



**GOVERNMENT OF THE PEOPLE'S
REPUBLIC OF BANGLADESH**

Environmental Assessment Report

*Construction of Road and Drain at Different
Location of Manikgonj Pourashava.*

Subproject Package No.-03

Manikgonj Pourashava, Manikgonj.

**BANGLADESH MUNICIPAL DEVELOPMENT
FUND (BMDF)**

**MUNICIPAL GOVERNANCE AND SERVICES
PROJECT (MGSP)**

July-2018

Table of Contents

1	INTRODUCTION.....	1
1.1	Background of the Project	1
1.2	Subproject Background	1
1.3	Aims of the Study	3
1.4	Scope of the EA.....	3
1.5	Methodology of the EA	4
2	SUBPROJECT DESCRIPTION.....	5
2.1	Setting of the Subproject Site	5
2.2	Subproject Scope of its Components.....	6
2.3	Present Status and Need for the Subproject.....	6
2.4	Justification of Selection of the Subproject.....	9
2.5	Key Subproject Activities and Implementation Process.....	10
2.6	Category of subproject.....	11
2.7	Analysis of Alternatives.....	11
3	DETAILED ENVIRONMENTAL AND INFRASTRUCTURAL FEATURES.....	14
4	BASELINE ANALYSIS OF THE ENVIRONMENTAL CONDITION	19
4.1	General Consideration.....	19
4.1.1	Physical environment.....	19
4.1.2	Biological Environment	25
4.1.3	Socio-economic environment.....	26
5	ENVIRONMENTAL SCREENING	28
6	SPECIFIC IMPACT, MITIGATION AND ENHANCEMENT MEASURES	30
6.1	Impact Due to Subproject Location/ Preconstruction Phase.....	30
6.1.1	Disorder of Earth Surface	30
6.1.2	Constuction of Labour Shed	30
6.1.3	Ecological Impact Due to Felling of Trees and Clearing of Vegetation	31
6.2	Impact at Construction Phase.....	31
6.2.1	Earth Work and Site Clearing Work for the Site Clearing	31
6.2.2	Sourcing, Extraction and Use of Construction Materials.....	31
6.2.3	Pollution from the Construction Materials' Transportation and Storage	32
6.2.4	Air Quality and Dust.....	32
6.2.5	Noise and Vibration	33
6.2.6	Water Quality	33
6.2.7	Drainage and Impact on surface water	33
6.2.8	Impact on host comminutes from out sides worker	34
6.2.9	Occupational Health, Aesthetics and Safety	34
6.2.10	Impacts on Social Environment and Common Property Resources	35
6.2.11	Traffic Management.....	37
6.3	Impact on Operation and Maintenance	37
7	ENVIRONMENTAL MANAGEMENT PLAN (EMP)	38
7.1	Access to Information	38
7.2	Grievance Redress Mechanism.....	38
7.2.1	Grievance Redress Committee (GRC).....	38
7.3	Grievance Resolution Process.....	39
7.4	Institutional Concern Person for Environmental Safeguard Compliance	39
7.5	Capacity Building.....	40
7.6	Environmental Management Action Plan	40
7.7	Environmental Safeguard Cost during Construction Phase.....	60
8	PUBLIC CONSULTATION AND PARTICIPATION	61
8.1	Objective and Methodology	61
8.2	Issues Raised by the Participants.....	62

8.3	Feedback, Suggestions, and Recommendations of the Participants.....	62
9	CONCLUSIONS AND RECOMMENDATIONS.....	64
9.1	Conclusions and Recommendations.....	64
	APPENDIX.....	65
	Appendix 1: List of the Participants	65

List of Figure

Figure 2-1: Topographic Feature of Monora Road, and Upazilla Road and its influence Area	Error! Bookmark not defined.
Figure 2-2: Topographic Features of NPI Road and H/O Darbesh Road and Its influence Area	Error! Bookmark not defined.
Figure 2-3: Topographic Feature of Dhaka Aricha Road to House of Fajal Ali and its influence Area	Error! Bookmark not defined.
Figure 2-4: Present Condition of the Subproject Roads.....	9
Figure 2-5: Present Condition of the Outfall of the Proposed Drain	9
Figure 4-1: Soil Region Map and Earth Quake Zone Map of Bangladesh.....	20
Figure 4-2: The locations of the subproject study site on the mean annual rainfall map of Bangladesh. (Map source: www.banglapedia.org)	21
Figure 4-3: Wind rose plot of from the 2008-2012 wind speed/ direction data gathered from Dhaka BMD station showing predominant directions and speeds of wind.	21
Figure 4-4: Locations of the Manikgonj Pourashava site on the flood risk map of Bangladesh (map source: BARC)	23
Figure 7-1: Environmental and Social Management Team (Tentative)	40
Figure 8-1: Public consultation with local people and other stakeholders.	62
Figure 8-2: Consultation Meeting with Local NGO Workers, Civil Society and Pourashava Officials about Subproject in the Pourashava Office.....	62

List of Table

Table 3-1: Major Environmental and Infrastructural Features from Beautha Bridge North to Sylipara.....	14
Table 3-2: Major Environmental and Infrastructural Features at Joynagar Mosque to End of Pourashava.....	15
Table 3-3 Major Environmental and Infrastructural Features from Shop of Aynal to north side near the H/O Arshed Ali Biswas.	15
Table 3-4 Major Environmental and Infrastructural Features from H/O Tara Mia to south side H/O Nitay Gun, H/O Abul Kalam Azad at East Dashora.	15
Table 3-5 : Major Environmental and Infrastructural Features at Gongadharpatty Professor housing Area.....	16
Table 3-6: Major Environmental and Infrastructural Features at Katcha Mal Arot Road.....	16
Table 3-7: Major Environmental and Infrastructural Features from H/O Kzol Mollique to Porrah Primary School	16
Table 3-8: Major Environmental and Infrastructural Features from H/O Indira Howlader to H/O Apon Bhaban Road	17
Table 3-9 Major Environmental and Infrastructural Features from Shib Bari Road from H/O Siddque.....	17
Table 4-1: Monthly averages of climatic variables at the Dhaka BMD Station, 2001-2013 ..	22

Table 4-2: Ambient Noise Quality Analysis.....	24
Table 6-1 : Impacts on Social Environment and Common Property Resources.....	35
Table 7-1: Anticipated Impacts during Construction and Corresponding Mitigation Measures with Monitoring guide line)	41
Table 7-2 Anticipated Environmental Impacts during Operation Phase and Corresponding Mitigation and Enhancement Measures	47
Table 7-3: Environmental Management Budget	60

ABBREVIATIONS

AP (AP's)	Affected Person
BDT	Bangladeshi Taka
BOQ	Bill of Quantity
B MDF	Bangladesh Municipal Development Fund
CC	Cement Concrete
CIP	Capital Investment Plan
CP	Contingency Planning
EA	Environmental Assessment
ECR	Environmental Conservation Rules
EMP	Environmental Management Plan
EPP	Emergency Preparedness Planning
ES	Environmental Screening
EMF	Environmental Management Framework
FGD	Focal Group Discussion
GoB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GRP	Grievance Redress Procedure
MGSP	Municipal Governance and Services Project
MD	Managing Director
PPEs	Personal Protective Equipment's
PMU	Project Management Unit
RCC	Reinforcement Cement Concrete
RP	Relevant Reports
OHWT	Over Head Water Tank
ULB	Urban Local Body
WB	World Bank
XEN	Executive Engineer

EXECUTIVE SUMMARY

BACKGROUND

The Mainkgonj Pourashava proposes to construct road and drainage network under this sub-project package. This Project is a transportation and drainage infrastructure improvement initiative by the province under the MUNICIPAL GOVERNANCE AND SERVICES PROJECT (MGSP).

All the proposed interventions are proposed within the Manikgonj Pourashava and within the existing right of way of the Pourashava. There are no environmentally sensitive areas in the subproject locations. Assessment of the potential environmental impacts due to the subproject, as part of the EA exposes that the impacts shall be largely generic construction related impacts associated with improvement of roads and drain. For all construction related impacts, environmental management measures are integrated into the EA. This subproject package consists of ten roads that will be reconstructed in their original right-of-ways and alignments with improved subgrade, sub base, base course, and surfacing. The existing right-of-way is mostly clear, and for which no acquisition for land is required.

The subproject has been categorized as 'Orange-B category as per ECR-97 and as well as accordance with WB Safeguard Policy and an EA is carried out that provides mitigation measures for impacts and a monitoring and reporting protocol.

SUMMARY OF SUBPROJECT-RELATED IMPACTS AND BENEFITS

The following presents a summary of the potential impacts to natural, social, economic, and cultural resources as a result of the proposed roadway improvement project.

Impact Category	Impact Assessment
Land Use	<ul style="list-style-type: none">Existing land use adjacent to the roadways will not change as a result of the subproject (but the land value will be increased).
Site Clearing Work	<ul style="list-style-type: none">Road side trees and natural grown vegetation to be cut down to provide uniform road width.
Noise	<ul style="list-style-type: none">Moderate adverse impacts to adjacent residential and commercial properties, during construction works.Change in noise levels will not exceed state regulatory thresholds at any location
Tribal People	<ul style="list-style-type: none">No minority, or tribal populations exist on site or within the immediate area and, therefore, no impacts will fall on such populations. The subproject will not adversely impact the character of the community surrounding the roadway.
Air Quality	<ul style="list-style-type: none">No measurable impacts are anticipated
Water Quality	<ul style="list-style-type: none">Though, the drains are designed only for the storm water; however, storm water may carry wash-out materials which may disturb the aquatic environment of the outfall. In addition, dumping of solid wastes, household wastewater into the

	drain and illegal toilet connections may create pollution in the aquatic environment.
Threatened and Endangered Species	<ul style="list-style-type: none"> There is no threatened and endangered species in the sub-project area. So, no impacts are anticipated to threatened or endangered species habitat.
Drainage Congestion	<ul style="list-style-type: none"> Drainage congestion is minor. However, erratic rainfall may create drainage congestion for short term.
Pollution of Construction Debris	<ul style="list-style-type: none"> Improper collection and disposal of the generated wastes materials may degrade the quality of the surrounding environment and degrade the aesthetic value.
Benefit Category	Benefit Assessment
Traffic Safety	<ul style="list-style-type: none"> Substandard roadway elements will be eliminated, reducing potential crashes. Additional roadway features such as lighting, and pavement drainage will contribute to the improvements in motorized vehicles and pedestrian safety. Separate walk way will reduce the probable accident by avoiding speedy vehicle path way.
Water logging	<ul style="list-style-type: none"> RCC drain will improve drainage facilities and prevent the accumulation of the stagnant water on the road surface. This will prevent formation of muddy and slippery surface on the road.

METHODOLOGY OF THE STUDY

The EA study was carried out using reconnaissance survey, field visits, consultation with stakeholders and others, review of existing data, assessment to identify adverse impacts and preparation of EMP and post-project Environmental Monitoring Programme. Geographic information system, and noise quality determination tools were used to analyze the likely impact of proposed subproject activities. Physical assessments were made for entire corridors with respect to terrestrial and aquatic aspect.

CONSULTATION, DISCLOSURE AND GRIEVANCE REDRESS

The stakeholders were involved in developing the EA through discussions on-site and public consultation, after which views expressed were incorporated into the EA and in the planning and development of the subproject. The EA will be made available at public locations in the Pourashava and will be disclosed to a wider audience via WB, BMDF and Pourashava websites. The consultation process will be continued and expanded during subproject implementation to ensure that stakeholders are fully engaged in the subproject and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the EA to ensure any public grievances are addressed quickly.

MONITORING AND REPORTING

The PMU-BMDF, and PIU (Pourashava), will be responsible for safeguard monitoring. The PIU (Pourashava) will submit monthly monitoring reports to PMU-BMDF, and the PMU-BMDF will send quarterly monitoring reports to WB.

BASELINE ENVIRONMENT

Baseline environment is concerned with existing physical, chemical and biological conditions of the area where the plant is going to be set up. The surface water, and noise level have been analyzed to evaluate the primary baseline of the area. The data of air quality will be analyzed prior to the construction, to evaluate the baseline data. The main objective of examining the present environment is to provide an environmental baseline against which potential impacts from development and operational phases of the project can be compared. In physicochemical component, parameters are included as; land, water quality, soil quality, air quality, climate and noise. Biological environment covers general description on floral and faunal species in the study area. Socio-economic environment presents social structure, housing pattern, etc.

FORECAST AND EVALUATION OF IMPACTS

To maintain logical sequence of the EA process, the possible mitigation/enhancing measures for significant impacts are discussed in the chapter-6. Beneficial impacts and enhancement during development and operation phase have been identified and found that the subproject will ensure safe potable water to the dwellers of Pourashava.

ENVIRONMENTAL MANAGEMENT PLAN

Environmental management is concerned with the implementation of the measures necessary to minimize or offset adverse impacts and benefit enhancement measures identified. In order to be effective, environmental management must be fully integrated with the overall project management effort. A monitoring program needs to be put in place to assess any adverse impacts on the environment. Sections 7-1 and 7-2 set out the management measures to be taken with regard to controlling the potential impacts which could occur during the construction and operational phases of the subproject, and indicates responsibilities for the various actions concerned.

INSTITUTIONAL ARRANGEMENTS

B MDF is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan. B MDF has established a Project Management Unit (PMU) to manage all aspects of loan project implementation, coordinate construction of subprojects across all towns, and ensure consistency of approach and performance. The Environmental and Social Safeguard Specialists have been appointed to coordinate social and environmental issues. Environmental review of subproject and monitoring implementation of mitigation measures are primary functions of the Environmental and Social Safeguarded Specialist within the PMU.

The EA has been prepared by the Environmental Consultant of ULB assisting the PMU-B MDF at the time of the detailed design. Costs for mitigation measures and monitoring are considered at the time of bid document preparation and in contract procurement. A Project Implementation Unit (PIU) will be established at the Manikgonj Pourashava, staffed by Manikgonj Pourashava and supported by PMU-B MDF staff. The PIU-engineers are trained in ensuring the environmental safeguard compliance issues during implementation (capacity building has already ensured by B MDF).

The PIU will hire Construction Contractors (CC) to build elements of the infrastructure. Environmental Specialists within the PMU will assist PIU to ensure that the construction packages comply with environmental safeguards and the Environmental Monitoring Plan contained in the EA. Inspection of progress in construction will be undertaken locally by the PIU, supported by the PMU-BMDF. During implementation, the contractor will submit monthly progress reports to the PIU, which includes a section on EMP implementation. The PIU will submit reports to the PMU for review. The PMU will review progress reports to ensure that all the mitigation measures are properly implemented. The PMU will consolidate monthly reports and submit quarterly reports to WB for review.

CONCLUSIONS AND RECOMMENDATIONS

The citizens of Manikgonj Pourashava will be the major beneficiaries of this subproject. The proposed subproject is unlikely to cause significant adverse impacts and net environmental benefits to citizens of Manikgonj Pourashava and its adjacent unions will be positive. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

The EA report has been prepared before the detailed engineering design. In this regard, any major changes during detailed design, or any major additional work other than the proposed subproject activities will require updating of this environmental assessment. It shall have to be sent to WB for concurrence before civil works commence. Moreover, the executing agencies have to submit the detailed engineering designs to WB, which will review them and examine whether major changes or major additional works have been included.

1 INTRODUCTION

1.1 Background of the Project

The Government of Bangladesh (GoB) intends to enhance the capacity of urban local bodies (ULBs) in development and management of urban infrastructure, and improve municipal governance and services through undertaking the Municipal Governance and Services Project (MGSP) in selected Pourashava and City Corporations. The Local Government Engineering Department (LGED) and the Bangladesh Municipal Development Fund (BMDF) will implement the project with participation of the selected ULBs. The project will be financed by IDA, with GoB contribution for land acquisition and management, and Municipalities equity for accessing BMDF competitive finance. Under the MGSP the LGED will implement about 20 types of sub-projects in 26 ULBs, which include 22 Pourashava and 4 City Corporations; while the BMDF will implement about 13 types of sub-projects in 119 Pourashava.

Both the LGED and the BMDF intends to ensure that the proposed infrastructure takes into account the environmental concerns in accordance with the Environment Conservation Rules 1997, and the World Bank Safeguard Policies. In this regard under MGSP a framework approach has been adopted for EA; the EA has two major components: (a) Overall environmental assessment, and (b) Development of Environmental Management Framework (EMF). Hence, to meet the regulatory requirement EA or EMP (based on screening) is mandatory to implement any subproject under MGSP.

1.2 Subproject Background

Manikgonj Pourashava is an “A” type, which was established in the year of 1958. The Pourashava has an area of 42.50 sq. km, divided into 9 wards with a total population of 1, 20,000. Density of population per sq. km is 1,236 whereas the average household size are 4.5 respectively (At a Glance of Pourashava). It is located in between latitude 23°51'32.15"N and longitude 90° 0'23.36"E. It is bounded by Sauria Upazila on the north, Nawabganj (Dhaka) and Harirampur Upazilla on the south, Singair and Dhamrai Upazila on the east, Harirampur and Ghior Upazilla on the west¹.

Like other fast growing towns, Manikgonj Pourashava also demonstrates similar symptoms of hardships of urbanization such as, sprawl development, inadequacy of provisions for piped water supply, sanitation, drainage and also facing the problems like lack of physical infrastructure, lack of development control regulations. In Manikgonj Pourashava, traffic volume is increasing day by day with the increase in population and demand. The substandard road network cannot cope with the growing demand; consequently, traffic congestion becomes a common problem. Hence, planned development of road network with drainage facilities is essential to meet the emergent demand.

This subproject includes the following components: BC Road, CC Road HBB Road and RCC Road, The significant features of the subproject are mentioned below:

¹ Banglapedia, Manikgonj Pourashava, Manikgonj

Name of the Subproject	<p>(i) Construction of Beribath road from Beautha bridge north to Sylip-ara. Link-1: Improvement of HBB road Bagan bari road from Captain Abdul Halim Sarak to Beribath. Link-2: Improvement of road and Construction of drain from Beribath to Bandutia H/O Rony manson via H/O Kabi Mohidor Rahaman and Tower building. Link-3: Improvement of road & Construction of RCC drain For Abdul Halim chow.road form passport office to west side Bandutia khal. (Ch-410).</p> <p>(ii) (a) Construction of road from Joynagar mosque to end of Pourashava. (b) Construction of road from Mazipara Botttala south to H/O Harun. (c) Construction of Joynaga Mazipara road & RCC drain from Bottala to north side river bank. (d) Improvement of road from Andhermanik old khaya Ghat to end of Pourashava via Andhermanik chourasta. (e) Construction of HBB road from Char Beautha H/O Bellal to Madrasha.</p> <p>(iii) (a) Construction of HBB road from Bandutia Chakpara road. (b) Construction of HBB road from Bandutia primary school to H/O Motaleb.</p> <p>(iv) (a) Improvement of road starting from shop Aynal to north side near the H/O Arshed Ali Biswas. (b) Wedding of Diabetic Hospital road starting from H/O Bisno Doctor to IHT. (c) Construction of RCC drain from IHT gate to south side the shop of Aynal via bat Gach at Hijuli bazer. (v) Improvement of Poura Katcha mal arot by HBB & Construction of drain. Link-1: Construction of road from Katcha arot to north side H/O Jahangir.</p> <p>(vi) Improvement of Manikganj Katcha bazer by drain & CC work. (vii) Construction of RCC road from H/O Indira Howlader to H/O Apon Bhaban via H/O Moddon Dhopa at East Dashora.</p> <p>(viii) Construction of HBB road from H/O Tara Mia to south side H/O Nitay Gun, H/O Abul Kalam Azad at East Dashora.</p> <p>(ix) Construction of RCC drain from H/O Kzol Mollique to Porrah Primary school at Porrah. Link-1: Construction of RCC drain at Gongadharpatty B-block.</p> <p>(x) Construction of RCC drain on the Shib bari road from H/O Siddque to west side Food godown. Link-1: Construction of RCC drain from H/O Niamot Ali Master to north side H/O Mina on the Shib bari road at East Dashora.</p>
Package No.	MGSP/Manikgonj/ 2017-18/W-04
District Name	Manikgonj
ULB Name	Manikgonj Pourashava
Structural Design Option	BC Road, HBB Road, CC Road RCC Drain
Jurisdiction area:	Wards no 1, 2 ,3,4,5,6,7 and 8
Beneficiary Population	About 60,000
Tribal People	None

Land Acquisition	Not required
Estimated Cost	14.93 million in BDT
Subproject Duration	18 months
Tentative Start Date	August-2018
Tentative Completion Date	January-2019

1.3 Aims of the Study

This report presents the finding of an Environmental Assessment (EA) of road and drain sub-project. The objective of the study is to provide an examination and assessment of the principal environmental impacts of the subproject activities. The outline of an environmental management plan also suggested with an indication of the extent of work to be done to keep the development and environment compatible. In this context, it should be noted that the term “environment” and its derivatives have been used in a wide sense, which covers not only physical and chemical aspect, but also the human dimension. The specific objectives of this EA are to:

- Present a brief discussion on the EA process and its role in the planning and implementation of development subprojects;
- Present a general description of the subproject and the process;
- Present a description of the pre-project environment;
- Delineate the significant environmental issues found and believed to be involved;
- Identify the environmental impacts of the subproject and quantify them to the extent possible;
- Suggest plan for management of the environment, during the implementation and operation.
- To present the findings for public input.
- To provide sufficient information to serve as a record for environmental approvals and consultations as required by law.

1.4 Scope of the EA

The EA report was prepared on the basis of proposed engineering works, field investigations, stakeholder consultation, primary and secondary data collection, screening of all baseline environmental parameters, environmental quality baseline monitoring, and review of other similar project reports in Bangladesh. The study conducted on 13 June in the year of 2018. The EA covers the general environmental profile of the subproject area including physical, ecological, environmental, social, cultural and economic resources. Baseline environmental monitoring (primary data) was carried out on water (surface), and noise quality measurements. The EA includes an overview of the potential environmental impacts and their severity, and proposes necessary mitigation measures and environmental management plan for each of the identified and anticipated impacts. Three numbers of public consultations were conducted as part of the EA.

1.5 Methodology of the EA

The methodology used for this study is based on the procedures described in Environmental Guidelines, (Volume 1 and 2)² published by Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF) and the other relevant regulation of Bangladesh as well as World Bank Guidelines for Environmental and Social Considerations

- Scoping workshop organization with various stakeholders at the beginning of the sub-project preparation activities;
- Reconnaissance survey was taken up to collect baseline information in devised formats;
- Analysis of collected data was carried out;
- Documentation of baseline conditions was done by doing on site environmental monitoring
- Analysis and assessment of various alternatives was taken up;
- Identification and assessment of various impacts was done;
- Formulation of mitigation, and avoidance measures was done for identified impacts;

² **Environmental Assessment Volume 1: Overall Environmental Assessment [Draft Final Report], September 2013. Municipal Governance and Services Project (MGSP), Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF), Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh.**

Environmental Assessment Volume 2: Environmental Management Framework (EMF) [Draft Final Report], September 2013. Municipal Governance and Services Project (MGSP), Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF), Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh.

2 SUBPROJECT DESCRIPTION

2.1 Setting of the Subproject Site

This proposed subproject includes- road and drain component. These components are situated at different ten location of the Pourashava which contain jurisdiction of the ward no. 1, 2, 3, 4,5,6,7 and 8 of the Manikgonj Pourashava. None of sensitive and protected area is located nearby the subproject site. All the development work goes through within the exiting right of way of the Manikgonj Pourashava. The land of the proposed intervention is solely owned by the Manikgonj Pourashava. These subproject area belong the mixed land use pattern of commercial, and residential area of the Pourashava. However, most of place of the subproject sites are basically semi urban residential setting with few commercial activities. Despite the dominating of semi urban setting there are few residential cum agricultural rural setting was observed during site visit.

2.2 Subproject Scope of its Components

Width of the road and capacity of the drain may be variable depending on the availability of space and catchment area respectively. Total 7170 m road (BC, HBB and CC Road) is proposed while drain is proposed 3910 m.

Subgrade and base courses of the existing road will be rebuilt on some roads and as well as for the road widening work where road width is not uniform, whereas elsewhere new materials will be placed on top of the existing roadway and extension portion materials.

2.3 Present Status and Need for the Subproject

The subproject area is mostly built-up area. This subproject consists of road, drain and beautification work at ten different roads. The major roadside built-up structures include road side residential houses, shops, agricultural activities educational institutions, religious centers and commercial and business offices.

At present, **Beautha Bridge North to Sylipara** road and link-1 is earthen road while other two link road is BC road. At **Joynagar Mosque to End of Pourashava road**, the existing road is earthen road whereas link roads area BC. **Bandutia Chakpara Road and Diabetic Hospital Road** are currently mostly BC road with few BFS. **Katcha Arot Road** is presently HBB road. At present, **Manikganj Katcha Bazar road** is CC road. Currently **H/O Indira Howlader to H/O Apon Bhaban road** is BFS. At present, **H/O Tara Mia to south side H/O Nitay Gun and H/O Abul Kalam Azad at East Dashora road** are earthen road.

Most of the existing BC, HBB and BFS road is badly damaged and road width is also non-uniform. These BC carpeting roads severely damaged containing cracks, pot holes, edge broken and depressions are prevalent whereas in HBB and BFS road brick is missing. The existing earthen road and damaged BC road generates dust which is degrading the surrounding environment and has discomfort felling to the local community. Additionally, these damaged road accumulates storm water after rain. Thus, traffic and pedestrian movement are interrupted. Hence, considering the bad condition of roads and meet the subproject demand following intervention is proposed.

To provide safe and smooth traffic operation in the subproject area, BC road is proposed from **Beautha Bridge to Sylipara** with two link road while link-1 will be developed by HBB road. **Joynagar Mosque to End of Pourashava Road** with Link road are proposed to develop by BC pavement. **Bandutia Primary School to H/O Motaleb Road** is proposed for the HBB road. **H/O Bisno Doctor to IHT Road** has been proposed for the formation of BC road. **Poura Katcha Malarot Road** is proposed for the HBB road. At **Manikganj Katcha Bazar area** CC road is proposed for the better movement of the buyer. From **H/O Indira Howlader to H/O**

Apon Bhaban Road RCC road has been proposed. **From H/O Tara Mia to South Side of H/O Nitay Gun and H/O Abul Kalam Azad at East Dashora Road** will be developed by HBB Road.

On the Country, at present **Beribath to Bandutia H/O Rony Manson and Link-3** was not found during site visit. At **Joynagar Mirza Para Road (Bottala to North Side River Bank Road)** there is no drain. At present **IHT Gate to South side the shop of Aynal** there is no drain. In the **Kacha Bazar Mal Arto** area there is no drain except dew earthen surface drain. At **Manikganj Katcha Bazar area** there is brick drain but discontinuous. At, **Mollique to Porrah Primary School Road** there is brick drain but at link road exiting drain earthen. At present, **Shib Bari Road from H/O Siddique to Westside of Food Godown** there is no drain.

Most of the existing brick drains and earthen drain are inadequate dimension, partially damaged and discontinuous. Due to discontinuity, blockage by various waste materials, silted up by debris and natural growing aquatic vegetation on the drain surface, reduce the drainage capacity. Thus, delay discharge of the storm water especially during monsoon period causes water logging problem in the subproject area. Consequently, water logging degrades the environmental quality of the subproject area and causes severe public health hazards.

RCC drain with cover slab will be constructed from **Beribath to Bandutia H/O Rony Manson (Length-1090 m)** and at **link-1 from Passport Office to West Side Bandutia khal (Ch. 0-410m)**. At **Joynagar Mirza Para Road from Bottala to North Side River Bank Road side drain (Length 280 m)** will be placed as RCC drain with cover slab. **IHT gate to south side the shop of Aynal via road side drain (Length: 320 m)** will be RCC with cover slab. At **Poura Katcha Malarot area**, to better drainage facilities RCC drain (**Length-160m**) will be constructed. At **Manikganj Katcha Bazar area**, total 160m RCC drain has been proposed. From **H/O Kzol Mollique to Porrah Primary School (350m)** and **link road at Gongadharpatty B-block (length 350)** RCC drain with cover slab will be constructed. At **Shib Bari Road**, from **H/O Niamot Ali Master to north side H/O Mina 500m** RCC drain with cover slab will be constructed. Present condition of the subproject area road are shown in the following figures.



Figure 2-1: Present Condition of the Subproject Roads



Figure 2-2: Present Condition of the Outfall of the Proposed Drain

2.4 Justification of Selection of the Subproject

The Pourashava prepared the priority subproject list as per CIP. The consultant inspected the site conditions and recommended the subproject having low environmental and social negative impacts. To implement this subproject the road side built infrastructure will not be severely disturbed. In addition, land acquisition is not an issue for implementation of this subproject. The Pourashava is solely owned the subproject road.

After completion, the subproject will improve the road communication system. These roads will facilitates transport facilities for motorized and non-motorized vehicles. The local people

will have better access for the neighboring areas. The improved roads will also improve ambient environment by reducing dust and water stagnation by eliminating pot holes. The improved roads will decrease the frequency of the potential road accident by eliminating rough surface and pot holes. The RCC drain will reduce the drainage congestion and water logging problem. Hence, considering the potential benefits after completion this subproject has been selected.

2.5 Key Subproject Activities and Implementation Process

The general activities for the subproject includes: Site clearing & grubbing works, construction of the semi-pucca site office, construction of the labor shed and relocation of the electric poles and GI poles.

The key activities for BC and HBB Road include:

- Dismantling of the damaged BC , CC and HBB road;
- Earth work in box cutting;
- Earth filling work;
- Sand filling on the road bed;
- Mechanical compaction;
- Brick work on edging;
- Compacted aggregate sand sub base course;
- Preparation of compacted WBM base
- Providing prime coat;
- Laying pre-mixed dense bituminous surfacing wearing course

The key activities for CC Road include:

- Dismantling of the damaged CC road;
- Sand filling on the road bed;
- Mechanical compaction;
- Laying of Polythene Sheet
- Casting of pavement by CC mixture

The key activities for RCC Drain include:

- Earth work in excavation of the foundation;
- Pumping and bailing out of water as per requirement;
- Lying of polythene sheet;
- Sand filling for the preparing foundation bed;
- Plain cement concrete work in foundation;
- Manufacturing and placing of CC blocks;
- Fabrication of the ribbed or deformed bar;
- Reinforced cement concrete work.

2.6 Category of subproject

For BC, CC road and HBB road and RCC Drain

- According to ECR 1997: Orange B
- According to WB classification : Category B

Considering the anticipated environmental impacts, primarily drain and road can consider as Orange-B as per ECR-97. According to the WB classification, it can classify as Category *B*.

2.7 Analysis of Alternatives

This section examines alternatives to the proposed subproject sites, technology, design, and operation in terms of their potential environmental impacts, and the feasibility of mitigating these impacts. It also states the basis for selecting alternative options for the component. The analysis of alternatives for the subproject components was carried out as part of the feasibility study, and has been taken forward.

a) Zero or No Project Alternative

The No Project option in respect to the proposed subproject implies that subproject area people will deprive from benefit of improve transport and drainage facilities and Pourashava as well.

The No Project option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of local people would remain unchanged.
- No employment opportunities will be created for the local residents who will work in the sub project area.
- Development of infrastructural facilities (roads and associated infrastructure) will not be undertaken.
- Water logging problem of the subproject area would not to be improved.
- Maximize usage and utilization of this township will not to be achieved.

b) Analysis of the Alternative Routes/ Alignments/ Location

(i) Analysis of alternative routes/ alignments for Road:

This is a reconstruction subproject where the existing damaged road will be replaced by the new BC, HBB and CC pavement using the same alignment. Therefore, analysis of alternatives routes/ alignment is not really applicable

(ii) Analysis of alternative routes/ alignments for Drain:

The following three alignments can primarily be considered for alternative analysis.

Route/Alignment	Advantages	Disadvantages
Alternative-1 (both sides of the road)	-Easier house connection -Ease of construction without much disruption to traffic	-Two drainage lines need to be constructed -Expensive-it needs more money, area and time.
Alternative-2 (median/center of the road)	-Single drain needs to be constructed along the median	-Difficult to make house connection

Alternative-3 (one side of the road)	-Single drain needs to be constructed -It is suitable for single lane road	-Difficult to make house connections from other side of the road -It is not suitable for more than single lane road.
--	---	---

As per sites requirement three alternative has been recommended. Designer will be decided with the assistance of ULB engineer which one is suitable for the subproject areas.

c) Analysis of the Alternative Designs

(i) Analysis of the Alternative Designs for Road:

For a road subproject, alternative designs may include asphalt road, CC road, HBB and RCC road. Through a comparative study considering the advantages of the BC road, CC road, HBB road and RCC road, the consultants examined which one is feasible. General advantage and disadvantage of the BC, CC, HBB and RCC roads are shown in following table.

Design Alternatives	Advantages	Disadvantages
Alternative 1: Bituminous Carpeting (BC) Road	<ul style="list-style-type: none"> ● Low Construction cost; ● Provide smooth surface; ● Aesthetic value is high 	<ul style="list-style-type: none"> ● Frequency of maintenance is relatively high; ● Early damaged in heavy rainfall
Alternative 2: CC Road	<ul style="list-style-type: none"> ● Do not require frequent repairing like BC roads; ● Durability is more than BC road but less than RCC road 	<ul style="list-style-type: none"> ● Concrete roads do not require frequent maintenance but if damaged the whole concrete slab needs to be replaced; ● Costly higher than BC road
Alternative 3: HBB Road	<ul style="list-style-type: none"> ● Require less construction cost; ● Construction time is less 	<ul style="list-style-type: none"> ● Frequent maintenance is required ● Surface is not smooth
Alternative 3: RCC Road	<ul style="list-style-type: none"> ● Capacity of passing heavy loaded vehicles ● RCC road is not damaged in heavy rainfall ● Frequency of maintenance is relatively low. 	<ul style="list-style-type: none"> ● High construction cost ● Provide relatively less smooth surface

This is an improvement subproject where the damaged earthen, BC, CC and HBB road will be replaced by the new BC, CC and HBB road on the place of exiting road surface. Hence, in this cases no alternative design is considerable. However, when existing earthen road will develop, it will take place as a BC road because it has more aesthetic value than rough surface that provided by RCC and CC road and during expansion of the utility services for instance water supply line, gas line BC road is more flexible than RCC and CC road. Therefore, considering the low construction cost and high aesthetic value and as a whole to meet the Pourashava demands, BC road is recommended by the designer where applicable.

(ii) Analysis of alternative designs for Drain:

For a RCC drain subproject, alternative designs may include RCC drain and earthen drain. The following table discusses the general advantages and disadvantages of RCC drain and earthen drain.

Design	Advantages	Disadvantages
Alternative 1: RCC drain	<ul style="list-style-type: none"> ● Not prone to encroachment ● Area above RCC drain could be used as a part of 	<ul style="list-style-type: none"> ● Higher cost of construction

Alternative 2: Earthen drain	<ul style="list-style-type: none"> • Less construction cost 	<ul style="list-style-type: none"> • Need more land for construction of open earthen drain • Prone to encroachment, disposal of solid waste/ debris
Alternative 3: Pipe drain	<ul style="list-style-type: none"> • Require less time to construction 	<ul style="list-style-type: none"> • Maintenance is difficult

The selected design is alternative 1 because RCC drain is advantageous than other

d) Analysis of the Alternative Technologies/ Methods of the Construction

Method of the construction should be selected based on the available technologies in Bangladesh and with the assistance of the consultant, the Pourashava Officials. However, to minimize occupational health and safety risks and for effective use of the human labors, it is highly recommended to adapt mechanical system where possible for instance concrete mixer machine for casting, mechanical vibrator machine, and other electro-mechanical equipment as per requirement.

3 DETAILED ENVIRONMENTAL AND INFRASTRUCTURAL FEATURES

The major environmental and infrastructural features in the subproject area have been collected from the field investigation. Manikgonj Pourashava survey team has also performed the conditional survey. Hence, the survey data is also used for preparation of the report. The finding of the sites inspection and investigation are shown in following tables. Effort has been given for getting major environmental and infrastructural features within 100 m of both sides from the center of the road at 100 m longitudinal intervals. The major environmental and infrastructural features are given below Table 3.1.

Table 3-1: Major Environmental and Infrastructural Features from Beautha Bridge North to Sylipara.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Trees , low land, vegetation coverage, tin fence, pucca, semipucca and tin shed residents, electric pole
		√	Boundary wall, pucca, semipucca and tin shed residents
100-200	√		Low land, vegetation coverage, trees ,
		√	Tin fence, pucca, semipucca and tin shed residents, electric pole
200-300	√		Boundary wall, tin shed and semi pucca residents resident
		√	Electric pole, tin shed and semi pucca residents resident
300-400	√		Tin shed and semi pucca residents resident, vegetation coverage
		√	Vegetation coverage, tin shed and semi pucca residents resident
400-500	√		Tin shed and semi pucca residents resident
		√	Semi pucca and tin shed residents resident
500-600	√		Pond, tin shed and semi pucca residents resident
		√	tin shed and semi pucca residents resident
600-700	√		Mosque, tin shed and semi pucca residents resident
		√	Low land, vegetation coverage, tin shed and semi pucca residents resident
700-800	√		tin shed and semi pucca residents resident
		√	tin shed and semi pucca residents resident
800-900	√		Electric pole, tin fence, trees tin shed and semi pucca residents resident
		√	Tin shed and semi pucca residents resident, vegetation coverage
900-1000	√		Vegetation coverage, tin shed and semi pucca residents resident,
		√	Low land, vegetation coverage, tin shed and semi pucca residents resident
1000-1090	√		tin shed and semi pucca residents resident
		√	tin shed and semi pucca residents resident

Table 3-2: Major Environmental and Infrastructural Features at Joynagar Mosque to End of Pourashava.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00	√		Mosque, semi pucca resident, trees
		√	Semi pucca resident, trees
00-100	√		Semi pucca resident, trees
		√	Boundary wall , semi pucca resident, trees
100-200	√		Semi pucca resident, trees
		√	Electric Pole semi pucca resident, trees
200-300	√		Semi pucca resident, trees
		√	Open Land, tress. Low land
300-400	√		Boundary wall, Electric Pole semi pucca resident, trees
		√	Pond, semi pucca resident, trees
400-480	√		Electric Pole semi pucca resident, trees
		√	Shop, semi pucca resident, trees

Table 3-3 Major Environmental and Infrastructural Features from Shop of Aynal to north side near the H/O Arshed Ali Biswas.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00	√		Resident
		√	Canal
00-100	√		Canal
		√	Semi pucca resident, trees
100-200	√		Semi pucca resident, trees
		√	Semi pucca resident, trees
200-300	√		Semi pucca resident, trees
		√	Semi pucca resident, trees
300-400	√		Semi pucca resident, trees
		√	Resident
400-500	√		Hijuli bazar
		√	Hijuli bazar, electric pole
500-600	√		Hijuli bazar
		√	Hijuli bazar, electric pole
600-700	√		Hijuli bazar
		√	Hijuli bazar

Table 3-4 Major Environmental and Infrastructural Features from H/O Tara Mia to south side H/O Nitay Gun, H/O Abul Kalam Azad at East Dashora.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00	√		semi pucca resident, trees
		√	semi pucca resident, trees
00-100	√		semi pucca resident, trees
		√	Boundary wall , semi pucca resident, trees

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
100-200	√		semi pucca resident, trees
		√	Electric Pole semi pucca resident, trees
200-300	√		semi pucca resident, trees
		√	Open Land

Table 3-5 : Major Environmental and Infrastructural Features at Gongadharpatty Professor housing Area

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00	√		semi pucca and tin shed resident
		√	semi pucca and tin shed resident
00-100	√		semi pucca and tin shed resident
		√	semi pucca and tin shed resident
100-200	√		semi pucca and tin shed resident
		√	semi pucca and tin shed resident
200-300	√		semi pucca and tin shed resident
		√	semi pucca and tin shed resident
300-350			semi pucca and tin shed resident
			semi pucca and tin shed resident

Table 3-6: Major Environmental and Infrastructural Features at Katcha Mal Arot Road

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Commercial structure, electric pole
		√	Commercial structure,
100-160	√		Commercial structure,
		√	Commercial structure, electric pole

Table 3-7: Major Environmental and Infrastructural Features from H/O Kzol Mollique to Porrah Primary School

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Pucca , semi pucca and tin shed residents, boundary wall, trees
		√	Low Land, vegetation coverage, seasonal spring
100-200	√		Stationary shop, semi pucca and tin shed residents, boundary wall, trees
		√	semi pucca and tin shed residents, boundary wall, trees
200-300	√		semi pucca and tin shed residents, boundary wall, trees
		√	Seasonal spring, semi pucca and tin shed residents, boundary wall, trees
300-400	√		semi pucca and tin shed residents, boundary wall, trees

		√	Tea stole, Vegetation coverage, semi pucca and tin shed residents, boundary wall, trees
400-450	√		semi pucca and tin shed residents, boundary wall, trees
		√	Primary School, semi pucca and tin shed residents, boundary wall, trees

Table 3-8: Major Environmental and Infrastructural Features from H/O Indira Howlader to H/O Apon Bhaban Road

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Boundary wall, semi pucca and tin shed residents, trees
		√	Pucca Residents, semi pucca and tin shed residents, trees
100-205	√		Pucca Residents, semi pucca and tin shed residents, trees
		√	Pucca Residents, semi pucca and tin shed residents, trees

Table 3-9 Major Environmental and Infrastructural Features from Shib Bari Road from H/O Siddque

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Pucca, semipucca and tin-shed residents, electric pole, trees, boundary wall
		√	Tin shed and semi pucca residents resident, boundary wall, trees, tin fence
100-200	√		Semipucca and tin-shed residents, electric pole, trees, boundary wall
		√	Boundary wall, trees, electric pole, mosque, semipucca and tin-shed residents
200-300	√		Tin shed and semi pucca residents resident, boundary wall, trees, tin fence
		√	Pucca, semipucca and tin-shed residents, electric pole, trees, boundary wall
300-400	√		Semipucca and tin-shed residents, electric pole, trees, boundary wall
		√	Boundary wall, trees, electric pole, semipucca and tin-shed residents
400-500	√		Semipucca and tin-shed residents, electric pole, trees, boundary wall
		√	Boundary wall, trees, electric pole, mosque, semipucca and tin-shed residents

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
500-600	√		Semipucca and tin-shed residents, electric pole, trees, boundary wall
		√	Boundary wall, trees, electric pole, mosque, semipucca and tin-shed residents

4 BASELINE ANALYSIS OF THE ENVIRONMENTAL CONDITION

4.1 General Consideration

Baseline condition of environment states the present status of different components of environment in absence of the subproject. The main objective of examining the present environment is to provide an environmental baseline against which potential impacts from construction and operational phases of any subproject can be compared. A second important function of establishing a baseline for parameters such as air, noise and water quality is to ensure that any problems arising from existing sources are not erroneously attributed to the subproject under study. In the present study the different environmental components examined for setting baseline conditions of the subproject area, are physico-chemical, biological and socio-economical. In physico-chemical component, parameters included are land, water quality, air quality, climate, and noise.

4.1.1 Physical environment

4.1.1.1 Geology, Soils and Seismicity

Geology of Bangladesh is generally dominated by poorly consolidated sediments deposited over the past 10,000 to 15,000 years (Holocene age). It is mostly characterized by the rapid subsidence and filling of a basin in which a huge thickness of deltaic sediments were deposited as a mega-delta out built and progressed towards the south. The delta building is still continuing into the present Bay of Bengal and a broad fluvial front of the Ganges-Brahmaputra-Meghna river system gradually follows it from behind.

Soil Characteristics

The soil formation in Bangladesh is remarkably homogeneous in appearance, both vertically and laterally. It comprises layer of unconsolidated clay, about 10m thick near Dhaka, but apparently thinner to the east and possibly much thicker in the west of the Rajshahi district. The sand mineralogy in this area is broadly similar to that of the tertiary hill sediments. Mineral contents of the soil are high in quartz, relatively low in feldspar and mica, and with zircon, tourmaline, kyanite, staurolite, sillimanite, and epidote dominating the heavy mineral fractions. The content of easily weatherable minerals ranges from 4 to 9%. The soil of Bangladesh can broadly be classified into seven tracts: (1) Madhupur Tract or Red Soil Tract, (2) Barind Tract, (3) Tista Silt, (4) Brahmaputra Alluvium, (5) Gangetic Alluvium, (6) Coastal Saline Tract, and (7) Hill Tracts. Figure 4.14 shows the position of the project site on the soil tract map of Bangladesh.

The soil formation of Manikganj district falls under the Brahmaputra Alluvium floodplain. The dominant soil texture is sandy loam. The soils are acidic in character and the pH ranges from 5.5 to 6.8. The soils are naturally fertile and are recharged every year by fresh deposition by the floodwaters.

Seismicity

In the north and northeast of Bangladesh, there are areas of high seismic activity and some of the major earthquakes originating in these areas have affected the adjacent regions of the country. The whole of Bangladesh is divided into three seismic zones (Figure 4-1). The northern part of the country that includes the greater districts of Rangpur, Mymensingh, and Sylhet are in the Zone-I where earthquake shock of maximum intensity of IX of the Modified Mercalli Scale is possible. The Zone-II includes the greater districts of Dinajpur, Bogra, Dhaka and

Chittagong and the shocks of intensity of VIII are possible. The southern part of the country, the least active region, where the maximum intensity is not likely to exceed VII, is in the Zone-III. Manikganj district is under zone II. Figure 4-1 shows the locations the project study area in the seismic map of Bangladesh.

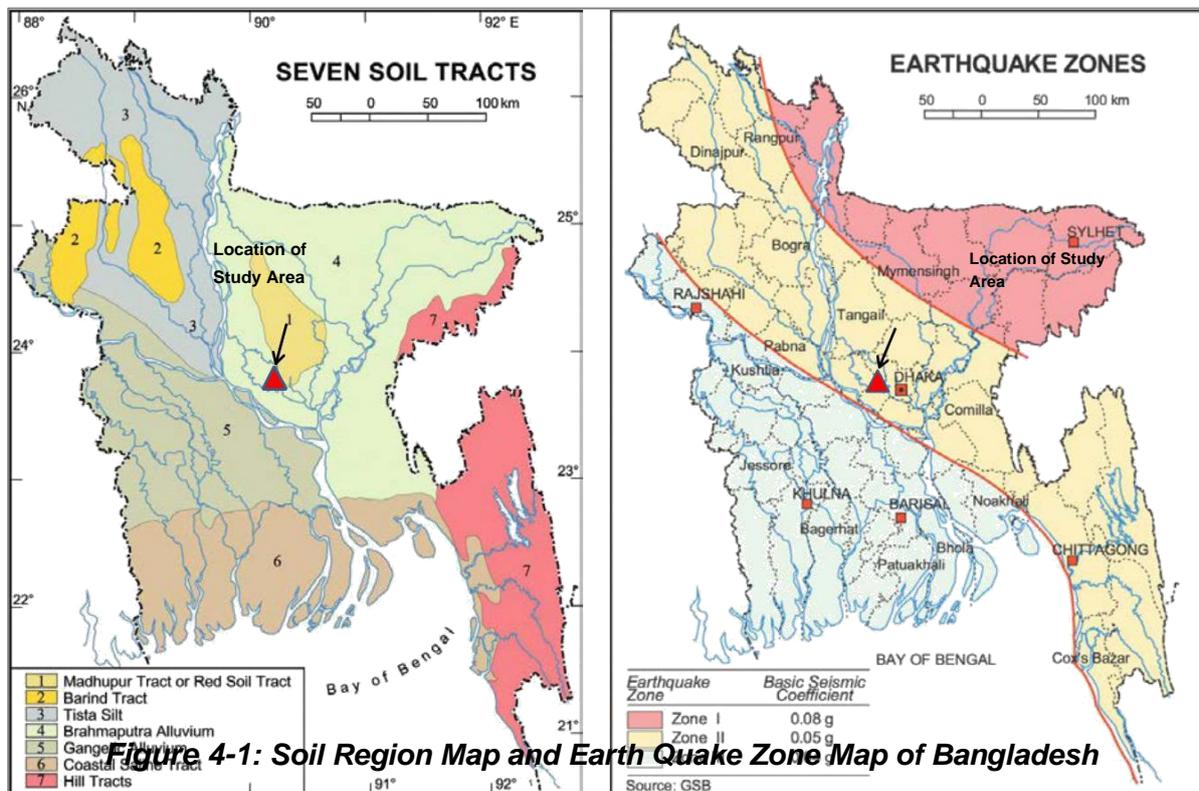


Figure 4-1: Soil Region Map and Earth Quake Zone Map of Bangladesh

4.1.1.2 Climate and meteorology

Bangladesh is located at the central part within the Asiatic monsoon region where the climate is tropical. Relatively small size of the country and generally low-lying area cause moderate spatial variation of temperature, precipitation, relative humidity, wind speeds and other climatic variables. However, the climate of Bangladesh exhibits pronounced temporal variability. This is because of the moisture-laden monsoon wind flowing predominantly from the southwest during summer and the comparatively dry and colder northwestern winds during winter. Three seasons are generally recognized: a hot, muggy summer from March to June; a hot, humid and rainy monsoon season from June to November during which more than 85% of the total annual rainfall occurs; and a moderately cold, dry winter from December to February. The beginning of the rainy season vary from year to year; heavy rains may commence anywhere between mid-April and early June and may end anywhere between the end of September and mid-November. Usually winter season is dry with occasional rains. The early summer season is considered from March-April. During summer the air becomes hot with very low humidity. Baishaki cyclone and rains also dominate the early summer³.

³ Bangladesh Meteorological Department, 2012. Climate data for Dhaka District.

The Bangladesh Meteorological Department monitors different climatic variables from 35 stations in Bangladesh. Among the station located at Agargaon, Dhaka is closest to the site and will best represent the meteorological condition of the site. Different meteorological data like rainfall, temperature, relative humidity, evaporation, and solar radiation measured in these stations during the period 2001 – 2013 are summarized in Table 4-2.

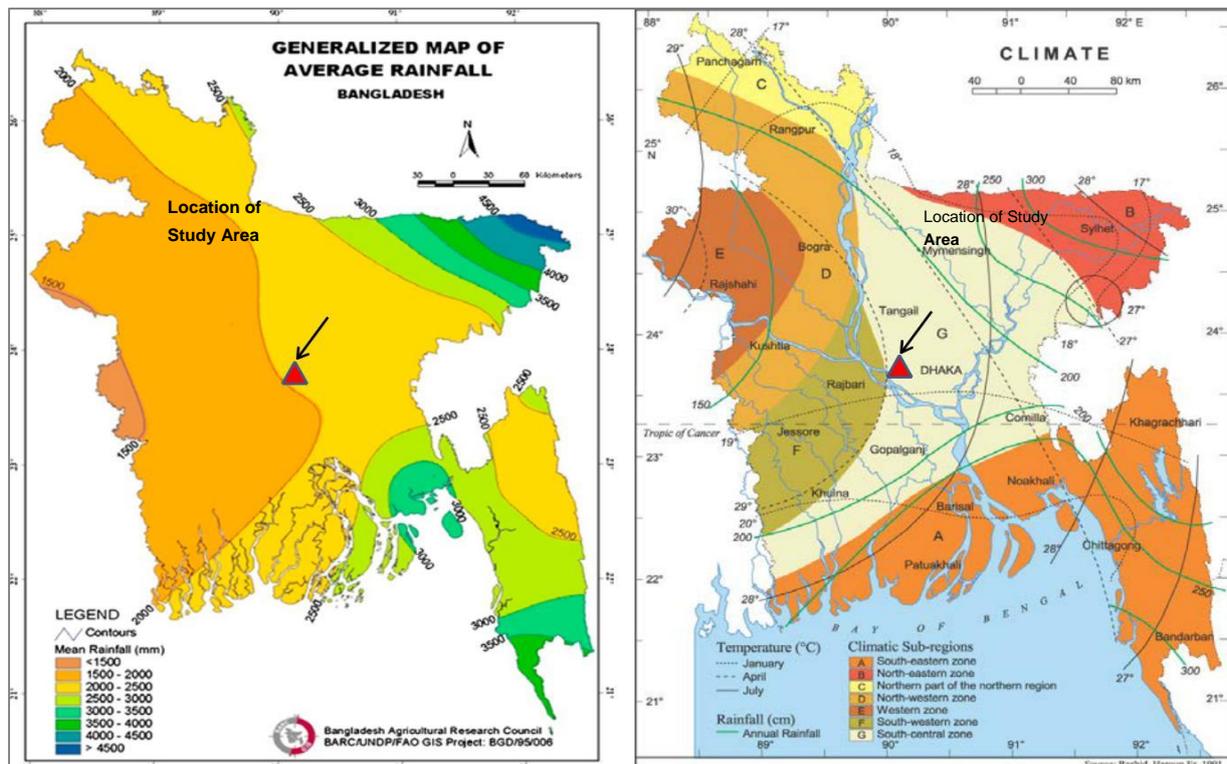


Figure 4-2: The locations of the subproject study site on the mean annual rainfall map of Bangladesh. (Map source: www.banglapedia.org)

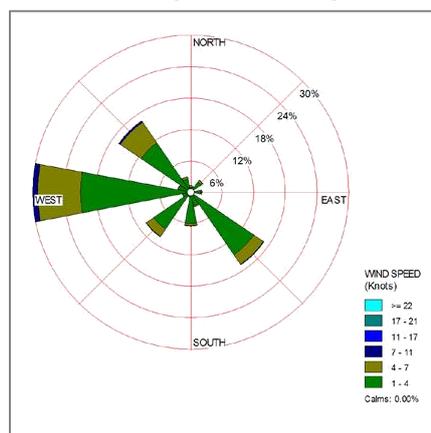


Figure 4-3: Wind rose plot of from the 2008-2012 wind speed/ direction data gathered from Dhaka BMD station showing predominant directions and speeds of wind⁴.

⁴ Bangladesh Environmental survey, 2005. Wind speed data for Bangladesh.

Precipitation

The general pattern of precipitation (which consists entirely of rain) follows the monsoon pattern with the cooler, drier months of November to March, increasing rains in April and May and highest rainfall in the summer months of June to September when the prevailing wind direction from the southwest brings moisture-laden air from the Bay of Bengal. The winter period (November to February) is dry with very little rainfall. Figure 4-2 shows the location of the site in Manikganj District on the rainfall map and climatic zone map of Bangladesh. Figure 4-3 shows the wind rose plot from the data of the last 5 years indicating the dominant directions and wind speed prevalence.

Table 4-1: Monthly averages of climatic variables at the Dhaka BMD Station, 2001-2013

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	5	14	29	111	212	326	350	290	316	155	19	11
Mean Temp (°C)	18.0	21.9	26.0	28.1	28.5	28.4	28.3	28.5	28.2	27.1	23.7	19.9
Max Temp (°C)	28.3	32.3	36.0	36.7	36.5	35.7	34.8	34.8	35.0	34.8	32.3	29.2
Min Temp (°C)	10.1	12.4	16.5	19.3	20.6	22.7	23.9	24.0	23.7	20.6	15.8	11.8
Humidity (%)	69	60	59	68	72	80	81	80	80	76	70	71
Sunshine (Hours)	5.7	7.3	7.5	7.7	6.8	3.4	4.0	4.5	4.2	5.7	6.8	5.8
Solar Radiation (Cal/cm ² /min)	166	207	231	244	229	175	189	192	172	183	174	146
Evaporation (mm/d)	2.6	4.0	5.0	5.5	5.3	4.1	3.8	3.8	3.6	3.5	3.3	2.5

Source: Bangladesh Meteorological Department

Relative Humidity

The spatial and temporal variation of Relative Humidity throughout the year is very low in Bangladesh. The relative humidity varies from 59% to 86%.

4.1.1.3 Hydrology (surface water, ground water, and rainwater)

Groundwater is the main source of potable water in the subproject area. Local people typically use deep tube-well water for drinking and other domestic purposes. The main surface water body in the study area is the Kaligonga River, Manikgonj Cannel, and bokjuri Khal which serves the purpose natural drainage of storm water. In addition, Dhaleshwari River flows very close to the Manikgonj Pourashava. The main stream flows north of Manikgonj and joins the other

branch, the Kaliganga, south of Manikgonj. The Kaliganga again joins with the Dhaleshwari. There is no remarkable source of industries which can pollutes the surface water bodies in the Pourashava. However, discharge of household wastes, kitchen waste from bazar area, and direct connection of sewer or toilet line in to the drain which is discharging their waste water in to the river or cannel might be degrade the surface water quality. In order to assess any domestic or industrial pollution in nearby areas, surface water can be a good indicator. Hence, prior to commencement of the subproject, contactor will be performed surface water quality test of outfall to evaluate the exiting condition of the water quality of the subproject area.

4.1.1.4 Flooding, water logging, and drainage pattern

There isn't any significant flooding in the region. Although, during the wet season, heavy rainfall can cause water logging due to lack of proper drainage systems in the city. The City has a few narrow drains that are not enough to carry storm and domestic waste water. The existing drainage system is not functional because people throw and dispose wastes in the drains. Figure 4-4 shows the positions of the project site over the flood risk map of Bangladesh. It can be observed that the project area is subject to low to Moderate River flooding. The Dhaleshwari River flows very close to the Manikgonj River.

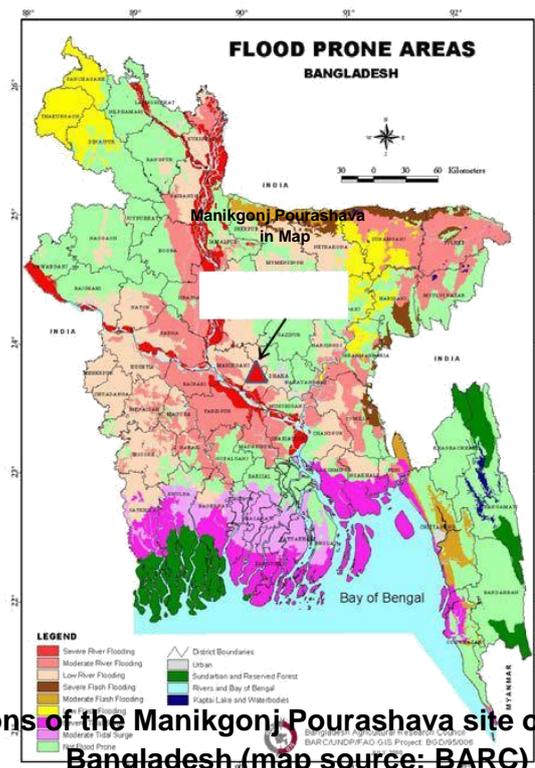


Figure 4-4: Locations of the Manikgonj Pourashava site on the flood risk map of Bangladesh. (map source: BARC)

4.1.1.5 Air quality and dust

Air quality data of the sub-project area is not readily available. However, from visual observation air seems to be clear in the subproject area. The possibilities of air pollution from the industries is insignificant as there is no air polluting industries in the subproject area. Major atmospheric pollution is caused by man induced activities like - burning fossil fuels, construc-

tion works and transportation. During construction period use of subproject vehicles and construction equipment may degrade the air quality. However, proper implementation of mitigation measure which are addressed in the EMP is good enough to control the expected air pollution to be raised from construction activities. Moreover, to evaluate the existing condition of air quality contractor will perform the air quality test prior to construction. Following Table shows the Bangladesh National Ambient Air Quality Standard comparing the WHO Guideline standard.

Parameter	Environmental Conservation Rules, 1997				WHO
	microgram/m ³				
	Industrial	Commercial and Mix use	Residential and Rural area	Sensitive area	
SPM	500	400	200	100	-
PM 2.5	65				10
PM10	150				20
SO ₂	120	110	80	30	20
NO ₂	100	100	80	30	40
Pb	.5				

4.1.1.6 Noise level

Subproject components are in the built-up part of Pourashava, which mainly buildup with residential and commercial activities. The volume of traffic that passes through these sections is not significant and traffic jams are not frequent. However vehicular movement can be considered as major cause of noise pollution especially particular area adjacent to the main road near bazar area. In addition, sophisticated machineries will be used at construction period which will produce little significant noise. But it would be temporary and site specific. Even, if proper measure are taken it would be within tolerable limit. Noise level has been monitored at the various locations of the subproject sites during day time of 13 June 2018. As a part of the baseline study, noise level measurements were made at different locations around the proposed subproject sites. Table 4-2 shows the summary of noise level measurements carried out in different locations in and around the study area.

Table 4-2: Ambient Noise Quality Analysis

Noise level measurement locations	GPS Co-ordinate	Day-time	
		Equivalent Noise level (dBA), L _{eq}	Maximum Noise level (dBA), L _{max}
Near Beautha Bridge	23°69'09.96"N 89°56'41.66"E	66.89	69.78
Near Mazipara Botttala	23°45'22.66"N 89°45'91.88"E	63.18	66.67
At Kacha Bazar	23°57'18.49"N 90°10'11.27"E	72.12	72.79
Near Porrah Primary School	23°87'50.00"N 90°01'4168"E	49.87	50.54
Bangladesh (DoE) Standard			
Zone	Max	Min	

Industrial	75	70
Commercial	70	60
Mixed Area	60	50
Residential Area	55	45
World Bank Standard		
Industrial	70	70
Commercial, Residential, Educational	55	45

4.1.1.7 Solid waste management

The Pourashava has designated dumping site at Muljan which is near last boundary of municipality. The collected solid wastes are transported by the garbage trucks to the dumpsite site. Due to lack of awareness about waste disposal by the community people, Manikgonj Pourashava faces challenges proper disposal of the solid wastes. The local people informed that due to habitual problem they throw their solid wastes into the vacant lowland, khals and drains. Therefore, improper solid waste disposal by the community people creates severe public health hazards and environmental degradation. It is noted, at present garbage collection is mainly practiced in the core area of the Pourashava. The municipality has planned to do it larger scale over the whole jurisdiction of the Pourashava.

4.1.2 Biological Environment

4.1.2.1 Flora and fauna

The common natural native species of vegetation are found in the subjected area. The road side planted trees include Mahogany, Rain-tree, Shiris, Mango, Jackfruit, Banana, Coconut, Betel nut, Wood apple tree, Date juice tree and Palm trees. There is huge natural growth aquatic and terrestrial vegetation (herbs and shrubs) both sides of the proposed road. In the subproject area, agricultural practices (paddy cultivation) are common. Other crops and seasonal vegetables also cultivated in the agricultural land and homestead garden. The natural surfaces water bodies (khals, ponds, ditches) are the worthy habitat for the aquatic animals.

Wild animals and endangered faunal (Jackal, Mongoose) species were found. The common local birds such as Doel, Shalik, Chil, Pecha, Kak, Tuntuni, Bulbuli, and Kokil were found in the subproject area. Nevertheless, some natural fish species exist in these canals and road side ponds and ditches as per information by the local people. The local inhabitants also addressed migratory birds are coming in the winter season.

4.1.3 Socio-economic environment

4.1.3.1 Land Use Pattern, Status of Housing and Built-up Infrastructure

The subproject area mostly consists of medium to high densely populated residential area with few commercial area of the Pourashava. The built-up infrastructure includes mainly pucca, semi-pucca and tin-shed residential houses and shops, educational institutions, religious centers (Mosques and Temple), slum area, hospital and health care center, Moreover, there are notable amount of agricultural activities in the subproject area.

4.1.3.2 Area and population

Manikgonj Pourashava occupies an area of 42.50 km² with population of 1,20,000⁵. It is divided into 9 wards and density of population per sq.km is 1236. The rate of population increase is 4.5 %⁶. This subproject goes through the Ward number 1, 2, 3, 4,5,6,7 and 8. As per information by the municipality, considering the ward population about 60,000 people will benefit directly and many others indirectly.

4.1.3.3 Education

Manikgonj Pourashava has an average literacy rate of 73.52% (Bangladesh Bureau of Statistics, 2011). There are a few government and private schools and colleges present in the city. However, since it is very close to Dhaka hence, notable amount of students of Manikgonj move to Dhaka for better education.

4.1.3.4 Tribal communities

There is no indigenous or tribal people settlement in the subproject influence area. Therefore, there is no measure needed for indigenous peoples' safeguard.

4.1.3.5 Archeological/Historical places

No known remarkable archeological or historically important structure or sites are reported in the survey area. So, no cultural impact is expected.

4.1.3.6 Land acquisition and resettlement

Since, the entire sub-project area is solely owned by the Municipality. So, land acquisition is not an issue to implement this subproject.

4.1.3.7 Local economies such as employment, livelihood

The subproject area is inhabited by the people of mixed occupations. In the Pourashava area, major income comes from business, enterprises, small trades, private sector jobs and government jobs in the town.

⁵ BBS, 2011 Bangladesh Bureau of Statistics (BBS) Census.

⁶ At a Glance of Pourashava, Manikgonj Pourashava, Manikgonj.

4.1.3.8 Water supply facilities

Manikgonj Pourashava has a piped municipal water supply system with 05 PTWs, 01 water treatment plants, one iron removal plant, 01 overhead tank and 10 street hydrants. Some 4,500 households through 84 km of lines avail municipal water supply system's benefit, which is about 33% of the total households. There are some 1,227 hand tube wells owned by the municipality, which cover some 11% of the households, and an unknown number of HTWs owned by individual households serve the rest of the population⁷.

⁷ Web Site: [www. Govt. manikgonj pourashava](http://www.Govt.manikgonjpourashava.gov.bd), Manikgonj Pourashava.

5 ENVIRONMENTAL SCREENING

Environmental Screening (ES) for the subproject have been conducted with the purpose of fulfilling the requirements of GOB and WB. ES ensures that environmental issues are properly identified in terms of extent of the impacts. Environmental Screening Checklist, as adopted in Appendix C of the Environmental Management Framework of the MGSP, was administered for identifying the impacts and their extents. The screening data and information for the **Road and Drain** been formulated and are shown in below.

1) Potential Environmental Impact during Construction Phase:

(a) Ecological Impacts:

- | | | | | | |
|--|--------------------------------------|--|---|-----------------|----|
| ➤ Felling of trees | Significant <input type="checkbox"/> | Moderate <input checked="" type="checkbox"/> | Minor <input type="checkbox"/> | Number of trees | 15 |
| ➤ Clearing of vegetation | Significant <input type="checkbox"/> | Moderate <input type="checkbox"/> | Minor <input checked="" type="checkbox"/> | | |
| ➤ Potential impact on species of Aquatic (i.e., water) environment | Significant <input type="checkbox"/> | Moderate <input type="checkbox"/> | Minor <input checked="" type="checkbox"/> | | |

The subproject area goes through developed mixed zone of residential and commercial area. However, due to site clearing work 15 numbers of trees to be felled down at different subproject sites. However, these trees are not big in size in term of length and diameter. Major trees to be chopped down are: Mango, Betel Nut, Coconut, Jambura, Jackfruits. All the subproject road sides have natural grown vegetation which is to be needed clearing for implementing the proposed intervention. However, intensity of the vegetation coverage along the roads are not uniform. There are lots of surface water bodies like ponds, low ditches, and khals nearby subproject area. These surface water bodies may be polluted due to accidental leakage and spillage of oil, grace etc. or throwing of waste material into the road side water bodies. Taking the amount of trees to be felled down, overall ecological impact is considered as minor

(b) Physicochemical Impacts:

- | | | | |
|---|--------------------------------------|--|---|
| ➤ Noise pollution | Significant <input type="checkbox"/> | Moderate <input checked="" type="checkbox"/> | Minor <input type="checkbox"/> |
| ➤ Air pollution | Significant <input type="checkbox"/> | Moderate <input checked="" type="checkbox"/> | Minor <input type="checkbox"/> |
| ➤ Drainage congestion | Very likely <input type="checkbox"/> | Likely <input type="checkbox"/> | Unlikely <input checked="" type="checkbox"/> |
| ➤ Water pollution | Significant <input type="checkbox"/> | Moderate <input type="checkbox"/> | Insignificant <input checked="" type="checkbox"/> |
| ➤ Pollution from solid/ construction wastes | Significant <input type="checkbox"/> | Moderate <input checked="" type="checkbox"/> | Insignificant <input type="checkbox"/> |
| ➤ Water logging | Significant <input type="checkbox"/> | Moderate <input type="checkbox"/> | Insignificant <input checked="" type="checkbox"/> |

This subproject component consist of ten different location of the Pourashava. These subproject sites will have negative impact on the physicochemical parameter (noise and air) due to use of hydraulic excavator, mechanical compaction machine, concrete mixer machine, vibrator machine, and mobilization of the equipment, vehicles movement for the transportation of the materials. However, the potential impact on air and noise from these subproject activities is manageable because these impact are site specific and context of impact is limited. Moreover, the construction work will be performed section wise to minimize the impact. Therefore, anticipated impact on noise and air is considered as moderate. The generated construction waste like loose soil, dismantling debris perhaps disturb the nearby community people if proper measure are not taken. Additionally these generated debris may also get worse condition for the road side water bodies if not properly collected and disposed. In addition, aesthetic landscape value and surrounding environment may be degraded from the improper collection and disposal of the generated wastes materials. Generally there will be no drainage congestion or water logging because most of earth work will be performed at dry season. Even there will provision for pumping facilities to drain off the water if required. Furthermore there are lots of open space along the proposed road.

(c) Socio-economic Impacts:

- | | | | |
|---|---|--|---|
| ➤ Traffic congestion | Very likely <input type="checkbox"/> | Likely <input checked="" type="checkbox"/> | Unlikely <input type="checkbox"/> |
| ➤ Health and safety | Significant <input type="checkbox"/> | Moderate <input checked="" type="checkbox"/> | Insignificant <input type="checkbox"/> |
| ➤ Impact on archaeological and historical | Significant <input type="checkbox"/> | Moderate <input type="checkbox"/> | Insignificant <input checked="" type="checkbox"/> |
| ➤ Employment generation | Significant <input checked="" type="checkbox"/> | Moderate <input type="checkbox"/> | Insignificant <input type="checkbox"/> |

Though it is temporary and site specific; however, the construction activities will have likely negative impact on local traffic system. During construction work, the existing road width will permit movement of pedestrians, bicycles and rickshaws. In addition, construction work will be performed section wise to minimize traffic congestion. *Moreover, for all the roads there are adequate connecting and alternatives road. These roads will continue the vehicles and pedestrian movement during conduction period. So, expected impact on the traffic is insignificant. The proposed construction activities does not require use of heavy equipment and construction work will follow simple procedure with commonly used equipment. Hence, anticipated impact on health and safety is moderate. There is no archaeological and historical site within the influence area. The subproject has positive impact by generating work opportunities for the local people.*

2) Potential Environmental Impact during Operational Phase:

(d) Ecological Impacts:

- Potential impact on species of aquatic (i.e., water) environment Significant Moderate Minor

The road component does not have any likely impact on the aquatic environment during operation. Though, the drain is designed for storm water; however, the storm water may carry washed-out materials, pollutants from any sources that may disturb the aquatic environment of the outfall.

- Potential air quality Improvement No-improvement Deterioration
- Noise Level Improvement No-improvement Deterioration
- Drainage congestion Improvement Minor Improvement No Impact
- Risk of water pollution Significant Moderate Minor
- Pollution from solid waste Improvement Minor improvement Minor

During operation phase, improved and widened road may increase traffic volume. This may degrade the air quality and noise level due to black smoke emission and un-due use of hydraulic horn from the vehicles. The wastewater to be discharged may degrade the water quality of the outfall, if it carries pollutants. The new drain after construction will reduce water logging problem. The covered drain also will reduce throwing of the waste materials in to the drain. This will reduce drain water pollution. Consequently, spreading of the bad odor will be minimized.

(f) Socio-economic Impacts:

- Traffic Improvement No-improvement Adverse
- Safety Improvement No-improvement Adverse
- Employment generation Significant Moderate Minor

After completion, this road will improve the transport facilities. By providing uniform pavement, it will also enhance traffic safety. Newly constructed drain will improve drainage facilities and prevent the accumulation of the stagnant water on the road surface. This will reduce wearing of the BC road surface. Consequently, it will enhance traffic safety.

3) Summary of the Possible Environmental Impacts of the Subproject:

The ecological impact for implementation of this subproject is minor. There will be temporary negative impacts on physic-chemical environment during construction phase. Nevertheless, these impacts are manageable if mitigation measures are taken according to EMP.

The wastes generated due to the construction activities should be properly collected and disposed in a designated dumping site. Some earthwork will be involved for the construction work; however, no agricultural productive soil will be used for the purpose. The inputs that may affect the environment will be mainly at construction phase. Moreover, mitigation measures will be taken according to the EMP for minimizing the environmental pollution.

Using of the excavator, cutter machine and other mechanical equipment may cause potential safety risks. Safety concern is an important issue for both the construction and operation phases that should be considered properly. This subproject will have positive impacts in terms of the generation of the employment and business activities by supplying construction materials and equipment. However, it has significant positive social impacts.

6 SPECIFIC IMPACT, MITIGATION AND ENHANCEMENT MEASURES

The impacts, which are likely to be occurred in the different phases of the subproject, are identified in this section. In addition, evaluation of these impacts was done mentioning their origin and characteristics along with their possible mitigation/enhancing measures.

6.1 Impact Due to Subproject Location/ Preconstruction Phase

6.1.1 Disorder of Earth Surface

Cause of Impact

Width of the most of existing road is non-uniform. Thus, to provide uniform road width at few section of the proposed road, widening work would be performed. Hence, these section to be elevated up to the existing road level by cutting and filling work. This land filling will be from its original level which will not disrupt the natural surface of earth and obstruct the natural drainage system of the area.

Mitigation Measure

The subproject intervention will not create any water logging and drainage problem as the Pourashava authority collects the soil to develop the area by carried sand from different places. Cross drainage works should be constructed to bypass the surface water and other discharges if required.

6.1.2 Constuction of Labour Shed

Cause of Impact

The precise locations of construction camps for the proposed subproject will be decided by the contractor with the assistance of the Engineer of the Pourashava. During site visit, there is tentative one site office, one labor shed and one stack yard is recommended by Pourashava at vacant place near Pourashava water Supply Office which is located at word no 7. However, the siting of the camps may cause a number of issues such generation of sewage, sold waste. The people and the changes they bring can have impacts on the local communities and social structures. Most important aspects are: pollution risk of soil and surface water due to sanitation of the labor camps and wastes from the camps

Mitigation Measures

To meet the workers basic needs labor shed will be constructed which will contains adequate ventilation facilities and standard living condition and it never be overcrowded. In addition, safe potable drinking water will be provided. Furthermore, contractor will construct two sanitary latrine considering 15 persons for one toilet at the labor shed (one for male and other for female). Proper health and safety of workers will be ensured through providing health and hygiene training to the workers by the Municipality and the contractor. Waste bins will be present at the labor shed, and the workers will be encouraged to dispose of all their garbage at the

waste bins. All the waste will be collected daily and taken to the Municipality waste dump site at Muljan (near last boundary of Pourashava).

6.1.3 Ecological Impact Due to Felling of Trees and Clearing of Vegetation

Cause of Impact

During site visit it was counted that at different subproject sites total 15 numbers of planted and natural grown trees to be chopped down, to provide the uniform road width. Medium quantity vegetation clearing is also needed.

Mitigation Measures

75 nos. of trees will be planted to compensate the felled down trees (preferably local fruits, flowers, medicinal and ornamental trees- Mango, Jackfruit, Plam, Jam, Neem, Amloki, Horitoki, Bohera, Shunalu, Arjun, Jarul, Palash, Krishnachura, Bakul, Mahogany, Rain Tree, Koroi anywhere suitable Pourashava owned places within the influence area of the subproject. Planting trees will enhance the ecological balance of the subproject area after their successful growth.

6.2 Impact at Construction Phase

6.2.1 Earth Work and Site Clearing Work for the Site Clearing

Cause of Impact

Each development project more or less requires site preparation. The preparation works for road and drain generally done during construction stages includes-cut and filling work, soil export or import work and demolition of the existing brick drain, damaged BC and HBB, BFS road. The mentioned activities will arise the following impact- noise, generation of dust, soil erosion, drainage congestion and safety concern.

Mitigation Measures

Cutting and filling operation should be kept minimum. During earth work, will try to avoid loss of the topsoil. In addition, for backfilling work use of sand will be ensured. The subproject contractor should ensure construction of proper drainage facility. Regular water sprinkle should be ensured by the contractor to minimize elusive dust emission. Cover the exposed earth works with much fabric to minimize the dust. Moreover, proper care will be taken by the contractor during earth work and disposal work to avoid any undue disturbances to the nearby people. As a part of safe working procedures contractor should be ensured used of PPEs as per requirement. Undertaking construction work during dry seasons to minimize the water congestion. The heavy equipment should be operated at day time. The generated waste from the dismantling work will be deposited regularly and quickly in to the designated dump site of Pourashava at Muljan which is located at last boundary of Pourashava.

6.2.2 Sourcing, Extraction and Use of Construction Materials

Cause of Impact

Construction materials such as rough stone, ballast and bitumen required for construction of the roads and drain subproject will be obtained from quarries and bitumen dealers. Since considerable quantities of these materials will be required for construction of the roads and drains,

the availability and sustainability of such resources at the extraction sites will be negatively affected, as they are not renewable in the short term.

Mitigation Measures

The contractor will source construction materials such as sand, ballast and hard core from registered quarry of Sylhet and local sand mining firms. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated. Contractor will ensure that materials are not extracted or purchased in excessive quantities. Moreover, the contractor shall consider reuse of construction materials and use of recycled materials. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

6.2.3 Pollution from the Construction Materials' Transportation and Storage

Cause of Impact

Lack of proper guideline for the construction material transportations, handling and storage may lead the occupational health and safety risk. On the contrary, dumping of the construction spoils, including accidental leakage of the oil, grease, and fuel in equipment yards is a significant hazard. These substances can be washed-out by the storm water and can be discharged in the nearby subproject area surface water bodies. Even the people to be engaged for the construction activities and local communities might endanger the physical and human habitats of the area.

Mitigation Measures

Safe transport, storage, and disposal of the construction materials, and the equipment have to be carried out in order to avoid the accidental spillage and loss and to minimize any health risk. Fuels, lubricants, and other hazardous materials should store over raised platforms and not directly on the ground. Place storage areas for fuels and lubricants away from any drainage leading to water bodies. Maintain adequate moisture content of sand during transportation, compaction and handling. Carry the materials especially loose soil and sand with adequate cover. Contractor will responsible to avoid head loads for carrying soil, construction materials and construction equipment and disposal of the wastes at the designated dump site which is located at last boundary of Pourashava.

6.2.4 Air Quality and Dust

Cause of Impact

The air quality in the subproject area may slightly deteriorate for the time being during construction activities. The major construction activities from which air emission mostly dust emission may occur are; unpaved road width, transportation of construction materials (especially fine aggregate), Opening-up of cement bags and emptying the cement in order to mix with other construction material; black smoke emission from the subproject vehicles and equipment's, handling of sand, stone/brick chips may contain loose dust particles. These activities will temporarily disturb the nearby resident and associates construction worker by creating eye irritation, skin irritation, respiratory difficulties and difficulties of breathing. However, emissions are temporary and not expected to contribute significantly to the ambient air quality and will be within prescribed limits.

Mitigation Measures

Regular sprinkling of water to be done on open surface and dust grounds until paving is done. Maintain adequate moisture content of soil and sand for transportation, compaction, bed preparation, backfilling and handling. Avoid use of dust generating equipment which produce significant amount of particulate matter far from the local residents. Contractor will responsible to ensure that all subproject vehicles and equipment are in good operating condition. Even periodically air quality test near subproject vehicles will be performed. The subproject management and contractor to enforce strictly use of personal protective as per requirement especially face mask and proper clothing to minimize the skin irritation, respiratory difficulties and difficulties of breathing.

6.2.5 Noise and Vibration

Cause of Impact

Noise and vibration caused by the equipment (concrete mixture machine, vibrator, asphalt plant, road cutter and excavator etc.) and movement of the construction vehicles, may temporarily disturb nearby residents and the sensitive areas. In the subproject, sensitive areas like roadsides houses, shops, administrative office and educational institutes are likely to be affected from the roadside noise, though the impacts are limited to the sites and very short-term.

Mitigation Measures

Transportation of the construction materials and noisy construction work have to be carried during the scheduled times, and mainly during the day. Even transportation of construction materials have to be carried with scheduled time. Where applicable and possible exceptionally noisy machines to be fitted with noise abating gear such as mufflers for effective sound reduction. Providing suitable hearing protection to all workers exposed to noise levels where it is more than regulatory limit.

6.2.6 Water Quality

Cause of Impact

The water quality may deteriorate if the construction materials, sand, construction wastes, effluent from the work camps, and food wastes are dumped in the roadside water bodies.

Mitigation Measure

Proper construction management including waste management as well as training of the operators and other workers should provide to avoid pollution of the water bodies. In addition, construction waste will carefully remove and taken to the municipal waste dump site at Muljan (not in the water bodies or lowland), for which contractor will be responsible.

6.2.7 Drainage and Impact on surface water

Cause of Impact

The potential impacts on local hydrology are mainly those of altered patterns as a result of onside construction and earthwork activities. The proposed subproject will affect natural drainage, surface and ground water quality if not managed the construction works properly. There could be siltation of water system or drainage from uncovered piles of construction materials.

Mitigation Measure

To avoid the drainage, earthwork of the subproject will mostly cover in the dry season. Additionally surface drainage shall be controlled to divert surface runoff away from the construction area. Even at construction sites pumping provision will be ensured by the contractor. Stock piling of spoil soil shall be selected at a safe distance from the drainage system. Containment of sanitary waste from camp site should be adequately disposed off to avoid surface and ground water contamination.

6.2.8 Impact on host communities from outside workers

Cause of Impact

The differences in the cultures of workers (in case hiring is required) and local community may create some problems. Therefore, the unknown identity of the hired labor to the host communities has possibilities to create social crisis by involving with local politics, even teasing or sexual abuse the campsite female worker or campsite nearby neighboring people may be affected.

Mitigation measures

The subproject proponent and his organization have practice of working with the workers of different cultures. It is recommended to aware of the outside workers about the social & religious actability in the area so that they could maintain those when they will have touch with local community.

6.2.9 Occupational Health, Aesthetics and Safety

Cause of Impact

Construction activities lead to generation of dust, unpleasant view, obstruction in access of public properties due to excavation etc. which may have negative impact. Adequate waste management plan, air, soil, noise and water pollution controls are required to be adopted to prevent any impact on society. Also various health hazards are associated with construction activity which may significantly impact the workers if not taken care like as mechanical failure of the equipment, traffic collision or accidents during operation of the equipment such as hydraulic excavator, steel cutter, head loads for carrying soil, construction materials and construction equipment; the sudden bad weather working conditions such as storm, thunder storm and earth quake etc. hazardous substances and wastes pose risks of the infections and diseases.

Mitigation Measures

- Provision of proper training to all workers for handling the construction equipment
- Provision of cautionary and guiding signage in local and English language indicating the hazard associated with the site
- Provision of the adequate latrines and separate toilets for the women;
- Wastewater from the toilet should be disposed off in septic tanks and soak pits and should not be allowed to accumulate at labor camp site or construction site
- Dustbins should be provided at labor camps for collection of waste and waste should be regularly disposed off through the concerned agency

- Temporary storm water drainage system should also be provided at camp site so as to drain the storm water and prevent accumulation of storm water at site and thus breeding of mosquitoes/flies
- Provision of personal protective equipment like safety jackets, helmets, gumboots, gloves, face mask, ear buds, goggles, safety shoes etc as per requirement and nature of job in which they are involved
- Job rotation should be carried out for workers exposed to high noise and dust areas
- Provision of First aid facility at the site and the labor camp
- Labor camps should be located at neat and clean location with no water logging issues
- Proper sanitation facility including toilets, bathing facility and washing facility should be provided at site and at labor camps for workers
- Clean drinking water supply should be provided to labor
- Brest feeding facility should be provided for kids if female workers are employed
- Regular inspection for hygiene and safety in labor camps should be done
- Construction debris should not be allowed to enter into aquaculture ponds located along the road
- Entrance to any road/structure should not be blocked for construction material
- Contractors will bear medical treatment costs. If any sever accidents such as loss of hands, legs or loss of working ability or any case of death needs compensation-(the amount of the compensation should be fixed considering the type of accidents).

6.2.10 Impacts on Social Environment and Common Property Resources

Through comprehensive study, it is revealed that impacts are expected not to be severe and to be largely manageable. The following **Table 6.1** presents impacts on socio-economic environment and common property resources.

Table 6-1 : Impacts on Social Environment and Common Property Resources

Social Components	Impacts on IECs	Impact Significance
Community Perception	The local community people welcome this subproject and there is no visible objection from them.	Significant (+ve)
Employment and Business Opportunity	Community feels happy because generally the local contractor will be engaged for the construction works which will create work opportunity for the skilled and non-skilled labor. The subproject will create business opportunity for the equipment and materials suppliers.	Significant (+ve)
Community Order and Security	This subproject activity does not create any severe security problems to the local community and community people.	Minor (-ve)

Social Components	Impacts on IECs	Impact Significance
Possible damage to infrastructure and facilities	Possible damage of the existing road infrastructure by the construction equipment and vehicles used in this subproject.	Minor (-ve)
New infrastructure and facilities	Improvement of the existing road will enhance infrastructure facilities.	Moderate (+ve)
Agriculture and Land Use	No direct impact on agriculture however, it could affect the adjacent land to a very limited extent.	Minor (-ve)
Landscape and Aesthetics	This subproject activity temporarily will degrade landscape and aesthetics values of the subproject area to a limited extent.	Minor (-ve)
Labor Habitat	Most of the labors will stay at the Labor shed which will have impacts on the environment relates to the generation of the solid wastes, effluent, and water consumption.	Moderate (-ve)
Health Care	Workers may suffer from the dehydration problems, respiratory problem, and other health hazards.	Minor (-ve)
Accident	In case of road accidents by the vehicles to be used for the transportation may have serious negative impact.	Significant (-ve)

Specific Measures and Guidelines for the Key Social Issues

The primary objective of these guidelines is to ensure social compliances and requirements required for the subproject. The social guidelines required for the subproject as appeared in this report are given in below.

- Conduct dissemination with details about the subproject to the local community;
- Continue liaison with the community leaders in order to maintain the community support;
- Engage local contractor and local people for the positive perception of the local community;
- Avoid peak hours for transportation of the equipment and construction materials to avoid any undue disturbance to the roadside people;
- Ensure no child workers (less than 18 years) and aged worker (more than 65 years);
- Ensure no discrimination between the male and female in terms of the wages and getting work opportunity;
- Ensure regular payment to the workers;
- Consult with the workers for feeling of any health problems and take measures accordingly;
- Monitor the workers movement for avoiding any unexpected social activities (robbery, crime, political attachment and conflicts, taking drugs);
- Monitor contractor behavior and attitude to the workers.

6.2.11 Traffic Management

The subproject activities will interrupt free movement of the pedestrians and non-motorized vehicles during construction phase. Since the volume of the motorized traffic is not huge for this road. Hence, the subproject activities do not have any severe impact on the motorized vehicles. However, the subproject activities have negative impact on the local traffic during construction phase due to inadequate connecting and diversion roads. Therefore, to keep the impact minimal, construction work will be performed section wise.

During construction phase, interruption of the traffic movement and impact on the local traffic system due to the subproject activities will be monitored closely. Then separate traffic management plan will be provided if required. However, the following safeguard measures are recommended to minimize the impacts associated to the traffic movement:

- Inform local people about the subproject activities;
- Inspire local people to use connecting and diversion roads;
- Ensure schedule deliveries of material/ equipment during off-peak hours;
- Place traffic sign/cautionary sign to avoid undue traffic congestion and associated traffic control measures to limit possible disruption;
- The place of construction works should be fenced off with fences if required and should be isolated from general public access and marked with signs to ensure safe movement.
- At the points where traffic is to deviate from its normal path (whether on temporary diversion or part of the width of the carriageway), the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums, or a similar device to the directions of the vehicles.
- At night, the passage shall be delineated with lanterns or other suitable light source.
- For notification of construction activities, at least two signs shall be put up for each road, one close to the point of carriageway begins, and another will put on the end of the carriageway.

6.3 Impact on Operation and Maintenance

Cause of Impact

Once in operation the improved roadways may be responsible for an increase in noise and air emissions from increased vehicular traffic. There will be a tendency for increasing speed because of an improved driving surface, resulting possibilities of accidents. During operation phase, the throwing of waste material into the drain and silted up of outfall by various wastes may crates water stagnant in the drain and backflow of the drain.

Mitigation Measures

To control the probable accident beater traffic management need to be ensured. As a part of traffic management improved signage and speed barker near sensitive area need to be constructed. At operation, phase drain and out fall need to be cleared as per requirement to avoid backflow of the drain.

7 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The Environmental Management Plan (hereinafter, the Plan or EMP) aims to ensure the compliance of all activities undertaken during the preconstruction, construction and the operation of this subproject with the environmental safeguard requirements of WB and the Government of Bangladesh. Furthermore, it aims at integrating the environmental components of the subproject with existing initiatives and programs in these fields. The plan consists of mitigation, monitoring and institutional measures to be taken during preconstruction, construction and operation to minimize adverse environmental impacts, offset them, or reduce them to acceptable levels.

7.1 Access to Information

The environmental assessment report should be translated into Bengali and disseminated locally. The copies of the report (both in English and Bengali) will be sent to all the concerned personnel responsible for subproject implementation. It will also be made available to the public. The final assessment report will also be uploaded in the, Manikgonj Pourashava website, BMDF website and the World Bank website after approval.

7.2 Grievance Redress Mechanism

The project-specific Grievance Redress Mechanism (GRM) will be established by the PIU of Manikgonj Pourashava to receive, evaluate, and facilitate the solution of APs concerns, complaints and grievances concerning the social and environmental performance of the subproject. The GRM is aimed to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the subproject.

The grievance mechanism is related to resolve the risks and adverse impacts of the subproject. It addresses APs' concerns and complaints promptly, using an understandable and transparent process that is also gender responsive, and culturally appropriate. It is readily accessible to all segments of the affected people at no costs and without retribution. The mechanism should not impede access to the country's judicial or administrative remedies. The affected people will be appropriately informed about the mechanism.

BMDF has its own Grievance Redress Procedure (GRP), which it operates to address any dissatisfaction and complaints by the local people regarding its activities. This procedure is being applied to address any complaints or grievances through negotiations with the community leaders and representatives of the APs during implementation of the MGSP.

7.2.1 Grievance Redress Committee (GRC)

The discussions and negotiations has been conducted by the PIU of Manikgonj Pourashava and will be involved the APs and Grievance Redress Committee (GRC) headed by the Mayor of Manikgonj Pourashava. With the facilitation of Consultant, the Mayor nominated the GRC members and included representative from the Government Agencies, local NGO, and Civil Society. The GRC has been formed and established at Manikgonj Pourashava. The grievance box will be delivered to the Pourashava to receive complaints. The grievance response focal point will be available at Pourashava for instant response to an aggrieved person. The Focal Point of GRC committees will collect the written complaints or suggestions from the box, and produce them to the GRC for hearing and resolution. The members of the committee are:

1. Gazi Kamrul Hoda Selim, Mayor, Manikgonj Municipality, Chairman of GRC
2. Nazma Akter, Female Councilor, Manikgonj Municipality, Member of GRC

3. Abdus Salam, Teacher, Member of GRC
4. Md. Uzzal Hossain, Social Worker, Member of GRC
5. Kazi Hemayet Hossain Himu, NGO Worker, Member of GRC
6. Hazrat Master, NGO Worker, Member of GRC
7. Bellal Hossain Executive Engineer, Manikgonj Municipality, Member Secretary of GRC

7.3 Grievance Resolution Process

In case of grievances that are immediate and urgent in the opinion of the complainant, the contractor and PIU on-site personnel will provide the most easily accessible or first level of contact for quick resolution of grievances.

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

All grievances that cannot be redressed within 7 days at site will be reviewed by the grievance redress cell (GRC) headed by Mayor of the Pourashava with support from PIU designated safeguard focal person. The PIU designated safeguard focal person will be responsible to see through the process of redressed of each grievance.

The PIU designated safeguard focal person will refer any unresolved or major issues to the PMU, BMDF. The PMU of BMDF in consultation with the MD of BMDF will resolve them within 30 days.

If the appellant is still not satisfied, he or she has the right to take the case to the public courts. Manikgonj Pourashava should also publish the outcome of cases on public notice boards. All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by Manikgonj Pourashava.

Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected and final outcome will be kept by PIU. The number of grievances recorded and resolved and the outcomes will be disclosed in the PMU office, Pourashava office, and on the web, as well as reported in monitoring reports submitted to WB on a quarterly year basis.

7.4 Institutional Concern Person for Environmental Safeguard Compliance

The Pourashava Officials, especially engineer in charge will be responsible for supporting the construction supervision with the facilitation of BMDF. The civil works contractors will implement the environmental mitigation measures.

The BMDF, with the help of Environmental Specialist will submit the monthly monitoring reports on Environmental Compliances to the World Bank.

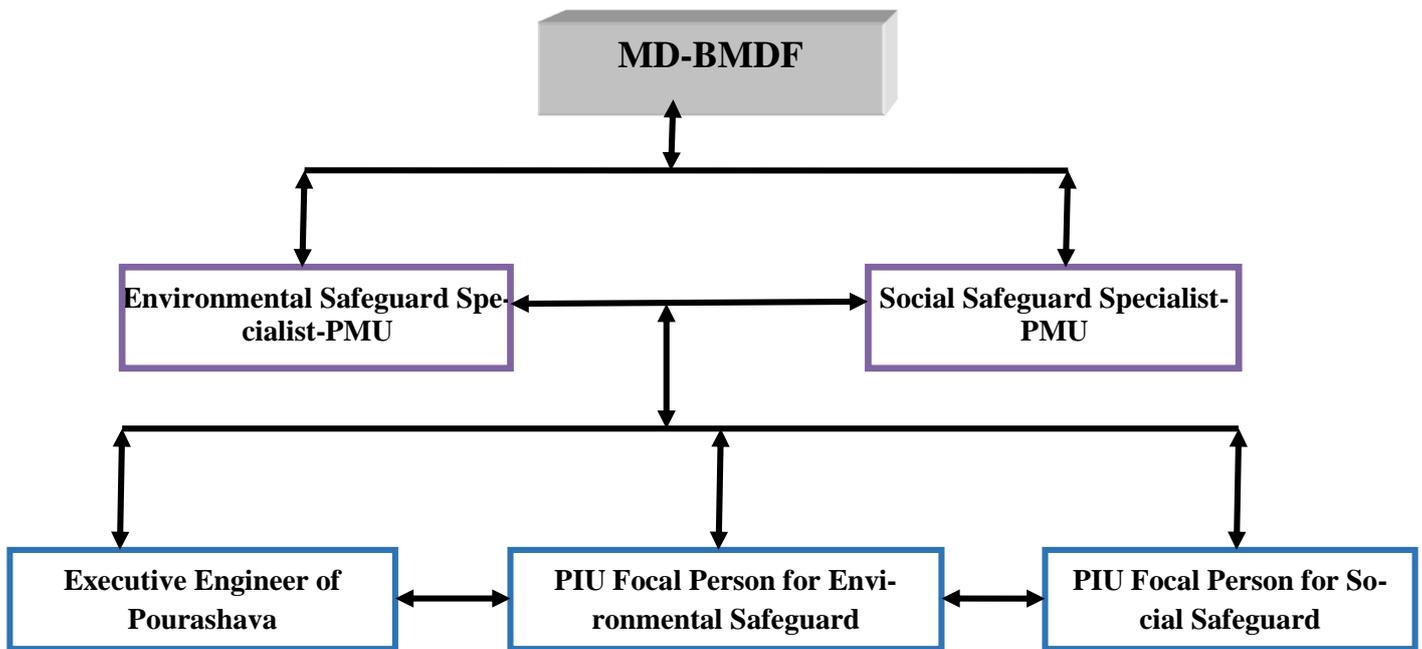


Figure 7-1: Environmental and Social Management Team (Tentative)

7.5 Capacity Building

A training program has been developed by the PMU of BMDF to build the capability of PIU of Manikgonj Pourashava. In addition, the hired consultants of Manikgonj Pourashava was also there. Under this training program PMU was organize an introductory course for the training of the Manikgonj Pourashava officials, preparing them on: (i) Environmental Screening, (ii) EMP Implementation, including environmental monitoring requirements related to mitigation measures; and (iii) taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of the implementation. The contractor should be also included in the training program to enhance the Environmental awareness and orientation among the workers

7.6 Environmental Management Action Plan

The environmental management action plan has been outlined in Table 7.1. The mitigation measures as well as responsible parties to implement of the EMP are also incorporated in action plan.

Table 7-1: Anticipated Impacts during Construction and Corresponding Mitigation Measures with Monitoring guide line)

Activity/ Issues	Potential Im- pact	Proposed Mitigation &En- hancement Measure	Monitoring Method	Frequency of Monitoring	Responsible for Monitoring	
					Implement	Supervision
At Pre-construction stage						
Construction and operation of labor shed for the workers (Workforce and labor shed management)	Generation of sewage and solid waste may cause water/ environmental pollution/	<ul style="list-style-type: none"> • Ensure construction of the labor shed and stockyard at the designated place (Vacant place near Pourashava Water Supply Office at ward no. 7.); • Construction of sanitary latrine considering 15 persons for one toilet at the labor shed and separate toilet for male and female; • Erection of “no litter” sign, provision of waste bins (introduce separate waste bins for organic and inorganic wastes); • Ensure wastes (solid wastes and other forms of the wastes) disposal at the dumping yard is located at the Muljan which is located last boundary of Pourashava. • Ensure emptying and cleaning of the waste bins regularly; • Drum trucks are available in the Pourashava. Hence, drum truck should be used for transportation of the wastes; • Cleanliness of premises and workers living places and at the Labor Shed; • Arrangement of the proper ventilation and temperature at the Labor Shed; • Protection against dust by using masks and covering of the head and body; 	Visual Observation	Regularly	Contractor	<p>Primarily by PIU of Pourashava</p> <p>Secondarily by PMU of BMDF</p>

		<ul style="list-style-type: none"> • Proper disposal of the wastes and effluents; 				
	Health Hazard of Labor	<ul style="list-style-type: none"> • Conduct formal and unofficial discussion to increase awareness about hygiene practices among the workers; • Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances • Ensure that all site personnel have a basic level of environmental awareness training. If necessary, the environmental management specialist and/or a translator shall be called to the sites to further explain aspects of environmental or social behavior that are unclear. • Comply with requirements of Government of Bangladesh Labor law of 2006 and all applicable laws and standards on worker's Health and Safety; • Provide construction workers and local people with basic information on infectious diseases including HIV/AIDS • Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal 	Visual Observation	Regularly and As per requirement	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Possible development of labor camp into permanent settlement	<ul style="list-style-type: none"> • Contractor to remove labor camp at the completion of contract. 	Visual Observation	End of the Construction work	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Outside labor force causing negative impact on health and social well-being of local people	<ul style="list-style-type: none"> • Ensure that contractor employ local work force to provide work opportunity to the local people and conduct formal and unofficial awareness program for the health and social well-being of the local people. 	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

At Construction Stage						
General construction works (Site Clearing, Earth work, Backfilling, fueling of subproject vehicles etc.)	Drainage congestion and flooding	<ul style="list-style-type: none"> • Ensure provision for adequate drainage of storm water, if needed; • Ensure provision for pumping of congested water, if needed; • Ensure adequate monitoring of drainage effects, especially if construction works are carried out during the wet season. 	Visual Observation	Regularly	Contractor	<p>Primarily by PIU of Pourashava</p> <p>Secondarily by PMU of BMDF</p>
	Air pollution	<ul style="list-style-type: none"> • Check regularly and ensure that all the subproject vehicles are in good operating condition; • Ensure contractor spray water on dry surfaces regularly to reduce dust generation; • Maintain adequate moisture content of soil and sand for transportation, compaction, bed preparation, backfilling and handling; • Ensure contractor sprinkle and cover stockpiles of loose materials (e.g., fine aggregates); 	Visual Observation/Analytical	Regularly and Periodically	Contractor	<p>Primarily by PIU of Pourashava</p> <p>Secondarily by PMU of BMDF</p>
	Traffic congestion, effect on traffic and pedestrian safety	<ul style="list-style-type: none"> • Ensure schedule deliveries of material/equipment during off-peak hours; • Avoid road side storage of the construction materials; • Place cautionary sign for the pedestrian and safety traffic movement. • Inform the local people about subproject activities and inspire them use to alternative road to avoid traffic jam. • Ensure flag man especially at road crossing • Increase workforce in front of critical areas such as administrative office, hospitals, and schools. 	Visual Observation	Regularly	Contractor	<p>Primarily by PIU of Pourashava</p> <p>Secondarily by PMU of BMDF</p>
	Noise pollution	<ul style="list-style-type: none"> • Check and maintenance the equipment properly; • Avoid using of construction equipment producing excessive noise at night; 	Visual Observation/Analytical	Regularly and Periodically	Contractor	Primarily by PIU of Pourashava

		<ul style="list-style-type: none"> • Avoid prolonged exposure to noise (produced by equipment) by the workers; • Regulate use of horns and avoid use of hydraulic horns in subproject vehicles. • Any noise generating equipment should be performed after office or school hour. • Arrange ear plugging or ear muff if noise level at the construction site is severe. 				Secondarily by PMU of BMDF
	Water and soil pollution	<ul style="list-style-type: none"> • Prevent discharge of fuel, lubricants, chemicals, and wastes into adjacent water bodies and soil; • Vehicle maintenance and refueling should be confined to the designated areas with sealing to prevent the spillage of lubricants and fuels on the water bodies and soil; • Restrict disposal of any construction waste into the nearby water bodies. • Location of stockyards for construction materials shall be identified at a safe distance from watercourses. 	Visual Observation/ Analytical	Regularly/ Periodically	Contractor	<p>Primarily by PIU of Pourashava</p> <p>Secondarily by PMU of BMDF</p>
	Accidents	<ul style="list-style-type: none"> • Conduct formal and informal discussion for creating awareness about the accident; • Provides PPEs and ensure using of the personal protective equipment by the workers. • Maintain the register to record accidental events if occur; 	Visual Observation	Regularly	Contractor	<p>Primarily by PIU of Pourashava</p> <p>Secondarily by PMU of BMDF</p>
	Spills and leaks of oil, toxic chemicals	<ul style="list-style-type: none"> • Proper handling of lubricating oil and fuel so that it does not fall on the soil and adjacent water bodies; • Collection and disposal of spills; • Waste petro-chemicals must be properly collected, stored and not directly disposed on the ground. 	Visual Observation	Regularly	Contractor	<p>Primarily by PIU of Pourashava</p> <p>Secondarily by PMU of BMDF</p>
Potential Impact of BC road Construction						

Dismantle work/ Excavation/Earth work/	Generation of solid and construction waste due to the dismantle works; Generation of loose soil due to the earth excavation work and earth work.	<ul style="list-style-type: none"> • Cover expose construction wastes and loose dry soil with fabric; • Disposal of soil and construction wastes at dumping site near Muljan which is located at last boundary of Pourashava. 	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
IGS (improve sub grade) /sand filling	Air and dust pollution affecting nearby settlement	<ul style="list-style-type: none"> • Maintain adequate moisture content of the soil during construction transportation, compaction and handling; • Carry the materials especially loose soil and sand with adequate cover. 	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Setting up and operation of asphalt plant	Possible degradation of the air quality by the suspended particles and increase of the noise level from asphalt plant affecting nearby settlements.	<ul style="list-style-type: none"> • Locate plant away from residential settlements; • Consider use of emulsified bitumen. 	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Possible water pollution (surface and ground water) by bitumen and solvents.	<ul style="list-style-type: none"> • Avoid spills and proper collection and disposal of the generated spills. 	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Possible preparation of the bitumen in open air and using of charcoal and wood as fuel.	<ul style="list-style-type: none"> • Strictly prohibit bitumen preparation in the open air and use of charcoal and wood as fuel. 	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Potential impact of RCC Drain						
Dismantling work for site clearing and	Generation of loose and clay soil due to the earth excavation work.	<ul style="list-style-type: none"> • Cover exposed loose dry soil and wastes materials before disposal; • Disposal of soil and construction wastes at existing dumping site at 	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava

excavation work		Muljan which is located at last boundary of Pourashava.				Secondarily by PMU of BMDF
	Accidents from careless use of hydraulic excavator and hammer if needed.	<ul style="list-style-type: none"> Carefully handle of the hydraulic excavator and hammer if needed. 				
	Possible damage of road side infrastructure due to earth excavation for drain construction.	<ul style="list-style-type: none"> Ensure drum sheet palisading work for shallow depth to stabilize the structure; Ensure plunk palisading work for shallow depth to stabilize the structure; Bolly drive for deep depth construction works. 				
	Air pollution due to black smoke emission from excavator.	<ul style="list-style-type: none"> Regular maintenance of the equipment. 				
Sand filling /Back filling work	Air and dust pollution affecting nearby settlement	<ul style="list-style-type: none"> Maintain adequate moisture content of soil and sand during transportation, compaction and handling; Carry the materials especially loose soil and sand with adequate cover. 	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Cutting & welding of the reinforcement for RCC work	Noise pollution due to using of rod cutter and welding machine	<ul style="list-style-type: none"> Avoid using of rod cutter and welding machine at night; Avoid prolonged exposure to noise (produced by equipment) by workers. 	Visual Observation/ Analytical	Regularly/Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Potential health and safety risks from rod cutter and welding machine if any	<ul style="list-style-type: none"> Ensure use of the personal protective equipment (helmet, goggles, gloves, safety boot); Availability and access to first-aid equipment and medical supplies in case of any accidents. 	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
RCC (reinforcement cement concrete) work	Air pollution due to black smoke emission from concrete mixer machine and vibrator machine	<ul style="list-style-type: none"> Regular maintenance of the concrete mixer and vibrator machine to avoid any black smoke emission. 	Visual Observation/ Analytical	Regularly/Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

	Noise nuisance from concrete mixer machine and vibrator machine	<ul style="list-style-type: none"> • Avoid operation of the concrete mixer and vibrator machine at night; • RCC work should be avoided at schooling time; • Inform local people about casting work and potential impacts. 	Visual Observation/ Analytical	Regularly/Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
--	---	--	-----------------------------------	------------------------	------------	--

Table 7-2 Anticipated Environmental Impacts during Operation Phase and Corresponding Mitigation and Enhancement Measures

Activity / Issues	Potentials Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Operation of the BC and HBB road	Increase in traffic speed and accidents; Increased traffic congestion due to movement of increased number of vehicles; Damage to road by movement of heavy vehicles; spillage of water to bitumen road surface.	<ul style="list-style-type: none"> • Better traffic management; • Control heavy traffic movement. 	Primarily by Pourashava
	Increased air and noise pollution affecting surrounding areas	<ul style="list-style-type: none"> • Traffic management, increased vehicle inspection 	
Operation of the RCC drain	Pollution of downstream water body due to disposal of polluted water from the drain	<ul style="list-style-type: none"> • Ensure installation of septic tank by the household people in all establishment; • Stop connecting sanitation facilities to storm drain directly. 	Primarily by Pourashava
	Blockage in the drain due to disposal of solid waste/debris	<ul style="list-style-type: none"> • Creation of awareness, introduce SWM system and install and maintenance cover in open manholes; • Regular maintenance / cleaning of the drain; • Stop throwing of the wastes materials in to the drain by the community people. 	
	Possible backflow of water due to blockage in the drain and at outfall	<ul style="list-style-type: none"> • Proper maintenance and cleaning of the drain and outfall on regular basis. 	

Most of the monitoring parameter evaluation will be done by visual observation except noise, air, and water quality parameter. These parameter will be monitored by analytically. Hence, analytical monitoring guideline are shown below in tabular form

Matrix Table of Monitoring Plan (Analytical Monitoring during construction phase)

Monitored Parameter/ Issues	Monitoring Method/Key Aspects	Location of Monitoring	Period & Monitoring Frequency
Noise level measurement	<ul style="list-style-type: none"> • Through digital instruments 	<ul style="list-style-type: none"> • Sub-project site 	<ul style="list-style-type: none"> • Two times at construction phase; • Reporting: Once in a month and immediately after measurement

<p>Ambient air quality/ Stack Emission</p>	<ul style="list-style-type: none"> • Visually-black smoke; • Sampling; • Analysis at laboratory; • Data analysis of merits determination by using quality standards; • Through digital instruments. 	<ul style="list-style-type: none"> • Sub-project site 	<ul style="list-style-type: none"> • Two times at construction phase; • Reporting: Once in a month and immediately after measurement
<p>Waste Water quality</p>	<ul style="list-style-type: none"> • Sampling; • Analysis at laboratory; • Data analysis of merits determination by using quality standards. 	<ul style="list-style-type: none"> • At intake and outfall 	<ul style="list-style-type: none"> • Two times at construction phase; • Reporting: Once in a month and immediately after measurement

7.7 Environmental Safeguard Cost during Construction Phase

Considering the environmental impacts and their mitigation measures for these subprojects, several items are included in the BOQ to address these issues. The estimated cost to implement the EMP is elaborated in **Table.7-3**

Table 7-3: Environmental Management Budget

Item No.	Description of the Items	Costs (Tk)
1	Establishment of labor camp (male shed - 15 ft x 30 ft and female shed 12 ft x 15 ft1) with living arrangement, drinking water facilities, cooking arrangement, mosquito net,, waste bin etc.	200,000.00
2	Masonry pucca platform (at least 100 sft size), providing brick soling and net cement finishing for keeping fuel and lubricants for machineries.	15,000.00
3	Dust suppression measures by water spraying in and around the subproject site, uncovered aggregates and loose materials such as stoke files of the roadside excavated earth etc. (lump sum)	60,000.00
4	Noise level measurement. It can be measured from the pre-approved public institute/ university two times during construction phase @Tk. 1,000.00 per measurement (3*7,000.00 Tk) and one time after construction	21,000.00
5	Air quality (SPM, PM10, and PM 2.5) measurement- it can be measured from the recognized environmental survey company, public institute/ university two times during construction phase and one time after construction	90,000.00
6	Water quality(pH, NH ₃ , BOD ₅ , COD, TDS,)- it can be measured two from the recognized environmental survey company, public institute/ university one times during construction phase and one time after construction(2*5*10000)	100000.00
7	Temporary camp site waste disposal facility: 2nos. (1no. of the organic waste and 1 nos. of the inorganic waste disposal facility) @Tk.20,000.00 (2*20,000.00 Tk)	40,000.00
8	Water supply (at the labor sheds):1nos. of tube well	60,000.00
9	Sanitation facilities (at the labor sheds): 3nos. of the toilets preferably portable toilets (1 no. for women and 2nos. for men) @ 20,000.00 (3* 20,000.00 Tk)	60,000.00
10	Providing safety gear packages like hand gloves, spectacles for eye protection, helmets, masks, ear plug, visible jacket, rubber shoes for 35 persons where 35 for workers and 10 for visitor (45*3,000.00Tk.) and one first aid box (1*2,500.00Tk)	135,000.00
11	Tree plantation for ecological enhancement work- preferably local fruits, flowers, medicinal and ornamental trees- (including protection and conservation during project defect liability period) 75 nos. of the trees @Tk 1,000.00 per tree (75* 1000.00)	75000.00
12	Cautionary Sign 8 nos.	20,000.00
	Total	876000.00

8 PUBLIC CONSULTATION AND PARTICIPATION

8.1 Objective and Methodology

Public consultation is one of the key components of the environmental assessment. In addition, for determining the environmental and social impacts associated with subproject implementation, the GOB and WB give great importance on involving primary and secondary stakeholders of the subproject area. In order to collect local knowledge for baseline conditions, understand perceptions of the community regarding impact significance, and propose meaningful mitigation measures, participation of stakeholders is an integral part of the EA process. Thus, EA team conducted public consultations in the study area. The approach involved a mix of conventional as well as participatory, focus group discussions (FGD) and one-to one interviews. Public consultations were held during the site visit on 13th June, 2018. For better understanding the socio-economic and environmental condition three focus group discussion has been conducted in the subproject study area (*Figure 8-1*).

The public consultations were conducted with the following objectives: (i) to intrude awareness of the stakeholders about the subproject and to collect their opinion, suggestions for planning and designing of the subproject (ii) to identify the need and concern of the public, (iii) to assess cultural patterns and behavior of local communities. Stakeholder consultation, was targeted at people/communities who may – directly or indirectly, positively or negatively- be affected by the outcomes of a subproject. The consultations were conducted at two different tiers of stakeholders: local people and Pourashava Officials.





Figure 8-1: Public consultation with local people and other stakeholders.

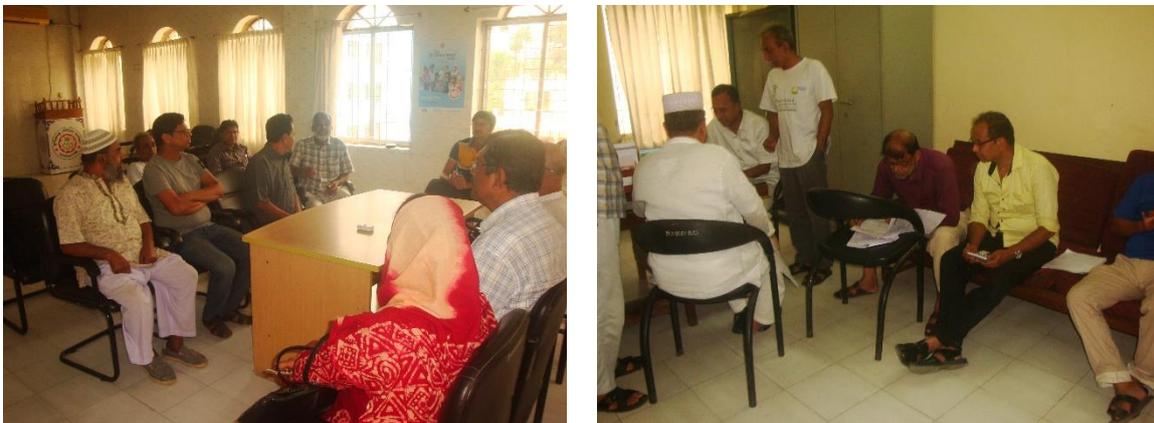


Figure 8-2: Consultation Meeting with Local NGO Workers, Civil Society and Pourashava Officials about Subproject in the Pourashava Office.

8.2 Issues Raised by the Participants

For the better traffic operation in the subproject area and to respite from water logging problem, subproject area peoples are highly interested about this subproject. They also said, they would help the Pourashava to implementing the subproject activities.

The participants raised the issues related to the infrastructure development of Manikgonj Pourashava. They emphasized on the subproject selection for the future development and also discussed about the procedure for the quality construction work. In the FGD, the participants discussed the requirements for the Pourashava future development through a list of the sub-projects. The Key participants list of Focus Group discussion in the subproject study area is attached in the Appendix-2.

8.3 Feedback, Suggestions, and Recommendations of the Participants

In each of the consultation, participants were encouraged to share their observations, suggestions, and experiences on various environmental and safety issues and suitable mitigation and enhancement measures. The participants' feedback, suggestions, and recommendations from FGD can be cited:

- ✓ For the better traffic operation in the subproject area and to respite from water logging problem, subproject area peoples are highly interested about this subproject. They also said, they would help the Pourashava to implementing the subproject activities.
- ✓ All the proposed infrastructure implementation is badly needed for Manikgonj Pourashava, all will provide benefit, no major environmental concern;
- ✓ All the participants felt that the proposed road construction subproject will facilitate a better traffic system. However, it was felt that accidents might increase in number if a high standard of engineering design is not followed. Participants mentioned that safety measures are especially important for social institutions like schools, hospitals
- ✓ They are thinking that, due to implementation of this subproject few part of land may need to be acquired. According to the participants, this can be mitigated through proper compensation and amicable assistance to the affected persons.
- ✓ People expect employment generation for them from upcoming subproject
- ✓ Awareness and extent of the project and development components;
- ✓ All development works are essential but sound design and construction is necessary so that they are not affected by environmental pollution.
- ✓ Most of the participants expressed that the number of subprojects that have been selected for each financial year is not adequate.
- ✓ The participants also addressed the solid waste management issue to reduce environmental and public health hazards.
- ✓ Major problem is drainage congestion, less cleaning, drains are filled with solid waste
- ✓ The causes of water logging problem is mainly the inadequate drainage network, seasonal sub-mergence, clogging due to garbage dumping
- ✓ Special safety measures should be taken to avoid land subsidence due to heavy construction activities
- ✓ Flooding and water logging both affect access to key activities
- ✓ Traffic management is important
- ✓ During construction period public safety and workers' safety is important
- ✓ Participants suggested signage (speed limits, warnings etc.), pedestrian crossings in front of social institutions and to ensure that there are footpaths along the road
- ✓ The proposed road and drain construction subproject do not pass any protected or ecological critical area.
- ✓ They have suggested that, dust suppression, noise mitigation and road safety should be considered.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions and Recommendations

This study has described in details the existing environmental conditions of the subproject area. The effort has been given for identifying possible sources of the environmental impacts through details investigation of the subproject site, key subproject activities and assigned equipment to be used for the subproject activities. From the comprehensive study it has been revealed that impacts are expected to be largely manageable, if they are acknowledged and addressed with appropriate mitigation measures-such measures are also included in this report. However, a few key recommendations, as outlined below.

- Contractor will ensure implementation of the EMP properly as a part of the contract;
- EMP should be available at the subproject site during construction period;
- All mitigation, compensation, and enhancement measures should be followed as per EMP;
- Regular field visit and monitoring as per recommended management plan by PMU, and Pourashava is needed for the effective implementation of the EMP;
- An efficient line of communication between the PMU (BMDF), Pourashava, and the contractors is needed;
- Contractor will ensure availability of the PPEs and first aid box, water supply and sanitation facilities for the workers;
- Contractor will monitor the workers behavioral matter to avoid any undue issues related to labor influx;
- To minimize occupational health and safety risks, it is highly recommended to adapt mechanical system where appropriate;
- Planted trees should be properly maintenance by the contractor during project liability period.

It should be noted that environmental assessment report is a live document. Hence, due to changing circumstances during the construction phase if any, there might be minor adaptation needed for environmental, health and safety issues.

APPENDIX

Appendix 1: List of the Participants



Attendance of Local Participants in the Screening Exercise
Local Stakeholders, community members and WLCC/CBO)

Name of Subproject: *package 2 to 5 (Road, drain, Beautification, culvert, Bridge)*
 Package : Package No: BMD/ MANIKGANJ/ 2017-18/W02...05
 Name of ULB : Manikganj Upazila: Manikganj Sadar
 District : Manikganj Date: 13/6/2018

SL#	Name	Gender	Social Status	Contact Number	Signature/LTI
১৬	শ্রীমতী	নারী	গৃহিণী	নাই	শ্রীমতী
১৭	জামাল	নারী	গৃহিণী	নাই	জামাল
১৮	শ্রীমতী	নারী	গৃহিণী	০১৭৪০৫২২২১	শ্রীমতী
১৯	শ্রীমতী	নারী	গৃহিণী	০১৬৭৩৪৪	শ্রীমতী
২০	আনাসিকা	নারী	গৃহিণী	০১৭৩৭৭৭৭৭৭	আনাসিকা
২১	হোসনা	নারী	গৃহিণী	নাই	হোসনা
২২	বাহিনী	নারী	গৃহিণী	নাই	বাহিনী
২৩	শ্রীমতী	নারী	গৃহিণী	নাই	শ্রীমতী
২৪	শ্রীমতী	নারী	গৃহিণী	নাই	শ্রীমতী
২৫	শ্রীমতী	নারী	গৃহিণী	নাই	শ্রীমতী
২৬	শ্রীমতী	নারী	গৃহিণী	নাই	শ্রীমতী
২৭	শ্রীমতী	নারী	গৃহিণী	নাই	শ্রীমতী
২৮	শ্রীমতী	নারী	গৃহিণী	নাই	শ্রীমতী
২৯	শ্রীমতী	নারী	গৃহিণী	নাই	শ্রীমতী
৩০	শ্রীমতী	নারী	গৃহিণী	নাই	শ্রীমতী

সুভাষ চন্দ্র সরকার

 কাউন্সিলর, ০৬নং ওয়ার্ড কাউন্সিলর, সংরক্ষিত-১,২,৩, ওয়ার্ড

 মানিকগঞ্জ পৌরসভা, মানিকগঞ্জ। মানিকগঞ্জ পৌরসভা, মানিকগঞ্জ। মানিকগঞ্জ পৌরসভা, মানিকগঞ্জ।

