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.-02

Manikgonj Pourashava, Manikgonj.

BANGLADESH MUNICIPAL DEVELOPMENT FUND (BMDF)

MUNICIPAL GOVERNANCE AND SERVICES PROJECT (MGSP)

July-2018

Table of Contents

List of Figure

List of Table

ABBREVIATIONS

AP (AP's)	Affected Person
BDT	Bangladeshi Taka
BOQ	Bill of Quantity
BMDF	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

This Road and Drainage Subproject comprises 11 roads that will be reconstructed in their original right-of-ways and alignments with improved subgrade, sub base, base course, and surfacing. Most (3) will be constructed including drain with cover slab within the available right-of-way widths. The existing right-of-way is mostly clear, and for which no acquisition for land is required.

Typical construction related impacts are associated with this type of civil works. Impacts are of limited intensity and short duration, and can be mitigated by appropriate measures including enforced traffic management by the contractor and adoption of good construction practices related to protection of community health and safety. None of the subproject interventions are proposed within locations in or near sensitive ecosystems. 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	• 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	• Road side trees and natural grown vegetation to be cut down to provide uniform road width.
Noise	• 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	• 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	• No measurable impacts are anticipated
Water Quality	• 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	• There is no threatened and endangered species in the subproject area. So, no impacts are anticipated to threatened or endangered species habitat.
Drainage Congestion	• Drainage congestion is minor. However, erratic rainfall may create drainage congestion for short term.

Pollution of Construction Debris	• 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	• 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	• 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

BMDF is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan. BMDF 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-BMDF 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-BMDF staff. The PIU-engineers are trained in ensuring the environmental safeguard compliance issues during implementation (capacity building has already ensured by BMDF).

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 it 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

In the year of 1845 Manikgonj Mohokuma was established, but within about 15 years, it was disappeared by Dholeshowri River. After year of 1860, again this city is being gradually growing up. It is the low elevated city of the country comparatively other. However, in the year of 1958 Manikgonj union perished has been converted in to the Manikgonj Pourashava for providing urban facilities to the citizen who is living in the Manikgonj area. The Pourashava covers an area of 42.50 sq. km sq. km. Now it is “A” type Pourashava with present population of 1, 20,000. (*Manikgonj Pourashava web site*). The Pourashava has 120 km Pucca Road, 5 km RCC and CC Road, 1km HBB Road, 127 km Katcha Road. The total drain is 12 km. (*Manikgonj Pourashava: at a glance*).

Infrastructure and physical development are not attained significantly in the Manikgonj Pourashava. The urbanization process in the Pourashava and increasing population necessitates continuous development of roads and drains. Hence, this subproject is a continuation of the infrastructural development of the Manikgonj Pourashava to improve transport and drainage facilities.

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

Name of the Subproject	i) Improvement of Road from Char Hijuli Mosque to Kolir More via H/O Amir Ali. Link-1: Construction of road from Char Hijuli H/O M.A. Kader to north side end of Pourashava. (ii) Improvement of Road from Hijuli Bazar Saidul Shop to Ryintha H/O Pannu via H/O Khaleque Pir and Motta Mot. Link-1: Improvement of road from Motta Culvert to Mendibag Culvert. Link-2: Improvement of road from Malancha H/O Nabu to Batela BC road (iii) Improvement of Malancha Road from Bakjuri Bridge to End of Pourashava via Malancha Eidgha Mat. Link-1: Malancha bridge to east side H/O Bachhu. (iv) Improvement of Road from Aowlad Hossain College to Bakjuri Bridge via Siddique Nagar. (v) Improvement of Road from Siddique Nagar to Vayapara Moor via Rahamatpor Mosque. Link-1: Front of Polly Mangal Club Math. Link-2: Construction of RCC Road from H/O Sankar Master to H/O Touhid via H/O Hanif at East Dashora. Link-3: Construction of HBB Road from H/O Chondon Hur South Side Biswa Ijtema at East Dashora. Link-4: Improvement of road and Construction of RCC drain from H/O Baccho near the Nobogram School to East Side H/O Akkel. (vi) Improvement of Noyakandi Road from Noyakandi Bridge to End of Pourashava via Kusherchar High School. Link-1: H/O Somed Ali to north side Kaliganga River. Link-2: Improvement of Road from Noyakandi Dewan Bari Moor to H/O Somer Uddin. (vii) Improvement of Kewarjani Road from Kewarjani Moor to Jillur Moor via Shaid Alom House, Kewarjani Primary School, Horonnahar School. Link-1: Improvement of Road from Horonnahar School to Halim dewan house via Kewarjani Primary School. (viii) Improvement of Road and construction of RCC drain from Paran Commissioner moor to Beautha main road via Gayjuddin Moor. Link-1: Improvement of Road and construction of RCC drain from Gayjuddin moor to Beautha Baribath via Beautha primary school. Link-2: Beautha Primary School to Beautha Road via H/O Kader Commissioner. Link-3: Improvement of o BC Road from Singair Road to Jalkhola Mosque. (ix) Construction of RCC Drain from Manahan House to East Side Bandutia khal. (x) Construction of Drain and improvement of Road from LGD Office west to Manikgnaj Singair Road Lacnch Ghat. Link-1: LGED Char H/O Abdul Jalil to Nagar Bhaban road via Manikganj CRP. Link-2: Construction of drain and road from LGED Chak H/O Adv. Jashim Uddin to H/O Ataur Rahaman (Ata). (xi) Improvement of Road from Niramoy Clinic to South Side of Court via Bazar Bridge, Shahid Rafique Sarak (Ch. 0-1080). Link-1: Sarat press lane. Link-2: Kalibari to Nagarbabhan. Link-3: Govt. Boys high school to Girls high school.
Package No.	MGSP/Manikgonj/ 2017-18/W-03

District Name	Manikgonj
ULB Name	Manikgonj Pourashava
Structural Design Option	BC Road, HBB Road RCC Drain
Jurisdiction area:	Wards no 4, 5, 6, 7 and 9
Beneficiary Population	About 76,000
Tribal People	None
Land Acquisition	Not required
Estimated Cost	141.930 million in BDT
Subproject Duration	18months
Tentative Start Date	August-2018
Tentative Completion Date	January-2020

1.3 Aims of the Study

This report presents the finding of an Environmental Assessment (EA) of road and drain subproject. 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 March 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*) 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 SUBPROJECT DESCRIPTION

2.1 Setting of the Subproject Site

The development work involves road and drain construction work at different location (Jurisdiction of the word no 3, 4, 5, 6, 7 and 9) of the Manikgonj Pourashava. 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 urban and semi urban residential setting with few commercial activities. Despite the dominating of urban and semi urban setting there are few residential cum agricultural rural setting was observed during site visit. Locations for various improvements and topographic feature a are shown in Figure 2.1 and

Figure 2-1: Topographic Feature of Hijuli Mosque Road and its influence Area

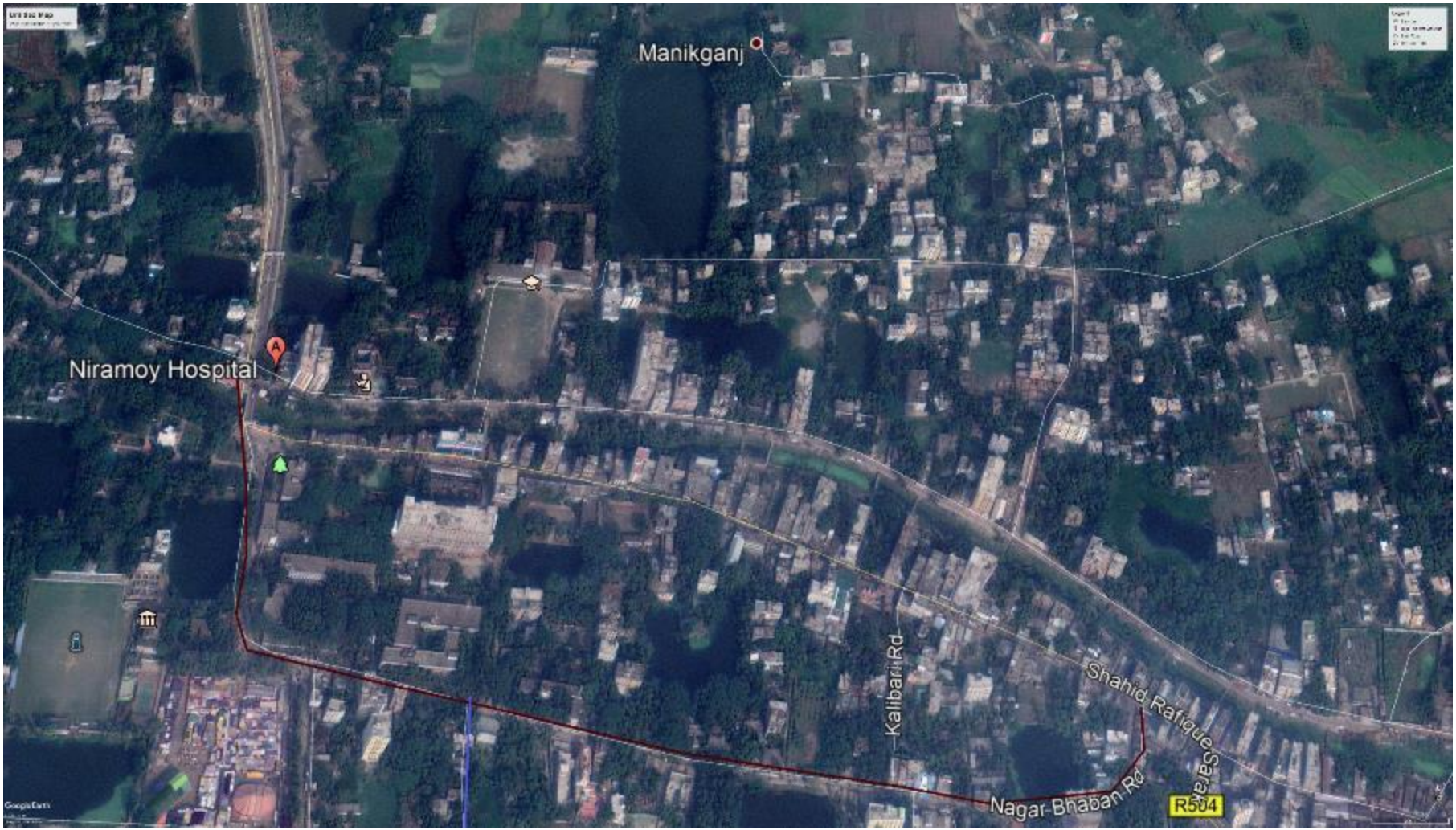

Figure 2-2: Topographic Features of Niramoy Clinic Road and Its influence Area

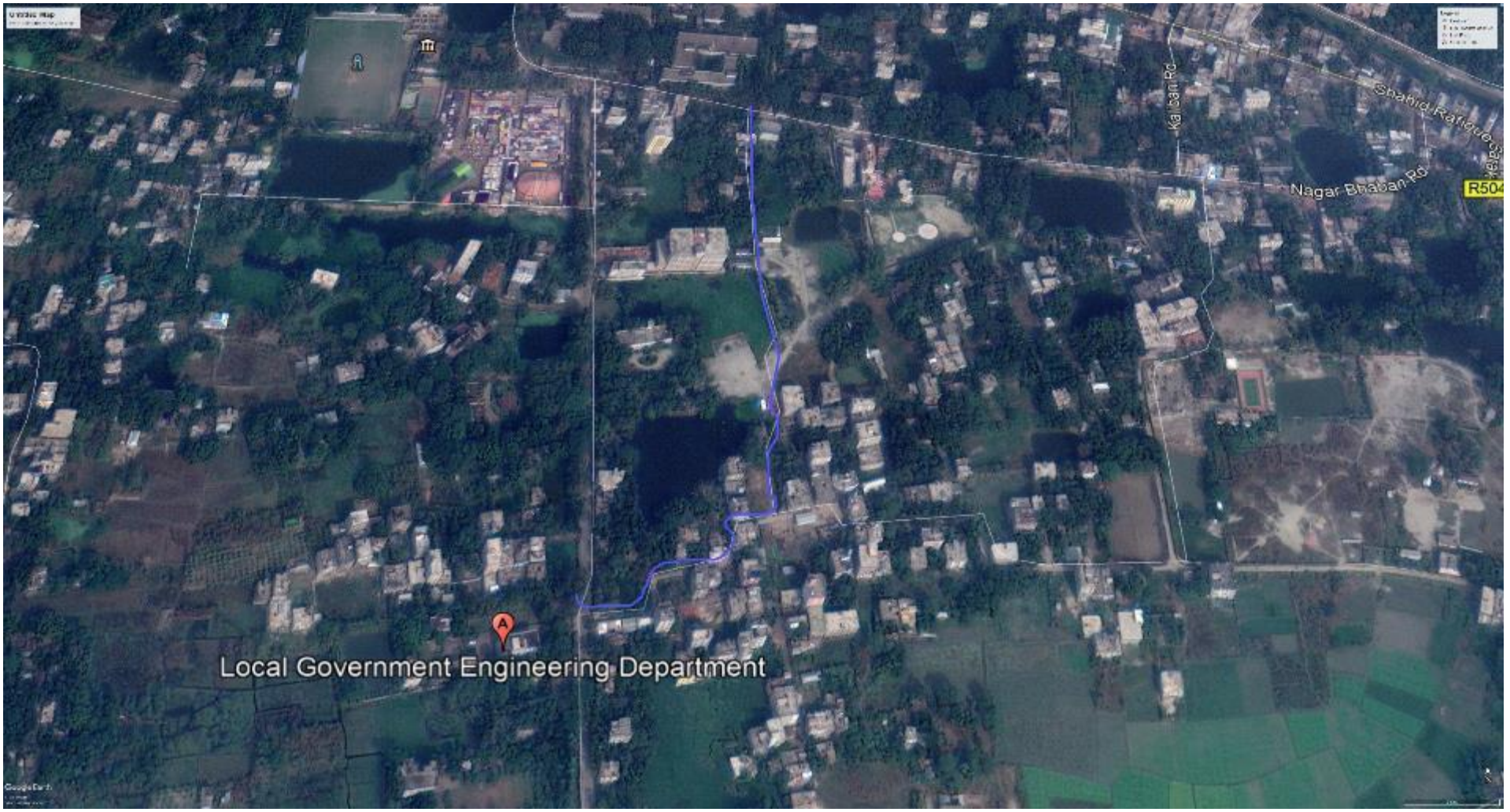

Figure 2-3: Topographic Feature of LGED Road and its influence Area

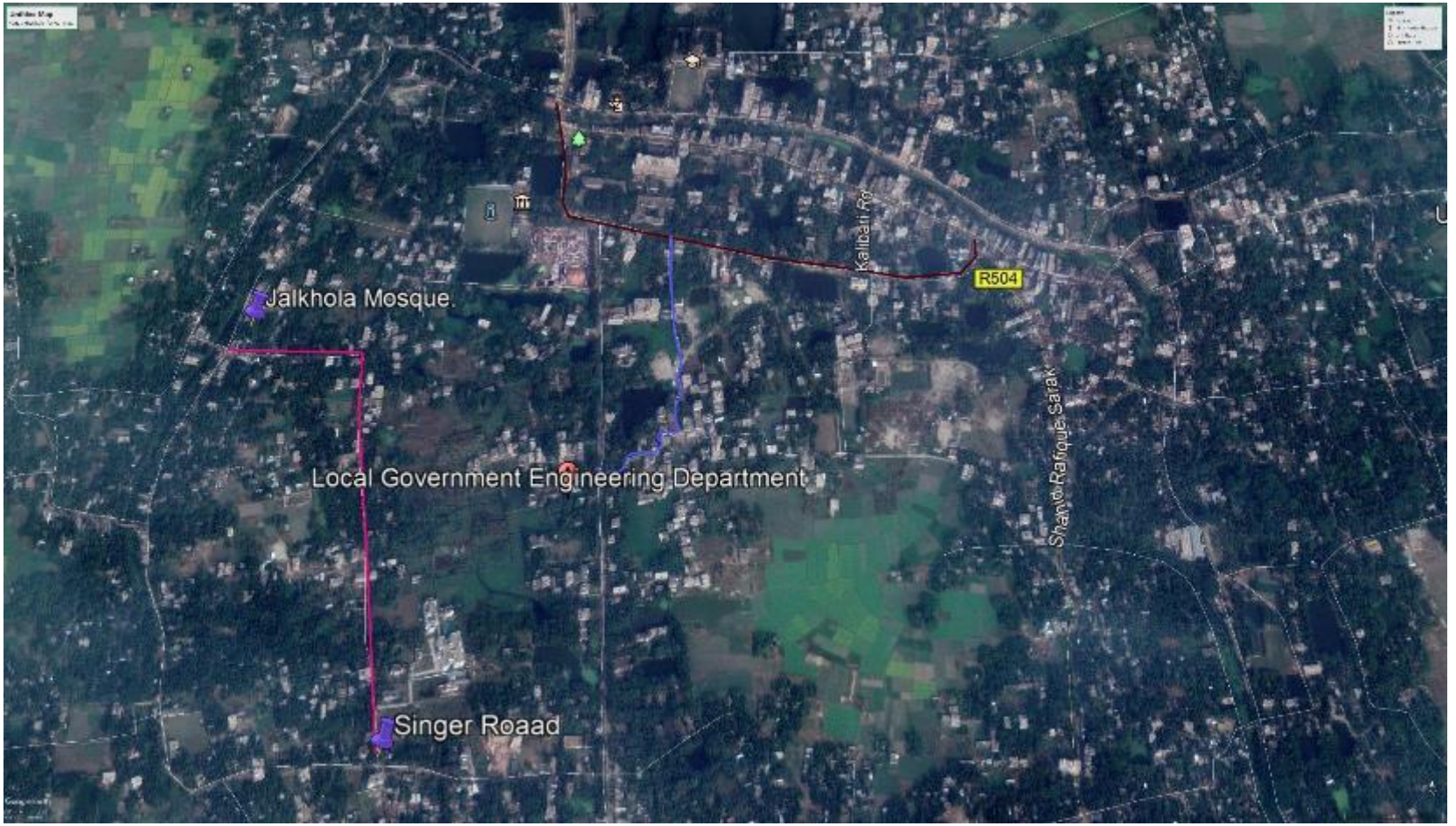

Figure 2-4: Topographic Feature of Singer, LGED Road and its influence Area

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 19582 m road is proposed while drain is proposed 2140 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

Char Hijuli Mosque to Kolir Moar is located at the ward number 4 of the Manikgonj Pourashava. Its starts from Chair Hijuli Mosque and End at Kolir Moar via house of Amir Ali and length of the road is 950m. In addition, there are two link road which length are: Link-1 650m and Link-2 385m.The pavement width of the existing road is average 2.75 to 3m. It is the residential area of the Pourashava where notable amount of agricultural activities have been seen during site visit. Existing road is BC road while link road is HBB road. Both the roads are damaged road due to worn out of wearing surface, crack on the road edge and missing of brick in HBB road. Additionally, due to expose of the wearing surface, lots of pot holes has been formed. These potholes retain storm water after rain which aggravate the damaged of the road and as well as suffering of the dweller of the Pourashava. Hence, Pourashava has taken initiative to formation of 950m long BC road from Chair Hijuli Mosque to Kolir Moar and Link -1(650m) with HBB road.

Figure 2-5: Current Situation of the Subproject Roads

At present ***Hijuli Bazar Saidul Shop to Ryintha H/O Pannu Road*** and its link road are extensively damaged. However, at few segment these road are badly damaged due to expose of the BC carpeting. On the other hand, link road is earthen road and its surface is very much uneven. Resulting motorized vehicles movement in this road is restricted. In addition, the width of the roads are not uniform. Therefore, traffic movement is interrupted. To mitigate the suffering of bad road, these damaged BC (1200m) and earthen road (1075m) to be replaced by new BC pavement.

Figure 2-6: Current Situation of the Hijuli Bazar Saidul shop to Ryintha H/O Pannu Roads

At present ***Malancha Road from Bakjuri Bridge to End of Pourashava*** is BC road and road width is 3 m. This is the important road of the Pourashava because this road goes through local bazaar area (Malancha Bazar). But this road entirely badly damaged by loosing of BC carpeting and edge cracking. Hence, traffic movement is hampered. So, to minimize the trouble of the vehicles movement and provide safe and smooth road surface, 1500m long old BC road will be replaced by new BC pavement.

Figure 2-7: Current Situation of the Malancha Road

Now, ***Aowlad Hossain College to Bakjuri Bridge via Siddique Nagar Road*** is the BC road. Basically, subproject area is the rural setting with residential hubs. Along the proposed road at few section there is Bokjuri Khal. From, Ch. 0-500 m (approximately) and Ch. 1300-1900m is partially damaged whereas rest of the part is badly damaged. This damaged road contains-potholes, surface and edge crack and uneven road surface and its width is also non-uniform (width on average 3m). So, traffic movement is hampered. Therefore, 2250 m long old damaged BC pavement to be developed by new asphalt based pavement.


Figure 2-8: Current situation of the Aowlad Hossain College to Bakjuri Bridge Road

Siddique Nagar to Vayapara Moar Road is BC road starts from Siddique Nagar and End at Vayapara Moar via Rahamatpur Mosque. The subproject area is the residential area of the Pourashava. In addition, there is included 4 link road with proposed road. These road are currently BC road except link-3. However, Link-3 is earthen road. The existing BC road is badly damaged and in the entire road containing cracks, pot holes, edge broken and depressions are prevalent. The road surface is also uneven and width of the road is narrow and non-uniform road width on average 3m. Hence, the normal traffic operation and pedestrian movement is hampering. Additionally, this damaged earthen and BC roads creates dust which have discomfort felling to the road user and nearby residents. So, for better traffic operation damaged BC road will be replaced by new BC pavement and at link 3 earthen road will develop to HBB Road.

On the other hand, though subproject area is the densely populated residential area but there is no drainage facilities in the Link-4 road area. Therefore, during monsoon period after rainfall storm water cannot drain off from the subproject area. Subsequently, road side areas become waterlogged. Hence, to mitigate the this problem 130m long RCC drain with cover slab is proposed from H/O Baccho to East Side of H/O Akkel.

Figure 2-9: Current Situation of the Siddique Nagar to Vayapara Moar Road

Figure 2-10: Current Situation of the Outfall

Noyakandi Road is starts from Noyakandi Bridge and last point is End of Pourashava via Kusher Char High School. Two link road is also included with this road. Effective length of the proposed road is 2410m. The existing width of the road is 3m on average. The subproject area is the mixed zone of commercial and residential at ward no.9. The existing road is BC road. But currently due to bad condition of the road motorized vehicles movement are interrupted. To establish a good connectivity with adjacent area of the subproject area and minimize the suffering of the people, new 2410 long BC road has been proposed.

Figure 2-11: Current situation of the Noyakandi Road

Karajan Road is starts from Kewarjani Moar and end at Jillur Moar. It is located at the jurisdiction of the ward no. 9 of the Pourashava. Existing road is mostly partially damaged and width of the road is narrow (on average 3m) and not uniform. However, at few section this road is also badly damaged. Therefore, normal traffic operation is hampered. In this context, to overcome these problem and provide smooth traffic operation 2210 m long BC road of uniform width has been proposed from Kewarjani Moar to Jillur Moar.

Figure 2-12: Current situation of the Karajan Road.

At present**, Paran Commissioner Moar to Beautha Main Road** is the BC road. The existing roads are badly damaged which containing cracks, pot holes, edge broken and depressions are prevalent. Therefore, subproject area traffic have been woe for long time for the bad condition of the road. To accommodate the normal traffic operation improved road is needed. Hence, 850 m BC road of uniform width has been proposed in the subproject area. On the

other hand, there is no drainage facilities in the subproject area. Hence, Pourashava has decided to construct RCC drain with cover slab in the subproject area. The proposed new RCC drains will be connected with Kaliganga River.

Figure 2-13: Current Situation of the Subproject sites and Outfall of Kaligonga River.

There is no drainage facilities in the **Sajahan House to East Side Bandutia khal Area**. Due to absent of the drainage network, after rainfall this area become water logged. So, surrounding environment of the subproject are is degraded. Hence, to provide better environment in the subproject area, 230m RCC drain with cover slab will be constructed from Sajahan House to East Side Bandutia khal Area**.** This drain will be connected with Manikgonj Khal.

Figure 2-14: Current Situation of the Sajahan House to East Side Bandutia khal Road and its outfall.

West side of LGD office to Manikgnoj Singer Road Launch Ghat road is the busy area of the Pourashava as it is locate at the core area of the Pourashava. Consequently, pour citizen has dependency on the road to meet their daily demand to reach the main town. However, the exiting condition of the BC raod is not good, because of potholes and edge crack on the road surface. Therefore, traffic movement is interrupted. Hence, old damaged BC road will develop to new BC

road from West side of LGD office to Manikgnoj Singer Road.

On the other hand, there is no drainage facilities in the subproject area. Hence, during rainy season waterlogging is occur in the subproject area. Resulting, surrounding environment of the subproject site is degrading. In addition, traffic movement is also interrupted. Hence, RCC drain with cover slab is proposed at one side of the proposed road. This drain water will be discharged in to the Manikgonj Khal.

Figure 2-15: Current Situation of the Subproject Road and its outfall.

2.4 Justification of Selection of the Subproject

The proposed subproject has significant importance for the Pourashava. The proposed roads will make safe, easy and smooth connection with Manikgonj City. Hence, this subproject has been considered as priority subproject in the CIP. PMU representative, and hired consultant of Pourashava visited the subproject site to assess the site condition.

From the site visit, it is revealed that these road is very much inconvenience for the movement of the motorized vehicles. The subproject is located solely on the right of way. Additionally, there is no road widening work. Hence, private land acquisition is not an issue for implementation of this subproject. From the site inspection, it is also revealed that roadside built-up infrastructure will not be severely affected due to the implementation of the subproject.

The subproject has significant benefit to the community people. After completion, the road will provide uniform width. By eliminating pot holes and providing smooth road surface it will provide better, easy and safe movement facilities for the travelers. On the contrary, the drain will reduce water logging problem. Thus, the subproject area will get better environment. Hence, considering the benefits that will derive, the subproject is selected for implementation.

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 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 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 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) Analysis of the Alternative Routes/ Alignments/ Location

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

Existing BC and HBB road will be replaced by the new BC and HBB pavement using the same alignment. Therefore, analysis of alternatives routes/ alignment is not really applicable.

(ii) Analysis of alternative routes/ alignments for RCC 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.

b) Analysis of the Alternative Designs

(i) Analysis of the Alternative Designs for BC 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 and RCC roads are shown in following table.

Design Alternatives	Advantages	Disadvantages
Alternative 1: Bituminous Carpeting (BC) Road	• Low Construction cost; • Provide smooth surface; • Aesthetic value is high	• Frequency of maintenance is relatively high; • Early damaged in heavy rainfall
Alternative 2: CC Road	• Do not require frequent repairing like BC roads; • Durability is more than BC road but less than RCC road	• 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	• Require less construction cost; • Construction time is less	• Frequent maintenance is required • Surface is not smooth
Alternative 3: RCC Road	• Capacity of passing heavy loaded vehicles • RCC road is not damaged in heavy rainfall • Frequency of maintenance is relatively low.	• High construction cost • Provide relatively less smooth surface

This is an improvement subproject where the damaged BC and HBB road will be replaced by the new BC 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.

(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	• Not prone to encroachment • Area above RCC drain could be used as a part of	• Higher cost of construction
Alternative 2: Earthen drain	• Less construction cost	• Need more land for construction of open earthen drain • Prone to encroachment, disposal of solid waste/ debris
Alternative 3: Pipe drain	• Require less time to construction	• Maintenance is difficult

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

c) 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 H/O Kazimuddin to H/O Chan Mia.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
H/O Kazimuddin to H/O Chan Mia.			
0-100	√		semi pucca resident, trees, khal
		√	semi pucca resident, trees, khal
100-200	√		semi pucca and tin shed resident, electric pole
		√	pucca, semi pucca and tin shed resident
200-300	√		pucca, semi pucca and tin shed resident, tress, vegetation coverage
		√	semi pucca resident, stationary shops
300-400	√		pucca resident, low land, electric pole
		√	tin shed resident, trees,
400-500	√		tin shed resident, trees, low land, agricultural field
		√	tin shed resident, agricultural field
500-600	√		tin shed resident, agricultural field
		√	low land, agricultural field
600-700	√		pucca resident, boundary wall, agricultural field
		√	ditch, vegetation coverage
700-800	√		tin shed and semi pucca resident
		√	low land, vegetation coverage, trees
800-900	√		tin shed and semi pucca resident, trees
		√	tin shed and semi pucca resident, electric pole
Link-1: H/O Vetku to H/O Akkel.			
00-100	√		semi pucca and tin shed resident, electric pole
		√	open space, semi pucca and tin shed resident, electric pole
100-200	√		semi pucca and tin shed resident, electric pole
		√	canal, trees
200-300	√		canal, vegetation coverage, trees
		√	open space, semi pucca and tin shed resident, electric pole
300-400	√		canal, trees
		√	open space, semi pucca and tin shed resident, electric pole
400-500	√		Resident

		√	Open land , semi pucca and tin shed resident, electric pole
500-600	√		semi pucca and tin shed resident, electric pole
		√	semi pucca and tin shed resident, electric pole

Table 3-2 : Major Environmental and Infrastructural Features from Bakjuri Bridge to End of Pourashava

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Canal, trees, aquatic vegetation coverage
		√	Tea Stole, electric pole,
100-200	√		Canal, trees, aquatic vegetation coverage
		√	Boundary wall, tin shed and semi pucca residents
200-300	√		Canal
		√	Agricultural land
300-400	√		Agricultural land
		√	Canal, tin shed and semi pucca residents
400-500	√		Agricultural land, trees
		√	tin shed and semi pucca residents, trees
500-600	√		tin shed and semi pucca residents, trees
		√	tin shed and semi pucca residents
600-700	√		Canal, vegetation coverage
		√	Agricultural land
700-800	√		Canal
		√	tin shed and semi pucca residents, trees
800-900	√		Beauty Parlor,
		√	tin shed and semi pucca residents, trees
900-1000	√		Canal
		√	tin shed and semi pucca residents, trees
1000-1100	√		Canal
		√	tin shed and semi pucca residents, trees
1100-1200	√		tin shed and semi pucca residents, trees
		√	Canal
1200-1300	√		tin shed and semi pucca residents, trees
		√	tin shed and semi pucca residents, trees
1300-1400	√		Agricultural land
		√	tin shed and semi pucca residents, trees
1400-1500	√		Agricultural land, tin shed and semi pucca residents, trees
		√	Agricultural land, tin shed and semi pucca residents, trees

Table 3-3: Major Environmental and Infrastructural Features from H/O Sankar Master to H/O Touhid via H/O Hanif at East Dashora.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Pucca , semi pucca and tin shed resident, trees, vegetation coverage
		√	semi pucca and tin shed resident, trees, vegetation coverage
100-200	√		Trees, electric pole, pond, semi pucca and tin shed resident, trees, vegetation coverage

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
		√	resident
200-300	√		electric pole, pond, semi pucca and tin shed resident, trees, vegetation coverage
		√	Trees, electric pole, pond, semi pucca and tin shed resident, trees, vegetation coverage
300-400	√		semi pucca and tin shed resident, trees, vegetation coverage
		√	semi pucca and tin shed resident, trees, vegetation coverage
400-500	√		trees, electric pole, pond, semi pucca and tin shed resident, trees, vegetation coverage
		√	trees, electric pole, pond, semi pucca and tin shed resident, trees, vegetation coverage
500-600	√		trees, electric pole, pond, semi pucca and tin shed resident, trees, vegetation coverage
		√	trees, electric pole, pond, semi pucca and tin shed resident, trees, vegetation coverage
600-700	√		pond, semi pucca and tin shed resident, trees, vegetation coverage, trees, electric pole,
		√	semi pucca and tin shed resident, trees, vegetation coverage
Link-1: Front of Polly Mangal Club Math.			
00-100	√		Open space, trees
		√	Saifuddin School, trees , pucca and semi pucca residents
100-200	√		Open space, trees
		√	Trees , pucca and semi pucca residents

Table 3-4: Major Environmental and Infrastructural Features from Siddique Nagar to Vayapara Moar via Rahamatpur mosque

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	√		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
		√	Semi pucca and tin shed residents, boundary wall, trees
300-400	√		Semi pucca and tin shed residents, boundary wall, trees
		√	Vegetation coverage, semi pucca and tin shed residents, boundary wall, trees

400-500	√		Semi pucca and tin shed residents, boundary wall, trees
		√	Semi pucca and tin shed residents, boundary wall, trees
500-600	√		Semi pucca and tin shed residents, boundary wall, trees
		√	Semi pucca and tin shed residents, boundary wall, trees
600-700	√		Seasonal spring, semi pucca and tin shed residents, boundary wall, trees
		√	Seasonal spring, semi pucca and tin shed residents, boundary wall, trees
700-800	√		Semi pucca and tin shed residents, boundary wall, trees
		√	Semi pucca and tin shed residents, boundary wall, trees
800-915	√		Semi pucca and tin shed residents, boundary wall, trees

Table 3-5: Major Environmental and Infrastructural Features from Noyakandi Bridge to End of Pourashava

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Varieties Shops of Noyakandi Bazar, electric pole, tress
		√	Varieties Shops of Noyakandi Bazar, , tress
100-200	√		Varieties Shops of Noyakandi Bazar, electric pole, tress
		√	Varieties Shops of Noyakandi Bazar, tress
200-300	√		Varieties Shops of Noyakandi Bazar,
		√	Varieties Shops of Noyakandi Bazar, electric pole, tress
300-400	√		Pucca, semi-pucca and tin shed residents, electric pole, trees
		√	Pond, semi-pucca and tin shed residents, , trees
400-500	√		Mosque, semi-pucca and tin shed residents, trees
		√	Semi-pucca and tin shed residents, electric pole, trees
500-600	√		Tin fence, semi-pucca and tin shed residents, electric pole, trees
		√	Boundary wall, semi-pucca and tin shed residents, electric pole, trees
600-700	√		Electric pole, tin fence, semi-pucca and tin shed residents,
		√	Semi-pucca and tin shed residents, trees
700-800	√		Semi-pucca and tin shed residents,
		√	Morning Sun School, semi-pucca and tin shed residents, electric pole, trees
800-900	√		Semi-pucca and tin shed residents, electric pole, trees
		√	Tin fence, semi-pucca and tin shed residents, electric pole, trees
900-1000	√		Semi-pucca and tin shed residents, trees
		√	Semi-pucca and tin shed residents, electric pole, trees
1000-1100	√		Pucca, semi-pucca and tin shed residents, trees
		√	Boundary wall, trees, vegetation coverage

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
1100-1200	√		Trees, pucca, semi-pucca and tin shed residents, electric pole,
		√	Pucca, semi-pucca and tin shed residents,
1200-1300	√		Boundary wall, pucca, semi-pucca and tin shed residents,
		√	Pucca, semi-pucca and tin shed residents,
1300-1400	√		Pond, pucca, semi-pucca and tin shed residents, electric pole,
		√	Pucca, semi-pucca and tin shed residents,
1400-1500	√		Pucca, semi-pucca and tin shed residents, electric pole,
		√	Kaligonga river, pucca, semi-pucca and tin shed residents,
1500-1600	√		Tin fence, pucca, semi-pucca and tin shed residents, trees
		√	Kaligonga river, tin fence, pucca, semi-pucca and tin shed residents, electric pole,
1600-1700	√		Pucca, semi-pucca and tin shed residents,
		√	trees, pucca, semi-pucca and tin shed residents,
1700-1740	√		Kaligonga river, tin fence, pucca, semi-pucca and tin shed residents, electric pole,
		√	Pucca, semi-pucca and tin shed residents,

Table 3-6: Major Environmental and Infrastructural Features Aowlad Hossain College to Bakjuri bridge

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Awlad Hossain College, pucca , semi-pucca and tin shed residents, electric pole, trees
		√	Shops, teal stole, trees , flexi load shops, semi-pucca and tin shed residents, electric pole, trees
100-200	√		semi-pucca and tin shed residents, electric pole, trees
		√	semi-pucca and tin shed residents, electric pole, trees
200-300	√		semi-pucca and tin shed residents, electric pole, trees
		√	semi-pucca and tin shed residents, electric pole, trees
300-400	√		semi-pucca and tin shed residents, electric pole, trees
		√	semi-pucca and tin shed residents, electric pole, trees
400-500	√		semi-pucca and tin shed residents, electric pole, trees
		√	semi-pucca and tin shed residents, electric pole, trees
500-600	√		semi-pucca and tin shed residents, electric pole, trees
		√	Bakjuri Khal, trees, vegetation coverage,
600-700	√		Boundary wall, semi-pucca and tin shed residents, electric pole, trees
		√	Bakjuri Khal, trees, vegetation coverage
700-800	√		low land
		√	Bakjuri Khal, trees, vegetation coverage
800-900	√		Pucca, semi pucca and tin shed residents, boundary wall
		√	Bakjuri Khal, trees, vegetation coverage
900-1000	√		semi pucca resident
		√	Bakjuri Khal, trees,

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
1000-1100	√		Tin fence, pucca, semi pucca and tin shed residents, boundary wall
		√	Bakjuri Khal, trees,
1100-1200	√		Pucca, semi pucca and tin shed residents, boundary wall
		√	Bakjuri Khal, trees,
1200-1300	√		Pucca, semi pucca and tin shed residents, boundary wall
		√	Bakjuri Khal, trees,
1300-1400	√		Pucca, semi pucca and tin shed residents, boundary wall
		√	Bakjuri Khal, trees,
1400-1500	√		guide wall, pond
		√	Bakjuri Khal, trees,
1500-1600	√		Varieties shops, semi pucca and tin shed residents, boundary wall
		√	Open space, semi pucca and tin shed residents, boundary wall
1600-1700	√		Low land, semi pucca and tin shed residents, boundary wall
		√	Semi pucca and tin shed residents, boundary wall, trees,
1700-1800	√		Semi pucca and tin shed residents, boundary wall, trees,
		√	Semi pucca and tin shed residents, boundary wall, trees,
	√		Semi pucca and tin shed residents, boundary wall, trees,
1800-1900		√	Semi pucca and tin shed residents, boundary wall, trees,
	√		Semi pucca and tin shed residents, boundary wall, trees,
1900-2000		√	Semi pucca and tin shed residents, boundary wall, trees,
	√		Semi pucca and tin shed residents, boundary wall, trees,
2000-2100		√	Semi pucca and tin shed residents, boundary wall, trees,
2100-2200	√		Semi pucca and tin shed residents, boundary wall, trees,
		√	Semi pucca and tin shed residents, boundary wall, trees,

Table 3-7 Major Environmental and Infrastructural Features from Bakjuri bridge to end of Pourashava via Malancha Eidgha.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Pucca and semi pucca resident, boundary wall
		√	khal
100-200	√		ditch
		√	khal
200-300	√		Tin shed and semi pucca resident
		√	khal
300-400	√		low land
		√	khal
400-500	√		tin shed resident, semi pucca resident, boundary wall
		√	Eidgha math, boundary wall
500-600	√		tin shed and semi pucca residents resident
		√	Eidgha math, boundary wall
600-700	√		low land, trees
		√	Graveyard, trees, electric pole
700-800	√		low land
		√	Ditch, vegetation coverage
800-900	√		Khal, Nowkhanda kali Mondir, trees,

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
		√	Open space, tin shed and semi pucca and residents
900-1000	√		Pucca , semi-pucca and tin shed resident, trees, electric pole,
		√	Khal, pucca , semi-pucca and tin shed resident, trees, electric pole,
1000-1100	√		Pucca , semi-pucca and tin shed resident, trees, electric pole,
		√	Khal, pucca , semi-pucca and tin shed resident, trees, electric pole,
1100-1200	√		Khal, pucca , semi-pucca and tin shed resident, trees, electric pole,
		√	Semi-pucca and tin shed resident, trees, electric pole,
1200-1300	√		Pucca, semi-pucca and tin shed resident, trees, electric pole,
		√	Khal, pucca , semi-pucca and tin shed resident, trees, electric pole,
1300-1400	√		Pucca , semi-pucca and tin shed resident, trees, electric pole,
		√	Pucca, semi-pucca and tin shed resident, trees, electric pole,
1400-1500	√		Shops, Pucca , semi-pucca and tin shed resident, trees, electric pole,
		√	Pucca, semi-pucca and tin shed resident, trees, electric pole,

Table 3-8 : Major Environmental and Infrastructural Features from Sajahan House to Bandutia khal.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Pucca and semi pucca resident, boundary wall, low land
		√	Boundary wall, tin fence, tin shed and semi pucca resident
100-200	√		Pucca and Semipucca residents, trees, boundary wall
		√	Pucca and Semipucca residents, trees, boundary
200-300	√		Pucca and Semipucca residents, trees, boundary
		√	Pucca and Semipucca residents, trees, boundary

Table 3-9: Major Environmental and Infrastructural Features from LGD Office West to Manikgnaj Singair Road Lacnch Ghat.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Pucca, semi-pucca and tin shed residents, , trees
		√	Stationary shops, Pucca, semi-pucca and tin shed residents, electric pole, trees
100-200	√		Pucca, semi-pucca and tin shed residents, trees
		√	Pucca, semi-pucca and tin shed residents, boundary wall
200-300	√		Pucca, semi-pucca and tin shed residents, electric pole, trees
		√	Pucca, semi-pucca and tin shed residents, , trees
300-400	√		Pucca, semi-pucca and tin shed residents,
		√	Pond, semi-pucca and tin shed residents, , trees

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
400-500	√		Mosque, semi-pucca and tin shed residents, trees
		√	Semi-pucca and tin shed residents, electric pole, trees
500-600	√		Tin fence, semi-pucca and tin shed residents, electric pole, trees
		√	Boundary wall, semi-pucca and tin shed residents, electric pole, trees
600-700	√		Electric pole, tin fence, semi-pucca and tin shed residents,
		√	Semi-pucca and tin shed residents, trees
700-850	√		Pond, Semi-pucca and tin shed residents,
		√	semi-pucca and tin shed residents, electric pole, trees

Table 3-10: Major Environmental and Infrastructural Features from Niramoy Clinic to South side of Court

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		khal
		√	Stationary shops, Pucca, semi-pucca and tin shed residents and commercial structure, electric pole, trees
100-200	√		Khal, trees, electric pole
		√	Pucca, semi-pucca and tin shed residents and commercial structure, electric pole
200-300	√		Khal, trees,
		√	Pucca, semi-pucca and tin shed residents and commercial structure, electric pole
300-400	√		Khal, trees,
		√	Pond, semi-pucca and tin shed residents, , trees
400-500	√		Khal, trees,
		√	Pucca, semi-pucca and tin shed residents and commercial structure, electric pole
500-600	√		Khal, trees,
		√	Pucca, semi-pucca and tin shed residents and commercial structure, electric pole
600-700	√		Khal, trees,
		√	Pucca, semi-pucca and tin shed residents and commercial structure,
700-800	√		Khal, trees,
		√	Pucca, semi-pucca and tin shed residents and commercial structure, trees
800-900	√		Pucca, semi-pucca and tin shed residents and commercial structure, trees
		√	Pucca, semi-pucca and tin shed residents and commercial structure, trees, electric pole,
900-1000	√		Pucca, semi-pucca and tin shed residents and commercial structure, trees
		√	Pucca, semi-pucca and tin shed residents and commercial structure, trees
1000-1080	√		Boundary wall, pucca, semi-pucca and tin shed residents and commercial structure, trees
		√	Pucca, semi-pucca and tin shed residents and commercial structure, trees

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

Geology, Soils and Seismicity

Geology of Bangladesh is generally dominated by poorly consolidated sediments deposit 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.

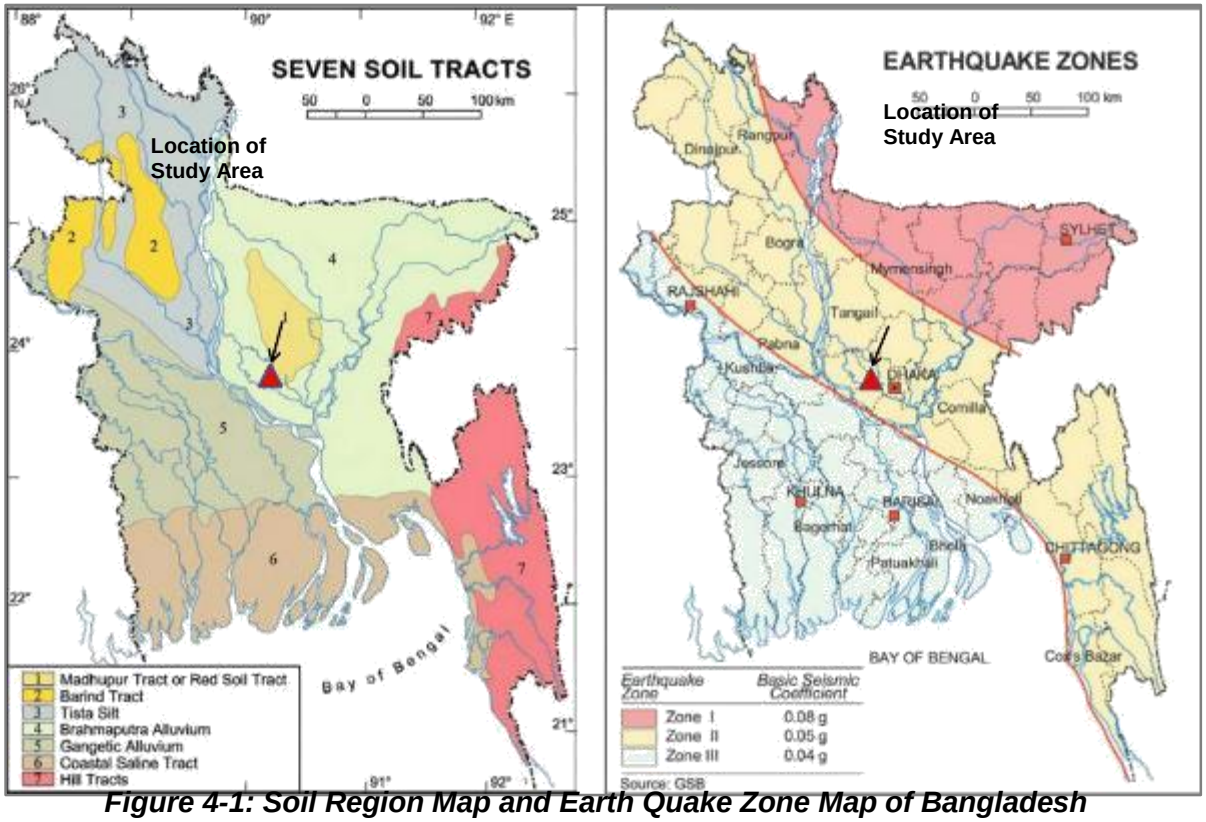

Figure 4-1: Soil Region Map and Earth Quake Zone Map of Bangladesh

4.1.1.1 *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 rain-fall 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 summer.

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 4-1

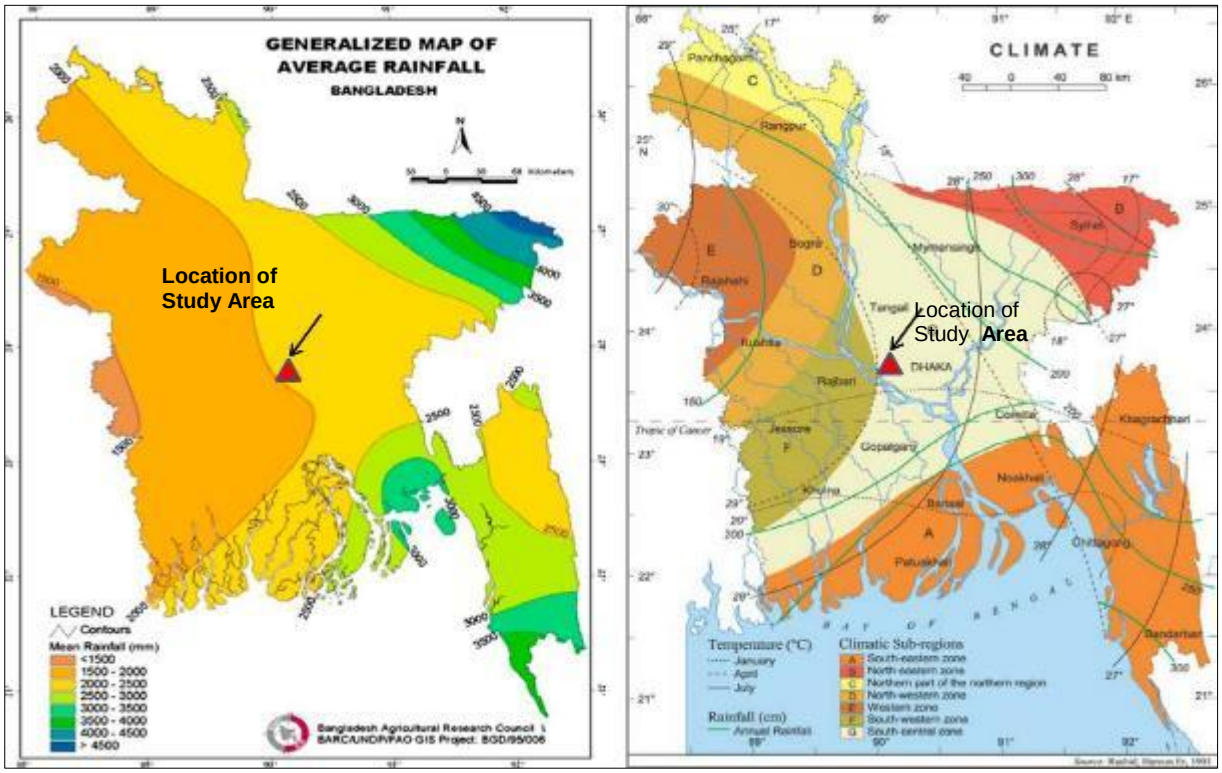

Figure 4-2: The locations of the subproject study site on the mean annual rainfall map of Bangladesh. (Map source: www.banglapedia.org)

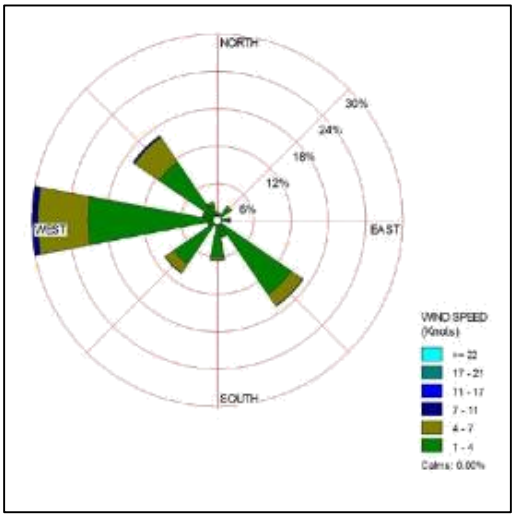

Figure 4-3: Wind rose plot of from the 2008-2012 wind speed/ direction data gathered from Dhaka BMD station showing predominant directions and speeds of wind.

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/cm2/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%.

4.1.1.2 *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 Joyra Cannel, Bokjuri Cannel 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. Therefore, prior to construction work surface water quality data will be evaluateed as a part of base line date collection.

4.1.1.3 *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.

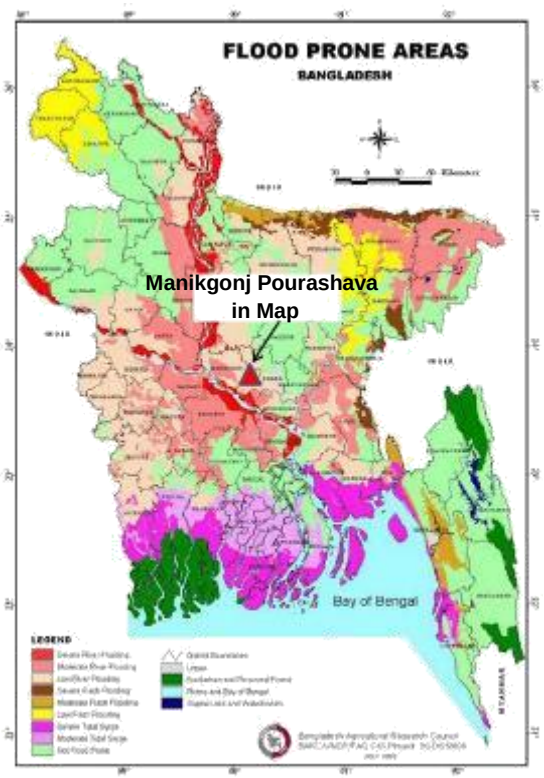

Figure 4-4: Locations of the Manikgonj Pourashava site on the flood risk map of Bangladesh (map source: BARC)

4.1.1.4 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, construction 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				

4.1.1.5 Noise level

The major source of noise in the area is from transportation. However, the main mode of transportation in the Pourashava area is electric auto for the semi-urban and rural area of the Pourashava where density of the population is not high and use of motorized vehicles is also few. So, it is expected that noise nuisance would be insignificant. However, 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. 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 Bokjuri Khal	23°90'05.59"N 89°34'49.94"E	50.78	51.00
Near Hijoli Kachari Moth	23°59'93.94"N 89°79'11.98"E	60.12	65.78
Near Kaligonga River	23°52'17.49"N 90° 0'10.27"E	58.89	60.89

Near Malonch Bazar Road	23°87'50.00"N 90°01'4168"E	71.21	72.00
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	

4.1.2 Biological Environment

4.1.2.1 Flora and fauna

All homesteads are usually covered by dense and lush green foliage of wide variety of both native and exotic species of trees. Both sides of the road are covered by exotic trees. In addition along the road side area, there are natural grown vegetation like helencha, komli, dhutora etc.

Along the road alignment common planted local and exotic trees include; Mango, Mahogany, Jackfruit, Banana, Betel Nut, Coconut, Rain-tree, Shisso, Debdaru, Japanese Acacia and others fruits and timber trees are found during the site visit. Again, on the road side medicinal plants, herbs and shrubs are available. In the subproject influence area, there are lots of water bodies like – khal, pond, low land/ seasonal spring. These are the worthy habitat of the aquatic flora and fauna species. The common local birds such as Doel, Shalik, Chil, Pecha, Kak were found during site visit. Migratory birds are also available in the seasonal spring/ wetland and experimental paddy field during winter season.

4.1.2.2 Biodiversity Status

Public consultations discussed the outcomes and there are no special or site specific terrestrial and aquatic ecosystems heavily disturbed by the development activities of this area. However, the populations of the floral and faunal species have declined generally due to the regional and national climate change (low rainfall, high temperature, high humidity, short winter period, and long dry season) due to the over exploitation, poor management, demographic pressure, natural calamities.

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 hub of the Pourashava. The built-up infrastructure includes mainly pucca, semi-pucca and tin-shed residential houses and shops, educational institutions, industries, religious centers (Mosques and Temple), slum area, hospital and health care center, trade and commerce, business centers (market and bazar, hotel and restaurant). Moreover, there are notable amount of agricultural activities in the subproject area.

4.1.3.2 *Beneficiary population*

The subproject area covers jurisdiction area of the ward 4,5,6,7 and 9 of Manikgonj Pourashava. As per information by the municipality, considering the ward population about 76,000 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 closest to the 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 issues 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 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 **BC Road and RCC Drain** been formulated and are shown in below.

1) Potential Environmental Impact during Construction Phase:

(a) Ecological Impacts:

➢ Felling of trees	Significant □	Moderate □	Minor □√	Number of trees 21
➢ Clearing of vegetation	Significant □	Moderate □ √	Minor □	
➢ Potential impact on species of Aquatic (i.e., water) environment	Significant □	Moderate □	Minor □ √	

Since, it is an improvement subproject of the existing road, hence road widening do not to be need. But to provide uniform road width at few section of the different roads, 19 numbers of trees to be cut down. Major trees to be cut down are: Betel Nut, Bakul, Plum, Akashi, Jackfruits, and Neem etc. Size of the trees to be cut down are small in size and will have no religious and cultural values. 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 □	Moderate □√	Minor □
➢ Air pollution	Significant □	Moderate □√	Minor □
➢ Drainage congestion	Very likely □	Likely □	Unlikely □√
➢ Water pollution	Significant □	Moderate □	Insignificant □√
➢ Pollution from solid/ construction wastes	Significant □	Moderate □√	Insignificant □
➢ Water logging	Significant □	Moderate □	Insignificant □√

This road and drain component of the proposed subproject are located at different eleven location. 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 all of the subproject sites will have negative impact on the physicochemical parameter (noise and air). 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 will have adverse impact on 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 □	Likely □√	Unlikely □
➢ Health and safety	Significant □	Moderate □√	Insignificant □
➢ Impact on archaeological and historical	Significant □	Moderate □	Insignificant □√
➢ Employment generation	Significant □√	Moderate □	Insignificant □

Currently, due to bad condition of the roads, motorized vehicles movement in the most of the subproject area is very few. In addition, most of the roads are rural and semi urban residential area. 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 □√

At operation, road component does not have any impact on ecology. On the other hand, the waste water from the drain may degrade the water quality of the outfall if carries pollutants. Though, the drain is designed for storm water only. However, the storm water may carry washed-out materials, pollutants from any sources that may disturb the aquatic environment of the outfalls.

➢ 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 new drain will minimize drainage congestion and water logging problem. The storm water to be discharged through the drain may degrade the water quality of the outfall if it carries pollutants from any sources. Pollution from solid waste will be improved by restricting the throwing of the household waste material in to the drain.

(f) Socio-economic Impacts:

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

After completion, these roads will improve the transportation facilities. By providing uniform pavement, it will also enhance traffic safety. In addition, new road will provide opportunities for the local people for using of CNG, battery operated rickshaw van and

pickup and non-motorized vehicles for communicating and transportation of goods. New 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. Consequently, it will enhance traffic safety.

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

The overall ecological impact due to the subproject implementation is not minor. However, the subproject has adverse impacts on the physicochemical components especially on air, noise and solid wastes. Nevertheless, it is anticipated that the adverse impact is not significant and limited in the subproject boundary. The subproject activities may degrade the air quality and noise level to a limited extent. The wastes generated due to the construction activities should be properly collected and disposed in a designated dumping site. The inputs that may affect the environment will be mainly at construction phase and limited within the subproject boundary. Moreover, mitigation measures will be taken according to the EMP for minimizing the air, dust, and noise pollution.

Furthermore, the socio-economic feature mainly includes health and safety and employment generation. Safety concerns should be considered properly for both the construction and operation phases to avoid any potential safety risks. This subproject will have positive impacts in terms of generation of employment and business activities due to supplying of the materials and equipment.

6 SPECIFIC IMPACT, MITIGATION AND ENHENCEMENT MEASURES

From the environmental study, the possible impacts of the subproject are mainly caused by the site condition, key activities, raw materials to be used and equipment. Key activities of the subproject - earth work, back filling, reinforcement cement concrete work with mixer and vibration machine, fabrication of ribbed or deformed bar, fixing rain water down pipe and relocation of telephone and electrical poles which have temporary negative impact on ecology, physico-chemical and socio-economy at construction stage and tree plantation measure proceeds the long time positive impact on environment. The materials and resources to be used for the key activities: soil in earth work, sand, stone chips, reinforcement, diesel, electricity and water. The major equipment to be used for the implementation of the subproject: excavator, brick breaking and stone crushing machine, mechanical concrete mixer and vibrator machine, mechanical compaction machine, diesel engine, steel cutter, steel shutter.

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

In the subproject sites, all of the entire road length do not belong uniform width. So, to provide uniform road width at few section of the proposed road, widening work would be required. 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

Camp for labor will be constructed in construction sites. Contractor will select the location of the camp through consultation with Pourashava Engineer. However, during environmental reconnaissance survey Pourashava has recommended a tentative location for the construction of labor shed near Ambala Cold Storage which is located at ward no.4. Unhygienic condition at the labor shed and generation of sewage and solid waste at the labor shed may cause degradation of the surrounding environment.

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

Prior to start construction, the subproject sites need to be cleared and as a result, medium amount of standing vegetation (e.g. crops, grass, bushes etc.) loss will be occurred. In addition, total 21 numbers of trees need to be cut down at different sites.

Mitigation Measures

105 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 at one sides of the Noyakandi Road, and Siddique Nagor Road and 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 constriction stages includes-cut and filling work, soil export or import work and demolition of the existing brick drain, damaged BC and HBB 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 deposed regularly and quickly in to the designated dump site of Pourashava at Muljan which is located at last boundary of Pourashava.

6.2.2 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.

6.2.3 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 empting 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 temporally 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

6.2.4 Noise and Vibration

Cause of Impact

The proposed areas are mostly relatively rural areas. Generation of noise pollution will be occurred from the construction activities for the construction sites such as earth filling, crushing of bricks , concrete mixing machine, movement of construction vehicles, functioning of generators and as result, local community, project workers, wildlife and other lives will be affected. However, the probable impact is temporary and site specific.

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.

6.2.5 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.

6.2.6 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.

6.2.7 Impact on host comminutes from out sides worker

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, eve 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 out sides workers about the social & religious actability in the area so that they could maintain those when they will have touch with local community.

6.2.8 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).

6.2.9 Traffic Management

The proposed all the roads are in extensively damaged condition. Hence, traffic movement on these road is very few. Additionally, most of the sites are located in the rural and semi urban residential area of the Pourashava. In addition, there are adequate alternative and connecting road in the subproject area. During construction, these roads will helps to diversify the traffic which will minimize the impact on traffic. Moreover, Pourashava will inform the local people about subproject activities and inspiring them to use the alternative road.

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 MANAGEMENTPLAN (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.

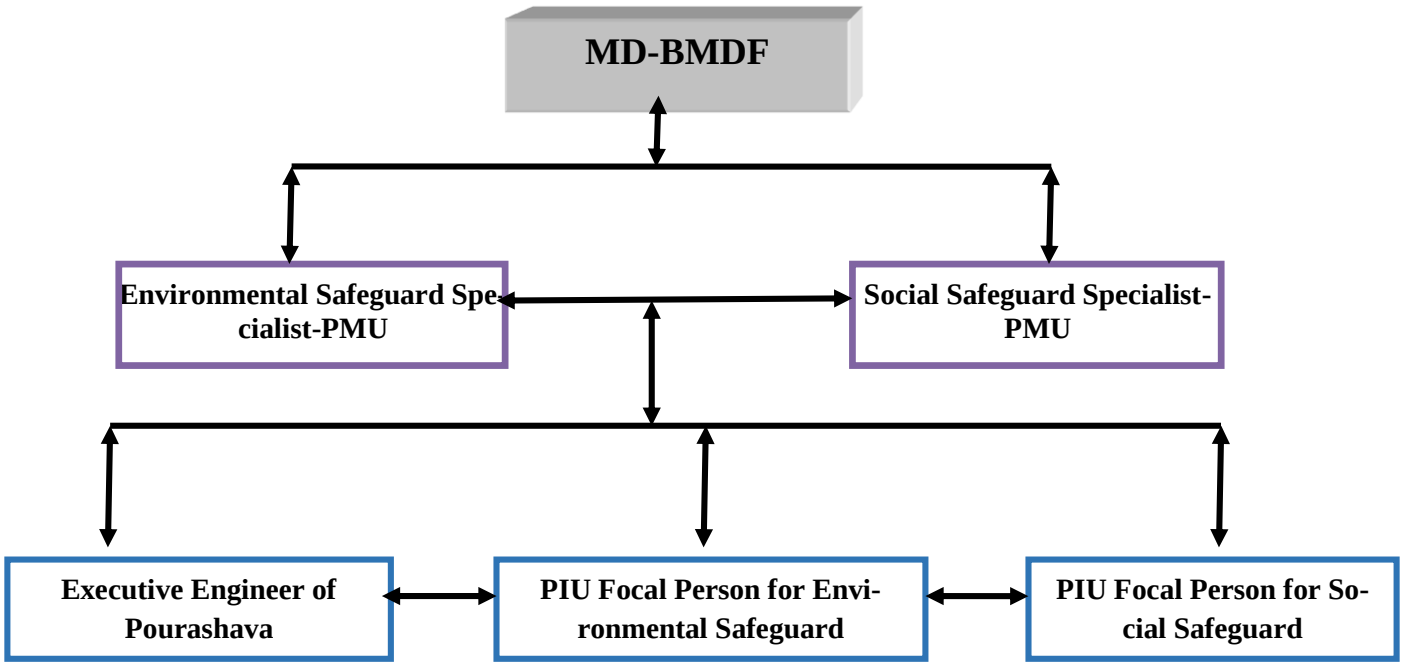

Figure 7-1: Environmental and Social Management Team (Tentative)

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 Impact	Proposed Mitigation &Enhancement Measure	Monitoring Method	Frequency of Monitoring	Responsible for Monitoring	
					Implement	Supervision
At Pre-construction stage						
Arrangement of the and operation of labor shed for the workers (Workforce and labor shed management)	Generation of sewage and solid waste may cause water/ environmental pollution/	• Ensure construction of the labor shed and stockyard at the designated place (Vacant place near Ambala Cold Storage at ward no. 4.); • 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	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

		• Proper disposal of the wastes and effluents;				
	Health Hazard of Labor	• 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	• 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	• Ensure that contractor employ local work force to provide work opportunity to the local people and conduct formal and unofficial awareness program for	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava

	and social well-being of local people	the health and social well-being of the local people.				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	• 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	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Air pollution	• 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); • Construction materials (sand, gravel, and rocks) and spoil materials will be transported trucks covered with tarpaulins.	Visual Observation/Analytical	Regularly and Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Traffic congestion, effect on traffic and pedestrian safety	• Ensure schedule deliveries of material/ equipment during off-peak hours; • Avoid stockpiling of materials specially at the road sides that could disturb traffic movement; • Place cautionary sign for the pedestrian and safety traffic movement. • Inform the local people about subproject activities and inspire them	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

		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.				
	Noise pollution	• Check and maintenance the equipment properly; • Avoid using of construction equipment producing excessive noise at night; • 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.	Visual Observation/Analytical	Regularly and Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Water and soil pollution	• 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	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Accidents	• Conduct formal and informal discussion for creating awareness about the accident;	Visual Observation	Regularly	Contractor	Primarily by PIU of

		• Provides PPEs and ensure using of the personal protective equipment by the workers. • Maintain the register to record accidental events if occur;				Pourashava Secondarily by PMU of BMDF
	Spills and leaks of oil, toxic chemicals	• 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	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
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.	• 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	• 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.	• 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.	• 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.	• 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 excavation work	Generation of loose and clay soil due to the earth excavation work.	• Cover exposed loose dry soil and wastes materials before disposal; • Disposal of soil and construction wastes at existing dumping site at Muljan which is located at last boundary of Pourashava.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Accidents from careless use of hydraulic excavator and hammer if needed.	• Carefully handle of the hydraulic excavator and hammer if needed.				
	Possible damage of road side infrastructure due to earth excavation for drain construction.	• 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.	• Regular maintenance of the equipment.				
Sand filling /Back filling work	Air and dust pollution affecting nearby settlement	• 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	• 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	• 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	• 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	• 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.	• Better traffic management; • Control heavy traffic movement.	Primarily by Pourashava
	Increased air and noise pollution affecting surrounding areas	• Traffic management, increased vehicle inspection	
Operation of the RCC drain	Pollution of downstream water body due to disposal of polluted water from the drain	• Ensure installation of septic tank by the household people in all establishment; • Stop connecting sanitation facilities to storm drain directly.	Primarily by

	Blockage in the drain due to disposal of solid waste/debris	• 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.	Pourashava
	Possible backflow of water due to blockage in the drain and at outfall	• 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	• Through digital instruments	• Sub-project site	• Two times at construction phase; • Reporting: Once in a month and immediately after measurement
Ambient air quality/ Stack Emission	• Visually-black smoke; • Sampling; • Analysis at laboratory; • Data analysis of merits determination by using quality standards; • Through digital instruments.	• Sub-project site	• Two times at construction phase; • Reporting: Once in a month and immediately after measurement
Waste Water quality	• Sampling; • Analysis at laboratory; • Data analysis of merits determination by using quality standards.	• At intake and outfall	• 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) 105 nos. of the trees @Tk 1,000.00 per tree (105* 1000.00)	105000.00
12	Cautionary Sign 8 nos.	20,000.00
	Total	**906000.00**

8 PUBLIC CONSULTATION AND PARTICIPATION

8.1 Objective and Methodology

The Public Consultation (PC) was undertaken as a part of the EA in order to obtain the views of members of the immediate community and interested and subproject affected persons (PAPs) within the site's immediate area of influence. The consultations were done with randomly selected people in the neighborhood of the proposed sites and involved use of a semi-structured public participation form. In general, the subproject is acceptable and no objections were raised concerning the development as proposed by the local people.

The Public Consultation has been conducted during 13 June 2017 through Stakeholder Consultations (SC), & individual during the environmental study of the proposed subproject in conformity with the WB's and DOE's environmental guidelines to achieve the following objectives:

The public consultations were conducted with the following objectives:

(i) To introduce 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;
(iv) To identify the conflict issues in advance & to find acceptable solutions;
(v) To gather local knowledge before decision making of the proposed subproject
(vi) To assess cultural patterns and behavior of local communities.


Figure 8-1: Public consultation with local people and other stakeholders at subproject site and with Pourashava Officials at 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 subprojects. The Key participants list of Focus Group discussion in the subproject study area is attached in the Appendis-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 been conducted to understand the initial environmental impacts for the subproject as well as to formulate the applicable mitigation and monitoring plans. Based on the environmental assessment, all possible environment aspects have been adequately assessed and necessary control measures have been formulated to meet with statutory requirements.

The overall conclusion is that if the mitigation, compensation, and enhancement measures are entirely implemented, there will be no significant negative environmental impacts as a result of location, design, construction, and or operation of the proposed subproject. In fact, there will be tremendous benefits from the recommended mitigation and enhancement measures and major improvements in quality of the life that enhance economic activities, education, job creation and public health once the scheme is in operation.

The conclusions of the environmental assessment can be summarized as follows:

- The short-term negative impacts that may come such as air quality, noise, solid waste, occupational health and safety will be minimized through the mitigation plan;
- The subproject will create employment for the workforce who live in the vicinity of the construction site and will provide them a short-term economic gain.

A few key recommendations are outlined below:

- All mitigation, compensation, and enhancement measures proposed in this report should be followed by the concern authorities for implementing this subproject;
- The environmental management and monitoring plan proposed in this report also needs to be followed;
- A specific training program should be carried out for Pourashava staffs to deliver overall knowledge for environmental safeguards;
- Natural resources such as water, wood, and fuel should properly use;
- Equipment should be checked by the ULB engineer prior to work.

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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, Beatification culvert, Bridge)

Package : Package No: BMDF/ MANIKGANJ/ 2017-18/WA2-05

Name of ULB : Manikganj **Upazila:** Manikganj Sadar

District : Manikganj **Date:** 13/6/2018

SL#	Name	Gender	Social Status	Contact Number	Signature/LTI
১৬		নারী	গৃহিনী	নাই	
১৭		নারী	গৃহিনী	নাই	
১৮		নারী	গৃহিনী		
১৯		নারী	গৃহিনী	01673384	
২০		নারী	গৃহিনী	8247 01739441917	
২১		নারী	গৃহিনী	নাই	
22		নারী	গৃহিনী	নাই	
২৩		নারী	গৃহিনী	নাই	
24		পুরুষ	কৃষিকাজ	নাই	
২৫		নারী	গৃহিনী	নাই	
২৬		নারী	গৃহিনী	নাই	
২৭		নারী	গৃহিনী	নাই	
২৮		নারী	গৃহিনী	নাই	
২৯		নারী	গৃহিনী		
৩০		নারী	গৃহিনী	নাই	

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নাজমা আকতার

সাবিহা হাবিব
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জেসমিন আক্তার
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সাবিহা একৌশলী
সহকারী একৌশলী
মানিকগঞ্জ পৌরসভা, মানিকগঞ্জ।