonj(Bazar) RHD Road.	4.27	
		ISLAMPUR	339293006	Patharshi UP-Molomgonj Bazar Rd.	4.50	
				Sub-Total :	**51.40**	
14	**KISHOREGANJ**	**KISHOREGANJ-S**	348492002	Kishorgonj-Latibpur-Kapasatia GC Road.	6.24	
		KARIMGANJ	348422001	Karimganj-Gundhar GC Road	10.00	
		BAJITPUR	348062003	Bajitpur-Kuliarchar Road (Bajitpur part).	4.12	
		KATIADI	348453003	Katiadi-Gachihata Hat.	10.16	
		KULIARCHAR	348542005	Dariakandi R&H-Belabo GC.	9.45	
				Sub-Total :	**39.97**	
15	**COMILLA**	**LAKSHAM**	419722003	Laksam-Monohargonj	6.40	
		BRAHMANPARA	419152004	Comilla-Fakir bazar-Salda Nodi road	6.59	
		CHANDINA	419273024	Chandina-Rammohan Road via Edthbarpur	6.00	
		COMILLA-S	419673009	Nandirbazar-Panchthubi U.P.Office - Subornopurbazar-Golabari bazar road	7.00	
		NANGALKOT	419873021	Madra Bazar Mokora Sarkar bazar Naradia Kakapoith Rd	7.40	
		COMILLA-S DAKSIN	419913002	Narpati - Sharifpur road.	7.40	
		DAUDKANDI	419362003	Barkota G.C.-Nayergaon bazar via Pitambardi bazar Road at Ch. 00.00-8750m.	8.75	
		BURICHONG	419182007	Kabila Bazar GC - Debpur Bazar RHW Road.	6.00	
		BURICHONG	419183001	Burichang UP Office - Rajapur UP office Road.	6.20	
		BURICHONG	419183002	Burichang UP Office - Anandapur Via Bakshimul UP Office Road.	7.30	
		MONOHORGANJ	419902002	Natherpetua-Hasnabad Rd.	13.34	
		COMILLA-S DAKSIN	419912003	Balutupa Chowmohani-Tomsom bridge	3.80	
		COMILLA-S DAKSIN	419912006	Bagmara-Changahata-Pickpara Rd.	4.90	
		COMILLA-S DAKSIN	419913006	Suagonj-Talpatty-Birahimpur-Kamalpur Rd	7.10	
		COMILLA-S DAKSIN	419913007	Suagonj-Kalikapur-Talikhona Rd	4.70	
		COMILLA-S DAKSIN	419913030	Bagmara-Joynagar-Ashara Bazar-Rd.	4.75	

SL No	DISTRICT	UPAZILA	ROAD CODE	ROAD NAME	TOTAL LENGTH (Km)	REMARKS
		CHANDINA	419273006	Kutumbapur-Kaliarchar Bazar Road.	11.44	
		BARURA	419093006	Uttar Shilmuri UP Office-Sultanpur bazar Road	3.86	
		BARURA	419093033	Bauksar - Gonamar - Bottali Bazar Road	3.50	
		BARURA	419093011	Amratali - Barbatna and Narindapur - Ekbarta Road.	3.00	
		CHOUDDAGRAM	419313004	Amjader Bazar-Jakjur via Kankapaith bazar UP Office	6.50	
		CHOUDDAGRAM	419313010	Kalabagan bazar-Sreepur UP Office (Padua bazar) Road	3.87	
		CHOUDDAGRAM	419313019	Gunabati UP office(bazar)-Batiara(Gangra) bazar road.	7.00	
		LAKSHAM	419723010	Chitoshi C&B-Pomgaon Via Rajapur,Sikhatia & UP office.	2.30	
		NANGALKOT	419873015	Gomkot-Tilip-Baro Fatepur Rd.	3.35	
		MONOHORGANJ	419903005	Chitoshi R&H (Nurul Amin College)- Jalam (N) UP-Pomgao Jalam (S) UP office.	6.65	
				Sub-Total :	**159.10**	
16	**CHANDPUR**	**FARIDGANJ**	413452001	Faridganj GC-Rupsha GC Road.	5.40	
		FARIDGANJ	413452006	RupshaGC-Polishara GC (Hajigonj Upazila). Via-Khajuria Road.	13.80	
		CHANDPUR-S	413222002	Chandpur (Bagadi R&H)-Chandra GC Road.	8.25	
		MATLAB (UTTAR)	413762003	Senganchar-Kalirbazar Road.	5.00	
		KACHUA	413582010	Rahimanagar GC-Naluabazar-Darbeshgonj-Raghunathpur GC Road.	15.80	
		KACHUA	413583021	Sachar UP-Ragdail Bazar road.	3.89	
		HAZIGANJ	413492006	Balakhal-Rampur-Narayanpur road	10.10	
				Sub-Total :	**62.24**	
17	**B.BARIA**	**KASBA**	412632002	Kasba-Akhaura Road	7.10	
		BANCHARAMPUR	412042001	Bancharampur GC-Jibonganj GC Road via Sonarampur Bazar	22.21	
		NASIRNAGAR	412902003	Nasirnagar R&H-Haripur GC-Madhabpur R&H Road via Chairkuri GC	19.30	
				Sub-Total :	**48.61**	

SL No	DISTRICT	UPAZILA	ROAD CODE	ROAD NAME	TOTAL LENGTH (Km)	REMARKS
18	FENI	FENI-S	430292001	Dula miah-Sharisadi bazar-Kaikhali-Koresmunshi-Rd	5.70	
		DAGANBHUIYAN	430252003	Shebar hat-dudmukha bazar road	7.17	
				Sub-Total :	**12.87**	
19	LAXMIPUR	LAXMIPUR-S	451432001	Dalal Bazar-Ramgonj[PAN-PARA] Road 3-2-1 No Up	8.90	
		RAMGANJ	451652004	Baluachowmuhani-Shampur Miahr hat Road.	6.30	
		KOMOL NAGAR	451742004	Hazirhat-MatabbarNagar-Kadirpanditerhat-Munshirhat-Charubati-Bhabanigonj Road.	15.38	
				Sub-Total :	**30.58**	
20	NOAKHALI	KABIR HAT	475903001	Maijdee-Oter hat-Bhuiar hat Road (Old Hospital Road).	8.00	
		COMPANIGANJ	475212008	Basurhat-Bangla Bazar-Chaprashirhat Road	16.30	
		SONAIMURI	475883007	Mukilla (DH)-Bargaon UP-Bottali Bazar Road	6.30	
		SENBAG	475803007	Senbag-Arjuntala UP Office (Chilonia Bazar).	3.25	
				Sub-Total :	**33.85**	
21	HABIGANJ	NABIGANJ	636772009	Inathgonj (Nadampur)-Kurshi Road.	10.33	
				Sub-Total :	**10.33**	
22	MOULVIBAZAR	KAMALGANJ	658562005	Kamolgonj HQ.-Munshibazar G.C. Road .	7.00	
		RAJNAGAR	658802001	Rajnagor-Fatepur (Balagonj)	17.26	
		SREEMANGAL	658832002	Bhunabir-Shamshergonj Athangiri Road (Sreemangal part).	20.20	
				Sub-Total :	**44.46**	
23	SUNAMGANJ	CHATAK	690232007	Jalalpur-Dularbazar-Lamarasulganj	18.59	
		JAGNATHPUR	690472003	Bhaber bazar-Syedpur bazar-Goalabazar (Khatalkhair) Road.	11.86	
				Sub-Total :	**30.45**	
24	SYLHET	ZAKIGANJ	691942001	Atgram (R&H)-Zakigonj (G.C) Road.	11.89	
		JOINTIAPUR	691532003	Dorbast Bazar (G.C) Kanaighat Road.(Jaintia Part.)	6.70	
		SYLHET-S	691622005	Shiber bazar GC-Companigonj RHD Road (Sadar Portion).	6.50	
		BISWANATH	691202001	Biswanath GC-Perer bazer GC-	13.33	

SL No	DISTRICT	UPAZILA	ROAD CODE	ROAD NAME	TOTAL LENGTH (Km)	REMARKS
				Jaganthpurpur HQ Road.(Biswanath Part.)		
				Sub-Total :	**38.42**	
25	**CHITTAGONG**	**FATIKCHARI**	415332009	Chittaagong Khagrachari Road to Binajhuri Road via ----	7.50	
		FATIKCHARI	415332007	Katirhat-Jogirhat Road via Samitirhat Bazar (Fatickchari portion)	6.26	
		BANSKHALI	415083009	Chambol UP office to Gondamara u.p Rd. (Rahamani---)	7.38	
		RAOJAN	415742008	Thana Sadar - Kagotia Hat Road (From RHD#86)	5.80	
		LOHAGARA	415473001	Baro Awlia Tankabati Road.	13.95	
				Sub-Total :	**40.89**	
26	**COX'S BAZAR**	**PEKUA**	422952001	Charapara RHD to to PABT via Sowdagarhate GC Road	5.60	
		COX'S BAZAR-S	422242003	Napith Khali-Islampur - Pokkhali-Chowfaldandi Road	14.20	
				Sub-Total :	**19.80**	
					1096.01	

ANNEX 2: GENERAL BASELINE DESCRIPTION FOR RTIP-2

2.1 Physical Environment

2.1.1 Atmosphere and Climate

National Context: Bangladesh has a tropical monsoon climate with the three main seasons: monsoon or wet season (from June to October), cold season (November to February) & hot season (March to May). The mean annual temperature in Bangladesh is about 26°C. The temperature varies from 10° C to 39° C. Bangladesh is monsoonal and characterized by highly seasonal rainfall. The mean annual rainfall is around 2540mm but concentrated in the five months of the monsoon (June to October). During monsoon season, rainfall varies from 1300 to 4300mm. Humidity remains as high as 80 % or more in Bangladesh. The wind speed may rise up to 150 km/hour. Cyclones develop in the Bay of Bengal and cause damage to coastal areas of Bangladesh. The most severe cyclone (wind speed 224km/hr.) that ever hit Bangladesh occurred on 12 November 1970 killing 300,000 people.

Context: Rajshahi has a tropical wet and dry climate. The climate of Rajshahi is generally marked with monsoons, high temperature, considerable humidity and moderate rainfall. The hot season commences early in March and continues till the middle of July. The maximum mean temperature observed is about 32 to 36 °C during the months of April, May, June and July and the minimum temperature recorded in January is about 7 to 16 °C. The highest rainfall is observed during the months of monsoon. The annual rainfall in Rajshahi Division is about 1, millimeters The maximum mean temperature observed is about 3 2 °C during the months of April, May, June and July and the minimum temperature recorded in January is about 7 to 1 °C. The highest rainfall is observed during the months of monsoon. The annual rainfall in Sylhet is about millimeters The maximum mean temperature observed is about 3 2 °C during the months of April, May, June and July and the minimum temperature recorded in January is about 9 to 1 °C. The highest rainfall is observed during the months of monsoon. The annual rainfall in Dhaka is about millimeters The maximum mean temperature observed is about 3 °C during the months of April, May, June and July and the minimum temperature recorded in January is about to 1 °C. The highest rainfall is observed during the months of monsoon. The annual rainfall in Chittagong is between 2,500 to 3,500mm

2.1.2 Topography

National Context: Bangladesh is a mostly low-lying delta formed at confluence of major rivers namely Jamuna, Ganges & Meghna. Overall topography of Bangladesh is relatively flat alluvial plains (about area) except Chittagong & Sylhet Zones. The topography of Chittagong & Sylhet Zones is hilly, undulated & flat. The land gradient of Bangladesh is approximately m / km from north to south. The maximum elevation above the mean sea level is about m at Keocradang Hill in Rangamati District under Chittagong Hill Tracks

Context: The topography of the Division is mainly flat. The lands in Rajshahi are generally classified as very low (about m water depth during high flood) to medium high (about m water depth during minimum flood) The ground elevation of ranges from 25mPWD to mPWD. The major rivers run in R are: , Karatoya. The low-lying floodplains covering Sunamganj, Habiganj, Netrokona, Manikganj, Munshiganj districts The maximum flooding is in the haor areas of Kishoreganj, Netrakona, Sunamganj, Hobiganj and Brahmanbaria districts, large parts of which are deeply flooded during the monsoon season. Dhaka Narayanganj, Gazipur and Narshingdi districts are generally more deeply flooded than those in the other parts of the . In greater Dhaka, the Madhupur terrace extends north-west from the north of the city, resulting in higher, dry land areas covering the north-west of Dhaka district, much of Gazipur and parts of Narayanganj district. The north-east of Narshingdi district is also relatively high. The highest elevation in Bangladesh occurs in the Chittagong at around meters above mean sea level (MSL). There are upland areas in many of the districts that border on to India – run-off from these hills makes the downstream areas prone to flash-flooding

2.1.3 Physiography and Geology

The term "physiography' refers to the form of the earth's surface. The physiography of Bangladesh may be classified into three distinct regions: (a) floodplains, (b) terraces, and (c) hills, each having distinguishing characteristic and has been divided into sub-regions and units Bangladesh has been tentatively divided into Agro-ecological Zones. The Project area encompasses agro-ecological zones Ganges Brahmaputra and Jamuna Floodplain Barind Tract Surma-Kushiyara Floodplain Piedmont Plain Meghna River Floodplain Northern and Eastern Hills Chittagong Coastal Plain

Geologically, Bangladesh is a part of the Bengal Basin, one of the largest geosynclinals in the world. The Basin is bordered on the north by the steep Tertiary Himalayas; on the northeast and east by the late Tertiary Ceylong Plateau, the Tripura hills of lesser elevation, and the Naga-Lusai folded belt; and in the west by the moderately high, ancient Chotanagpur plateau. The geophysical evidence indicates that the southern fringe of the basin is open towards the Bay of Bengal for a considerable distance, though it is not distinct. The formation and growth of the Bengal Basin is directly related to the origin and morphology of the Indo-Gangetic trough, which itself is overlaid and filled by sediments thousands of meters thick. The flat topography of the Basin, and the occurrence of recurring floods that cause rivers to change course have complicated the river morphology pattern.

A large portion of the project area lies within the major physiographic unit of the Ganges-Brahmaputra and Meghna floodplains . Chandpur, Laxshmipur, Noakhali, Feni, Chittagong and Cox's Bazar all have coastal areas. There are upland areas in many of the districts that border on to India – run-off from these hills makes the downstream areas prone to flash-flooding. Scattered throughout the RTIP-2 project area there are higher land areas which form part of the Pleistocene terraces. In greater Dhaka the Madhupur terrace extends north-west from the north of the city, resulting in higher, dry land areas covering the north-west of Dhaka district, much of Gazipur and parts of Narayanganj district. The north-east of Narshingdi district is also relatively high.
Northern and Eastern Hills and piedmont plains, high hill range

2.1.4 Seismicity

Bangladesh is situated in one of the most tectonically active regions in the world. Here is where three major plates meet (the Indian Plate, the Tibet Sub-Plate, and the Burmese Sub-Plate). However due to the location of relevant plates, fault lines and hinge zones, Bangladesh itself is divided into three seismic zones**,** based on the ranges of the seismic coefficient (*note: the seismic coefficient is a measure of how strong an earthquake has the potential to be based on a combination of the mass of the plate and the seismic forces acting on it, as well as how frequently these quakes are likely to occur*). Zone 3 is in the most seismically active area with a seismic coefficient on 0.25, and Zone 1 is the least active with a significantly lower seismic coefficient of 0.075.
based on the ranges of the seismic coefficient

one I which is defined as being seismically severe area Noakhali and the western part of Chittagong Division one II is the severe . The is defined as being seismically relatively quiet and has the lowest probability of an earthquake occurring.

2.1.5 Hydrology and Drainage

In Bangladesh, rainfall and transnational river flows are the main sources of surface water (SW). The sources of SW in the Project area are mainly: rivers, canals, ponds and beels Bangladesh has an average annual surface flow of approximately , m million acre feet (MAF), of which about m MAF (are received from India as inflow and the remaining m MAF (as rainfall. This is enough water to cover the entire country to a depth of m. About m MAF (of rainfall and of total)) is evaporated (cm), and the remainder flows into the Bay of Bengal. The rivers passing through the Project areas carry a considerable amount of flow during the rainy season. The surface hydrology of the coastal plains of Bangladesh presents a complicated interaction of fresh water flows with the tides and tidal flows from the Bay of Bengal (FAO,

Except for higher ridges including the Madupur Tract, the water table is generally high because of soil porosity and permeability, and low topography. In the floodplains it varies from within one meter of the surface in the wet season to seven meters or more during the dry season. In the older terraces the water level is more than meters below the surface during the dry season. However, increasing extraction of water for irrigation and domestic use, and the reduced flow of the Ganges, in recent years have contributed to general lowering of the water table. However, in 1993 Department of Public Health and Engineering (DPHE) first detected arsenic in hand tube wells (HTW's) and arsenic contamination has become one of the most pressing environmental issues in Bangladesh. The levels of arsenic in groundwater in Bangladesh are considered to be some of the highest in the world. At present, occurrence of Arsenic in drinking water has been identified in 272 Upazilas under 61 Districts of the country. The World Health Organization's (WHO) has defined the tolerance limit of arsenic for drinking water as 0.01mg/L while the Bangladesh standard for arsenic in drinking water is 0.05mg/L.

vast floodplains traversed by three river basins of the Himalayan drainage system: the Ganges, the Brahmaputra and Meghna. in Ganges-Padma and Brahmaputra-Jumuna-Tista River systems he headwaters of both the Ganges-Padma and Brahmaputra-Jumuna-Teesta River systems are in the main Himalayan ranges.

The Meghna and the Padma Rivers join a few kilometers downstream of Munshiganj, Dhaka Division. Water for the Meghna River, originating in the Shillong Plateau, drains one of the heaviest rainfall areas of the world.

-

The levels of arsenic in groundwater in Bangladesh are the highest in the

The water table is generally high because of soil porosity and permeability, and low topography.

2.1.6 Air Quality

There is no official record of secondary air quality data due to non-availability of a regular air quality monitoring program for ambient conditions or emissions. Air quality monitoring in Bangladesh is mainly done in Dhaka city and Chittagong city where ambient concentrations of airborne pollutants have been found to be generally higher than the WHO guidelines and the United States EPA National Ambient Air Quality Standards. The main sources of air pollutant emissions in are brick kilns and domestic biomass burning (such as wood, dung, and straw) is responsible for most air emissions Other contributors to air pollution include vehicular and rail traffic, re-suspended road dust to make bricks, and small industries.

problem is acute in Dhaka (capital city) and Chittagong (commercial capital city) cities However, the air quality is generally good in the divisions . Moreover, air pollution due to vehicular emissions is also low in those areas.

2.1.7 Noise Quality

Noise is another potentially serious threat to the quality of the environment. Noise levels vary at the given locations according to (i) the number, composition, and speed of ; (ii) horn usage by locomotives; and (iii) other sources of ambient noise, including road-traffic noise, industrial noise, general community noise, and noise from birds and insects.

The background noise level at the project area is low , due to an absence of heavy industries, large urban development or other significant noise sources.

2.2 Biological Environment

2.2.1 Terrestrial Ecology

The countries of South and Southeast Asia are considered by the IUCN as regions of high species diversity. A large number of native plants, including - species of woody flora, have

been recorded from Bangladesh. The country lies at the meeting point (ecotonal region) of several floristic provinces, including the Manipur-Khasia, Bengal and North Burman provinces within the Indo-Malayan realm

The entire floodplain of Bangladesh was once well forested, but most of the native forests have disappeared in recent decades due to mounting pressure from human populations. The floodplain land has long been subject to cultivation, the most dominant land use within the study area. Thus only scattered patches of native trees, savanna, wetlands and associated fauna habitat remain in isolated locations within the terrestrial environment In many parts of the country, such as eastern Sylhet and northern Barisal, the abundance of plantations and groves of trees around villages creates an aspect of discontinuous fores In many of these village groves, density and diversity of plant species are extremely good. However the Ganges floodplain, which constitutes the major part of the study area, possesses very low endemism and there is a low probability of the occurrence of any rare or vulnerable plant species in the Project areas.

The terrestrial floral habitats in the project area include various types of trees and natural vegetation in common, fairly common and frequent distributions in and around homesteads, along and in open spaces as well as in non-cultivated highlands that support a wide range of wildlife species. The tree species in Dhaka, Rajshahi, Sylhet Divisions are almost same and include: jackfruit (*Artocarpusheterophylla*), bamboo (*Bambusabalcoona*), fanpalm (*Borassusflabellifer*), coconut (*Cocosnucifera*), eucalyptus (*Eucalyptus sp.*), banyan tree (*F. religiosa*), mango (*Mangiferaindica*), banana (*Musa sapientum*), guava (*Psidiumguajava*), mahogany (*Swieteniamahogoni*), tamarind (*Tamarindusindica*), shajna (*Moringaoleifera*), etc. Natural vegetations occurring in the subproject site areas include: dholpata (*Commelinabenghalensis*), junjhuni (*Crotalaria saltiana*), grasses (*Axonopuscompressus, Cynodondactylon, Dicanthiumannulatum, Digitariasanguinalis, Eleusineindica, Oplismenusburminii, Veteveriazizanioides, etc*.), kantamehdi (*Durantareppens*), matkila, datmajon (*Glycosmispentaphylla*), dulkalmi (*Ipomoea crassicaulis*), dhanchi (*sesbaniacanabina*), pakur (*Ficuscomosa*). Tree species in Chittagong are generally: Jhaw, coconut, babla, shilkoroi, shishu, mehogoni, shishu, epil-epil etc.

The terrestrial faunal species are: mongoose (Herpestesauropunctatus), field mouse (*Musboodga*), rodent (*Musmusculus*), squirrel (*Callosciurus sp*.), wild cat (*Felischaus*), jackal (*Vulpesbengalensis*), frog (*Ranacyanophyctis*), toad (*Bufomelanostictus*), lizard (*Hemidactylusflaviviridis*), monitor (*Varanusbengalensis*), etc. Bird species include crow, woodpecker, kite, sparrow, weaver bird, parakeet, robin, bulbul, pigeon, dove, hawk, cuckoo, black cormorant, owl, etc.

2.2.2 Aquatic Ecology

Rivers, canals, perennial water bodies and fishponds are the permanent wetland. Seasonal wetlands are mainly floodplains which inundates in the monsoon. Most of the Project areas support seasonal wetlands. Wetlands govern necessary nutrients and other elements for whole ecosystems as it is an important type.

Aquatic flora in the wetland ecosystem within the project divisions include aquatic vegetation species, like ghechu (*Aponogetonappendiculatus*), wild paddy (*Hygrorizaaristata*), water lily (*Nymphaeanouchali*), panchuli (*Nymphoidesindica and Nymphoidescristata*), kuchkola (*Otleliaalismoides*), water hyacinth (*Eichhomiacrassipes*), floating grass (*Echinocloacolonum*), water chestnut (*Trapabispinosa*), spiral algae (Spirogyra sp.), reeds/sedges, etc., within and along the banks of ponds, lakes, rivers, channels and floodplain lands. The fish species include: prawn (*Macrobrachiummalcolmsoni, M. dyanus, M. birmanicus, M. lamenii, Leander styliferus, etc.*), perch (*Anabas testudineus*), catfish (*Mystusvittatus, Mystustengara, Clariusbatrachus, Wallagoattu, Heteropneustesfosslis, Ompokbimaculatus, etc.), major carp (Labeorohita, Catlacatla, etc.*), minor carp (*Puntiussophore, Puntiusticto, Amblypharyngodonmola, Pseudeutropicusatherinoides, etc*.), shads (*Gudusiachapra, Coricasoboma), snakehead (Channapucntatus, Channastriatus, Channamanulius*), eel (*Mastacembelusarmatus, Xenentodoncancila*), etc.

The faunal species present in the terrestrial ecosystems are the common kingfisher (*Alcadoathis*), openbill stork (*Anastonusoscillans*), great egret (*Egretta alba*), small egret (*Egrettagazetta*), intermediate egret (*Egrettaintermedia*), fish eagle (*Ichthyophagusichthyaetus*), snipe (*Gallinagohenura*), kite (*Haliasterindus*), water snake (*Enhydrisenhydris*), monocellate cobra (*Najanaja*), common toad (*Bufomelanostictus*), and others.

2.2.3 Biodiversity

Traditionally biodiversity in Bangladesh has been identified and described in three levels (e.g. Genetic, species and ecosystem) Bangladesh was once rich in wildlife species and is an important transition zone between Indo-China, the Himalayas and the rest of the Indian subcontinent. The tropical moist forests were botanically amongst the richest in the Indian subcontinent, and they also supported the greatest diversity of mammals and a high diversity of birds. In recent times, although the endemism is low and the species richness is relatively large for the small area of Bangladesh, the population size of most of the species has declined drastically. Eighteen species of wildlife are now extinct from Bangladesh. Among them are several internationally threatened species such as the three species of Asian rhinoceros, and also the banteng, nilgai, swamp deer, pink headed duck, bengal florican and mugger crocodile.

Fish and aquatic resources, and other biodiversity of this country are summarized in the Red list of IUCN data indicates there are 54 species of inland fishes, 8 amphibians, 58 reptiles, 41 resident birds, and 40 mammals, which are threatened throughout the country. Among the marine and migratory species of animals, 4 fishes, 5 reptiles, 6 birds, and 3 mammals are threatened. Most of the forests of project districts are located in the Chittagong, Sylhet, Dhaka, Mymensingh, Noakhali, Lakshmipur, Feni and Tangail districts.

Table 2.1: Flora Resources

Category	Total number of Species
Flora	
Angiosperms	5000
Gymnosperms	5
Algae/seaweed	168
Source: Khan, 1991; Ahmed and Ali, 1996; Alam 1967; IUCN, 2000, Adopted from: State of Environment, Bangladesh	

Table 2.2: Fauna Resources

Category	Total number of Species
Fauna	
Sponges	3
Corals	66
(Marine + freshwater) Molluscs	(336+26) 362
Insects	2493
Mites	19
Shrimp/prawns	56
(Marine + freshwater) Crabs	(11+4) 15
Lobsters	3
Echinoderms	4
(Marine + freshwater) Fish	(442+266) 708
Amphibians	22
(Marine + inland) Reptiles	(17+109) 126
Birds	628
(Marine + inland) Mammals	(3+110) 113
Source: Khan, 1991; Ahmed and Ali, 1996; Alam 1967; IUCN, 2000, Adopted from: State of Environment, Bangladesh	

2.2.4 National Conservation Site of Importance

Several Environmentally Protected Areas (EPA) are located in Bangladesh. All of them are ecologically very important. Some endangered wildlife species such as wild elephants, monkeys, snakes are living in these habitats. The national conservation sites of importance in Bangladesh are: (a) Himchari National Park, Cox' Bazar District, (b) Teknaf game reserve, Cox's Bazar, (c) St. Martins island,

Cox's Bazar, (d) Bostami pond, Chittagong, (e) Chunati reserve forest, Chittagong, (f) Bogakine lake, Chittagong , (g) Rangamti lake, Chittagong District, (h) Cox's Bazar Sea Beach, Cox' Bazar, (i) Sundarban, Khulna District, (j) Kuakata, Patuakhali District, (k) Tangua Haor, Sunamganj District, (l) Hakaluki Beel, M. Bazar District, (m) Ramsagar , Dinajpur (n) Bhawal National Park,Gazipur District & (o) Modhupur Forest, Tangail Disrict

7 National Parks, Wildlife Sanctuaries and 1 Game Reserve, declared as environmentally protected areas according to the provisions of the Bangladesh Wildlife Preservation Act 1973 and Bangladesh Wildlife Preservation Act [Amendment] 1974 for biodiversity conservation and improvement **(Table 2.3 & 2.4). But none of these is affected by any of the sub-projects under the RTIP-2 as these are located far away (> 2km) from the sub-project sites.**

2 N P s & Wildlife Sanctuary & Game Reserve*

Sl. No.	Name	Location	Year created	Area (ha)
NATIONAL PARK				
1	Himchari National Park	Northeastern part of Cox's Bazar District	1980	1729
2	Madhupur National Park	Northeastern part of Tangail District with some part in Mymensingh District	1982	8436
3	Bhawal National Park	Gazipur district near Dhaka	1982	5022
4	Lawachara National Park	Sylhet Forest Division, Moulavibazar District)	1996	1250
5	Kaptai National Park	Rangamati Hill District	1999	5465
6	Ramsagar National Park	Eastern part of Dinajpur District	2001	
7	Nijhum Dweep National Park	Consisting of 11 different chars in the South eastern part of Noakhali District	2001	16352
WILDLIFE SANCTUARY				
1	Hazarikhel Wildlife Sanctuary	North eastern part of Chittagong District	1973 (Not formally notified)	2903
	Rema Kalenga Wildlife Sanctuary	Sylhet Forest Division(Eastern Part of Habiganj District)	1981/1996 (area expanded in 1996)	1796
	Pablakhali Wildlife Sanctuary	Khagrachari Hill District	1983	42087
	Chunati Wildlife Sanctuary	South western part of Chittagong District	1986	7764
GAME RESERVE				
1	Teknaf Game Reserve	South eastern part of Cox's Bazar District	1983	11615
			Total	**2441**

Table 2 : List of Ecologically Critical Areas preserved *

Sl. No.	Name	Location	Area (ha)	Year	Present condition/remarks
	Cox's Bazar toTeknaf sea beach	Teknaf, Ukhia, Ramu and Cox's Bazar Upazilas of Cox's Bazar District	10645	1999	Will be managed under GEF supported project to be implemented by DOE. The project has been approved and will enter into execution phase soon
	St Martin's Island	Teknaf Upazila, Cox's Bazar District	590	1999	Will be managed under GEF supported project to be implemented

Sl. No.	Name	Location	Area (ha)	Year	Present condition/remarks
					by DOE. The project has been approved and will enter into execution phase soon
	Sonadia Island	Moheshkhali Upazilla, Cox's Bazar District	4916	1999	Will be managed under GEF supported project to be implemented by DOE. The project has been approved and will enter into execution phase soon
	Hakaluki Haor	Barolekha and Kulaura upazilas Moulvibazar District, and Fenchuganj, Golabganj upazilas Sylhet District	18383	1999	Will be managed under GEF supported project to be implemented by DOE. The project has been approved and will enter into execution phase soon. Certain activities are underway by IUCN/CNRS under SEMP support.
	Tanguar Haor	Taherpur and Dharmapasha upazilas, Sunamganj District	9727	1999	Declared as a Ramsar site Environment Management Plan prepared MOEF is seeking fund from NORAD for implementation of the Environment Management Plan prepared under NCS Implementation Project 1
	Gulshan Baridhara lake	Dhaka City Corporation		2002	A rather strange ECA in the very urban setting, which has aesthetic and recreational value

*Note that the above mentioned environmental protected and critical areas **(Table 4.2 and 4.3)** are not affected by the project activities as these areas are located far away (>2km) from the RTIP-2 sites.

2.3 Socio-economic Environment

2.3.1 Demography

National Context: Bangladesh is the most densely populated country in the world. Based on the census, the total population of Bangladesh is of which about male and about female The national average population density of Bangladesh is persons/sq,km in which was in According to BBS, **,** the rate of population growth is About populations live in rural areas & rest in urban areas. The average household size in Bangladesh is According to population census, muslim communities comprise about of the total population Hindus are the largest religious minority in Bangladesh. Rest (is Buddhist, Christians & others. The Muslim and Hindus are distributed throughout the country. The Buddhists are mainly concentrated in the Eastern Hill areas. The country's settlement pattern is predominantly rural & about population lives in rural areas. Indigenous or tribal minority communities are reported to comprise slightly over of the country's population and are geographically concentrated mainly in Chittagong Hill Tracks Areas. Santhal, Chakma, Garo, Bihari, Oraon, Munda and Rohingya

The highest population density was observed in Dhaka (persons /sq.km) & lowest was in Chittagong Division (persons/sq.km) Indigenous or tribal minority communities are reported to comprise slightly over of the country's population and are geographically concentrated mainly in Chittagong

2.3.2 Settlement Pattern

National Context: The population of Bangladesh is overwhelmingly rural; forming about 84 per cent of the whole Ericksen . Rural land is densely settled, especially in the more fertile areas where alluvial soils support such crops as rice, jute, fruit and vegetables. However, in only seven of the 64 districts making up Bangladesh does the population density fall below 500/km2. Because of flooding in the rainy season, settlements in low basins, floodplains, and the delta are sited on natural or artificially raised land (ridges or mounds). Thus, linear settlements are the norm. About half of rural settlement in Bangladesh is of this type. The remainder— in areas of Medium Highland and Highland land types- the settlement pattern is either semi-nucleated or scattered. In low-lying basins, homestead mounds may be 3-5m high (Sultana, 1993). Also worth noting is the rather surprising prevalence of dispersed settlement in estuarine *char* areas, with homesteads built on plinths raised only above normal seasonal flood levels, not above experienced storm surge levels. The latter does not seem to reflect a misplaced sense of security behind coastal embankments, since the practice pre-dates modem embankments. There seems little prospect that this basic rural settlement pattern will alter over the next 40 years. Three things that may change are:

- The continued spread of population onto flood- and cyclone-prone *char* land;
- The spread of settlements onto relatively lower land in flood-protected areas (as in the Dhaka-Narayanganj-Demra project area) where they would be exposed to risk of catastrophic flooding if embankments are breached;
- The expanding urban population will spread onto floodplain agricultural land.

The densities population areas in Dhaka district, where it averages 3,000 people per km2, and the nearby districts of Narayanganj and Narsingdi, where it is over 1500/km2 BBS, 1992 . These three districts also have large urban populations. In a band extending south-east from Dhaka to Chittagong, the population averages over 1,000/km2. The concentration in these areas probably reflects more stable agricultural production and less proneness to flood and drought than in many other areas of the country.

It is certain that, over the next to years, the density of rural settlement in Bangladesh will markedly increase. This will increase the absolute number of people at risk from climatic variations and extremes. It is clear that densities in rural and urban areas will increase, exposing settlements to the full range of climatic extremes. If these extremes are exacerbated by climate change and sea level rise, then the exposure of infrastructure associated with settlements will be greatly enhanced, especially on floodplains and along the coast .

2.3.3 Land Use and Water Use Pattern

National Context: The land area of Bangladesh is 147,470 sq,km. Land is an important non produced asset of Bangladesh. Proper use of land can bring prosperity in production & growth. The productivity of land in Bangladesh is very high & present agricultural production can be increased to a large extent with intensive cultivation. In terms of use of land in Bangladesh 52% of total land are agricultural land, 24% water bodies & urban land, 17% forests land, 3% fallow land, & rest 4% are wasteland BBS,2004

Agriculture land is dominating the land use in . Clustered houses are found elsewhere with numerous small, medium & large homestead trees. Roadside settlement is frequently visible. Roadside trees are also observed. Roadside borrow-pits & ponds are found at most of the road sides in .

Big scour hole (treats as fish ponds) are found at downstream of most of the bridges on the roads. These borrow-pits & ponds are mainly used for fish culture. Rivers & canals across almost all the roads in . Factories & industries are also located at both sides of some roads side s

2.3.4 Water Supply and Sanitation

National Context: About 96% of population in Bangladesh had access to potable water within 150m of their dwellings via DTWs, HTWs, taps or ring wells W A Bangladesh Country strategy P - . The effective coverage of safe water dropped to approx. 80% due to arsenic (As) contamination. About 60% of the households in rural areas of Bangladesh used hygienic latrines such as water sealed latrines & homemade pit latrines as of 2004. Using of hygienic latrines in urban areas is double that of rural areas.

Bangladesh has made commendable strides in improving access to safe water. About of the people drink tube well water. Arsenic in groundwater is estimated to have affected of the shallow wells increasing the ratio of persons per tube well from to ; in pockets of hard to reach areas, the ratio is even higher. Hand tube wells, of which there are an estimated million, are the primary means of water supply in rural Bangladesh However, the majority of these do not have a proper platform and drainage, jeopardising the current claimed level of access to safe water further. More than of the urban population of Bangladesh have access to an improved water supply. Less than one third, i.e. about , of the -plus municipal towns has piped water that primarily serves the urban core. The people in urban slums, fringes and in medium and small towns rely on hand tube wells. Surface water is the traditional source of water in Bangladesh but high pathogen, agro-chemical and industrial loads render most surface water sources unsuitable for consumption without treatment. Surface water from perennial water bodies have been used for developing small-scale piped water systems as demonstrated by the DCH. Arsenic in groundwater poses a great challenge to the water supply in the country. Since the detection of arsenic in , various organizations have been screening tube wells for arsenic contamination in excess of the Bangladesh Drinking Water Standard (BDWS) of mg/L. The most contaminated areas lie in the in the districts of Chandpur, Comilla, Noakhali, Munshiganj Excessive levels have also been found in the part of the North West , Sylhet and Dhaka Divisions. The least contaminated or uncontaminated areas lie in the Rajshai, Dhaka and Chittagong Divisions. W A Bangladesh Country strategy P -

The access to sanitary latrines is in rural areas, in municipalities and in city corporations Progress Report March , Government of Bangladesh Half of rural primary schools do not have sanitary latrines . GOB's effort to achieve sanitation coverage by has pushed sanitation high up in the list of government priorities. They undermine the strong empirical evidence suggesting that social mobilization, not funding, is critical to sustainable access to sanitation . The sanitation facilities in schools and public places and their proper use and maintenance are again a big challenge to achieving the sanitation target.

2.3.5 Fisheries

National Context: The challenges for sustaining multiple uses of aquatic resources are evident globally. Until recently, traditional management of fisheries resources has commanded a low level of compliance with management measures (Alam and Thomson, 2001; Nielsen et al., 2004) and resulted in over exploitation leading to resource degradation. Such management has often ignored the socio-economic aspects of small-scale fisheries (World Bank, 1991), generating increasing calls for a tangible change in the process. The most significant issues arising from attempts to change existing fisheries management will be the need for resource protection and equity in the allocation of access to the resource, both between and within the various user groups. However, many developing countries face major constraints in capacity and the ability to identify and achieve implementation of long-term sustainable policies (Rahman, 1992; Williams, 1996).

In addition to varieties of aquatic organisms, a total of 260 indigenous freshwater bony fish species suitable for human consumption, belonging to 145 genera and 55 families (Rahman, 1992), constitutes a very rich aquatic bio-diversity. Within these, Hilsha (*Tenualosa ilisha*) is perhaps the most important single species and highly demanded in the local market. The annual catch of Hilsha is over 0.20 million metric ton (Mmt) and accounts for 20% of the country's total fisheries production (FAO, 1995a). Besides the large number of fresh water fish species, there are 24 species of shrimps belonging to five families having a very high commercial value and playing an important role in the economy. Fish from inland water accounts for an average of 83% of the total fish protein and most of the inland water fish species are only used for domestic consumption. More than 70% of the population of the country lives in flood plain and coastal areas where the fish and aquatic resources are perceived as exploitable natural capital assets but needing no husbandry. The unrestricted access which fishing communities have to the rivers and floodplains which are the ideal natural breeding grounds for many commercial and non-commercial fish species, has significantly contributed to over-fishing and severe resource degradation. However, the denial of access to certain public fishing grounds which have been leased to private leaseholders has also contributed to making life more difficult for fishing communities. Fish habitat destruction by the construction of roads and embankments, together with drainage, flood control and natural siltation, along with weak implementation of outdated policy measures by the government, have been commonly cited as causes for the deterioration of the country's fishery resources. Increased use of pesticides and fertilizers for producing high yielding

varieties of food crops and rising industrial pollution are also contributing to the deterioration of the aquatic environment (Ali, 1997). The situation has further been complicated by upstream damming in the major river systems that significantly reduces the water level and raises much of the river beds, thus dangerously modifying many of the aquatic habitats of the country. The conflicting demand for agricultural production, particularly rice, encourages attempts to dry out the floodplains, reducing open water areas and destroying their fisheries resources. Furthermore, population growth, rapid urbanization and industrialization are also imposing rapidly growing pressures on aquatic

located in the delta of three mighty rivers (the Ganges, the Meghna and the Brahmaputra), has vast inland water resources in the forms of ponds, *beels*, *haors*, *baors*, canals, rivers, floodplains and reservoirs. Among these resources ponds, *baors*, Flood Control Drainages (FCD) and burrow pits are used for freshwater aquaculture (MOFL, 1995). However, the freshwater culture fisheries include the following water bodies The total area of freshwater ponds is about 0.15 million ha representing 3.53 percent of total inland water resources (DoF, 1995) The total area under this component is estimated to be 0.7 million ha, of which about 7,000 ha area is now under being developed for different integrated aquaculture projects. Data regarding the area of water bodies under burrow pits could not obtained (MOFL, 1995).The freshwater area is getting reduced and the overall ecology of fish habitats and the routes of migration have altered due to various water resources development activities

. So, it is very difficult to fulfill the minimum protein requirement of the teeming millions from the freshwater sub-sector alone. But the highest priority has always been accorded to the freshwater fisheries, as reflected in the number of fisheries development projects implemented since liberation, in spite of that the marine and brackish water fisheries sectors have the lion's share of foreign exchange earnings and contributes to the development budget in that proportion. If similar level of management and development attention was paid to the marine and brackish water sectors, it would be possible to give substantially increased production .

2.3.6 Industries and Commerce

National Context: The industrial sector in Bangladesh is relatively small, but growth in output has been at nearly percent per year during the past decade. Some million people were employed in this sector in out of a total labor force of million (Bangladesh Bureau of Statistics, a). Industries are largely based on agricultural commodities, such as jute, cotton, sugarcane, tea, and hides. However, Bangladesh also has some heavy industries, such as steel, pharmaceuticals, chemicals, machine tools, and diesel plants According to the Bangladesh Bureau of Statistics a, , the industrial sector accounted for per cent of the GDP in - , of which per cent was due to large-scale industries and per cent to small scale industries. However, there is a large number of rural (generally cottage type) industries dispersed throughout the country, most of which are not included in the statistics of the Bangladesh Bureau of Statistics, but significantly contribute to national income and employment, and have the potential to contribute much more to both. Much of the industry is located on floodplains, although in the metropolitan areas it is often on elevated land or land that is protected by embankments. Nevertheless, whether concentrated or dispersed, much of the nation's industry is susceptible to severe flooding and/or cyclones

Different industrial units including garment factories, jute mills, dying industries, fertilizer factories, sugar mills and brick manufacturing units (fields) are in operation in the project area. Most of these industries are concentrated in the city areas Dhaka, Chittagong, Sylhet and other district towns. Industry along the coast is predominantly concentrated within the Patenga area of Chittagong areas. This area supports a variety of industrial plant which includes the following:

- Fertilizer Manufacturing Plant (TSP)
- Chittagong Steel Mills
- General Electrical Manufacturing
- Chittagong Cement Clinker Factory
- Eastern Cable
- Eastern Refinery

Another concentration in this industrial area is the Bangladesh Export Processing Zone which was established in 1983. There are many farmers engaged in salt production particularly in the districts of Chittagong and Cox'sbazar. Tannaries are mostly concentrated in the Hazaribag areas of Dhaka City and

some in the Chittagong area. As the industrial units are mostly without proper effluent treatment facilities are the major source of pollution including untreated sewerage disposal.

2.3.7 Cultural and Archeological Resources

National Context: Bangladesh is exceptionally rich in historical, archaeological & cultural wealth, especially of the medieval period during muslim & pre-muslim rules. Buddist Monastery at Rajshahi District, Mausoleum of Hazrat Shah Jalal, one of the greatest muslim saints in the sub-continents, at Sylhet District, Ahshan Monjil at Dhaka, the stronghold of Isha Khan (one of the famous Twelve Bhuyians of Bengal during Maghal Rule) at Kishoreganj District, ancient Shib Temple at Dinajpur District named as Kantajeer Temple, two famous Majar (Islamic holy or memorial places) at Chittagong named “Baro Awliar Majar” and “Bijit Bostami’r Majar”, Mohasthangarh at Bogra District, the seat of administration of the old rulers with its ruins & archaeological finds, Independence War Monument at Dhaka etc. All these resources signify abundance of historical/ archaeological and cultural resources of concerned areas in Bangladesh. Other cultural resources such as mosques, graveyards, temples are frequently found in all over Bangladesh.

cultural and archeological

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- The stone sarcophagus of Sultan Ghiyasuddin Azam Shah (1409 A.D.) Sonargaon, Narayanganj;
- Atia Jami Mosque, Tangail;
- Shah Muhammad Mosque at Egarasindur, Mymensingh;
- Hajiganj Fort at Narayanganj;
- Sonakanda Fort on the eastern bank of Sitalakhya river, Narayanganj;
- Lalbagh Fort, Dhaka City;
- Three domed two-storeyed Mosque, built by Khan Muhammad Mirdha, Dhaka;
- Bara Katra, Dhaka;
- Highly ornate ‘Jor Bangla’ temple at Dakshin Raghabpur, Pabna Town;
- Bara Ahnik temple at Puthia;
- ‘Pancharatna’ Govinda temple at Puthia;
- ‘Pancharatna’ Siva temple at Puthia;
- The Siva and Kali temples at Sonarang (Tongibadi) near Dhaka;
- A Buddhist pagoda with tapering spire at Cox’s Bazar;
- Picturesque Buddhist Khyangs at Ramu near Cox’s Bazar;
- Megalithic memorial monuments at Jaintiapur, associated with the Khasi tribe, Jaintiapur, Sylhet; and
- Ahsan Manzil or the palace of the Nawabs’ of Dhaka, Dhaka City.

ANNEX 3: POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES FOR EACH SUBCOMPONENT

3.1 General

The environmental impacts identified at this stage are preliminary in nature and will need to be further elaborated specifically (subproject wise) and potential for occurrence has to be ascertained during further stages of subproject design and implementation. The potential impacts will identify during various stages of the subprojects: preconstruction, construction and operation as their potential nature, extent, duration and severity differs between the nature of subprojects and stages.

The potential impacts and possible mitigation measures for a subproject under each of following component of the project: (i) rural road improvements; (ii) rural road maintenance; (iii) rural waterways; and iv) growth centre markets have been described below and sample subproject has been described in **Chapter 3.**

3.2 Potential Environmental Impacts and Mitigation Measures for Rural Road Improvements

3.2.1 General

The main activities of the subprojects are as follows:

- Site clearance (removal of trees from one side, assets etc.);
- Construction yard & Labor Camp;
- Earth works (cutting & filling);
- Bridges/Culverts;
- Bituminous pavement works;
- Slope protection works for road (by grass turfing) & Bridge/culvert (by blocks);
- Removal of construction waste.

The potential impacts along with possible mitigation measures due to the above subproject activities are given below.

3.2.2 Preconstruction Phase

Impacts- Due to implementation of the subproject the following potential negative impacts will be occurred:

- loss of land including agricultural, commercial and homestead;
- loss of buildings such as homestead, bazaars, religious, cultural, etc.;
- loss of crop production due to widening of existing road;
- loss of income; and
- loss of trees due to widening of road.

Mitigation- To minimize the above impacts, the possible mitigation measures are recommended:

- To ensure that adverse impacts on the community, agricultural and commercial will be avoided, mitigated or compensated.
- To ensure similar or better living conditions for project affected persons (PAPs) for the limited period of time their livelihood may be interrupted.
- Formulate a comprehensive Compensation Plan with due consideration to the 'Social Safeguard Framework for RTIP-2 in LGED as agreed between WB and Government of Bangladesh to be implemented whenever community along the road is affected adversely.
- Replantation of suitable trees (wood 50%, fruit 30%, fuel 10% & medicine 10%) on the road side slopes during operation stage.
- Conduct public consultations on the compensation package and implement the Compensation Plan where necessary.

3.2.3 Construction Phase

Environmental impacts of the construction phase will expected to be temporary. Construction impacts will

consider being minimal as all the construction works will be carried out within the site boundary of the acquired land and will be controlled via the mitigation measures.

- **Construction Camp**

Impacts-The civil works will be a major undertaking, and will bring with them construction camps and itinerant workers. The road improvement process will take quite time, with the result that the camps will take on a semi-permanent appearance. The people and the changes they bring will have significant impacts on the local communities and social structures. Substantial numbers of workers will inhabit the area in temporary camps loading local infrastructure and causing ambient social influence.

Mitigation Measures- To minimize the above impacts, the possible mitigation measures are recommended:

- To conduct special briefing and/or on-site training for the contractors and workers on the environmental requirement of the project activities.
- To ensure that the contractors and the workers understand the environmental requirements of the rural road improvements and implementation of mitigation measures.
- Identify location of work camps in consultation with local community; where possible, camps shall not be located near settlements or near water supply intakes.
- The contractor shall organize and maintain a waste separation, collection and transportation system.

- **Earthworks**

Impacts-The earthworks for the road embankment improvement for the rural road improvement sub-project activities might affect crop production, hinder drainage and modify local hydrology within the command area and in the vicinity. Direct impacts of embankment improvement are erosion on embankment slopes, deposition of silt on crop fields, dust blowing, noise and vibration to disturb the local people. The contractors if permitted to collect fill materials by scraping the topsoil from agriculture lands for road embankment construction would affect the natural fertility of soil severely.

Mitigation Measures- Cutting and filling of land for the improvement of the rural road will be done in such a way that the slope of the area or toe of the road embankment should be within right of way and will not disrupt crop production as well as there will be no water logging or drainage problems.

- Road embankments will be provided with chutes and drains to minimize soil erosion;
- Stone pitching and retaining walls will be made on steep road embankments in critical areas such as ponds, canals, etc.;
- Turfing of low road embankments and planting of shrubs and trees will be done to protect slopes; and

- **Topography, Geology, and Soils**

Impacts-The main impacts generating activities during improvement will be clearing of right-of-way, cutting and filling, blasting, and dismantling damaged pavements and borrows pits. The topography along the rural roads will change to some extent because of filling and cutting of soil, filling and improvement of project related structures.

Loss of productive soil, albeit during the construction stage only, is envisaged at locations of workers camps, storage, go downs etc. (for the duration of construction) if these are located on fertile areas. The EMP can ensure that no productive areas are used for these purposes and avoid adverse impact. In any case, though it would be a direct impact, it would be reversible as the soil can be stockpile and replace after the construction is complete and the worker camps etc. are closed.

Mitigation Measures-To avoid landslides, land stabilization will be included in the rural road improvements. Visual changes to the landscape will have no mitigation measures, but the rural road improvements should consider aesthetic concerns. Tree planting along the rural road improvements sub-project area should be properly planned.

In the selection of borrow areas for the subproject, productive agricultural areas have been avoided for borrowing of materials. The workers camps, storage and godowns will not be established at agricultural

land. In case productive areas are taken for storage or workers' camp, the post construction rehabilitation will be ensured.

- **Surface Water Quality**

Impacts- Surface water quality of the water bodies such as ponds, canals, rivers, and in close proximity to the rural road improvements sub-project construction sites may deteriorate if construction material including borrowed fill material and sand, construction waste, water used in construction activities and domestic effluent from work camps will allowed to reach the receiving water bodies. Surface water quality in the rivers and other water bodies could be affected due to rise of suspended solids that could affect the living conditions of aquatic flora and fauna. The sources of the contamination could be:

- removal of vegetation cover could cause local erosion; and
- movement of heavy building machinery can cause the rise in amounts of suspended solids in the surface water.

Mitigation Measures - Proper construction management including, training of operators and other workers to avoid pollution of water bodies by the operation of construction machinery and equipment. Temporary construction facilities including structures and material stockpiles shall be located at least 50 m away from water bodies. Construction of small bridges and culverts should be done during dry season as much as possible.

- **Ground Water Quality**

Impacts-Impact on ground water will anticipated due to seepage of untreated waste from workers' camps, discharges from the service facilities, storage depots, etc

Mitigation Measures-Proper sanitary conditions and treatment facilities and regular monitoring need to be ensured toward making such wastes and effluents correspond to acceptable standards.

- **Air Quality**

Impacts-Construction works will involve breaking up, digging, crushing, transporting, and dumping large quantities of dry material. It will inevitably lead to an increase in suspended particulate matter (SPM) in and around the construction zones. Possible sources of air pollution will be dust due to construction activities, machinery movement and other sources.

Mitigation Measures- Spraying of water is the main way of controlling dust. Water is, in any case, required to be added to fill material during the construction of the road base. Spraying of road surfaces, including haul roads from borrow pits and quarries, should be undertaken regularly during construction, particularly in the vicinity of villages. Excessive exposure should be avoided; therefore, the asphalt and crushing plants should not be placed near residential areas or social infrastructure such as mosques, schools, markets etc. At least 0.5-1 km should be placed between these facilities and residential areas or social infrastructure.

- **Noise and Vibration**

Impacts-A significant increase in noise is expected during construction specially during driving of piles at culvert and bridge sites. Noise and vibration levels in and around the construction sites could increase as a result of operating construction machinery and during unloading and loading of material. The main sources are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, drills, and stone crushers.

Mitigation Measures-All powered mechanical equipment and machinery shall be fitted with noise abating gear such as mufflers for effective sound reducing, in full compliance with the DOE regulations. Prior to the blasting the elementary precautions should be undertaken. Also, health and safety equipment, such as helmets, masks, ear plugs, hand gloves and boots should be used. The visual and audible warnings should be presented to the people. The noisiest operations should be performed during daytime. Proper equipment maintenance and restricted operation between 0700 to 1800 hours will reduce noise.

- **Hydrology/ Drainage Congestion**

Impacts-The potential risk of erosion will increase during rural road improvements if the culverts and

bridges crossings improvements are provided with waterway width less than the regime width of the canal and river. The portion of the road that is in contact with canal and river will be provided with slope protection measures. Adequate drainage structures need to be provided at appropriate location of the road.

Mitigation Measures-Provision of adequate waterway opening of the bridges/culverts should be included in the design and implement accordingly. River bank revetment works should be done to protect the roads from river bank erosion. In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion, flood damage and rainfall. Drainage facilities need to be provided in the diversion road at the bridge/culvert construction sites to avoid temporary drainage congestion.

- **Occupational Health and Safety**

Impacts-Construction workers may be affected adversely due to hazardous working environments where high noise, dust, unsafe movement of machinery etc. may be present. The construction of a high-speed road can lead to severance issues.

Roads in good condition will reduce traffic blocks, engine idle time and damage to motor vehicles. The ensuing benefits to public health and economy though marginal will also add to the main benefit of smooth and faster traffic flow.

Mitigation Measures-Residents must be able to cross the road safely and particular attention must be given to vulnerable groups such as children, the elderly, and animals. All vehicles should observe speed limits and load restriction.

The contractor shall instruct his workers in health and safety matters, and requires the workers to use the provided safety equipment. The scope will need to include transmittable diseases establish all relevant safety measures as required by law and good engineering practices. Arranging for provision of first aid facilities, rapid availability of trained paramedical personnel, and emergency transport to nearest hospital with accident and emergency facilities. Arranging for regular safety checks of vehicles and material, and allocation of responsibility for checking. The contractor will responsible for ensuring that all construction vehicles observe speed limits on the construction sites and on public roads.

- **Flora, Fauna and Livestock**

Impacts-Wildlife and livestock of the rural road improvements area will be affected by the activities during the construction. There will be number of trees in area of influence. These trees and bushes are at high risk of being cut for the construction or the heating or cooking in the camps. The natural and planted vegetation in the rural road improvements area of influence, especially in the immediate vicinity of the rural road sub-project area, will be subjected to disturbance and removal during the construction.

Mitigation Measures-Try to avoid using trees/bushes as fuel for the construction & general purposes. Special care should be taken to preserve the lives and health of all animals that cross the road. The plant cover should be repaired after the construction, especially with fast growing species on suitable sites on embankment slopes. All construction related disturbances will be expected to be temporary and the situation will be restored after the construction is over.

- **Socio-economic**

The number of households and small business and shop owners on either side of the rural road improvements sub-project area may be affected adversely during the construction. During the construction phase could also result from, construction workers developing conflicts with local community, spread of vector borne and communicable diseases from labour camps, and disruption of services and shifting of utilities as rural road improvement sub-project will pass several villages.

The project when implemented will (i) reduce travel time; (ii) ensure uninterrupted traffic and; (iii) increase economic activities in the region. The social development outcomes of the project will include increased employment due to augmentation of the regional trade and thereby reduce poverty in the long run.

Implementing the rural road improvements sub-project will bring in economic and social benefits to the people in the subproject area. The road will provide better connectivity between upazila in the different district. The project will thus contribute to economic growth from the improved road through increased employment, industrialization and overseas trade. Improved connectivity with increased capital inflow for promoting industrial and commercial activities and increased economic and employment opportunities for

the local populations. During construction activities, local unemployed people will get employment and increased income.

Mitigation Measures-All the above adverse impacts of construction phase are localized in spatial extent, temporary and short in duration and can be mitigated by good standard construction practices. To ensure that adverse impacts on the community are avoided, mitigated or compensated. Provide alternative sites for vendors/micro businesses and houses using or are in the right of way. These sites should be selected to facilitate equal or enhanced income/living conditions. Schedule the construction activities to avoid or minimize impact on road side shops, businesses and houses.

The project authorities might employ local people wherever possible, hopefully with preference to the qualified landless and jobless poor of the subproject areas ensuring socio-economic enhancement in the real terms. Women from PAPs' families could be offered the project created facilities.

3.2.4 Operation Phase

Due to increased activities and efficient operational systems, there will be some potential impacts on the environmental set-up in the rural road improvements sub-project area, which are discussed hereunder. In order to achieve sustainability of the development works, it is necessary to ensure the effectiveness of mitigation measures even after construction, as some adverse environmental impacts may result from the operation of the project facilities. As the rural road improvements sub-project improvement will facilitate smooth flow of traffic it is expected that exhaust emissions and noise emanation from vehicular traffic will not increase significantly.

- **Air Quality**

Impacts-Levels of air pollutants could increase marginally as more vehicles would use the roads after improvement of the rural road sub-project. Impact on the air quality due to operational activities after completion of the project would be minimal. The number of vehicles would increase but due to improved road quality and openness of the area the overall increase in air pollution will be miniature. Due to the improvement of the road there will be less dust affecting the people and animals.

Mitigation Measures- Awareness building and administrative measures should be taken to ensure proper maintenance of vehicles. Training and measuring equipment need to be provided to law enforcement authority to enable them to enforce smoke emission standards.

- **Noise and Vibration**

Impacts-During operation, passing vehicles will generate noise. Noise levels may also marginally increase as more vehicles use the rural road at higher speeds. In open areas, traffic noise will disperse and will create a minor impact. Impact on the traffic noise due to operational activities after completion of the rural road improvements would be minimal. The number of vehicles would increase but due to improved road quality and openness of the area the overall increase in noise and vibration will be minor.

Mitigation Measures-In sensitive areas such as schools, mosques, bazzar, settlement areas etc., sound barriers including berms, wall and tree linings may be required. Awareness building and administrative measures should be taken to ensure proper maintenance of vehicles.

- **Surface and Ground Water Quality**

Impacts- Impacts due to the operational activities after the completion of the rural road improvements is mainly of indirect nature:

- The increase traffic will induce development of traffic-related infrastructure such as filling stations, repair-shops that can cause risks to the water quality.
- The increased industrial activities, such as local industries can cause harmful effects to the surface water and gradually can affect also the groundwater.

Mitigation Measures-Traffic related infrastructure should be managed properly through local administration. Drainage is an important part of rural road improvements. Unless road drainage is maintained properly, drains and culverts can block, causing localized flooding and damage to the road itself. A commitment to regular monitoring and maintenance will be a requirement under the LGED.

- **Flora, Fauna and Livestock**

Impacts-The operation of improved road causes additional direct disturbance to the wildlife. Better accessibility increases directly hunting pressure and exploitation of few forest resources in the rural road improvements area. Also by increasing general development in the area affected by road development the pressure to the wildlife resources would increase as significant numbers of trees will be affected due to widening of road.

Mitigation Measures-The proper wildlife monitoring system should be applied along the rural road improvements area, especially in the vicinity of larger settlements. In formerly forested areas reforestation should be considered. The various suitable trees need to be replanted on the rural road improvements side slopes.

- **Socio-economic**

Impacts-Improved rural road improvements also increase the incidence of social problems such as drugs, crime, privacy etc. The improved rural road socio-economical positive impacts will be as follows:

- The better accessibility will create more jobs due to general economic development and increasing tourism; and
- Increase accessibility to the markets, schools, and social and health services.

Mitigation Measures-The rural road improvements will pass several villages. Planting or roadside barriers should be constructed to shield the view of the village from passing vehicles.

- **Road Accidents**

Impacts- The construction of a high-speed rural road can lead to severance issues. Road accidents may increase due to higher number of vehicles using the roads at increased speeds. The road after completion of construction will attract settlements and undesired structures including commercial facilities particularly near the community. Growth of settlement on vacant ROWs near the community increase accident risk.

Mitigation Measures-If control measures are not adopted this could become a hazard to pedestrians, too. Residents must be able to cross the road safely and particular attention must be given to vulnerable groups such as children, the elderly, and animals. All vehicles should observe speed limits and load restriction. Traffic signs, speed breaker especially nearby the cultural/health centres should be installed. Drivers should follow BRTA rules& regulations.

3.3 Potential Environmental Impacts and Mitigation Measures for Rural Road Maintenance

3.3.1 General

The main activities of the subprojects are as follows:

- Construction Camp;
- Earth works for filling of deep potholes;
- Repairing of bridges/culverts;
- Bituminous pavement works for pothole & crack repairing;
- Slope protection repairing works for road & bridge/culvert
- Removal of construction waste.

The potential impacts along with possible mitigation measures due to the above subproject activities are given below.

3.3.2 Construction Phase

Construction impacts on road maintenance will consider being negligible as all the construction works will be carried out within the site boundary and will be controlled via the mitigation measures.

- **Earthworks**

Impacts-The earthworks for the rural road maintenance sub-project activities might affect crop production; hinder drainage etc. within the sub area and in the vicinity. Direct impacts of embankment improvement are erosion on embankment slopes, deposition of silt on crop fields, dust blowing, noise and vibration to disturb the local people.

Mitigation Measures- Cutting and filling of land for the rural road maintenance sub-project will be done in such a way that the slope or toe of the road embankment should be within right of way and will not disrupt crop production as well as drainage problems.

- **Dust**

Impacts- Possible sources of air pollution will be dust due to rural road maintenance activities, machinery movement and other sources. Maintenance works involve breaking up, digging, crushing, transporting, and dumping small quantities of dry materials.

Mitigation Measures- Spraying of water is the main way of controlling dust. Water is, in any case, required to be added to fill material during the construction of the road base. Spraying of road surfaces, including haul roads from borrow pits and quarries, should be undertaken during construction, particularly in the vicinity of villages.

- **Occupational Health and Safety**

Impacts- Roads in good condition will reduce traffic blocks, engine idle time and damage to motor vehicles. The ensuing benefits to public health and economy though marginal will also add to the main benefit of smooth and faster traffic flow. Construction workers may be affected adversely due to hazardous working environments where high noise, dust, unsafe movement of machinery etc. may be present. The construction of a high-speed road can lead to severance issues.

Mitigation Measures-The contractor shall instruct his workers in health and safety matters, and requires the workers to use the provided safety equipment. Arranging for provision of first aid facilities, rapid availability of trained paramedical personnel, and emergency transport to nearest hospital with accident and emergency facilities. The contractor will responsible for ensuring that all construction vehicles observe speed limits on the construction sites and on public roads.

- **Socio-economic**

The project rural road maintenance will (i) reduce travel time; (ii) ensure uninterrupted traffic and; (iii) increase economic activities in the region. The social development outcomes of the project will include increased employment due to augmentation of the regional trade and thereby reduce poverty in the long run.

Mitigation Measures-All the above adverse impacts of construction phase are localized in spatial extent, temporary and short in duration and can be mitigated by good standard construction practices. Provide alternative sites for vendors/micro businesses and houses using or are in the right of way. These sites should be selected to facilitate equal or enhanced income/living conditions. Schedule the construction activities to avoid or minimize impact on road side shops, businesses and houses.

The project authorities might employ local people wherever possible, hopefully with preference to the qualified landless and jobless poor of the rural road maintenance areas ensuring socio-economic enhancement in the real terms.

3.3.3 Operation Phase

- **Noise Quality**

Impacts-During operation, passing vehicles will generate noise. Noise levels may also marginally increase as more vehicles use the rural road maintenance at higher speeds. In open areas, traffic noise will disperse and will create a minor impact. Impact on the traffic noise due to operational activities after completion of the rural road maintenance would be minimal.

Mitigation Measures-In sensitive areas such as schools, mosques, bazar, settlement areas etc., sound barriers including berms and tree linings may be required. Awareness building and administrative measures should be taken to ensure proper maintenance of vehicles.

- **Air Quality**

Impacts-Levels of air pollutants could increase marginally as more vehicles would use the roads after maintenance of the rural road sub-project. Impact on the air quality due to operational activities after completion of the rural road maintenance would be minimal. The number of vehicles would increase but due to improved road quality and openness of the area the overall increase in air pollution will be miniature. Due to the maintenance of the road there will be less dust affecting the people and animals.

Mitigation Measures- Awareness building and administrative measures should be taken to ensure proper maintenance of vehicles. Training and measuring equipment need to be provided to law enforcement authority to enable them to enforce smoke emission standards.

- **Road Accidents**

Impacts- After maintenance, road accidents may increase due to higher number of vehicles using the roads at increased speeds. The road after completion of construction will attract settlements and undesired structures including commercial facilities particularly near the community. Growth of settlement on vacant ROWs near the community increase accident risk.

Mitigation Measures-
school, mosques, industries, to avoid accidents
Traffic signs should be installed in the right place.

3.4 Potential Environmental Impacts and Mitigation Measures for Rural Waterways

3.4.1 General

The main activities of the subprojects are as follows:

- Site clearance;
- Construction yard & camp;
- Dredging and disposal of dredged materials;
- Eroded river bank protection;
- Improvement of ghat;
- Removal of construction waste.

The potential impacts along with possible mitigation measures due to the above subproject activities are given below.

3.4.2 Construction Phase

- **Construction Camp**

Impacts-The civil works will be a major undertaking, and will bring with them construction camps and itinerant workers. The will take moderately time, with the result that the camps will take on a semi-permanent appearance. The people and the changes they bring will have significant impacts on the local communities and social structures. Substantial numbers of workers will inhabit the area in temporary camps loading local infrastructure and causing ambient social influence.

Mitigation Measures- To minimize the above impacts, the possible mitigation measures are recommended:

- Conducting special briefing and/or on-site training for the contractors and workers on the environmental requirement of the project activities.
- To ensure that the contractors and the workers understand the environmental requirements of the rural waterways and implementation of mitigation measures.

- Identify location of work camps in consultation with local community; where possible, camps shall not be located near settlements or near water supply intakes.
- The contractor shall organize and maintain a waste separation, collection and transportation system.

- **Loss of Productive Soils**

Impacts- Loss of productive soil, albeit during the construction stage only, is envisaged at locations of workers camps, storage, go downs etc. (for the duration of construction) if these are located on fertile areas. The EMP can ensure that no productive areas are used for these purposes and avoid adverse impact. In any case, though it would be a direct impact, it would be reversible as the soil can be stockpile and replace after the construction is complete and the worker camps etc. are closed.

Mitigation Measures- In the selection of borrow areas for the subproject, productive agricultural areas have been avoided for borrowing of materials. The workers camps, storage and godowns will not be established at agricultural land. In case productive areas are taken for storage or workers' camp, the post construction rehabilitation will be ensured.

- **Dredging & Dredged Materials**

Impacts- A considerable quantity of dredged materials will be generated from dredging works of the river bed and direct disposal of the dredged materials (sand) in the rural waterways will influence the waterways water quality and aquatic wildlife; and direct disposal of dredged materials on land will influence the soil quality. Improper disposal of this water may cause water logging in the surrounding area. Dredging of sand from the river may trigger siltation at downstream & river bank erosion.

Mitigation Measures- Dredged materials and river water should be tested prior to start dredging. Outflow from hydraulic fill should have maximum retention time to enhance settling at the dredged materials dumping site and avoid water congestion. Dredged sand will be sold quickly to the people for developing town/city area. Surrounding the dumping site area should not be damaged by spillage of dredged soils. Dredging location should be far away from the river bank to avoid erosion.

- **Surface Water Quality**

Impacts- The river water quality may be deteriorated due to dredging of the river bed materials. Movement of heavy dredging machinery can cause the rise in amounts of suspended solids in the river water.

Mitigation Measures - Proper construction management including, training of operators and other workers to avoid pollution of water bodies by the operation of construction machinery and equipment. River water should be tested prior to start dredging.

- **Ground Water Quality**

Impacts-Impact on ground water will anticipated due to seepage of untreated waste from workers' camps, discharges from the service facilities, storage depots, etc

Mitigation Measures-Proper sanitary conditions and treatment facilities and regular monitoring need to be ensured toward making such wastes and effluents correspond to acceptable standards.

- **Erosion/Scour**

Impact- Dredging of sand from the river may trigger river bank erosion.

Mitigation Measures- Dredging location should be far away from the river bank to avoid erosion.

- **Air Quality**

Impacts-Construction works involve breaking up, digging, crushing, transporting, and dumping large quantities of dry material. It will inevitably lead to an increase in suspended particulate matter (SPM) in and around the construction zones. Possible sources of air pollution will be dust due to construction activities, machinery movement and other sources.

Mitigation Measures- The dredging and others equipment should not be placed near residential areas or social infrastructure such as mosques, schools, markets etc.

- **Noise**

Impacts-A significant increase in noise is expected during construction. Noise and vibration levels in and around the river sites could increase as a result of operating construction machinery and during unloading and loading of material. The main sources are heavy machinery such as dredging machinery, etc.

Mitigation Measures-All powered mechanical equipment and machinery shall be fitted with noise abating gear such as mufflers for effective sound reducing, in full compliance with the D E regulations. Also, health and safety equipment, such as helmets, masks, ear plugs, hand gloves and boots should be used. The visual and audible warnings should be presented to the people. The noisiest operations should be performed during daytime. Proper equipment maintenance and restricted operation between 0700 to 1800 hours will reduce noise.

- **Occupational Health and Safety**

Impacts-Construction workers may be affected adversely due to hazardous working environments where high noise, unsafe movement of machinery etc. may be present.

Mitigation Measures-The contractor shall instruct his workers in health and safety matters, and requires the workers to use the provided safety equipment. Arranging for provision of first aid facilities, rapid availability of trained paramedical personnel, and emergency transport to nearest hospital with accident and emergency facilities. Arranging for regular safety checks of vehicles and material, and allocation of responsibility for checking. The contractor will responsible for ensuring that all construction vehicles observe speed limits on the construction sites and on public roads.

- **Flora & Fauna**

Impacts- of the area will be affected by the activities during the river dredging. There are different types of fauna species living in the rural waterways. These fauna species are at high risk of being river dredging for the rural waterways. The natural and planted vegetation in the area of influence, especially in the immediate vicinity of the sub-project area, will be subjected to disturbance and removal during the river dredging.

Mitigation Measures- Special care should be taken to preserve the faunal species and health of all animals that living in the rural waterways. All river dredging related disturbances will be expected to be temporary and the situation will be restored after the river dredging is over.

- **Socio-economic**

The number of households and small business on either side of the rural waterways sub-project area may be affected indirectly during the river dredging. During the construction phase could also result from, construction workers developing conflicts with local community, spread of vector borne and communicable diseases from labour camps, and disruption of services and shifting of utilities as rural sub-project will pass several villages.

If the rural waterways when implemented will (i) reduce travel time in the different upazillas; (ii) ensure uninterrupted transportation and; (iii) increase economic activities in the region. The social development outcomes of the subproject will include increased employment due to augmentation of the regional trade and thereby reduce poverty in the long run.

Implementing the rural waterways sub-project will bring in economic and social benefits to the people. The project will thus contribute to economic growth through increased employment, industrialization and overseas trade. Improved connectivity with increased capital inflow for promoting industrial and commercial activities and increased economic and employment opportunities for the local populations. During construction activities, local unemployed people will get employment and increased income.

Mitigation Measures-All the above adverse impacts of construction phase are localized in spatial extent, temporary and short in duration and can be mitigated by good standard construction practices. To ensure that adverse impacts on the community are avoided, mitigated or compensated. Schedule the construction activities to avoid or minimize impact on river side businesses shops and houses. The subproject authorities might employ local people wherever possible, hopefully with preference to the qualified landless and jobless poor of the project areas ensuring socio-economic enhancement in the real terms.

3.4.3 Operation Phase

Due to increased activities and efficient rural waterways operational systems, there will be some potential impacts on the environmental set-up in the rural waterways sub-project area, which are discussed hereunder. In order to achieve sustainability of the development works, it is necessary to ensure the effectiveness of mitigation measures even during operation, as some adverse environmental impacts may result from the operation of the project facilities.

- **Air Quality**

Impacts-Levels of air pollutants could increase marginally as more water transport would use the waterways after implementation of the rural waterways sub-project. Impact on the air quality due to operational activities after completion of the project would be minimal. The number of water transport would increase but due to improved rural waterways and openness of the area the overall increase in air pollution will be miniature. Due to the improvement of the river transport there will be no dust affecting the people and animals.

Mitigation Measures- Awareness building and administrative measures should be taken to ensure proper maintenance of river transportation. Training and measuring equipment need to be provided to law enforcement authority to enable them to enforce smoke emission standards.

- **Noise**

Impacts-During operation, passing river transport will generate noise. Noise levels may also marginally increase as more waterways transportation use the river at higher speeds. In open areas, traffic noise will disperse and will create a minor impact. Impact on the traffic noise due to operational activities after completion of the rural would be minimal. The number of water transportation would increase but due to river transport and openness of the area the overall increase in noise and vibration will be minor.

Mitigation Measures-In sensitive areas such as schools, mosques, bazzar, settlement areas etc., sound barriers including berms and tree linings may be required. Awareness building and administrative measures should be taken to ensure proper maintenance of river transport.

- **Surface Water Quality**

Impacts- Impacts due to the operational activities after the completion of the rural will be mainly of indirect nature:

- The increased industrial activities, such as local industries can cause harmful effects to the surface water; and
- Different kind of liquid waste discharge could be effect in surface water quality during river transportation operation.

Mitigation Measures-Traffic related infrastructure should be managed properly through local administration. A commitment to regular monitoring and maintenance will be a requirement under the LGED.

- **Flora and Fauna**

Impacts-The operation of rural causes additional direct disturbance to the . Better accessibility increases directly hunting pressure and exploitation of few in the subproject area.

Mitigation Measures-The proper monitoring system should be applied along the waterways area, especially in the vicinity of larger settlements.

3.5 Potential Environmental Impacts and Mitigation Measures for Growth Centre Markets

3.5.1 General

The main activities of this subproject are as follows:

- Construction Camp;
- Earth works for GC market;
- Internal HBB roads along with drains in the GC market;
- Toilet & HTW at GC market ;
- Slope protection for side slopes by grass or blocks/retaining works; and
- Removal of construction waste.

The potential impacts along with possible mitigation measures due to the above subproject activities are given below.

3.5.2 Construction Phase

- **Earthworks**

Impacts-The earthworks for the growth centre market activities might affect crop production, hinder drainage in the vicinity. Direct impacts of activities dust blowing, noise and vibration to disturb the local people. The contractors if permitted to collect fill materials by scraping the topsoil from agriculture lands for growth centre market embankment construction would affect the natural fertility of soil severely.

Mitigation Measures- Cutting and filling of land for the growth centre will be done in such a way that the slope of the area should be within the location and will not disrupt crop production as well as there will be no water logging or drainage problems.

- **Loss of Productive Soils**

Impacts- Loss of productive soil, albeit during the construction stage only, is envisaged at locations of workers camps, storage, go downs etc. (for the duration of construction) if these are located on fertile areas. The EMP can ensure that no productive areas are used for these purposes and avoid adverse impact. In any case, though it would be a direct impact, it would be reversible as the soil can be stockpile and replace after the construction is complete and the worker camps etc. are closed.

Mitigation Measures- In the selection of borrow areas for the subproject, productive agricultural areas have been avoided for borrowing of materials. The workers camps, storage and godowns will not be established at agricultural land. In case productive areas are taken for storage or workers' camp, the post construction rehabilitation will be ensured.

- **Air Quality**

Impacts- Impacts on air quality during construction are due to generation of dust due to earth moving activities on growth centre market, generation of dust due to excavation and handling of construction materials and vehicle movements. The area will be impacted to some extent by air pollution during construction stage only. Construction stage impacts will be of short term and may have adverse impacts on the construction workers as well as on the settlements adjacent to the growth centre market, especially those in the downwind direction.

Mitigation Measures- Spraying of water is the main way of controlling dust. Water is, in any case, required to be added to fill material during the construction of the growth centre market base. Spraying of growth centre market surfaces, should be undertaken regularly during construction, particularly in the vicinity of markets

- **Noise**

Impacts-A significant increase in noise is expected during construction. Noise and vibration levels in and around the construction sites could increase as a result of operating construction machinery and during unloading and loading of material.

Mitigation Measures-All powered mechanical equipment and machinery shall be fitted with noise abating gear such as mufflers for effective sound reducing, in full compliance with the DOE regulations.

- **Occupational Health and Safety**

Impacts-Construction workers may be affected adversely due to hazardous working environments where high noise, dust, unsafe movement of machinery etc. may be present. Growth centre market in good condition will reduce dust pollution in the subproject location.

Mitigation Measures-The contractor shall instruct his workers in health and safety matters, and requires the workers to use the provided safety equipment. Arranging for regular safety checks of vehicles and material, and allocation of responsibility for checking.

- **Socio-economic**

Impact- Implementing the growth centre market sub-project will bring in economic and social benefits to the people in the subproject areas. The subproject will thus contribute to economic growth from the improved growth centre market through increased employment, industrialization and overseas trade. During construction activities, local unemployed people will get employment and increased income.

Mitigation Measures-The subproject authorities might employ local people wherever possible, hopefully with preference to the qualified landless and jobless poor of the growth centre market areas ensuring socio-economic enhancement in the real terms. Women from PAPs' families could be offered the subproject created facilities.

3.5.3 Operation Phase

- **Air Quality**

Impacts- Dust is the important air pollutant that is generated due to more peoples will be using this market, accumulation of wastes on growth centre market etc. Impact during operation phase is continuous and to some extent unavoidable.

Mitigation Measures- Spraying of water is the main way of controlling dust. In sensitive areas close to growth centre markets sound barriers including berms and tree linings may be required.

- **Noise Quality**

Impacts- During operation, noise levels may also marginally increase as more people use the market Impact on the people noise due to operational activities after completion of the growth centre market would be minimal.

Mitigation Measures- In sensitive areas close to growth centre markets sound barriers including berms and tree linings may be required. Awareness building and administrative measures should be taken to ensure proper maintenance of vehicles.

- **Socio-economic**

Impacts- The improved growth centre market socio-economical positive impacts will be as follows:

- The better growth centre market will create more jobs due to general economic development and motivating to the local people.

Mitigation Measures- Planting should be constructed to shield the view of the marker.

ANNEX-4: MONITORING PLAN AND APPROXIMATE BUDGET FOR THE SAMPLE SUBPROJECTS

The monitoring plan and approximate environmental mitigation cost for the following subprojects are given in **Table 4.1 to 4.8.**

Table 4.1: Environmental Monitoring Plan for Hatubhanga – Kaliakoir - Fulbaria Road via Khatar Hat Road Improvement

Environmental Items	Parameters/ Units	Location	Means of Monitoring	Frequency	Responsibility	
					Implementation	Supervision
Construction Stage						
Air Quality	Measurement of dust and vehicular emissions such as SPM, etc.	Close to School/ Madrasha, Hospital & Villages	Test	once	Contractor	D&SC & LGED
Surface Water Quality	Monitoring of water such as PH, DO, BOD, COD, etc.	River (if any)	Test	once	Contractor	D&SC & LGED
Flora and fauna	Monitoring of flora, fauna and other resources.	in vicinity of construction camp	Inspection	Monthly	Contractor	D&SC & LGED
Traffic movements	Monitoring of traffic control devices	Construction areas	Inspection	Daily	Contractor	D&SC/LGED
Waste management (including construction wastes)	Monitoring of collection, transportation and disposal of solid waste. Inspection of waste disposal sites and construction camps	Construction Yard/Labor Camp	Inspection	Daily	Contractor	D&SC/LGED
Health and safety	Monitoring of health and safety of workers	Construction Site/ Labor Camp	inspection	Daily	Contractor	D&SC/LGED
Reporting and Documentation	Regular reporting	Along the road	Reporting	Daily	Contractor	D&SC/LGED
Operation Stage						
Air Quality	Measurement of dust and vehicular emissions such as SPM, etc.	Close to School/ Madrasha, Hospital & Villages	Test	Once	LGED	LGED
Traffic Safety	Monitoring of traffic control devices	Along the road	Inspection	Once	LGED	LGED
Tree re plantation	Two tree seedlings to be planted for each tree felled	Road side slope	Inspection	Monthly	FD/NGOs	LGED

Table 4.2: Environmental Mitigation Cost for Hatubhanga – Kaliakoir - Fulbaria Road via Khatar Hat Road Improvement

No.	Activities/item	Unit	No	Rate (USD)	Quantity	Amount (USD)
A	**During Construction**					
1	Air Quality	Location	3	500	24	12,000
2	Surface water	Location	2	50	20	2,000
3	Flora and fauna	LS				1,000
4	Traffic Safety	LS				5,000
5	Waste Management	LS				6,000
6	Health and Safety	LS				3,000
7	Reporting and Documentation	LS				2,000
8	Contingency	LS				2,000
	Sub Total:					33,000
B	**During Operation**					
1	Air Quality	Location	3	500	24	12,000
2	Traffic Safety	LS				2,000
3	Tree Re- Plantation	No.		2	32,500	65,000
4.	External Monitor	No	1	2,000	1	6,000
5.	Contingency	LS				2,000
	Sub Total:					85,200
	Total (A+B):					**118,200**

Notes: 1. cutting of trees will be included under the civil works item. 2. Budget for Environmental Specialist will be included in the D&S consultancy services. All these environmental items/activities will be included in the bid document.

Table 4.3: Environmental Monitoring Plan for Mowchak-Fulbaria Road Maintenance

Environmental component	Location	Means of Monitoring	Frequency	Responsibility	
				Implementation	Supervision
Construction Stage					
Dust Management	Dust Generating place Close to School/Madrasha, Hospital, etc.	Observation	As & when required	Contractor	LGED
Worker facilities	Proper sanitation facilities should be provided at construction camp	Observation	As & when required	Contractor	LGED
Health and Safety	Construction Site and Camp sites	Inspection	As & when required	Contractor	LGED

Table 4.4: Environmental Mitigation Cost for Mowchak – Fullbari Road Maintenance

No.	Activities/item	Unit	No	Rate (USD)	Quantity	Amount (USD)
During Construction						
1	Dust management	LS				5,000
2	Worker Facilities	LS				2,000
3	Health and Safety Provision	LS				2,000
4	Contingency	LS				1,000
Total						10,000

Notes: 1. The LGED will hire Individual Consultant for carrying out this maintenance activities.

Table 4.5: Environmental Monitoring Plan for Mirzapur- Kaliakoir Rural Waterways

Environmental component	Parameters/ Units	Location	Means of Monitoring	Monitoring Period/ Frequency	Responsibility	
					Implementation	Supervision
Pre-construction/Design Stage						
Air Quality	PM, SO_x and NOx	Along the river at Ghat, School & Hospital & Village	Test	Once	D&SC	LGED
Noise Level	dB(A)	Along the river at Ghat point and close to School, Hospital & Village	Mesurement	Once	D&SC	LGED
Surface water	pH, TDS, DO, BOD,COD, Oil & Grease	Upstream and downstream location	Test	Twice (one each during lean flow and high flow seasons)	D&SC	LGED
RBM	Heavy Metals (Zn, Hg, Cd, Cr, As, Pb&Cu)	Dredging location of River	Test	once	D&SC	LGED
Construction Stage						
Air Quality	PM, SO_x and NOx	Along the river at School & Hospital & Village	Test	Quarterly	Contractor	LGED
Noise Level	dB(A)	Along the river at Ghat, School & Hospital & Village	Measurement	As & when required	Contractor	LGED
Surface water	pH, TDS, DO, BOD,COD, Oil & Grease	Upstream and downstream location	Test	Twice (one each during lean flow and high flow seasons)	Contractor	LGED/D&SC
RBM	Heavy Metals (Zn, Hg, Cd, Cr, As, Pb&Cu)	Dredging location of River	Test	once	Contractor	LGED/D&SC
Wastes (including construction wastes)	Different kind of wastes such as dredging debris, camp site waste etc.	Labor Camp & Const. Yard	Inspection	Daily	Contractor	LGED
Wildlife	Aquatic Wildlife habitat and movement	Along the River	Observation	Weekly	Contractor	LGED/D&SC
Health and safety	Monitoring of health and safety of workers	Construction Site/ Labor Camp	Inspection	Daily	Contractor	LGED/D&SC
Operation Stage						
Air Quality	PM, SO_x and NOx	Along the River at Ghat, School & Hospital & Village	Test	Once	LGED	LGED

Environmental component	Parameters/ Units	Location	Means of Monitoring	Monitoring Period/ Frequency	Responsibility	
					Implementation	Supervision
Noise Level	dB(A)	Along the River at Ghat, School & Hospital & Village	Measurement	Once	LGED	LGED
Surface water	pH, TDS, DO, BOD,COD, Oil & Grease	Upstream and downstream location	Test	Twice (one each during lean flow and high flow seasons)	LGED	LGED

Table 4.6: Environmental Mitigation Cost for Mirzapur- Kaliakoir Rural Waterways

No.	Activities/item	Unit	No	Rate (USD)	Quantity	Amount (USD)
A.	**During Pre- Construction**					
1.	Air quality	Location	1	1000	3	3,000
2	Noise	Location	4	50	4	200
3	Surface Water (SWQ)	Location	2	25	16	400
4	River bed materials	Location	2	40	16	640
5	Contingency	LS				1,000
Subtotal:						5,240
B	**During Construction**					
1	Air quality	Location	4	1000	3	3,000
2	Noise	Location	4	50	4	200
3	Surface Water (SWQ)	Location	2	25	32	800
4	River Bed Quality	Location	2	40	32	1,280
5	Waste management	Location	4	50	20	1,000
6	Wildlife	LS				3,000
7	Health and Safety	LS				3,000
6	Contingency	LS				1,000
	Sub Total:					13,280
C	**During Operation**					
1	Air quality	Location	1	1000	3	3000
2	Noise	Loc.	4	50	4	200
3	Surface Water (SWQ)	Loc.	2	25	16	400
5.	External Monitor	No	1	2,000	1	2,000
6	Contingency	LS				2,000
	Sub Total:					7,600
	Total (A+B+C):					**26,120**

Notes: 1. cutting of trees on the river bank slopes will be included under the civil works item. 2. Budget for Environmental Specialist will be included in the D&S consultancy services. All these environmental items/activities will be included in the bid document.

Table 4.7: Environmental Monitoring Plan for Fulbaria Growth Centre Markets

Environmental component	Location	Means of Monitoring	Frequency	Responsibility	
				Implementation	Supervision
Construction Stage					
Dust Management	Dust Generating place Close to School/Madrasha, Hospital, etc.	Observation	As & when required	Contractor	LGED
Worker facilities	Proper sanitation facilities should be provided at construction camp	Observation	As & when required	Contractor	LGED
Health and Safety	Construction Site and Camp sites	Inspection	As & when required	Contractor	LGED

Table 4.8: Environmental Mitigation Cost for Fulbaria Growth Centre Markets

No.	Activities/item	Unit	No	Rate (USD)	Quantity	Amount (USD)
During Construction						
1	Dust management	LS				5,000
2	Worker Facilities	LS				2,000
3	Health and Safety Provision	LS				2,000
4	Contingency	LS				1,000
Total						10,000

Notes: 1. cutting of trees on the river bank slopes will be included under the civil works item. 2. Budget for Environmental Specialist will be included in the D&S consultancy services. All these environmental items/activities will be included in the bid document.

ANNEX 5: PUBLIC CONSULTATIONS FINDINGS FOR RTIP-2

Annex 5.1: Public Consultations Findings for Hatubhanga – Kaliakoir - Fulbaria Road via Khatar Hat Road Improvements

PUBLIC CONSULTATION NO. 1
SITE: MATIKHOLA BAZAAR (CHAINAGE 4+000 KM)
ROAD: HATUBHANGA – KALIAKOIR - FULBARIA ROAD VIA KHATAR HAT ROAD, MIRZAPUR TANGAIL
DATE: 26 NOVEMBER 2011
TIME: 1.30 PM TO 3.00 PM.

A consultation meeting was held during 1:30 PM to 3:00 PM on 26 November 2011 at Matikhola Bazaar. Most of the participants were people inhibiting in and around the project area. Around 13 people participated in the meeting. In consultation meeting; environmental and social issues were discussed. The main focus was to dig out information on how does indiscriminate use of natural resources cause poverty and environmental degradation by declining the homestead forests, depleting biodiversity and decreasing livelihood of people. The issue on potential impact of construction works has also been raised.

During the consultation the participants appreciated the road improvement project explaining their desires and expectations. The subproject will increase and improve the quality of their life. Currently, the main medium of transport is foot and some people use motor cycle for long distance travel. The sub-project will ease their turmoil and reduce their commuting time. Moreover, barrier for transporting goods and products will be removed.

From the consultation meeting, it is evident that not much people have knowledge and idea about noise pollution. Most of them are willing to tolerate noise pollution to some extent. Another problem they raised is air pollution during the construction work. Some of them suggested that spraying of water can minimize the dust pollution. For minimize the water pollution they expect necessary measure will be taken during construction work.

Public Consultation at Matikhola Bazzar

Environment Specialist Mr. Ahmed Al Farouq and Mr. Manirul Islam were present as facilitators. Mr. Joinal was selected by the participants to chair the meeting. The participants were spontenious and gave their full consent regarding the road improvement project.

Mr. Jibon Ali, a farmer and Mr. Kamrul Hassan, a student were nominated by the participants to speak for them. They spoke on the project and its impact like noise and dust involved during the operation stages. Their querries were answered by Mr. Islam up to their satisfaction.

Suggestions:

- Effective measure should be taken to minimize the adverse impact of construction works.
- There should be effective mitigation measures in order to reduce noise pollution. Tree plantation and construction of noise protection walls is suggested.
- Water could be sprayed at the construction site in order to reduce dust, particularly during the construction phase.

Table 1: List of Participants during Consultation at Matikhola (Ch 4+000km)

EMF of Rural Transport Improvement Project (RTIP-II)-II

Focus Group Discussions (FGDs)

List of Participants

Focused Group Mat Date & Time 26/11/2011

Location Matikhola Bazar (Ch: 4+000Km)

Sl No.	Name, Address & Telephone No.	Occupation	Signature
1	Abu bakkar. 01745493	farmer	Abu Bakkar
2	Khurshed Alom. 01714215849	Village Doctor	
3	Kamrul Hasan. 01932803887	Student	
4	Almas. 01731085566	Painter	
5	Rasel. 01751860403	Business	Rasel
6	Jamal. 01757575805786	Business	
7	Jibon Ali	Farmer	
8	Yasin	farmer	
9	Abdul Hakim. 01724754926	Village Doctor	Dr Hakim
10	Halim.	Shopkeeper	
11	Anwar Hossain. 01821483098	UP member	
12	Khairul Hossain	farmer	
13	Kader Molla	Business	
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PUBLIC CONSULTATION NO. 2
SITE: KHATIAR HAT-BAZAAR (CH 7+000KM)
ROAD: HATUBHANGA – KALIAKOIR - FULBARIA ROAD VIA KHATAR HAT ROAD, MIRZAPUR TANGAIL
DATE: 26 NOVEMBER 2011
TIME: 4:00 PM TO 5:30 PM

A consultation meeting was held during 4.00 PM to 5:30 PM on 26 November 2011 at Khatiar Har-Bazaar. The meeting was with the people inhibiting in and around the road improvement project who are inloved in different occupation like faremer, businessman, UP member, shop-keepers, and etc. Around 12 people participated in the meeting. In consultation meeting; environmental and social issues were examined. The main focus was to dig out information on how does indiscriminate use of natural resources cause poverty and environmental degradation by declining the homestead forests, depleting biodiversity and decreasing livelihood of people. The issue on potential impact of construction works has also been raised.


Public Consultation at Khatiarhat Bazzar

Khatiar Har-Bazaar is a area where most of the land is occupied under agricultural practice consequently most of the people are engaged in agricutural prodcution. Their socioeconomic conditin is very poor. Most of the people believe that this improvement of road will be bleesing for them. The expect their livelihood will be improved.

Environment Specialist Mr. Mr. Ahmed Al Farouq and Junior Environmental Specialist Mr. Manirul Islam were present as facilitators. Mr. Khan Abdul Baset was selected by the participants to chair the meeting. The participants were spontenious and gave their full consent regarding the improvement of the road as they deeply feel the need of it.

Mr. Abdul Jalil, a farmer and Mr. Md. AKkas Ali, a driver were nominated by the participants to speak on behalf of them. They discussed on the project and its impact like noise and dust involved during the operation stages. Their querries were answered by Mr. Rahman up to their satisfaction.

Suggestions:

- Local employment need to be created during the construction phase.
- There should be acceptable and effective mitigation measures in order to reduce noise and dust pollution.

Table 2: List of Participants during Consultation at Haridaspur (Ch 7+000km)

Focus Group Discussions (FGDs)

List of Participants

Focused Group _____ Date & Time 26/4/2021

Location Khatiar hat Bazar (Ch: 7+000Km)

Sl No.	Name, Address & Telephone No.	Occupation	Signature
1	Khan Abdul Barek. 01740801578	UP member	
2	Hasan sikder. 01731040402	Business	
3	Abdul Kader. 01787282970	farmer	Kader
4	Md. AK Kausali. 01742781234	Driver	
5	Jasimuddin.	Shop Keeper	
6	Saiful. 01740651769	Farmer	
7	Abdul Jalil.	farmer	
8	Hatem Ali.	farmer	
9	Sahabuddin mulla	farmer	
10	Sultan. 01726365233	Mechanic	
11	Mahatab Beparsi	Business	
12	Sharifal Mia	farmer	
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Annex 5.2: Public Consultations Findings for Mowchak – Fulbaria Road Maintenance

SITE: DHENGARBARI VILLAGE
ROAD: MOWCHAK – FULBARIA ROAD, KALIAKOIR, GAZIPUR
DATE: 26 NOVEMBER 2011
TIME: 12.00 PM TO 12.45 PM.

A consultation meeting was held during 12.00 PM to 12.45 PM in the afternoon on 26th November 2011 at Dhengarbari village. The consultation meeting were conducted with the local people (e.g., farmer, Labour Containing Society). Around 7 people participated in the meeting. In consultation meeting; environmental and social issues were examined. The main focus was to dig out information on how does indiscriminate use of natural resources cause poverty and environmental degradation by declining the homestead forests and decreasing livelihood of people. The issue on potential impact of construction works has also been raised.


Public Consultation at Dhengarbari Village

Environment Specialist Mr. Nazim Uddin and LGED Upazila Engineer Mr. Anisur Rahman were present as facilitators. Mr. Anisur Rahman was selected by the participants to chair the meeting. The participants were spontenious and gave their full consent regarding the maintenance of the Mowchak-Fulbaria Road as they deeply feel the need of it.

Suggestions:

- Local employment need to be created during the construction phase.
- There should be acceptable and effective mitigation measures in order to reduce noise and dust pollution.

Table 1: List of Participants during Consultation at Dhengarbari Village

Focus Group Discussions (FGDs)

List of Participants

Focused Group Women Workers Date & Time 26/11/11 (12 30.)
Location Vill - Dhengarbari, LGED Uz. Kaliakoir, Dist. Gazipur.

Sl No.	Name, Address & Telephone No.	Occupation	Signature
1	Jomola Begum	LCS, LGED	[illegible]
2	Moriam Begum	LCS, LGED	[illegible]
3	Shahida Begum	LCS, LGED	[illegible]
4	Momotaj Begum	LCS, LGED	[illegible]
5	Lalla Begum	LCS, LGED	[illegible]
6	Joynal Abedine	Farmer	[illegible]
7	Mojibor Rohman	Farmer	[illegible]
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LCS - Labor Contracting Society.

Annex 5.3: Public Consultations Findings for Mirzapur-Kaliakoir Rural Waterways

SITE: KUNDA GHAT, MIRZAPUR-KALIAKOIR RURAL WATERWAY
DATE: 26 NOVEMBER 2011
TIME: 4.00 PM TO 4.40 PM.

A consultation meeting was held during 4.00 PM to 4:40 PM on 26 November 2011 at Kunda Ghat. The meeting was with the people inhibiting in and around the selected fisherman who are using Turag River for fish capturing. Around 7 fisherman participated in the meeting. In consultation meeting; environmental and social issues were examined. The main focus was to dig out information on how does indiscriminate use of natural resources cause poverty and environmental degradation by decreasing livelihood of people. The issue on potential impact of river dredging works has also been raised.

Public Consultation at Kunda Ghat

Kunda ghat is an area where most of the land is occupied under agricultural practice consequently most of the people are engaged in agricutural prodcution and fisheries. Their socioeconomic condition is very poor. A landless community live here in beside river were very much concern as the rural waterways make them destitute. Some fisherman believe the proposed rural waterways will be bleesing for them. The expect their livelihood will be improved.

Environment Specialist Mr. nazim Uddin and LGED Upazila Engineer Mr. Anisur Rahman were present as facilitators. The participants were spontenious and gave their full consent regarding the Mirzapur-kaliakoir rural waterways as they deeply feel the need of it.

Suggestions:

- Some of the people engaged in fisheries practices so dredging program should consider appropriate measure.
- To mitigate the noise and air pollution improved technology should be used during construction.
- Local employment need to be created during the project implementation phase.
- Care should also be taken for the fauna species.

Table 1: List of Participants during Consultation at Kunda Ghat

Focus Group Discussions (FGDs)

List of Participants

Focused Group Fisherman Date & Time 26.11.2011 and 4.00 PM

Location kunda ghat

Sl No.	Name, Address & Telephone No.	Occupation	Signature
1	Dulal Mia, kunda ghat	Fisherman	
2	Mr. Mithun	Fisherman	
3	Mr. Liton	Fisherman	
4	Mr. Uzzal	Fisherman	
5	Mr. Ripon	Fisherman	
6	Mr. Anwar	Fisherman	
7	Mr. Matin	Fisherman	
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Annex 5.4: Public Consultations Findings for Fulbaria Growth Centre Market

SITE: FULBARIA BAZAAR, FULBARIA GROWTH CENTRE MARKET
DATE: 26 NOVEMBER 2011
TIME: 1.30 PM TO 2.30 PM.

A consultation meeting was held during 1.30 PM to 2:30 PM on November 2011 at Fulbaria bazzar in Fulbaria, Kaliakoir. The meeting was with the people inhibiting in and around the concerned fulbaria growth centre property, market staffs and small and medium vendors and as well as few other local individuals. Around 8 people participated in the meeting. In consultation meeting; environmental and social issues were examined. The main focus was to dig out information on how does indiscriminate use of natural resources cause poverty and environmental degradation by decreasing livelihood of people. The issue on potential impact of construction works has also been raised.


Public Consultation at Fulbaria Bazzar

Senior Environment Specialist Mr. Nazim Uddin and Environmental Specialist Mr. Shafiqur Rahman were present as facilitators. Mr. Abdul Ali Sarker was selected by the participants to chair the meeting. The participants were spontenious and gave their full consent regarding the improvement of the Fulbaria Growth Centre Market also mentioned that they are prepared to eccept temporary problems for the long term development of the Bazzar.

Suggestions:

- There should be an effective and acceptable mitigation measure for the people doing business in the fulbaria bazzar who will be impacted by the project.
- If any shop keepers and small businessmen are evacuated by the subproject they require convenient resettlement and appropriate compensation.
- Local employment need to be created during the construction phase.
- There should be effective mitigation measures in order to reduce noise and dust pollution.
- Fund to be utilized in constructive improvement of the fulbaria bazzar rather unproductive beautification.

Table 1: List of Participants during Consultation at Fulbaria Bazzar

Focus Group Discussions (FGDs)

List of Participants

Focused Group Stakeholder from Fulbaria Bazar Date & Time 26 November 2011 at 1:30 pm
Location Fulbaria Bazzar

Sl No.	Name, Address & Telephone No.	Occupation	Signature
1	Kamal Hossain, Fulbaria, 01728100797	Meghna Life Insurance	Kamal
2	Bilal Hossain	Businessman	
3	Matiar Rahman	Milk seller	
4	Aminul Islam Jarka	Ex- member Union Parishad	
5	Shah Badsha	Businessman	
6	Md. fazlur Rahma	Imam, Bazar Mosque	Md. Fazlur Rahman
7	Abdul Barek	Agriculture	
8	Abdul Ali Sarkar	Businessman	
9			
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ANNEX 6: SCREENING CHECKLIST FOR SAMPLE SUBPROJECT UNDER RTIP-2

Annex –6(a): Screening Checklist for Rural Road Improvements

Name of Sub-project: Hatubhanga – Kaliakoir – Fulbaria Road Improvement via Khatar Hat Road

Location of Sub-project:1) Upazila: Mirzapur **2) District:** Tangail

Major Components of the Improvement Works: Road Improvement/Structure Construction.

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
A. Potential Environmental Impacts during planning and design phase/ Sub-project siting. Is the sub-project area adjacent to or within any of the following environmentally sensitive areas?						
▪ Protected Area (Forest)		√				
▪ Wetland (Beel, Haor), River	√				√	About 55m width river crossing the road at approximate chaiange of 10+850
▪ National Park		√				
▪ Wildlife sanctuary		√				
▪ Buffer zone of protected areas		√				
▪ Special area for protecting biodiversity		√				
B. Potential Environmental Impacts from construction of improved road. Will the sub-project cause……						
▪ loss of agricultural land ?	√			√		Land will be required to raise the formation level to construct the embankment to LGED standard.
▪ negative effects on rare (vulnerable), threatened or endangered species of flora or their habitat ?		√				
▪ negative effects on designated		√				

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
wetlands ?						
▪ negative effects on wildlife habitat, populations, corridors or movement ?		√				
▪ negative effects on locally important or valued ecosystems or vegetations ?		√				
▪ destruction of trees and vegetation	√		√			About 16,246 trees such as Gozari, Akasmoni, Eucalyptus, bamboo, etc. to be removed.
▪ impact on fish migration and navigation ?		√				
▪ obstruction of natural connection between river and wetlands inside project area ?		√				
▪ water logging in polder areas ?		√				
▪ insufficient drainage ?	√				√	Adequate cross drainage capacity will be provided as part of the sub-project.
▪ negative effects on surface water quality?	√				√	
▪ negative effects on groundwater quality, quantity or movement?	√				√	
▪ loss of existing buildings, property, economic livelihood ?	√				√	At bazaar such as Khatar Hat-bazaar, Azguna bazaar etc. some shops need to shifted.
▪ increased soil erosion and/or sedimentation ?		√				
▪ negative impact on soil stability and compactness ?		√				
▪ impacts on sustainability of associated construction waste disposal ?	√				√	Proper disposal of wastes of construction materials to be monitored during construction.
▪ traffic disturbances due to construction material transport and wastes ?		√				
▪ increased noise due to transportation of equipment and construction materials ?	√			√		Some noise but impact will be minimal as noise level will be within allowable limit.

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
▪ increased noise due to day-to-day construction activities ?	√			√		Some noise but impact will be minimal as noise level will be within allowable limit.
▪ increased wind-blown dust from material (e.g. fine aggregate) storage areas ?	√			√		There will be some dust nuisance during construction but proper environmental code of practice will be in place to reduce dust emission.
▪ health risks to labors involve in activities ?	√			√		Some risk during construction is anticipated which will be taken care of by adopting remedial measures incorporated in the contract document and by monitoring.
C. Potential Impacts of the improved road. Will the improved road cause …….						
▪ negative effects on neighborhood or community characters ?		√				
▪ negative effects on local business, institutions or public facilities ?	√				√	Some mosques, religious school and shops (at different bazaars) will be exposed to increased noise and dust pollution but impact will be minimal.
▪ potential social conflict between occupational groups-farmers vs. fisheries ?		√				
▪ degradation or disturbance of historical or culturally important sites (mosque, graveyards, monuments etc.) ?	√				√	There are a few mosques and religious school which are located outside road alignment and will not be affected except exposure to dust nuisance and noise pollution from increased vehicular traffic.
▪ blockage of navigation system ?		√				
▪ impediments to movements of people and animals ?		√				
▪ conflicts in water supply rights and related social conflicts ?		√				
▪ air quality ?	√				√	The number of motor vehicle is expected to increase after road improvement.

*Please consider scale of 1 -2 for Low, 2 -3 for Medium and 5 for High impact.

Note: Please add any other screening questions relevant to the sub-project. Also provide additional comments and/or positive impacts in 'remarks' column.

Assessment:

The proposed road (sub-project) does not fall within any environmentally sensitive area. The existing road at one point passes along existing river bank for about 70 m needing retaining wall and at number of locations passes along a number of ponds and /ditches where slope stabilization and widening will be required. This will have positive impact in reducing the risk of erosion. Only one bridge of span less than 15m (photograph – 3) will need to be constructed across a drainage canal which goes dry during lean season. Though the sub-project is not going to pose severe threat to important environmental components except some nuisance due to dust emission during construction, considering the total length, number of trees to be removed and additional land to be acquired, the subproject is recommended to be categorized as Medium impact sub-project.

Categorization:

Category	Action Required	Assessment
Low Impact		
Medium Impact	The sub-project needs limited environmental study and overall environmental Management Plan (EMP).	√
High Impact		

Surveyed by: **Designation:** **Signature:** **Date:**

Annex –6(b): Screening Checklist for Rural Road Maintenance

Name of Sub-project: Mowchak-Fulbaria Road Maintenance (UZR).

Location of Sub-project: 1). Upazila: Kaliakoir **2). District:** Gazipur

Major Components of the Improvement works: Road Maintenance

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
D. Potential Environmental Impacts during planning and design phase/ Sub-project siting. Is the sub-project area adjacent to or within any of the following environmentally sensitive areas?						
▪ Protected Area (Forest)		√				
▪ Wetland (Beel, Haor)		√				
▪ National Park		√				
▪ Wildlife sanctuary		√				
▪ Buffer zone of protected areas		√				
▪ Special area for protecting biodiversity		√				
E. Potential Environmental Impacts from construction of maintenance road. Will the sub-project cause……						
▪ loss of agricultural land ?		√				
▪ negative effects on rare (vulnerable), threatened or endangered species of flora or their habitat ?		√				
▪ negative effects on designated wetlands ?		√				
▪ negative effects on wildlife habitat, populations, corridors or movement		√				

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
?						
▪ negative effects on locally important or valued ecosystems or vegetations ?		√				
▪ destruction of trees and vegetation	√				√	Some government owned trees to be removed.
▪ impact on fish migration and navigation ?		√				
▪ obstruction of natural connection between river and wetlands inside project area ?		√				
▪ water logging in polder areas ?		√				
▪ insufficient drainage ?		√				
▪ negative effects on surface water quality?		√				
▪ negative effects on groundwater quality, quantity or movement?		√				
▪ loss of existing buildings, property, economic livelihood ?		√				
▪ increased soil erosion and/or sedimentation ?		√				
▪ negative impact on soil stability and compactness ?		√				
▪ impacts on sustainability of associated construction waste disposal ?	√				√	Proper disposal of wastes of construction materials to be monitored during construction.
▪ traffic disturbances due to construction material transport and wastes ?	√				√	Minimum disturbance is anticipated due to earthen road and traffic load is also less at present.
▪ increased noise due to transportation of equipment and construction materials ?	√				√	Some noise but impact will be minimal as noise level will be within allowable limit.
▪ increased noise due to day-to-day construction activities ?	√				√	Some noise but impact will be minimal as noise level will be within allowable limit.
▪ increased wind-blown dust from material (e.g. fine aggregate) storage areas ?	√				√	There will be some dust nuisance during construction but proper environmental code of practice will be in place to reduce dust emission.

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
▪ health risks to labors involve in activities ?	√				√	Some risk during construction is anticipated which will be taken care of by adopting remedial measures incorporated in the contract document and by monitoring.
F. Potential Impacts of the maintenance road. Will the improved road cause …….						
▪ negative effects on neighborhood or community characters ?		√				
▪ negative effects on local business, institutions or public facilities ?	√				√	Some mosques cum religious school will be exposed to increased noise and dust pollution but impact will be minimal.
▪ potential social conflict between occupational groups-farmers vs. fisheries ?		√				
▪ degradation or disturbance of historical or culturally important sites (mosque, graveyards, monuments etc.) ?		√				
▪ blockage of navigation system ?		√				
▪ impediments to movements of people and animals ?		√				
▪ conflicts in water supply rights and related social conflicts ?		√				
▪ air quality ?	√				√	The number of motor vehicle is expected to increase after road maintenance.

*Please consider scale of 1 -2 for Low, 2 -3 for Medium and 5 for High impact.

Note: Please add any other screening questions relevant to the sub-project. Also provide additional comments and/or positive impacts in 'remarks' column.

Assessment:

The proposed road maintenance (sub-project) does not fall within any environmentally sensitive area. The existing road passes at start along the small shops and at number of locations passes along a number of ponds and /ditches where slope stabilization and widening will be required. This

will have positive impact in reducing the risk of erosion. However, for maintenance of the road as per LGED standard, land acquisition will not require. Though the sub-project is not going to pose severe threat to important environmental components except some nuisance due to dust emission during maintenance, considering the total length, number of trees to be removed and additional land would not acquired, the subproject is recommended to be categorized as Medium impact sub-project.

Categorization:

Category	Action Required	Assessment
Low Impact	The sub-project needs limited environmental study.	√
Medium Impact		
High Impact		

Surveyed by: **Designation:** **Signature:** **Date:**

Annex 6 (c): Screening Checklist for Improvement of Rural Waterway

Name of Sub-project: Silt Removal by Manual/Locally Manufactured Equipment in Turag-Bansi River from Kaliakoir to Mirzapur

Location of Sub-project: 1). Upazila: Kaliakoir **2). District:** Gazipur

Major Component: Silt Removal /Landing Station/Protection Works/Navigation Aids

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
Is the project site/ activity falls within and/ or will it affect the following environmentally sensitive areas?						
A. Environmental impacts during Planning and Design (Sub-Project Siting) Phase						
▪ Protected area		√				
▪ Wetland		√				Wetlands (Haola Beel, Ujan Beel) are about 7 to 10 km away get connected during monsoon. Little or no impact is anticipated.
▪ Reserve forest		√				
▪ National park		√				
▪ Buffer zone of protected areas		√				
▪ Special area for protecting biodiversity		√				
▪ Near cultural heritage sites		√				
▪ Areas with rare or endangered flora or fauna		√				
B. Potential impacts from Construction of improved Waterway Will the intervention cause …….						
▪ Loss of agricultural land?		√				
▪ Availability of irrigation water?	√				√	The intervention will increase availability of water for irrigation.
▪ Affect rare, threatened or endangered aquatic species or their habitat?		√				
▪ Affects designated fish sanctuary?		√				
▪ Degradation or disturbance of historical or culturally important sites (mosque, graveyards, monuments etc.)?		√				
▪ Displacement of habitation?		√				
▪ Reduction of soil fertility by dredged materials?		√				
▪ Increase river bank erosion?		√				

▪ Affect fishers?		√				There will be some localized disturbance but total fish population will remain unaffected.
▪ Affect boat traffic?	√				√	Limited disturbance during silt removal operation.
▪ Require additional land for disposal of spoils?		√				
▪ Increase road traffic?		√				
▪ Affect surface water quality?		√				
▪ Affect groundwater quality?		√				
▪ Loss of property, economic livelihood?		√				Spoil will be disposed on the river bank in compartments.
▪ Impacts on air quality?		√				
▪ Traffic disturbances due to waterway improvement?	√				√	Little obstruction during disposal of silt from water way
▪ Increased noise due to transportation of equipment and tools?	√				√	Only manually operated tools will be used for the purpose. As such noise level will be within allowable limit.
▪ Increased noise due to construction of landing facilities?	√				√	Locally manufactured hand tools will be used for the purpose. So noise level will be within allowable limit.
▪ Risks due to dredging/jetty construction on health and safety to workers?	√				√	Appropriate personal protective equipment will be used. So risk will be minimal.
▪ Cause drainage congestion?	√				√	Improper spoil disposal may cause drainage congestion. To avoid this adequate measure will be in place.
▪ Nuisance due to improper disposal of solid wastes?	√				√	To address this aspect environmental code of practice and monitoring will be practiced.
▪ Unhygienic condition due to lack of sanitary toilet and potable water?	√				√	To ensure hygienic condition at camp site sanitary toilet and potable water supply will be ensured.
▪ increase dust emission from stack yard	√				√	To reduce dust emission appropriate measures will be adopted.
C. Potential Impacts during operation phase Will the intervention cause …….						
▪ Enhance safety of the waterway?	√			√		Navigation aids will be installed thereby enhancing safety of the waterway.

▪ Air pollution due to increase of boat traffic?	√				√	There will be some air pollution due to emission from increased number of boat traffic.
▪ Water pollution due to increase in boat traffic?	√				√	There will be water pollution due to leakage of oil and lubricant from mechanized boat traffic. But impact will be minimal as measure will be adopted to reduce such leakage.
▪ Increase in livestock population?	√				√	There may be increase in livestock population as more fodder will be available due to availability of more irrigation water for crop production.
▪ Potential social conflict between occupational groups- farmers fisheries/businessman vs. transporters?		√				
▪ Increase in movement of people and animals?		√				
▪ Affect Indigenous people?		√				
▪ Water pollution due to use of Jetty/ Ghat?	√				√	Minimal pollution.
▪ Increase in agriculture production?	√				√	Increase in crop production due to availability of more water for irrigation during lean season.
▪ Decrease of fish production?		√				With improved waterway fish population may increase.

Major Component: Silt Removal /Landing Station/Protection Works/Navigation Aids

*Please consider scale of 1 - 2 for Low, 3- 4 for Medium and 5 for High Impact

Note: Please add any other screening questions relevant to the sub-project. Also provide additional comments and/or positive impacts in 'remarks' column.

Assessment:

The proposed waterway (Kaliakoir – Mirzapur 18.7 Km) passes mostly through agricultural land, home stead land, brick fields, a few patches of Gajari forest and some market places including growth centers. No endangered and/or threatened species both aquatic and terrestrial are anticipated to be affected or any religious institution or settlement will need to be shifted including land acquisition by the sub-project intervention. Major environmental concerns due to proposed improvement are disposal of spoils and effect on biodiversity. Locally manufactured equipment will be used for removal of silt from the waterway and disposed to high river bank inside compartments. Adequate precautions to be taken so that the spoils do not flow back in dredged cut. There will be some disturbance to the aquatic flora and fauna including vegetation on the river bank where spoils will be disposed. Since spoils will be removed from the shallower reaches covering only a part of the waterway, the extent and duration of the

impact are short, localized as well as reversible, the sub-project may be categorized as low impact one. However, considering the fact that the sub-project is extended over long distance under two Upazilas of two different districts, lies within national reserve forest (Madhupur Tract) which is ecologically sensitive, including the fact that the sub-project is considered as a pilot project, it is recommended that the sub-project may be treated as medium impact category.

Environmental Category:

Category	Action Required	Assessment
Low Impact		
Medium Impact	The sub-project needs Limited Environmental (LEA) Study and an indicative Environmental Management Plan (EMP).	√
High Impact		

Surveyed by: **Designation:** **Signature:** **Date:**

Annex –6(d): Screening Checklist for Growth Centre Market

Name of Sub-project: Fulbaria Growth Centre Market

Location of Sub-project: 1). **Upazila**: Kaliakoir 2). **District**: Gazipur

Major Components of the Improvement works: Improvement of Fulbaria Growth Centre Market

Screening Questions	Yes	No	Scale of Impact			Remarks
			High	Medium	Low	
G. Potential Environmental Impacts during planning and design phase Sub-project Siting Is the sub-project area adjacent to or within any of the following environmentally sensitive areas?						
▪ Protected Area (Forest)		√				
▪ Wetland (Beel, Haor)		√				Not applicable
▪ National Park		√				Do
▪ Wildlife sanctuary		√				Do
▪ Buffer zone of protected areas		√				Do
▪ Special area for protecting biodiversity		√				Do
H. Potential Environmental Impacts from construction of improved road Will the sub-project cause……						
▪ loss of agricultural land ?	√				√	The sub-project is close to agricultural land. As such very little agricultural land will be affected. Affected persons will be compensated under the RTIP-2, LGED.
▪ negative effects on rare (vulnerable), threatened or endangered species of flora or their habitat ?		√				No such species anticipated to be affected by the intervention.
▪ negative effects on designated wetlands ?		√				Not applicable
▪ negative effects on wildlife habitat, populations, corridors or movement		√				Do

Screening Questions	Yes	No	Scale of Impact			Remarks
			High	Medium	Low	
?						
▪ negative effects on locally important or valued ecosystems or vegetations ?		√				Do
▪ destruction of trees and vegetation	√				√	Only few trees will be cutting during growth centre improment
▪ Impact on fish migration and navigation?		√				Not applicable
▪ Obstruction of natural connection between river and wetlands inside project area?		√				Do
▪ Water logging in sub-project areas?		√				Not anticipated
▪ Insufficient drainage?		√				Do
▪ Negative effects on surface water quality?	√				√	Water quality may be affected if construction works continue during rainy season.
▪ Negative effects on groundwater quality, quantity or movement?		√				Not anticipated
▪ Loss of existing buildings, property, economic livelihood?		√				Do
▪ Increased soil erosion and/or sedimentation?		√				Not anticipated if proper slope and turfing are maintained as per design specification.
▪ negative impact on soil stability and compactness ?		√				Not anticipated
▪ Impacts on sustainability of associated construction waste disposal?		√				Do
▪ Traffic disturbances due to construction material transport and wastes?		√				
▪ Increased noise due to transportation of equipment and construction materials?		√				Little noise not exceeding limit as prescribed by DOE.
▪ Increased noise due to day-to-day construction activities?		√				Do
▪ Health risks to labors involve in activities?	√				√	There will be some risk but proper environmental code of practice will be followed to minimize negative effects

Screening Questions	Yes	No	Scale of Impact			Remarks
			High	Medium	Low	
						of this aspect.
▪ Increased wind-blown dust from material (e.g. fine aggregate) storage areas?	√				√	Chances for windblown dust are anticipated but preventive measures will be in place to limit dust emission.
I. Potential Impacts of the Improved Road Will the demonstration cause …….						
▪ Negative effects on neighborhood or community characters?		√				Not anticipated
▪ Negative effects on local business, institutions or public facilities?	√				√	Some shops/markets will be exposed to increased noise and dust pollution but impact will be minimal.
▪ Potential social conflict between occupational groups-farmers vs. fisheries?		√				Do
▪ Degradation or disturbance of historical or culturally important sites (mosque, graveyards, monuments etc.)?		√				
▪ Blockage of navigation system?		√				Not applicable
▪ Impediments to movements of people and animals?		√				Not anticipated
▪ Conflicts in water supply rights and related social conflicts?		√				Do
▪ Air quality?		√			√	

*Please consider scale of 1 -2 for Low, 2 -3 for Medium and 5 for High impact.

Note: Please add any other screening questions relevant to the sub-project. Also provide additional comments and/or positive impacts in 'remarks' column.

Assessment:

The proposed Growth Centre Market (Fulbaria) exist mostly non-agricultural high land (flood free). No endangered and/or threatened species are anticipated to be damaged or any religious institution or settlement will be affected by the sub-project intervention. So the sub-project is not going to

pose serious threat to existing environment and is recommended to be considered as low impact one subject to compliance with the existing environmental code of practice.

Categorization:

Category	Action Required	Assessment
Low Impact	The sub-project needs environmental survey and environmental code of practice to be followed during sub-project implementation.	√
Medium Impact		
High Impact		

Surveyed by: **Designation:** **Signature:** **Date:**

ANNEX 7: SAMPLE SCREENING CHECKLIST FOR RTIP-2

Annex –7(a): Screening Checklist for Rural Road Improvements

Name of Sub-project: ……..

Location of Sub-project: 1). Upazila: …… **2). District:** …….

Major Components of the Improvement works: ……..

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
J. Potential Environmental Impacts during planning and design phase/ Sub-project siting. Is the sub-project area adjacent to or within any of the following environmentally sensitive areas?						
▪ Protected Area (Forest)						
▪ Wetland (Beel, Haor)						
▪ National Park						
▪ Wildlife sanctuary						
▪ Buffer zone of protected areas						
▪ Special area for protecting biodiversity						
K. Potential Environmental Impacts from construction of improved road. Will the sub-project cause……						
▪ loss of agricultural land ?						
▪ negative effects on rare (vulnerable), threatened or endangered species of flora or their habitat ?						
▪ negative effects on designated wetlands ?						

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
▪ negative effects on wildlife habitat, populations, corridors or movement ?						
▪ negative effects on locally important or valued ecosystems or vegetations ?						
▪ destruction of trees and vegetation						
▪ impact on fish migration and navigation ?						
▪ obstruction of natural connection between river and wetlands inside project area ?						
▪ water logging in polder areas ?						
▪ insufficient drainage ?						
▪ negative effects on surface water quality?						
▪ negative effects on groundwater quality, quantity or movement?						
▪ loss of existing buildings, property, economic livelihood ?						
▪ increased soil erosion and/or sedimentation ?						
▪ negative impact on soil stability and compactness ?						
▪ impacts on sustainability of associated construction waste disposal ?						
▪ traffic disturbances due to construction material transport and wastes ?						
▪ increased noise due to transportation of equipment and construction materials ?						
▪ increased noise due to day-to-day construction activities ?						
▪ increased wind-blown dust from						

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
material (e.g. fine aggregate) storage areas ?						
▪ health risks to labors involve in activities ?						
L. Potential Impacts of the improved road. Will the improved road cause …….						
▪ negative effects on neighborhood or community characters ?						
▪ negative effects on local business, institutions or public facilities ?						
▪ potential social conflict between occupational groups-farmers vs. fisheries ?						
▪ degradation or disturbance of historical or culturally important sites (mosque, graveyards, monuments etc.) ?						
▪ blockage of navigation system ?						
▪ impediments to movements of people and animals ?						
▪ conflicts in water supply rights and related social conflicts ?						
▪ air quality ?						

*Please consider scale of 1 -2 for Low, 2 -3 for Medium and 5 for High impact.

Note: Please add any other screening questions relevant to the sub-project. Also provide additional comments and/or positive impacts in 'remarks' column.

Assessment:

……

Categorization:

Category	Action Required	Assessment
Low Impact		
Medium Impact		
High Impact		

Surveyed by: **Designation:** **Signature:** **Date:**

Annex –7(b): Screening Checklist for Rural Road Maintenance

Name of Sub-project: ……..

Location of Sub-project: 1). Upazila: …… **2). District:** ……..

Major Components of the Improvement works: ……..

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
M. Potential Environmental Impacts during planning and design phase/ Sub-project siting. Is the sub-project area adjacent to or within any of the following environmentally sensitive areas?						
▪ Protected Area (Forest)						
▪ Wetland (Beel, Haor)						
▪ National Park						
▪ Wildlife sanctuary						
▪ Buffer zone of protected areas						
▪ Special area for protecting biodiversity						
N. Potential Environmental Impacts from construction of maintenance road. Will the sub-project cause……						
▪ loss of agricultural land ?						
▪ negative effects on rare (vulnerable), threatened or endangered species of flora or their habitat ?						
▪ negative effects on designated wetlands ?						
▪ negative effects on wildlife habitat,						

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
populations, corridors or movement ?						
▪ negative effects on locally important or valued ecosystems or vegetations ?						
▪ destruction of trees and vegetation						
▪ impact on fish migration and navigation ?						
▪ obstruction of natural connection between river and wetlands inside project area ?						
▪ water logging in polder areas ?						
▪ insufficient drainage ?						
▪ negative effects on surface water quality?						
▪ negative effects on groundwater quality, quantity or movement?						
▪ loss of existing buildings, property, economic livelihood ?						
▪ increased soil erosion and/or sedimentation ?						
▪ negative impact on soil stability and compactness ?						
▪ impacts on sustainability of associated construction waste disposal ?						
▪ traffic disturbances due to construction material transport and wastes ?						
▪ increased noise due to transportation of equipment and construction materials ?						
▪ increased noise due to day-to-day construction activities ?						
▪ increased wind-blown dust from material (e.g. fine aggregate)						

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
storage areas ?						
▪ health risks to labors involve in activities ?						
O. Potential Impacts of the maintenance road. Will the improved road cause …….						
▪ negative effects on neighborhood or community characters ?						
▪ negative effects on local business, institutions or public facilities ?						
▪ potential social conflict between occupational groups-farmers vs. fisheries ?						
▪ degradation or disturbance of historical or culturally important sites (mosque, graveyards, monuments etc.) ?						
▪ blockage of navigation system ?						
▪ impediments to movements of people and animals ?						
▪ conflicts in water supply rights and related social conflicts ?						
▪ air quality ?						

*Please consider scale of 1 -2 for Low, 2 -3 for Medium and 5 for High impact.

Note: Please add any other screening questions relevant to the sub-project. Also provide additional comments and/or positive impacts in 'remarks' column.

Assessment:

……

Categorization:

Category	**Action Required**	**Assessment**
Low Impact		
Medium Impact		
High Impact		

Surveyed by: **Designation:** **Signature:** **Date:**

Annex 7 (c): Screening Checklist for Improvement of Rural Waterway

Name of Sub-project: ……

Location of Sub-project: 1). Upazila: …… **2). District:** ……..

Major Component: ……

Screening Questions	Yes	No	Scale of Impact*			Remarks
			High	Medium	Low	
Is the project site/ activity falls within and/ or will it affect the following environmentally sensitive areas?						
A. Environmental impacts during Planning and Design (Sub-Project Siting) Phase						
▪ Protected area						
▪ Wetland						
▪ Reserve forest						
▪ National park						
▪ Buffer zone of protected areas						
▪ Special area for protecting biodiversity						
▪ Near cultural heritage sites						
▪ Areas with rare or endangered flora or fauna						
B. Potential impacts from Construction of improved Waterway Will the intervention cause …….						
▪ Loss of agricultural land?						
▪ Availability of irrigation water?						
▪ Affect rare, threatened or endangered aquatic species or their habitat?						
▪ Affects designated fish sanctuary?						
▪ Degradation or disturbance of historical or culturally important sites (mosque, graveyards, monuments etc.)?						
▪ Displacement of habitation?						
▪ Reduction of soil fertility by dredged materials?						
▪ Increase river bank erosion?						
▪ Affect fishers?						
▪ Affect boat traffic?						
▪ Require additional land for disposal of spoils?						
▪ Increase road traffic?						

▪ Affect surface water quality?						
▪ Affect groundwater quality?						
▪ Loss of property, economic livelihood?						
▪ Impacts on air quality?						
▪ Traffic disturbances due to waterway improvement?						
▪ Increased noise due to transportation of equipment and tools?						
▪ Increased noise due to construction of landing facilities?						
▪ Risks due to dredging/jetty construction on health and safety to workers?						
▪ Cause drainage congestion?						
▪ Nuisance due to improper disposal of solid wastes?						
▪ Unhygienic condition due to lack of sanitary toilet and potable water?						
▪ increase dust emission from stack yard						
C. Potential Impacts during operation phase Will the intervention cause …….						
▪ Enhance safety of the waterway?						
▪ Air pollution due to increase of boat traffic?						
▪ Water pollution due to increase in boat traffic?						
▪ Increase in livestock population?						
▪ Potential social conflict between occupational groups- farmers fisheries/businessman vs. transporters?						
▪ Increase in movement of people and animals?						
▪ Affect Indigenous people?						
▪ Water pollution due to use of Jetty/ Ghat?						
▪ Increase in agriculture production?						
▪ Decrease of fish production?						

Major Component: Silt Removal /Landing Station/Protection Works/Navigation Aids

*Please consider scale of 1 - 2 for Low, 3- 4 for Medium and 5 for High Impact

Note: Please add any other screening questions relevant to the sub-project. Also provide additional comments and/or positive impacts in 'remarks' column.

Assessment:

……

Environmental Category:

Category	Action Required	Assessment
Low Impact		
Medium Impact		
High Impact		

Surveyed by: **Designation:** **Signature:** **Date:**

Annex –7(d): Screening Checklist for Growth Centre Market

Name of Sub-project: ……

Location of Sub-project: 1). **Upazila**: …….. 2). **District**: ……

Major Components of the Improvement works: ……..

Screening Questions	Yes	No	Scale of Impact			Remarks
			High	Medium	Low	
P. Potential Environmental Impacts during planning and design phase Sub-project Siting Is the sub-project area adjacent to or within any of the following environmentally sensitive areas?						
▪ Protected Area (Forest)						
▪ Wetland (Beel, Haor)						
▪ National Park						
▪ Wildlife sanctuary						
▪ Buffer zone of protected areas						
▪ Special area for protecting biodiversity						
Q. Potential Environmental Impacts from construction of improved road Will the sub-project cause……						
▪ loss of agricultural land ?						
▪ negative effects on rare (vulnerable), threatened or endangered species of flora or their habitat ?						
▪ negative effects on designated wetlands ?						
▪ negative effects on wildlife habitat, populations, corridors or movement ?						
▪ negative effects on locally important						

Screening Questions	Yes	No	Scale of Impact			Remarks
			High	Medium	Low	
or valued ecosystems or vegetations ?						
▪ destruction of trees and vegetation						
▪ Impact on fish migration and navigation?						
▪ Obstruction of natural connection between river and wetlands inside project area?						
▪ Water logging in sub-project areas?						
▪ Insufficient drainage?						
▪ Negative effects on surface water quality?						
▪ Negative effects on groundwater quality, quantity or movement?						
▪ Loss of existing buildings, property, economic livelihood?						
▪ Increased soil erosion and/or sedimentation?						
▪ negative impact on soil stability and compactness ?						
▪ Impacts on sustainability of associated construction waste disposal?						
▪ Traffic disturbances due to construction material transport and wastes?						
▪ Increased noise due to transportation of equipment and construction materials?						
▪ Increased noise due to day-to-day construction activities?						
▪ Health risks to labors involve in activities?						
▪ Increased wind-blown dust from material (e.g. fine aggregate) storage areas?						

Screening Questions	Yes	No	Scale of Impact			Remarks
			High	Medium	Low	
R. Potential Impacts of the Improved Road Will the demonstration cause …….						
▪ Negative effects on neighborhood or community characters?						
▪ Negative effects on local business, institutions or public facilities?						
▪ Potential social conflict between occupational groups-farmers vs. fisheries?						
▪ Degradation or disturbance of historical or culturally important sites (mosque, graveyards, monuments etc.)?						
▪ Blockage of navigation system?						
▪ Impediments to movements of people and animals?						
▪ Conflicts in water supply rights and related social conflicts?						
▪ Air quality?						

*Please consider scale of 1 -2 for Low, 2 -3 for Medium and 5 for High impact.

Note: Please add any other screening questions relevant to the sub-project. Also provide additional comments and/or positive impacts in 'remarks' column.

Assessment:

……..

Categorization:

Category	Action Required	Assessment
Low Impact		
Medium Impact		
High Impact		

Surveyed by: **Designation:** **Signature:** **Date:**

ANNEX 8: ENVIRONMENTAL CODE OF PRACTICES (ECP)

GUIDELINE-1: SITE PREPARATION

1. General

The preparation of site for construction involves: (i) clearing of land required for construction; and (ii) management of activities such as traffic during construction. These activities have been detailed out for civil works of RTIP-2 activities separately.

2. RTIP-2 activities

a. Site Preparation Activities

After obtaining the consent of the community on the alignment, the Project Implementation Cell (PIC) of the District Office shall be responsible to stake out the alignment by establishing working benchmarks on ground. It shall be the responsibility of the PIC to take over the possession of the proposed RoW and hand over the land width required clear of all encumbrances to the Contractor. Activities pertaining to the clearance of land and relocation of utilities need to be initiated by the PIC well in advance to avoid any delays in handing over of site to the Contractor. Assistance of the Revenue Department shall be sought in accomplishing the task. To summarize, the PIC's responsibilities before handing over the site to the contractor include:

- Clearance of encroachments within proposed ROW;
- Initiation of process for legal transfer of land title;
- Alignment modification or relocation of common property resources in consultation with the local community;
- Alignment modification or relocation of utilities in consultation with the various government departments; and
- Obtain clearances required from government agencies for

- Cutting of trees; and
- Land Diversion of forestlands, etc.

b. Site Preparation Activities by the Contractor

Site preparation shall involve formation of the road base wherein it is ready for construction of protective/drainage works, carriageway, shoulders, parapets and other road furniture. The PIC shall transfer the land for civil works to the Contractor after peg marking of the alignment.

The Contractor shall verify the benchmarks soon after taking possession of the site. The Contractor, prior to initiation of site preparation activities, shall highlight any deviations/discrepancies in these benchmarks to the PIC in writing. The contractor shall submit the schedules and methods of operations for various items during the construction operations to the PIC for approval. The Contractor shall commence operations at site only after the approval of the schedules by the PIC.

The activities to be undertaken by the contractor during the clearing and grubbing of the site are as follows:

The clearance of site shall involve the removal of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, part of topsoil and rubbish. Towards this end, the Contractor shall adopt the following measures: (i) Limiting the surface area of erodible earth material exposed by clearing and grubbing; (ii) Conservation of top soil and stock piling as per the measures suggested as part of Guideline 7, “Top Soil Salvage Storage and Replacement”; and (iii) Carry out necessary backfilling of pits resulting from uprooting of trees and stumps with excavated or approved materials to the required compaction conforming to the surrounding area. To minimize the adverse impact on vegetation, only ground cover/shrubs that impinge directly on the permanent works shall be removed. Cutting of trees and vegetation outside the working area shall be avoided under all circumstances. In case the alignment passes through forest areas, The Forest Ranger shall be consulted for identification of presence of any rare/endangered species within the proposed road way and water way. Protection of such species if found shall be as per the directions of the Forest Department.

The locations for disposal of grubbing waste shall be finalized prior to the start of the works on any particular section of the road. The selection of the site shall be approved by the PIC. The criteria for disposal of wastes shall be in accordance with the measures given in Guideline on, “Waste Management and Debris Disposal” (Guideline 2).

In locations where erosion or sedimentation is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion and sedimentation control features can follow immediately, if the project conditions permit. Dismantling of structures and culverts shall be carried out in a manner as not to damage the remaining required portion of structures and other surrounding properties. The disposal of wastes shall be in accordance with the provisions given in Guideline 2, “Waste Management”. The following precautions shall be adopted:

- The waste generated shall not be disposed off in watercourses, to avoid hindrance to the flow,
- All necessary measures shall be taken while working close to cross drainage channels to prevent earthwork, stonework as well as the method of operation from impeding cross drainage at rivers, water canals and existing irrigation and drainage systems.

The designated sites duly approved by Implementing Agency shall be cleared of its existing cover for setting up of the construction sites, camps and related infrastructure facilities, borrow areas and other locations identified for temporary use during construction. The contractor shall comply with all safety requirements in consideration as specified in the Guideline on**,** “Labour & Worker’s Health and Safety”. Before initiation of site preparation activities along these lands to be used temporarily during construction, it shall be the responsibility of the Contractor to submit and obtain approval of the site redevelopment plan from the implementing agency. The letter/contract agreement between the owner(s) of the land parcel for temporary usage shall include site redevelopment to its original status. The guidelines for the same are furnished in the Guideline on**,** “Construction Plants & Equipment Management”; guideline**,** “Construction and Labour Camps”; and “Borrow areas”.

c. Traffic management during construction

Traffic management during construction is an activity specific to the contractors. Contractors must ensure a reasonably smooth flow of traffic during construction. The following are the general principles to be followed for traffic management during construction:

- Partial pavement construction over long lengths will not be permitted. The contractor should concentrate his activities over sections such that he can complete continuous fronts of up to a maximum of 1 km before starting the adjacent front. The contractor may open more than one continuous 1 km front provided that he has the separate resources to do so. The resources working on a 1 km front may not be shifted to another front until no longer required on that front.
- The construction activities should be staggered over sub-sections to the extent that the use of plant and equipment is optimized to maximum efficiency and to avoid idling. For road widening operations, excavation adjacent to the existing road shall not be permitted on both titles simultaneously. Earthworks must be completed to the level of the existing road before excavation work on the opposite side will be permitted.
- The construction operations taking place on a particular front must be managed efficiently such that delays between successive pavement layers are minimized.
- Before the start of the monsoon season (June) the contractor shall ensure that the pavement over any front is complete, full width, at least up to Dense Bituminous Macadam, DBM level, but preferably with Asphaltic Concrete, AC wearing course. The contractor should not start any sections of pavement that he cannot complete by the start of the monsoon season.
- In the absence of permanent facilities, temporary drainage and erosion control measures, as required by the Specifications, are to be implemented prior to the onset of the monsoon.

In cases where separate traffic diversions are not essential or cost effective the construction methodology should be in accordance with the guidelines following:

On a 1km section, the pavement construction (except new alignments) should be limited to 500m subsections with a minimum of 1 to 1.5 km between successive sub-sections to ease traffic management and safety issues. The earthworks in the widening portions are not limited in, this respect. Excavation on both sides of the existing, road over the same sub-section simultaneously shall not be permitted for reasons of safety to the traffic, particularly at night.

Sub-sections longer than 500 m may be authorized by the Engineer if two-way traffic flow can be comfortably managed and the Contractor can demonstrate his ability to maintain dust control, proper road edge delineation, proper signage and traffic control. Where single file traffic is permitted ('only applicable to final wearing course operations), the sub-sections shall be reduced to a maximum length whereby safe traffic regulation can be physically managed. Single file traffic may not be permitted at certain locations or times of the day when traffic volumes are such that excessive congestion shall occur.

GUIDELINE-2: WASTE MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	The Contractor shall ▪ Develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior to commencing of construction and submit to RTIP-2II, LGED for approval. ▪ Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact. ▪ Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		▪ Segregate and reuse or recycle all the wastes, wherever practical. ▪ Prohibit burning of solid waste ▪ Collect and transport non-hazardous wastes to all the approved disposal sites. Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route ▪ Provide refuse containers at each worksite. ▪ Request suppliers to minimize packaging where practicable. ▪ Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	The Contractor shall ▪ Collect chemical wastes in 200 liter drums (or similar sealed container), appropriately labeled for safe transport to an approved chemical waste depot. ▪ Store, transport and handle all chemicals avoiding potential environmental pollution. ▪ Store all hazardous wastes appropriately in bunded areas away from water courses. ▪ Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. ▪ Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse,

GUIDELINE-3: HAZARDOUS MATERIALS MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuels and Hazardous goods.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers.	▪ Prepare spill control procedures and submit the plan for RTIP-2, LGED approval. ▪ Train the relevant construction personnel in handling of fuels and spill control procedures. ▪ Store dangerous goods in bounded areas on a top of a sealed plastic sheet away from watercourses. ▪ Refueling shall occur only within bounded areas. ▪ Make available MSDS for chemicals and dangerous goods on-site. ▪ Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by the DOE. ▪ Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use. ▪ Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		▪ Make sure all containers, drums, and tanks that are used for storage are in good condition and are labeled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. ▪ Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area shall preferably slope or drain to a safe collection area in the event of a spill. ▪ Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. ▪ Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials.

GUIDELINE-4: WATER RESOURCES MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Discharge from construction sites	During construction both surface and groundwater quality may be deteriorated due to construction activities in the waterway/river, sewerages from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns of the area including infiltration and storage of storm water. These changes in hydrological regime lead to increased rate of runoff increase in sediment and contaminant loading, increased flooding, groundwater contamination, and effect habitat of fish and other aquatic biology.	The Contractor shall ▪ Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials ▪ Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site ▪ Divert runoff from undisturbed areas around the construction site ▪ Stockpile materials away from drainage lines ▪ Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot ▪ Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This should be done in every exit of each construction vehicle to ensure the local roads are kept clean.
Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and	The Contractor shall ▪ Stabilize the cleared areas not used for construction activities with vegetation or

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	contaminant loading of surface water bodies.	appropriate surface water treatments as soon as practicable following earthwork to minimize erosion ▪ Ensure that roads used by construction vehicles are swept regularly to remove sediment. ▪ Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)
Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology.	The Contractor Shall ▪ Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary ▪ Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers ▪ Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables. ▪ Use environment friendly and nontoxic slurry during construction of piles to discharge into the river. ▪ Reduce infiltration of contaminated drainage through storm water management design ▪ Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets.
Drinking water	Groundwater at shallow depths is contaminated with arsenic and hence not suitable for drinking purposes Depletion and pollution of groundwater resources.	The Contractor Shall ▪ Pumping of groundwater should be from deep aquifers of more than 300 m to supply arsenic free water. Safe and sustainable discharges are to be ascertained prior to selection of pumps. ▪ Tube wells will be installed with due regard for the surface environment, protection of groundwater from surface contaminants, and protection of aquifer cross contamination ▪ Protect groundwater supplies of adjacent lands

GUIDELINE-5: DRAINAGE MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Excavation and earth works, and construction yards	Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms environment in terms of water and soil	The Contractor shall ▪ Prepare a program for prevent/avoid standing waters, which CSC will verify in advance and confirm during implementation ▪ Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	contamination, and mosquito growth.	drainage line ▪ Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there ▪ Rehabilitate road drainage structures immediately if damaged by contractors' road transports. ▪ Construct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning. ▪ Provide appropriate silt collector and silt screen at the inlet and manholes and periodically clean the drainage system to avoid drainage congestion ▪ Protect natural slopes of drainage channels to ensure adequate storm water drains. ▪ Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem. ▪ Reduce infiltration of contaminated drainage through storm water management design
Ponding of water	Health hazards due to mosquito breeding	▪ Do not allow ponding of water especially near the waste storage areas and construction camps ▪ Discard all the storage containers that are capable of storing of water, after use or store them in inverted position

GUIDELINE-6: SOIL QUALITY MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Filling of Sites with dredge materials	Soil contamination will occur from drainage of dredged materials	The Contractor shall ▪ Ensure that dredged sand used for land filling should be free of pollutants. Prior to filling, sand quality should be tested to confirm whether soil is pollution free. Sediments should be properly compacted. Top layer should be the 0.5 m thick clay on the surface and boundary slopes along with grass. Side Slope of Filled Land of 1:2 should be constructed by suitable soils with proper compaction as per design. Slope surface should be covered by top soils/ cladding materials (0.5m thick) and grass turfing with suitable grass. ▪ Leaching from the sediments should be contained to seep into the subsoil or should be discharged into settling lagoons before final disposal. ▪ No sediment laden water in the adjacent lands near the construction sites, and/or wastewater of suspended materials excessive of 200mg/l from dredge material storage/use area in the adjacent agricultural lands.
Storage of	Spillage of hazardous	The Contractor shall

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
hazardous and toxic chemicals	and toxic chemicals will contaminate the soils	▪ Strictly manage the wastes management plans proposed in ECP1 and storage of materials in ECP2 ▪ Construct appropriate spill contaminant facilities for all fuel storage areas ▪ Establish and maintain a hazardous materials register detailing the location and quantities of hazardous substances including the storage, use of disposals ▪ Train personnel and implement safe work practices for minimizing the risk of spillage ▪ Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site ▪ Remediate the contaminated land using the most appropriate available method to achieve required commercial/industrial guideline validation results
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall ▪ Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds

GUIDELINE-7: TOP SOIL MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Earthworks will impact the fertile top soils that are enriched with nutrients required for plant growth or agricultural development.	The Contractor shall ▪ Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m. ▪ Remove unwanted materials from top soil like grass, roots of trees and similar others. ▪ The stockpiles will be done in slopes of 2:1 to reduce surface runoff and enhance percolation through the mass of stored soil. ▪ Locate topsoil stockpiles in areas outside drainage lines and protect from erosion. ▪ Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil. ▪ Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites ▪ Prior to the re-spreading of topsoil, the ground surface will be ripped to assist the bonding of the soil layers, water penetration and re-vegetation

GUIDELINE-8: BORROW AREAS DEVELOPMENT AND OPERATION

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Development and operation of borrow areas	Generally dredge materials will be used as borrow material for filling of construction sites to the 100 year flood level. In case, the borrow pits developed by the Contractor, there will be impacts on local topography, landscaping and natural drainage.	The Contractor shall ▪ Identify borrow pits in consultation with the local LGED staff and RTIP-2 staff. ▪ Obtain the borrow material from: - barren land or land without tree cover outside the road reserve; - excavating land and creating new water tanks/ponds; - land acquired temporarily outside the road reserve; - excavation of proposed culverts; ▪ Do not dug the borrow pits within 5m of the toe of the final section of the road embankment. ▪ Dig the borrow pits continuously. Ridges of not less than 8 m widths shall be left at intervals not exceeding 300 m and small drains should be cut through the ridges to facilitate drainage ▪ Slope the bed level of the borrow pits, as far as possible, down progressively towards the nearest cross drain, if any, and do not lower it than the bed of the cross-drain, to ensure efficient drainage. . ▪ Do not locate the borrow pits within 500 m of any identified archaeological, religious or cultural sites if any. ▪ Follow the below for restoration of borrow areas are: - Return stockpiled topsoil to the borrow pit if is used for agriculture; - Stabilize the banks of the borrow pit with the top soil if it is used for fish ponds by compaction; - Return stockpiled topsoil to the borrow pit and all worked areas to be stabilized through re-vegetation using local plants. ▪ Control at each site by ensuring that base of the borrow pit drains into a sediment trap prior to discharging from the site.

GUIDELINE-9: AIR QUALITY MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	The Contractor should ▪ Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. ▪ Operate the vehicles in a fuel efficient manner ▪ Cover haul vehicles carrying dusty materials moving outside the construction site

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		▪ Impose speed limits on all vehicle movement at the worksite to reduce dust emissions ▪ Control the movement of construction traffic ▪ Service all vehicles regularly to minimize emissions
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	The Contractor shall ▪ Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize the contaminant emissions. Proof or maintenance register shall be required by the equipment suppliers and contractors/subcontractors ▪ Focus special attention on containing the emissions from generators ▪ Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites ▪ Service all equipment regularly to minimize emissions ▪ Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection, aggregate handling, cement dumping, circulation of trucks and machinery inside the installations
Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard.	▪ Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds). Stored materials such as gravel and sand shall be covered and confined to avoid their being wind-drifted ▪ Minimize the extent and period of exposure of the bare surfaces ▪ Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site ▪ Restore disturbed areas as soon as practicable by vegetation/grass-turfing ▪ Store the cement in silos and minimize the emissions from silos by equipping them with filters. ▪ Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations

GUIDELINE-10: NOISE AND VIBRATION MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Noise quality will be deteriorated	The Contractor shall ▪ Maintain all vehicles in order to keep it in good working

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	due to vehicular traffic	order in accordance with manufactures maintenance procedures ▪ Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc. ▪ Organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall ▪ Appropriately site all noise generating activities to avoid noise pollution to local residents ▪ Use the quietest available plant and equipment ▪ Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines) ▪ Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of maintenance register of their equipment. ▪ Install acoustic enclosures around generators to reduce noise levels. ▪ Fit high efficiency mufflers to appropriate construction equipment ▪ Avoid the unnecessary use of alarms, horns and sirens
Construction activities	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall ▪ Notify adjacent landholders prior any typical noise events outside of daylight hours ▪ Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions ▪ Employ best available work practices on-site to minimize occupational noise levels ▪ Install temporary noise control barriers where appropriate ▪ Plan activities on site and deliveries to and from site to minimize impact ▪ Monitor and analyze noise and vibration results and adjust construction practices as required. ▪ Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas

GUIDELINE-11: TREE CUTTING AND AFFORESTATION

This Guideline discusses the issue of tree cutting and afforestation. Loss of trees creates adverse environmental impacts. In order to mitigate there impacts, suitable measures have been suggested as part of this Guideline. These measures have been given for each of the stages of the road construction activities.

1. Project Planning and Design Stage

During alignment finalization, due consideration shall be given to minimize the loss of existing tree cover, encroachment of forest areas / protected areas etc. as specified in guideline on**,** “Project Preparation”. Tree

felling, if unavoidable, shall be done only after compensatory plantation of at least three saplings for every tree cut is done.

The plantation/afforestation would be carried out by the forest department. It should be ensured that plantation is carried out only in areas where water can be made available during dry seasons and the plant can be protected during the initial stages of their growth. The species shall be identified giving due importance to local flora. It is recommended to plant mixed species in case of both avenue or cluster plantation.

The plantation strategy shall suggest the planting of fruit bearing trees and other suitable trees. Development of cluster plantations will be encouraged in the community lands, at locations desired by the community. The choice of species will be based on the preferences of the community. The PIC shall oversee the plantation to check the following:

- Whether trees are obstructing live of right at junctions;
- Whether trees are at the inside of the junctions; and
- Whether trees are within 5 meters of the proposed centerline.

2. **Post-construction Stage**

The maintenance of the saplings (including activities much as weeding, watering, planting of replacement saplings, etc. application of manure etc.) shall be the responsibility of the forest department. The PIC shall ensure the following:

- Shoulder of roads to be kept clear of weeds/undesirable undergrowth; and
- Branches of trees do not obstruct clear view of the informatory and cautions signs.

GUIDELINE-12: PROTECTION OF FISHERIES

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities in River	The main potential impacts to fisheries are hydrocarbon spills and leaks from riverine transport and disposal of wastes into the river	The Contractor shall ▪ Ensure the riverine transports, vessels and ships are well maintained and do not have oil leakage to contaminate river water. ▪ Contain oil immediately on river in case of accidental spillage from vessels and ships and in this regard, make an emergency oil spill containment plan to be supported with enough equipments, materials and human resources ▪ Do not dump wastes, be it hazardous or non-hazardous into the nearby water bodies or in the river
Construction activities on the land	Filling of ponds for site Preparation will impact the fishes.	The Contractor shall ▪ Inspect any area of a water body containing fish that is temporarily isolated for the presence of fish, and all fish shall be captured and released unharmed in adjacent fish habitat ▪ Install and maintain fish screens etc. on any water intake with drawing water from any water body that contain fish

GUIDELINE-13: ROAD TRANSPORT AND ROAD TRAFFIC MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Increased traffic use of road by construction vehicles will affect the movement of normal road traffics and the safety of the road users.	The Contractor shall ▪ Prepare and submit a traffic management plan to the RTIP-2, LGED for his approval at least 30 days before commencing work on any project component involved in traffic diversion and management. ▪ Include in the traffic management plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary road, temporary bridges temporary diversions, necessary barricades, warning signs / lights, road signs etc. ▪ Provide signs at strategic locations of the roads complying with the schedules of signs contained in the Bangladesh Traffic Regulations. ▪ Install and maintain a display board at each important road intersection on the roads to be used during construction, which shall clearly show the following information in Bangla: - Location: chainage and village name - Duration of construction period - Period of proposed detour / alternative route - Suggested detour route map - Name and contact address/telephone number of the concerned personnel - Name and contact address / telephone number of the Contractor - Inconvenience is sincerely regretted.
	Accidents and spillage of fuels and chemicals	▪ Restrict truck deliveries, where practicable, to day time working hours. ▪ Restrict the transport of oversize loads. ▪ Operate road traffics/transport vehicles, if possible, to non-peak periods to minimize traffic disruptions. ▪ Enforce on-site speed limit

GUIDELINE-14: WATER TRANSPORT MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities in River	The presence of construction and dredging barges, pipe lines and other construction activities in the River can cause hindrance and risks to the river traffic.	The Contractor shall ▪ Not obstruct other normal riverine transport while doing riverine transport and works ▪ Keep regular and close contacts with Bangladesh Inland Water Transport Authority (BIWTA) regarding their needs during construction of the project ▪ Plan the river transport and transportation of large loads in coordination with BIWTA to avoid traffic congestions.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		▪ Provide signage for river traffic conforming to the BIWTA requirements ▪ Position the dredge and pipeline in such a way that no disruption to the channel traffic will occur
	Accidents	The Contractor shall ▪ Prepare an emergency plan for dealing with accidents causing accidental sinking of the vessels and ships ▪ Ensure sufficient equipment and staffs available to execute the emergency plans ▪ Provide appropriate lighting to barges and construction vessels.

GUIDELINE-15: EROSION AND SEDIMENTATION CONTROL

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Clearing of construction sites	Cleared areas and slopes are susceptible for erosion of top soils that affects the growth of vegetation which causes ecological imbalance.	▪ Reinstate and protect cleared areas as soon as possible. ▪ Mulch to protect batter slopes before planting ▪ Cover unused area of disturbed or exposed surfaces immediately with mulch/grass turfings/tree plantations
Construction activities and material stockpiles	The impact of soil erosion are (i) Increased run off and sedimentation causing a greater flood hazard to the downstream, (ii) destruction of aquatic environment in nearby lakes, streams, and reservoirs caused by erosion and/or deposition of sediment damaging the spawning grounds of fish, and (iii) destruction of vegetation by burying or gullying.	The Contractor shall ▪ Locate stockpiles away from drainage lines ▪ Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds ▪ Remove debris from drainage paths and sediment control structures ▪ Cover the loose sediments and water them if required ▪ Divert natural runoff around construction areas prior to any site disturbance ▪ Install protective measures on site prior to construction, for example, sediment traps ▪ Control drainage through a site in protected channels or slope drains ▪ Install 'cut off drains' on large cut/fill batter slopes to control water runoff speed and hence erosion ▪ Observe the performance of drainage structures and erosion controls during rain and modify as required

GUIDELINE-16: CONSTRUCTION CAMP MANAGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of construction camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	The Contractor shall ▪ Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view. ▪ Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. ▪ Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters
Construction Camp Facilities	Lack of proper infrastructure facilities such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	Contractor shall provide the following facilities in the campsites ▪ Adequate housing for all workers ▪ Safe and reliable water supply. Water supply from deep tube wells of 300 m depth that meets the national standards ▪ Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. The minimum number of toilet facilities required is one toilet for every ten persons. ▪ Provide in-house community/common entertainment facilities. Dependence of local entertainment outlets by the construction camps to be iscouraged/prohibited to the extent possible.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	The Contractor should ▪ Ensure proper collection and disposal of solid wastes within the construction camps ▪ Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level. ▪ Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipments/vehicles needed. ▪ Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odor likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with. ▪ Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		disposed in approval waste disposal sites.
Health and Hygiene	There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices.	The Contractor shall ▪ Provide adequate health care facilities within construction sites. ▪ Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. ▪ Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals. ▪ Initial health screening of the laborers coming from outside areas ▪ Provide adequate drainage facilities throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellant sprays during monsoon. ▪ Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices

GUIDELINE-17: CULTURAL AND RELIGIOUS ISSUES

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities near religious and cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.	The Contractor shall ▪ Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction. ▪ Do not block access to cultural and religious sites, wherever possible ▪ Restrict all construction activities within the foot prints of the construction sites. ▪ Stop construction works that produce noise (particularly during prayer time) should there be any mosque/religious/educational institutions close to the construction sites and users make objections. ▪ Take special care and use appropriate equipment when working next to a cultural/religious institution. ▪ Show appropriate behavior with all construction workers especially women and elderly people ▪ Resolve cultural issues in consultation with local leaders and supervision consultants ▪ Establish a mechanism that allows local people to raise grievances arising from the construction process.

GUIDELINE-18: OCCUPATIONAL HEALTH AND SAFETY

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases etc.), (and (ii) road accidents from construction traffic.	The Contractor shall ▪ Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g. International Labor Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national standards of the Government of Bangladesh (e.g. `The Bangladesh Labor Code, 2006') ▪ Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, ▪ Provide personal protective equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. ▪ Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job ▪ Appoint an environment, health and safety manager to look after the health and safety of the workers
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	▪ Provide health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations should be easily accessible throughout the place of work ▪ Document and report occupational accidents, diseases, and incidents. ▪ Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. ▪ Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. ▪ Provide awareness to the construction drivers to strictly follow the driving rules ▪ Provide adequate lighting in the construction area and along the roads
Water and sanitation facilities at the construction	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction	▪ The contractor should provide portable toilets at the construction sites, if about 25 people are working the whole day for a month. Location of portable facilities should be at least 6m away from storm drain system and

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
sites	workers and affect their personal hygiene.	surface waters. These portable toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic tank for further treatment. ▪ Contractor should provide bottled drinking water facilities to the construction workers at all the construction sites.