



**Bangladesh Economic Zones Authority (BEZA)
Prime Minister's Office**

Environmental and Social Assessment (ESA)

For

Mirsarai Economic Zone-2A & 2B

Under

**Private Investment and Digital
Entrepreneurship (PRIDE) Project**

Revised Draft Report

February 2020

EXECUTIVE SUMMARY

Introduction

The PRIDE project aims to promote private investment and job creation in economic zones and digital entrepreneurship in hi-tech parks. The project will spearhead the adoption and mainstreaming of green industrial park concepts in the implementation and development of economic zones in Bangladesh. The project will have four components:

Component 1: *Creating an enabling environment for private investment, sustainability & jobs:*

The first component will finance technical assistance, goods and training to inform and implement institutional, regulatory and administrative reforms. It will strengthen BEZA's core competence in technical functions that would allow it to be a more effective partner to leading private investors; and embed resilience and sustainability concepts into its development of infrastructure and associated services.

Component 2: *Developing a greener and resilient BSMSN:* This component will support phased development of the BSMSN Green Industrial City based on the recently approved Master Plan for BSMSN. It will finance works, goods and technical assistance for three areas—BSMSN-2A (380 ha), BSMSN-2B (192 ha) and BSMSN-IMD (100-200 ha)—to help catalyze the development of state-of-the-art green economic zones and set an example for sustainable, resilient and environmentally sound industrial development in Bangladesh.

Component 3: *Creating a dynamic private market for serviced industrial land:* The third component will seek to catalyze the creation of a dynamic private market for serviced industrial land. This component will support strengthening of institutional capacity and compliance mechanisms and capital grant funding to crowd in private investment.

Component 4: *Strengthening The Digital Entrepreneurship and Innovation Ecosystem:* The fourth component will be implemented by BHTPA. It aims to strengthen the foundation of the digital entrepreneurship and innovation ecosystem in Bangladesh. It will create the country's largest agglomeration of IT and ITeS companies and promote digital entrepreneurship more broadly among young professionals and women.

Out of the four components, the first three components will be implemented by Bangladesh Economic Zone Authority (BEZA) and the fourth one will be implemented by Bangladesh High-Tech Park Authority (BHTPA).

Objectives of the ESA

The objectives of this study are to prepare an ESA report by updating the existing EIA and SIA of zone 2A and 2B (which were prepared during PSDSP following WB old safeguard policies) in line with the World Bank's Environmental and Social Framework (ESF) by updating the baseline information and taking into consideration the planned activities under PRIDE project. The ESA also includes an assessment of Institutional Capacity of BEZA to manage Environmental and social issues and provide key recommendations and inputs to the Environmental and Social Commitment Plan (ESCP)

This ESA covers all the activities and sub-projects to be implemented by BEZA for which the location and adequate information about the size and scale of the activities are known (some of the activities within 2A and 2B). However, it is important to mention that the detailed design of some of the large infrastructure such as CETP, sanitary landfill, construction of a biogas plant, waste sorting and material recovery facility (that have been included in this ESA) are not finalized yet. Once detailed designs of these sub-projects are available, the sub-project specific ESIs will be prepared. BEZA would hire independent consulting firms to prepare these sub-project specific ESIs based on detailed infrastructure designs.

Regulatory Framework, Standards and Guidelines

The proposed PRIDE Project will be implemented in compliance with applicable environmental and social laws and regulations of the Government of Bangladesh (GoB). Relevant environmental and social regulations of GoB and policies, framework and standards of the World Bank have been reviewed and compared which was the basis of risk categorization of the project and assessment and management of environmental and social risks. The project consists of a number of infrastructures which fall under **Red Category**¹ as per GoB rules. Given the project's nature and scale, potential environmental and social risk and impacts, the capacity of the implementing agency to manage, implement and monitor the ESMP and the project context, the project has been categorized as "**High Risk**". Detailed screening of environmental and social risks and impacts were conducted following the similar screening process recommended in the BEZA ESMF.

Project Description

Project Location: The Zone 2A & 2B is located at Mirsharai and Sonagazi Upazilas of Chattogram district. The existing BWDB embankment runs through the East side of the proposed location. The area is 12 Km west to Dhaka-Chattogram National Highway and 60km North to Chattogram City.

Influence Area of Zone 2A & 2B: Although the project area for this ESA study is confined in zone 2A & 2B, a 10 km buffer zone area around the proposed site has been considered as the project influence area. Some of the impacts such as social issues might cover even bigger geographical area. These issues will be identified in the RESA. The overall socio-economic benefits will reach out to other parts of the country as labourers will be coming to EZs from across the country.

Interventions considered for this ESA under PRIDE: Among the four main components of the PRIDE project, the World Bank will support BEZA in the execution of the several sub-projects which have been described briefly in **section 3.5** and **Table 3-2** of ESA main report.

This ESA has been prepared for the following activities for in 2A and 2B:

Sub-project A.1: Construction of arterial and non-arterial roads, footpath and plot entry culvert.

Sub-project A.2: Construction of integrated stormwater management network

Sub-project A.3: Water supply network

Sub-project A.4: Site upgradation

Sub-project A.5: Construction of telecommunication network

Sub-project A.6: Construction of some key public buildings and facilities

Sub-project A.7: Construction of Internal Power Distribution Network

Sub-project B.1: Construction of a Common effluent treatment plant (CETP)

Sub-project B.5: Development of a landfill site for solid waste generated

Sub-project B.6: Construction of a biogas plant

Environmental and Social Baseline

Environmental Baseline

Mirsharai Upazila in Chattogram District where the project site is located falls in the exposed coastal zone. The project area lies in the South-Eastern climate zone of the country and shows three main seasons. The Southwest Monsoon lasts from May to October with a 90% of the annual rainfall and high humidity. The annual average rainfall is 3419mm. The Northeast Monsoon lasts from November to March. The hottest season extends from late March to May. The average maximum and minimum temperature is 36°C and 7.5°C respectively. Overall air quality of the area is good with most of the parameters within the Bangladesh Standard though the SPM, PM₁₀ and PM_{2.5} values in the 2A and 2B were found above the standard values mostly due to some ongoing works. Major water bodies in and around the study area are Feni River, Ichakhali khal, Daborkhali khal and Bamon Sundar khal.

¹ As per schedule-1 of ECR-97

Ichakhali khal passes through the proposed location. Most of the water quality parameters of these waterbodies exceed standard value. Shallow aquifer exists at a depth of about 50m and water is mostly saline with some sweet water pocket. Depth of the main aquifer is not precisely known. From ground water quality analysis, it is evident that water of deep aquifer (confined) is of good quality. The project area is free from tidal flooding due to the recent site development work. Moreover, the area will be protected by a super dyke from storm surges, part of which is being constructed under the current PSDS project for site 2A and 2B. Within the project site, there is natural drainage system e.g. Ichakhali canal direction of flow is towards the Ichakhali channel and the water from Ichakhali channel is finally drained into the sea. Pollution prevention measures would be in place to prevent water pollution during the construction phase. Main pollution concern would be during the operation phase for which the ESIA proposes that each industry owner would prepare ESIA to be reviewed by BEZA. BEZA would also need to prepare guidelines for operation of these industries. From the measured noise level, it was found that most of measured ambient noise levels were below 60 dBA. Zone 2A and 2B completely comprise of developed land. The soil of Zone 2A and 2B is non-saline, slightly alkaline and organic content is very low (0.2%). Among heavy metals, Cadmium is absent whereas Nickel and Chromium content are 9.507 ppm and 8.1631 ppm respectively in the soil of Zone 2A and 2B. The proposed area falls under seismic Zone-II on the earthquake map which means that earthquake load should be taken care into consideration in designing the infrastructure. There is no ecologically sensitive area or biological hotspot in or around the proposed location. Major land use in the study area comprises of low depth ponds used for aquaculture and agriculture. There are no ecosystem services in 2A & 2B area except some water bodies which is used by the local people for occasional fishing purposes.

Social Baseline

Administratively, Zone 2A and Zone 2B is mostly located within the Mirsharai upazila. Project adjacent unions of Mirsharai Upazila are Ichakhali, Mogadia & Saherkhali. According to the Census 2011 report, the total population in Ichakhali Union is, Moghadia Union, Saherkhali Union and Mirsharai upazila are 27,980, 23406, 16912 and 3,98,716 respectively. The religion of almost 85 percent of the population is Islam. According to "Population and Housing census 2011, Community report: Chittagong, BBS", main occupation in area is agriculture.

There is no historical, cultural and archaeological site within 2A & 2B Zones. As both 2A and 2B are being developed now under PSDSP, PRIDE project will not have negative social impacts as sites are encumbrance free. However, influx of labour and construction activities may pose risks for community health and safety due to noise and dust pollution and security of women and girls. Moreover, potential conflicts may arise between local communities and migrant workers.

Environmental and Social Impacts

PRIDE would support some basic infrastructure in zone 2A and 2B. It would also support some common and shared facilities such as central effluent treatment plant (CETP), sanitary landfill for solid waste management, construction of bio gas plant, etc. to dispose and treat the liquid and solid waste during the operation phase. However, these infrastructures would have various impacts during the construction and operation phase which also should be taken into consideration. The potential environmental and social impacts from the project activities during construction and operation phase has been summarized below:

E&S risks and impacts on Disadvantaged and Vulnerable persons: ESS 1

The project site is mostly reclaimed area and there is no human settlement within 2A & 2B area. This is low lying land next to the Bay of Bengal which is either inundated or threatened by water on a seasonal basis. The land has been filled gradually over the years because of the natural deltaic sedimentation process. This area is not a natural wetland habitat. No vulnerable or disadvantaged group were identified whom might be adversely affected by the project activities.

E&S risks on labour and working conditions: ESS 2

BEZA shall contract agencies to undertake civil works, agencies/firms to support core-functions; may need primary suppliers of material/equipment and other implementation support partners. Project workers would include Direct workers, Contracted workers (including Migrant Workers) and may also include Primary supplier workers (those providing goods and materials outsourced by the contractor). Risks include: employment of child labour, non-payment of wages by employer; Non-payment of benefits (compensation, bonus, maternity benefits, etc.) by employer; discrimination in employment (e.g. abrupt termination of the employment, working conditions, wages or benefits etc.); possibility of gender-based violence; Health risks of labour relating to HIV/AIDS and other sexually transmitted diseases. The development of the Zone 2A and 2B will involve a range of activities that might possibly be unsafe to workers and the local community if measures or precautions are not taken. Considering the intensity of work, project location and types of activities that will be done for the proposed facilities, it seems without mitigation measures this project may carry high risk on the OHS. Taking into account the potential impact on GBV without mitigation measures, substantial risk is expected. The influx of workers to the community may cause impacts to community health and safety, especially an increase in prevalence of diseases and social conflict.

There would be issues related to labour during operation phase of the project. Operation of certain infrastructure such as CETP and sanitary landfill will likely have an impact on occupational health and safety for the personnel exposed during longer time periods to such activities.

E&S risks and impacts related to Resource Efficiency and Pollution Prevention: ESS 3

Air quality will be affected at the Zone 2A and 2B project site and its approach road due to various construction activities and movement of vehicles carrying construction materials and machineries. The fuel of vehicles and construction machineries will also contribute to air pollution releasing hazardous air emissions such as: NO_x, SO₂, CO₂, CO, PM_{2.5}, PM₁₀ and SPM. Surface water quality might be contaminated due to the accidental spills/leaks at the storage areas of construction site. Construction activities in the vicinity of the canal bed (piling of building, excavation, concreting work), accidental spillage of hazardous chemicals like fuel oil and lubricant from the construction vehicles, improper storage and disposal of construction waste (debris and cement), solid and liquid waste from the worker's facilities may mix with rainfall water and it can accumulate on the adjacent river & canal bed through runoff. However, the extent of pollution would not be very high during construction phase. This is more important during operation phase. Recommended measures have been included in the ESMP to cover both the phases.

Due to treatment of wastewater during operation phase, a substantial amount of sludge will be produced at drying bed of CETP. The soil might get contaminated due to mixing of leachate from sludge drying bed and also due to failure or leakage of effluent collection pipeline of CETP. Landfill leachates contain dissolved ingredients resulting from the degradation of the disposed waste. It also can contain some suspended solids, including pathogens. If collection and treatment are not done properly (without impermeable layer at bottom), leachate can spread from the landfill and contaminate surface water and ground water.

E&S risks and impacts related to Community Health and Safety: ESS 4

The local community near Zone 2A and 2B site will not to be impacted by the proposed onsite construction activities since there is no residence adjacent to the project site. However, offsite infrastructure such as accesses road i.e. Sheikh Hasina avenue (from Dhaka-Chattogram Highway to project site) is permitting movement of construction vehicles for the transportation of construction materials at the project site. Considering the project nature and extent of work, significance of impact or risk on the community health and safety can be assessed to be moderate. Potential impact

of significance is considered to be moderate for utilities and traffic. The project activities will generate both solid non-hazardous and hazardous wastes throughout the construction and Operational phase.

E&S risks and impacts on Land & Assets: ESS 5

No Resettlement and rehabilitation or land acquisition is needed for Zone 2A and 2B development as per current study. As the land has already been secured under PSDSP, no physical and economic displacement is anticipated.

E&S risks and impacts related to Bio-diversity & Living Natural Resources: ESS 6

There are no critical ecological zones or any bio-diversity hotspot in and around the project area including the marine area near the coast which might be negatively impacted by the project activities. However, construction activities may have negative impact on aquatic ecosystems by increasing sediment loading of streams and changes in turbidity. There is no major provisioning ecosystem service available in 2A & 2B area except some water bodies which are used by the local people for occasional fishing purposes.

E&S risks and impacts related to Indigenous People/Small Ethnic Minorities: ESS7

There is no ethnic minority adjacent to the Zone 2A and 2B project site. Also, as mentioned earlier, the land is mainly recently silted reclaimed area, there is no group with collective attachment to the land.

E&S risks and impacts related to Cultural Heritage: ESS8

Based on the field survey and discussion with local people and review of related literatures, its recorded that there are no physical cultural resources.

Environmental and Social Management Plan (ESMP)

An ESMP has been prepared to mitigate Project's environmental and social risks and impacts. It includes mitigation measures, monitoring plan, capacity building, responsibilities and reporting system and budget. The activity wise anticipated environmental and social impacts and corresponding mitigation measures have been outlined in **Table 8-1** of the ESA Main report.

Compliance monitoring will be conducted in accordance with the environmental and social mitigation measures and monitoring plan provided in Chapter 8 of ESA main report. Several physical, biological and social components which are of particular significance to the proposed project are listed as monitoring indicators. These indicators will be evaluated periodically based on the monitoring results, baseline conditions, predicted impacts and mitigation measures.

In addition, a Labour Management Procedure has been developed in conformity with the requirements of the International practice provided in the ESF to deal with labour influx and to ensure safe and healthy working conditions, and a comfortable environment for migrant labourers.

Institutional Capacity Assessment and Implementation Arrangement

BEZA is currently implementing the World Bank financed PSDS project and is familiar with the World Bank's old safeguard policies. However, World Bank's ESF is new to them. An assessment of institutional capacity identified lack of adequate human resources, lack of operational manual and policy/ procedure and adequate financial resources to comply with the requirements of ESF. For proper assessment and management of the E&S risks, BEZA would be required to appoint Environmental, Social Development and Gender Specialists in the PMU to facilitate undertaking ESIA/ESAs of various sub-projects as per ESMF and monitor implementation of ESMP. BEZA also needs to ensure adequate Environmental and Social development specialists in the Project

Monitoring Consultant (PMC). Moreover, long term sustainable solution to manage environmental and social risks and impacts of projects, capacity building activities need to be included in the project design. A permanent E&S unit should be set up in BEZA with adequate number of specialists to oversee implementation of ESMP and ESCP during the project period and co-ordinate all the E&S activities during operation phase.

Necessary operational manual, ES policies and procedures also have to be prepared and implemented by BEZA for long term sustainability of their ES capacity such as trainings on: ESSs, occupational health and safety, labour and working conditions, grievance redress mechanism, construction waste management and gender based violence risks.

Contents

Executive Summary.....	i
Introduction	i
Objectives of the ESA	i
Regulatory Framework, Standards and Guidelines	i
Project Description	ii
Environmental and Social Baseline	ii
Environmental and Social Impacts	iii
Environmental and Social Management Plan (ESMP)	v
Institutional Capacity Assessment and Implementation Arrangement.....	v
Chapter 1. Introduction	1
1.1 Background	1
1.2 Components of the Project	1
1.3 ESA Study under PRIDE Project	4
1.4 Objectives of the Study	4
1.5 Scope of this ESA.....	4
1.6 Study Area for this ESA	5
1.7 Approach and Methodology	6
Chapter 2. Regulatory Framre work, standards and guidelines	8
2.1 Introduction	8
2.2 Relevant Regulations of GOB	8
2.3 World Bank ESF Policy, Directives and Standards – Extent of Relevance.....	13
2.4 Comparison of GOB legislations and ESF, 2016.....	21
2.5 Environmental Standards.....	24
Chapter 3. Project Description	25
3.1 Introduction	25
3.2 Master Plan for BSMSN	25
3.3 Project Location	26
3.4 Areas covered under Zone 2A & 2B	27
3.5 Influence Area of Zone 2A & 2B	27
3.6 Sub-projects under PRIDE Project	28
3.7 Description of the Sub-Projects (Interventions considered for this ESA under PRIDE)	33
3.7.1 Sub-project A.1: Construction of arterial and non-arterial roads, footpath and plot entry culvert	33
3.7.2 Sub-project A.2: Construction of storm water management network	35

3.7.3	Sub-project A.3: Water supply network	35
3.7.4	Sub-project A.4: Site upgradation	36
3.7.5	Sub-project A.5: Construction of telecommunication network	37
3.7.6	Sub-project A.6: Construction of some key public buildings and facilities	37
3.7.7	Sub-project A.7: Construction of Internal Power Distribution Network	37
3.7.8	Sub-project B.1: Construction of a Common effluent treatment plant (CETP)	37
3.7.9	Sub-project B.5: Development of a landfill site for solid waste generated.....	38
3.7.10	Sub-project B.6: Construction of a biogas plant	38
3.8	Risk categorization of PRIDE Project	38
3.9	Associated Facilities	38
3.10	Implementation Schedule.....	38
Chapter 4.	Environmental and Social Baseline.....	40
4.1	Introduction	40
4.2	Baseline Data Collection	40
4.2.1	Ambient air quality monitoring locations	41
4.2.2	Surface water quality sampling locations	42
4.2.3	Ground water quality sampling locations	42
4.2.4	Ambient noise level monitoring locations	42
4.2.5	Soil and sediment quality sampling locations.....	43
4.3	Assessment of Environmental Baseline	43
4.3.1	Physio-Chemical Environment.....	43
4.3.2	Ambient Air Quality	46
4.3.3	Water Resources	46
4.3.4	Drainage System.....	54
4.3.5	Ambient Noise Level.....	55
4.3.6	Land Resources.....	56
4.3.7	Seismicity	60
4.4	Assessment Biological Environment	61
4.4.1	Aquatic Flora and Fauna	61
4.4.2	Terrestrial Flora and Fauna.....	61
4.4.3	Buffer Zone: Ecological Assessment	63
4.5	Assessment Social Baseline.....	63
4.5.1	Demographic Profile.....	63
4.5.2	Income and Poverty	64

4.6	Assessment of infrastructure facilities	67
4.6.1	Housing Condition	67
4.6.2	Water Supply & Sanitation	67
4.6.3	Other Infrastructure facilities	67
4.7	Assessment of Baseline information on gender and women.....	68
4.8	Historical, Cultural and Archaeological sites	70
4.9	The allotted plots in 2A & 2B	70
Chapter 5.	Analysis of Alternatives	74
5.1	Introduction	74
5.2	Comparison of “Without Project” and “With project” Scenarios.....	74
5.3	Alternative Site Consideration	77
Chapter 6.	Stakeholder Engagement	78
6.1	Introduction	78
6.2	Stakeholder Identification and Analysis.....	78
6.2.1	Project-affected parties.....	78
6.2.2	Other interested parties.....	78
6.3	Information disclosure and consultation	78
6.4	Consultation and Participation.....	79
6.4.1	Consultation Meetings	79
6.4.2	ESA Disclosure Consultation Meetings	80
6.5	Grievance Redress Mechanism	81
6.5.1	GRM for Dealing with Labourers Issues.....	81
6.6	GRM Monitoring and Reporting.....	81
6.7	GRM contact information - BEZA	81
Chapter 7.	Environmental and Social Impacts	83
7.1	Introduction	83
7.2	Determination of Impact Significance.....	83
7.3	Assessment of Environmental and Social Issues	83
7.4	Impacts during Pre-construction and Construction Phase.....	86
7.4.1	E&S Risks and Impacts Related to ESS 1	86
7.4.2	E&S Risks and Impacts Related to ESS 2	86
7.4.3	E&S Risks and Impacts Related to ESS 3	88
7.4.4	E&S Risks and Impacts Related to ESS 4	90
7.4.5	E&S Risks and Impacts Related to ESS 5	92
7.4.6	E&S Risks and Impacts Related to ESS 6	92

7.4.7	E&S Risks and Impacts Related to ESS 7	93
7.4.8	E&S Risks and Impacts Related to ESS 8	93
7.5	Impacts during Operation Phase.....	93
7.5.1	Impact due to Operation of on-site Intervention of EZ (2A & 2B)	93
7.5.2	E&S Risks and Impacts Related to ESS 2	93
7.5.3	E&S Risks and Impacts Related to ESS 3	94
7.5.4	E&S Risks and Impacts Related to ESS 4	95
7.5.5	E&S Risks and Impacts Related to ESS 5	95
7.5.6	E&S Risks and Impacts Related to ESS 6	95
7.5.7	Impact due to Operation of Zone 2A & Zone 2B with Industries.....	96
7.6	Overall Impact Significance	97
Chapter 8.	Environmental and Social Management Plan (ESMP)	98
8.1	Objectives	98
8.2	Mitigation Measures	99
8.3	Responsible Party for Implementing ESMP.....	99
8.4	Environmental and Social Management Plan (ESMP)	99
8.5	Monitoring Indicators	116
8.6	Environmental and Social Monitoring Plan	116
8.7	Labour Management Plan during Construction	123
8.7.1	Objectives.....	123
8.7.2	Selection and Layout of Construction Camp.....	123
8.7.3	Hiring and Recruitment Procedure.....	123
8.7.4	Facilities at workers' camps.....	124
8.7.5	Attendance & Working hours.....	126
8.7.6	Activities prohibited at site.....	126
8.7.7	Guidelines for night time working at the site.	126
8.7.8	Record keeping & Maintenance	127
8.7.9	Auditing & Inspection.....	127
8.7.10	Grievance Redress Mechanism	127
8.7.11	Security System	127
8.7.12	Closure of the Construction Site and Construction Labour Camps.....	127
8.8	Emergency Response and Disaster Management Plan	127
8.9	Guidelines on environmental and social conditions in the BOQ/contract documents.....	127
8.10	Third Party Monitoring.....	130

8.11	Estimated Budget for Implementing the ESMP.....	130
Chapter 9.	Institutional Capacity Assessment and Implementation Arrangement	132
9.1	Institutions and Roles in Project Implementation.....	132
9.2	Roles and Responsibilities of Various Organisations	132
9.3	Institutional Setting and Implementation Arrangement	134
9.4	Assessment of Capacity of BEZA	135
9.5	Action Plan to Strengthen Staffing, Capacity, Systems and Implementation	135
References		138

Annexes

Annex A: Emergency Response and Disaster Management Plan

Annex B: List and Photographs of Participants in Consultation Meetings

Annex C: Primary Test Results

Annex D: Assessment of Air Quality and Water Quality

Annex E: Associated Facilities Screening Form

Annex F: Traffic Management Plan

Annex G: Waste Management Plan

Annex H: Ecological Baseline

Annex I Sample Grievance Registration Form

Annex J: Green Belt Development Plan

Annex K: Temporary Drainage Management Plan

Annex L: List of Industries in Zone 2A and 2B

Figures

Figure 1-1: Zone 2A & 2B Area Map.....	6
Figure 3-1: Proposed Land Use Plan of BSMSN.....	26
Figure 3-2: Project Location Map.....	27
Figure 3-3: Area of influence map for Zone 2A & 2B.....	28
Figure 3-4: Typical Cross Section of Major Road.....	34
Figure 3-5: Typical Cross Section of Minor Road.....	34
Figure 3-6: Typical Cross Section of A Road Pavement in 2A & 2B.....	35
Figure 3-7: Water supply distribution network in 2A.....	36
Figure 3-8: Water supply distribution network in 2B.....	36
Figure 3-9: Cross-section of dike with green area.....	37
Figure 3-10: Building layout of a typical cyclone shelter.....	37
Figure 4-1: Ambient air quality measuring and Surface water, Groundwater, Soil & Sediment sampling locations map.....	41
Figure 4-2: Air quality measurement near Moghadia Nurul Absar Chowdhury High School.....	42
Figure 4-3: Sound level measuring locations within map.....	43
Figure 4-4: Distribution of wind direction of Chattogram during different Season.....	45
Figure 4-5: Groundwater Zoning Map.....	47
Figure 4-6: Coastal Map of Bangladesh.....	52
Figure 4-7: Tracks of Major Cyclones (1960-2009).....	52
Figure 4-8: Inundation Risk Map for Storm Surge.....	53
Figure 4-9: Flood Prone Area Map.....	54
Figure 4-10: Drainage pattern of nearby areas of 2A & 2B zones.....	55
Figure 4-11: Physiographic Map of Bangladesh.....	56
Figure 4-12: Geologic Map of Bangladesh.....	57
Figure 4-13: Landuse of 2A & 2B and Adjoining Area (2018).....	58
Figure 4-14: Seismic zone map of Bangladesh (BNBC).....	60
Figure 4-15: Demographic Profile of the study area.....	64
Figure 4-16: Field of employment (Chattogram District).....	65
Figure 4-17: Field of Employment (Mirsharai Upazila).....	65
Figure 4-18: Distribution of population employed by field of employment in Ichakhali Union.....	65
Figure 4-19: Daily average wage rate of labourers in Mirsharai Upazila (Wages are in BDT).....	66
Figure 4-20: Housing pattern in Mirsharai Upazila (percentage).....	67
Figure 4-21: Water Supply & Sanitation facilities of the study area.....	67
Figure 4-22: Female Population (percent), Gender ratio (no. of males per 100 female) and Female Literacy rate (percent) in Ichakhali Union, Maghadia Union, Saherkhali Union and Mirsharai Upazila.....	68
Figure 4-23: Employment Condition/Type of Women (%) in Ichakhali Union, Maghadia Union, Saherkhali Union and Mirsharai Upazila.....	69
Figure 4-24: Proportion of ever-married women experiencing partner physical and/or sexual violence during lifetime and in last 12 months as reported in BBS 2015 survey.....	70
Figure 4-25: Allocation of Plot in Zone 2A.....	71
Figure 4-26: Allocation of Plot in Zone 2B.....	71
Figure 4-27: Type of Industries in 2A (Area wise).....	72
Figure 4-28: Type of Industries in 2A (Number wise).....	72

Figure 4-29: Type of Industries in 2B (Area wise) 73
Figure 4-30: Type of industries in 2B (Number wise) 73
Figure 9-1: Institutional setup for environmental and social management 132
Figure 9-2: Institutional setting and implementation arrangement of BEZA for environmental and social issues 135

Tables

Table 2-1: Summary of Relevant E&S Regulations of GOB.....	9
Table 3-1: Existing Features surrounding the project site.....	28
Table 3-2: Summary of Works in IMD Zone, BSMSN-2A and BSMSN-2B.....	29
Table 4-1: Data Sources for Various Parameters	40
Table 4-2: Air Quality Sampling Location	41
Table 4-3: Surface Water Sampling Locations.....	42
Table 4-4: Ground Water Sampling Location	42
Table 4-5: Soil sampling location	43
Table 4-6: Average Annual Climate Data of Study area (Average data from 2009 to 2018)	44
Table 4-7: Results of Ambient Air Quality	46
Table 4-8: Characteristics of collected surface water samples	48
Table 4-9: Characteristics of Collected Ground Water Samples.....	49
Table 4-10: Existing Wells Groundwater Quality Test Results (Field Kit) of Secondary Data	49
Table 4-11: Periodic Water Quality Laboratory Analysis of Different Wells (Secondary Data)	50
Table 4-12: Industry wise daily water consumption	50
Table 4-13: Daily Water Consumption of Various Land Use	51
Table 4-14: Summary of daytime noise level measurement in the project area	55
Table 4-15: Bangladesh standards for sound level (GoB, 2006).....	56
Table 4-16: Land use details in Zone 2A and 2B.....	57
Table 4-17: Soil and sediment quality.....	59
Table 4-18: Households by Main Source of Income.....	64
Table 4-19: Working Age population, Economically Active Population and Participation Rate	66
Table 4-20: Field of activity of women in study area	69
Table 5-1: Comparison between without project and with project scenarios alternative	74
Table 6-1: Summary of issues and concerns raised by the people and responses provided.....	79
Table 6-2: ESA Disclosure Consultation Meetings.....	80
Table 7-1: Activity–Impact Interaction Matrix for Pre-construction, Construction and Operation phases of the Project	84
Table 7-2: Impact Significance for different issues	97
Table 8-1: Environmental and Social Management Plan (ESMP)	100
Table 8-2: Environmental and Social Monitoring Plan	118
Table 8-3: Estimated budget for implementing ESMP	130
Table 9-1: Roles and responsibilities of various organizations.....	132
Table 9-2: Capacity development support (training)	136

List of Acronyms and Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
AP	Affected People
ARP	Abbreviated Resettlement Plan
BBS	Bangladesh Bureau of Statistics
BEPZA	Bangladesh Export Processing Zone Authority
BEZA	Bangladesh Economic Zones Authority
BHTPA	Bangladesh Hi-Tech Park Authority
BNBC	Bangladesh National Building Code
BOD ₅	Bio-chemical Oxygen Demand at 5 Days
BP	Bank Policy
BSMSN	Bangabandhu Sheikh Mujib Shilpa Nagar
BTCL	Bangladesh Telecommunications Company Limited
BWDB	Bangladesh Water Development Board
CDA	Cox's Bazar Development Authority
CDSP	Char Development and Settlement Project
CETP	Common Effluent Treatment Plant
COD	Chemical Oxygen Demand
CPA	Chattogram Port Authority
CRO	Chief Resettlement Officer
DC	District Commissioner
DEM	Digital Elevation Model
DLI	Disbursement Linked Indicators
DMP	Disaster Management Plan
DO	Dissolved Oxygen
DoE	Department of Environment
DoF	Department of Fisheries
DP	Development Partner
DPD	Deputy Project Director
DPHE	Department of Public Health & Engineering
DTW	Deep Tube-well
E&S	Environmental and Social
EA	Environmental Assessment
EBRD	European Bank for Reconstruction and Development
ECA	Environment Conservation Act
ECA	Ecologically Critical Area
ECC	Environmental Clearance Certificate
ECR	Environment Conservation Rules
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EM	Ethnic Minorities
EMAP	Environment Management Action Plan
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EQS	Environmental Quality Standards
ES	Environmental Standard
ES	Environmental Specialist
ESA	Environmental and Social Assessment

ESC	Environmental and Social Cell
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMoP	Environmental and Social Monitoring Plan
ESMP	Environmental and Social Management Plan
ESS	Environment and Social Standards
ETP	Effluent Treatment Plant
EZ	Economic Zone
FC	Faecal Coliform
FGD	Focus Group Discussions
FPIC	Free, Prior and Informed Consent
GAP	Gender Action Plan
GBV	Gender Based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GIIP	Good International Industry Practice
GO	Government Organizations
GPP	Guidelines for People's Participation
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HH	Household
HIV	Human Immunodeficiency Virus
HYV Boro	High Yielding Variety of Boro
IA	Implementing Agency
ICT	Inland Container Terminal
ICTP	International Conventions, Treaties and Protocols
IEE	Initial Environmental Examination
IFC	International Finance Corporation
INGO	Implementing Non-Government organization
IP	Indigenous Peoples
IPF	Investment Project Financing
IPP	Indigenous People Plan
IWM	Institute of Water Modelling
JV	Joint Venture
KGDCL	Karnaphuli Gas Distribution Company Ltd
KII	Key Informant Interviews
LA	Land Acquisition
LAP	Land Acquisition Plan
Leq	Equivalent Level
LG	Local Governance
LGED	Local Government Engineering Department
LGI	Local Government Institute
LMP	Labour Management Procedures
LNG	Liquefied Natural Gas
LRSP	Livelihood Restoration Support Plan
MLD	Million Litre per Day

MOEFCC	Ministry of Environment, Forest and Climate Change
MoWR	Ministry of Water Resources
mPWD	Metres from above from Public Works Datum
NBC	National Building Code
NBSAP	National Biodiversity Strategy & Action Plan
NEMAP	National Environmental Management Action Plan
NEP	National Energy Policy
NEQS	National Environmental Quality Standards
NGO	Non-Government Organizations
NLTP	National Land Transport Policy
NLUP	National Land Use Policy
NOx	Nitrogen Oxides
NWMP	National Water Management Plan
O&M	Operation and Maintenance
OHS	Occupational Health Safety
OP	Operational Policy
OSS	One Stop Shop
OT	Overtime
PAH	Project Affected Households
PAP	Project Affected People
PCU	Passenger Car Unit
PD	Project Director
PDO	Project Development Objective
PEZ	Private Economic Zone
PGCB	Power Grid Company of Bangladesh
PIU	Project Implementation Unit
PL	Post Larvae
PM ₁₀	Particulate Matter ₁₀
PM _{2.5}	Particulate Matter _{2.5}
PMC	Project Management Consultant
PMO	Prime Minister's Office
PMU	Project Management Unit
PPE	Personal Protective Equipment
PPP	Public Private Partnership
PPSEZ	Phnom Penh Special Economic Zone
PRIDE	Private Investment & Digital Entrepreneurship
PSDSP	Private Sector Development Support Project
PUC	Pollution Under Control
QA	Quality Assurance
QC	Quality Control
RAP	Resettlement Action Plan
RHD	Roads and Highways Department
RP	Resettlement Plan
RPF	Resettlement Policy Framework
RSMF	Resettlement and Social Management Framework
SEC	Small Ethnic Communities
SECDP	Small Ethnic Community Development Plan
SEF	Stakeholder Engagement Framework

SEP	Stakeholder Engagement Plan
SHE	Safety, Health and Environmental
SIA	Social Impact Assessment
SOB	Survey of Bangladesh
SPM	Suspended Particulate Matter
SPT	Standard Penetration Test
SRDI	Soil Resource Development institute
SS	Social Standard
SS	Social Specialist
STP	Sewage Treatment Plant
SWTP	Storm Water Treatment Plant
TC	Total Coliform
TDS	Total Dissolved Solids
ToR	Terms of Reference
TOT	Training of the Trainers
TPI	Third Party Inspection
TPP	Tribal Peoples Plan
TSS	Total Suspended Solids
UNDP	United Nations Development Programme
UNO	Upazila Nirbahi Officer
VSIP	Vietnam-Singapore Industrial Park
WARPO	Water Resources Planning Organization
WB	The World Bank
WMP	Waste Management Plan
WTP	Water Treatment Plant

CHAPTER 1. INTRODUCTION

1.1 Background

The Government of Bangladesh (GOB) has taken up an initiative to provide industrial land and infrastructure to increase private and foreign investment to support its development goals. The Government also plans to create 100 economic zones over the next decade using a wide variety of arrangements. Bangladesh Economic Zone Authority (BEZA) is the overall agency responsible for establishments of Economic Zones (EZs). BEZA, under the Prime Minister's Office (PMO), aims to establish EZs in all potential areas of Bangladesh including backward and underdeveloped regions with a view to encouraging rapid economic development through increased and diversified industries, employment, production and export enhancement.

The on-going Private Sector Development Support Project (PSDSP) supported the establishment of BEZA and Bangladesh High Tech Park Authority (BHTPA). PSDSP is also supporting setting up of EZs at Mirsharai, Chattogram and Mongla Economic Zone at Bagerhat districts along with High Tech Park at Gazipur and Software Technology Parks and Incubation Centres in a few places. In addition, PSDSP supported the preparation of a master plan to setup Bangabandhu Sheikh Mujib Shilpanagar (BSMSN) at Mirsharai, Sitakunda and Sonagazi Upazilas. BSMSN will be built up on an area of around 30,000 acres that includes approximately 1,450 acres of land (Zone 2A & 2B) of which most of the plots have been allocated to private investors by BEZA. The proposed Bangladesh Private Investment & Digital Entrepreneurship (PRIDE) Project will build upon the foundation laid by PSDSP and strengthen the capacity of BEZA and BHTPA to deliver on their mandates.

1.2 Components of the Project

The Project Development Objective (PDO) of the PRIDE project is “to promote private investment and job creation in economic zones and digital entrepreneurship in hi-tech parks.” The project has four components. The first three components will be implemented by BEZA and the fourth component will be implemented by BHTPA. The components are as follows:

COMPONENT 1: CREATING AN ENABLING ENVIRONMENT FOR PRIVATE INVESTMENT, SUSTAINABILITY & JOBS

The first component will finance technical assistance, goods and training to inform and implement institutional, regulatory and administrative reforms. It will strengthen BEZA's core competence in technical functions that would allow it to be a more effective partner to leading private investors; and embed resilience and sustainability concepts into its development of infrastructure and associated services. The technical assistance and DLIs will incentivize good governance, good international practices, sustainability and climate-friendly investments, and be associated with expenditures incurred under Components 2-3.

Sub-component 1.1: Promoting good governance and administrative efficiency

This sub-component will promote good governance and administrative efficiency at BEZA to render the authority a more effective counterpart to private investors. The objective is to help BEZA realize more attractive proposals in its US\$18 billion investment pipeline—in particular the entry of foreign multinationals that could bring about transformational change to the Bangladesh economy. The activities will help ensure that these investments are properly implemented and generate public benefits by reducing the risk of negative social and environmental externalities, and financial exposure by the Treasury. It will allow BEZA to build on its achievements over the last five years and strengthen the authority and its operations to deliver on its commitment to public and private partners.

Sub-component 1.2: Promoting public private partnerships

The project will finance technical assistance and training to support the PPP Special Operations Unit develop a PPP program, including the delivery of specific PPP transactions, with the aim of attracting internationally reputed developers and operators. The project will provide support for legal, regulatory and institutional reforms. It will develop procedures and guidelines for identifying, selecting, preparing, structuring, negotiating, implementing and monitoring PPP transactions. The preliminary pipeline of potential transactions includes:

- a) **PPP for Green Zone Master Developer (500 acres, in two phases):** feasibility study, transaction advisory services, capital contribution for land elevation, and possibly partial capital contribution for key green infrastructure. The latter may include desalination, rain water capture, water resource management, solid waste management, waste pyrolysis/energy, solar energy production, sewage management, waste water treatment, flood management, etc.
- b) **PPP for Sea Port, Port Facilities and Land Reclamation:** feasibility study, transaction advisory services, support to help mobilize public financing for port superstructure, capital investment from other financing sources for port superstructure, etc. Total funding would likely amount to approximately US\$1bn and BEZA has received unsolicited proposals that the project will integrate in an open and competitive selection process.
- c) **PPP for Desalination and Wastewater Treatment:** feasibility study, transaction advisory services and capital investment to buy down the cost of green, best practice solutions. Other green zone activities such as solar power, rain water capture and flood management will be considered at the pre-appraisal stage.

COMPONENT 2: DEVELOPING A GREENER AND RESILIENT BSMSN

This component will support phased development of the BSMSN Green Industrial City based on the recently approved Master Plan for BSMSN. It will finance works, goods and technical assistance for three areas—Zone-2A (939 acres), Zone 2B (474 acres) and BSMSN-IMD (250-500 acres)—to help catalyze the development of state-of-the-art green economic zones and set an example for sustainable, resilient and environmentally sound industrial development in Bangladesh. All land in BSMSN-2A and BSMSN-2B has been leased out and covers 99 unit investors/industrial tenants. The base scenario in a demand analysis conducted in November-December 2019 of all unit investors/industrial tenant indicate that the two zones will host 224,000 direct jobs within five years of operation, 273,000 within ten years of operations, and a maximum of 360,000 at full capacity. The following interventions will help optimize utility costs and resource utilization for the tenants and reduce negative externalities and operational risks associated with industrial production.

Sub-component 2.1: Basic infrastructure to implement the Master Plan for Zone 2A & 2B

This sub-component will finance works, goods and technical assistance for onsite and last mile infrastructure in Zone 2A and Zone 2B as outlined in the recently finalized Master Plan for BSMSN. Given the risk for natural disasters in the area, the infrastructure will be developed with enhanced resilience to climate impacts. The support will cover basic infrastructure networks for 25 km of road network, with storm water drainage, street lighting, pedestrian sidewalks and landscaping; water network (supply and sewer), power network (power distribution lines and substations), and other utility connections (such as telecom). Basic infrastructure will integrate measures resilient to flood and seismic risks. Furthermore, investments will be made towards resilient site upgrade and green building and infrastructure development such as green and gray coastal protection and buffers, water and energy efficiency design for buildings, and site level interventions for subsidence and liquefaction. Support amenities will include public facilities that could serve as hubs for business continuity planning and emergency response.

Sub-component 2.2: Sustainable and resilient services for the city and industries

This sub-component will finance works, goods, technical assistance and training to support the design and construction of shared facilities and services primarily in Zone 2A and 2B, which will eventually provide sustainable and resilient services for the city. Private partners, whenever feasible, will co-finance capital investments and contribute business and technology expertise by handling operations and maintenance. Several pre-feasibility and feasibility studies have either been finalized in 2019 (CETP and seaport) or are being prepared and due in the spring of 2020 (desalination, waste water treatment, renewable energy solutions, including optimized integration of resilience measures into these solutions). Key outputs of the technical assistance are feasibility studies and full technical designs of: (i) rooftop water capture, wastewater treatment and desalination plants to supply process water; (ii) renewable (solar) energy generation, and (iii) solid waste treatment. The technical studies will inform the engineering design, evaluate costing and business models, and present public and private financing options. The work will feed into the PPP transaction activities under sub-component 1.2. It will comply with the National Green and Resilient Economic Zone Guidelines that are being developed based on the International Framework for Eco-Industrial Parks.² Training support will address capacity gaps related to engineering design, construction, operation and maintenance of infrastructure, which are significant barriers to the establishment of a competitive, green and resilient economic zone.

COMPONENT 3: CREATING A DYNAMIC PRIVATE MARKET FOR SERVICED INDUSTRIAL LAND

The third component will seek to catalyze the creation of a dynamic private market for serviced industrial land. Eleven private economic zones (PEZs) have obtained a full license to develop and operate a PEZ in the last few years. Many of them have yet to attract external unit investors/industrial tenants that are unaffiliated to the developer-operator. However, a few of them have already attracted credible foreign anchor investors, such as Honda and Hindustan Unilever. The announcement in May 2019 that Sumitomo International is starting to develop an economic zone in Narayanganj within metropolitan Dhaka is a sign that this concept may finally be taking off. This component will support the following two forms of interventions to help accelerate the development of this market for private developer-operators, including PEZs with domestic or international ownership, and PPP-EZs with or without public minority participation.

Sub-component 3.1: Strengthen institutional capacity and compliance mechanisms

This sub-component will finance technical assistance and training to, first, review and revise the regulations and procedures around the licensing of PEZs.

Sub-component 3.2: Capital grant funding to crowd in private investment

This sub-component will finance capital grants that support private participation in projects with high economic returns but lower financial returns under three windows.

COMPONENT 4: STRENGTHENING THE DIGITAL ENTREPRENEURSHIP AND INNOVATION ECOSYSTEM

The fourth component will be implemented by BHTPA. It aims to strengthen the foundation of the digital entrepreneurship and innovation ecosystem in Bangladesh. It will create the country's largest agglomeration of IT and ITeS companies and promote digital entrepreneurship more broadly among young professionals and women. The goals are: (a) for STPs and leading universities to evolve into entrepreneurship hubs, (b) to increase market entry and growth rates of digital startups and small

² The International Framework for Eco-Industrial Parks was jointly developed by the World Bank Group, UNIDO and GIZ to outline critical elements, in the form of performance requirements, for establishing EIPs that are economically, socially and environmentally sustainable. The Framework aims to support developing and emerging economies in decoupling economic growth from resource use and emissions. To date, WBG has projects on EIPs in China, Ethiopia, Pakistan, Turkey and Vietnam leveraging this framework.

and medium-sized enterprises, and (c) to create a gender-inclusive culture for digital entrepreneurship.

1.3 ESA Study under PRIDE Project

Setting up of EZ has two distinct phases. The first one is the **'Development'** phase which entails activities like land development, construction of various basic infrastructure such as road, water supply network, gas distribution network, storm, sewer connection network etc. It also includes common and shared infrastructure which are deemed necessary to make the economic zone resilient and sustainable such as central waste water treatment plant, desalination plant, sanitary landfill for solid waste management etc. The second phase is the **'Operation Phase'**. Once the Development phase is completed, the plots would be leased out to potential investors who would set up various industries having varying degree of environmental and social impacts in and around the project area. Involvement of PRIDE project would be mostly during Development phase and hence this ESA would mainly focus on the environmental and social impacts during the Development phase. However, as there would be potential environmental and social risk during the Operation phase, this study has taken into consideration the potential risks during operation phase particularly focusing on the need of capacity enhancement of BEZA in terms of human resource, policy formulation, preparation and/or upgradation of various safeguard documents to manage those risks.

An Environmental Impact Assessment (EIA) and a Social Impact Assessment (SIA) for the Mirsharai Economic Zone II (2A, 2B) were prepared under the World Bank Supported PSDS Project as per the World Bank's previous Safeguard Policies. As part of its several components, PRIDE project (Component 1-3) would finance some additional basic and common infrastructure in the same 2A, 2B sites. The project needs to follow the World Bank's new ESF and comply with the ESSs. These called for preparing an Environmental and Social Assessment for the activities to be undertaken in Zone 2A and 2B by updating the existing EIA report.

1.4 Objectives of the Study

The objectives of the study are to:

- a) prepare an ESA report by updating the existing EIA (which was prepared during PSDSP following the World Bank's old safeguard policies) for zone 2A and 2B in line with the World Bank's ESF by updating the baseline information and taking into consideration the additional newly planned activities under PRIDE project. Revision was also done to make the document aligned with the ESF.
- b) carry out an assessment of Institutional Capacity of BEZA to manage Environmental and social issues and
- c) provide key recommendations and inputs to the Environmental and Social Commitment Plan (ESCP)

1.5 Scope of this ESA

This ESA covers all the activities to be implemented by BEZA for which the location and some information about the size and scale of the activities are known (some of the activities within 2A and 2B). It can be mentioned here that a separate ESMF has been prepared for the activities for which either the location or detail information or both are not known (i.e. the activities in IMD zone and some activities in 2A and 2B).

The scope of this ESA report is to update the existing EIA SIA prepared under PSDSP for Zones 2A and 2B of BSMSN which was prepared on the basis of old safeguard policies of the World Bank. This is mostly due to the inclusion of many new activities in the PRIDE project such as construction of central effluent treatment plant, construction of sanitary landfill etc. and to comply with the requirement of ESF which is applicable to this project. Component 2 of the project will support

phased development of BSMSN Green Industrial City based on recently completed Master Plan. The PRIDE project activities will eventually be part of the BSMSN. To consider a holistic approach in assessment and management of environmental and social risks associated with the full-scale operation of the industrial city, a Regional Environmental and Social Assessment (RESA) will be conducted. There would be works, goods and technical assistance for three areas- Zone 2A, Zone 2B and International Master Developer (IMD) Area. The location of the IMD area has not yet been finalized. Hence this ESA would cover the assessment and management of potential environmental and social risks and impacts from activities of PRIDE within 2A & 2B. Moreover, detail design of most of the sub-projects are not fully known at this stage and this ESA has been prepared based on the available information. That is why quantification of some of the risks and impacts could not be completely illustrated although all likely risks and impacts from the planned activities have been taken into consideration.

The scope of this ESA is to:

- i. update the existing environmental and social baseline such as change in land use, latest status of various environmental and social parameters of zone 2A, 2B and its area of influence;
- ii. identify the probable adverse and positive E&S risk and impacts due to the planned project activities within 2A and 2B with the available information
- iii. identify stakeholders and various groups/institutions who are either affected or have an interest or a stake in the project, with additional emphasis on disadvantaged and vulnerable groups and to carry out consultations with stakeholders to help elicit their concerns, suggestions and support;
- iv. identify optimum mitigation measures of the anticipated risks and impacts due to PRIDE project activities in Zone 2A & 2B
- v. identify capacity constraint of BEZA in respect to E&S risk and impact assessment, management and monitoring and propose commensurate capacity enhancement measures; and
- vi. prepare environmental and social management plan (ESMP) and provide key recommendation for the ESCP.

This ESA covers all the activities and sub-projects to be implemented by BEZA for which the location and adequate information about the size and scale of the activities are known (some of the activities within 2A and 2B). However, it is important to mention that the detailed design of some of the large infrastructure such as CETP, sanitary landfill, construction of a biogas plant, waste sorting and material recovery facility (that have been included in this ESA) are not finalized yet. Once detailed designs of these sub-projects are available, the sub-project specific ESIs will be prepared. BEZA would hire independent consulting firms to prepare these sub-project specific ESIs based on detailed infrastructure designs.

1.6 Study Area for this ESA

The study area includes 1450 acres of Zone 2A and 2B of BSMSN and its area of influence. In **Figure 1-1**, Zone 2A & 2B area is shown. A detail description of the area is provided Chapter 3.

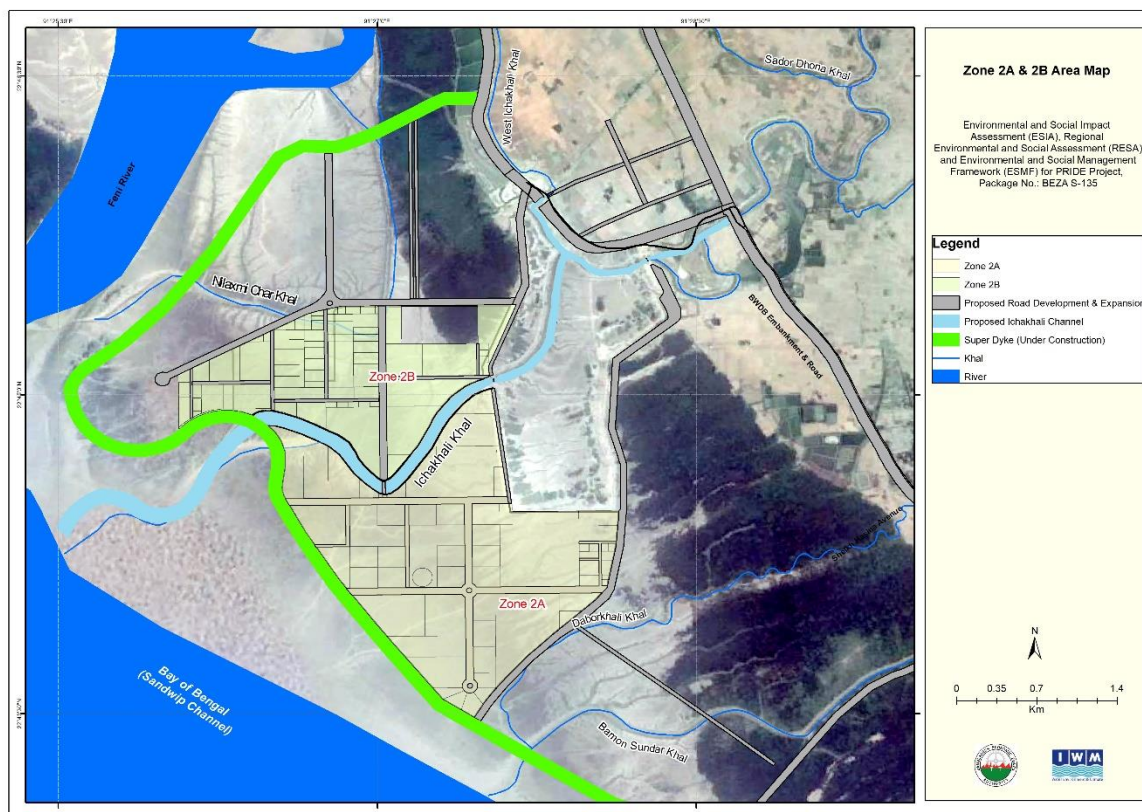


Figure 1-1: Zone 2A & 2B Area Map

1.7 Approach and Methodology

The task of preparing this ESA report consisted of the following sequential steps:

- Identification of all the activities to be undertaken under the project;
- Identification and screening of the environmental parameters relevant to the proposed activities through a scoping process which includes consultation with different levels of stakeholders i.e. BEZA officials, local people, key informants, experts from relevant agencies, field visits and consideration of baseline conditions;
- Field visits to capture environmental and social baseline;
- Preparation of Stakeholder Engagement Plan (SEP) and consultation with project affected and interest parties;
- Assessment of potential risk and impacts on relevant environmental and social parameters;
- Recommending mitigation measures as per mitigation hierarchy to address the potential negative impacts;
- Preparation of Environmental and Social Management Plan (ESMP);
- Preparation of Labour Management Procedure (LMP).
- Provide inputs for the preparation of ESCP

The field visits to the project sites helped to identify the environmental parameters/components (relevant to the project actions) which are likely to be affected. The field visit also included participatory approach, which involved discussions with local people in order to identify the perceptions and priorities of the stakeholders in and around the study area. Apart from the local people, information was also obtained from the local school teachers, businessmen and social elites. Key Informant Interviews (KIIs) with concerned government officials were also carried out. Information was also derived from secondary sources such as different reports, journals, satellite imagery analysis, etc.

The time for updating of the ESA does not cover the whole hydrological cycle. Therefore, the study team had to depend on the secondary data sources to some extent. The modelling activities could not be performed due to the absence of long term time data records of relevant environmental and hydrological parameters.

CHAPTER 2. REGULATORY FRAMEWORK, STANDARDS AND GUIDELINES

2.1 Introduction

The proposed PRIDE Project will be implemented in compliance with applicable environmental and social laws and regulations of Bangladesh. In this chapter relevant environmental and social regulations of GOB, World Bank's ESF (2018) and a comparison of both have been conducted.

2.2 Relevant Regulations of GOB

The Government of Bangladesh has laid out various policy guidelines, acts and regulations pertaining to environment and social aspects. **Table 2-1** demonstrates relevant GOB regulations and their relevance to this project.

Table 2-1: Summary of Relevant E&S Regulations of GOB

SN	Acts / Rules/ Polices/ Plans	Key provisions and purpose	Relevance to this Project
1	National Environmental Policy, 1992	<p>Key elements of this Policy are: maintaining ecological balance and ensuring sustainable development of the country through protection, conservation, and improvement of the environment; protecting the country from natural disasters; identifying and regulating all activities that pollute and destroy the environment; ensuring environment-friendly development in all sectors; ensuring sustainable and environmentally sound management of the natural resources and promoting active association, as far as possible with all international initiatives related to the environment.</p> <p>The Environmental Policy of 1992 requires specific actions with respect to the industrial sector which are as follows: to carry out corrective measures in polluting industries; to conduct EIAs for all new public and private industrial developments; To ban or find environmentally sound alternatives for the production of goods that cause environmental pollution and to minimize waste and ensure sustainable use of resources by industry.</p>	For ensuring sustainable development and environmentally sound management of the natural resources and to meet the DoE/GOB regulatory requirement, this project will follow this policy.
2	National Environmental Management Action Plan, 1995	NEMAP was developed to achieve the following broad objectives: identification of key environmental issues affecting Bangladesh; identification of actions necessary to halt or reduce the rate of environmental degradation; improvement of the natural environment; conservation of habitats and biodiversity; Promotion of sustainable development and improvement of the quality of life of the people.	This Environmental & Social Assessment has been prepared considering the objectives of the NEMAP.
3	National Land Use Policy, 2001	Deals with several lands uses including agriculture (crop production, fishery, and livestock), housing, forestry, industrialization, railways and roads, tea and rubber and identifies land use constraints in all these sectors.	Land use pattern are being changed due to the project activities.
4	National Fisheries Policy, 1998	Preservation, management, and exploitation of fisheries resources in inland open water; fish cultivation and management in inland closed water; prawn and fish cultivation in coastal areas and preservation, management and exploitation of sea fisheries resources.	Water pollution due to project interventions may affect the water quality of the khals and nearby sea portion.
5	Industrial Policy, 1999	Deals with industrial development, direct foreign investments, investment by public and private sector, introduction of new appropriate technology, women's participation, infrastructure	This project is for industrial development.

SN	Acts / Rules/ Polices/ Plans	Key provisions and purpose	Relevance to this Project
		development and environmentally sound industrial development.	
6	The Environment Conservation Act, 1995 and subsequent amendments until 2010	Defines applicability of environmental clearance; regulation of development activities from environmental perspective; framing applicable limits for emissions and effluents; framing of standards for air, water, and noise quality; formulation of guidelines relating to control and mitigation of environmental pollution, conservation, and improvement of environment and declaration of Ecologically critical areas.	Environmental issues are taken care of under this act.
7	Environmental conservation Rules, 1997 and subsequent amendments until 2010	Declaration of ecologically critical areas; requirement of environmental clearance certificate for various categories of projects; requirement of IEE/EIA as per category; renewal of the environmental clearance certificate within 30 days after the expiry; provides standards for quality of air, water and sound and acceptable limits for emissions/discharges from vehicles and other sources.	Environmental issues are taken care of under these rules.
8	Environment Court Act, 2000 and amendment in 2002	Provides the jurisdictions of environment court, the penalty for violating court's order, trial procedure in special magistrate's court, the power of entry and search, the procedure for investigation, procedure and power of environment court, the authority of environment court to inspect, appeal procedure and formation of environment appeal court.	Will be applicable in case of violation of Environment Court Act, 2000.
9	The Vehicle Act, 1927; The Motor Vehicles Ordinance, 1983; and The Bengal Motor Vehicle Rules, 1940, The Road Transport Act, 2018	Exhaust emissions, vehicular air and noise pollution; road/traffic safety;; fitness of motor vehicles and parking.	Substantial number of vehicles will be in operation during construction phase of this project.
10	National Land Transport Policy (NLTP), 2004	This policy introduced the concept of long-term network planning and integration of transport policy, planning and appraisal across land transport modes. Each sub-sector undertakes physical and institutional improvement in line with its long-term policy. As indicated in the NLTP, environmental adaptation needs to be taken into account in project assessment which will help to mitigate climate change.	There will be numerous movement of the construction vehicles and public transport of construction materials and workers.
11	The Groundwater Management Ordinance, 1985	Management of groundwater resources; Installation of tube- wells at any place after licensing from Upazila Parishad.	Licenses will be required prior to installation of any tube-wells.

SN	Acts / Rules/ Polices/ Plans	Key provisions and purpose	Relevance to this Project
12	National Biodiversity Strategy and Action Plan, 2004)	Conserve and restore the biodiversity of the country for well-being of the present and future generations; maintain and improve environmental stability for ecosystems; ensure preservation of the unique biological heritage of the nation for the benefit of the present and future generations; guarantee the safe passage and conservation of globally endangered migratory species especially birds and mammals in the country; stop introduction of invasive alien species, genetically modified organisms and living modified organisms	Project will comply with this plan by conserving biodiversity.
13	National Water Bodies Protection Act, 2000	The characterization of water bodies as river, canal, tank or floodplain identified by municipalities in division and district towns shall not be changed without approval of concerned ministry.	This is relevant as the 2A & 2B areas are located near the Bay of Bengal and there are rivers, canals, ponds, etc. in the adjoining area.
14	The Forest Act, 1927 and subsequent amendments in 1982 and 1989; National Forest Policy, 1994	Categorization of forests as reserve, protected and village forests; Permission is required for the use of forest land for any non-forest purposes and Conservation of private forests and afforestation on wastelands	There will be afforestation activities along the roads, green spaces within industry compounds, landscaping, etc. under 2A & 2B zones and its adjoining areas.
15	Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009	The GOB also prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008 and revised in 2009. This is a comprehensive strategy to address climate change challenges in Bangladesh. There are 44 specific programs proposed in the BCCSAP under six themes.	The project will involve greenery activities which will offset carbon emissions. The project promotes energy efficient and cleaner production in industries.
16	Wildlife Conservation (Protection and Safety) Act, 2012	The act has been formulated for the conservation and safety of wildlife to manage the protected areas. Under this act, there are provisions for penalty and imprisonment for killing of wildlife animals.	The act is applicable since there are wild animals including deer, fox, etc. in the area of influence of Zone 2A & 2B.
17	Bangladesh Biodiversity Act, 2017	This Act regulates the biodiversity conservation and sustainable use of its resources, biota and the fair and equitable share of the benefits derived from their use of and other matters.	The act is applicable since there is coastal biodiversity in the area of influence of 2A & 2B.
18	National Agriculture Policy, 2013	The National Agriculture Policy, 2013 approved by the Government focuses on agriculture production, alleviation of poverty through generating jobs and ensuring of food security.	The project will have direct impact on the fertility of the agricultural land. Private land acquisition/ requisition may also take place for the PRIDE project.
19	National 3R Strategy for Waste Management, 2010	The strategy for solid waste management is essential in order to minimize the environmental, social and economic problems by applying 3R (reduce, reuse & recycle) strategy.	This strategy is applicable for Zone 2A & 2B for the management of construction waste.
20	BEZA Act, 2010	Under this act, BEZA, economic zone developers, industrial units	It is the own act of project proponent to regulate the

SN	Acts / Rules/ Polices/ Plans	Key provisions and purpose	Relevance to this Project
		established in the economic zones shall be bound to comply with international commitments recognized by the Government of Bangladesh including compliance to all the existing laws on environment and environmental protection.	social and environmental issues.
21	The National Water Act, 2013	The National Water Act, 2013 is based on the National Water Policy, 1999 and provides the legal framework for integrated development, management, abstraction, distribution, usage, protection and conservation of water resources in Bangladesh. The Act authorized DoE to prevent water pollution. The Act denotes water pollution as 'direct and indirect harmful changes of physical, chemical and organic properties of water'.	The project will comply with the provisions of the Act by ensuring that storm water disposal structures intended to control runoffs from project area into the aquatic environment. Moreover, this is also applicable for the preservation of water quality during construction work and camps site effluent.
22	The Acquisition and Requisition of Immovable Property Act, 2017	Current GOB land acquisition act refers to acquisition and requisition of land and address usufructuary right holders. Compensations to be paid including 200% premium for affected land.	At this stage, not applicable for Zone 2A & 2B.
23	Bangladesh National Building Code (BNBC), 2006	The Bangladesh National Building Code (BNBC) clearly sets out the constructional responsibilities according to which the relevant authority of a particular construction site shall adopt some precautionary measures to ensure the safety. The BNBC also stipulates the general duties of the employer to the public as well as workers. According to this section, "All equipment and safeguards required for the construction work such as temporary stair, ladder, ramp, scaffold, hoist, run way, barricade, chute, lift shall be substantially constructed and erected so as not to create any unsafe situation for the workmen using them or the workmen and general public passing under, on or near them". The Code also clarifies the issue of safety of workmen during construction and with relation to this, set out the details about the different safety tools of specified standard. In relation with the health hazards of the workers during construction, this chapter describes the nature of the different health hazards that normally occur in the site during construction and at the same time specifies the specific measures to be taken to prevent such health hazards.	This code is relevant, since different types of building to be constructed as a part of EZ development work.
24	Noise Pollution (Control)	Prevention of Noise pollution and standards for noise levels	This is relevant to identify the potential impact on

SN	Acts / Rules/ Polices/ Plans	Key provisions and purpose	Relevance to this Project
	Rules 2006		health and wellbeing of workers and the surrounding communities.
25	Standing Order on Disaster, 2010 and Disaster Management Act, 2012	The Order (2010) and Act (2012) address activities related to disaster management in a coordinated, object oriented manner and strengthened way and to formulate rules to build up infrastructure as part of effective disaster management to fight against all types of disasters.	Applicable, as the project is located in a cyclone prone area.
26	Right to Information Act, 2009	The Act makes provisions for ensuring free flow of information and people's right to information. The freedom of thought, conscience and speech is recognized in the Constitution as a fundamental right and the right to information is an alienable part of it. Since all powers of the Republic belong to the people, it is necessary to ensure the right to information for their empowerment. The right to information shall ensure that transparency and accountability in all public, autonomous and statutory organizations and in private organizations run on government or foreign funding shall increase, corruption shall decrease and good governance shall be established. It is expedient and necessary to make provisions for ensuring transparency and accountability.	This act provide legal bindings to disclose the ESA and ESMF report of this project.
27	The Sustainable and Renewable Energy Development Authority Act, 2012 (Act No. 48 of 2012)	This act makes provisions for the establishment of the Sustainable and Renewable Energy Development Authority to ensure energy security.	This act is relevant to Zone 2A and 2B to make the energy sources sustainable.
28	Bangladesh EPZ/EZ Labour Law Ordinance No 01, 2019	This law has been designed to ensure occupational health & safety, cleanliness, safety and welfare management, no discrimination in term of wage and a well as human right at the working site.	All labour related issues including complaints will be addressed following this Ordinance.

2.3 World Bank ESF Policy, Directives and Standards – Extent of Relevance

The relevance of ESF Policy, each of the ten standards (ESS1 to 10) and associated directive and their requirements are summarized in **Table 2-2**. Additionally, it also discusses the relevance and requirements relating to other guidance notes of World Bank.

Table 2-2: World Bank ESF Policy, and World Bank Groups' EHSs, IFC

SN	World Bank ESS Policy, Standards, Directive	Objectives	Requirements	Relevance & Extent of Relevance to the sub-projects/project
1	World Bank Environment and Social Policy for Investment Project Financing	It sets out the mandatory requirements of the Bank in relation to the projects it supports through Investment Project Financing.	The types of E&S risk and impacts that should be considered in the environmental and social assessment. The use and strengthening of the Borrower's environmental and social framework for the assessment, development and implementation of World Bank financed projects where appropriate.	Applicable to this project
2	ESS-1 Assessment and Management of Environmental and Social Risks and Impacts	Identify, assess, evaluate, and manage environment and social risks and impacts in a manner consistent with the ESF. Adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, and they are not disadvantaged in sharing development benefits and opportunities.	The types of E&S risk and impacts that should be considered in the environmental and social assessment. The use and strengthening of the Borrower's environmental and social framework for the assessment, development and implementation of World Bank financed projects where appropriate.	E&S risks and Impacts have been identified based on surveys and consultations with primary stakeholders including communities and implementing agency.
3	ESS-2 Labour and Working Conditions	Promote safety and health at work. Promote the fair treatment, non-discrimination, and equal opportunity of project workers. Protect project workers, with particular emphasis on vulnerable workers. Prevent the use of all forms of forced labour and child labour. Support the principles of freedom of	Requirements for the Borrower to prepare and adopt labour management procedures. Provisions on the treatment of direct, contracted, community and primary supply workers and government civil servants. Requirements on terms and conditions of work, non-discrimination and equal opportunity and worker's	Following types of worker may be involved in the project work. i) Direct workers will include the project managers and supervisors, who are employees of BEZA, deployed for PRIDE; ii) Contracted workers will be the work force deployed by the Contractors and the Project Management Consultant under the PRIDE project. The Contractor(s) might further engage multiple subcontractors; iii) Influx of migrant workers from other area for construction works has been a norm in the project area and is likely to

SN	World Bank ESS Policy, Standards, Directive	Objectives	Requirements	Relevance & Extent of Relevance to the sub-projects/project
		association and collective bargaining of project workers in a manner consistent with national law. Provide project workers with accessible means to raise workplace concerns.	organizations. Provisions on child labour and forced labour management. Requirements on occupational health and safety, in keeping resemblance with the World Bank Group's Environmental, Health, and Safety Guidelines (EHS).	continue in this project; iv) Primary supplier workers will be the workers who will be providing goods and materials e.g. construction material.
4	ESS-3 Resource Efficiency and Pollution Prevention and Management	Promote the sustainable use of resources including energy, water, and raw materials. Avoid or minimize adverse impacts on human health and the environment caused by pollution from project activities. Avoid or minimize project-related emissions of short and long-lived climate pollutants. Avoid or minimize generation of hazardous and non-hazardous waste. Minimize and manage the risks and impacts associated with pesticide use. Requires technically and financially feasible measures to improve efficient consumption of energy, water, and raw materials and introduces specific requirements for water efficiency where a project has high water demand.	Requires an estimate of gross greenhouse gas emissions resulting from project (unless minor) where technically and financially feasible. Requirements on management of wastes, chemical and hazardous materials and contains provisions to address historical pollution. ESS-3 refers to national law and Good International Industry Practice, in the first instance the World Bank Groups' EHSs.	With respect to Resource Efficiency, the project preparation and the ESA process will identify feasible measures for efficient (a) energy use; (b) water usage and management to minimize water usage during construction, conservation measures to offset total construction water demand and maintain balance for demand of water resources; and (c) raw materials use by exploring use of local materials, recycled aggregates, use of innovative technology so as to minimize project's foot prints on finite natural resources. Sourcing of construction material would also need to be consistent with the provision of WBG EHS. With respect to Pollution Management, based on similar project experiences, the project will develop, as part of the ESA process, prevention and management measures to offset risks and impacts of pollution from potential sources such as dust and emission from operation of hot-mix and batching plants, crushers, construction and haulage vehicles, material and spoil stockpile; effluents and wastewater from labour camps, construction camp; spillage or leakage during handling of chemical admixtures, hazardous materials like bitumen, high strength diesel, used oil, battery wastes etc.; and disposal of non-hazardous wastes (municipal wastes) generated during project

SN	World Bank ESS Policy, Standards, Directive	Objectives	Requirements	Relevance & Extent of Relevance to the sub-projects/project
5	ESS-4 Community Health and Safety	<p>Anticipate or avoid adverse impacts on the health and safety of project-affected communities during project life-cycle from routine and non-routine circumstances. Promote quality, safety and climate change considerations in infrastructure design and construction including dams. Avoid or minimize community exposure to project-related traffic and road safety risks, diseases and hazardous materials. Have in place effective measures to address emergency events. Ensure that safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities.</p>	<p>Requirements on infrastructure taking into account safety and climate change, and applying the concept of universal access where technically and financially feasible. Requirements on traffic and road safety including road safety assessments and monitoring. Addresses risks arising from impacts on provisioning and regulating ecosystem service. Measures to avoid or minimize the risk of water-related, communicable, and non-communicable diseases. Requirements to assess risks associated with security personnel, and review and report unlawful and abusive acts to relevant authorities.</p>	<p>implementation period.</p> <p>In the project corridor there is likely to be i) small scale filling in some pockets of zones 2A and 2B, excavation for building foundation, CETP, culverts, drainage and internal road, etc. use of vibratory equipment, construction debris handling and disposal etc. during construction; ii) high likelihood of direct exposure to increased construction related traffic and equipment especially at approach road sections traversing settlement area with limited carriageway/roadway width, and sensitive receptors iii) high dust levels from earthworks, high noise and emission level from traffic congestion and idling of vehicles; and iv) influx of migrant workers could potentially cause local discomfort or potential conflicts with local people.</p>
6	ESS-5 Land Acquisition Restrictions on Land Use and Involuntary Resettlement	<p>Avoid or minimize involuntary resettlement by exploring project design alternatives. Avoid forced eviction. Mitigate unavoidable adverse impacts from land acquisition or restrictions on land use by providing compensation at replacement cost and assisting displaced persons in their efforts to improve or at least</p>	<p>Applies to permanent or temporary physical and economic displacement resulting from different types of land acquisition and restrictions on access. Does not apply to voluntary market transactions, except where these affects third parties. Provides criteria for “voluntary” land donations, sale of community land, and parties obtaining income from</p>	<p>Previous resettlement action plan has been reviewed. Compensation and other resettlement benefits have been duly paid to all affected HHS under PSDSP. No new land acquisition will be required under the PRIDE project in zone 2A and 2B.</p>

SN	World Bank ESS Policy, Standards, Directive	Objectives	Requirements	Relevance & Extent of Relevance to the sub-projects/project
		restore, livelihoods and living standards to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher. Improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities and security of tenure. Conceive and execute resettlement activities as sustainable development programs.	illegal rentals. Prohibits forced eviction (removal against the will of affected people, without legal and other protection including all applicable procedures and principles in ESS5). Requires that acquisition of land and assets happens only after payment of compensation and resettlement has occurred. Requires community engagement and consultation, disclosure of information and a grievance mechanism.	
7	ESS-6 Biodiversity Conservation	Protect and conserve biodiversity and habitats. Apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity. To promote the sustainable management of living natural resources.	Requirements for projects affecting areas that are legally protected designated for protection or regionally/internationally recognized to be of high biodiversity value. Requirements on sustainable management of living natural resources, including primary production and harvesting, distinguishing between small-scale and commercial activities. Requirements relating to primary suppliers, where a project is purchasing natural resource commodities, including food, timber and fiber.	The EZ development work has potential to cause conversion of habitat and impair associated ecological functions by: altering aquatic habitat through discharging solid or liquid waste of land development work (road, drain and water supply network, construction of some key public buildings, site upgradation etc.) into adjacent khal, river and sea, changing/interrupting ecological connectivity between adjacent mangrove and open locality unlikely. Appropriate mitigation and control measures have been included for the activities that have been covered in this ESIA.
8	ESS-7 Indigenous Peoples	Ensure that the development process fosters full respect for	Applies when the Indigenous Peoples are present or have a	There are no Indigenous Peoples adjacent to the EZ site. Therefore, this standard currently not relevant

SN	World Bank ESS Policy, Standards, Directive	Objectives	Requirements	Relevance & Extent of Relevance to the sub-projects/project
		<p>affected parties' human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods. Promote sustainable development benefits and opportunities in a manner that is accessible, culturally appropriate and inclusive. Improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with affected parties. Obtain the Free, Prior, and Informed Consent (FPIC) of affected parties in three circumstances. Recognize, respect and preserve the culture, knowledge, and practices of Indigenous Peoples, and to provide them with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.</p>	<p>collective attachment to the land, whether they are affected positively or negatively and regardless of economic, political or social vulnerability. The option to use different terminologies for groups that meet the criteria set out in the Standard. The use of national screening processes, providing these meet World Bank criteria and requirements. Coverage of forest dwellers, hunter gatherers, and pastoralists and other nomadic groups. Requirements for meaningful consultation tailored to affected parties and a grievance mechanism. Requirements for a process of free, prior and informed consent in three circumstances.</p>	<p>for the project.</p>
9	ESS-8 Cultural Heritage	<p>Protect cultural heritage from the adverse impacts of project activities and support its preservation. Address cultural heritage as an integral aspect of sustainable development. Promote meaningful</p>	<p>Requires a chance finds procedure to be established. Recognition of the need to ensure peoples' continued access to culturally important sites, as well as the need for confidentiality when revealing information about cultural heritage</p>	<p>In the previous RAP, five mosques (cultural infrastructures) relocated by involving the associated stakeholders concern. However, in the updating this study no any cultural heritage or cultural structures is recorded. However, the ESA is carried out for subsequent phases of the project includes full assessment of any</p>

SN	World Bank ESS Policy, Standards, Directive	Objectives	Requirements	Relevance & Extent of Relevance to the sub-projects/project
		<p>consultation with stakeholders regarding cultural heritage. Promote the equitable sharing of benefits from the use of cultural heritage.</p>	<p>assets that would compromise or jeopardize their safety or integrity. Requirement for fair and equitable sharing of benefits from commercial use of cultural resources. Provisions of archaeological sites and material, built heritage, natural features with cultural significance, and moveable cultural heritage.</p>	<p>cultural heritage that may be affected, and appropriate mitigation measures is identified in the detailed EMPs as required. In addition, 'chance find' procedure is included in the EMPs for all work phases.</p>
10	ESS-9 Financial Intermediaries	<p>Sets out how Financial Intermediaries (FI) will assess and manage environmental and social risks and impacts associated with the subprojects it finances. Promote good environmental and social management practices in the subprojects the FI finance. Promote good environmental and sound human resources management within the FI.</p>	<p>Financial Intermediaries (FIs) to have an Environmental and Social Management System (ESMS) - a system for identifying, assessing, managing, and monitoring the environmental and social risks and impacts of FI subprojects on an ongoing basis. FI to develop a categorization system for all subprojects; with special provisions for subprojects categorized as high or substantial risk. FI borrowers to conduct stakeholder engagement in a manner proportionate to the risks and impacts of the FI subprojects.</p>	<p>Not relevant as there is no financial intermediary involved.</p>
11	ESS-10 Stakeholder Engagement and Information Disclosure	<p>Establish a systematic approach to stakeholder engagement that helps Borrowers identify stakeholders and maintain a constructive relationship with them. Assess stakeholder interest and support for the project and enable</p>	<p>Requires stakeholder engagement throughout the project life cycle, and preparation and implementation of a Stakeholder Engagement Plan (SEP). Requires early identification of stakeholders, both project-affected parties and other interested parties, and</p>	<p>World Bank has developed an approach for disclosure of information, transparency and sharing of knowledge. The public will have access to a broad range of information about project in preparation and implementation. The ESA will be disclosed on BEZA website and also on WB website. Consultations have been held while conducting ESA. Few consultations and FGD are conducted during</p>

SN	World Bank ESS Policy, Standards, Directive	Objectives	Requirements	Relevance & Extent of Relevance to the sub-projects/project
		stakeholders' views to be taken into account in project design. Promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life-cycle. Ensure that appropriate project information is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner.	clarification on how effective engagement takes place. Stakeholder engagement to be conducted in a manner proportionate to the nature, scale, risks and impacts of the project, and appropriate to stakeholders' interests. Specifies what is required for information disclosure and to achieve meaningful consultation.	environmental and social reconnaissance survey. A disclosure workshop will be carried out for the ESA of the subsequent phases of the PRIDE.
World Bank Groups' EHSs, IFC, 2007				
12	General EHS Guidelines, April, 2007, IFC	The General EHS Guidelines contain information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors	Requirements on environmental, health, and safety issues during construction of different intervention of EZ-II.	Yes, project will comply where applicable
13	EHS Guidelines for Construction Materials Extraction, April, 2007, IFC	The EHS Guidelines contain the performance levels and measures that are considered to construction materials extraction activities such as aggregates, limestone, slates, sand, gravel, clay, gypsum, feldspar, silica sands, and quartzite	Requirements on the resource management of construction materials extraction activities such as aggregates, limestone, slates, sand, gravel, clay, gypsum, feldspar, silica sands, and quartzite	Yes, project will comply where applicable
Other World Bank Documents				
14	The World Bank's Country Partnership Framework (For the Period FY 2016-FY 2020)	The CPF's primary objective is to increase engagement in the five transformational priorities to make a dent in poverty reduction.	(i) consistency with the GoB's 7th Five-Year Plan, to ensure country ownership; (ii) alignment with policy priorities identified in the SCD; and (iii) the WBG comparative	The project supports two of three focus areas of CPF i.e. it is addressing key constraints to the Growth and Competitiveness agenda as it is seeking to address impediments to greenfield investment and job creation and the project is incorporating the Climate

SN	World Bank ESS Policy, Standards, Directive	Objectives	Requirements	Relevance & Extent of Relevance to the sub-projects/project
			advantage, considering the knowledge and financing support provided by other development partners.	and Environment Management agenda as a core focus.

2.4 Comparison of GOB legislations and ESF, 2016

The GOB legislations and ESF, 2018 of World Bank have been compared and gaps are summarized in **Table 2-3**.

Table 2-3: Comparison of National Environmental and Social Policies and Regulations with ESF, 2018

SN	ESS	Equivalent National Environmental Policy and Regulations	Policy Gaps and its remedy redressal
1	ESS-1 Assessment and Management of Environmental and Social Risks and Impacts	National Environmental Policy, 1992 National Environmental Management Action Plan, 1995 Environmental conservation Rules, 1997 and subsequent amendments in 2002, 2003 and 2010 The Environment Conservation Act, 1995 and subsequent amendments until 2010 Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009 BEZA Act, 2010 The Acquisition and Requisition of Immovable Property Act, 2017	By and large, the national policies and regulations are consistent with the requirements of ESS 1 with some gaps as mentioned below.
2	ESS-2 Labour and Working Conditions	Bangladesh Labour Law, 2006, Bangladesh Labour Act, 2013 and Bangladesh Labour Rules, 2015 Bangladesh EPZ/EZ Labour Law Ordinance No 01, 2019 Industrial Policy, 1999	The national legal provisions almost cover all requirements of ESS2. Under this project, a Project's Labour management procedure has been prepared to regulate working conditions and management of worker relations including workers specific GRM, terms and conditions of employment, non-discriminations and equal opportunity, protection of work force, prohibition of child/forced labour and provision of OHS.
3	ESS-3 and EHS Guidelines of IFC Resource Efficiency and Pollution Prevention and	National Fisheries Policy, 1998 Water Supply and Sanitation Act, 1996 The Ground Water Management ordinance, 1985 National Water Bodies Protection Act, 2000 National Agriculture Policy, 2013	GOB has rules and regulation those address the pollution prevention such as ECA 95, ECR 97, Rules for hazardous waste management and strategies for adaptation and mitigation to climate change. While many ESS3 requirements are addressed by existing regulations, there are gaps in many cases such as lack of rules directly addressing the issues related to sourcing of construction material, resource efficiency

SN	ESS	Equivalent National Environmental Policy and Regulations	Policy Gaps and its remedy redressal
	Management	<p>The National Water Act, 2013</p> <p>The Protection and Conservation of Fish Act 1950 subsequent amendments in 1982</p> <p>Noise Pollution (Control) Rules 2006</p> <p>Disaster Management Act, 2012</p> <p>Standing Order on Disaster, 2010</p> <p>The Sustainable and Renewable Energy Development Authority Act, 2012 (Act No. 48 of 2012)</p> <p>National Strategy for Waste Management</p> <p>Environment Court Act, 2000 and amendment in 2002</p> <p>The Vehicle Act, 1927</p> <p>The Motor Vehicles Ordinance, 1983; and The Bengal Motor Vehicle Rules, 1940</p> <p>National Land Transport Policy (NLTP), 2004</p> <p>National 3R Strategy for Waste Management, 2010</p>	etc. .
4	ESS-4 Community Health and Safety	<p>National Water Bodies Protection Act, 2000</p> <p>Noise Pollution (Control) Rules 2006</p> <p>National Strategy for Waste Management</p> <p>Bangladesh National Building Code (BNBC), 2006</p> <p>Bangladesh EPZ/EZ Labour Law Ordinance No 01, 2019</p>	<p>In the existing GoB regulatory systems (laws, rules, policies and acts), there is no direct community health and safety. Hence, these policies fulfil the community health and safety partially.</p> <p>The gaps are addressed through suitable provisions in ESMP. In addition, contractor will be responsible to implement the ESMP regarding community health and safety which includes OHS plan, labour Influx management Plan, workers camp management plan, traffic and road safety management plan etc.</p>
5	ESS-5 Land Acquisition Restrictions on Land Use and Involuntary Resettlement	<p>The Acquisition and Requisition of Immovable Property Act, 2017</p> <p>National Land Use Policy, 2001</p>	<p>Gap exists specifically related to aspects such as identification of non-titleholders as PAPs and cut off dates for non-titleholders. However, this ESS is not relevant for activities in zones 2A and 2B.</p>
6	ESS-6 Biodiversity Conservation	<p>National Biodiversity Strategy and Action Plan (2004)</p> <p>The Forest Act, 1927 and subsequent amendments in 1982 and 1989;</p> <p>National Forest Policy, 1994</p>	<p>While these strategies and acts cover bio-diversity conservation but does not directly cover issues such as eco-system services. Such provision was considered during assessment of project impact.</p>

SN	ESS	Equivalent National Environmental Policy and Regulations	Policy Gaps and its remedy redressal
		Wildlife Conservation (Protection and Safety) Act, 2012 Bangladesh Biodiversity Act, 2017	
7	ESS-7 Indigenous Peoples	Not applicable for the project	
8	ESS-8 Cultural Heritage	-	Currently no official cultural heritage policy is available in Bangladesh hence provisions from the act do not fully meet the ESS requirements. Chance find procedures is included in ESMP. Impacts on religious structures (not protected, but social and cultural value) will be mitigated or managed through provisions for restoration.
9	ESS-9 Financial Intermediaries	Not applicable	
10	ESS-10 Stakeholder Engagement and Information Disclosure	Environmental conservation Rules, 1997 and subsequent amendments in 2002, 2003 and 2010 Right to Information Act, 2009	Although national rules allow for public consultation as part of the preparation of ESIA reports, there is no provision of continuous engagement with stakeholders during the full life cycle of the project as required by ESS10. Under this Project, a Stakeholder Engagement Plan (SEP) has been prepared to ensure such engagement with stakeholder at various stages of the project.

Based on comparative analysis of national regulatory frameworks with ESSs, the requirements in the country regulatory frameworks were found to be consistent. In case of stakeholder engagement, specifically, the EIA notification DoE, GoB 1997 requires conducting of public hearings during process of impact assessment, but is limited to project that are categorized as Category- Red.

In the event of any conflict or inconsistency between the provisions of this GOB regulatory framework and the provisions of World Bank's ESF, the more stringent one will prevail.

2.5 Environmental Standards

The appropriate national environmental standards are applied under the ECR, 1997 and amendments. The standards, commonly known as Environmental Quality Standards (EQS), are legally binding. There is a separate schedule on industry specific standards, other than the general industrial emission and effluent standards.

CHAPTER 3. PROJECT DESCRIPTION

3.1 Introduction

The PRIDE project aims to promote private investment and job creation in economic zones and digital entrepreneurship in hi-tech parks. The project will spearhead the adoption and mainstreaming of green industrial park concepts in the implementation and development of economic zones in Bangladesh. The project has four components. Short description of the project components is provided in Chapter 1. The first three components will be implemented by BEZA and the fourth component will be implemented by BHTPA.

The Government of Bangladesh (GOB) plans to create 100 economic zones all over the country in the next decade using a wide variety of arrangements. Bangabandhu Sheikh Mujib Shilpanagar (BSMSN) will be one of the largest of this kind to be set up on 30,000 acres of land located in Mirsharai, Sonagazi and Sitakunda Upazilla of Chattogram and Feni Districts. A master plan of BSMSN has been prepared under the current PSDS project financed by the World Bank. The PRIDE project would support phased development of BSMSN. The project would support further development of zone 2A and 2B and development of a third piece of land by an international Master Developer, all within the proposed BSMSN.

Under the current PSDS project, economic zone 2A and 2B at Mirsharai, Chattogram are being developed. PRIDE would provide support construction of some basic infrastructure (such as internal road network, water supply, sewer and storm drainage system etc.) and construction of some common and shared facilities (such as central waste water treatment plant, landfill for solid waste management, desalination plant, solar energy, biogas plant etc.). It would also support some infrastructure in the international master developer area and some last mile infrastructure to ensure accessibility and utility services in the economic zones.

3.2 Master Plan for BSMSN

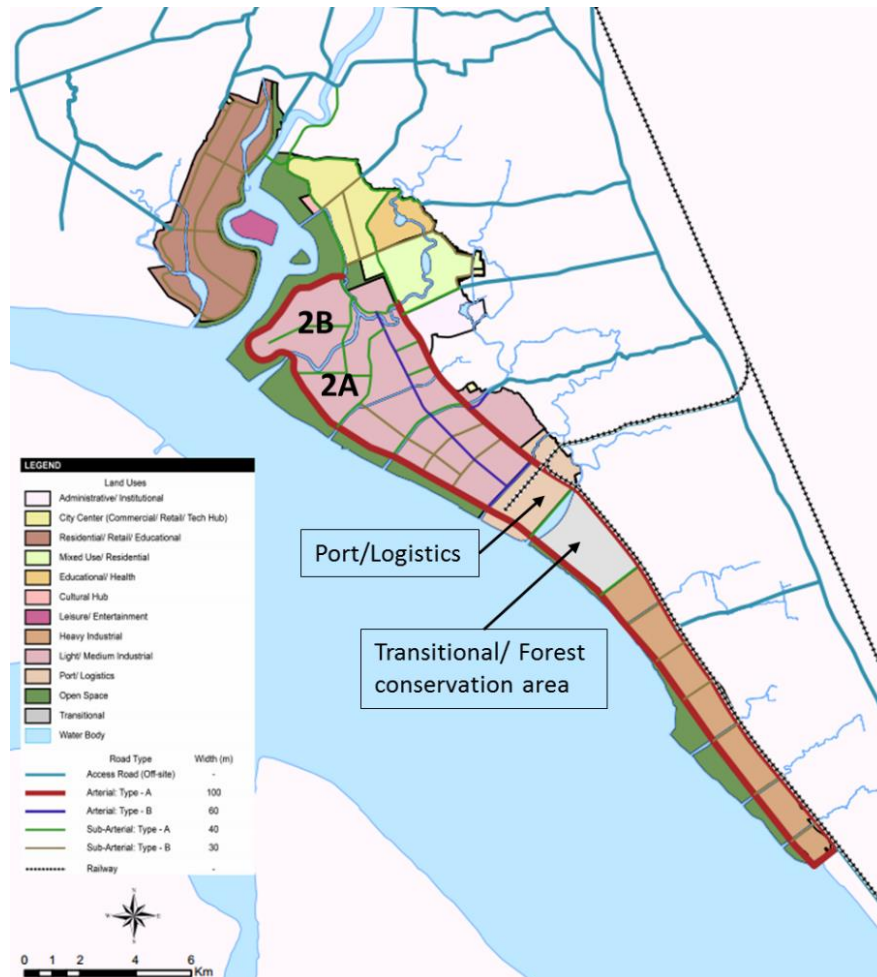
BEZA has prepared a draft Master Plan for Bangabandhu Sheikh Mujib Shilpa Nagar (BSMSN) for next 20 years focusing on Land Use Plan, Zoning Plan, Phasing Plan, Urban Design Guidelines, Infrastructure/ Utility Plan, Development Management Plan, etc. The PRIDE project will be implemented within the overarching master plan of the BSMSN. The final draft of the Plan includes among other the following:

- revision/validation of development programs of BSMSN
- population projection for the next 20-year period including work force and amenities requirements
- industrial land demand for next 20 years
- projection of utility and infrastructure requirements for the entire industrial city for next 20 years
- assessment of existing transport infrastructure and facilities within and offsite areas

In general, the report made assessment and evaluation of available on and off-site infrastructures and services including the transport infrastructure and services. The report also made projection of population and work force for the next 20 years who will be the recipient of amenities and services to be provided.

The core of the master plan was the land use plan where land was sub-divided for different uses of the industrial city, like industry, housing, commerce, utility services and green and open areas including water body. A phasing plan will follow for industrial city expansion commensurate with the market demand for industrial lands spanning over next 20 years.

The Part III of the Master Plan provides the site plan and the land allocations being made and the infrastructure and utility services development programs on going therein. The recommended land use plan in Part III of BSMSN has been presented in **Figure 3-1**. To consider a holistic approach in assessment and management of environmental and social risks associated with the full-scale operation of the industrial city, a Regional Environmental and Social Assessment (RESA) will be conducted.



Source: Adapted from BSMSN Master Plan

Figure 3-1: Proposed Land Use Plan of BSMSN

3.3 Project Location

The Zone 2A and 2B are situated in Mirsharai and Sonagazi Upazilas of Chattogram district near Abu Torab Village adjacent to Mirsharai EZ-I. The site is located at west site of BWDB embankment. The site is at 12 Km west of the national Highway (Dhaka-Chattogram Highway) with Chattogram City 60 Km south of this location. Mirsharai Railway station is about 10 km away from the site towards the East. The Shah Amanat International Airport at Chattogram is located in the Southern direction at a distance of approximately 79 Km and the seaport at Chattogram is 67 Km south of the site. Sluice gate of River Feni is approximately 9 km from the site in West/NW direction. A rivulet from river Feni just abuts the western boundary of the site at one location. Project location map is shown in **Figure 3-2**.

The land for the Zone-2A and Zone-2B are being landfilled and it will be ready for industrial development by the middle of 2020. In addition, a number of on-site and off-site activities are ongoing which includes construction of embankment, internal roads, access roads, telecommunication infrastructure, power and water supply infrastructure, drainage management

infrastructure, etc. The Green Master Developer (GMD) area is not yet been identified. However, it is expected that the development in the GMD will follow the Eco-Industrial Park (EIP) framework³.

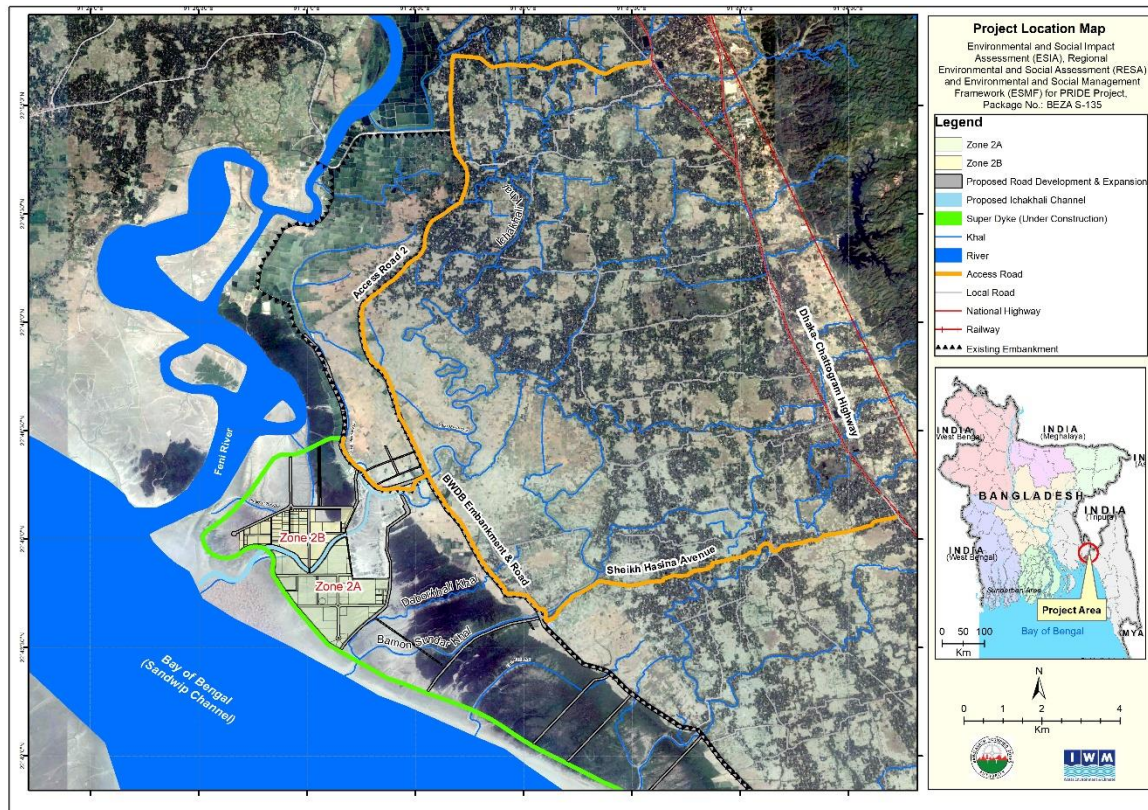


Figure 3-2: Project Location Map

3.4 Areas covered under Zone 2A & 2B

The study area includes 572 ha of Zone 2A and 2B of BSMSN and its area of influence. In the following section, areas covered under zone 2A & 2B and their area of influence has been described in detail. The area covered under Zone 2A & 2B are situated in Mirsharai and Sonagazi Upazilas. The 2A & 2B land is Government Land and land use pattern was Char land as per revenue records, but now most of the area is already developed by sand filling. The area is located at the end of the eastern side of the Bay of Bengal. A super dyke is under construction along the western boundary of Zone 2A & 2B to protect the site from the water ingress from Sea during high tide and surges.

3.5 Influence Area of Zone 2A & 2B

The project influence area incorporates two concepts such as area of direct impacts and area of indirect impacts. Area of direct impacts are considered as the physical footprint of the project such as right-of-way, construction sites, work staging areas, and areas affected during the operational phase. Again, area of indirect impacts: more difficult to define precisely but includes areas which may experience induced or cumulative changes in combination with activities not under the direct control of the project. The overall and detailed indirect and cumulative impacts of PRIDE project will be captured by a separate Regional Environment and Social Assessment (RESA) study.

³ An International Framework for Eco-Industrial Parks. The World Bank (2017).

Although the project area for this ESA study is confined in zone 2A & 2B, BSMSN will have environmental and social impacts in the adjoining areas. For 2A & 2B, a 10 km buffer zone area around the EZ site has been considered as the project influence area. Some of the impacts such as social issues might cover even bigger geographical area. The overall socio-economic benefit will reach out to other parts of the country as labourers will be coming to BSMSN from across the country. In **Figure 3-3**, the project influence area is illustrated.

Table 3-1: Existing Features surrounding the project site

Direction	Features
North	Zone 1 of BSMSN followed by CDSP Bund, Feni river, switch gate of Feni river, Agricultural land, mangrove forest, etc.
East	Dhaka-Chattogram Highway (10 km from study area), EZ connecting road, Ichakhali khal switch gate, Mangrove forest, CDSP Bund, etc.
South	Bay of Bangle, Under construction super dyke, etc.
West	Bay of Bengal, Super dyke of Economic zone (under construction), Power plant (under construction) etc.

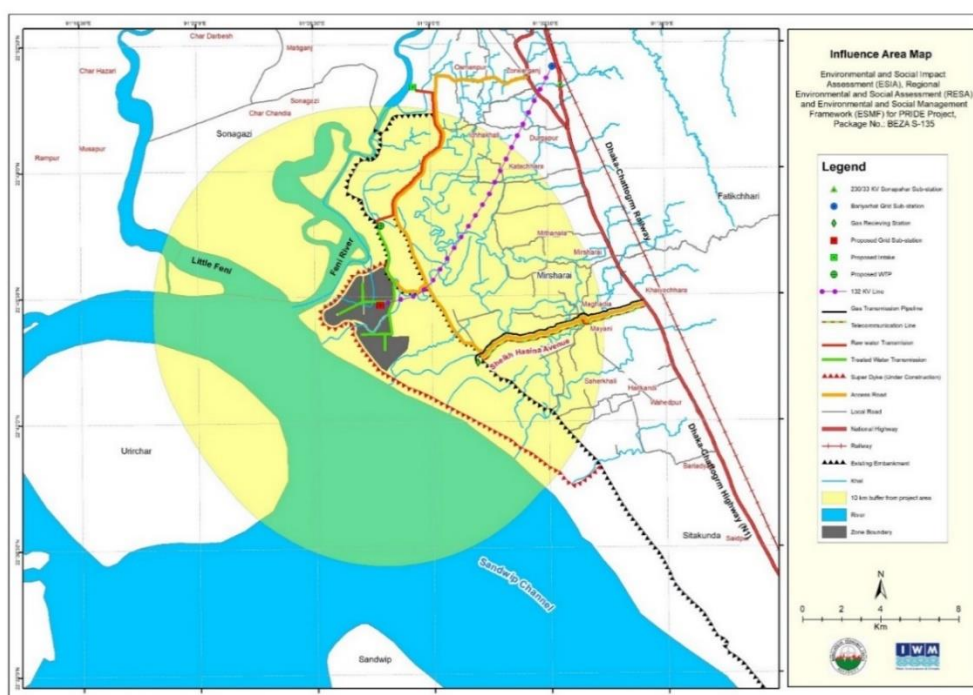


Figure 3-3: Area of influence map for Zone 2A & 2B

3.6 Sub-projects under PRIDE Project

Among the four main components of the PRIDE project, the World Bank will support BEZA in the execution of the following sub-projects. All the sub-projects will follow the EIP guidelines for green and resilient infrastructure.

(A) Sub-component 2.1: Basic infrastructure to implement the Master Plan for BSMSN-2A & 2B. This will include onsite and last mile infrastructures in Zone-2A and Zone-2B as outlined in the recently finalized Master Plan for BSMSN.

- a) **Sub-project A.1:** Construction of arterial and non-arterial roads, footpath and plot entry culvert
- b) **Sub-project A.2:** Construction of storm water management network
- c) **Sub-project A.3:** Construction of water supply network
- d) **Sub-project A.4:** Site upgradation
- e) **Sub-project A.5:** Construction of telecommunication network

- f) **Sub-project A.6:** Construction of some key public buildings and facilities
- g) **Sub-project A.7:** Construction of Internal Power Distribution (OHT) network
- h) **Sub-project A.8:** Construction of sewer network and waste water/sewage treatment plant

(B) Sub-component 2.2: Sustainable and resilient services for the city and industries. This will include construction of shared facilities in Zone-2A and Zone-2B, which will eventually provide sustainable and resilient services for the BSMSN.

- a) **Sub-project B.1:** Construction of a common effluent treatment plant (CETP)
- b) **Sub-project B.2:** Construction of a desalination plant
- c) **Sub-project B.3:** Construction of a rooftop and floating solar power system
- d) **Sub-project B.4:** Construction of high-pressure steam pipelines connecting relevant tenant firms
- e) **Sub-project B.5:** Development of a landfill site for the generated solid waste
- f) **Sub-project B.6:** Construction of a biogas plant, waste sorting and material recovery facility

(I) Sub-Component 1.2: Capital contribution for IMD (covering an area of 250-500 acres) under PRIDE includes:

- a) **Sub-project I.1:** Land elevation
- b) **Sub-project I.2:** Desalination plant
- c) **Sub-project I.3:** Rain water capture
- d) **Sub-project I.4:** Water resource management
- e) **Sub-project I.5:** Solid waste management
- f) **Sub-project I.6:** Waste pyrolysis/energy
- g) **Sub-project I.7:** Solar energy production
- h) **Sub-project I.8:** Sewage management
- i) **Sub-project I.9:** Waste water treatment
- j) **Sub-project I.10:** Flood management

The location of IMD zone is yet to be identified. Furthermore, the design and scale of the above activities have not yet been defined. The location of the site, criteria for selection, and key performance indicators for the above sub-projects will depend on feasibility studies and market engagement. The procedure to be followed in assessing and managing the risks of these infrastructure has been covered in ESMF.

A summary of the sub-projects to be implemented by BEZA is given in **Table 3-2**.

Table 3-2: Summary of Works in IMD Zone, BSMSN-2A and BSMSN-2B

Sub-project	Related ongoing activities under PSDSP and Other Projects	Proposed Investments/Sub-projects to be undertaken by PRIDE project	Activities under IMD or Zone 2A & 2B	Included in ESA/ ESMF
Sub-project I.1: Land elevation Sub-project I.2: Desalination plant Sub-project I.3: Rain water capture Sub-project I.4: Water resource management Sub-project I.5:	None	Location of IMD zone is yet to be identified. Design and scale of the sub-projects not yet been defined.	IMD	ESMF

Sub-project	Related ongoing activities under PSDSP and Other Projects	Proposed Investments/Sub-projects to be undertaken by PRIDE project	Activities under IMD or Zone 2A & 2B	Included in ESA/ESMF
Solid waste management Sub-project I.6: Waste pyrolysis/energy Sub-project I.7: Solar energy production Sub-project I.8: Sewage management Sub-project I.9: Waste water treatment Sub-project I.10: Flood management				
Sub-project A.1: Construction of arterial and non-arterial roads, footpath and plot entry culvert	Construction of new access road and widening of existing ones of approximately 19 km and 4 bridges are underway and expected to be completed by end January 2020.	Construction of approximately 30km of arterial and non-arterial roads, footpath and plot entry culvert.	Zone 2A & 2B	ESA
Sub-project A.2: Construction of integrated stormwater management network	Construction of 16 Vent regulator on Ichhakhali khal ongoing	Construction of approximately 30km of integrated stormwater management network including resilient drains, infiltration and retention facilities.	Zone 2A & 2B	ESA
Sub-project A.3: Water supply network	Feasibility study of water network completed. Work in progress to Install 5 test tube wells, 3 production deep tube wells, pipelines and construction of underground water reservoir	Construction 30km water distribution network.	Zone 2A & 2B	ESA
Sub-project A.4: Site upgradation	Site development works incl. landfilling of 1500 acres. Coastal embankment (super dyke) is being constructed at 9 m average mean sea level for 7.7 km along the coastlines of Zone-2A and Zone-2B. The coastal embankment construction is expected to be completed by end April 2020. River embankment with a bund of 8m average mean sea level and a cyclone shelter have been constructed to protect the area	Construction of infrastructure and site development measures to enhance flood and liquefaction resilience performance of flood prevention measures (super dyke, embankments, site development) through green and gray investments (open Space/ Landscaping, Greenery along road; Percolation Pits, etc.), infrastructure Maintenance.	Zone 2A & 2B	ESA

Sub-project	Related ongoing activities under PSDSP and Other Projects	Proposed Investments/Sub-projects to be undertaken by PRIDE project	Activities under IMD or Zone 2A & 2B	Included in ESA/ ESMF
	and people from impacts of cyclones. A mangrove has been planted alongside the coastline. Mangrove was also planted alongside the coastline.			
Sub-project A.5: Construction of telecommunication network	Not yet started.	A total of 30km telecommunication cable network.	Zone 2A & 2B	ESA
Sub-project A.6: Construction of some key public buildings and facilities	Construction of Administrative Building, Office Building and Accommodation Shed ongoing	Construction of a key public buildings and facilities such as fire stations and cyclone shelters that serve as an emergency response and operation centre in the event of disasters.	Zone 2A & 2B	ESA
Sub-project A.7: Construction of Internal Power Distribution Network	Not yet started	Construction of approximately 30km of Internal Power Distribution, Transformer, Street Light (LED / Solar), Internal Substation, Fire Hydrant, etc. The alignment and designs of the power distribution network are not finalized.	Zone 2A & 2B	ESA
Sub-project A.8: Construction of sewer network and waste water/sewage treatment plant	Not yet started	The design and alignment of the sewer network are not finalized. The sewer network will consider green and resilient features and designs	Zone 2A & 2B	ESMF
Sub-project B.1: Construction of a Common effluent treatment plant (CETP)	Not yet started	A CETP with a capacity to treat 48,000 m ³ /day. 18 acres' land have been earmarked for the CETP where influent norms at the inlet will be set at BOD ₅ – 600 mg/L, COD – 1260 mg/L and TDS – 2100 mg/L. The design of the CETP is not finalized. It is envisaged that (i) CETP capacity will be enhanced in modular phases. The civil works will be constructed at capacity, but the electromechanical equipment will be commissioned in phases. (ii) the effluent network will be built in	Zone 2A & 2B	ESA

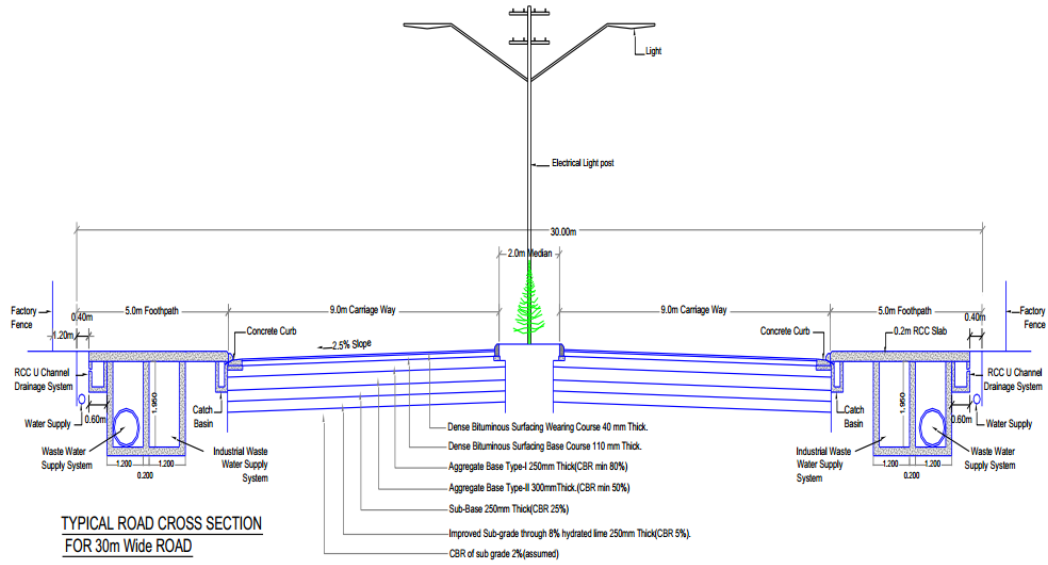
Sub-project	Related ongoing activities under PSDSP and Other Projects	Proposed Investments/Sub-projects to be undertaken by PRIDE project	Activities under IMD or Zone 2A & 2B	Included in ESA/ESMF
		a single phase and the operations will be carried out based on effluent load. (iii) treated effluent can potentially be supplied for reuse and the pumping station will be constructed at capacity.		
Sub-project B.2: Construction of a desalination plant	Not yet started	The desalination plant will be constructed to supply process water with a quality that can be used without further treatment by most of the industrial unit investors in BSMSN. As per BEZA current strategy, Zone 2A and 2B water demand will be met by 101 MLD of treated water from Feni River surface water treatment plants and groundwater production tubewells. The envisioned desalination plant will further support 2A and 2B and also cover the demand of IMD area.	Zone 2A & 2B	ESMF
Sub-project B.3: Construction of a Rooftop and floating solar power system	Not yet started	The location and design of the rooftop and floating power system are not finalised. The potential rooftop solar capacity is 60 MWp while floating is 10 MWp. The total available rooftop surface is around 1.4 km ² . The water basins in the selected zones cover an area of 0.1 km ² , but the proximity to the sea should provide additional capacity.	Zone 2A & 2B	ESMF
Sub-project B.4: Construction of high-pressure steam pipelines connecting tenant firms	Not yet started	High-pressure steam pipelines connecting tenant firms will be constructed. This will be constructed to send steam and receive condensate between suitable industrial plants. Location and design yet to be determined.	Zone 2A & 2B	ESMF
Sub-project B.5: Development of a landfill site for solid waste generated	Not yet started	Although the location of the solid waste land fill has been decided but detail design is not finalized. It is estimated that the amount	Zone 2A & 2B	ESA

Sub-project	Related ongoing activities under PSDSP and Other Projects	Proposed Investments/Sub-projects to be undertaken by PRIDE project	Activities under IMD or Zone 2A & 2B	Included in ESA/ESMF
		of solid waste generated from zone-2A and 2B will be 464 tons/day. This will include industrial (both hazardous and non-hazardous) and organic solid wastes. Municipal solid waste and domestic sewage can be collected from the point sources throughout BSMSN.		
Sub-project B.6: Construction of a biogas plant, waste sorting and material recovery facility	Not yet started	A biogas plant will be constructed on two acres of land to process up to 300 tons of municipal solid waste per day.	Zone 2A & 2B	ESA

3.7 Description of the Sub-Projects (Interventions considered for this ESA under PRIDE)

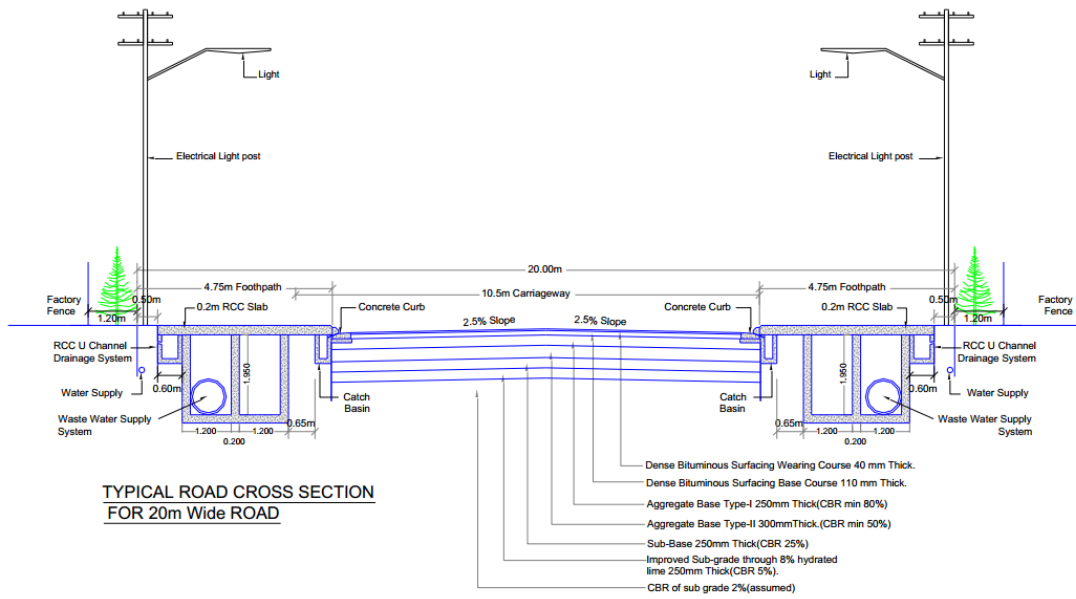
3.7.1 Sub-project A.1: Construction of arterial and non-arterial roads, footpath and plot entry culvert

Under PRIDE project, it is expected that there would be funding for construction of approximately 30km of arterial and non-arterial roads, footpath and plot entry culverts. A concrete surface road is selected for the internal road in the economic zone in terms of resistance against heavy rain and heavy truckload that is very common in economic zones. Two types are selected for the road network design; main road (width: 30m) and minor road (width: 20m). The main road is divided by the central median. The carriageway of each direction of traffic is 9 m. A 5 m sidewalk is also provided on both sides of the road. Plants are provided on the median and street lightings are provided on the median of the main road. The minor road is supposed to be an undivided 2-lane type which carriageway is 10.5 m. A 4.75 m sidewalk is to be also provided on both sides of the road. Street lightings are to be provided on both sides of the sidewalk. As provided in the pre-feasibility report of Mirsharai EZ-II, the cross sections of the main and minor road are shown in **Figure 3-4** and **Figure 3-5**. Typical cross section of a road pavement in zone 2A & 2B is given in **Figure 3-6**.



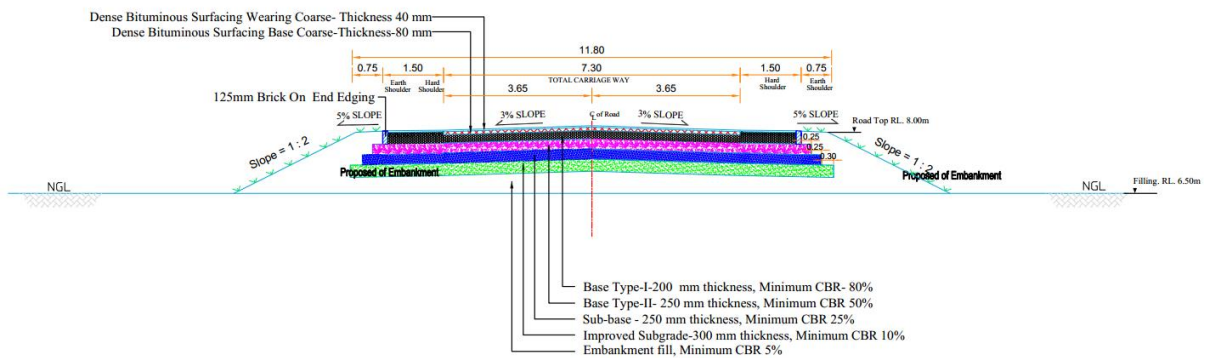
Source: Pre-feasibility Study Report of Mirsharai EZ-II, 2016

Figure 3-4: Typical Cross Section of Major Road



Source: Pre-feasibility Study Report of Mirsharai EZ-II, 2016

Figure 3-5: Typical Cross Section of Minor Road



Source: BEZA

Figure 3-6: Typical Cross Section of A Road Pavement in 2A & 2B

3.7.2 Sub-project A.2: Construction of storm water management network

Under the PRIDE project, there will be funding for construction of approximately 30km of integrated stormwater management network including resilient drains, infiltration and retention facilities. As shown in the typical cross sections of the roads, it is evident that the storm water management network will run along the major and minor roads through utility ducts. The stormwater management network will finally be discharged into Ichakahali khal.

3.7.3 Sub-project A.3: Water supply network

A surface water treatment plant of capacity 50 MLD (Phase-1) will be constructed at Poshchim Ichakhali Mouza in the east side of CDSP embankment. Water will be withdrawn from Feni River at about 2.5 km upstream of the Feni Regulator. Raw water transmission main of about 9.5 km is required to carry the river water to the treatment plant. After treatment the water will be carried through treated water transmission main of about 12.4 km near Zone 2A & 2B and will be distributed to industrial plots.

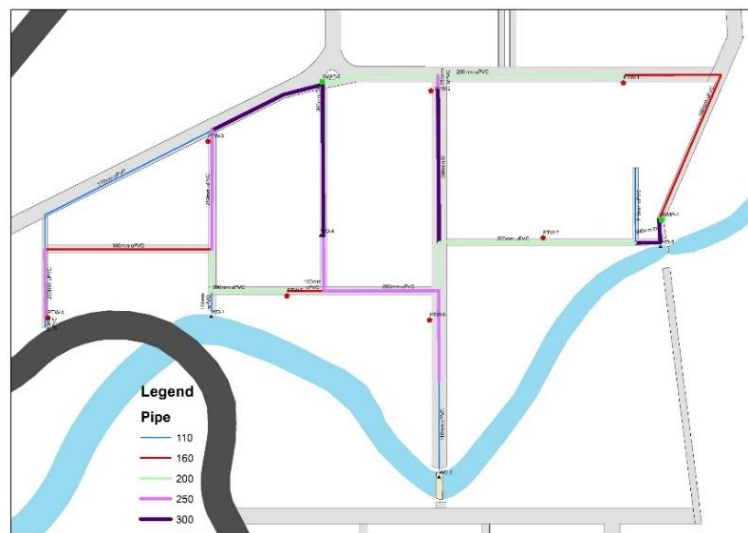
Groundwater is another potential source of water to supply in the economic zones for industrial and other usages. About 10nos. production tube wells (PTW) in zone 2A and 6nos. in Zone 2B has been proposed based on Hydrogeological investment. Average thickness of deeper aquifer in the project area varies from 120m to 205m. The capacity of each PTW will be 1 cusec (28.3 litre/sec). The water quality of the deep aquifer in these are is quite good and the Iron and Arsenic concentrations are within Bangladesh Standard (ECR'97).

Under PRIDE project, it is expected that there would be funding for construction of approximately 25km water distribution network for 2A & 2B.



Source: IWM

Figure 3-7: Water supply distribution network in 2A

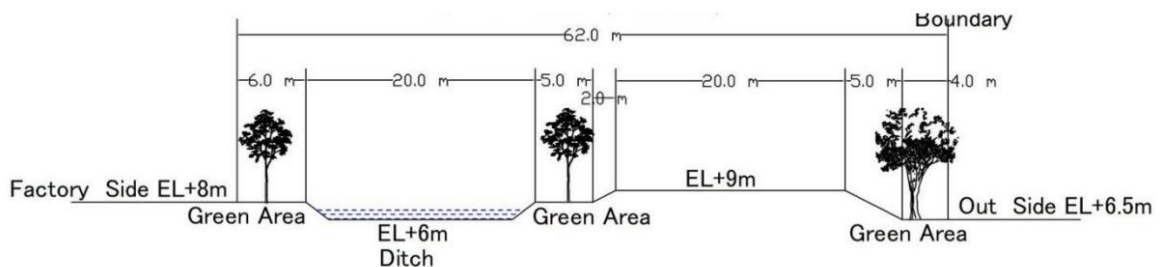


Source: IWM

Figure 3-8: Water supply distribution network in 2B

3.7.4 Sub-project A.4: Site upgradation

Construction of infrastructure and site development measures to enhance flood and liquefaction resilience performance of flood prevention measures (super dike, embankments, site development) through green and gray investments (open space/ landscaping, greenery along road; percolation pits, etc.), infrastructure maintenance.



Source: Feasibility Study of Mirsharai EZ, 2014

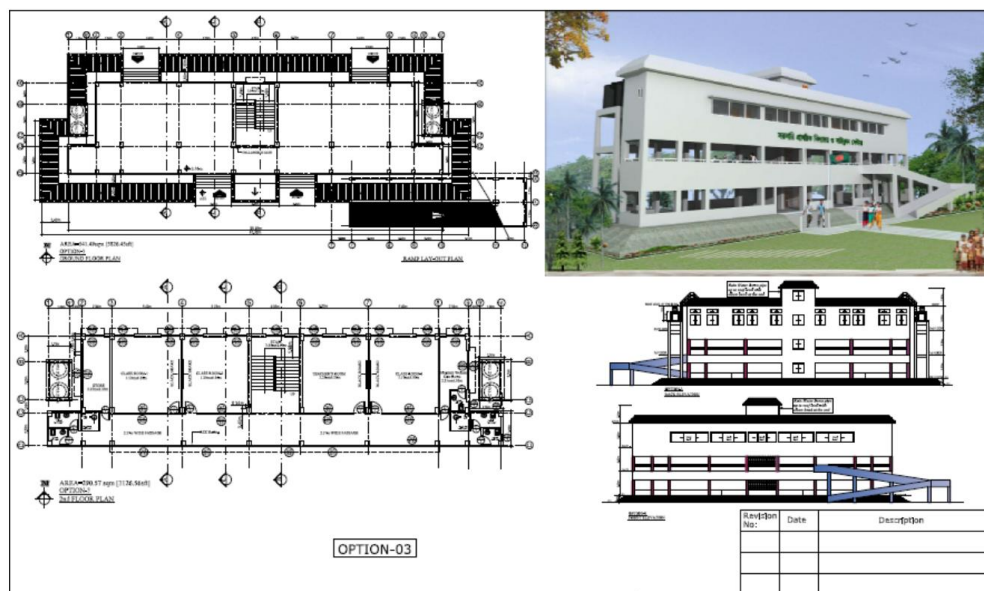
Figure 3-9: Cross-section of dike with green area

3.7.5 Sub-project A.5: Construction of telecommunication network

A total of approximately 30km telecommunication cable network through optical fibre network will be funded under PRIDE project to provide telecommunication services. In the pre-feasibility report of Mirsharai EZ-II, connections in the BEZA administrative office, customs office, proposed power plant, and power supply office and some residential connections, the total numbers of telephone connections is estimated to be 3,500 LU and the number of distribution points is considered to be 800 in 2 phases. The capacity of the telephone exchange, considering future expansion in the surroundings, is assessed to be 6,000 LU and effective number of connections in the 1st Phase will be 2,000LU, proportional internet connections. The number of industries may be more or less than the number of plots.

3.7.6 Sub-project A.6: Construction of some key public buildings and facilities

Under the PRIDE project, there will be funding for some key public buildings and facilities for 2A and 2B such as fire stations and cyclone shelters that serve as an emergency response and operation centre in the event of disasters.



Source: Multi-Purpose Disaster Shelter Project (MDSP), LGED, 2014

Figure 3-10: Building layout of a typical cyclone shelter

3.7.7 Sub-project A.7: Construction of Internal Power Distribution Network

Construction of approximately 30km of Internal Power Distribution, Transformer, Street Light (LED / Solar), Internal Substation, Fire Hydrant, etc. The alignment and designs of the power distribution network are not finalized.

3.7.8 Sub-project B.1: Construction of a Common effluent treatment plant (CETP)

A CETP with a capacity to treat 48,000 m³/day. 18 acres' land have been earmarked to for the CETP where influent norms at the inlet will be set at BOD5 – 600 mg/L, COD – 1260 mg/L and TDS – 2100 mg/L. The design of the CETP is not finalized. It is envisaged that (i) CETP capacity will be enhanced in modular phases. The civil works will be constructed at capacity, but the electromechanical equipment will be commissioned in phases. (ii) the effluent network will be built in a single phase and the operations will be carried out based on effluent load. (iii) 70 percent of treated effluent can potentially be supplied for reuse and the pumping station will be constructed at capacity. The pump and rising main will be installed in phases. The initial electromechanical capacity of the CETP is

planned for 16 MLD and it will increase to 48 MLD by the 9th year when all industries in BSMSN-2A and BSMSN-2B are expected to require full utilization. The reused water pipeline will be constructed to support 17 MLD reused water initially and it could ultimately be augmented to 34 MLD by the 9th year.

3.7.9 Sub-project B.5: Development of a landfill site for solid waste generated

It is estimated that the amount of solid waste generated from zone-2A and 2B will be 464 tons/day. This will include industrial (both hazardous and non-hazardous) and organic solid wastes. Municipal solid waste and domestic sewage can be collected from the point sources throughout BSMSN.

The landfill will be provided with a bottom liner system that serves as an impermeable barrier between the waste mass and underground soils / groundwater; leachate collection layer to ensure proper drainage and management of leachate that will be pre-treated and discharged to sewer; and a final cover system and stormwater management controls that consider land fill gas management and protection of the landfill site against heavy rainfall. Other design factors, such as improved billing and recording system to monitor types of waste and volumes, buffer areas (approximately 118 acres) to minimize disturbance to industrial tenants and residents, connection with other utilities such as road network leading to the landfill, and groundwater and gas monitoring networks will be also taken into consideration.

The landfill will have to be accompanied by other environmentally sustainable waste management options such as biogas plants, particularly because the availability of land is limited. Bioconversion of Municipal Solid Waste (MSW) is environmentally sustainable and cost effective. Biogas produced from organic waste can be used locally for the generation of electricity and heat or it can be upgraded for injection into the natural gas network and/or used as a transport fuel.

3.7.10 Sub-project B.6: Construction of a biogas plant

A biogas plant will be constructed on two acres of land to process up to 300 tons of municipal solid waste per day. The waste sorted at the waste sorting facility will be used as feedstock to generate approximately 3 MW of biogas. The site and design of the biogas plant, waste sorting and material recovery facility is yet to be finalised.

3.8 Risk categorization of PRIDE Project

Considering the potential impact during construction of various large infrastructure such as construction of central effluent treatment, sanitary landfill, etc. and potential impact during operation of these infrastructure along with operation of the individual industry and considering the capacity of the implementing agency for assessment and management of E&S risk, PRIDE project falls under “High Risk” category according to the WB’s ESF.

3.9 Associated Facilities

There may be activities/investments (not funded under the PRIDE project) that would be considered as Associated Facilities for this project. Associated Facilities will need to meet the requirements of the ESSs, to the extent that BEZA has control or influence over such Associated Facilities. A screening form has been provided as **Annex E** to identify whether future activities would be associated facilities or not.

3.10 Implementation Schedule

The PRIDE project is going to be implemented for five (5) years starting from July 2020. The detail implementation schedule is not available right now. When it becomes available, it will be reflected in this part.

CHAPTER 4. ENVIRONMENTAL AND SOCIAL BASELINE

4.1 Introduction

As part of the Environmental and Social Assessment (ESA) of the activities in zone 2A & 2B, an environmental and social baseline survey was carried out in and around the project locations. The specific objectives of the baseline study were:

- To gather information on the existing physical environment, biological-ecological environment and socio-economic environment;
- To identify the significant environmental and social aspects that are likely to be affected by the proposed subprojects activities; and

Relevant information on climate, topography, drainage, geology, soil characteristics, hydrology and water resources, air quality, noise level, soil & sediment quality water quality, etc. have been described in this chapter. Moreover, baseline information on ecological environment & socio-economic environment have also been described in this chapter. Data sources for various environmental and social parameters are given in **Table 4-1**.

Table 4-1: Data Sources for Various Parameters

Sl. No.	Data/Information	Source
01	Physio-chemical Environment (Temperature, Rainfall, Humidity, Wind Regime and Sun-shine Hour) Data (Secondary)	BMD
02	Ambient Air Quality Data (Primary)	In situ Measurement by Enviro Consultants Ltd. appointed by IWM
03	Surface Water Data (Primary)	Sample collected by IWM & Tested in DPHE Central Laboratory
04	Groundwater Data (Primary)	Sample collected by IWM & Tested in DPHE Central Laboratory
05	Groundwater Data (Secondary)	DPHE
06	Noise Level Data (Primary)	In situ Measurement by IWM
07	Soil and Sediment Data (Primary)	Sample collected by IWM & Tested in SRDI Laboratory
08	Demographic (Population, Religion, Culture and Literacy) Data (Secondary)	BBS, 2011
09	Income and Poverty (Employment Status and Wage Market) Data (Secondary)	BBS, 2011
10	Infrastructure Facilities (Housing Pattern, Water Supply and Sanitation) Data (Secondary)	BBS, 2011
11	Women and Their Literacy and Employment Status Data (Secondary)	BBS, 2011
12	Gender Based Violence	BBS, 2016

Test Report of all primary data is attached as **Annex C**.

4.2 Baseline Data Collection

As a part of baseline survey air, water & soil sample were collected from the study area and sent to Laboratory for analysis. Ambient noise quality was measured from different locations of the study area. Data collection procedure, location & time are described within this section.

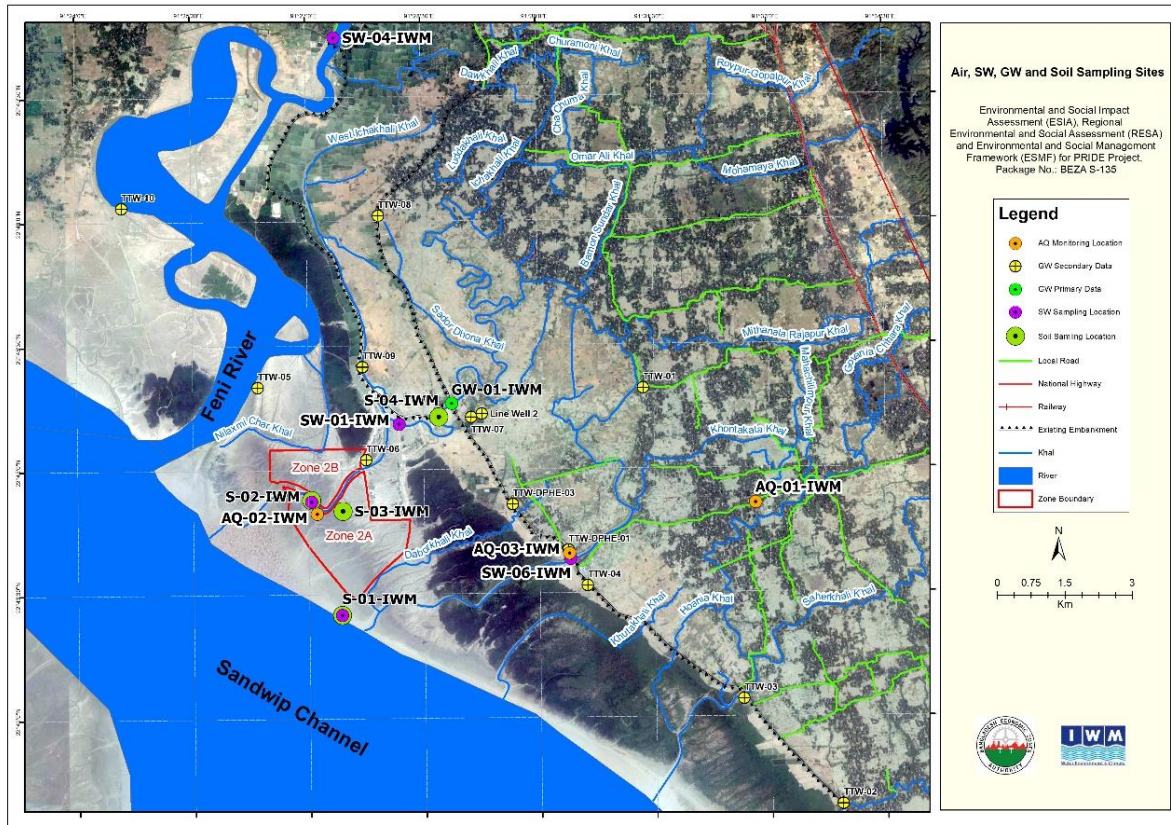


Figure 4-1: Ambient air quality measuring and Surface water, Groundwater, Soil & Sediment sampling locations map

4.2.1 Ambient air quality monitoring locations

Ambient air quality data was collected at three (03) locations of the project area for 12 hours. The air quality measuring locations were selected based on the locations of settlements and receptors within the project area. Logistical factors such as consent of villagers/community, mainly the house owners, power connection, accessibility, security, etc. were also taken into account in finalizing the monitoring stations. Air quality measurements were conducted at the following location (**Table 4-2**) on 8/11/2019 and 28/11/19. The pictorial evidence of the AQ testing is shown in **Figure 4-2**.

Table 4-2: Air Quality Sampling Location

Sl. No.	Latitude	Longitude	Location Name
01.	22°44'37.52"N	91°32'37.85"E	Near Moghadia Nurul Absar Chowdhury High School
02.	22°44'31.52"N	91°26'55.89"E	Within 2A & 2B Zones
03.	22°44'1.74"N	91°30'12.24"E	Near Bamon Sundar Khal



Figure 4-2: Air quality measurement near Moghadia Nurul Absar Chowdhury High School

4.2.2 Surface water quality sampling locations

Surface water quality samples were collected from Ichakhali khal (2 samples), Bamon Sundar khal, Bay of Bengal and Feni River on 5th November, 2019. Locations of these samples are shown in **Table 4-3**.

Table 4-3: Surface Water Sampling Locations

Sample ID	Latitude	Longitude	Location Name
SW-01-IWM	22°45'36.0"N	91°28'00.3"E	Ichakhali Khal U/S (Near BWDB Rest house gate)
SW-02-IWM	22°44'40.4"N	91°26'51.5"E	Ichakhali Khal D/S
SW-03-IWM	22°42'29.0"N	91°27'22.6"E	Sea Shore
SW-04-IWM	22°50'16.0"N	91°27'11.7"E	Muhuri Sluice Gate
SW-06-IWM	22°43'57.7"N	91°30'13.5"E	Bamun Sundar Khal D/S

4.2.3 Ground water quality sampling locations

One groundwater sample was collected from a deep tube well on 05/11/2019 near the project area. Location of the sample is shown in **Table 4-4**. Moreover, other secondary ground water data have been obtained from previous water demand and water resource assessment study performed by IWM (2019).

Table 4-4: Ground Water Sampling Location

Sample ID	Latitude	Longitude	Location Name
GW-01-IWM	22°45'50.8"N	91°28'41.4"E	Near Ichakhali Sluice Gate

4.2.4 Ambient noise level monitoring locations

As a part of the baseline assessment, noise level measurements were carried out at 12 different locations in and around the project area (**Figure 4-3**). Sound level measurements were taken on November 2019 during daytime time using a data logging sound level meter (Extech HD600). The purpose of ambient noise level measurement was to determine the sound intensity in and around the project area. These locations are chosen in such a way that a representative data could be recorded all over the project area. Noise level measurement was recorded for 10 minutes for each location.

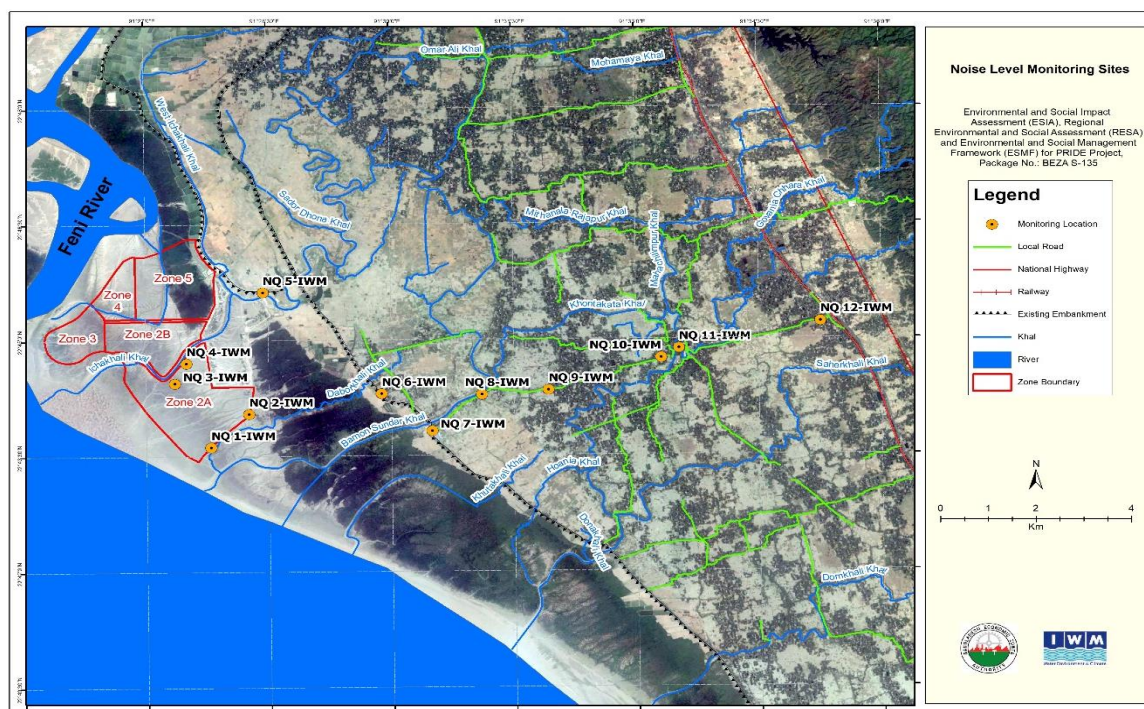


Figure 4-3: Sound level measuring locations within map

4.2.5 Soil and sediment quality sampling locations

Two soil and one sediment samples were collected within the project area on 5th November, 2019 for quality analyses. The three (03) soil samples were collected from sea shore, Zone 2A site whereas, one (01) sediment sample was collected from Ichakhali Khal bed. Standard sampling procedures were followed by IWM to ensure the quality of sample collection. After collection, samples were sent to the Soil Resource Development institute (SRDI) Laboratory, Dhaka for soil constituents analyses.

Table 4-5: Soil sampling location

SL	IWM ID	GPS Coordinate		Location	SRDI ID
		Latitude	Longitude		
1	S-01-IWM	22°43'28.7"N	91°27'22.5"E	Sea-shore	7568
2	S-02-IWM	22°44'41.4"N	91°26'51.5"E	Ichakhali Khal Bed	7569
3	S-03-IWM	22°44'33.3"N	91°27'16.0"E	Developed Land	7570

4.3 Assessment of Environmental Baseline

4.3.1 Physio-Chemical Environment

4.3.1.1 Climate

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 winds flowing predominantly from the south-west during summer and the comparatively dry and colder north-western winds during winter. The project area lies in the South-Eastern climate zone of the country and shows three main seasons, i.e.

- **The Southwest Monsoon:** May to October- 90% of the annual rainfall occurs during this period and relative humidity is high.
- **The Northeast Monsoon:** It lasts from November to March.

- **The Hot Season:** This hottest season extend from about late March to May. The highest daily temperatures generally occur at this time, and Flash floods often occur from the rivers entering the eastern part of the region from the Tripura Hills.

The climate is tropical in Chattogram. Chattogram has significant rainfall most months, with a short dry season. Meteorological condition has been established using data on different metrological parameters accumulated from Bangladesh Meteorological Department for Chattogram Division. Average annual climate data of the Study area are shown in **Table 4-6**.

Table 4-6: Average Annual Climate Data of Study area (Average data from 2009 to 2018)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	18.01	21.55	25.49	28.03	28.46	28.4	27.96	28.1	28.17	26.99	23.47	19.4
Min. Temperature (°C)	7.42	10.14	14.63	19.12	20.89	22.63	24.18	24.04	24.04	19.51	13.93	9.60
Max. Temperature (°C)	30.7	33.4	35.8	36.6	35.9	35.6	34.9	34.6	35.7	35.4	34.2	31.1
Precipitation / Rainfall (mm)	2.6	31.1	40.1	164.6	296.5	734.8	858.8	630.3	427.1	212.6	15.8	5.6
Humidity (%)	78.7	74.2	76.4	80.1	82.3	86.5	87.8	87.3	86.8	85.1	81.4	74.5
Avg. Wind speed (Kmph)	3.11	4.63	5.56	6.26	5.3	5.39	5.52	4.76	4.8	4.06	2.33	3.15

Source: Bangladesh Meteorological Department (Sitakunda Station)

Summary of the analysis of metrological parameters are given in the following sections:

4.3.1.2 Temperature

The temperature of the country is related to the period of rainfall. In general, cool seasons coincide with the period of lowest rainfall. Error! Reference source not found. shows the monthly average mean, maximum and minimum temperature of the study area. Maximum average temperature over the year is usually observed in April - September and minimum average temperature in January.

4.3.1.3 Rainfall

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 May to October 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. Even though the temporal pattern of rainfall is pretty much similar throughout the country, there is pronounced spatial variation of rainfall over the country with the north-eastern and south-eastern part of the country receiving relatively higher amount of rainfall compared to the western part. The project area receives around 3419 mm rainfall annually, which is much higher than the average annual rainfall of the country (i.e. 2400 mm). **Table 4-6** shows the monthly average precipitation/rainfall (mm) of the study area.

4.3.1.4 Humidity

The spatial and temporal variation of Relative Humidity throughout the year is very low in Bangladesh. In the project area, the relative humidity varies from 74% to 87%. **Table 4-6** shows the monthly average humidity (%) data of the study area.

4.3.1.5 Wind regime

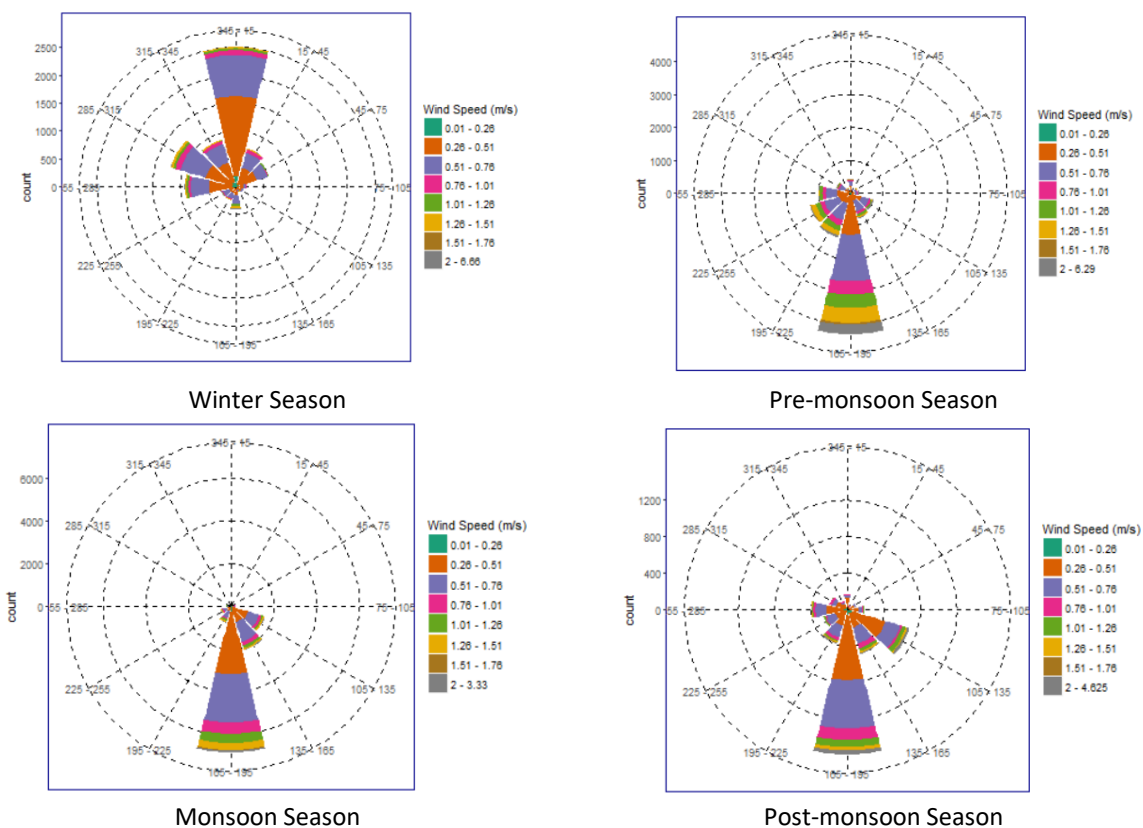
The winter season in Bangladesh comprises of December, January and February. During the winter season (December, January and February) the north-easterly winds prevail over the country blowing from land to sea except northern hilly areas where mainly easterly wind prevails. During the summer season (March to May) heating belt shifts northward due to the apparent northward movement of

the sun. The summer months’ experience high temperature and falling of air pressure over the country. Thunderstorms are very common during this season over the country. In this season, localized thunderstorms associated with violent winds, torrential downpours and occasionally hail occurs. These are locally known as the ‘Kalbaishakhi’.

Generally, monsoon season onsets early June and withdraws by the end of September in Bangladesh. During this season, the persisting low pressure over northern India and Bangladesh intensifies and attracts the trade winds of the southern hemisphere.

The post-monsoon season in Bangladesh continues from October to November. During this season the low-pressure trough over Bangladesh territory becomes weakened and gradually replaced by a high-pressure system. The low-pressure conditions transfer to the Bay of Bengal by early November resulting in the formation of depressions which of them sometimes intensified into a cyclonic storm. Wind direction from October to February is the calm condition followed by wind speed of 4.63 kmph to 2.33 kmph. In the rest of the months, the predominant wind speed is 6.26 to 4.7 kmph. This indicates the weather conditions are favourable for the dispersion of the pollutants released in the air. The monthly wind trend: NE and NW wind prevail in November to February; wind flows multi-directional in March and October; the predominant wind direction is south followed by SE and SW in April; in May the wind direction is south and SE, the predominant wind direction is SE followed by south in June to September.

Seasonal wind pattern of Chattogram station of BMD is provided in **Figure 4-4**.



Source: *Climate of Bangladesh, A joint report by Norwegian Meteorological Department and Bangladesh Meteorological Department, May 2016*

Figure 4-4: Distribution of wind direction of Chattogram during different Season

4.3.1.6 Sunshine Hours

The monthly average sun-shine hour in Sitakunda varies from 4 to 9 hour/day in a year. Highest sunshine hours are recorded in month of April, May and June. In general, maximum average sunshine hour of 12 hours in a day is found in April, May and June.

4.3.2 Ambient Air Quality

Summary of the ambient air quality results are presented in **Table 4-7**. From the analysis it is observed that the concentration of all the parameters are below the allowable limit as per DoE standard (Bangladesh) at Moghadia Nurul Absar Chowdhury High School. In case of 2A & 2B zones, SPM, PM₁₀ and PM_{2.5} values are above the DoE standard because of some ongoing construction activities. This assessment is performed to evaluate the baseline of air quality at study area since during construction period there will be chance to change the air quality due to generation of dust and construction vehicles emission. Thus, during construction work air quality will be periodically monitored and will compare with baseline data.

Table 4-7: Results of Ambient Air Quality

Sample Location with GPS Coordinate	Ambient Air Pollution Concentration in $\mu\text{g}/\text{m}^3$					
	SPM	PM ₁₀	PM _{2.5}	SO ₂	NO _x	co
Moghadia Nurul Absar Chowdhury High School (GPS coordinate: 22°44'37.52"N 91°32'37.85"E)	88.52	62.96	18.90	LOO	63.67	NII
Within 2A & 2B Zones (GPS coordinate: 22°44'31.5"N & 91°26'55.9"E)	255.14	161.90	68.17	31.22	45.98	NII
Near Bamon Sundar Khal (GPS coordinate: 22°44'1.74"N & 91°30'12.24"E: AQ-03-IWM)	196.61	147.29	55.74	26.02	32.16	NII
Unit	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	ppm
Method Analysis	Gravimetric	Gravimetric	Gravimetric	West-Geake	Jacob & Hochheiser	Sensor
Duration	8	24	24	24	24	1
DoE (Bangladesh Standard)	200	150	65	365	100	35

4.3.3 Water Resources

4.3.3.1 Surface Water System

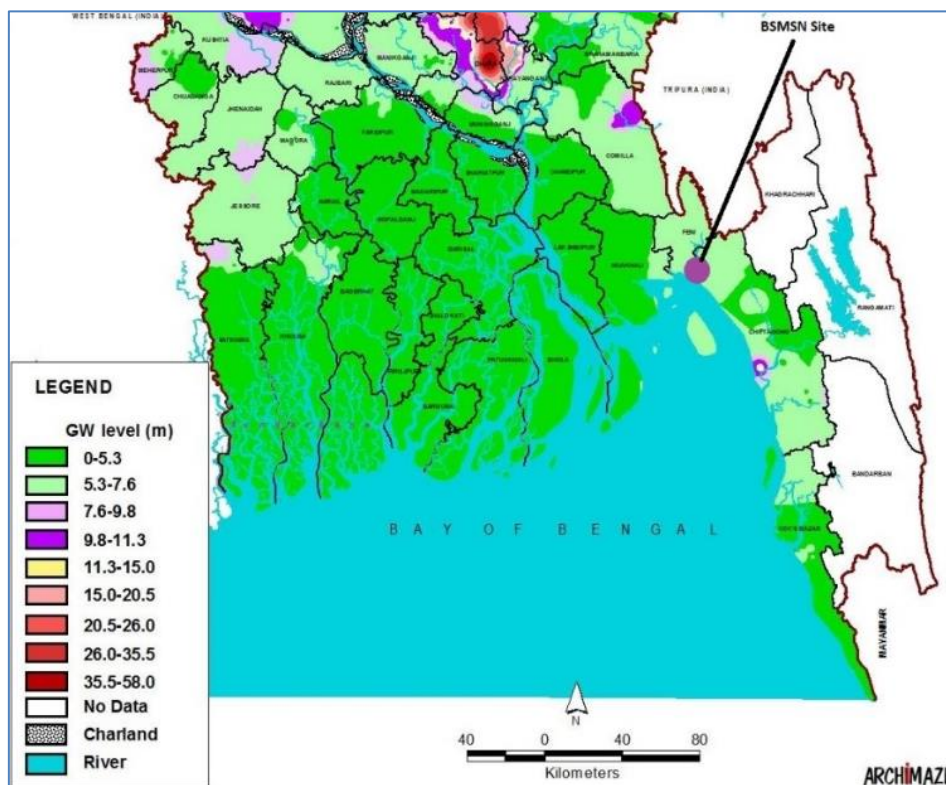
Major water body adjacent to section 2A & 2B are Feni River, Ichakhali canal, Daborkhali khal and Bamon Sundar Canal. Feni River originates in the eastern hills of Tripura and enters Bangladesh at Belchhari of Matiranga Upazila of Khagrachhari District. It flows through Ramgarh (Khagrachhari), Fatikchhari (Chattogram) and then flows along the border of Chattogram (Mirsharai Upazila) and Feni (Chhagalnaiya, Feni, Sonagazi Upazila) districts, before discharging into the Bay of Bengal near Sonagazi. The length of the river is 108 Km. The principal tributary of the Feni River is the Muhuri River, which drains the Feni plain. Lemua canal is also a tributary to this river. Project site lies in the flood plain of Feni River. Ichakhali canal pass within the project area (2A & 2B). Without proper management of solid & liquid waste from different construction activities & Labour camp, water of these water bodies may pollute. Other waterbodies in the 10 km radius area are Kachoppia khal, Jailiachora khal, Kananchori khal, Maidrchora khal and Lambakhali khal. Water pollution of these water bodies are not possible during construction of different subprojects of PRIDE project, construction activities of PRIDE project are very site & time specific.

4.3.3.2 Groundwater System

Chattogram District is covered with Piedmont and estuarine deposits. These deposits have transmissivity of 400 sqm/day. These deposits are not favourable aquifers for extensive withdrawal. Aquifer material is covered with 25-30m thick zone of silt and clay. Clay thickness gradually increases towards the Bay. Sandy materials are predominantly medium to coarse. A shallow aquifer of about 20-50m thickness exists near the surface. Main aquifer is deep seated whose nature and extent are not known. Shallow aquifer exists at a depth of about 50m depth to the main aquifer is not precisely known. Aquifers are semi-confined to confine in nature. Transmissivity of the Chattogram district varies from 114-600 sqm/day. Storage coefficient varies from 0.0007 to 0.03. Permeability of the aquifer varies from 3-10 sqm/day.

There is currently heavy use of groundwater for irrigation which is used to support the shortfall of surface water. Shallow groundwater is available within 2 to 4m below the ground surface in the project area but its quality it is not good and availability is variable. The groundwater is exploited by shallow tube wells for irrigation and deep tube wells with hand pumps for drinking water. There are a few deep tube wells where good quality water can be abstracted at a depth of greater than 150m for irrigation these can potentially provide yields of about 20 l/s. Ground water zone map of the study area is given in Figure 4-5.

Recharge of groundwater in the project area occurs by slow vertical percolation of rain irrigation water, seepage loss of the run-off the rivers and stored water in canals, khals, streams and rivers in groundwater. There is net groundwater inflow from the uplands to the north which may be a main source of recharge. The rate of percolation of water derived from rainfall to the aquifer is retarded due to thickness and impermeability of the upper clay layer. Recharge begins from the month of May peaks during August; the upper water bearing horizons quickly become saturated and due to the heavy surface soil, much of the potential recharge is rejected.



Source: Final Report on Reduced Level (RL) Detection of Deep Tube Well and Shallow Tube Well, BADC, 2015

Figure 4-5: Groundwater Zoning Map

4.3.3.3 Surface Water Quality

As a part of the baseline survey, efforts were made to collect available information on surface water from in and around the project area. Four sample of surface water were collected from Ichakhali canal (2 samples), Bay of Bengal (01 sample) and Feni River (Muhuri Sluice Gate-01 sample) on 05 November 2019. One more sample from Bamon Sundar canal was collected on 27 November, 2019. Analysis results shows in **Table 4-8**. By comparing the surface water samples, it is evident that most of the water quality parameters of Bamon Sundar Khal have exceeded the surface water quality standard of Bangladesh. In case of Ichakhali Khal, the water is saline, whereas Feni River water quality is non-saline. Moreover, BOD level of all surface water samples has exceeded the surface water quality standards.

Table 4-8: Characteristics of collected surface water samples

SL#	Water Quality Parameters	Bangladesh Standard	Concentration Present					Unit	Analysis Method	LOQ
			Ichakhali Khal 1 (SW-01-IWM)	Ichakhali khal 2 (SW-02-IWM)	Sea shore (SW-03-IWM)	Feni river (SW-04-IWM)	Bamon Sundar Khal (SW-06-IWM)			
1	Alkalinity	-	132	135	102	82	130	mg/L	Titrimetric	-
2	Ammonia	0.5	0.18	0.13	0.26	0.29	0.68	mg/L	UVS	0.1
3	Biochemical Oxygen Demand (BOD)	0.2	1	1	2	1	17	mg/L	5 days incubation	0.1
4	Cadmium (Cd)	0.005	0.00015	0.00015	0.00026	0.00019		mg/L	AAS	0.00015
5	Chemical Oxygen Demand (COD)	4.0	4	4	8	8	72	mg/L	CRM	-
6	Cr (Total)	0.05	0.02	0.03	0.03	0.04	0.01	mg/L	AAS	0.0003
7	Hardness	200-500	725	822	1182	235	2165	mg/L	Titrimetric	-
8	Lead (Pb)	0.05	0.015	0.012	0.020	0.025		mg/L	AAS	0.001
9	Manganese (Mn)	0.1	0.75	0.22	0.86	0.04	0.16	mg/L	AAS	0.03
10	Nickel (Ni)	0.1	0.04	0.04	0.06	0.03		mg/L	AAS	0.01
11	Salinity	-	3.22	3.68	6.65	0.09	10.25	ppt	Multimeter	-
12	Total Dissolved Solid (TDS)	1000	3150	3610	6580	92	10100	mg/L	Multimeter	-
13	Total Suspended Solid (TSS)	10	15	12	16	7	13	mg/L	Gravimetric Method	-
14	Turbidity	10	457	71	726	23	265	NTU	Turbidity Meter	-
15	Zinc (Zn)	5.0	0.08	0.07	0.08	0.08		mg/L	AAS	0.05
Comments: Sample was collected & supplied by client N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, CRM- Closed Reflex Methods, LOQ- Limit of Quantitation.										

Note: Complete result of Bamon Sundar canal sample is yet to be received from DPHE lab, Mohakhali.

4.3.3.4 Ground Water Quality

As a part of the baseline survey, efforts were made to collect available information on tube well water from deep tube well. One groundwater sample was collected on 05/11/2019 near the 2A & 2B area and was analysed from DPHE lab, Mohakhali, Dhaka. **Table 4-9** shows results of ground water quality analysis. It is evident from the test result that the water of deep aquifer (confined) is of good quality. However, level of lead was found marginally above the drinking water quality standard of Bangladesh which calls for necessity of test of ground water before using such tube wells for the purpose of drinking.

Table 4-9: Characteristics of Collected Ground Water Samples

SL#	Water Parameters	Quality	Bangladesh Standard	Concentration Present	Unit	Analysis Method	LOQ
1	Arsenic (As)		0.05	0.001	mg/L	AAS	0.001
2	Calcium (Ca)		75	28	mg/L	AAS	0.17
3	Colour		15	1.0	Hazen	UVS	-
4	Fluoride		1.0	0.14	mg/L	UVS	0.12
5	Hardness		200-500	160	mg/L	Titrimetric	-
6	Iron (Fe)		0.3-1	0.84	mg/L	AAS	0.05
7	Lead (Pb)		0.05	0.068	mg/L	AAS	0.001
8	Magnesium (Mg)		30-35	6	mg/L	AAS	0.05
9	Manganese (Mn)		0.1	0.04	mg/L	AAS	0.03
10	Salinity		-	0.22	ppt	Multimeter	-
11	Zinc (Zn)		5.0	0.08	mg/L	AAS	0.05

Comments: Sample was collected & supplied by client

N.B: AAS- Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, LOQ- Limit of Quantitation.

Secondary data of eleven existing exploratory wells and two DPHE wells including details of the location, tube well depth and field test result have been shown in **Table 4-10**. These data also suggest that some of the parameters such as arsenic, iron and manganese level are above the acceptable drinking water quality indicating that water quality needs to be tested before using any existing or newly sunk tube well before using such source as drinking water.

Table 4-10: Existing Wells Groundwater Quality Test Results (Field Kit) of Secondary Data

Existing Groundwater Quality test results at field, BSMSN area, Mirsarai, Chattogram											
Well ID	Location	Latitude (N)	Longitude (E)	Well Depth (m)	Fe (mg/l)	As (mg/l)	Mn (mg/l)	EC (µS/cm)	TDS (mg/l)	pH	Temp. (°C)
Bangladesh Standard					0.3-1.0	0.05	0.10	600-1000	1000	6.5-8.5	20-30
TTW-01	Banatoli	22.7669	91.5197	179.73	6.0	0.01	Nil	755.0	339.0	7.4	29.5
TTW-02	Dhumkhali	22.6829	91.5622	192.07	1.5	Nil	Nil	1590.0	732.0	7.53	29.4
TTW-03	Shaherkhali	22.7048	91.5416	176.78	2.5	Nil	Nil	892.0	404.0	7.76	29.2
TTW-04	Near CP Moor	23.7273	91.5073	182.93	0.5	Nil	Nil	702.0	307.0	8.11	28.3
TTW-07	South Ichakhali	22.7615	91.4823	170.08	1.5	Nil	Nil	642.0	281.0	7.84	30.0
TTW-08	Chunimidhir Tek	22.8019	91.4625	185.97	>7.0	0.01	0.40	3550.0	1566.0	7.06	29.8
TTW-09	NW Side of Cyclone Center, near zero point	22.7715	91.4589	134.19	3.5	Nil	Nil	2470.0	1127.0	7.48	30.2
TTW-10	South Char Chandia, Sonagazi, Feni	22.8014	91.3909	213.41	1.0	Nil	Nil	689	290	7.52	29.7
Line well -2	South Ichakhali	22.7614	91.4823	39.53	7.0	0.15	0.20	9590.0	4650.0	7.63	30.1
TTW-DPHE-01	Ichakhali	22.7646	91.4786	237.80	3.0	0.01	Nil	2350.0	1076.0	7.47	30.0
TTW-DPHE-03	Near PTW-03_DPHE	22.7672	91.4768	237.80	2.0	Nil	Nil	706.0	297.0	7.59	29.6

Source: BEZA (2019), Draft Final Report on Water Demand and Water Availability Assessment by IWM

The major constituents (Na⁺, Cl⁻ and HCO₃⁻), minor constituents (Fe) and some trace elements (As and Mn) of these 13 nos. of secondary data have been determined periodically in the Laboratory. Laboratory analysis results of these 13 nos. of secondary data have been given in **Table 4-11**.

Table 4-11: Periodic Water Quality Laboratory Analysis of Different Wells (Secondary Data)

Periodic water quality laboratory analysis in wells, BSMSN area, Mirsarai, Chattogram															
Well ID	Location	Well Depth (m)	HCO ₃ (mg/l)		Na (mg/l)		Cl (mg/l)		As (mg/l)		Fe (mg/l)		Mn (mg/l)		
			Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current	
Bangladesh Standard for Drinking Water ECR'97			--	--	200	200	150-600	150-600	0.05	0.05	0.3-1.0	0.3-1.0	0.10	0.10	
WHO Guideline Value 2004			--	--	200	200	250	251	0.01	0.01	0.30	1.30	0.40	0.40	
TTW-01	22.767	91.520	179.73	407.5	421.80	157	356.00	15	11	0.002	0.018	0.85	9.00	0.007	0.090
TTW-02	22.683	91.562	192.07	426	453.20	262	360.00	300	11	0.001	0.006	0.1	2.80	0.01	0.114
TTW-03	22.704	91.541	176.78	407.3	417.20	163	259.00	42	250	0.001	0.010	0.1	3.60	0.007	0.140
TTW-04	22.727	91.507	182.93	389	391.20	189	231.00	19	50	0.003	0.004	0.45	0.16	0.008	0.024
TTW-05	22.769	91.434	173.73	265.3		66.5		132.5		<MDL		0.35		0.013	
TTW-06	22.753	91.460	204.22	226.4		122		500		0.001		0.62		0.018	
TTW-07	22.761	91.482	170.08	290.5		51		25		0.001		1.5		0.015	
TTW-08	22.802	91.463	185.97	145	141.40	260	360.20	112.5	1200	0.002	0.015	8.4	19.60	0.187	0.450
TTW-09	22.771	91.459	134.19	254	237.00	142.2	337.40	570	430	0.001	0.007	0.9	4.80	0.036	0.170
TTW-10	22.804	91.407	195.12	231	308.00	256	78.40	95	66	0.001	0.006	0.1	2.00	0.02	0.045
Line well 2	22.761	91.482	39.53		141.4		1720		3500		0.17		7.5		0.228
TTW-DPHE-01	22.765	91.479	237.8		272.2		205	44	590	0.006	0.018	2.38	3.8	0.13	0.14
TTW-DPHE-03	22.767	91.477	237.8		269.3		290	47	55	0.002	0.004	1.79	1.8	0.08	0.041

Source: BEZA (2019), Draft Final Report on Water Demand and Water Availability Assessment by IWM

4.3.3.5 Salinity

River Feni is Major River in the study area. Feni River carries fresh water in upstream, i.e. above coastal embankment (Muhuri Project Road). In down streams water of Feni River is saline due to tidal influence. Salinity is more during lean season. Influx of saline water within the river is controlled with the help of regulators/gates. From the primary data analysis (Table 4-8), it is evident that except for upstream of Feni regulator, other surface water samples are saline in nature. In many parts along the coast of this region brackish/saline water of marine origin renders the groundwater unsuitable for irrigation and potable water supply. In addition, extensive areas are found in the central and western parts of the region where the groundwater salinity exceeds 1000 $\mu\text{s}/\text{cm}$, and 2000–8000 $\mu\text{s}/\text{cm}$ locally (WARPO).

4.3.3.6 Water Demand for 2A & 2B Zones

Water would be required during construction and operation phase. During construction phase, water would be required for activities such as concrete casting, plastering, curing etc. Water would also be required for compaction of road base and sub-bases, dust suppression and for the domestic use of the labor working in the project site. Water would also be required during operation phase of industries. An assessment conducted by IWM (IWM 2019) found the following water demand for the operation of industries in 2A and 2B shown in Table 4-12.

The assumptions for water demand calculation for Zone 2A area:

- Operating land area for industries and other usage are considered as to be 60%.
- Loss along the raw water transmission main and distribution system is considered 15%

Table 4-12: Industry wise daily water consumption

Type of Industry	Daily Water Consumption (m ³ / hectare)
Garment	399
Garment accessories	302
Integrated textile	1921
Motorbike assembly	70
Automobile assembly	56
Automobile parts	18

Type of Industry	Daily Water Consumption (m ³ / hectare)
Other parts & machine	18
Chemical & other products	700
Food & beverage	33
Rental factory	397
Warehouse zone	20

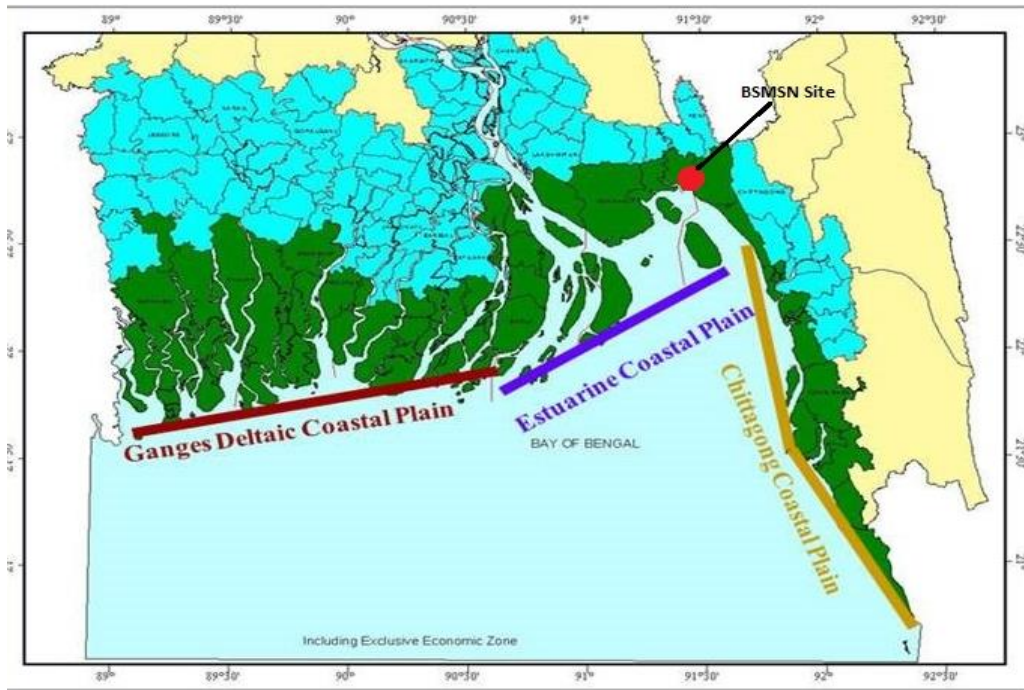
Table 4-13: Daily Water Consumption of Various Land Use

Type of Land Use	Daily Water Consumption (m ³ / hectare)
Commercial	200
Resident/ housing	100
Warehouse	50
Others (clinics & training, services)	100

Considering the above factors, the total water requirement during operation phase of Zone 2A & 2B has been estimated about 50MLD and 30MLD respectively.

4.3.3.7 Tropical Cyclones & Tidal flooding

Bangladesh very often becomes the landing ground of cyclones formed in the Bay of Bengal. This is because of the funnel shaped coast of the Bay of Bengal, most of the damage occurs in the coastal regions of Khulna, Patuakhali, Barisal, Noakhali and Chattogram and the offshore islands of Bhola, Hatiya, Sandwip, Manpura, Kutubdia, Maheshkhali, Nijhum Dwip, Urir Char and other newly formed islands. Project site is located in southeast part of the coastal areas of Bangladesh in the Chattogram District. A map showing the coastal area of Bangladesh is given in **Figure 4-6**. Mirsharai Upazila in Chattogram District where the project site is located falls in the exposed coastal zone. However, the average level of the site is quiet high and full area is developed by sand filling therefore the current project area is free from tidal flooding. Moreover, the area will be protected by a super dyke of elevation 10 mMSL under construction. The super dyke will protect the area from storm surges.



Source: Disaster Management Bureau

Figure 4-6: Coastal Map of Bangladesh

4.3.3.7.1 Historical cyclone data for Chattogram

Numbers of cyclones have struck Chattogram in past and has cause severe damages at few times. As per the cyclone risk zone map (Figure 4-8) of coastal area of Bangladesh, project site is located in the high risk area of Bangladesh. Cyclone risk zone and track map of Bangladesh is given in figures below. Twenty-seven cyclones are recorded in last 56 years that had hit the Chattogram District of Bangladesh.

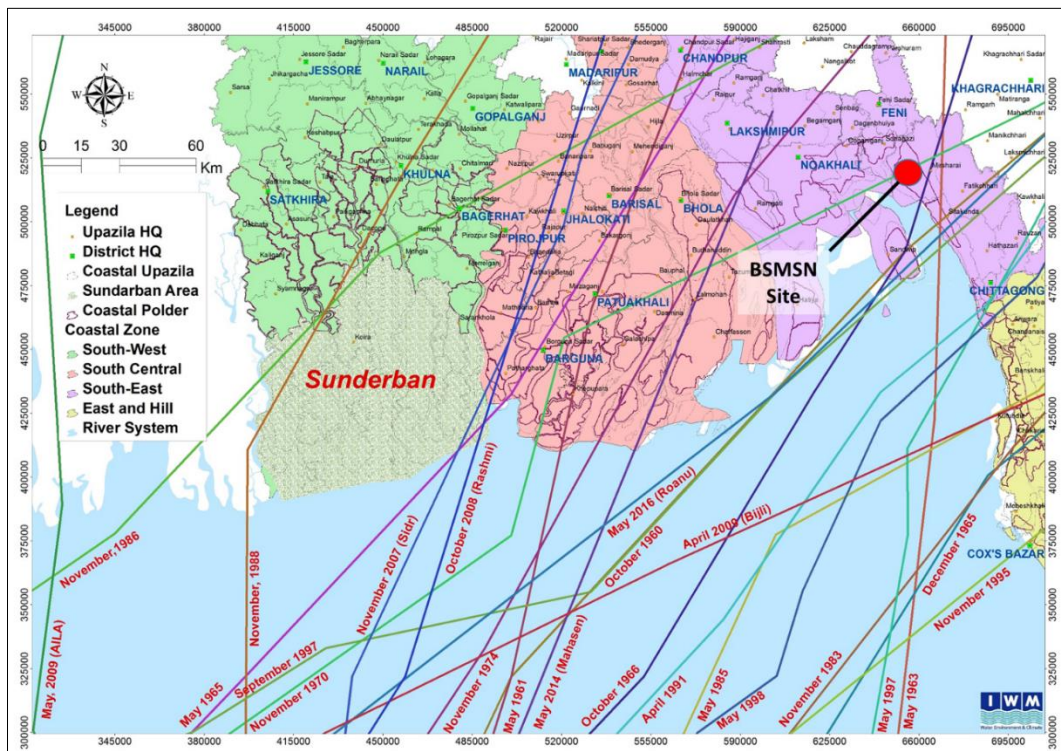
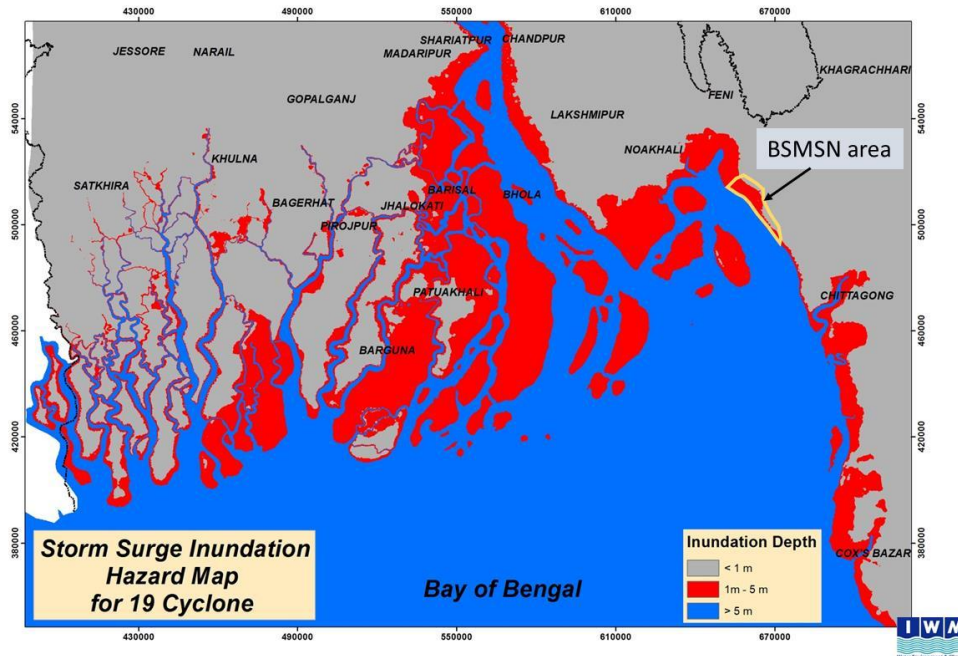


Figure 4-7: Tracks of Major Cyclones (1960-2009)

The inundation risk map (**Figure 4-8**) for storm surge shows that the cyclones in Bangladesh area accompanied by high tides and storm surges. Level of storm surges during the cyclone is highly variable and ranges from 0->6 m. A super dyke is being constructed along the BSMSN area considering the highest storm surges, it is expected that this super dyke will prevent the BSMSN area from future storm surges.



Source: IWM storm surge model study

Figure 4-8: Inundation Risk Map for Storm Surge

Going through the above collected historical data on wind velocity and storm surges during the cyclonic conditions in Chattogram District it is found the maximum height experienced by the coastal belt in the Chattogram area was during the 30th May, 1961, i.e. 6.1-8.8 with wind velocity of 160 kmph. Storm surge of app. 6 m was recorded in Chattogram during 1991 cyclone with wind velocity was around 250 Km/h. Both of these cyclones have caused devastation. 1961 cyclone lead to death of 10466 people and cyclone in 1991 lead to death of 1,45,000 people, 70,000 cattle and lot of crop & property damage. The extensive damage caused a huge increase in the price of building materials. The highest inundation depth having range between 5 m and 6 m lies in the Mirsharai area. Cyclone tracking map (**Figure 4-7**) of the Bangladesh shows the Tropical cyclones from the Bay of Bengal accompanied by storm surges are one of the major disasters in Bangladesh. The country is one of the worst sufferers of all cyclonic casualties in the world. The high number of casualties is due to the fact that cyclones are always associated with storm surges.

4.3.3.7.2 Floods

Bangladesh is prone to flooding; the coastal flooding as well as the bursting of Bangladesh's riverbanks is common and severely affects the landscape of the country. 75% of Bangladesh is less than 10m above sea level and 80% is flood plain, therefore rendering Bangladesh as a nation very much at risk of further widespread damage. Flooding normally occurs during the monsoon season from June to September during the monsoon. The convectional rainfall of the monsoon is added to by relief rainfall caused by the Himalayas. Melt-water from the Himalayas is also a significant input and flood every year. **Figure 4-9** shows the positions of the project site over the flood risk map of Bangladesh. It can be observed that the project area is within costal tidal surge prone area.

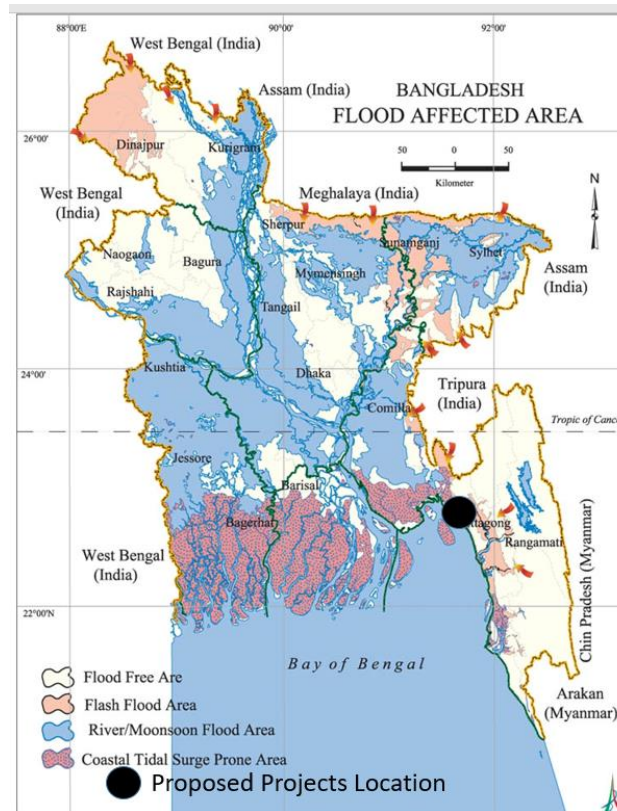


Figure 4-9: Flood Prone Area Map

4.3.3.8 Erosion

From site visit and literatures review, it is observed that project site area has erosion problem. However, the super dike and embankment are likely to protect the EZ from erosion & tidal surge. Thus, the chance of erosion problem would be minimized at project area.

4.3.4 Drainage System

There is no manmade drainage system at project site. However, within the project site there is natural drainage system e.g. Ichakhali canal. Water in Ichakhali canal is controlled with help of sluice gate which is located in SW direction of the project site at entry point of the channel within the site. Upstream area of Ichakhali Khal is criss-crossed with natural drains. Direction of flow is towards the Ichakhali channel and the water from Ichakhali channel is finally drained into the sea. Map showing drainage pattern of nearby areas of 2A & 2B zones is shown in **Figure 4-10**.

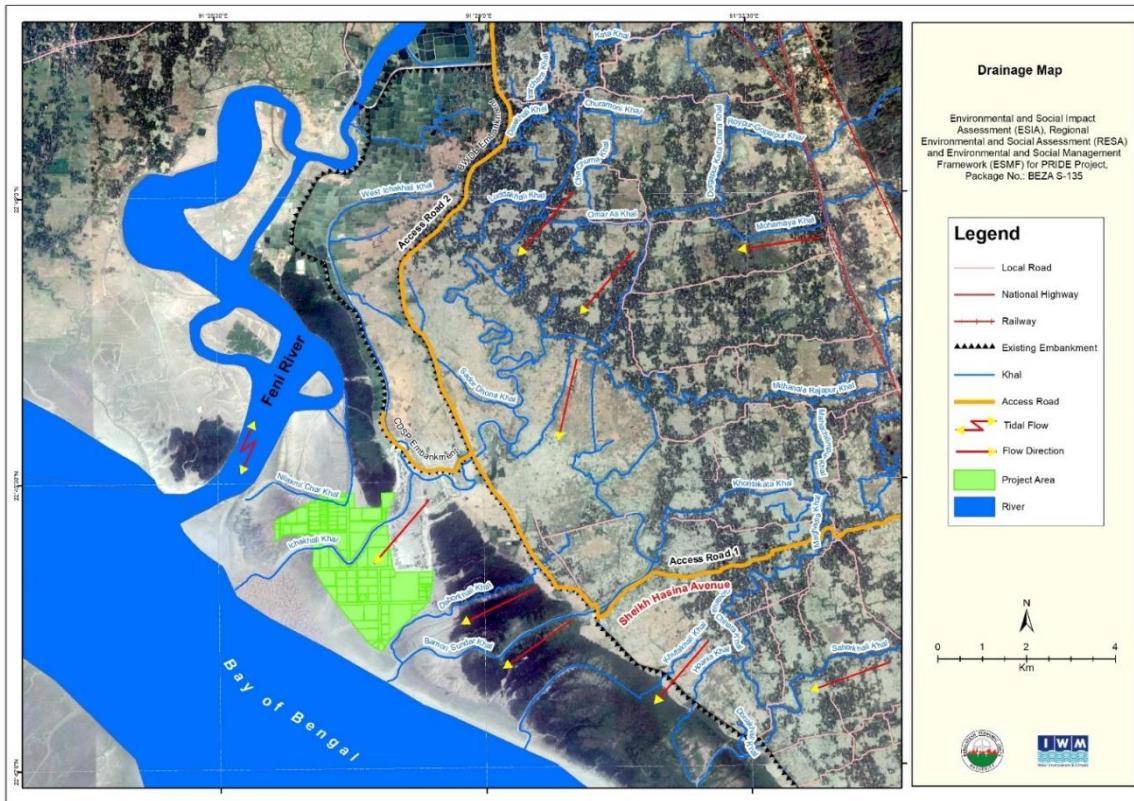


Figure 4-10: Drainage pattern of nearby areas of 2A & 2B zones

4.3.5 Ambient Noise Level

The statistical analysis is done for measured noise levels at several locations. The parameters are analysed for L_{eq} with their L_{max} and L_{min} . These results are tabulated in the following **Table 4-14**. From the measured noise level, it was found that most of measured ambient noise levels were below 60 dBA.

Table 4-14: Summary of daytime noise level measurement in the project area

Sl. No.	Location	GPS	Daytime Noise Level (dBA)			
			Measurement Time	L_{MAX}	L_{MIN}	1 min- L_{eq}
1	Embankment of Zone 2A	22°43'40.14"N 91°27'36.76"E	01-13 pm	68.7	55.2	59.8
2	Embankment of Zone 2A	22°44'5.69"N 91°28'4.83"E	01-40 pm	65.5	51.2	54.8
3	Within the EZ (Beside stake yard)	22°44'29.84"N 91°27'10.52"E	02-20 pm	57.2	51.1	53.7
4	Zone 2A (Beside Ichakhali canal)	22°44'45.27"N 91°27'19.17"E	02-46 pm	58.4	52.5	54.2
5	Starting point of Economic Zone Embankment from CDSP embankment	22°45'40.16"N 91°28'15.56"E	10-25 am	66.2	50.2	56.3
6	BWDB Embankment	22°44'21.16"N 91°29'42.15"E	10-50 am	77.2	52.9	59.7
7	CP Mor	22°43'52.07"N 91°30'19.04"E	11-33 am	71.2	55.3	59.2
8	Sheikh Hasina Avenue	22°44'20.21"N 91°30'55.75"E	12-00 pm	62.2	51.4	54.9
9	Sheikh Hasina Avenue	22°44'23.52"N	12-22 pm	65.3	52.7	55.4

Sl. No.	Location	GPS	Daytime Noise Level (dBA)			
			Measurement Time	L _{MAX}	L _{MIN}	1 min- Leq
		91°31'44.67"E				
10	Sheikh Hasina Avenue	22°44'48.12"N 91°33'7.52"E	12-50 pm	61.4	49.7	52.2
11	Sheikh Hasina Avenue	22°44'55.39"N 91°33'20.57"E	01-12 pm	68.3	55.7	57.2
12	Starting of Sheikh Hasina Avenue (Dhaka Cht. Highway to EZ Road)	22°45'15.78"N 91°35'4.63"E	10-05 am	73.5	66.2	68.4

Table 4-15: Bangladesh standards for sound level (GoB, 2006)

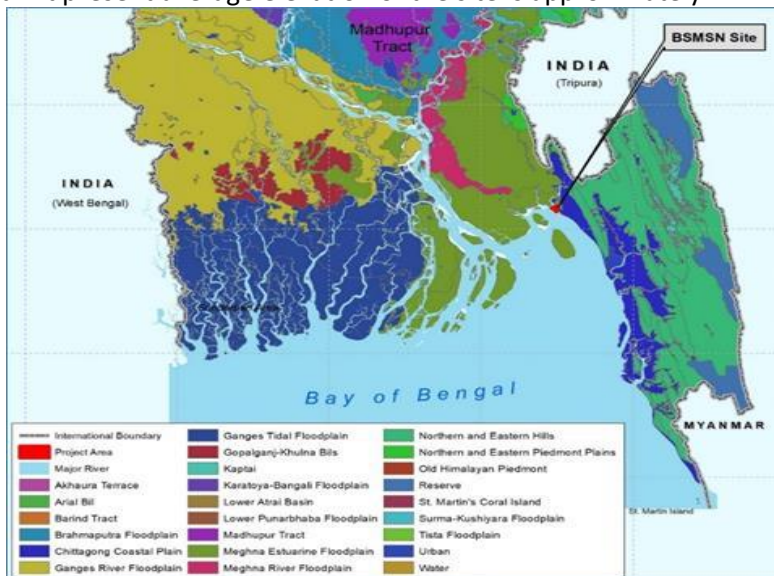
Locations	Noise level (dBA)at day	Noise level (dBA) at night
Silent zone	50	40
Residential area	55	45
Mixed area	60	50
Commercial area	70	60
Industrial area	75	70

[Note: Noise Levels are defined as 1-minute Leq]

4.3.6 Land Resources

4.3.6.1 Topography

Bangladesh is the largest deltaic region in the world with most of its parts, at low elevations. It is a riverine country criss-crossed by innumerable rivers, rivulets and their tributaries. It is divided into five physical regions- the Ganges Delta proper to the southwest, the Paradelta to the northeast, and the southeast undulating Chattogram region. Ganges total flood plains has a low ridge and a basin relief crossed by many tidal rivers and creeks. Physiographic map of Bangladesh is given in **Figure 4-11**. EZ site is generally flat, low lying and poorly drained. The land use of the project site is 'wetland'. Ichakhali Canals and tributaries of Ichakhali Canals are present at the site which gets flooded during the monsoon & high tides. Site development work is running and most of the land is already developed. At present average elevation of the site is approximately 7m MSL.

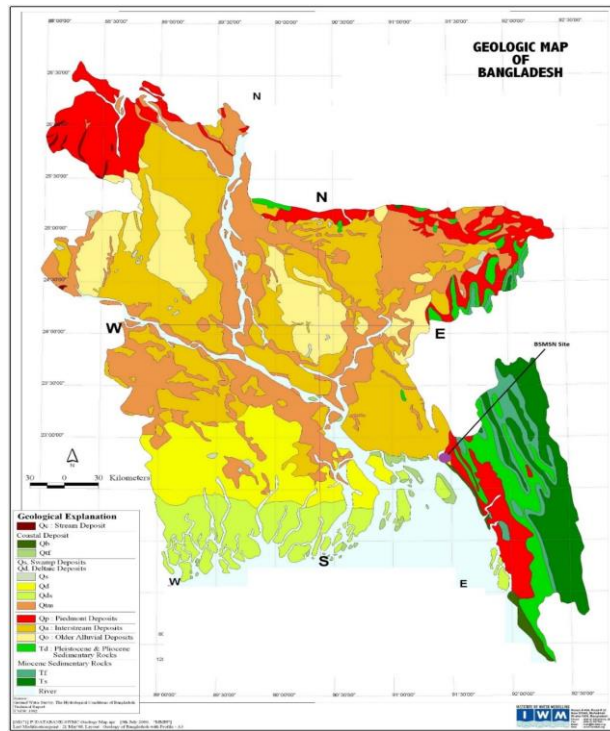


Source: IWM

Figure 4-11: Physiographic Map of Bangladesh

4.3.6.2 Geology

The geology of the project area can be generally classified as sedimentary with metamorphic rocks such as limestone including travertine. These occur as either of the following: quartzite, graphitic schist, chlorite, amphibole, mica and kyalite schist, hornblende, bitite and garnet, gneiss, acid gneiss, granulate or charkonite. The site is closed to the sea and Feni River and is covered with clay and sand deposits. As per the geological map of Bangladesh (Figure 4-12), site is covered with stream and flood plain deposits and is classified as lower and inters tidal flats as per geomorphic map of Chattogram.



Source: IWM

Figure 4-12: Geologic Map of Bangladesh

4.3.6.3 Land use Pattern

Zones 2A & 2B sites are already developed by sand filling. Total EZ site measures 1450 acres & the usable area is 1300 acres. Land use break down for the site is given in Table 4-16. In Figure 4-13, the land use pattern of zones 2A and 2B are shown.

Table 4-16: Land use details in Zone 2A and 2B

Land Use/Land Cover Class	Area (Acres)	Area Percentage (%)
Developed Area	1339	92.34%
Ichakhali Canal	111*	7.65%
Total	1450	100%

Source: EIA Report of Mirsharai EZ II

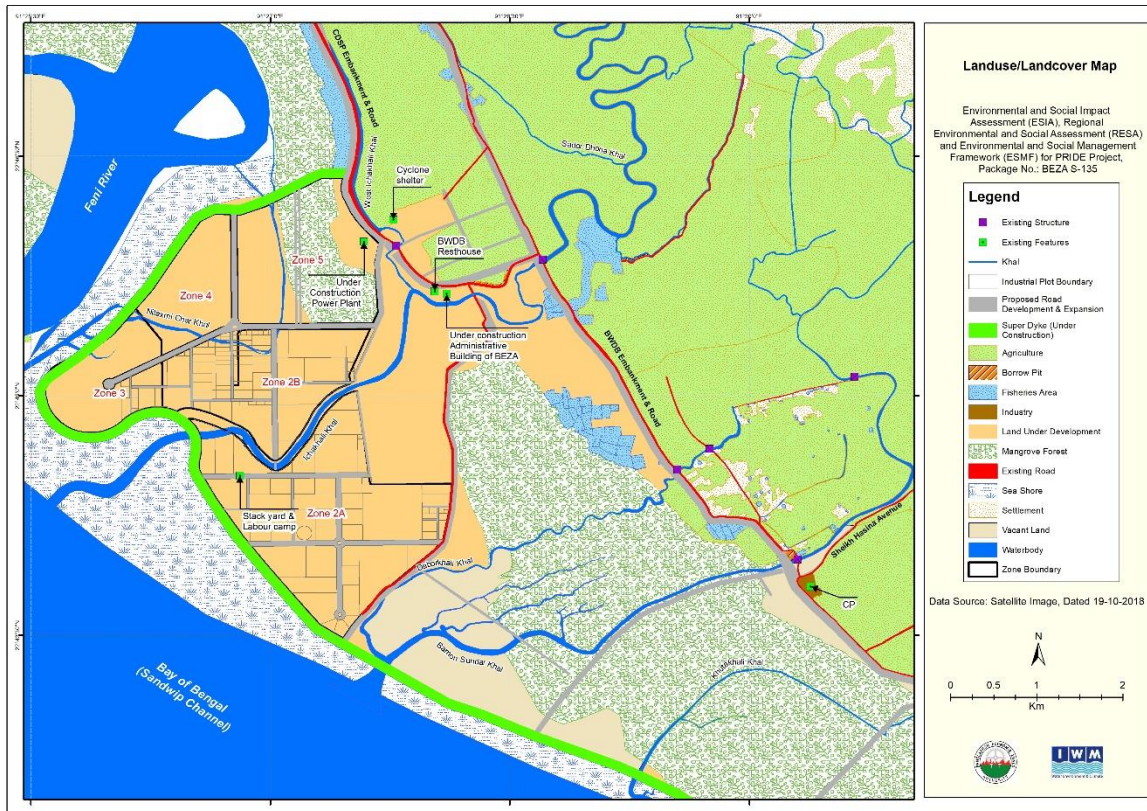


Figure 4-13: Landuse of 2A & 2B and Adjoining Area (2018)

4.3.6.4 Soil and Sediment Quality

Table 4-17 shows the soil and sediment quality of study area. From field visit it is known that, Zone 2A and 2B are made of the developed land by dredging sand from seashore. This is also verified from by the data provided below, because texture of both soil sample (Sea-shore and developed land) shows same texture i.e. Sandy loam. The previous soil (before land development) was silty clay loam represented by agricultural land sample. The developed land of Zone 2A and 2B is non-saline. The soil (developed land) of Zone 2A and 2B is slightly alkaline and organic content is very low (0.2%). Among heavy metals, Cadmium is absent whereas Nickel and Chromium content are 9.507 and 8.1631 ppm respectively. No soil and sediment screening criteria are readily available to assess the risks and impacts of high exceedances. However, as analysis shows presence of some heavy metals, any fruit produced in the area need to be tested for presence of heavy metal at certain intervals.

Table 4-17: Soil and sediment quality

SL	IWM ID	Location	EC (DS/m)	pH	OM (%)	TN (%)	K (meq/100 gm soil)	P (ppm)	Cu (ppm)	Zn (ppm)	Pb (ppm)	Cd (ppm)	Ni (ppm)	Cr (ppm)	Texture			
															% Sand	% Silt	% Clay	Textural Class
1	S-01-IWM	Sea-shore	4.4 (SS)	8.4 (SA)	0.3 (VL)	0.015 (VL)	0.75 (VH)	6.12 (VL)	1.44 (VH)	0.51 (L)	8.3828	0.0000	21.1995	21.5523	53	33	14	Sandy Loam
2	S-02-IWM	Ichakhali Khal Bed	5.7 (SS)	8.3 (SA)	0.6 (VL)	0.030 (VL)	0.60 (VH)	7.80 (L)	2.58 (VH)	0.52 (L)	5.3724	0.0000	25.9539	27.0611	14	78	8	Silt Loam
3	S-03-IWM	Developed Land	1.7 (NS)	8.0 (SA)	0.2 (VL)	0.010 (VL)	0.30 (O)	5.21 (VL)	0.16 (L)	0.46 (L)	3.3161	0.0000	9.5070	8.1631	89	10	1	Sandy Loam
4	S-04-IWM	Agricultural Land	2.1 (VSS)	7.6 (SA)	1.8 (M)	0.09 (VL)	0.75 (VH)	5.32 (VL)	4.94 (VH)	0.67 (L)	13.4662	0.0000	39.5157	38.7517	5	67	28	Silty Clay Loam

Note: SS= Slightly Saline, NS = Non-Saline, VSS = Very Slightly Saline, SA = Slightly Alkaline, VL = Very Low, M= Medium, VH = Very High, L = Low, O = Optimum

4.3.7 Seismicity

Most of the parts of Chattogram, the port city of Bangladesh consisting of fine sand and silt deposits are susceptible to liquefaction. Chattogram City is mostly a hilly region, but it also consists of alluvial flood plain and sandy sea-shore area. Although the hilly region is less susceptible to liquefaction, it is formed by sandy and clayey soil and the area bottom of the hill also liquefy if the intensity of shaking is high, which may cause landslide in the highly region. On the other hand, flood plains and sea shore areas consisting of fine sand and silt deposit with shallow water table in most of the places, which may liquefy during a strong earthquake. Under this project there will be several civil constructions including buildings associated with economic zone & it's associated works. It is important to consider the effect of earthquakes while designing these structures. Bangladesh is divided into four seismic zones. The Economic Zone sites fall under seismic Zone-II on the earthquake map (**Figure 4-14**). Construction of civil structures in this seismic region will adopt the requisite guidelines as per the Bangladesh National Building Code for ensuring structural safety.

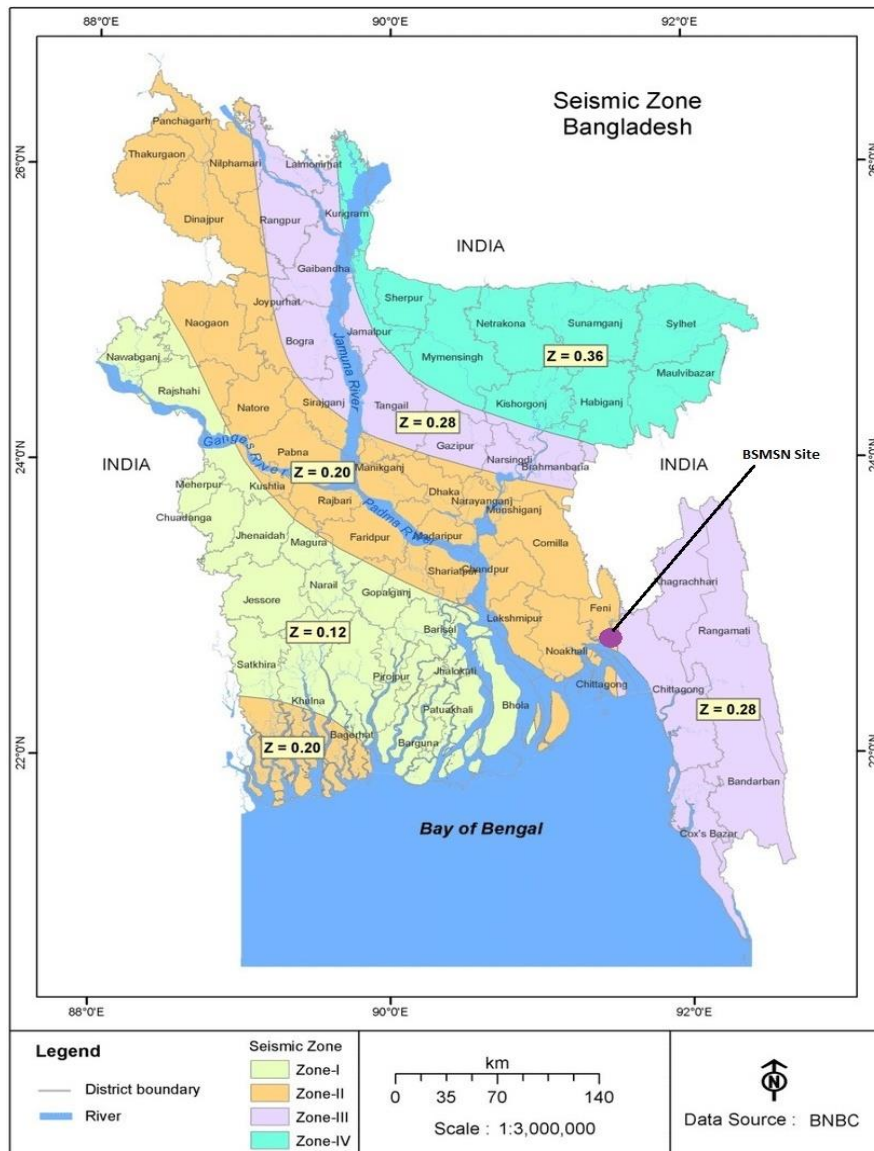


Figure 4-14: Seismic zone map of Bangladesh (BNBC)

4.4 Assessment Biological Environment

This section includes the present status of the prime biological features for the study area. The study covers both flora and fauna (including fish) within the influence area of the project. The baseline biological survey sought to determine the diversity and distribution of the flora and fauna, and the extent to which that may be impacted due to the project activities. A team visited the proposed project and its surrounding site in November 2019 to collect first hand data on floral and faunal diversity. The study was conducted only in day time. Herpetic-faunal and mammalian survey was done through visual search and also through discussion with local people and literature review (especially from previous EIA report). Aural and visual searching was the main method for ornithological survey. Information on fisheries was collected through local fish market survey and interviewing fishermen. Rapid field survey and discussion with local people was the main method for floral survey. The collected data were cross-checked with information from available literature. However, this baseline information will be used in the relevant section of this report to identify and assess impact of the proposed project activities on the existing ecological resources, and finally, to suggest mitigation measures for those impacts.

4.4.1 Aquatic Flora and Fauna

4.4.1.1 Habitat Description

There are a number of canals in and around the proposed site. Feni river is also close the project area. Fish habitats of the area are creeks, Khal, rivers, aquaculture ponds, natural ponds. Water in these bodies varies from fresh to brackish. Both natural and cultured fisheries exist in the study area. The Feni river estuary has moderate species diversity. Species diversity is higher in the estuarine mouth compared to that of its upstream direction. Fish species occurring in canals & ponds are: Golda chingri, Bagda chingri, Chiring, Pangash fish, Coral fish, Promphet fish, Catla Catla, Ruhi, Hilsa, Bata fish, Gulla, Pua, Riksha, Lorka, Senuwa, Loitta, Nylostika, Mud crabs, Holona, mrigal, silv er carp, gras carp, karpio, barbs (putis), Chitol, Folai, catfish (Tengra, Singi, Magur, Boal, Pungus), Snakehead (Shol, Taki), bele etc.

4.4.1.2 Fish Biodiversity in Feni River Estuary

Project site is approximately 800 m from the Feni River Estuarine system. From field survey & study of different secondary data sources different fish and shrimp species are found in the Feni River. The fisheries diversity present in the Feni River Estuary along with their habitat is listed in the **Annex H**.

As per a joint study carried out by group of experts from Bangladesh and India (Ahsan et al., 2014) as mentioned in Fifth National Report on Bangladesh to the Convention on Biological Diversity, Estuary area of Feni River in Mirsarai is one of potential spawning zone of Hilsa (*Tenualosa islisha*) fish. Spawning season of Hilsa fish is September to October. However, the peak time of spawning is for 11 days (15-24 October). Thus any activity having potential to affect aquatic fauna like dredging of sand should not be undertaken during this period as it may affect spawning activity of Hilsa.

4.4.2 Terrestrial Flora and Fauna

4.4.2.1 Terrestrial Flora

Tree species are observed beside access roads (Sheikh Hasina Avenue, BWDB road cum embankment & CDSP embankment) of the Economic Zone. Native Tree species are also noticed in the homestead areas. Various trees like Akashmoni, Jhao, coconut trees, etc. exists on the side of the road. Tree species are observed beside excess roads (Sheikh Hasina Avenue, BWDB road cum embankment & CDSP embankment) of the Economic Zone. Native Tree species are also noticed in the homestead areas. Various trees like Akashmoni, Jhao, coconut trees, etc. exists on the side of

the road. List of the trees along the access roads & homestead areas are given in Appendix-k Photographs of the vegetation are also given in **Annex H**.

There are no major forests within 10 km radius area of EZ site. Flora in the study area majorly comprises of the trees which were found along the access road and are given in the table-1 of Annex-H. Apart from the trees mentioned in the table, trees existing in study area are: Deodara (*Cedrus deodara*), yellow bell (*Tecoma stans*), Hibiscus (*Hibiscus rosa sinensis*), Chikrashi (*Chukrasia tabularis*), Telsur (*Butea monosperma*), Jarul (*Lagerstroemia speciosa*), Kadam (*Neolamarckia cadamba*), Dhakijam (*Syzygium grande*), Davana (*Artemisia pallens*), Lotkon (*Baccaurea ramiflora*), money plant (*Epipremnum aureum*), Toon (*Toona ciliata*), Bokain (*Melia azedarach*) and Banyan (*Ficus benghalensis*). Photographs of flora of buffer zone are shown in Error! Reference source not found. of Annex-H. Varied variety of vegetation occurs along the Ichakhali and Bamon Sundar canal in study area. This vegetation is both naturally occurring and planted by forest department. Golpata is planted all along the Bamon Sundar canal by Forest Department, Mirsarai.

4.4.2.2 Terrestrial Fauna

Mammals & Reptiles

Cows, goats, dogs, cats, mule, horse, monkey, fox, deer are found in the study area during the visit. No significant wild fauna was found in study area. As per discussion with local people it was learned that deer and fox are found in planted mangrove forests but none were spotted during visit. In Ramgarh reserve forest which is not within the project influence area, wild animals like Fox, Monkeys, Langoor, Ullunk, Wild Cats, Wild Boar, Bisons, Deer, Otter/Udbilaw (*Lontra Canadensis*), Kat Biral, Elephant, Bonrui, Rabbits, Deers, Wild goats & wild goats are found. Apart from the mammals, reptiles like chameleon, garden lizard & Gohar Saanp were also observed during the visit. Apart from this villager informed that cobras and python also present in this region.

Avifauna

Avifaunalike Gugu/Dove (*Streptopelia chinensis*), Paira/Pigeon, Doyal (Magpie Ribbon), House sparrow/Choroi, Parrot/Tiya, Crow (*Corvus splendens*), Myna/Shalik, Babui/Baya Weaver (*Ploceus philippinus*), Dhooli Bawk, Sarosh/Eastern Great Egret (*Ardea modesta*), Kaali Bawk, Machranga/Kingfisher (*Halcyn smyrensis*), Eagle, Koyal/Kokil (*Eudynamis scolopacea*), Baali, Dhanesh/Indian grey hornbill (*Ocyrceros birostris*), Baijja hash, blue throated barbet (*Megalaima asiatica*), Duck (*Anatidae anatinae*), Dhar Bawk/Egret, Konch Bawk/Pond Heron (*Ardeola grayii*) are found in the study area. Photographs of the birds observed in the study area are given in Figure 4. Some aquatic birds like Northern Pintail, etc. were also seen during visit.

Butterfly

Presence of butterfly was found in the settlement areas, fields, road side plantation and at bank of river. Some of the common butterfly of the Chattogram region are Gaudy Baron, Golden Browning, Leopard Lace, Clipper, Common Batwing, Common Gem, Orchid, Yellow Hellen etc.

RET Species

As per ecological assessment, no rare, endangered or threatened species are present at the site and in buffer area. None of the species recorded are listed in Red book of IUCN.

Livestock and poultry, being an essential sector of integrated farming system, play an important role in the economy of the study area. Livestock provide significant draft power for cultivation, threshing and crushing of oil seeds. Cow dung is used as a source of manure and fuel. Meat, milk and eggs are used for human consumption and a ready source of funds. Most of the households

raise poultry and livestock, a practice that significantly reduce the poverty by generating employment and income. Photographs of different livestock and poultry are given in **Annex H**.

4.4.3 Buffer Zone: Ecological Assessment

Buffer area of 10 km radius is considered for studying the ecology around the project site. Study area has all terrestrial, aquatic and wetland ecosystem. The river & canal systems of the area are rich in aquatic flora and fauna. Substantial fishing activities are carried out in these rivers & canals. Major land use in the study area comprises of the wetland and agriculture/aquaculture. Aquaculture ponds can be seen everywhere in the study area and people practice aquaculture throughout the year along with the agriculture. Mangroves plantation carried out by forest department exits adjacent to EZ site. An assessment on the ecology has been made for the study area from the available secondary data. Detail description of buffer zone ecological assessment is provided in **Annex H**.

4.4.3.1 Ecosystem Services and Function

Within the project area there are some water bodies (i.e. Ichakhali canal) which provide provisioning ecosystem services as local people used to fish from those resources.

4.5 Assessment Social Baseline

There is no settlement within the project area. But the project area is mostly located within the Mirsharai Upazila. Project adjacent unions of Mirsharai Upazila are Ichakhali, Mogadia & Saherkhali. Within this section socio-economic condition of Mirsharai Upazila and Ichakhali, Mogadia & Saherkhali unions are described. Mirsharai turned into as a Thana in 1901 and was upgraded to an Upazila in 1983. The Upazila consists of 2 Pourashava, 18 wards, 41 mahallas, 16 unions, 109 populated mauzas and 208 villages. The average size of population of each ward and mahalla are 1546 and 679 respectively. On the other hand, the average size of population of each union, mauza and village are 23181,3403 and 1783 respectively according to the 2011 Census (District Statistics Chattogram, BBS 2011).

4.5.1 Demographic Profile

4.5.1.1 Population

According to the Census 2011 report, the total population in Mirsharai Upazila 3,98,716. Total HH of the Upazila is 7,954 & total land area is 119,324 acres. The population density per sq. km of the area is 826 persons. The 2011 Census data reveals that the decadal population growth rate for the Upazila is 8.07% in comparison to the 2001 Census data. According to the Census 2011 report, the total population in Ichakhali Union is 27,980, Moghadia Union is 23406 and Saherkhali Union is 16912. Land area of these unions are 15754 ,2626 and 8609 acres respectively. In Mirsharai Upazila, Ichakhali, Moghadia and Saherkhali, majority of the population fall within the age group of 15-49. The percentage of young population is quite high than the dependent population implying that the majority of the population belongs to the employable age group, which is vital for fuelling the economic growth of the local area.

4.5.1.2 Religion & Culture

The majority of the population in Mirsharai Upazila is dominated by Muslims (86.12 %), followed by Hindus (12.36%), Buddhists (1.22 %) and Christians (0.018 %). The floating population of Upazila is 0.04% of the total population. The majority of the population in Ichakhali Union, Maghadia Union and Saherkhali Union are dominated by Muslims (87.017 %), followed by Hindus (12.89%) and Buddhists (0.1 %). The floating population of the Union Parishad is 0.06 percent of the total population. Further, there are no indigenous people (tribal or ethnic minority) within these areas.

4.5.1.3 Literacy rate

The literacy rate in Mirsharai Upazila (65%) is a higher then both district level (58.9 %) & national level figure (51.8 %). The female literacy rate (53.3 %) is almost equal to the male literacy rate (57.1%). Average literacy rate in Ichakhali, Maghadia and Saherkhali Union are 47.7%, 50.7% & 54.3 %, when average literacy rate of the Mirsharai Upazila is 55.1%, Chittagong district is 58.9 % or the national level figure is 51.8 %. Avarage female literacy rate (50.3 %) is almost equal to average male literacy rate (51.66%).

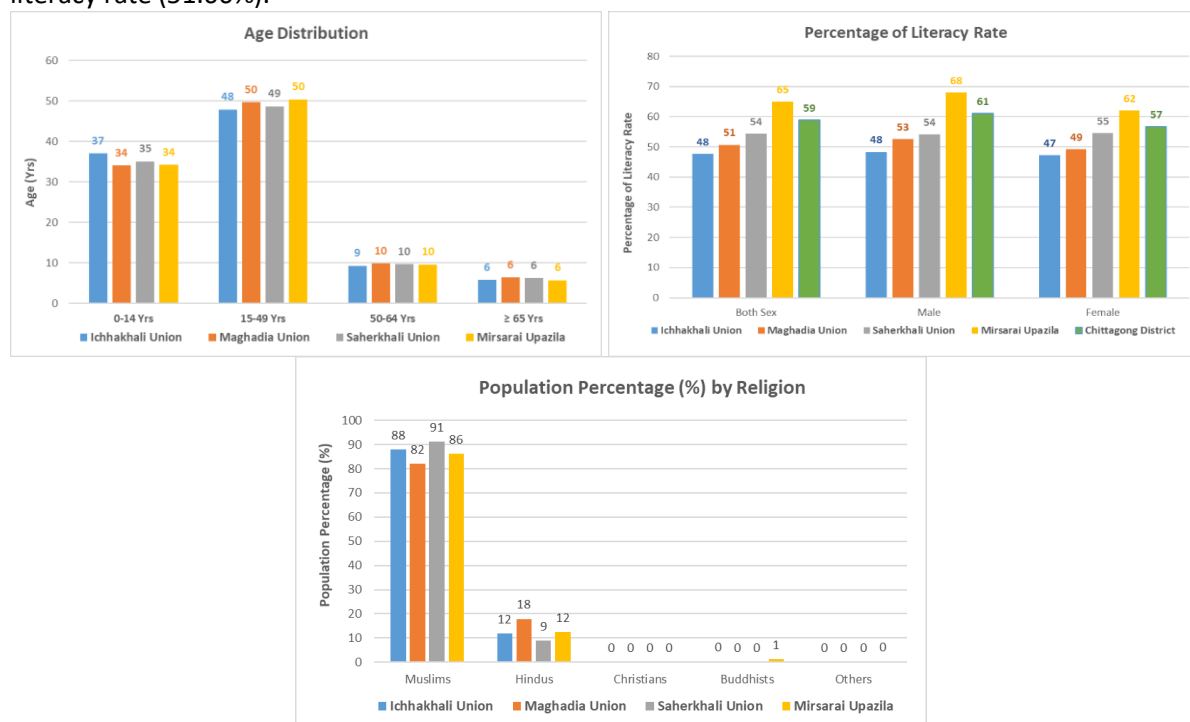


Figure 4-15: Demographic Profile of the study area

4.5.2 Income and Poverty

4.5.2.1 Employment Status

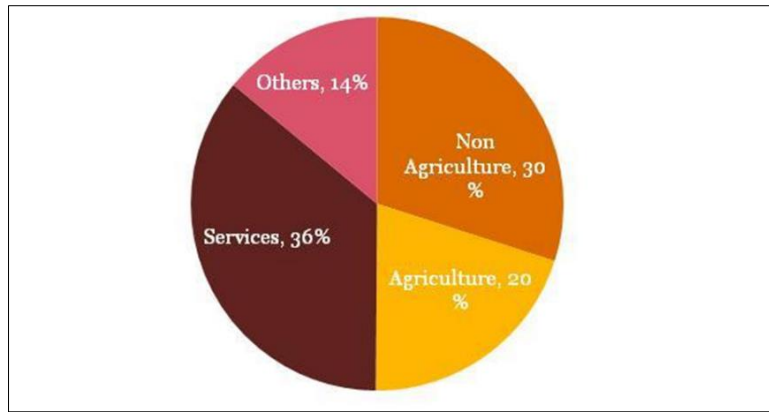
Households by Main Sources of Income

In Chattogram district as a whole, the services sector is the major source of employment providing employment to around 36% of the population. Non-Agricultural sector on the other hand accounts for 30% employment, while 20% comes from the agricultural sector. Table 4-18 analyses the scenario of major source of income of households at district level illustrates Distribution of population by field of employment of Mirsharai Upazila as per Population and Housing Census 2011, Chattogram district.

Table 4-18: Households by Main Source of Income

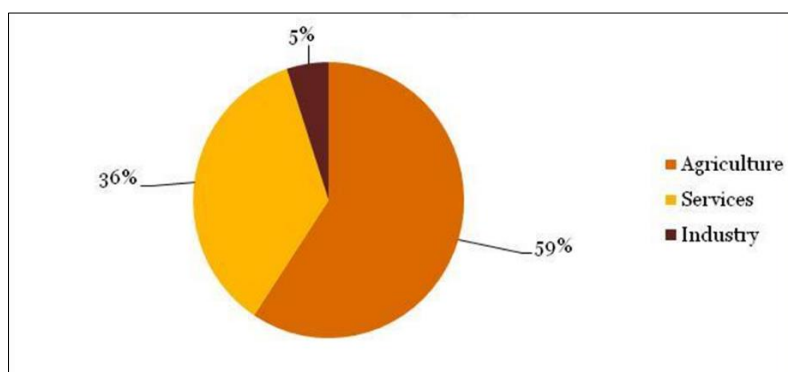
Administrative unit	Total Households	Main source of income of households (%)					
		Self-employed (Agriculture %)	Self-employed (Non-Agriculture %)	Service (%)	Day labourer (Agriculture %)	Day labourer (Non-Agriculture %)	Others (%)
Chattogram District	1567	13.47	17.10	35.93	6.7	12.89	13.98

Source: Labour Force Survey, Bangladesh 2011



Source: Population and Housing census 2011, Community report: Chittagong, BBS

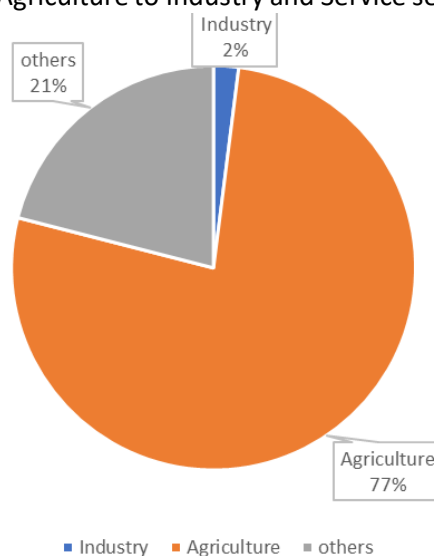
Figure 4-16: Field of employment (Chattogram District)



Source: Population and Housing census 2011, Community report: Chittagong, BBS

Figure 4-17: Field of Employment (Mirsharai Upazila)

On basis of above data, the negligence of industry sector in Mirsharai Upazila comes into the picture. The development of EZ could boost the employment in Industry sector and there can be gradual shift of population from Agriculture to Industry and Service sector.



Source: Population and Housing census 2011, Community report: Chattogram, BBS

Figure 4-18: Distribution of population employed by field of employment in Ichakhali Union

In Ichakhali Union it is found that 7% of population is engaged in agriculture activities and 2% are engaged in industrial activities. Field of activities in Ichakhali Union: The total number of people not attending school and employed is 1,625, among whom 1,587 are males and only 38 are

females. In Agricultural activities 1236 males and only 21 females are involved. Very few are employed in industry, only 25 males and 4 females. Men's involvement in the service sector is noticeable, 326 males are working in this sector compared to only 13 females.

The employment status clearly shows that the majority are dependent on agriculture related activities. The number of people in the service sector is just above one fourth of the number involved in agriculture. The very low number of people employed in industry is due to lack of opportunity. Thus, the development of EZ will generate quite a lot of job opportunities, which will change the scenario of the region and will contribute to a reduction in migration to the large cities such the capital, Dhaka and the nearby mega-city of Chattogram. This locality is expected to become a new hub for business the service sector with all urban facilities. Working Age Population, Economically Active Population and Participation Rate. The working age population in Chattogram district is 4.91 million (around 65% of the total population). Of these, males and females roughly have an equal share. However, if one considers the economically active population (i.e. the population that is actually working), the ratio is highly skewed towards the male population. Of the economically active population, more than 70% comprise of males. Further, at an overall level, the work force participation (w.r.t. the working age population) is also observed to be low, at 56%, as compared to the national level statistics of 59%. The work force participation of males is 80% vis-à-vis female participation (w.r.t. female population) at 32%. Thus, the commissioning of the EZ could act as a facilitator to reduce the gap between the economically active population and Work Force Participation to a great extent.

Table 4-19: Working Age population, Economically Active Population and Participation Rate

Administrative structure	Working Age Population (In millions)			Economically Active Population (In millions)			Participation Rate (%)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Chattogram District	4.91	2.45 (49.90%)	2.46 (50.10%)	2.759	1.967 (71.29%)	0.793 (28.71%)	56.2	80.3	32.2

Source: Labour force survey, 2011

4.5.2.2 Labour Market (wages)

The scenario for wages, analysed at the Upazila level reveals that the daily average wage rate of male agriculture labourer at the Upazila level is BDT500 and that for female labourers is BDT300, as against the BDT 658 daily average wage rate of labour in the manufacturing sector. The details of the Upazila level wage rates of various categories of labourers as per the District Statistics 2011 report are given in **Figure 4-19**

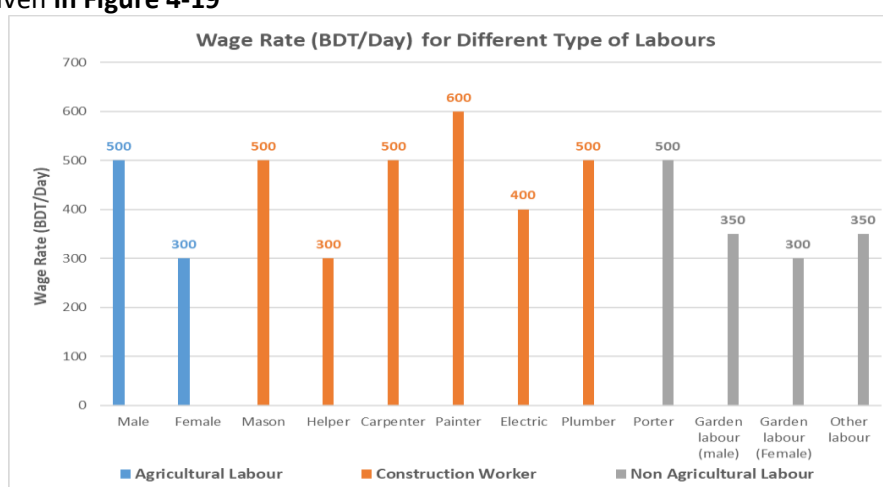


Figure 4-19: Daily average wage rate of labourers in Mirsharai Upazila (Wages are in BDT)

4.6 Assessment of infrastructure facilities

4.6.1 Housing Condition

The quality of housing in the area shows that 79.2% people in Mirsharai Upazila have “kutcha” houses, (made up of mud, straw, wood and dry leaves) indicating their low social and economic status. The kuccha houses are vulnerable and increase the risk to life in the event of natural disasters such as floods or cyclones. The need to provide good housing will be a challenge for the administration and will have to be dealt with effectively. Housing condition of Mirsharai Upazila, Ichakhali Union, Maghadia Union and Saherkhali Union are provided within **Figure 4-20**.

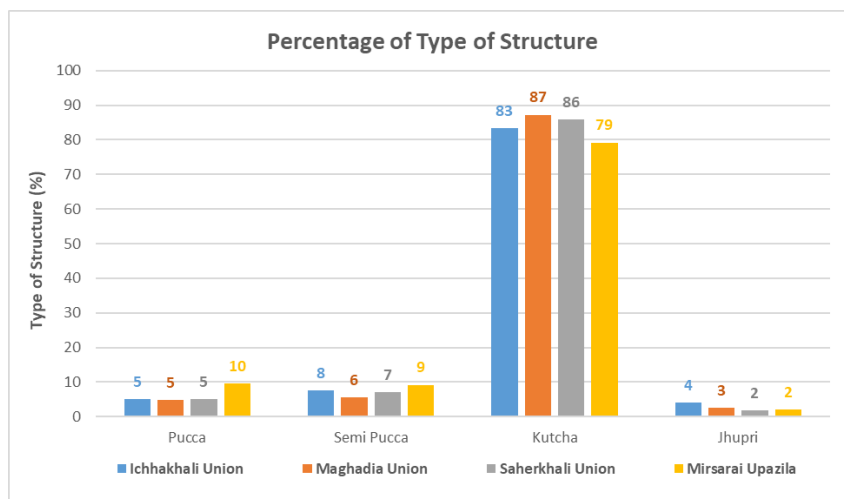


Figure 4-20: Housing pattern in Mirsharai Upazila (percentage)

4.6.2 Water Supply & Sanitation

A review of the project area highlights the fact that scarcity of safe drinking water is an acute problem faced in the Upazila. Tap water is available to only 1.6 percent of population. The majority 93.9 % of the population use Tube well water. Source of drinking water and sanitation of Mirsharai Upazila, Ichakhali Union, Maghadia Union and Saherkhali Union are provided in **Figure 4-21**.

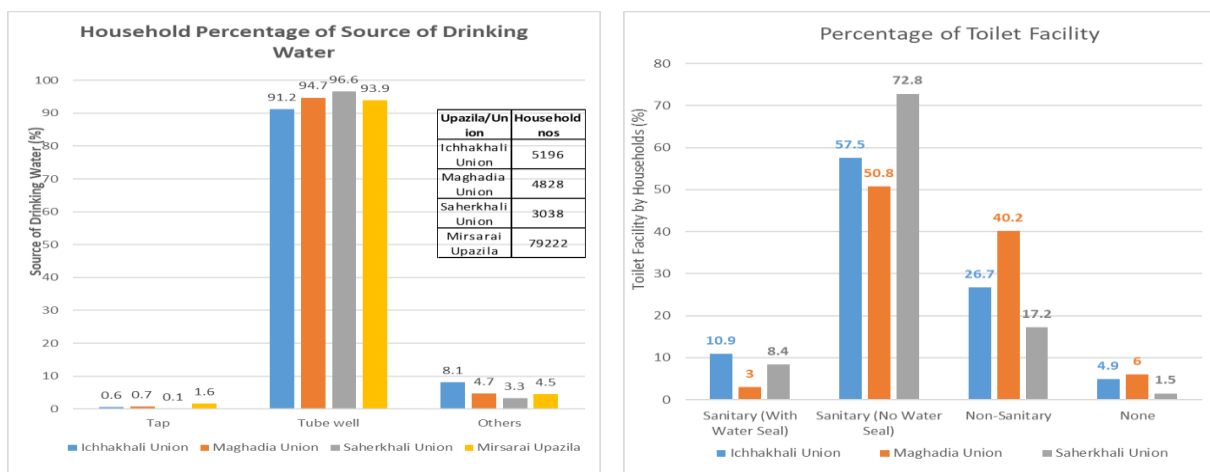


Figure 4-21: Water Supply & Sanitation facilities of the study area

4.6.3 Other Infrastructure facilities

Transport is a major problem in the project area as there is no public service connectivity from the NH to the project site. People have to walk down 10 Km or to use the auto rickshaws for

commutation. Further, health and education facilities are also not satisfactory as there are no schools or hospitals nearby. There are 1 Upazila Hospital, 14 family welfare centre, 7 union health centre, 18 community clinic and 1 mother & child welfare centre in Mirsharai Upazila.

4.7 Assessment of Baseline information on gender and women

Women and employment status

Women in Bangladesh are at the forefront of awareness and empowerment on account of various interventions by the GoB. Though, Bangladesh has already achieved gender parity in primary and secondary education (Promote Gender equality and empower women, UNDP Bangladesh), the female population, gender ratio, access to labour markets and the role of women in decision-making still leave gaps and this call for an improvement. This is especially true in the rural areas where women currently lack adequate access to resources and opportunities. Being a patriarchal society, the men exercise control over women's access to labour and their income and assets.

The female population in the Mirsharai Upazila constitute 53.3% of the total population. The gender ratio of 89 which has been tremendously decreased in 2011 as against 99 males in 2001, and female literacy rate of 53.3% is below the satisfactory level. The female population in Ichakhali Union, Maghadia Union and Saherkhali Union constitute 54.56% of the total population. Average gender ratio of 83.33 which has been tremendously decreased in 2011 as against 99 males in 2001, and average female literacy rate of 50.3% is below the satisfactory level. The table below indicates that women have out-numbered men in Ichakhali Union, Maghadia Union and Saherkhali Union. Thus, it appears that increased job opportunities within the localities for women will lead to women's economic empowerment and the economic up-grade of their families and the locality as a whole.

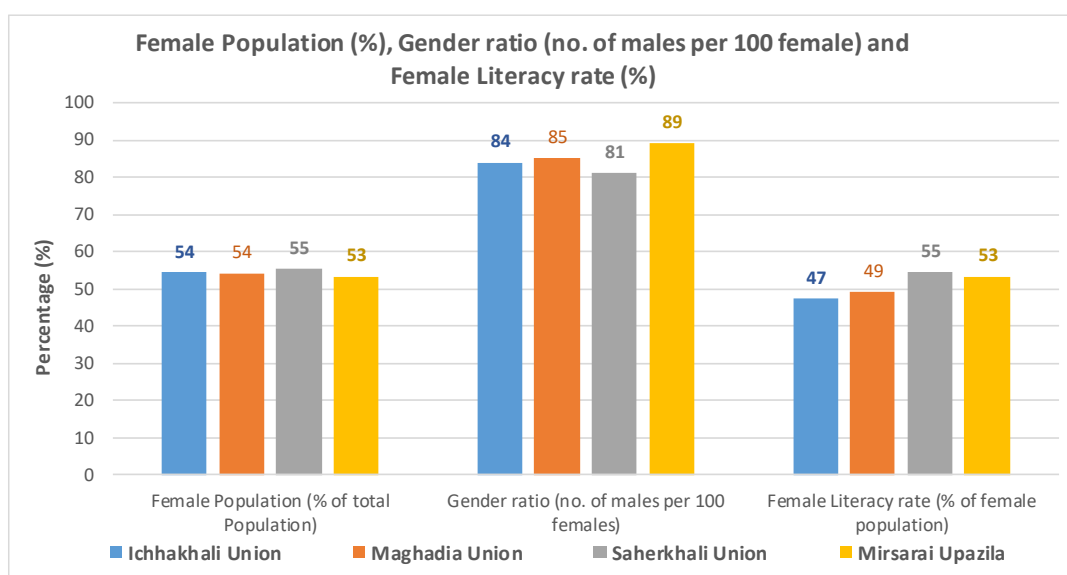


Figure 4-22: Female Population (percent), Gender ratio (no. of males per 100 female) and Female Literacy rate (percent) in Ichakhali Union, Maghadia Union, Saherkhali Union and Mirsharai Upazila

At the national level, female participation in the labour market is low (57.2%) in comparison to that of men (84.3%). The trend shows almost similar pattern in the Upazila. Women here are mainly engaged in household work (77.6%) and a mere 2.78% are employed. Women's participation in the other sectors including industry and agriculture employment is negligible. The trend is even worse in Ichakhali Union, Maghadia Union and Saherkhali Union.

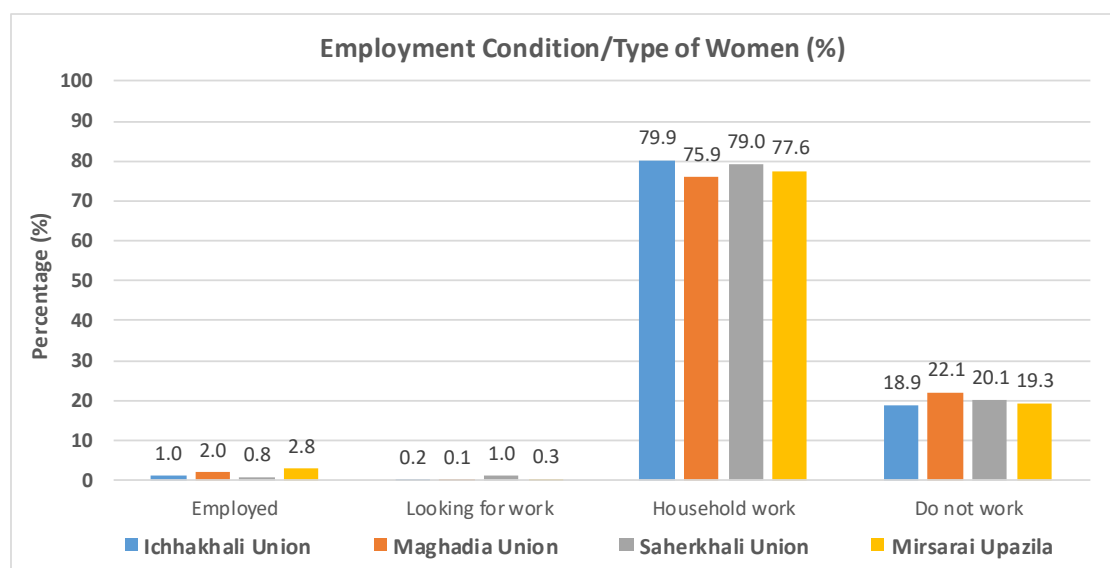


Figure 4-23: Employment Condition/Type of Women (%) in Ichhakhali Union, Maghadia Union, Saherkhali Union and Mirsarai Upazila

Women's presence is very poor in all the major fields of activities such as agriculture, industry and service sectors. One of the reasons may be that when women work as domestic labourers in agriculture, their economic contribution is not counted. It is rather counted as domestic work which seriously undermines women's productive role. Women's involvement in the EZ industrial zone will not only make their contributions visible in the productive sector, it will also empower them in all senses and will eventually have a positive impact on their own lives and that of their family members, particularly their children. The occupation of women in Upazila is mainly centred upon the service and agriculture sector: 43.3% and 40.74% respectively in Mirsarai Upazila. The scenario also depicts that the presence of about 16% women in industry sector which is very low. Scenario is even worst in Ichhakhali, Maghadia and Saherkhali Union. Employment of women in different service sectors are given in **Table 4-20**.

Table 4-20: Field of activity of women in study area

Administrative Unit	Field of Employment								
	Agriculture			Industry			Service		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Mirsarai Upazila	17284	16664	620	1453	1210	243	10404	9745	659
Ichhakhali Union	1257	1236	21	29	25	4	339	326	13
Maghadia Union	994	979	15	42	19	23	832	799	33
Saherkhali Union	807	796	11	15	15	0	249	244	5

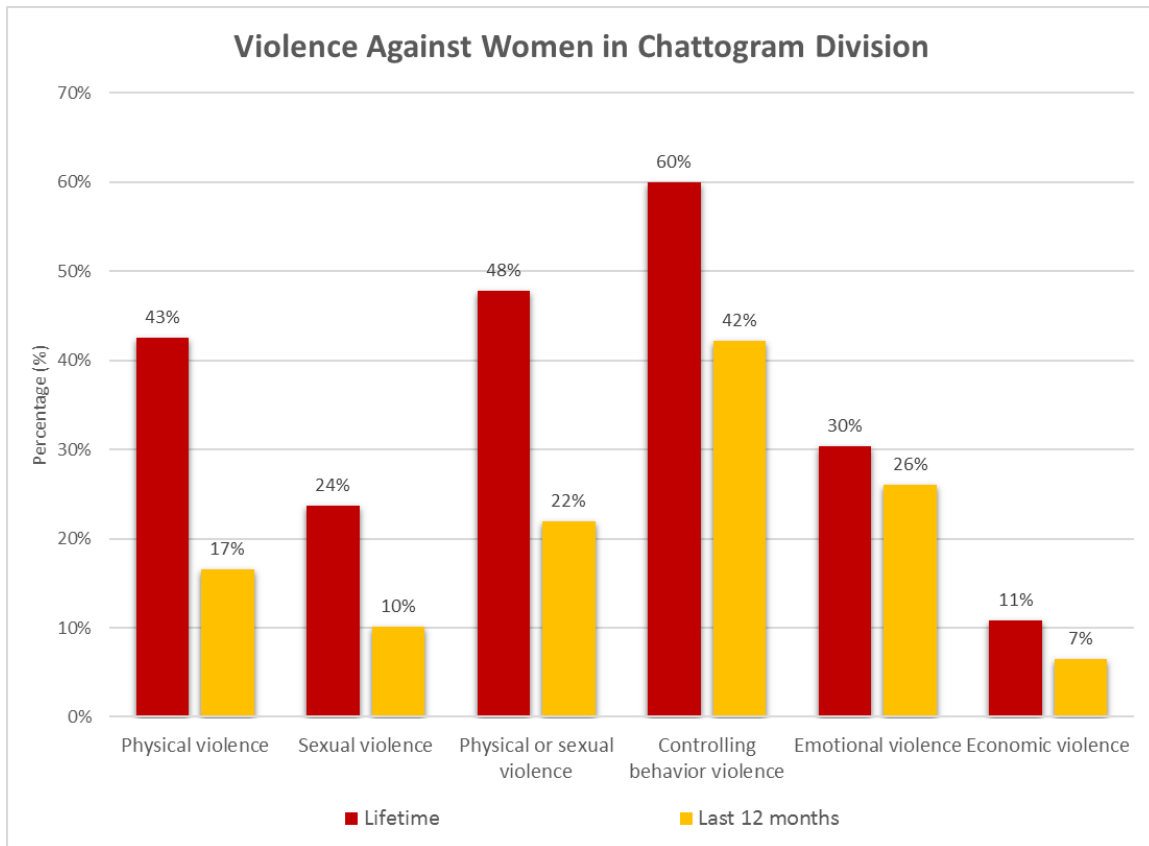
Source: Population and Housing census 2011, Community report: Chattogram, BBS

Traditionally, employment opportunities for women outside the homestead are very limited. Majority of the labour activities performed by women at household level (e.g. in rice milling, weaving etc.), has been displaced by technological changes and mechanization. Organized food for work and other employment schemes provide some employment for impoverished rural women, but are limited in scope and duration. Hence, the development of EZ will be an opportunity for the women in Mirsarai Upazila to access employment opportunities.

Gender Based Violence (GBV) in Chattogram Division

Gender-Based Violence (GBV) is a global phenomenon in both developed and developing countries. Many women suffer from controlling behaviours, physical, economic, emotional and sexual violence, causing physical and mental harm in Bangladesh. A survey named "Violence Against Women (VAW)

Survey 2015” were conducted by Bangladesh Bureau of Statistics. In that report, the statistics are available in division level. The project area falls under Chattogram division. Thus, violence against women data in Chattogram Division as a representative data are provided below:



Source: BBS, 2015

Figure 4-24: Proportion of ever-married women experiencing partner physical and/or sexual violence during lifetime and in last 12 months as reported in BBS 2015 survey

4.8 Historical, Cultural and Archaeological sites

There is no archaeological site within 2A & 2B Zones.

4.9 The allotted plots in 2A & 2B

Allotted plots in zone 2A & 2B are shown in **Figure 4-25** and **Figure 4-26** and the list of industries are provided in **Annex L**. The distribution of industries are shown graphically from **Figure 4-27** to **Figure 4-30**.

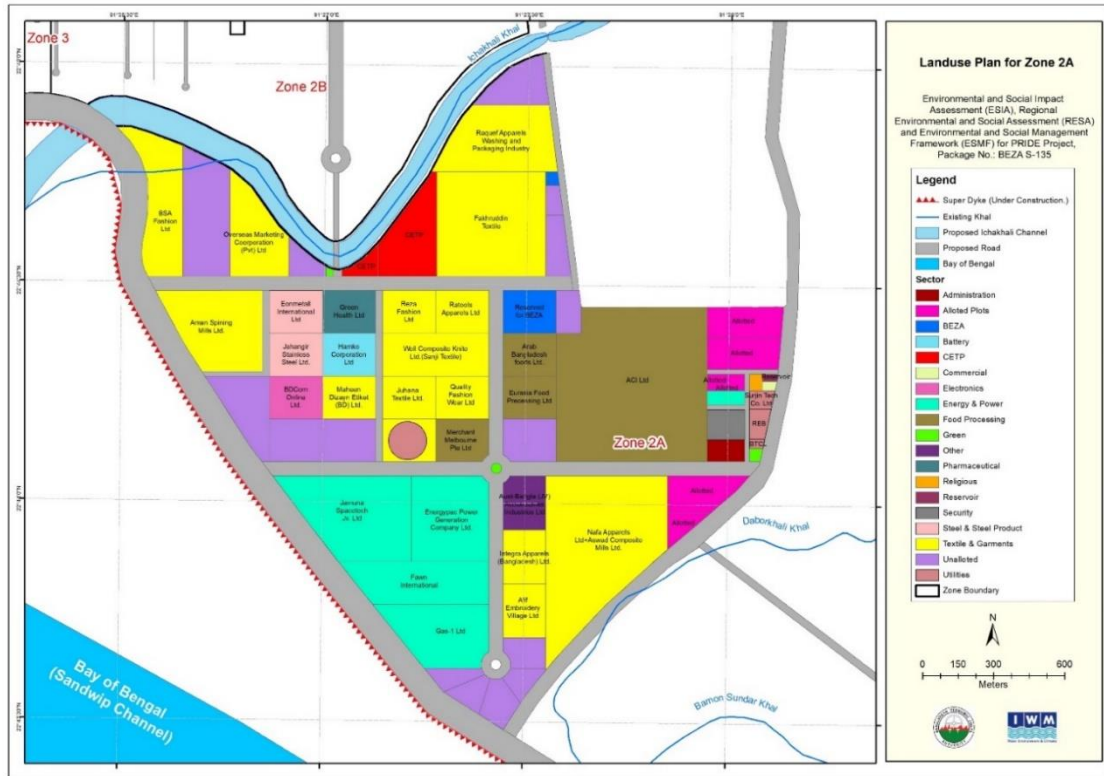


Figure 4-25: Allocation of Plot in Zone 2A

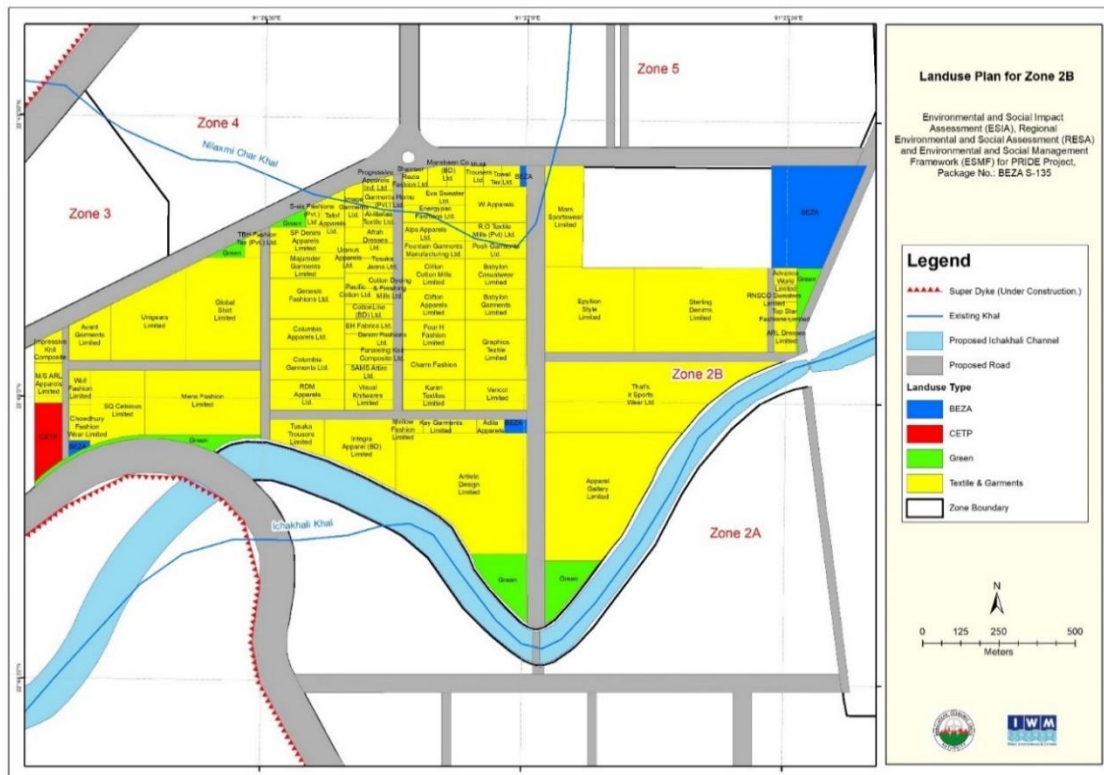


Figure 4-26: Allocation of Plot in Zone 2B

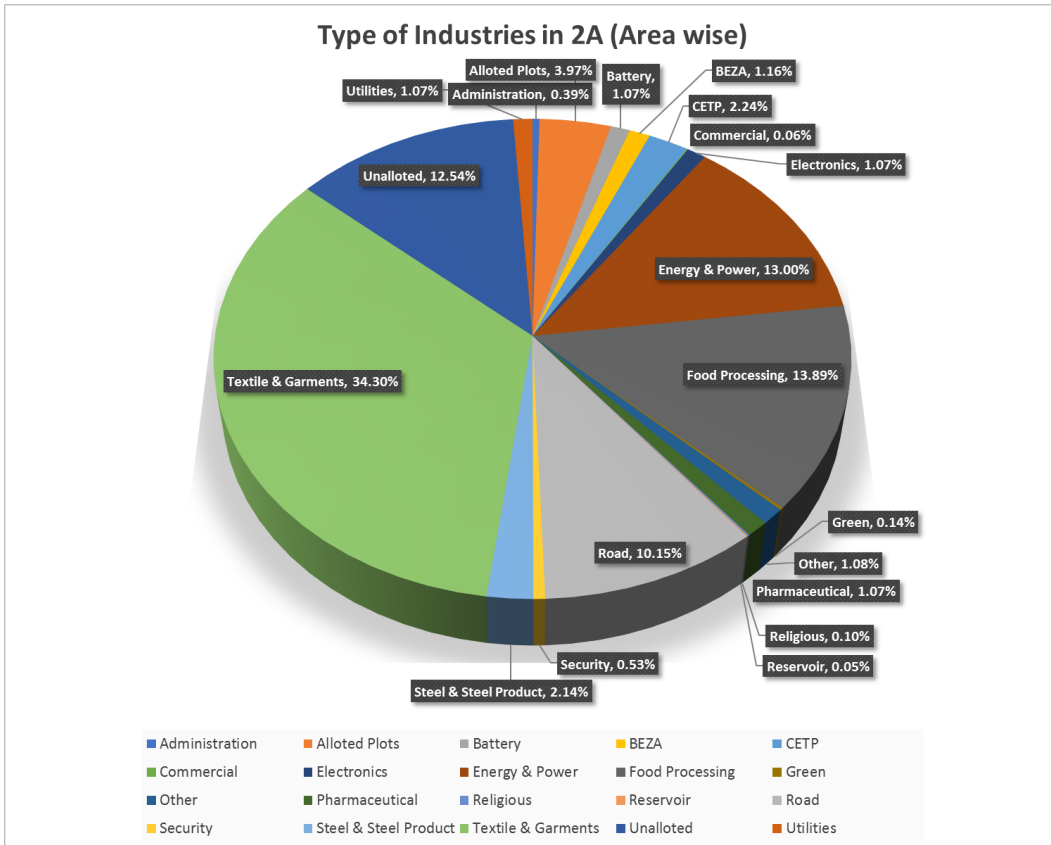


Figure 4-27: Type of Industries in 2A (Area wise)

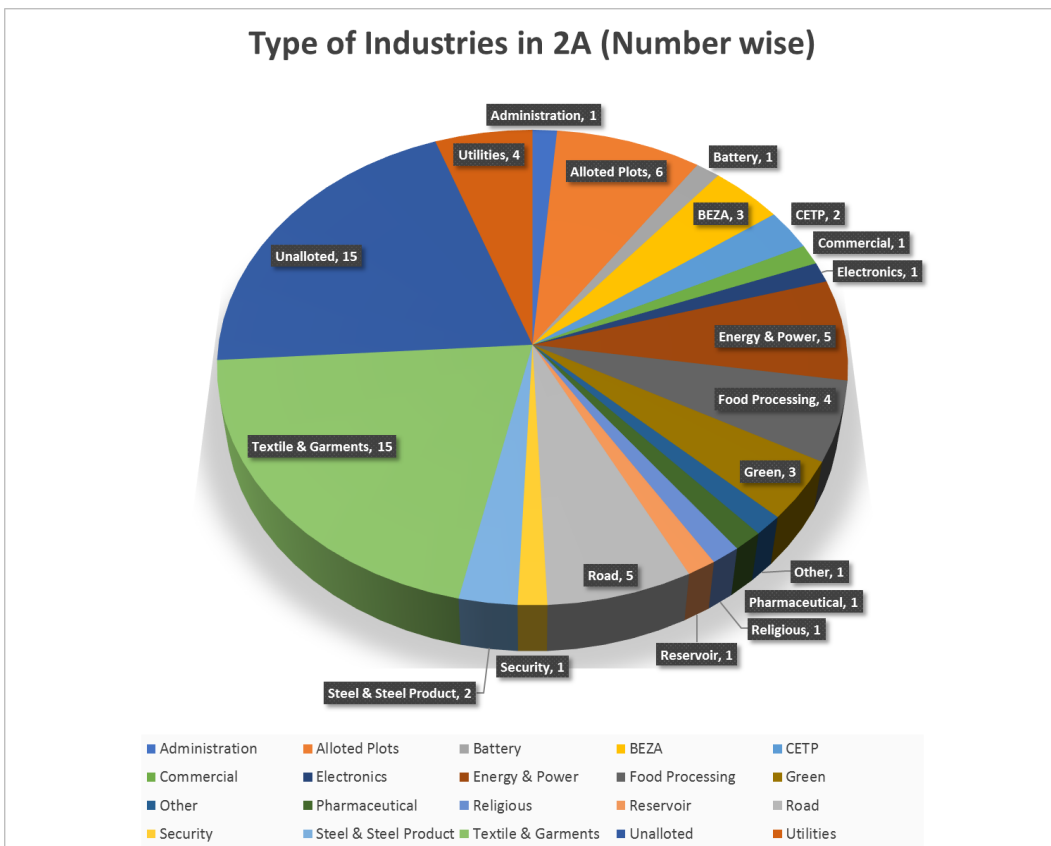


Figure 4-28: Type of Industries in 2A (Number wise)

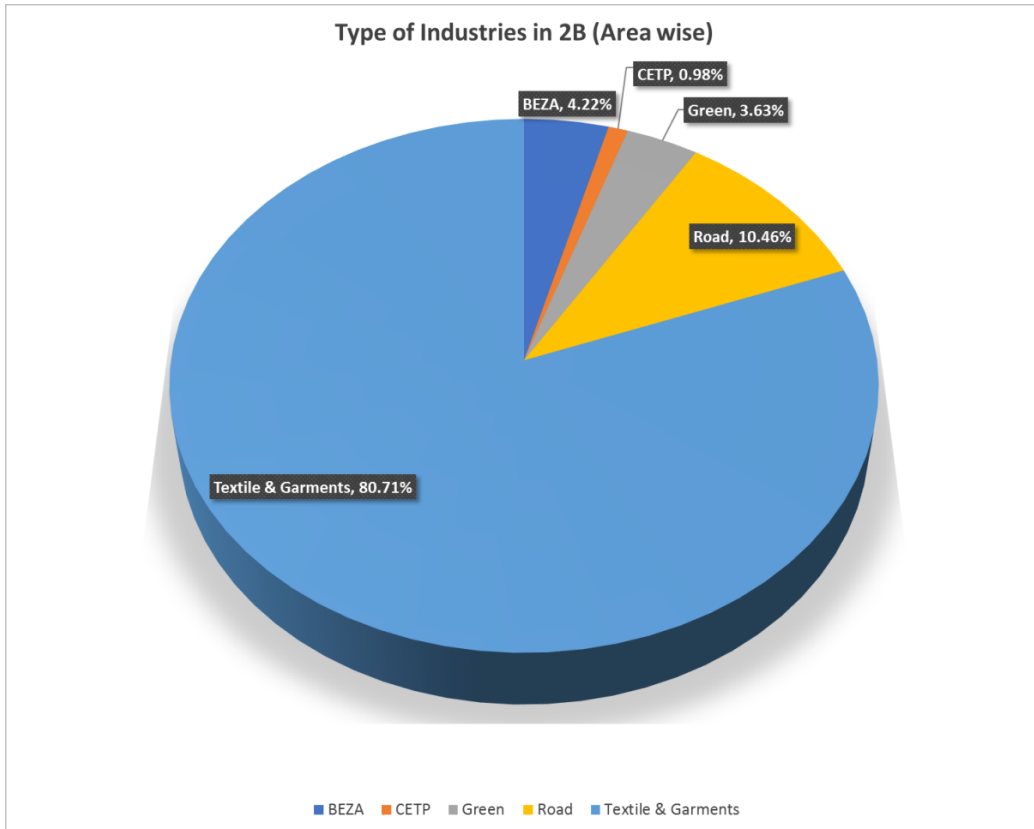


Figure 4-29: Type of Industries in 2B (Area wise)

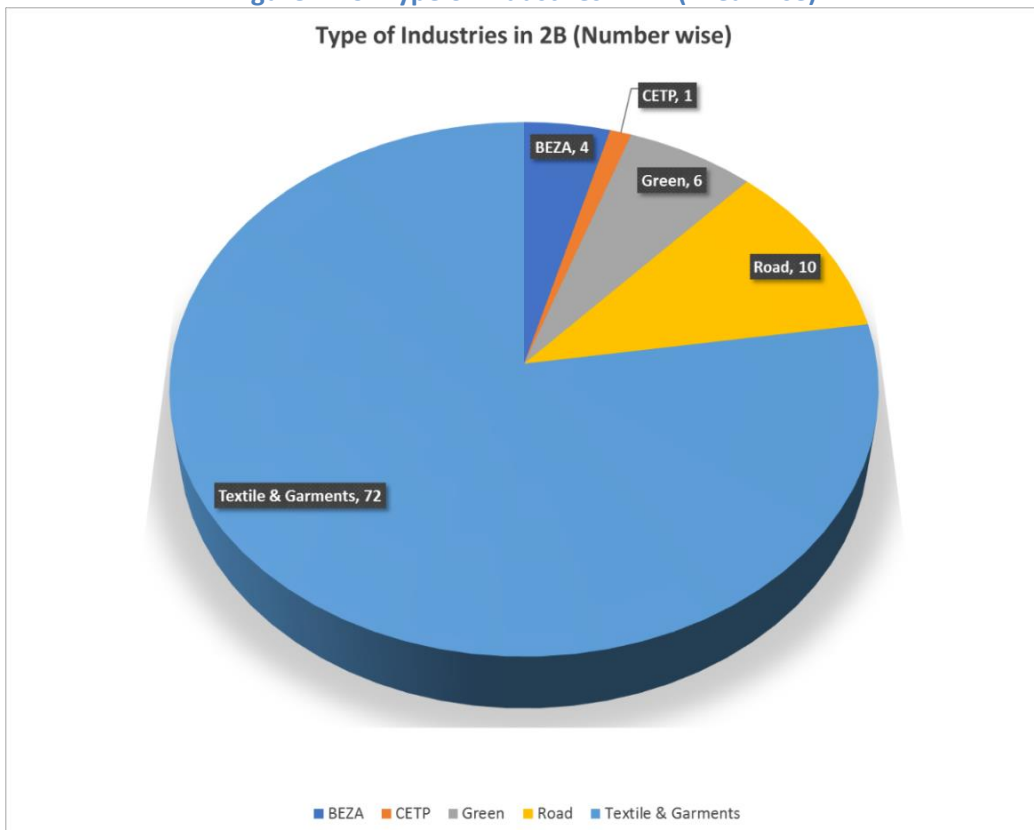


Figure 4-30: Type of industries in 2B (Number wise)

CHAPTER 5. ANALYSIS OF ALTERNATIVES

5.1 Introduction

The purpose of this chapter is to systematically compare feasible alternatives to the proposed interventions related technology, design, and operation – including the “without project” situation in terms of their potential environmental and social impacts. This section is a requirement of the World Bank and DoE and is critical in consideration of the ideal development with minimal environmental disturbance. The proposed project interventions have been compared in terms of overall technical, economic, environmental and social aspects.

5.2 Comparison of “Without Project” and “With project” Scenarios

Without Project Alternative in this report was based on the situation before starting of the development work of the zones. With project scenario is considered as the phase when the operation of the industries starts. In the following section a comparison between the without project and with project scenarios is shown in **Table 5-1**.

Table 5-1: Comparison between without project and with project scenarios alternative

Aspect		Condition Without the Project	Condition With the Project
Technical Aspect	Development planning of the area	<ul style="list-style-type: none"> Random development might be implemented without any plan for overall area development. Then, the future development plan might be restricted after disorderly development 	<ul style="list-style-type: none"> Economic Zone would be developed efficiently in accordance with the planned area development plan.
	Distribution of industries	<ul style="list-style-type: none"> The distribution of industries would have been sporadically and haphazardly. 	<ul style="list-style-type: none"> A well-studied and eco-friendly Master Plan has been prepared for BSMSN. In the Master Plan of BSMSN, clustering of industries (Light/ Medium & Heavy), and zoning of other associated facilities such has Residential, Educational, Health, Administrative/ Institutional, Open Space, etc. have incorporated.
	Source of water	<ul style="list-style-type: none"> In without project scenario, the sources of water for domestic use, irrigation and fish farming was based on surface water, rain water and ground water from shallow aquifer in small quantity. 	<ul style="list-style-type: none"> In after project scenario, surface water (Feni River, Halda River), rain water and ground water from confined deep aquifer will be used. BSMSN is situated adjacent to Bay of Bengal. Groundwater coming from the eastern hilly region is going to the Bay at a depth of about 600 feet or more almost in unused condition. That’s why BSMSN is/will be

Aspect		Condition Without the Project	Condition With the Project
			the last user of groundwater in this area.
	Energy use	<ul style="list-style-type: none"> Overall energy use in terms of electricity was low. There was no possibility of having gas connections in this area. 	<ul style="list-style-type: none"> Installation of 150MW power plant, 33/11 kv receiving sub-station and 400kv power grid sub-station are going on. Besides gas supply pipeline and associated infrastructures will be available.
	Green industrialization	<ul style="list-style-type: none"> The concept of green industrialization would not have been considered in case of unplanned and haphazard industrial development. 	<ul style="list-style-type: none"> Resource efficient and green industries will be possible to establish following international norms and guidelines.
Economic Aspect	Employment	<ul style="list-style-type: none"> Job opportunity would not increase from the current situation 	<ul style="list-style-type: none"> Job opportunities would increase for local community during construction & operation phase of the Economic Zone. Moreover, there would be a huge employment opportunity associated with development and operation of the industries. By 2040, the expected employment in BSMSN area will be 6,41,459 (Source: BSMSN Master Plan, 2019)
	Profession	<ul style="list-style-type: none"> No need to change the occupation of the local people 	<ul style="list-style-type: none"> Local people will have an opportunity to increase their skill by changing their profession based on the demands of the industries
	Infrastructural Development	<ul style="list-style-type: none"> Infrastructural development of the entire area would be limited. 	<ul style="list-style-type: none"> There would be a planned and systematic development of railways; access roads; waterway communication; educational facilities; health facilities; and different utility services such as water supply, gas supply, telecommunication, power supply

Aspect		Condition Without the Project	Condition With the Project
	Annual revenue	<ul style="list-style-type: none"> Annual revenue from farming and aquaculture is limited. 	<ul style="list-style-type: none"> Increased annual revenue from all types of infrastructures, utility services, wages/ salaries of staffs and workers.
	National economy	<ul style="list-style-type: none"> Contribution to the national economic development of this entire area would be limited. 	<ul style="list-style-type: none"> Because of high industrial development by local & foreign investors and thousand job holders will contribute on national economic growth.
Environmental and Social Aspects	Environment	<ul style="list-style-type: none"> Impact on natural environment due to existing farming and aquaculture will not be significant 	<ul style="list-style-type: none"> Impact on natural environment and pollution caused by the construction work and operation of Economic Zone would occur.
	Social	<ul style="list-style-type: none"> Impact on social environment that might be caused by the development of Economic Zone will not occur. 	<ul style="list-style-type: none"> Impact on social environment (road accident, social conflict, Community health and safety) caused by the construction work and operation of Economic Zone might occur.
	Environmental and Social Consideration	<ul style="list-style-type: none"> Issues of environmental and social consideration might be more complicated and segmented in case random developments are conducted. 	<ul style="list-style-type: none"> Planned area development would effectively and comprehensively address environmental and social consideration issues.
	Living environment	<ul style="list-style-type: none"> Living environment of the adjoining area of proposed BSMSN will improve slowly. 	<ul style="list-style-type: none"> Living environment for local residents would be improved due to the development of the surrounding infrastructure.
	Resettlement	<ul style="list-style-type: none"> Resettlement would not occur. 	<ul style="list-style-type: none"> Resettlement have already been done under PSDSP
	Source of labour	<ul style="list-style-type: none"> The main source of labour is local residents. 	<ul style="list-style-type: none"> In with project condition, major sources of labour will be from migrant workers coming from across the country. Even some of the skilled persons might come from abroad.

Considering the overall technical, economic, environmental and social aspects as mentioned above, it is revealed that the selection of BSMSN 2A & 2B site is more appropriate.

5.3 Alternative Site Consideration

Various sites have been identified by BEZA for development of economic zones. Pre-feasibility study for various sites has been carried out to analyse suitability of site for EZ development by BEZA. As per pre-feasibility study and the previous EIA & SIA report it has been observed that that selected site is one of the most potential & suitable zone for development of EZ.

This site is analysed on the basis of location, accessibility, potential for industrial growth, availability of raw material, infrastructural development, availability of man-power, vulnerability to natural and man-made disasters, availability of the basic amenities and utilities for industrial development. After analysis, ranking has been done for this site. As per ranking it is found that Mirsharai has potential to be developed as EZ site due to its strategic location on Dhaka Chattogram Industrial Corridor. Factors responsible for selection of Mirsharai EZ-II (Zone 2A & 2B) site as site for development of economic zone are given below:

- Contiguous stretch of Government Land (Dissected by Ichakhali Canal). Sufficient land area for development of EZ (1450 acres of development area)
- No Resettlement & Rehabilitation Issues for EZ development
- Located outside city Corporation, Municipality and Cantonment Board Area
- Located Near to Chattogram Port (app. 70 km)
- Close proximity to Feni River and also well-developed inland water transport. Ichakhali Canal and Bamon Sundar Canal connect and Sea
- Close vicinity to Dhaka Chattogram Highway (10 kms) connected through Abu Torab Road
- Railway station close by (approx. 13 kms)
- Project site does not lie within any eco-sensitive zone or ecological critical area
- Availability of large nos. of un-skilled and semi-skilled labour

CHAPTER 6. STAKEHOLDER ENGAGEMENT

6.1 Introduction

Stakeholder refers to individuals or groups who are affected or likely to be affected by the project and the term “stakeholder engagement” refers to a way to describe the process of engagement between a project developer and those potentially affected by the subprojects or way of supporting the implementation. Stakeholder engagement can cover a range of activities and approaches and those are; consultation, engagement, external relations, information disclosure and dissemination, community participation etc. In the PRIDE project BEZA has already designed a common Stakeholder Engagement Plan (SEP) for all of the activities under PRIDE project following ESS10 of WB ESF.

As a part of updating ESA for the 2A & 2B, stakeholders’ consultation, focus group discussions (FGDs) and key informant interviews (KIIs) were carried out (from 5th November 2019 to 8th November 2019) in the project influence area to seek opinion and suggestion of the stakeholders as indicated in the SEP.

6.2 Stakeholder Identification and Analysis

During preparation of the ESA and ESMF under the present study, all the stakeholders have been primarily synthesised into two categories that have been identified as:

- Project-affected parties: those who are or likely to be affected by the project, and
- Other interested parties: who may have an interest in the project and who could influence the opinions of affected parties either positively or negatively, or affect the implementation process or the sustainability of the project’s outcomes

6.2.1 Project-affected parties

The 2A and 2B area is fully occupied by the BEZA and sand filling along with other physical works is going on. Therefore, no one will be negatively affected by the project interventions within the territory of the 2A and 2B. Rather some of the parties would be benefitted by employment opportunity, business opportunity and trainings and capacity building programs for skill enhancement. The benefitted group consist of local labourers to be engaged in the project work, suppliers and service providers, contractors, sub-contractors and transport owners & workers.

6.2.2 Other interested parties

The projects’ stakeholders including local people, land owners, house owners, civil society organizations, locally active NGOs, government officials, farmers, transport owners, women and vulnerable groups, fishermen, etc. will be impacted during construction of the project directly or indirectly due to Labour influx and project construction activities.

6.3 Information disclosure and consultation

A combination of mixed methods of information disclosure and consultation process was adopted at this stage of ESA preparation. The methods used in the consultation process were: (i) Key Informants Interview (KII), (ii) Public Consultation, (iii) Focus Group Discussion (FGDs) and (iv) Walk in Interview during Survey. Consultation and information disclosure were held in the zone of influence of 2A and 2B. In all occasions the date, time and venue of the consultation was decided by the stakeholders keeping in view their prior engagement and availability. Group discussion with various occupational groups in the project influence area were conducted in the public places convenient to them while KIIs were done by visiting the offices/place of the key informants.

6.4 Consultation and Participation

6.4.1 Consultation Meetings

Three consultation meetings were held at Moghadia union, Shaher Khali union and Ichakhali union during 6-7 November 2019 with 142 people (Male 116 and Female 26) including community including affected people of Sheikh Hasina Avenue, local government representatives, farmers, women and vulnerable people. Local people of various occupational groups were consulted through focus group discussions and officials from relevant government offices at Upazila level including Agriculture, Fisheries, Forest, Water Development Board, Local Government and Engineering Department and Local Administration were consulted as key informants. List and photographs of participants have been provided in **Annex B**.

During consultation with the people in groups or individually, they were briefed about the project including potential benefits, potential positive and adverse impacts and mitigation measures as well. People also raised some issues related to the probable impacts on them considering other EZs in the country. They also suggested some mitigation measures for their existence and sustainable development.

Table 6-1: Summary of issues and concerns raised by the people and responses provided

Issues	Concerns raised by the people	Responses Provided
Environmental and Social Safeguards	Necessary precautions on environmental and social issues are to be taken to avoid the various impacts anticipated during the preconstruction, construction and operation stages of the project.	Proper care will be taken by BEZA to minimize the impacts on environmental and social issues. Necessary safeguard documents will be prepared following the GOB rules and regulations and World Bank's ESF.
Compensation to all affected people	Compensation for all affected parties may not be done properly	There is no land acquisition and economic/social displacements issues in Zone 2A & 2B and this has been clarified with the stakeholders.
Livelihood restoration	Local people particularly fishermen move to the sea through Ichakhali and other canals. So none of the canals would be blocked and their fishing ground would not be disturbed. Woodcutters, agricultural and other labourers should have alternative livelihood opportunities during construction and operation phase of the project.	Alternative livelihood opportunities would be ensured through skill development trainings. During construction and operation phase of the PRIDE project, preference would be given to local people to provide employment.
Protect mangrove forest	A large area of Mangrove Forest has been destroyed by the EZ (2A & 2B area) due to sand filling. More mangrove forests are in the surrounding area within proposed EZ's territory. These mangrove should be kept uninterrupted for the wild species and grazing field for the Buffaloes and cows.	Bangladesh Forest Department made mangrove plantation in Mirsharai and Sitakunda Upazila of Chattogram district in different phases starting from 1965-66. There are areas within BSMSN where such mangrove exists. This is a man-made mangrove forest. No mangrove plantation exists within 2A & 2B zones. The main purpose of the plantation was to build a natural barrier against storm surges and flooding. Due to the construction of super dike by the Government, some part of this mangrove would be affected due to lack of tidal water flow, which a pre-requisite for mangrove tree. Thus, usefulness of the planted mangroves as a natural barrier against storm surges will be limited after construction of the super dike. PRIDE project is not going to cause additional harm to these mangrove

Issues	Concerns raised by the people	Responses Provided
		forest. The forest department will execute an afforestation program on the seaside the super dike for enveloping the artificial mangrove forest to offset the loss of mangrove forest that have been affected by the construction of super dyke (not related to the PRIDE project). Moreover, within the Zone 2A & 2B area, there will be tree plantation to restore the greenery. Master Plan of BSMSN also includes provision for reserve forest. Plantation of area between Zone 2A and Zone 2B site and sea with mangroves shall be ensured. If any tree is to be cut, then plantation should be undertaken in minimum ratio of 1:3.
Employment opportunity for the local people	Local labourers are not getting job opportunities in the EZ preparatory activities. A clear policy should be adopted to deploy local people in the project activities during construction and operation phase.	BEZA replied that they will give priority to provide the job for local people, and specifically the vulnerable groups.
Compensation at replacement cost	People, who lost/ will lose their land due to the project activities or other additional (associated) activities, should be compensated at replacement cost so that they can purchase alternative land.	Affected land owners will get replacement cost for their lost assets following the ARIPA, 2017. As per good practices of other development projects, displaced people will be allowed to take away salvageable materials free of cost after payment of compensation. Structure owners will get at least 30 days to dismantle their structure after payment is made.

6.4.2 ESA Disclosure Consultation Meetings

Consultation meetings were conducted in Moghadia union, Shaheer Khali union and Ichakhali union on 31 January and 04 February 2020 by BEZA to share the draft ESA. Affected persons, labour Group, women group, vulnerable group, local community and relevant stakeholders both govt. and private sector representatives participated in the Public Consultation Meetings. Suggestions received from the stakeholders have been considered in revising the report.

Table 6-2: ESA Disclosure Consultation Meetings

SN	Disclosure Consultation	Place	Nos. of Participants
1	Disclosure Consultation on 31 January 2020	Near Bangabandhu Sheikh Mujib Shilpanaga (BSMSN)	40
2	Disclosure Consultation on 04 February 2020	Domkhali Village, Shaheer Khali union	33
3	Disclosure Consultation on 04 February 2020	Chorshorot Primary School Premises, Ichakhali union	50
4	Disclosure Consultation on 04 February 2020	# 06 -Icha Khali Union Parisad Premises, Ichakhali union	40

List of participants (attendance sheet) and photograph of this disclosure consultation have been provided in **Annex B**.

The following were shared and discussed in the meetings:

- Project brief on BSMSN;

- Future Plan of BSMSN;
- Future Employment plan at BSMSN;
- Baseline information of the study area;
- Key environmental and social benefits as well as potential negative impacts from construction and operation of planned activities in Zone 2A & 2B;
- Recommendations of the ESMP.

6.5 Grievance Redress Mechanism

Considering the overall need for the total project period, BEZA will establish a three-tier Grievance Redress Mechanism (GRM) to address complaints and grievances of the project affected people throughout the life cycle of the project. Project-affected-people in the PRIDE project and any other stakeholder may submit comments or complaints about less valuation of the affected assets; delay in compensation payment; adverse effect on the squatters/unauthorised occupants and their livelihood, effect on the society and the local community due to construction related activities leading to noise and dust pollution, conduct of the migrant workers, local workers and the contractor, GBV and spread of STD, etc. Details of the GRM procedure has been provided in the Stakeholder Engagement Plan (SEP). Sample Grievance Registration Form is provided in **Annex I**.

6.5.1 GRM for Dealing with Labourers Issues

A separate GRM for dealing with labourers issues including sexual exploitation and abuse has been designed following the requirements of ESS2. This GRM will deal with wage rates and unpaid overtime works; irregular and partial payments; lack / inadequacy of living accommodations; lack of clean drinking water and sanitation facilities; lack of medical care in emergencies; lack of protection against gender-based violence / sexual exploitation and abuse (GBV/SEA) of female workers by labourer suppliers / sardars, supervisors, and others who also deal with workers. Details of such GRM has been provided in Labour Management Procedure (LMP) document.

6.6 GRM Monitoring and Reporting

Day-to-day implementation of the GRM and reporting to the World Bank will be the responsibility of the Project Director of PRIDE project. To ensure management oversight of grievance handling, the Internal team will be responsible for monitoring the overall process, including verification that agreed resolutions are actually implemented.

6.7 GRM contact information - BEZA

Information on the project and future stakeholder engagement programs will be available on the project's website and will be posted on information boards in the project office, villages, Union Parishad Office, Upazila Office crossed by the line. Information can also be obtained from BEZA offices in Mirsharai and Dhaka.

The point of contact regarding the stakeholder engagement program at BEZA is given below:

Description	Contact details
Company:	Bangladesh Economic Zones Authority
To:	Project Director
Address:	111 CR Datta Raod (level 12), Dhaka
E-mail:	mahmud.faruk@gmail.com , social.stcb@beza.gov.bd
Website:	www.beza.gov.bd
Telephone:	02-9632459

CHAPTER 7. ENVIRONMENTAL AND SOCIAL IMPACTS

7.1 Introduction

This section identifies and predicts the probable environmental and social impacts in the proposed area in the project area of influence due to the various planned activities in zone 2A & 2B under PRIDE project. The impacts have been evaluated with respect to their nature of impact (i.e. direct or indirect), spatial nature (i.e. local or widespread), temporal nature (i.e. long term or short term), and likelihood of occurrence. Finally, the consequences of these impacts have been categorized into a qualitative scale defined by nature of work for each category. The following sections describe all the potential impacts during different phases of the project (i.e. pre-construction, construction and operation) on ecology, physio-chemical (water resources, land resources, agricultural resources, fisheries resources, ecosystem resources) and socio-economic environment in and around the project area. During the construction phase, the impacts may be observed as temporary or short-term; while long-term impacts may be observed during the operation stage.

7.2 Determination of Impact Significance

The significance of impacts has been determined by combining the perceived frequency of occurrence of the source of the impact, the duration, severity, and spatial extent of the impact and the sensitivity of the area being impacted upon.

7.3 Assessment of Environmental and Social Issues

There will be different activities related to development of the economic zone i.e. arterial and non-arterial roads, footpath and plot entry culvert, storm water management network, site filling, widening of under construction single lane road to 2 lane road, some key public buildings and facilities, water supply network, construction of landfill for solid waste management, biogas plant, construction of pump house, construction of central effluent treatment plant, preparing industrial plots by brick layout, installation of deep tube well, etc. Following impacts have been identified for the site preparation and construction phase based on the **ESS-1 of WB**.

Potential environmental impacts have been identified and predicted for both negative and positive impacts in terms of environmental and social parameters for the pre-construction, construction and operation phase. The impact identification matrices based on the activities involved in different phases have been prepared. An activity – impact interaction matrix for the pre-construction, construction and operation phase of the project has been presented in **Table 7-1**.

Table 7-1: Activity–Impact Interaction Matrix for Pre-construction, Construction and Operation phases of the Project

Project Interventions	Environmental and Social Impacts / Issues																		
	ESS1	ESS2					ESS3					ESS4		ESS5	ESS6		ESS7	ESS8	
	Disadvantaged/Vulnerable	Labour Influx	Occupational Health & safety	Employment	Gender Based Violence	Livelihood	Social conflict	Soil Quality	Sediment Quality	Water Resources (Quality & Quantity)	Air Quality	Noise Level	Community Health and Safety	Traffic & Transport	Land Acquisition, Resettlements on Land Use and Involuntary Resettlement	Terrestrial Ecology	Aquatic Ecology	Impacts on tribal peoples	Physical Cultural Resources
Pre-Construction & Construction Phase																			
Site upgradation	√	√	√	√	√		√	√		√	√	√	√	√		√	√		
Construction of arterial and non-arterial roads, footpath and plot entry culvert	√	√	√	√	√		√	√	√	√	√	√	√	√		√	√		
Construction of integrated stormwater management network	√	√	√	√	√		√	√	√	√		√	√	√			√		
Water supply network	√	√	√	√	√		√	√		√		√	√	√					
Construction of telecommunication network	√	√	√	√	√		√	√	√			√	√	√					
Construction of some key public buildings and facilities	√	√	√	√	√		√	√		√	√	√	√	√					
Construction of sewer network and waste water/sewage treatment plant	√	√	√	√	√		√	√		√	√	√	√	√		√	√		
Construction of a biogas plant	√	√	√	√	√		√	√		√	√	√	√	√		√			
Development of a landfill site for solid waste generated	√	√	√	√	√		√	√		√	√	√	√	√		√			
Construction of a Common effluent treatment plant (CETP)	√	√	√	√	√		√	√		√	√	√	√	√		√			
Operation Phase																			

Project Interventions	Environmental and Social Impacts / Issues																		
	ESS1	ESS2					ESS3					ESS4		ESS5	ESS6		ESS7	ESS8	
	Disadvantaged/Vulnerable	Labour Influx	Occupational Health & safety	Employment	Gender Based Violence	Livelihood	Social conflict	Soil Quality	Sediment Quality	Water Resources (Quality & Quantity)	Air Quality	Noise Level	Community Health and Safety	Traffic & Transport	Land Acquisition, Resettlements on Land Use and Involuntary Resettlement	Terrestrial Ecology	Aquatic Ecology	Impacts on tribal peoples	Physical Cultural Resources
Arterial and non-arterial roads, footpath and plot entry culvert.							√				√	√	√						
Integrated stormwater management network												√	√			√			
Water supply network												√	√						
Telecommunication network												√	√						
Some key public buildings and facilities												√	√			√			
Sewer network and waste water/sewage treatment plant			√				√	√	√			√	√			√			
Biogas plant			√				√		√			√	√			√			
Landfill site for solid waste generated			√			√	√	√	√	√		√	√		√	√			
Common effluent treatment plant (CETP)			√			√	√	√	√	√		√	√			√			
Operation of Section 2A & 2B with Industries																			
Textile	√	√	√	√	√		√	√	√	√	√	√	√	√		√	√		
Pharmaceutical	√	√	√	√	√		√	√	√	√	√	√	√	√		√	√		
Food Processing	√	√	√	√	√		√	√	√	√	√	√	√	√		√	√		

7.4 Impacts during Pre-construction and Construction Phase

7.4.1 E&S Risks and Impacts Related to ESS 1

7.4.1.1 Disadvantaged and Vulnerable persons

Under this project, vulnerable person has been defined in accordance with the WB's ESF that includes family/household headed by women/female, physically challenged person, families living below poverty line (extreme poor), widows and persons above the age of 65 years irrespective of their status of title (ownership). Vulnerable groups would also include those persons who (after acquisition of land) become small/marginal farmers and also qualify as vulnerable households and/or individuals. Most of the land under the project is reclaimed land not inhabited by human settlement. The project site is mostly reclaimed area and there is no human settlement within the 2A & 2B area. No vulnerable or disadvantaged group were identified whom might be adversely affected by the project activities. However, within the project influence area, people from certain vulnerable groups will be benefitted by new employment opportunities created in construction works and through the supply of goods and services.

7.4.2 E&S Risks and Impacts Related to ESS 2

7.4.2.1 Labour Influx and Working Conditions

Origin of Impact

Local and migrated workers, working condition and interaction with local community.

BEZA will contract with different agencies to undertake civil works and to support core-functions. BEZA will also contract with primary suppliers of material/equipment and other implementation support partners. These agencies could be from anywhere in the country or outside (if needed). Construction works will require labour force and associated goods and services.

The package wise construction contractors are expected to establish construction camp sites, material stack yards, hot mix plants and workforce camps at suitable place of 2A and 2B site. The accommodation for the skilled and unskilled labours will be provided at the work force camps, whereas all other category of construction workforce (supervisors and above rank) will be provided with rented accommodation at nearby settlement areas/towns.

In addition, this influx of labour may affect the project area adversely in terms of additional burden on public infrastructure such as health services, utilities (i.e. water and electricity), housing and social dynamics. Other related issues would be increased risk of spreading of communicable diseases and increased rates of GBV.

Project shall comprise the following types of workers:

Direct workers: Direct workers will include the project managers and supervisors, who are employees of BEZA, deployed for Zone 2A and Zone 2B. The estimated number of direct workers is not likely to exceed 33 for all of its units (i.e. project construction unit, technical unit, environmental and social management unit (ESMU), etc.) as per existing institutional arrangements and practices of BEZA, among others.

Contracted workers: All the work force deployed by the Contractors and the Project Management Consultant (for all packages) under the Zone 2A and Zone 2B will be deemed to be contracted workers. The Contractor(s) might further engage multiple subcontractors. All work force of all such sub-contractors will be also deemed to be contracted workers. These will also include migrant workers as all the required labour will not be fully supplied locally for a number of reasons such as worker unavailability and lack of technical skills and capacity. In such cases, labour force (total or partial) needs to be brought in from outside the project area. Influx of migrant labour from other district for construction works is likely to continue in this project resulting in potential social conflicts, gender-based violence (GBV) etc.

Primary supplier workers: There will be primary suppliers who will provide goods and materials i.e. construction material, security services, etc. outsourced through contractor(s). Such workers will support the project at different stages.

7.4.2.2 Occupational Health and Safety Hazard

The development of the Zone 2A and Zone 2B will involve a range of activities that might possibly be unsafe to workers and the local community if measures or precautions are not taken. The construction activities include site preparation, infrastructure utilities installation and building structures. Loading and unloading operation of the construction material may cause an injury if not handled properly. Overexertion injuries and illness are potentially the most common health hazards associated with construction activities. Further, there is potential for slips and fall on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction material, liquid spills and uncontrolled use of electrical cords and ropes on the ground which results in injuries and time loss during construction.

Hazards associated with fall of construction material (toxic or flammable liquids; flammable solids; oils and other hydrocarbons; paints; metal waste; etc. from diversity construction work) or tools, as well as the collapse of constructed slabs, walls and roofs can result in injury to head, eyes, and extremities. Most importantly, there is no hospital adjacent to the project site, which would arise serious problem for arranging preliminary treatment after of any injury. Transportation and movement of vehicles are associated with road accidents and related hazards, which can lead to injuries and fatalities. In this context, it seems that due to improper housekeeping, inappropriate use of PPEs and absence of emergency response plan at working site would likely impact the health and safety of associate's worker. Considering the intensity of work, project location and types of activities that will be done for the proposed facilities, it seems without mitigation measures this project may carry Substantial risk on the OHS.

7.4.2.3 Gender Based Violence (GBV)

The following probable impact is expected to occur if proper human resource management are not taken in project site.

- Wage discrimination between men & women
- Women friendly sitting arrangement and drinking water facilities may not be provided
- Eve teasing and sexual abuse
- Women, particularly of weaker sections may be discouraged to speak and demand equitable benefits in the name of porda/ dignity of women

The project has been screened for GBV risks and it has been rated as "substantial". The GBV Action Plan that will be prepared by BEZA will include appropriate mitigation measures.

7.4.2.4 Social Conflict

During the construction phase of Zone 2A and Zone 2B development project at Mirsharai, a large number of workers will be engaged and influx of construction workers will impact on the local environment. It will create an extra pressure on the local available resources like housing, water resource etc. The workers can be hired from the local community and surrounding districts. The influx of workers to the community may cause impacts to community health and safety, especially an increase in prevalence of diseases and social conflict. The main anxiety for the community is food and water borne diseases, faecal elements contamination into water. There is possibility to increase sexually transmitted diseases such as HIV/AIDS because of influx of the workers. Furthermore, migrant labour can involve with local politics and abuse the female worker as well as neighbouring society.

7.4.3 E&S Risks and Impacts Related to ESS 3

7.4.3.1 Air Quality

Origin of Impact

- From dust of earthworks such as levelling, grading, excavation works and movement of vehicles across dirt/unpaved roads,
- Construction of different infrastructures, loading and unloading of construction materials,
- Exhaust emissions of SO₂, NO_x, CO₂, CO, PM 2.5 and PM₁₀ from vehicles such as movement of trucks and vehicles during construction work.

Impact Assessment

Air quality will be affected at the Zone 2A & Zone 2B project site and its approach road due to various construction activities and movement of vehicles carrying construction materials and machineries. The fuel of vehicles and construction machineries will also contribute to air pollution releasing hazardous air emissions such as: NO_x, SO₂, CO₂, CO, PM_{2.5}, PM₁₀ and SPM. Among these emitted gases, NO_x and CO₂ are greenhouse gas. During construction of onsite infrastructures at project area, a considerable quantity of earth works will be required. The machinery used for the earth excavation will generate dust which can be dispersed by the wind. Construction works involve digging, crushing, transporting and dumping of large quantities of stones/bricks, sand and cement. During the dry season (October-May) dust pollution increases and during monsoon season (June-September), the dust pollution reduces due to the rain. Most importantly, nearby the project site there is no sensitive receptor like hospital, school residence etc. except few labour sheds of different project that might be affected by the dust pollution. Considering the context, without mitigation measures the significance of the impacts is assessed to be moderate risk.

7.4.3.2 Water Resources (Surface and Ground Water) and Quality

Origin of Impact

The expected possible sources of impact on surface and groundwater resources are as follows:

- Improper site selection and improper management of solid and liquid waste from labour sheds
- Withdrawal or abstraction of surface and groundwater(GW) for construction work and domestic purposes;
- Earthworks in the project area may increase the erosion, especially during rainfall events, which may increase the suspended sediment concentrations and pollute the adjacent Bamon Sundar and the Ichakhali Khal water sources;
- Sewage will generate from the construction workforce (toilets and washing facilities) and from drainage from cooking activities.
- Liquid effluents will also arise from washing of construction equipment and vehicles; and
- Inappropriate storage of construction waste, material storage that will lead to water quality impacts of Bamon Sundar and Ichakhali Khal through runoff into these canals.

Impact Assessment

There are two canals adjacent to the project site which may be contaminated through the discharge of construction waste as well as from camp-site organic waste and liquid waste if waste is not properly managed. Surface water quality also might be contaminated due to the accidental spills/leaks at the storage areas. A small volume of wastewater from the washing of equipment and machinery may also be generated. This wastewater may contain concentrations of suspended solids and traces of hydrocarbon. These pollutants may deteriorate the nearby surface water quality by the surface runoff. However, it will be site specific and in a confined area. Thus, the impact on water quality during the construction period has been assessed as moderate risk.

7.4.3.3 Land Resources (Soil)

Origin of Impact

The potential source of impact on land resources during the construction phase activities includes:

- Site Cleaning, levelling (cutting, stripping, excavation, earth movement and compaction);
- Transportation and storage of construction materials/equipment
- Storage, Transportation, and Disposal of Construction debris
- Influx of labour and construction of temporary houses
- Waste disposal from construction camp
- Civil construction activities for different infrastructures of EZ.

Impact Assessment

The soil at Zone 2A and 2B site can be polluted due to improper storage of construction wastes such as metal cutting, debris, packaging materials which may contaminate soil at the site of construction. It can also be polluted from accidental oil spillage from construction vehicles and public vehicles, liquid and solid waste from construction camp and improper disposal. Accidental spillage or inappropriate management of fuels, engine oil and hazardous chemicals during the maintenance and replacement of vehicles and equipment's can pollute the surface soil. However, the significance of impacts on the soil pollution can be assessed as Low.

7.4.3.4 Sediment Pollution

The expected possible sources of impact on sediment are as follows:

Origin of Impact

- Disposal of generated solid & liquid waste into the nearby khals from construction of onsite infrastructure of Zone 2A and Zone 2B
- Soil erosion from the embankment side and the spread of vehicles fuel & lubricant and stockpiles into the nearby water body through runoff

Impact Assessment

Construction activities vicinity of the Khal bed (piling of building, excavation, concreting work), accidental spillage of hazardous chemicals like fuel oil and lubricant from the construction vehicles, improper storage and disposal of construction waste (debris and cement), solid and liquid waste from the worker's facilities may mix with rainfall water and it can accumulate on the adjacent river & canal bed through runoff. Besides the above-mentioned sources of impacts, there are some additional sources i.e. runoff and erosion of exposed bare soil, slopes, earth and stockpiles, release of cement materials with rain and washing water of dust suppression sprays and vehicle wheel. The extra sediment loads in the canal and river water also lead to an impact on the aquatic environment. All of the anticipated impact is site specific and for short time duration and limited to construction period. Since earth work control measure has been taken, so potential impact from construction activities on sediment content of the water body is assessed to be low.

7.4.3.5 Noise

Origin of Impact

Following project activities were considered for the purpose of impact assessment on ambient noise levels during the construction phase:

- Operation of construction machineries and construction of buildings, CETP, sanitary land fill, biogas plant, etc.
- Operation of DG sets;
- Operation of concrete batching plant for buildings, CETP, sanitary land fill, biogas plant etc.

- The equipment likely required to complete the above tasks will typically include bulldozers, excavators, stabilizers, concrete mixture, concrete vibrator, brick/stone crushers, crane, and transport vehicles.

Impact Assessment

During the construction phase of Zone 2A and 2B, noise level could be increased as a result of transportation of construction materials and equipment, unloading of construction materials and operation of heavy vehicles/equipment for construction of super dike and other onsite allied building structures of Zone 2A and 2B. Number and types of vehicles/equipment for the construction activities also depends on construction methodology for various types of works. Most of vehicles will use diesel engines that generate noise and vibration. Other sources of noise pollution are the use of hydraulic horns, movement of public vehicles movement and use of generator in the construction site. Some common impacts of noise pollution include annoyance, sleep disturbance and interference with communication. However, there is no community located near Zone 2A and 2B project location but have a large number of birds seen in this area. There is a manmade mangrove is close to the site. Birds and animal of this mangrove forest will experience unusual living environment. Adjacent to the project site there is no sensitive respirator like school hospital etc. Areas in and around the project site is vacant place, hence possibility of change of baseline noise level at project area is to be minimal and very much site specific. Thus, the impact assessment has been considered as low.

7.4.4 E&S Risks and Impacts Related to ESS 4

7.4.4.1 Community Health and Safety

Origin of Impact

- Dust blowing, increase noise level from different subproject implementation;
- Faulty design of infrastructures;
- Use of hazardous material and generation of hazardous waste
- Deployment of security personnel.
- Increased construction vehicles movement etc.

Impact Assessment

The local community near Zone 2A and 2B site will not to be impacted by the proposed onsite construction activities since there is no residence adjacent to the project site. However, offsite infrastructure such as accesses road i. e. Sheikh Hasina avenue (from Dhaka-Chattogram Highway to project site) is permitting movement of construction vehicles for the transportation of construction materials at the project site. The number of vehicles will be increased. This increasing number of traffic will occur traffic congestion with the time. In addition, road accidents may be occurred due to the movement of construction vehicles with construction materials and equipment and operation of machineries and equipment's during construction phase. Specially the school going children are the major victim of accidents in the approach road. Particularly, Moghadia Bazar is an accident prone area because there is a high school, a primary school, a mosque and a local bazar. Communicable diseases can spread among the local community from the influx of the construction workers due to improper management of construction camp.

Zone 2A and 2B area is one of the most disaster-prone areas of Bangladesh especially for storm and cyclone. Therefore, with extreme weather condition such as in high wind if any construction work is carried out may cause serious threat to the construction worker by spreading pieces of construction debris, rod or any sharp object. Increased vehicles movement for transportation of material and equipment as well as operation of diesel-based machines will emit the black smoke which contains SO_x, NO_x, CO₂, etc. Adjacent to the project site khal water will have possibilities to be contaminated by the contact of toxic chemical or hazardous liquid from the construction vehicles and equipment

as well as discharge of human excreta. Subsequently, consumption of contaminated (due to human, animal or chemical waste) water will be the cause of water borne diseases to community. Furthermore, manmade hazard may occur in the site such as fire hazard from the short circuit of electrical wire or at open burning in the site. However, considering the project nature and extent of work, significance of impact or risk on the community health and safety can be assessed to be moderate.

7.4.4.2 Transport and Accessibility

No sensitive feature like school, hospital, etc. are located along the access road alignment that is to be widened. At present, no major impact is anticipated on social sensitive receptors due to widening of access road because only 14 temporary structures & 5 temporary prayer places are mentioned at a previous SIA which have already been relocated by following project ARP. Traffic movements do not generate any significant vibrations which can affect integrity of any structure. Furthermore, there could be impact on the utilities if resources being used by local communities will be diverted for development of Zone 2A and 2B i.e. ground water, roads, etc. Moreover, during construction phase traffic on existing Abu Torab road and under construction single lane road on BWDB/CDSP embankment is expected to increase and traffic congestion have been observed in these roads (study area). In this context, potential impact of significance is considered to be moderate for utilities and traffic.

7.4.4.3 Hazardous and non-hazardous waste

The project activities will generate both solid non-hazardous and hazardous wastes throughout the construction phase. The anticipated non-hazardous waste includes excavated material, construction material, Municipal Solid Waste, wastewater. While hazardous waste may include used oil, empty drums or replaced parts of the construction machinery, used battery, chemical for concreting like admixture etc. There are potentially a number of risks to human health and the environment that may be associated with the handling, storage and disposal of waste, both on and off-site. Improper handling and storage could result in possible cross contamination of air, soil and water resources; as well as direct and indirect effects on human health. Environmental pollution with organic and non-organic waste generated from project activities may occur due to uncontrolled disposal and inadequate management of waste during road construction and operation of the camps for construction workers. Discharge of untreated wastewater can result in pollution in soil, water bodies and have adverse effects on human health, flora and fauna and surface and groundwater. Considering the size of work and possibility of use of hazardous waste material to implement the construction activities, anticipated impact can be assessed as substantial due to hazardous and non-hazardous waste.

7.4.4.4 Employment Generation

Employment opportunities will be ensured by direct employment for unskilled labour, indirect employment to the local community; and employment of women workers. Direct employment includes site clearance, excavation, loading and offloading of materials and deliveries, mason and construction works. Further, the construction labour force will be requiring food and other items, which is expected to be supplied by the local eateries, retail shops and the local community. The local community members can take advantage of these opportunities. Employment generation benefits improve the quality of life of the labourers and enhance their productivity and living standards. Through employment generation, both direct and indirect, Mirsharai EZ (Zone 2A and Zone 2B) will have a tremendous impact on human development and poverty reduction in the Mirsharai area. Different types of construction works will create an important avenue for young women to become part of the formal economy at better wages compared to agriculture and domestic services. Employment opportunities within Zone 2A and 2B will increase their

employability and position in the household. In addition, Mirsharai EZ is expected to assist women in changing their occupation pattern and accessing better job opportunities and wages.

7.4.5 E&S Risks and Impacts Related to ESS 5

7.4.5.1 Land Acquisition, Resettlements on Land Use and Involuntary Resettlement

No Resettlement and rehabilitation or land acquisition is needed for Zone 2A and 2B development as per current study. However, in the previous SIA it was mentioned that, only 14 HHs (Squatters) and 5 temporary mosques were affected by the development of approach road. Hence, to apprise the issue as a part of this report several consultations were carried out adjacent to the project affected area. Public consultation confirmed that, those PAPs has been compensated as per GoB resettlement rules by following as per approved Abbreviated Resettlement Plan (ARP) (BEZA Document, 2016).

7.4.6 E&S Risks and Impacts Related to ESS 6

7.4.6.1 Biodiversity and Natural resources

The potential sources of impact on ecological resources during the construction phase of the project will be mostly from the following activities:

- Project site clearance;
- Project site levelling by sand filling
- Construction activities at site;
- Accidental leakage of oil or any petroleum from construction vehicles and equipment
- Construction vehicle's emission;

Impact on Flora

During site visit of Zone 2A and 2B, no vegetation coverage was identified. Thus, no vegetation removal will be required for construction of infrastructure and facilities in the project site. But, during earthworks for the construction of approach roads of Zone 2A and 2B and movement of heavy loaded trucks for transporting the construction materials and workers, dust will be generated and deposited on leaves of nearby trees/vegetation of manmade mangrove forest that is adjacent to the Zone 2A and 2B site. This will affect the growth of trees.

Impact on Fauna

Zone 2A and 2B construction activities have perhaps most serious effects on aquatic ecosystems though are not seen directly. Construction activities especially culvert on the Ichakhali Khal, will increase sediment loading of streams and changes in turbidity will impact adversely upon fishes and aquatic animals. During construction phase, accidental oil spillage, fuel leaks and chemical spillages in the Khal, noise and vibration from the piling activities will impose adverse impacts on fishes of the waterbodies nearby the project site. In addition, run-off from construction site may contain sediments or contaminant which may pollute water quality of Ichakhali canal and impose adverse impact on the aquatic life of Ichakhali canal if measures for minimizing the impact are not undertaken. The proposed interventions related to construction activities (for office building, storm drainage network, water supply network, etc.) of Zone 2A and 2B including noise from construction vehicles and machineries, movement of workers in the project site are likely to disturb the wildlife such as birds, dogs, fox, deer, etc. in the influence area of Zone 2A & 2B.

Some mud Crabs were observed near the canal at the site, this Crabs habitat may be adversely affected temporally from development work (greenery work: landscaping, percolation pits, eco-friendly vegetation) at sea side of embankment that is proposed along the Khal. However, embankment is proposed to leave zone of 30 m as no development zone along the Ichakhali canal which is passing through the site. So anticipated impact is minimal. Local people confirmed that, at winter season few migratory birds are found in the Zone 2A and 2B site but study team did not find any migratory birds in the project site. However, few migratory birds were recorded within the

project influence area by visual observation. The potential impact on migratory birds is minimal because there are lots of wetland and few manmade forests within the zone of influence. However, considering the aforementioned discussion it is identified that due to few long-term impacts on biodiversity and ecosystem, significance of impact would be considered as substantial. Within the project area, there are some water bodies (i.e. Ichakhali canal) which provide provisioning services (one of the ecosystem services) as local people who used to fish from those resources. Such services would be negatively impacted if the water of these water bodies become polluted. Any disturbance such as dredging activity to Feni river estuary during the month of October may negatively impact pawning of Hilsha fish.

7.4.7 E&S Risks and Impacts Related to ESS 7

7.4.7.1 Ethnic Minority

There is no ethnic minority adjacent to the Zone 2A and 2B site and its influence area. There are some ethnic minorities living in Chattogram Division particularly in Chattogram Hill Tracts (CHT). It is anticipated that, the project will not affect the ethnic minority community, rather would benefit them by providing employment opportunities through various development activities to be undertaken under this project.

7.4.8 E&S Risks and Impacts Related to ESS 8

7.4.8.1 Physical Cultural Resources

Based on the field survey and discussion with local people and review of related literatures, it is recorded that there are no physical cultural resources. A chance find procedure should be practised during construction works to scan through the area for any physical cultural resources. It will be included in all contracts relating to construction of the project, including excavations, demolition, movement of earth, flooding or other changes in the physical environment. In case of any cultural resource findings during excavation and general works, the works will cease immediately, the area will be secured and the relevant authorities will be informed within 24 hours of the said findings. The instructions received from the authorities and national law will be followed.

7.5 Impacts during Operation Phase

Generally, it is foreseeable that operation of on-site infrastructures of Zone 2A and 2B will have no significant impact to the environment and society except operation of CETP, biogas plant and sanitary landfill. But operation of the zones with industries may pose threat to environment and social component of the study area. In this regard, expected impact of operation phase has been divided in to two categories which are as follows:

1. Impact due to Operation of on-site Intervention of Zone 2A and 2B.
2. Impact due Operation of Zone 2A and 2B with Industries

7.5.1 Impact due to Operation of on-site Intervention of EZ (2A & 2B)

Majority of the on-site Intervention operations will bring positive impacts to Zone 2A and Zone 2B. Beside these positive impacts there will be some adverse impacts on local environment and social parameter due to operation of CETP, Biogas treatment plant and sanitary land fill. The potential environmental and social impacts linked with the subprojects during the operation phase are discussed below.

7.5.2 E&S Risks and Impacts Related to ESS 2

7.5.2.1 Occupational Health and Safety

Due to operation of CETP, activities such as handling of waste water, emissions during holding and treatment, discharge of pollutants, transportation and storage of raw materials will likely have an

impact on occupational health and safety for the personnel exposed during longer time periods to such activities.

The sanitary landfill also has potential to impact on public's and workforce health and safety. Most potential impacts are associated with the disposal sites. If proper measures are not taken, workers of landfill disposal site might experience adverse impacts through exposure to infectious and biological contaminants, odour, vector borne disease from land fill site vermin, handling of hazardous waste etc.

Operation of biogas plant will involve high voltage lines, field connections, and wet ground surfaces. Therefore, any loose connections and improperly grounded equipment may create severe health hazard.

Biogas, CETP, land fill facilities use significant amount of hazardous materials, including raw materials and intermediate/final products. In addition, if handling and disposal of used oil, discarded containers, CETP sludge are not properly stored, and transported then it will impose high risk to worker's health and safety.

7.5.3 E&S Risks and Impacts Related to ESS 3

7.5.3.1 Land Resources and Soil Quality

Due to treatment of waste water, a substantial amount of sludge will be produced at drying bed of CETP. The soil might get contaminated due to leakage of waste water treatment bed, mixing of leachate from sludge drying bed, over flow of sludge drying bed, failure or leakage of effluent collection pipeline of CETP. On the contrary, slurry produced during the waste processing in the digester of biogas plant, would affect the soil if it is not properly managed. At the same time, if engineering practices are not applied to handle the waste at land fill site, soil quality can decline at project site. Further, there will be possibility of contamination of the project site soil from leakage of sewer line.

7.5.3.2 Air Quality

Emissions of fugitive dust, bio-aerosols are quite common from operational activities viz. waste transportation, receipt, unloading, processing and storage of landfill site. Thus, if proper measures are not taken, it may degrade the air quality. On the other hand, possible air emissions from CETP operations include pollutants during treatment, particularly Volatile Organic Compounds (VOCs) from holding chambers or treatment cells, emissions from diesel generator sets and boilers etc. In addition, there will be chance of spreading bad odour from the effluent treatment plant. For the biogas subproject, any combustion process will not be needed except occasional operation of DG set in case of failure of power. Hence there will be no regular and continuous point source of flue gas emission. Beyond these adverse impacts, aesthetic beauty of landscape will also be improved by the operation of onsite infrastructures. Besides, air quality will improve as the paved surface minimizes the dust blowing.

7.5.3.3 Noise

After implementation of on-site interventions, noise will be mainly generated from CETP, biogas and land fill site, due to waste treatment machinery, pumps, blowers, diesel generator sets, vehicular movement for material transportation and loading and unloading activities.

7.5.3.4 Surface and Ground Water Quality

Landfill leachates contain dissolved ingredients resulting from the degradation of the disposed waste. It also can contain some suspended solids, including pathogens. Leachate and runoff from waste storage and processing areas may contain organic material such as biochemical oxygen demand (BOD), phenols, nitrates, phosphorous, dissolved metals, and other contaminants. If

collection and treatment are not done properly (without impermeable layer at bottom), leachate can spread from the landfill and contaminate surface water and ground water. The leachate penetration from sludge drying bed of CETP in underground water may decline the GW quality. Processed water is generated from the biogas scrubbing unit and from the boiler section which contain suspended solids, ammonia and nitrogen etc. Though discharge of processed water from scrubbing unit is generally minimum but without treatment, discharge of water may pose adverse effect to water quality. Besides, if storm water carries pollutants (washed materials like debris, metal pieces, etc.) from surface runoff during rainfall and mixes with nearby khals, it may degrade the water quality.

Assessment of air quality and water quality during operation has been presented as **Annex D**.

7.5.4 E&S Risks and Impacts Related to ESS 4

7.5.4.1 Traffic and Road Safety

Traffic movement would be increased due to operation of the industries in the economic zones. This might increase the risk of accident for the community people.

7.5.4.2 Security Personnel

The risk associated with security personnel, especially use of excessive force and unethical behaviour may pose risk to community members.

7.5.4.3 Risk from Hazardous Material and Wastes

It is likely that the project would generate hazardous wastes and if such wastes are not disposed off in an environmentally safe way, community health and safety may be at risk.

7.5.4.4 Infrastructure Design

The constructions must be designed considering BNBC and other related codes to deter the effect of seismicity and environmental hazards else workers and end users alike might be at risk of using the same.

7.5.5 E&S Risks and Impacts Related to ESS 5

7.5.5.1 Land Use

Development of Zone 2A and 2B will attract more infrastructural development around the project site to facilitate industrial growth changing the land use from agriculture to industrial. Some of the other developments such as new roads, housing facility, hotels, hospital, restaurants, schools, ancillary industries, cottage industries, etc. may also be established in nearby areas. This will lead to change in land use but will lead to significant development of the area.

7.5.6 E&S Risks and Impacts Related to ESS 6

7.5.6.1 Biodiversity and Ecosystem

After completion of onsite intervention significant adverse effect on biodiversity and ecosystem will be negligible. During operation of CETP, waste water of the Zone 2A and 2B will be treated prior to discharge to the nearby surface water body resulting in safe habitat of aquatic flora and fauna. BEZA would prepare detailed operational guideline for the individual industries for pollution prevention. However, parameter which indicate good quality water for aquatic life such a level of dissolved oxygen, bio-chemical oxygen demand, turbidity etc should be tested at regular intervals. The fish and other aquatic fauna, particularly which provide provisioning ecosystem services, should be tested for heavy metal at least once in a year.

7.5.7 Impact due to Operation of Zone 2A & Zone 2B with Industries

As per the planning for Mirsharai EZ (Zone 2A & Zone 2B), it is anticipated that industries like food processing, textile, petrochemical, steel and steel product and light engineering will come up in the Zone 2A and 2B after land development with utilities support. These industries are not heavily polluting like tanneries, distilleries, etc. But these industries generate waste both hazardous and non-hazardous in nature, which can pollute the environment if not managed properly. Since, at this moment design and location of industries are not known hence only general impact is identified here for the future industries that will take place at Zone 2A and 2B.

After development of economic zone with industries, disposal of industrial and domestic waste may contaminate soil, water, noise, air quality and ecology of the site and the nearby areas. Mentioned industries would generate a wide variety of solid and chemical waste. These wastes include spent catalyst, storage tank sediments, packaging waste, metal pieces, damaged electrodes and rods, ends of coils, wires and spools, greased clothes/cotton, metal dust, dust found from filter ventilation systems/air pollution control devices, floor sweepings, resins, fabrics, apparel, dye, discarded machineries, etc. Beside these inorganic waste food processing industries will generate organic solid waste like rinds, seeds, skin, and bones from raw materials, resulting from processing operations. These components may affect soil quality if not disposed properly.

Industrial development will involve generation of emissions and increased vehicular movements. These altogether may have overall negative impact on the air quality of the site and the nearby areas by releasing hazardous air emission like particulate matter, sulphur dioxide, metals and other criteria pollutants like ozone, oxides of nitrogen and carbon monoxide from the operation of light-engineering industries. Food processing and pharmaceutical industries will release volatile organic material. But air emissions from wastewater treatment plant of these industries will be a major concern. No significant air emissions will be generated from textile industries. It is anticipated that approximately 600 PCU per day will be added after project development (Source: EIA, Mirsharai EZ-II, 2016). CO generation standards for motorized vehicle as per ECR, 1997 are 24 g/km. Thus, due to addition of 600 PCU, it is expected 14400g/km CO will be added to the atmosphere per day during operation phase. These emissions may adversely affect the air quality in study area if not managed properly.

Noise will be generated from the operation of industrial units, running DG sets in each units and traffic movement within Zone 2A and 2B. Noise pollution is related to several industrials manufacturing phases, including raw material extraction; grinding and storage; raw material, intermediate and final product handling and transportation and operation of exhaust fans.

Industries are likely to be generated domestic and industrial effluent. Liquid waste which can be generated from industries will include waste acid, waste alkali, grease, used/spent oil, liquid metal, spent solvents etc. In addition, domestic and cleaning waste is likely to be generated. These effluents will contribute high COD and TDS in the receiving waterbody (Ichakhali khal and Bamon Sundar khal). If these effluents are discharged in the receiving waterbody, these effluents will pollute the water and will be potential threat to the aquatic life. In addition, storm water runoff in most cases carries pollutants like chemicals, oil and grease, heavy metals. Such contaminated runoff would make the receiving water bodies contaminated.

In Post development period of Zone 2A and 2B due to setting up of industries, there would be some adverse impacts on the ecosystem of the area. Industrial development will involve generation of emissions, effluents and increased vehicular movements. These altogether may have overall adverse impact on the eco-system of the site and the nearby areas as the air pollutant will impact the existing vegetation and avifauna in the area.

50 MLD and 30 MLD of water will be required for Zone 2A and 2B respectively during operation phase for both the consumption and industrial operation purpose (Source: Water Demand and Water Availability Assessment Report, IWM, 2019). However, no fresh water source except ground water is available in the area to meet this demand. Ground water in shallow aquifers is highly saline. Non-saline water has been found at higher depths (Deep Tube wells). Thus, extraction of ground water may affect the ground water resources.

After development of Zone 2A and 2B with onsite facilities there will be no issues about labour influx unless industrialization is taken place at the Zone 2A and 2Be premises. However, it is predicted that when Zone 2A and 2B will go to operation with industries may contain huge labour influx that could arise social conflict, community health and safety, GBV, labour unrest etc. if BEZA cannot develop an effective management.

Based on the above discussion, it is clear that if all types of planned industries run in Zone 2A and 2B without any pollution and emission prevention measures may result in high risk to the biodiversity, physiochemical and socio-economic component of environment and society at project site and its nearby area.

7.6 Overall Impact Significance

Table 7-2: Impact Significance for different issues

Impact During Different Phases	ESS	Issues/ Impacts	Nature of impact positive(+ve) or Negative(-ve)	Likelihood	Consequence	Risk
Impact during Pre-construction and Construction Phase	ESS1	Disadvantaged and vulnerable persons	-ve	Likely	Moderate	Moderate
	ESS2	Labour Influx and Working Conditions	-ve	Likely	Substantial	Substantial
		Occupational Health and Safety Hazard	-ve	Very Likely	Substantial	High
		Gender Based Violence (GBV)	-ve	Likely	Moderate	Substantial
		Social Conflict (due to labor influx)	-ve	Likely	Moderate	Moderate
	ESS3	Impact on Air Quality	-ve	Very Likely	Moderate	Moderate
		Water Resources (Surface and Ground Water) and Quality	-ve	Likely	Moderate	Moderate
		Land Resources (Soil)	-ve	Likely	Minor	Low
		Impact on Noise	-ve	Likely	Minor	Low
	ESS4	Community Health and Safety	-ve	Likely	Minor	Moderate
		Employment Generation	+ve	Likely	Moderate	
		Hazardous and non-hazardous waste	-ve	Likely	Substantial	Substantial
	ESS6	Bio-diversity and Natural resources	-ve	Likely	Moderate	Substantial
	ESS7	Ethnic Minority	-ve	Unlikely	Minor	Low
ESS8	Physical Cultural Resources	-ve	Unlikely	Minor	Low	
Impacts during Operation Phase for onsite	ESS2	Occupational Health and Safety	-ve	Very Likely	High	High
	ESS3	Land Resources and Soil Quality	-ve	Unlikely	Minor	Moderate
		Air Quality	-ve	Likely	Moderate	Substantial
		Noise Quality	-ve	Likely	Low	Low

Impact During Different Phases	ESS	Issues/ Impacts	Nature of impact positive(+ve) or Negative(-ve)	Likelihood	Consequence	Risk
Impact during Pre-intervention of EZ (2A&2B)	ESS1	Disadvantaged and vulnerable persons	-ve	Likely	Moderate	Moderate
		Surface and Ground Water Quality	-ve	Likely	High	High
	ESS4	Poverty alleviation and diversification in livelihood	+ve	Likely	Moderate	
		Access to civic amenities and communication	+ve	Likely	High	
	ESS5	Land Use	+ve	Likely	Moderate	
	ESS6	Biodiversity and Ecosystem	-ve	Unlikely	Moderate	Minor
During operation of EZ (2A&2B) with Industries	ESS-2 to ESS-10	All environmental and social parameter (Ecology or Biodiversity, physico- chemical, socio economic)	-ve	Very Likely	High	High

CHAPTER 8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

8.1 Objectives

The Environmental and Social Management Plan (ESMP) is the synthesis of all proposed mitigation and monitoring actions, set to a time frame, with specific responsibility assigned and follow-up actions defined. ESMP is a plan of actions for avoidance, mitigation and management of the adverse impacts of the project. Environmental enhancement is also an integral component of ESMP. A detailed set of mitigation measures have been compiled in view of the likely impacts associated with the interventions during implementation and operation under the proposed Zone 2A and 2B.

The purpose of ESMP is as follows:

- List of all suggested mitigation measures and control technologies, safeguards against all risks and impacts;
- Provide an institutional mechanism with well-defined roles and responsibilities for ensuring the measures against all the anticipated impacts mentioned in the ESA;
- Provide project monitoring program for effective implementation of the mitigation measures and ascertain efficacy of the environmental management and risk control systems in place;
- Assist in ensuring compliance with all relevant legislations at national level and as per ESS guidelines of the World Bank.

8.2 Mitigation Measures

The steps of mitigation hierarchy are to **avoid, minimize and reduce, and mitigate all the impacts including the residual impacts remain compensate/ offset if financially and technically feasible to manage** adverse impacts and, where appropriate, to incorporate these into an Environmental and Social Management Plan or System.

8.3 Responsible Party for Implementing ESMP

The full lifecycle of the Project components (1 to 3) will have considerable impacts on the environment and social status in the project and surrounding area. To manage and mitigate these, an ESMP has been designed. All onsite facilities shall be implemented by the BEZA authority and accordingly the same authority will in turn implement the ESMP through the engaged contractors.

8.4 Environmental and Social Management Plan (ESMP)

The activity wise anticipated environmental and social impacts and corresponding mitigation measures have been outlined in **Table 8-1**.

Table 8-1: Environmental and Social Management Plan (ESMP)

Issues	Impacts	Probable Mitigation Measures	Responsibility	
			Planning and Execution	Supervision & Monitoring
During Pre-Construction and Construction Phase (ESS 2)				
Social Conflict and labor unrest due to Labour Influx and lack of proper labor management.	During construction phases, some workers from outside the project area may be deployed where a conflict may arise among them and local residents, because of any changes to the local customs or when the external workers fail to understand the local customs. Due to engagement of a large number of migrant workers in the project site, an extra pressure may impose on the local available resources like housing, water resources etc. In addition, influx of workers to the community may cause impacts to community health and safety, especially an increase in prevalence of disease. Subsequently, main anxiety for the community is food and water borne diseases, faecal elements contamination into water etc. Further, due to discrimination of wages, lack of adequate OHS, aggressive behaviour by the migrant labours and manger etc. may create labour unrest in the project site.	LMP shall be followed in engaging and managing labor in all project activities. Provision of LMP shall be included in all the bidding documents as conditions of contract. Conditions of contract related to LMP shall be followed by the contractors. Local people should be deployed for the construction works to the maximum extent possible, and the migrated workers from other areas or from other countries should be taught to respect local customs in order to facilitate good relationships with local people. The compliance of clauses in the contract document related to LMP shall be monitored by BEZA.	BEZA, and Contractor.	ES Specialists of BEZA and PMC.
Gender Based Violence (GBV)	Sexual abuse of female workers by the male workers may happen at labour camp site. Wage discrimination between men &	Mitigation Measures may be as follows: Engage competent women Ward member speaking for women and working for them to participate in the implementation of the project. Impart awareness training for both elected representatives and employees	BEZA and the contractors a)	ES Specialists of BEZA and PMC.

Issues	Impacts	Probable Mitigation Measures	Responsibility	
			Planning and Execution	Supervision & Monitoring
	women workers may occur. Women friendly sitting arrangement and drinking water facilities may not be provided. Women may be a victim of eve teasing and sexual abuse.	(executives). Make conditionality in the bid document to ensure equal wage for equal work. Activate GRC in regards to hearing complaints and resolving them. Intimate the process to all workers Ensure representative of women groups in GRCs Beneficiary options reflected in subprojects design and implementation Ensure woman-friendly sitting arrangements and good drinking water facility in the women designated area. Workers should sign the Code of Conduct and adequate training on GBV is provided.		
Occupational Health and Safety Hazard	Handling and disposal of hazardous & non-hazardous waste during implementing various subprojects and from different construction related activities, including management of accidents.	LMP shall be followed in engaging and managing labor in all project activities. Provision of LMP shall be included in all the bidding documents as conditions of contract. Conditions of contract related to LMP shall be followed by the contractors. Local people should be deployed for the construction works to the maximum extent possible, and the migrated workers from other areas or from other countries should be taught to respect local customs in order to facilitate good relationships with local people. The compliance of clauses in the contract document related to LMP shall be monitored by BEZA.	BEZA, and Contractor.	ES Specialists of BEZA and PMC.
Emergency Response Plan & Disaster Management Plan	Accident from different project activities & natural disaster	During construction work due to technological failure hazards like; fire, electric power or gas cut, chemical hazard, spills of flammable liquids, accidental release of toxic substances, terrorist activities, threat, hostage incident, loss of water supply etc. may take place at EZ site as well as natural hazards like flood, cyclone and earthquake, etc. also can occur since its located in cyclone prone area. For Flood <ul style="list-style-type: none"> Evacuate the people from flooded area and place them to a safe area. Switch of the power supply from effected area. 	BEZA and Contractor	ES Specialists of BEZA and PMC.

Issues	Impacts	Probable Mitigation Measures	Responsibility	
			Planning and Execution	Supervision & Monitoring
		<ul style="list-style-type: none"> • Remove all types of obstructions from the drainage system. • Coordinate with local Emergency Response Team and take action as per their guidelines. • In case of any accident, ensure presence of first aid team and get medical attention as soon as possible. • Ensure presence of nearby fire brigade team system in case of worst or out of control situation. <p>For Cyclone</p> <ul style="list-style-type: none"> • Switch off the Power Supply of Sub-station. • Close all the wind-entering openings in the houses and sheds. • Open windows and exhaust points to allow the wind go out from the constructed building or labour shades. • Instruct all the associates including workmen not to allow them to go outside till the wind & cyclone effect reduces to the normal level • After the cyclone, inform the Emergency Response Team to investigate the property loss in the project site for further action. <p>For Earthquake</p> <ul style="list-style-type: none"> • Isolate electrical supply wherever it is possible. • Do not use elevators/ hoist • All electric connection of the Economic Zone should be cut off during cyclone. Safe evacuation is important for everybody and measures should be taken accordingly. • Ensure fire and siren alarm system in all floors. During earthquake all the employees will come down to a safe place in a row through stair after hearing the alarm. • Have to evacuate as per evacuation plan • Project should have Rescue Team to help the injured employees. And they will also take the injured employees for treatment. • Isolate all pipelines of steam, gas pipeline, compressed air, fuel and CO₂ when they are not in use. • Check availability of security personnel and have a chat with them in view of likely immediate action to be taken. 		

Issues	Impacts	Probable Mitigation Measures	Responsibility	
			Planning and Execution	Supervision & Monitoring
		<ul style="list-style-type: none"> • Empty the tanks that are installed in vertical and relatively unstable conditions. • Ensure the flammable liquids i.e. Petrol, Diesel and other petroleum products are stored under secondary containment with due precautions <p>For Fire</p> <ul style="list-style-type: none"> • Evacuate the people from Fire hazard area and send them to a safe exit direction. • Remove unwanted combustible material. • Keep cool and do not panic. • Inform the substation and electrician to get the affected area isolated from power supply. • Keep Fire Hydrant accessible. • Keep newest and good conditioned fire hoses and Fire Extinguishers readily available. • Ensure one operator is always present at Hydrant system area when using the fire Hydrant system. • If the fire is very small, use the correct Fire Extinguisher for extinguishing the fire. • Try to isolate the fire by removing the surrounding inflammable material around. • In case of big fire use local Hydrant system for extinguishing the fire. • If the fire is beyond the control, inform the security or higher authority to call local fire Brigade and Inform Emergency Response Team. • On arrival of the fire brigade, help them to reach the site of fire. • In case of any accident of human, ensure immediate medical attention as soon as possible. <p>Fatal Accidents</p> <ul style="list-style-type: none"> • During emergency operation, if there is any injured person, carry out victim/causality to the security room or Conference room or even to OHS room beside the support of contractor recommended nursing home. 		

Issues	Impacts	Probable Mitigation Measures	Responsibility	
			Planning and Execution	Supervision & Monitoring
		<ul style="list-style-type: none"> • Ensure attendance of First Aid Team and carry out the first aid. • Inform the Emergency Response Team. • If the accident is severe, ensure emergency vehicle for taking the victim to local hospital or recommended nursing home, phone numbers should be available in the site. • Accident report should be prepared with the help of witness and preserve it to the Emergency Response Team. <p>Utilities Failure</p> <ul style="list-style-type: none"> • For emergencies and potential danger, the control room of the respective utilities to be informed. • In a situation where a building needs to be evacuated, please proceed to the building specific evacuation area. • Turn off equipment, machines and computers. • Assist disabled persons, women and children at earlier stage. • Try to avoid elevators • Stay at the designated evacuation area until the fire department or designated representative has given the —all clear to re-enter the project site 		

During Pre-Construction and Construction Phase (ESS 3)				
Air Quality	Air pollution will occur due to; Site preparation, stack yards and labour shed construction, hauling of equipment/Dust generation from earthworks such as levelling, grading, excavation works and movement of vehicles across unpaved roads, especially during windy conditions	<p>Ensure that all trucks, vehicles, and electrical devices used in the project area will comply with technical and environmental safety regulations</p> <ul style="list-style-type: none"> • Schedule the operation times for vehicles, machines working in the construction area to reduce air emissions • Use of adapted Personal Protection Equipment like; ear plugs, goggles, helmets, gloves, masks etc. • Regular watering and sprinkling for dust suppression are to be done properly. • Stockpiles of dusty materials will be covered by polythene or tarpaulin to prevent the escape of dust during loading and transportation. • No stockpiles will be maintained outside, and maximum possible distance between the stockpiles and receptors will be maintained; • Covering and/or watering of all stockpiles of dusty materials such as excavated spoils to avoid fugitive dust emissions; • During construction, the approach road will be kept clean, free from mud and slurry; 	Contractor	ES Specialists of BEZA and PMC.

		<ul style="list-style-type: none"> • Material transport will be totally covered with impervious sheeting; • The provision of WBG EHSG needs to be followed in selecting the source of construction material. • Speed of vehicles on site and approach road will be limited to 15-20 km/hr which will help in minimizing fugitive dust emission due to vehicle movement; • All diesel-powered equipment will be regularly maintained to minimize emissions; • Low sulphur diesel will be used in diesel-powered equipment in collaboration with best management practices; • Solid waste burning in the project site is strictly prohibited. 		
Water Resources (Surface and Ground Water) and Quality	Surface and groundwater can be contaminated by sewage & wastewater from labour camp and effluent disposal from washing of construction vehicles as well as due to improper housekeeping of hazardous waste	<ul style="list-style-type: none"> • Labour camp should be constructed at a safer distance from the waterbody; • Arrangement of mobile toilets may be set at work sites • Waste disposal is prohibited to waterbodies. Proper disposal mechanism should be adopted • Proper sanitation facilities should be made available. • Channelize water from labour sheds and work place to nearby drains after passing through settling ditches to segregate sediments and solids • Labour camp shall be set up at safe distance from either any water body or settlement areas, • Camp site sewage disposal will be ensured by constructing septic tanks and soak wells • Periodical training needs to be provided to workers for best utilization of water; • Take permission for installation of deep tube well from Upazila Parishad/ Municipality; • Recycle/reusing of waste to the extent possible; • Fuel, oil and used oil storage areas shall be contained in concrete floor; • Refuelling will be carried out in designated areas using strict protocols; • Project staff will not be permitted to utilize any water sources (stream, river, or other water bodies) for the purposes of bathing or washing; • Construction vehicles and equipment will be serviced regularly at off-site location; • Oil leakage or spillage will be contained and cleaned up immediately. Waste oil will be collected and stored for recycling or disposal; • Oil and grease separator shall be used for wastewater generated from cleaning activities; • Adequate sanitary facilities, i.e. toilets and showers, will be provided for the construction workforce; • Workers will be trained in the use of designated areas/bins for waste disposal and encouraged to use toilets; 	Contractor	ES Specialists of BEZA and PMC.
Soil & Sediment Pollution	Project site soil and sediment can be polluted due to disposal of solid and liquid waste of diversified construction	<ul style="list-style-type: none"> • Soil conservation measures will be undertaken during stockpiling, preservation of topsoil or gravel for the remediation of disturbed areas; • Construction vehicles will remain on designated and prepared compacted gravel roads; • Earth material should be tested at source prior to fill the land for dike construction; • Fuel, lubricating oil, and used oil storage areas will be in the designated area. 	Contractor	ES Specialists of BEZA and PMC

	works. In addition, due to operation of heavy equipment may impact on soil texture etc. Further, sediment can contaminate due to oil spillage of construction vehicles and waste debris.	<ul style="list-style-type: none"> On-site sanitation system shall be adapted for latrines and sewage treatment. Spill containment and clean up kits will be available in the site and to be cleaned up appropriately. Construction vehicles and equipment will be under servicing in a regular interval. The Contractor will prepare guidelines and procedures for immediate clean-up actions following any spillages of oil, fuel or chemicals; Contractor shall ensure daily collection and disposal of construction waste, debris, metal cutting wastes, used oil etc. Special care needs to be taken during the road construction to maintain standard slope, and to maintain proper compaction of the road soil; Covering the road shoulders and slopes by the first growing grass; Adequate drainage arrangements for storm water management during construction period to ensure proper drainage pattern and avoid drainage congestion. 		
Noise pollution	Noise pollution may occur because of: Operation of vehicles and equipment during the site preparation, stack yards and labour shed construction, hauling of equipment/Transportation of construction materials, plant materials, machinery and personnel/Operation of DG sets/Operation of batching plant i.e. concrete, asphalt	<ul style="list-style-type: none"> Perform the pre-construction activities within the day time and minimize night time working. Regulate the speed for traffic in and around the project areas. Construct the sound walls as feasible in selected areas. Regularly carry out maintenance and routine inspections on vehicles and construction machineries to ensure the technical standards. The contractor shall ensure the construction equipment are with proper silencer and muffler. The contractor shall consider the noise emission characteristics of equipment when selecting equipment for the project and select the least noisy machine available to perform the respective work; Mobile noise sources such as cranes, earth moving equipment shall be routed in such a way that there is minimum disturbance to receptors (birds and fauna around); Only limited construction activities shall be carried out during night-time; Restrict the night time vehicle movement through the access road; The number of equipment operating simultaneously should be reduced as far as possible; Equipment known to emit noise strongly in one direction should be orientated so that the noise is directed away from nearby receptors as far as practicable; Rubber padding/noise isolators will be used for construction equipment; Temporary noise barriers shall be provided surrounding the high noise generating construction equipment; The personnel involved in high noise generating activities shall be provided with personal protective devices like ear plug to minimize their exposure to high noise levels; 	Contractor	ES Specialists of BEZA and PMC
Sourcing of Construction material	Project would support a number of large infrastructure and would	<ul style="list-style-type: none"> Selection of source of various construction materials need to be properly assessed as per the guide line of WBG EHS. Necessary condition has to be included in the bidding document so that if Primary Suppliers are 	PMU, contractor	PMC

	require various construction material in large quantities. Some of these raw materials can be supplied by the Primary suppliers. Selection of source of these raw materials needs to be carefully assessed.	engaged for supply of raw materials, the source of such material would be assessed as per the guide lines of the WBS EHS.		
--	---	---	--	--

Issues	Project Activity	Probable Impacts & Consequence Mitigation Measures	Responsibility	
			Planning and Execution	Supervision & Monitoring
During Pre-Construction and Construction Phase (ESS 4)				
Traffic & Transportation	Materials carrying vehicles and construction vehicles (Excavator, pay loader, dump-truck etc.) may damage environment in the construction area and may be a disturbance to nearby physical and social institutions. Without proper traffic management accidents may also occur.	<ul style="list-style-type: none"> • Inform local people about the subproject's activities; • Inspire local people to use connecting and diversion roads during the construction; • Temporary roads should be developed for transportation of material in place of using the community roads. If village roads are being used, transportation should be carried in non-peak hours and regular maintenance shall be carried out so as to minimize the impact. • Increased traffic should follow the traffic scheduled to avoid traffic congestion. • Place traffic sign/cautionary sign to avoid undue traffic congestion and associated traffic control measures to limit possible disruption; • At the points where traffic is to be deviated 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 regulation of traffic, the flagmen shall be equipped with red and green flags especially near at intersection. • For notification of construction activities, at least two signs shall be put up for each road, one close to the point of where carriageway begins, and another will be placed at the end of the carriageway. • Traffic safety is to be ensured as per the traffic management plan (Annex F). 	Contractor	ES Specialists of BEZA and PMC
Community Health and Safety	Community Health and Safety can hamper due	<ul style="list-style-type: none"> • Prior to start of the construction activities contractor will inform the local community; • Instruct the drivers and limit the speed (20km/hour) of the vehicles near the settlement 	Contractor	ES Specialists of BEZA and PMC

Issues	Project Activity	Probable Impacts & Consequence Mitigation Measures	Responsibility	
			Planning and Execution	Supervision & Monitoring
	to different construction works & traffic movement	<p>area especially in the bazar area;</p> <ul style="list-style-type: none"> • Ban the use of mobile phones and talking during driving in the approach road; • Regular health check-up of the workers and awareness training about the communicable diseases; • Proper lighting at the project site during the night time; • Avoid unnecessary noise pollution; • Water shall be spread in the dry surface to reduce dust pollution. • Contractor should comply with the Traffic Management Plan (Annex F) and develop site specific mitigation plan. • Awareness creation through training on STDs, HIV/AIDS will bring positive result. • Adequate preventive measures are to be taken and regular health check-up is required. 		
Hazardous and non-hazardous waste	<p>The Project will generate both solid non-hazardous and hazardous wastes throughout the construction phase. The anticipated non-hazardous waste types include excavated material, construction material, Municipal Solid Waste, wastewater. While hazardous waste may include used oil, empty drums or replaced parts of the construction machinery, used battery, chemical for concreting like admixture etc. There are potentially a number of risks to human health and the environment that may be associated</p>	<ul style="list-style-type: none"> • The hazardous waste generated at camp sites is to be collected in steel drums and stored in a segregated roofed area and periodically disposed at approved waste disposal facilities by BEZA. • The camp site shall have compost pits for treating organic waste and separate bins for collecting the inorganic waste, which shall be disposed at nearest disposal sites. 	Contractor	ES Specialists of BEZA and PMC

Issues	Project Activity	Probable Impacts & Consequence Mitigation Measures	Responsibility	
			Planning and Execution	Supervision & Monitoring
	with the handling, storage and disposal of waste, both on and off-site.			

During Pre-Construction & Construction Phase (ESS 6)				
Ecosystem and Biodiversity	Negative Impacts on Ecosystem and Biodiversity (Aquatic & Terrestrial Ecology) may occur because of spillage or disposal of solid & liquid wastes from onsite development activities and project construction vehicles and equipment will disturb the habitat of fishes. Construction work and its associated machineries and vehicles can adversely affect the biodiversity of the area.	<p>Consequence Mitigation Measures are given below:</p> <ul style="list-style-type: none"> • Proper disposal and management of construction waste • No waste should be dumped in water bodies during construction without proper treatment • Wastewater from labour camps and construction sites should not be disposed off in the waterbodies • Site should be kept clean so as no pollutant from site should enter the waterbodies along with run-off • Storage of raw material at construction site should be avoided near waterbodies. • The noise generating activities should be scheduled during daytime • Movement of construction and transport vehicles should be restricted to dedicated paths to minimize any harm to small mammals near to the proposed site. • Construction activities should be planned and undertaken in a phased manner • Damage to the natural topography and landscape should be minimized; • Strict prohibition should be implemented on trapping, hunting or injuring wildlife • Keep present condition of the canals functional in project site for aquatic species • A zone of 30 m is to be left along the canal & periphery of the Zone 2A & Zone 2B zone so that mud crab habitat, as well as migratory birds' habitat are not affected. • Embankments planned to be developed should be provided with grass which can survive in saline water also; • If any tree is to be cut, then plantation should be undertaken in minimum ratio of 1:3. • Plantation of area between Zone 2A and Zone 2B site and sea with mangroves shall be ensured, follow Annex J; • No untreated solid or liquid waste shall be discharged in waterbodies • Septic tanks/soak pit should be provided to treat sewage to be generated from labour camps and prevent its disposal in waterbody 	Contractor	ES Specialists of BEZA and PMC

		<ul style="list-style-type: none"> • Toilets should be provided at site to prevent contamination of water due to open defecation in nearby areas. • Vehicle washing/equipment cleaning should not be allowed near canal/drains in Zone 2A and Zone 2B site • Excavation and filling should be carried out in phased manner to minimize exposure of loose earth for longer duration • Temporary storm water drainage system should be developed at site to channelize the storm water away from excavation/filling area, debris storage area and raw material storage area • All the raw material and debris should be stored in covered sheds on paved surfaces to minimize the contamination of rainfall run-off • Diesel, paints, cements etc. should not be stored near the canal/water bodies • Implementation of the mangrove plantation in the area between the project area and the sea would be monitored. • No dredging work should be undertaken near the Feni River Estuary, particularly during the month of October. 		
--	--	---	--	--

Operation Phase				
Impact due to operation of onsite intervention of EZ (2A & 2B)				
ESS2				
Occupational Health and Safety	The handling of waste water, emissions during holding and treatment, discharge of pollutants, transportation and storage of raw materials are the activities of CETP, biogas and landfill that are likely to have an impact on occupational health and safety.	<ul style="list-style-type: none"> Monitoring devices will be installed to regularly monitor and check any leakages. Care will be taken to avoid all sources of ignition at the places of flammable material storage areas through erection / display of appropriate sign boards. Adequate PPE's (earmuffs, protective clothing, helmets, goggles, shoes, gloves, etc.) will be provided to people working in the vicinity of these areas. Operational manual of CETP, biogas plant and landfill shall be prepared considering all the aspect of worker health and safety of worker. 	E&S unit of BEZA	BEZA/ DoE/
ESS3				
Land Resources and Soil Quality	Leakage from CETP, mixing of leachate from sludge drying bed, leakage of sewer line, waste from bio-gas plant etc may contaminate the soil quality.	<ul style="list-style-type: none"> . Solid/hazardous waste generated from the CETP operation shall be properly handled with adequate solid/hazardous waste management facilities with pucca flooring and covered shed; After physic-chemical testing and complying with the norms of manure, generated slurry of biogas plant can be used as manure for green belt. 	E&S unit of BEZA	BEZA/ DoE/
Air Quality	Operation of Diesel Generator (DG) set, generation of fugitive dust, due to vehicle movement	<ul style="list-style-type: none"> The DGs will be operated only during emergencies when there is failure of power supply; Monitoring devices will be installed to regularly monitor and check any leakages; Continuous disposal of sludge, Proper operating condition will be maintained; Usage of PPEs by all employees shall be ensured; 	E&S unit of BEZA	BEZA/ DoE/

	for transportation of raw material, hazardous waste and spreading of odour from leachate dispose pond may cause degradation of air quality at project site.	<ul style="list-style-type: none"> Establishing frequent waste collection schedules and optimize waste collection routes to minimize distance travelled and overall fuel use and emissions; Enclose leachate drains to reduce the emission of odours; Ensure covered transportation of segregated waste 		
Noise Quality	During the operation phase, the source of noise shall be working equipment such as pumps, blowers, DG sets and treatment machinery. Noise can also be generated from the loading and unloading activities.	<ul style="list-style-type: none"> The noise producing machinery placed in acoustic enclosures/acoustic rooms to reduce the noise levels; Arrangement of ear plug shall be arranged for the worker, Periodical noise monitoring shall be carried out to ensure that ambient noise levels are restricted to permissible limits; DG Sets shall be provided with acoustic enclosures and shall be used only in case of power failure/emergency. 	E&S unit of BEZA	BEZA/ DoE/
Surface and Ground Water Quality	If solid and liquid waste are not collected and treated, leachate can spread from the landfill and contaminate surface water and ground water. Leachate penetration from	<ul style="list-style-type: none"> Treated effluent will be discharged only after achieving norms prescribed by the DoE; Proper storage area will be proposed with lining to avoid leakage; Potential ground water quality impacts arising from leachate generation, collection, treatment and reuse/discharge will be managed by the Leachate Management Plan; Periodic inspection of the leachate collection systems will be undertaken to identify broken pipes, leaking (if any) and damage; Drain outlet should be regularly cleaned to maintain proper discharge into outfall as if no backflow can take place; Provision of primary treatment of storm water shall be arranged; For detail potential impact in connection with SW and GW quality due to operation 	E&S unit of BEZA	BEZA/ DoE/

	<p>sludge drying bed to underground water which may decline the GW quality. Further, storm water drain may degrade the outfall water quality if drain water carries toxic pollutants from surface runoff.</p>	<p>of CETP, biogas and landfill, an exclusively ESIA study shall be assessed.</p>		
ESS-6				
Ecosystem and Biodiversity	<p>Solid and liquid waste from the operation of various shared infrastructure such as effluent treatment plant, sanitary landfill etc may pollute water</p>	<ul style="list-style-type: none"> • Effluent quality of CETP has to be monitored regularly to check whether all the parameters are within the acceptable limit. • Water quality of the water bodies also needs to be monitored. 		

	of the water bodies and may negatively impact aquatic fauna.			
Impact due to operation of EZ (2A & 2B) with industries				
Industrial waste, effluent, emission, consumption of natural resource and labour influx, etc..	With the industrial operation, project site ecology and biodiversity, environmental quality (soil, sediment, air, noise, water, etc) and socio-economic quality will be affected.	<ul style="list-style-type: none"> • BEZA would prepare a project preparation and operating guideline for Developer and Private investor to be followed to ensure compliance of various E&S safeguard issues. • Individual ESIA study for each industry needs to be conducted before commencement of any industrialization at Zone 2A and Zone 2B. Afterward it needs to be reviewed by BEZA and approved by DoE, GOB. • Waste should be segregated at source into hazardous and non-hazardous waste. Further the waste should be segregated into recyclable and rejected waste. Recyclable waste should be sent to authorized vendors for recycling and rejected waste should be disposed off as per the norms specified by DoE for the particular waste. • keeping designated spaces within each industry to facilitate day-to-day recycling; creation of a recycling centre that will reduce environmental impacts; development of a treatment facility which can provide an effective way to address the problem of hazardous wastes and construction of an incinerator or the operation of a controlled landfill and resource recovery facility, as appropriate. • Recycling/ disposal of used solar panel batteries as per the standard international practices. • Industrial waste generated should be stored on sealed surfaces and should be disposed of as per guidelines of DoE, Bangladesh. • A site for disposal of hazardous waste can be identified within the EZ and it should be developed as per the norms of DoE and upcoming Hazardous Waste Management rules of Bangladesh • Besides CETP, each industry should install their own effluent treatment plant to minimize the pollution load on CETP so that CETP can effectively work. • Power Generators should be provided with stacks of adequate height (higher than nearest building) to allow enough dispersion of emission. • Power connection should be obtained by all the units and Diesel Generators should be used only in case of power failure (not more than 8 hours/day) • Air pollution control measures should be adopted by respective industries in line 	Environmental and Social Monitoring Cell of particular industries and E&S unit of BEZA	BEZA/ DoE/

		<p>with DoE permission</p> <ul style="list-style-type: none"> • The industries having chance to produce significance hazardous air emission, should conduct air quality monitoring to fix their stack height. • To avoid GBV each industry should prepare a detail plan that needs to be approved by the BEZA’s social unit. • Common STP (in modules) should be constructed within the Zone 2A and Zone 2B to treat sewage from residential and commercial areas • Surface water & groundwater quality should be monitored periodically by each industry and test report should be verified by the BEZA and DOE. • To reduce pressure on ground water from extraction, provision of adequate water lifting system for each industry shroud be made mandatory by the BEZA. In addition, BEZA needs to encourage the use of solar panel instead of fossil fuel use for each industry. • Each industry should arrange fire hydrant and emergency exit; • The design of the proposed fire station for should be adequate considering the area of coverage and on the basis of a risk assessment. • Each industry should prepare their individual emergency and disaster management plan and it also needs to be approved by the BEZA’ s social and environmental unit • To resist labour unrest, GBV engaging of child labour and forced labour at Zone 2A and Zone 2B, BEZA should appoint an effective monitoring cell for frequently reviewing and monitoring each industry activities regarding the social and environmental issues. • Preferential employment of vulnerable people from the zone of influence should be ensured. • Equal remuneration for the male and female workers for similar types of assignment will encourage the female to do job. Social security and protection against gender based violence can benefit the poor women particularly adolescent girls. 		
--	--	--	--	--

8.5 Monitoring Indicators

The physical, biological and social components which are of particular significance to the proposed project are listed below:

- Air quality
- Surface (Sea & River) & Ground Water quality
- Noise Level
- Solid & Hazardous Waste Management
- Plantation Success / Survival Rate
- Soil Erosion
- Soil Quality
- Quality of Dredged Sediments
- Drinking Water Quality
- Sanitation and Hygiene at Construction Labour Camps and Construction Site
- Gender Based Violence (GBV)
- Labour Influx
- Employment
- Grievance Redress Mechanism (GRM)

These indicators will be evaluated periodically based on the monitoring results, baseline conditions, predicted impacts and mitigation measures.

8.6 Environmental and Social Monitoring Plan

Environmental and social monitoring is an essential tool for environmental and social management as it provides the basic information for rational management decisions. The purpose of the monitoring program is to ensure that the envisaged purposes of the project could be achieved and result in desired benefits could be reflected to the target population. To ensure the effective implementation of the mitigation measures, it is essential that an effective monitoring program is designed and carried out. Compliance monitoring will be conducted in accordance with the environmental and social mitigation measures and monitoring plan provided with this report (**Table 8-2**).

The objective of environmental and social monitoring during the construction and operation phases is to compare the monitored data with the baseline condition collected during the study period to assess the effectiveness of the mitigation measures and the protection of the ambient environment based on national standards. The main objectives of the pre-construction, construction and operation phase monitoring plans is:

- To ensure that the recommendations in the approved ESA report are adhered to by the various institutions
- To ensure that the environmental and social mitigation and their enhancement actions are well understood and communicated to all involved stakeholders.
- Recommend mitigation measures for any unexpected impact or where the impact level exceeds that anticipated in the ESA;
- Ensure compliance with legal and community obligations including safety on construction sites;
- Ensure the safe disposal of excess construction materials.
- Appraise the adequacy of the ESA with respect to the project's predicted long-term impacts on the physical, biological and socio-economic environment;
- Evaluate the effectiveness of the mitigation measures proposed in the ESMP and recommend improvements, if and when necessary;

This Monitoring Plan is only mandatory obligation for the onsite infrastructures that will be constructed by the BEZA. There is no specific monitoring plan for the industries that will be established after developing Zone 2A and 2B. But in impact identification chapter generic impact for the proposed industries has been identified and subsequent suggestive mitigation measure has been incorporated in this chapter. Those, impact identification and mitigation section could be used as monitoring tool of project proponent during allocation of land to the industries.

Table 8-2: Environmental and Social Monitoring Plan

Project Stage/ Affected Component	Environmental/ social Issue	Parameters to be Monitored	Location	Measurements	Standards/ Guidelines	Frequency	Responsible Agency	
							Implemented by	Supervised by
Pre-construction and Construction Phase								
Employment	Engaging local labour	Associated project worker	Camp site	Consultation with local labour	World Bank and GoB	Weekly	Supervision Engineer	BEZA
Women Worker/ Vulnerable/ Disadvantaged	GBV	Wage, increment, working hour, incidents of GBV etc.	Camp site and work site	Consultation with female labour	World Bank and GoB	Monthly	Supervision Engineer	BEZA
Community or labour	Social conflict and labour rest	GRM	At project office	Complaint box and discussion with labour	World Bank and GoB	Weekly	Supervision Engineer and SS	BEZA
Ambient Air Quality	Dust generation	Dust	Project activity areas and construction workers camp	Visual inspection of all active work areas	Government of Bangladesh (GoB) and international standard	Daily	Contractor	BEZA
	Ambient Air Pollutant	SPM, PM _{2.5} , PM ₁₀ , CO, SO ₂ , NO _x	2 samples at Project site (one at 2A and other one at 2B site)	24-hour	Air quality standard by DOE, Bangladesh	Quarterly	Contractor by Engaging Environmental Firm	BEZA
Noise	Increase in ambient noise levels	Noise levels in Leq, Leq day, Leq night	6 locations Project site at high noise generation location and adjacent sensitive receptor	24-hour	Noise Pollution Control Rules (2006)	Quarterly	Contractor by Engaging Environmental Firm	BEZA
Water Quality	Contamination of surface	Dissolved Oxygen, Turbidity, pH, DO, Total dissolved solids, oil &	Two samples form Canal	Monitoring	Surface water quality standard	Quarterly	Contractor by Engaging	BEZA

Project Stage/ Affected Component	Environmental/ social Issue	Parameters to be Monitored	Location	Measurements	Standards/ Guidelines	Frequency	Responsible Agency	
							Implemented by	Supervised by
	water	grease, BOD ₅ , COD, NH ₃			as per Schedule 3 of ECR 1997		Environmental Firm	
	Contamination of Groundwater quality	pH, Alkalinity, Cl, Fe, As, TSS, Salinity, Pb, etc.	2 Locations Project site and Closest borehole of the project site	Monitoring	Drinking water quality standard as per Schedule 3 of ECR 1997	Quarterly	Contractor by Engaging Environmental Firm	BEZA
Top Soil	Soil Pollution	<ul style="list-style-type: none"> Check liquid waste is carried out by experienced personnel and in proper way Careful and proper handling of oil and other hazardous liquids 	Project Site	Visual inspection of all active work areas	Monitoring	Quarterly	Contractor	BEZA
Sediment of Khal	Sediment Pollution	<ul style="list-style-type: none"> Heavy Metal 	Project site	Monitoring	International Standard	Quarterly	Contractor	BEZA
Waste	Liquid waste, Solid Waste	<ul style="list-style-type: none"> Check storage, transportation, disposal, handling of hazardous waste Waste and effluents to be collected and disposed safely of camp. Wastes and garbage from construction sites to be disposed safely 	Project Site	Visual inspection of all active work areas	Monitoring	Daily	Contractor	BEZA
Ecology	Terrestrial and aquatic flora and fauna	<ul style="list-style-type: none"> Tree and Aquatic Species 	Canals and Forest	Visual inspection	Monitoring	Once for tree prior to starting construction and yearly aquatic monitoring	Contractor	BEZA
Occupational Health and	Workers Health & Safety	<ul style="list-style-type: none"> Check quality of food and accommodation at 	Construction Camp &	Visual inspection of	Monitoring	Daily	Contractor	BEZA

Project Stage/ Affected Component	Environmental/ social Issue	Parameters to be Monitored	Location	Measurements	Standards/ Guidelines	Frequency	Responsible Agency	
							Implemented by	Supervised by
Safety		construction camp; • Check safe water supply, hygienic toilet at camp, construction of drain at campsite; • Check toilets are close to construction site; • First Aid Box with required tools and medicines; • The heavy construction material to handled and stored safely putting due care on public safety; • Heavy construction materials at construction site to be stored and handled safely; and • Check of personal protective equipment (PPE) for worker at the sites	Construction area	all active work areas				
Community Health and Safety	Community disturbance and potential safety hazard due to road traffic	Accidents, incidents, and complaints	Approach Road	Incidents, accidents, and community complaints	Monitoring	Based on occurrence	Contractor	BEZA
Operational Phase								
Female Worker, disadvantaged and vulnerable people	GBV	Wage, increment, working hour etc.	Project site	Consultation with female labour	World Bank and GoB	Monthly	Field level BEZA EHS and SS officer	BEZA Head Office
Community or	Social conflict	GRM	BEZA office at	Complain	World Bank and	Weekly	Field level SS	BEZA Head

Project Stage/ Affected Component	Environmental/ social Issue	Parameters to be Monitored	Location	Measurements	Standards/ Guidelines	Frequency	Responsible Agency	
							Implemented by	Supervised by
labour	and labour rest		EZ	box and discussion with labour	GoB		of BEZA	Office
Noise	Increase in ambient noise levels	Noise levels in Leq, Leq day, Leq nigh and hourly Leq	3 locations Project site at high noise generation location and adjacent sensitive receptor	24-hour	Noise Pollution Control Rules (2006)	1/year	O&M Unit by Engaging Environmental Firm	BEZA
Water Quality	Contamination of surface water	Dissolved Oxygen, Turbidity, pH, DO, Total dissolved solids, oil & grease, BOD ₅ , COD, NH ₃ , Tc, Fc	Canals inside the project area	Monitoring	Surface water quality standard as per Schedule 3 of ECR 1997	1/year	O&M Unit by Engaging Environmental Firm	BEZA
	Contamination of Groundwater quality	pH, Alkalinity, Cl ⁻ , Fe, As, TSS, Pb etc.	2 Locations Project site and Closest borehole of the project site	Monitoring	Drinking water quality standard as per Schedule 3 of ECR 1997	1/year	O&M Unit by Engaging Environmental Firm	BEZA
Soil Quality	Soil Pollution	Heavy Metal	Project site soil	Monitoring	-	1/year	O&M Unit by Engaging Environmental Firm	BEZA
Sediment Quality	Soil Pollution	Heavy Metal	Project site soil	Monitoring	-	1/year	O&M Unit by Engaging Environmental Firm	BEZA
Biological Environment	Horticulture and Greenbelt Development	Survival rate of plants and shrubs	Green belt	Monitoring	number successful growth	Quarterly	BEZA	BEZA
	Heavy metal accumulation in	Level of selected heavy metal such as lead, cadmium, zinc in	Estuary of Feni River and	Monitoring	As per standard guide lines	Once in a year	BEZA	BEZA

Project Stage/ Affected Component	Environmental/ social Issue	Parameters to be Monitored	Location	Measurements	Standards/ Guidelines	Frequency	Responsible Agency	
							Implemented by	Supervised by
	aquatic fauna	the body of fish and other aquatic life.	Ichakhali canal					
Disaster Management Plan (DMP) Monitoring	Earthquake	Structure Design	Zone 2A and Zone 2B	As per project DMP	Not Specific	Continuous	Operation & Maintenance Unit	BEZA
	Flooding	Structure Design	Zone 2A and Zone 2B	As per project DMP	Not Specific	Continuous	Operation & Maintenance Unit	BEZA
	Cyclone /Tornado	Project Structure Design	Zone 2A and Zone 2B	As per project DMP	Not Specific	Continuous	Operation & Maintenance Unit	BEZA

8.7 Labour Management Plan during Construction

The proposed project is in its preliminary phase of execution. It is predicted that during the construction phase of the project, Labourers for various jobs such as civil, mechanical and electrical works will be hired through authorized manpower agencies. Considering the proposed intervention that will be implemented a substantial amount of labour would be engaged. Therefore, it is also envisaged that many of the Labourers will be employed from outside the region which are migrant labour and hence, accommodation will be provided. These migrant Labourers will be accommodated in a temporary campsite within the project site (Zone 2A and Zone 2B area). This could result in stress on local resources and disruption in community relations.

A Construction Labour Management Plan has been developed in conformity with the requirements of ESS2 of the ESF. Nevertheless, depending on the project needs Labour Management Plan can be changed but it must meet the requirements of ESF.

8.7.1 Objectives

Due to influx of migrant Labour there will be both negative and positive impacts on the nearby community and local environment. The influx of migrant workers may increase of population in the immediate vicinity of the project area, for a limited time. This would put pressure on the local resources such as roads, fuelwood, water, etc. Hence, a plan has been designed to demonstrate the:

- Potential impacts associated with influx on the host population;
- Provision of safe and healthy working conditions, and a comfortable environment for migrant labour and
- To ensure compliance with the national labour laws as well as IFC & ESF (ESS2) standards;

8.7.2 Selection and Layout of Construction Camp

Labour camps, plant sites and debris disposal site shall not be located close to habitations, schools, hospitals, religious places and other community places. A minimum distance of 500m shall be maintained from the habitations, sensitive locations like temple, school & hospitals, forest areas and other eco-sensitive zones for setting up such facilities.

8.7.3 Hiring and Recruitment Procedure

The Labour contractor shall, wherever possible, locally recruit the available workforce and shall provide appropriate and requisite on job and EHS training as necessary. The following general measures shall be considered for the workforce during their employment tenure:

- BEZA should include a code of conduct to be signed with the contract document of contractor.
- The contractor shall not employ any person below the age of 18 years and above 65 years nor will have any forced Labour;
- The construction Labourers will be provided with documented information regarding their rights under national Labour law;
- First priority for employment of Labour should be given those impacted by the project such as landowners who have lost land;
- No discrimination shall be done by the construction contractor with respect to recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, termination of employment, and disciplinary practices;
- The contractor shall ensure that work hours is eight hours a day, 48 hours a week, with a weekly rest day for all engaged labours
- Every Labour is entitled to maximum of only two hours a day as Overtime (OT) work. OT

- pay is twice the hourly remuneration
- Client shall ensure equal wages for male and female workers for work of equal nature
- A grievance redress mechanism for workers shall be put in place by the contractor to raise workplace concerns. The workers will be informed about the grievance mechanism at the time of recruitment; and
- The BEZA shall ensure that their contractors develop and implement a procedure to review the performance of their sub-contractors.

8.7.4 Facilities at workers' camps

During the construction stage of the project, the construction contractor will construct and maintain necessary (temporary) living accommodation, rest area and ancillary facilities for labour. Facilities required are listed and elaborated below.

- Site barricading
- Clean Water Facility
- Clean kitchen area with provision of clean fuel like LPG
- Clean Living Facilities for Workers
- Sanitation Facilities separate for men and women workers
- Waste Management Facilities
- Rest area for workers at construction site
- Adequate Illumination & ventilation
- Safe access road is required at camps
- Health Care Facilities
- Crèche Facility, Play School and Breastfeeding Corner
- Fire-fighting Facility
- Emergency Response Area

8.7.4.1 Site Barricading

Site should be completely barricaded from all the sides to prevent entry of outsiders and animals into the site. Entry gate should be provided at the site and labour camp which should be guarded by security guard to minimize crime and thefts. All workers should be issued ID cards and entry of outsiders shall be maintained in the register at the gate. Board should be displayed at the site and the labour camp, the name of project, capacity of project, authority carrying our projects, restriction of entry without authorization, and no smoking zone and associated risks.

8.7.4.2 Safe Water Supply

Access to an adequate and convenient supply of free potable water is a necessity for workers. The domestic water supply shall be made available by the contractor.

- Safe drinking water shall be provided;
- Private tanks can be utilized for provision of drinking water for the migrant Labours;
- The direct usage of water from bore well should not be allowed and water shall be adequately treated; and
- The contractor should regularly monitor the quality of drinking water available. In case of noncompliance with the Drinking Water Specifications, additional treatment shall be provided or alternative sources of water supply shall be arranged;

8.7.4.3 Clean Living Facility for the Workers

Workers should be provided with proper bedding facility. Single bed should be provided to each worker and each bed should be at least 1 m apart from another. Double deck bedding should be avoided. Adequate fire-fighting facility should be provided. Bed linen should be washed regularly and should be applied with repellent and disinfectants so as to manage the diseases which causes

due to pests. Facilities for storage of personal belongings for workers should be provided in form of locker, shelf or cupboard. A separate storage area for the tools, boots, PPEs should be provided. Proper ventilation through mechanical systems and lighting system should be ensured in construction camps.

8.7.4.4 Sanitation Facilities

Construction camps shall be provided with sanitary latrines and urinals. Toilets provided should have running water availability all the time. Bathing, washing & cleaning areas shall be provided at the site for construction labour. Washing and bathing places shall be kept in clean and drained condition. Adequate nos. of bathing & toilet facility should be provided at site and should not less than 1 unit per 15 persons with provision of separate facilities for men and women. Toilets and bathing facility should be inside or very close to the camps. Workers shall be hired especially for cleaning of the toilets and bathing area. Septic tanks and soak pits shall be provided at site for disposal of the generated sewage. The toilets should be cleaned on daily basis. These tanks should be evacuated through authorized vendors if filled and at the time of closure. Pest management should be carried out at the camps if the area is infected by any pests. Adequate lighting should be ensured in camp area especially during night time.

8.7.4.5 Waste Management Facilities

Generated waste should be segregated at the site by providing the different colour bins for recyclable and non-recyclable waste. Recyclable waste shall be sold to authorized vendors and non-recyclable shall be handed over to responsible authority for waste management. Waste management for construction site shall be as per waste management plan proposed in EMP. Waste management area should be cleaned on regular basis to avoid germination of flies, mosquitoes, rodents and other pests.

8.7.4.6 Rest Area for Workers at Site

A rest area shall be provided at the site for construction workers where they can rest after lunch time so that they have not to lay down at site anywhere. The height of shelter shall not less than 3m from floor level to lowest part of the roof. Sheds shall be kept clean and the space shall be provided on the basis of at least 1.0 Sq. m per head.

8.7.4.7 Adequate Illumination & Ventilation

Construction worker camps shall be electrified and adequately illuminated. Illumination level shall be maintained to minimum 200 lux at the site after 5.30 P.M. Labour camps shall be adequately ventilated. Fans shall be provided for ventilation purpose.

8.7.4.8 Safe Access Road for Labour Camps

Temporary paved surface shall be constructed to approach the labour camp from the site. Movement shall not be hampered during monsoon season due to water logging and muddiness.

8.7.4.9 Health Care Facilities

First aid box, first aid room and personnel trained in first aid (certified first-aider) shall be available at labour camp and site all the time (24X7). Equipment in first-aid box shall be maintained as per state labour's law. Ambulance/ 4 wheeler motorized vehicle shall be available at the site for carrying injured labour to the nearby hospital. Tie-ups should be made with nearby hospital to handle emergency, if any. The contact number of ambulance, doctors and nearby hospital's shall be displayed in first-aid room, site office and labour camps. List of contact nos. of emergency personnel, hospitals, fire brigade and other emergency contact should be displayed at camp site, guard's room and first aid room. Workers shall be made aware about the causes, symptoms and prevention from

HIV/AIDS through posters and awareness programs. Workers shall have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets.

8.7.4.10 Crèche Facility, Play School and Breastfeeding Corner

Crèche facility and play school should be constructed at the site temporarily so as children of construction labour can be kept there. Care takers should be hired for taking care of children. Attendance records of children shall be maintained. Children should not be allowed to enter active work areas. A breastfeeding corner should be provided in the construction camp.

8.7.4.11 Fire-Fighting Facility

Fire-fighting facility such as sand filled buckets and potable fire-extinguishers shall be provided at labour camps and at site. Fire-extinguishers shall be provided as per BNBC norms. Personnel trained in handling firefighting equipment should be available at the site. Fire evacuation plan should be displayed at the site and should be communicated to all the workers and other staff at camp site.

8.7.4.12 Emergency Response Area

An area near the gate shall be demarcated as emergency response area where all the workers shall be guided in case of any emergency like fire, flood and earthquake.

8.7.5 Attendance & Working hours

Supervisor of the camp should perform the following work on daily basis

- Taking the attendance of the employee at each camp twice in a day (morning and evening) and should maintain the record.
- Work hours of the workers should be maintained in accordance to the labour law
- All workers should be provided with ID card and entry to the site should be through ID card only and should be ensured by security guard.

8.7.6 Activities prohibited at site

Activities which should be strictly prohibited at site shall include:

- Open burning of wood, garbage and any other material at the site for cooking or any other purpose
- Adoption of any unfair means or getting indulgence in any criminal activity;
- Noncompliance of the safety guidelines
- Operation of the plant and machinery between 10 pm to 6 am unless approved by team leader;
- Harm to animal (wild or domestic or bird) shall be harmed by any construction worker in any condition at the site and nearby areas;
- Cutting of tree without permission of team leader/authorized person;
- Harassment of indigenous population.

8.7.7 Guidelines for night time working at the site.

Activities that generate noise shall not be carried out at the site after 10:00 PM. Night working protocol should be followed (if required) as per guidelines prepared by BEZA. Site should maintain minimum illumination level of 200 lux. Personnel working shall obtain permit to work from the team leader prior carrying out any work in night time and the record of such working shall be maintained in register. Any accidents, if occurs at site during night time working shall be immediately reported and recorded. Penalty shall be imposed on the contractor for the accident. Analysis shall be carried out to find the reason for such accidents for future learning.

8.7.8 Record keeping & Maintenance

Record of entry/exit of the people in the construction site and labour camp area shall be maintained in register at gate. Record of material coming in and going out from site also shall be maintained.

8.7.9 Auditing & Inspection

Conditions of labour camp and site shall be inspected and audit report shall be submitted to BEZA on monthly basis.

8.7.10 Grievance Redress Mechanism

Complaint register and a complaint box should be provided at the site so any person from local community can register their complaint, if any due to the camp, workers and other facilities. The system shall be communicated to local communities through consultations. Open house meetings should be conducted with workers on monthly basis to identify their problems and issues if any related to health, hygiene, safety, comfort and other issues. It has been elaborated in **Chapter 6**.

8.7.11 Security System

Site should be barricaded and should be guarded by security guards at all the gates. Security guards should allow only authorized personnel to the campsite. Guards should be available during both morning and night time. Guard should allow entry of workers to the site only by seeing the ID cards. Guard should report if any unusual or unfair practise happening at site and nearby area. Guards should be trained to handle emergency situations like firefighting and should be responsible to contact the emergency personnel in case of any emergency.

8.7.12 Closure of the Construction Site and Construction Labour Camps

Construction site and labour camps shall be restored back to the original site conditions. Following measures are required to be taken during closure

- Septic tanks/soak pits should be dismantled;
- Any temporary/permanent structure constructed shall be dismantled;
- Construction/demolition waste, hazardous waste and municipal waste at site and labour camp site shall be disposed as per waste management plan in ESMP;
- The site shall be cleaned properly.

8.8 Emergency Response and Disaster Management Plan

An Emergency Response & Disaster Management Plan is a written document, which is required according to occupational health safety standards for an organization and must be displayed at every job site. It is a detail step-by-step procedure to follow in emergency such as fire, chemical spill or a major accident. An emergency response plan also includes information such as whom to notify, who should do what, and location of emergency stock. The Emergency Response Plan includes any measures that should be in place at all facilities to combat an accident resulting from fire, explosion or due to any natural calamities (e.g. Earthquake, cyclones, and flood). A detail emergency response & disaster management plan is provided in **Annex A**.

8.9 Guidelines on environmental and social conditions in the BOQ/contract documents

The environmental and social management program should be carried out as an integral part of the project planning and execution. It must not be seen merely as an activity limited to monitoring and regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as project implementation proceeds, dealing flexibly with environmental impacts, both expected and unexpected. For this purpose, it is recommended that the Project Director (PD) for this specific project takes the overall responsibility of environmental & social management and monitoring. The PD will form a team with required manpower and expertise to ensure proper

environmental monitoring, and to take appropriate measures to mitigate any adverse impact and to enhance beneficial impacts resulting from the project activities. The PD through its team will ensure that the contractor shall undertake and implement appropriate measures as stipulated in the contract document. It should be emphasized that local communities should be involved in the management of activities that have potential impacts on them. They should be properly consulted before taking any management decision that may affect them. Environmental and social management is likely to be most successful if such decisions are taken in consultation with the local community.

The environmental and social management during the construction phase should primarily be focused on addressing the possible negative impacts arising from:

- Cutting/ clearing of crops/ trees/ vegetation along RoW of trunk mains, and associated impact on terrestrial fauna
- Air pollution
- Traffic/ communication problems
- Noise pollution
- Drainage congestion
- Water and soil pollution
- Destruction of aquatic habitat and reduction of fisheries, aquatic fauna

Guidelines on Environmental safeguards are generally incorporated in the Schedule of Works/ BOQ.

In case of DB/ DBO contractors are engaged, the following guidelines need to be followed:

The Schedule of Works for a DBO Project is as follows:

1. General items
2. Design
3. Civil works
4. Procurement of pipes & appurtenances for trunk sewer and collection network
5. Sewer works for the treatment plant
6. Sewer installation for trunk main and collection network
7. Mechanical equipment
8. Electrical equipment
9. Internal roads and landscaping
10. Operation & maintenance works for 3 years

Environmental and social safeguard guidelines to be included in the General items of Schedule of Works and comprise the following points:

1. Insurances for Contractor's equipment, insurances for injury to persons and damage to properties and other insurances.
2. Quality assurance and control plan
3. Environmental & social management plan
4. Traffic management plan
5. Erection and removal of signboards
6. Health and safety plan
7. GBV plan
8. Labour management plan

A detailed write-up on the above issues is generally included in the employer's requirement which is a part of the bidding document.

Some but not limited to the following conditions should be included in the employer's requirement with the contract document for the DB/DBO contractor.

The DB/DBO contractor shall:

- a. design the works to minimise adverse environmental impacts;
- b. meet all the obligations under the prevailing environmental regulations and the Environmental Management Plan;
- c. The Contractor shall at all times operate and maintain the Works in accordance with the approved Environmental Social Management Plan and approved Contractor's Documents including:
 - i. the operating and maintenance manuals
 - ii. the Emergency Response Plan
 - iii. Traffic Management Plan
 - iv. the water quality testing plan
 - v. the health and safety manual
 - vi. GBV plan
 - vii. the quality assurance manual
 - viii. providing training on OHS and waste management plan
- d. The Contractor shall undertake all monitoring, sampling and testing in accordance with:
 - i. The minimum frequencies and sampling methods specified in these Employer's Requirements;
 - ii. The approved water quality testing plan;
 - iii. The Environmental Social Management Plan;
 - iv. Any additional requirements specified by the applicable regulatory authorities

For a DB/DBO contract The Employer should specify the scope of the contractor's responsibilities for preparing and implementing the ESMF and the ESMP. The proposals related to environmental social safeguards of the Contractor needs to be submitted to DoE for environmental verification. If the ESMP has already been prepared it should be included in the Employer's Requirements as an appendix.

Under the general requirement for **planning, design, approvals and documents** of the Bid document the following requirements are mandatory:

- a. design the works to minimise adverse environmental impacts;
- b. meet all the obligations under the prevailing environmental regulations and the Environmental Management Plan;

Under the general requirement for **Operation Management** in the Bid Document the following requirements are mandatory:

maintain the site in tidy condition and take measures to control potential environmental nuisance, including but not limited to, odours, litter, pests, insects, rodents and birds;

Under the general requirement for **Performance during the Operation Service Period** in the Bid Document the following requirements are mandatory:

The Contractor shall at all times operate and maintain the Works in accordance with the approved Environmental Social Management Plan and approved Contractor's Documents including:

- i. the operating and maintenance manuals
- ii. the Emergency Response Plan which includes managing emergencies in the event of chemical spills; contamination of the water source; pollution of the environment;
- iii. the water quality testing plan
- iv. traffic management plan
- v. the health and safety manual
- vi. the quality assurance manual

Under the general requirement for **Water Quality Testing Plan** in the Bid Document the following requirements are mandatory:

- i. The Contractor shall develop a water quality testing plan (the “Water Quality Testing Plan”) including methods, procedures, schedules and frequencies of sampling and analysis
- ii. a plan to monitor noise and other local environmental impacts
- iii. a program to monitor whether the work is complying with the Environmental Social Management Plan

Under the general requirement for **Overall description of the Operation Service** in the Bid Document the following requirements are mandatory:

- The Contractor shall treat wastewater including septic waste to meet the specified standards and shall discharge the treated wastewater into the environment safely (or at the specified discharge point)

8.10 Third Party Monitoring

For effective implementation and an independent environment evaluation, a third-party consulting firm will be hired by the BEZA. This consulting firm will be given the responsibility to monitor the overall performance of the contractor independently in complying with the provisions of the ESMP for satisfactory environmental management of the proposed project including compliance with the DoE conditions.

8.11 Estimated Budget for Implementing the ESMP

A summary of the budgets for recommended environmental and social management, mitigation and monitoring measures have been presented for each of the following key ESMP implementation activities:

- Implementation of mitigation measures;
- Environmental and social training;
- Environmental and social monitoring cost during construction and operation

The estimated budget for EMP implementation is given in **Table 8-3**.

Table 8-3: Estimated budget for implementing ESMP

Description	Quantity	Unit rate (US\$)	Total Amount (US\$) for 3 years	By whom	Remarks
PMU cost for Environmental and social Safeguards (Including Environmental Specialist, Social Specialist, Gender Specialist)	LS	100,000 per year	300,000	PMU, BEZA	
Implementation of Mitigation Measures				Contractor	Fund as part of Construction Contract as quoted by the contractor agreed by the Executing Agency
Training					

Description	Quantity	Unit rate (US\$)	Total Amount (US\$) for 3 years	By whom	Remarks
Training of BEZA Staff (Environmental management & monitoring)	10 persons	5,000	50,000	M&E Consultant	Independent Consultant to be appointed by the World Bank
Training of DoE Staff (Environmental management & monitoring)	10 person	5,000	50,000	M&E Consultant	
Training of other implementing agency's Staff (Environmental management & monitoring)	10 persons	5,000	50,000	M&E Consultant	
Independent Monitoring and Evaluation Consultant (M&E)	12 person-month	15,000	540,000		WB Fund
Environmental Audit	2	100,000	200,000	Third Party to be appointed by BEZA	At middle and end of project implementation
Environmental Quality Monitoring during Operation Phase	LS	10,000 per year		BEZA	from operation cost
Laboratory Test		250,000 per year	750,000		Water, soil and air quality etc. test (To be outsourced)
Consultation	3 times during construction		18,000		
Environmental Training During Operation		50,000 per year	150,000		from operation cost
Total Budget			2,108,000		

CHAPTER 9. INSTITUTIONAL CAPACITY ASSESSMENT AND IMPLEMENTATION ARRANGEMENT

9.1 Institutions and Roles in Project Implementation

The Environmental and Social Management Plan (ESMP) is developed to ensure that the project is implemented in an environmentally sustainable manner where all stakeholders including the project proponents, contractors, sub-contractors, consultant understand the potential environmental and social risks arising from the proposed project and take appropriate actions to properly manage those risks. Local governments, stakeholder agencies, consultants and contractors should follow the ESMP during all phases of the project to mitigate the anticipated adverse impacts and enhance the positive impacts. In **Figure 9-1**, institutional setup for environmental and social management has been presented.

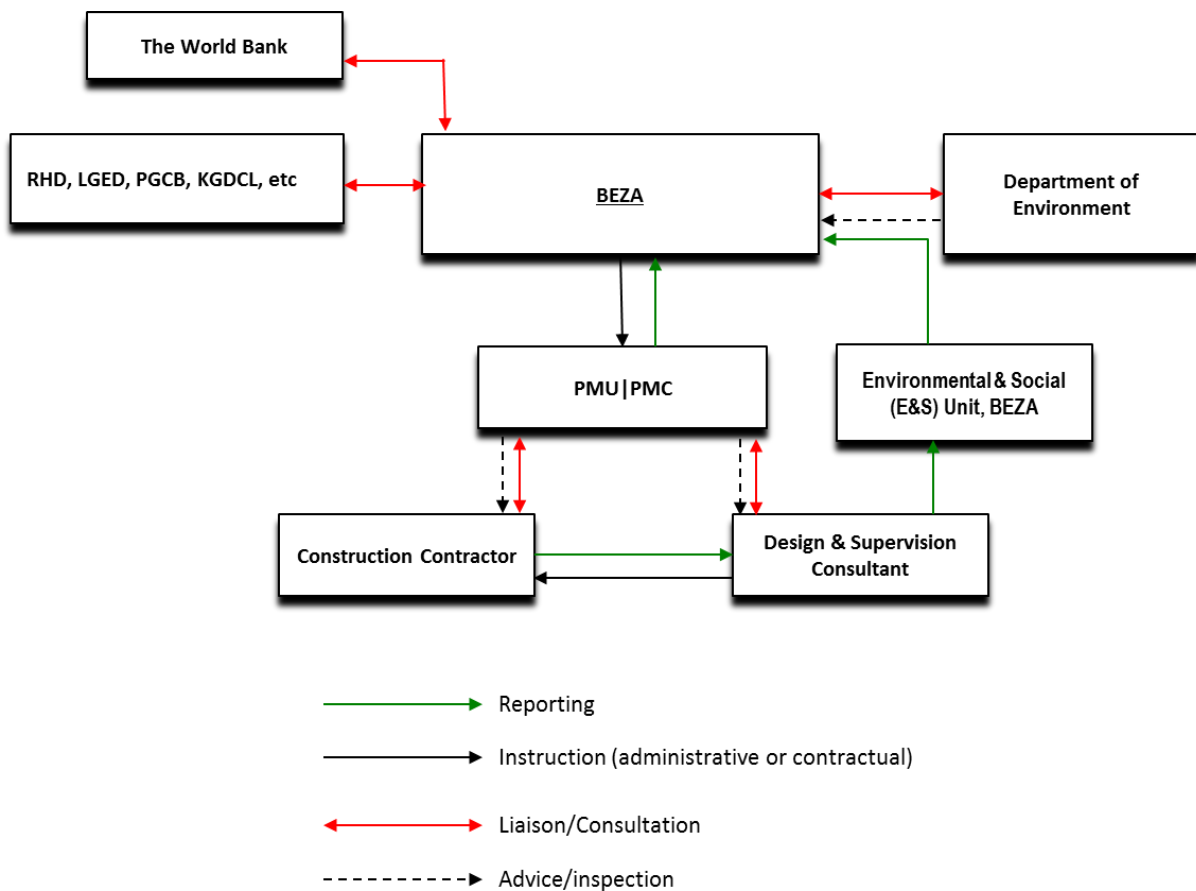


Figure 9-1: Institutional setup for environmental and social management

9.2 Roles and Responsibilities of Various Organisations

Roles and responsibilities of various organizations are given in **Table 9-1**.

Table 9-1: Roles and responsibilities of various organizations

SN	Organization	Responsibility
1.	Department of Environment	<ul style="list-style-type: none"> Define environmental impact assessment (EIA) procedures Approve environmental impact assessment report of the project Inspect the compliance with the environmental regulations during the project’s construction and operation Issue Environment Clearance Certificate (ECC) and controlling,

SN	Organization	Responsibility
		<p>preventing and regulating pollution affecting environment;</p> <ul style="list-style-type: none"> Conduct inquiries on pollution of the environment and rendering direction, guidance and assistance to any other authority or organization regarding those matters.
2.	Local Government Division, Ministry of Local Government, Rural Development & Cooperatives	Local Government Engineering Department under Local Government Division of MoLGRD&C are responsible for the construction of rural roads and other infrastructure as necessary for the project. They will also represent in the local Grievance Redress Committee for the project. Follow the environmental and social management plan during work.
5.	Construction Contractor	<ul style="list-style-type: none"> The contractor shall develop site specific ESMP before construction, as part of their method statement and submit to PMU for reviewing and approval; The contractor has to submit a monthly report on safeguard issues, mitigation, and results throughout the construction period. In case of unexpected problem, the contractor will consult PMU and PMC; Ensure that the construction work will comply with the approved ESIA/ESMP and the site ESMP; Control and minimize environmental impacts; Ensure that all staff and workers understand the procedure and their tasks in the environmental management program; Ensure environmental hygiene.
6.	Project management Unit (PMU)	In order to effectively manage ESMP implementation, an ESMP management team will be established and made operational after awarding the contract to contractor. Project Director will be the head of team and will be assisted by the PMC.
7.	Project Management Consultants (PMC)	<ul style="list-style-type: none"> Responsible for monitoring the contractor's activities and to ensure adequate implementation of the ESMP by contractor. Providing guidance to the PMU regarding any environmental and social issues which may arise during pre-construction and construction phase. Keep track of contractor's day to day activities, their commitment for implementation of ESMP, quality of work, adherence to safety guidelines and method statements. Review the Environment Management Action Plan (EMAP) submitted by contractor and should check adequacy as per the ESMP for this project. This EMAP should be amendable and can be updated time to time by PMC Evaluate Safety, Health and Environmental (SHE) plan covering various construction activities, health of workers/ labourers to be submitted by contractor for each activity. This plan should include evacuation plan, emergency management & response plan Closely monitor the sanitation and hygiene at the construction labour camp, construction site, first aid facilities at sites and labour camps, accident monitoring at the site, safety aspects, PPE usage, first aid box etc. Ensure that all construction and site vehicles should abide by the latest emission norms of the country. Monitor that all workers & labour of contractor should have valid ID cards to assess the site. Monitor that adequate safety trainings are being given to the workers, adequate mock drills are conducted at site by contractor, availability of emergency evacuation plan, emergency assembly area, availability of certified first aid trainer at all the construction site

SN	Organization	Responsibility
		<ul style="list-style-type: none"> Assure that contractor has carried out proper third Party Inspection (TPI) for lifting equipment like crane. Recommend to the PMU to take punitive action in non-compliance of ESMP & SHE Plan Submit monthly performance report on the level of compliance & non-compliance by the contractor.
8.	Environmental & Social Unit (E&S unit)	They will be given the responsibility to independently monitor the overall performance of environmental management of the project, including compliance with relevant GoB and WB regulations and the provision of the environmental and social management (ESMF) developed for the project. As a part of the monitoring, they will prepare a comparison of monitoring outcomes carried out, so that lessons learned and best practices could be replicated. They will prepare the Compliance Report and submit to the GM (P&D).
9.	Other organization such as RHD, KGDCL, etc.	Follow the environmental and social management plan during construction work.

9.3 Institutional Setting and Implementation Arrangement

BEZA has developed Environmental Management Framework with the help of World Bank. The institutional arrangement is aligned as per this framework. BEZA will have an E&S unit which will coordinate for implementation of environment management plan. The civil works contractors will implement the environmental mitigation measures. BEZA will appoint a PMC for monitoring the contractor activities and implementation of ESMP.

In the institutional arrangement procedure, Project Director, and Team Leader/Deputy Team Leader will be directly involved. The PD and DPD would be supported by Environmental Safeguard Specialist and Social Management Specialist. Under PMU, there will be relevant officials and consultants to support the PD.

The E&S unit and PMU will submit monthly and quarterly progress reports on Environmental and Social Compliances to GM (P&D). After reviewing it will be sent to World Bank.

Institutional setting and implementation arrangement of BEZA for environmental and social issues is shown in **Figure 9-2**.

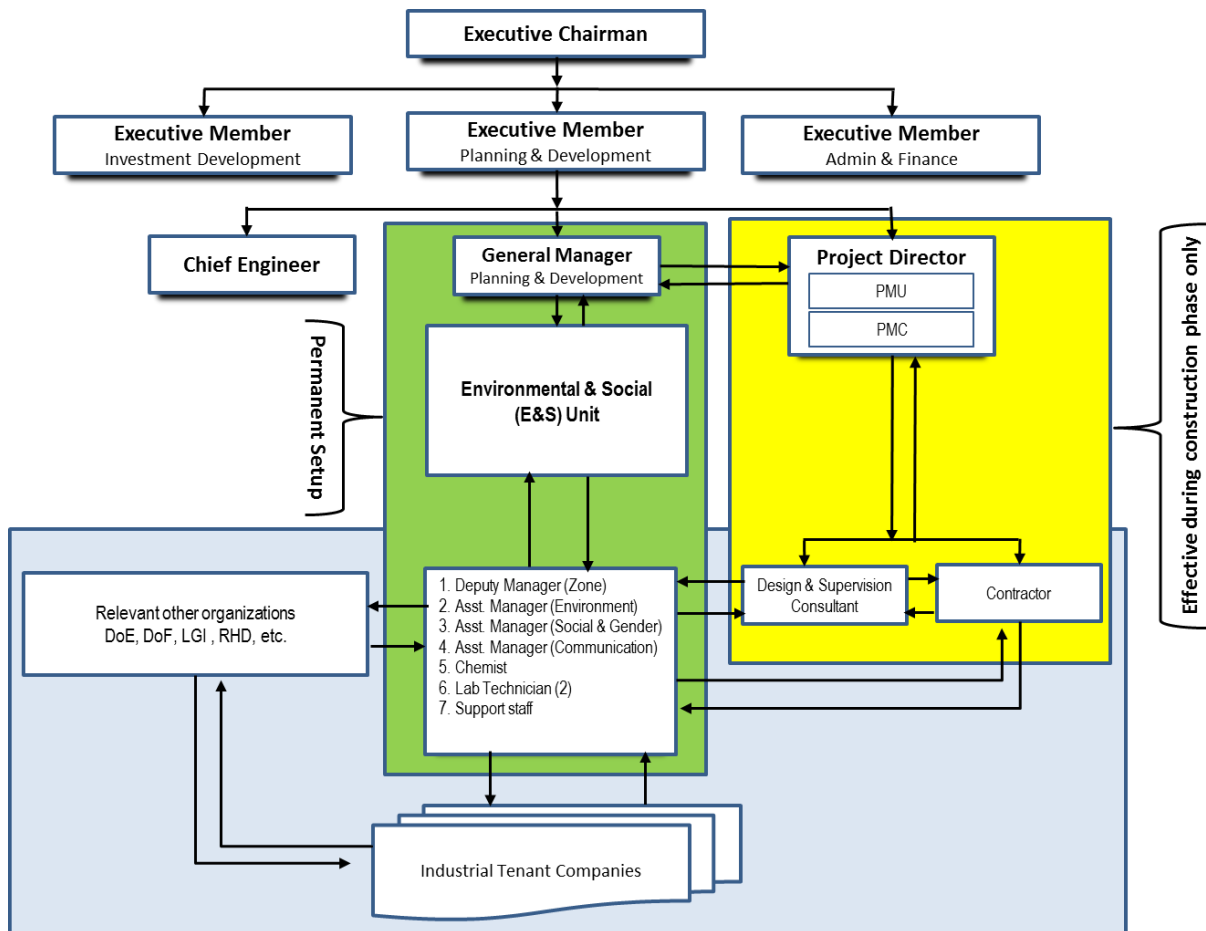


Figure 9-2: Institutional setting and implementation arrangement of BEZA for environmental and social issues

9.4 Assessment of Capacity of BEZA

A careful assessment of BEZA has been made which shows that there is no defined institutional setup to supervise the safeguard activities under the project. There is no dedicated social and environmental cell or unit in BEZA for monitoring and managing social, environmental and health and safety risks for the development projects, except the Individual Environmental and Social Consultants at head Office. A Social, Environmental and Communication cell is therefore recommended under the GM (P&D). This cell will work independently to monitor and supervise the ESMP for the project. The PMC will work under the PMU. The PMC will need to have qualified safeguard specialists who will review the reports from the Design and Supervision Consultants and the Contractors on the implementation of the ESMP. The Design and Supervision Consultant will work in the zone to monitor the implementation of the ESMP by the contractor and report to the PMU.

9.5 Action Plan to Strengthen Staffing, Capacity, Systems and Implementation

During the project period, the Safeguard Consultants will have to be deployed under both PMU and PIU level. After ending the project fund, the positions will have to be in permanent status under BEZA. Training shall be imparted, on a regular interval, to the BEZA officials and Staff on Safeguard Issues. The ESMP document will be used as a training material for capacity building of BEZA officials/ staff and the Environmental & Social Specialist will act as facilitators for the capacity building sessions. If the Consultants, ES & SS, do not feel confident on their subjects, the ESIA consultants will initiate training for the BEZA officials as a TOT course on safeguard issues. Later on, the BEZA officials and Consultants will train up the Contractors’ people on safeguard compliances.

On-the-job training is essential for the capacity building of Contractors' people (Supervisors and Labour Supervisors of Contractor). BEZA with support of third-party resources as needed (independent experts, NGOs, etc. will design and implement training for targeted groups involved in the Project to improve their awareness of risks and mitigate the impacts of the project.

Table 9-2: Capacity development support (training)

Training to be provided	Targeted Groups and Timeframe	Timeline of Trainings
Environmental and Social Framework: Training on ESF and the 10 ESSs including preparation of ESMP	Personnel directly related with project at BEZA head office and Filed office (if available)	Prior to Project effectiveness for 7 days
Occupational Health and Safety Module: Personal protection equipment Workplace risk management Prevention of accidents at work sites Health and safety rules Solid and liquid waste management Hazardous waste management e.g. fuelling of vehicles Preparedness and response to emergency situations Awareness campaign on HIV/AIDS	<i>Local Officials of BEZA, PMC, Locally active NGOs, Contractors</i>	Prior to the Project effectiveness 4 sessions with each comprising 2 days
Labour and Working Conditions: Terms and conditions of employment according to national working laws and regulations Contractor and sub-contractor codes of conduct Worker's organizations Child labour and minimum age employment rules	<i>Local officials of BEZA, Contractors Health Safety Officer, Labour Sardars (Leaders)</i>	Prior to the Project effectiveness 4 sessions with each comprising 2 days (can be merged with OHS module)
Grievance Redress Mechanism Module, design and production of a training module addressing the following aspects: <ul style="list-style-type: none"> • Registration and processing procedure • Grievance redress procedure • Documenting and processing grievances • Use of the procedure by different stakeholders 	ES, SDS, GS, Local Governments, Civil Society, Local NGOs working with host population and Contractors	Prior to Project effectiveness and thereafter once every six months Each session for 1 day
Construction Waste Management: Information about the risks, along with health and safety advice, see the World Bank Group Environmental Health and Safety Guidelines on managing construction waste and the relevant international good practices Basic knowledge about handling procedures and risk management Using protective and safety equipment Information about the waste sorting process Safe procedures for managing waste in dumps	ES, EHS, SDS, Contractors	Prior to Project effectiveness and thereafter every three months Each session for 1 day

Training to be provided	Targeted Groups and Timeframe	Timeline of Trainings
Hazardous waste management Refuelling procedure Spillage of soil management		
GBV Risk Module Raising awareness and measures to prevent and mitigate GBV risks The topics, activities and targeted groups will be developed in the GBV Action Plan including GBV-specific GRM	BEZA Local officials, Contractors Health Safety Officer, Labour Sardars (Leaders), Local NGOs	Prior to Project effectiveness and thereafter every six months Each session for 2 days

REFERENCES

- Alam, M.E. (2006), Impact of Unplanned Withdrawal of Groundwater in Shallow Tube-well Irrigation in Bangladesh, MSc Thesis, Bangladesh University of Engineering & Technology.
- BADC (2015), Final Report on Reduced Level (RL) Detection of Deep Tube Well and Shallow Tube Well, Bangladesh Agricultural Development Corporation, Government of the People's Republic of Bangladesh.
- BBS (2011) Census 2011, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh
- BBS (2013) Economic Census 2013, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh
- BBS (2016) Violence Against Women (VAW) Survey 2015, Bangladesh Bureau of Statistics, Ministry of Planning, Government of the People's Republic of Bangladesh
- BEZA (2014) Feasibility Study for Mirershorai Economic Zone, Bangladesh Economic Zones Authority (BEZA), Prime Minister's Office, Government of the People's Republic of Bangladesh
- BEZA (Nov 2016 a) Pre-feasibility Report: Mirsharai 2 Economic Zone, by IIFC & BETS, Prime Minister's Office, Government of the People's Republic of Bangladesh
- BEZA (Nov 2016 b) Social Impact Assessment Report of Mirsharai Economic Zone-2, Prime Minister's Office, Government of the People's Republic of Bangladesh
- BEZA (Dec 2016) Environmental Impact Assessment Report of Mirsharai Economic Zone-2, Prime Minister's Office, Government of the People's Republic of Bangladesh
- BEZA (2018) Survey Report for Preparation of Master Plan for Mirsharai Industrial City (MICITY), Bangladesh Economic Zones Authority (BEZA), Prime Minister's Office, Government of the People's Republic of Bangladesh
- BEZA (2019) Draft Final Report on Detail Study on Total Water Demand and Water Availability assessment for Bangabandhu Sheikh Mujib Shilpa Nagar by IWM, Bangladesh Economic Zones Authority (BEZA), Prime Minister's Office, Government of the People's Republic of Bangladesh
- The World Bank (2017) Environmental and Social Framework, International Bank for Reconstruction and Development/The World Bank, 1818 H Street NW, Washington, DC 20433
- WARPO (2017) Assessment of State of Water Resources, Water Resources Planning Organization (WARPO), Ministry of Water Resources, Government of the People's Republic of Bangladesh