
Environmental Impact Assessment Report

Mirsarai Economic Zone-II

*Submitted
to Bangladesh
Economic
Authority
December 2016*

Zones



Bangladesh Economic Zones
Authority (BEZA)

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Abbreviation & Glossary

Abbreviation	
%	Percentage
°C	Degree Celsius
µg/m ³	microgram per cubic meter
AEZ	Agro Economic Zone
amsl	Above Mean Sea Level
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh Taka
BEPZA	Bangladesh Economic Processing Zone Authority
BEZA	Bangladesh Economic Zone Authority
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BOD	Biochemical Oxygen Demand
BRI	Bangladesh Rice Research Institute
BSRM	Bangladesh Steel re-Rolling Mills
BTCL	Bangladesh Telecom Company Limited
BUA	Built-up Area
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
CaCO ₃	Calcium Carbonate
CCC	Criterion Continuous Concentration
CDSP	Char Development and Settlement Project
CETP	Common Effluent Treatment Plant
cm	Centimetre
CMC	Criterion Maximum Concentration
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CoI	Corridor of Impact
CPP	Captive Power Plant
Cr	Chromium
CRPA	Climate Resilience Participation Afforestation
CSTP	Common Sewage Treatment Plant
Cum	Cubic meter
DG	Diesel Generator
DMB	Disaster Management Bureau
DO	Dissolve Oxygen
DoE, B	Department of Environment, Bangladesh
DPHE	Department of Public Health and Engineering
DTA	Domestic Tariff Area
E	East
EC	Electrical Conductivity
ECA	Environment Conservation Act
ECC	Environment Clearance Certificate
ECR	Environment Conservation Rules
EIA	Environment Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EPZ	Economic Processing Zone
ETP	Effluent Treatment Plant
EZ	Economic Zone
FAR	Floor Area Ratio
FCD	Flod Control & Drainage
FDI	Foreign Direct Investment
FGDs	Focus Group Discussions

FMD	Foot & Mouth Disease
Ft.	Feet
g	Gram
GDP	Gross Domestic Product
GIS	Geo-Informatics System
gm/cc	gram per cubic centimetre
GoB	Government of Bangladesh
GSB	Geological Survey of Bangladesh
GSHAP	Global Seismic Hazard Assessment Program
Ha	Hectares
HDPE	High-Density Polyethylene
HHs	Households
HT	High Tension
HYV	High Yielding Variety
ICT	Inland Container Terminal
IEE	Initial Environment Examination
IFC	International Finance Corporation
JICA	Japan International Cooperation Agency
Kg	Kilogram
Kg/day	Kilogram Per Day
KLD	Kilo litres Per Day
Km	Kilometre
km	Kilometre
Km/h	Kilometre per Hour
KV	Kilo Volts
LCV	Low Carriage Vehicles
L _{eq}	Equivalent Noise Level
LPCD	Litre per Capita per Day
LPG	Liquefied Petroleum Gas
LT	Low Tension
LU	Land Use
M	Meter
m/s	meter / second
m/yr	meter / year
MAV	Multi-Axle Vehicles
max.	Maximum
mg/kg	microgram per kilogram
mg/l	microgram per litre
Mile/h	Mile per Hour
min.	Minimum
MLD	Million Litres Per Day
mm	Millimetre
Mm/day	Millimetre per Day
Mm/hr	Millimetre per hour
MT	Million Tonnes
MVA	Mega Volt Ampere
MVA	Mega Volts Ampere
MW	Mega Watt
N	North
NaCl	Sodium Chloride
NE	North East
NGL	Normal Ground Level
NNE	North-North-East
NOC	No Objection Certificate
NO _x	Oxides of Nitrogen
NW	North West
O.P.	Operational Policy

PCC	Pretoria Portland Cement
PCMs	Public Consultation Meetings
PCU	Passenger Car Unit
PDMs	Public Disclosure Meetings
PF	Protected Forest
PGA	Peak Ground Acceleration
PM ₁₀	Particulate Matter less than 10 micron size
PM _{2.5}	Particulate matter less than 2.5 micron size
PMC	Project Management Consultant
PPE	Personal protective Equipment
PPP	Public Private Partnership
PPR	Peste des petits ruminants (disease in ruminants)
PRA	Participatory Rural Appraisal
PSDSP	Private Sector Development Support Project
PUC	Pollution Under Control Certificate
R & R	Rules and Regulations
RAP	Resettlement Action Plan
REB	Rural Electricity Board
RF	Reserve Forest
ROW	Right of Way
RRA	Rapid Rural Appraisal
RWH	Rain Water Harvesting
S	South
SE	Socio Economic
SE	South East
SIA	Social Impact Assessment
SMF	Social Management Framework
SO ₂	Sulphur Dioxide
SPT	Standard Penetration Test
Sq Ft	Square Feet
sq.km	Square kilometre
sq.m.	Square Meter
STP	Sewage Treatment Plant
SW	South West
TCS	Typical Cross Section
ToR	Terms of Reference
TPP	Thermal Power Plant
TSS	Total Suspended Solids
UK-DFID	Department for International Development, United Kingdom
UNDP	United Nations Development Programme
US\$	United States Dollars
VOCs	Volatile Organic Compounds
W	West
WARPO	Water Resources Planning organization
WP	Water Pollution
XEN	Executive Engineer
YPSA	Young Power in Social Action
NGO	Non Government Organization
µmhos / cm	micromhos per centimetre

TOR COMPLIANCE

S. No.	ToR Point	Compliance
I	The project authority shall conduct a comprehensive Environmental Impact Assessment (EIA) study considering the overall activity of the said project in accordance with this ToR and following additional suggestions	EIA study has been carried out in line with the ToR Approved by DoE, WB guidelines & EMF of PSDSP
II	The EIA Report should be prepared in accordance with following indicative outlines:	Agreed
1	Executive Summary	Refer Chapter 1
2	Introduction: (background, brief description, rationale of the project, scope of study, methodology, limitation, EIA team, references)	Refer Chapter 2
3	Legislative, regulation and policy consideration (covering the potential legal, administrative, planning and policy framework within which the EIA will be prepared)	Refer Chapter 3
4	Project Description	Refer Chapter 4
i.	Introduction	Section 4.1
ii.	Project objective	Section 4.2
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III	Without obtaining approval of EIA report by the Department of Environment, the Project authority shall not be allowed to conduct earth filling or any kind of physical intervention in the proposed project site and also not be able to start the physical activity of the project.	Agreed
IV	This approval of the Terms of Reference (ToR) would not mean any acceptance or site clearance of the Project.	Agreed
V	The proposed EIA study would not establish any claim, right in favour of the proponent for getting site clearance or environmental clearance.	Agreed
VI.	Without obtaining Environmental Clearance, the project authority shall not be able to start the operation of the project.	Agreed
VII.	The project authority shall submit the EIA along with the No Objection Certificate (NOC) from the local authority, NOC from Forest Department (if it is required in case of cutting any forested plant, private	Agreed

S. No.	ToR Point	Compliance
	or public) and NOC from other relevant agencies for operational activity etc. to the Chittagong District Office of DOE with a copy to the Head Office of DOE in Dhaka.	

1. Executive Summary

1.1. Introduction

The Bangladesh Economic Zone Act, 2010, was passed by Government of Bangladesh to make provisions for the establishment of Economic Zones (EZs) in all the potential areas with an ambit to encourage rapid economic development and to instil confidence in investors and signal the Government's commitment to a stable EZ policy regime.

With an ambit of enhancement of economic development in the country, Government of Bangladesh with support from World Bank and the Department for International Development, United Kingdom (UK-DFID) has proposed to develop EZs at various potential locations in Bangladesh as Private Sector Development Support Project (PSDSP).

Bangladesh Economic Zone Authority (BEZA) is the overall agency responsible for establishments of EZs in all the potential areas including the backward and undeveloped regions. BEZA has identified various locations for development of EZs. One of the potential sites is located at Mirsarai Upzila and has total area of app. 1311 acres. One more site has also been proposed by BEZA at Mirsarai and is adjacent to the proposed EZ site. Approval from DoE has already been obtained for the previous EZ site. This site is being called as Mirsarai EZ-II.

1.2. Project Background

BEZA has planned to develop another EZ adjacent to under development EZ-I site at Mirsarai Upzila, Chittagong District. Economic zone will be developed under PPP mode. At this stage, BEZA will develop the land and will also cover the off-site infrastructure at the proposed project site on the basis of preliminary site feasibility study. Other services and infrastructure of EZ will be developed by the private developer at a later stage. Developer will also carry out the detailed feasibility study prior development of the project. The off-site development to be developed by BEZA will broadly include the following:

- Construction of Administration building
- Widening of existing access road on CDSP/BWDB bund to 2 lane road (7 kms)
- Site Preparation which includes
 - Landfilling of 1311 acres
 - Construction of bund for 1311 acres all around the boundary of new EZ site
 - Sluice Gate for managing flow of Isakhali Channel at entry point of channel at site

Taking into consideration the site location, available infrastructure, existing industries, investors interest and infrastructure & logistic requirement of the proposed industries and type of industries proposed for EZ-I it is predicted that industries like food processing, textile, petrochemical, ship building and light engineering will come up in this zone. Options for other industries can also be explored by the developer at the time of development of EZ depending on the investor's interest and availability of resources. At present, off-site infrastructure will be developed by BEZA for the proposed site identified for Mirsarai EZ.

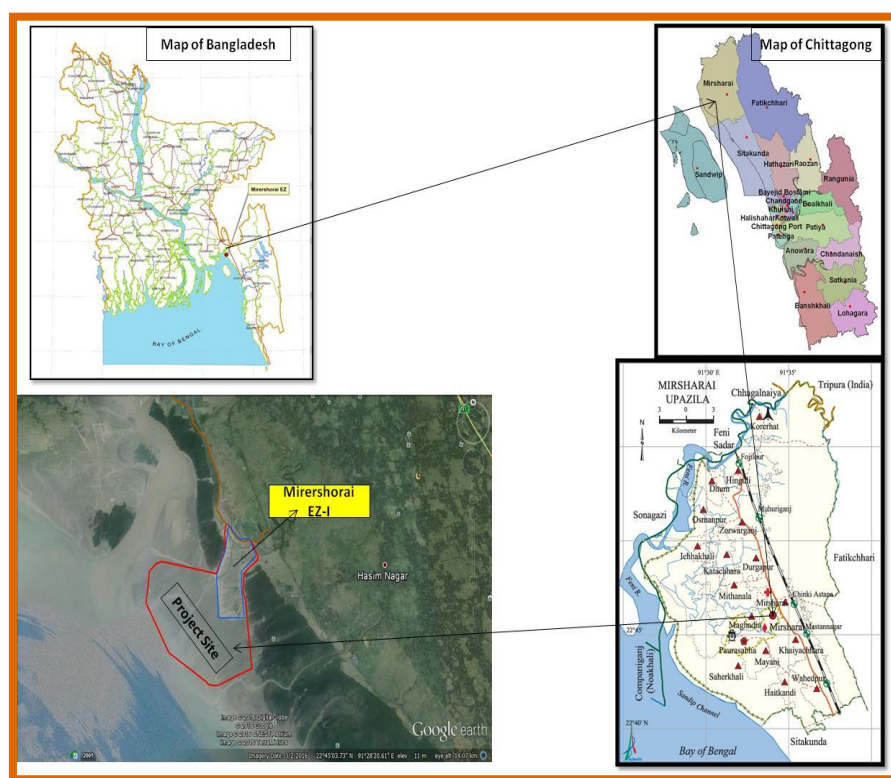
BEZA has appointed M/s Price Water Coopers Pvt. Ltd. to provide transaction advisory services for development of EZs in Bangladesh which also includes Environment Impact Assessment (EIA) study of the upcoming projects. The project attracts the applicability of Environment Conservation Act, 1995 & Environmental Conservation Rules, 1997. The proposed project is classified under red category as per Environmental Conservation Rules, 1997. Thus it is required to carry out EIA study for the proposed project as per Environmental Conservation Rules, 1997 and obtain approval of DoEB before taking up any construction activity for the project. Project is being implemented with the financial

support of World Bank. As per the World Bank Policy O.P.4.01 and the Environment Management Framework of PSDS project, development of the economic zone is classified as Category A project which requires a detailed environment assessment study prior development of zone to identify the potential threats of project to environment and to frame mitigation and environment management plan to reduce the negative impact of the project.

As per the procedure, an Initial Environment Examination (IEE) Report for development of EZ along with proposed Terms of Reference (ToR) was submitted to DOE on 04.04.2016. Approved ToR was granted by DoE vide Memo No. DoE/Clearance/5577/2016/174 dated 2nd May, 2016. The EIA study for the development of proposed Mirsarai EZ has been carried out as per the ToR issued by DoEB and World Bank's requirements and EMF of PSDS project.

1.3. Project Description

Mirsarai EZ –II is proposed to be located in Mirsarai Upzila of Chittagong district, Bangladesh near Abu Torab Village adjacent to under development Mirsarai EZ –I. Upcoming EZ covers area of 1311 acres. Project land is Government Land and land use is Char land (Wetland) as per revenue records. The proposed Mirsarai EZ II site is located at the end of the eastern side of the Bay of Bengal, surrounded by the coast and Mirsarai Town. The location map of the proposed EZ site is presented in Figure 1. Table showing geographical coordinates of the project site is given below. Surroundings of the project site are given in table 2 below.



Source: Google Earth

Figure 1: Location Map

Table 1: Coordinates of the proposed project site

Points	Latitude	Longitude
A	22°45'8.62"N	91°27'32.07"E
B	22°44'58.52"N	91°26'40.95"E
C	22°44'49.25"N	91°26'43.69"E
D	22°44'43.35"N	91°26'45.61"E
E	22°44'29.27"N	91°26'50.90"E
F	22°44'14.06"N	91°27'6.76"E
G	22°43'56.57"N	91°27'26.22"E
H	22°43'56.69"N	91°27'54.96"E
I	22°44'1.23"N	91°28'13.52"E
J	22°44'13.23"N	91°28'12.67"E
K	22°44'28.86"N	91°28'11.34"E

Table 2: Existing Features surrounding the project site

Direction	Features
North	Mirsarai EZ-I followed by CDSP Bund And Agricultural land across CDSP bund
East	Mangrove plantation
South	Wetland followed by Bay of Bengal
West	Mangroves and Wetland followed by River Fenny

The proposed project site is generally flat and lowlying. The proposed site will be required to be filled and levelled. Elevation of site is 3 m amsl on average. The elevation within the 10 km radius area varies from 0 m to 11 m. It is proposed to fill the site to 1.15 m to achieve level of 4.15 m amsl .

1.4. Connectivity of the Project Site

Site is at 10 Km west of the national Highway (Dhaka-Chittagong Highway) with Chittagong City 60 Km south of this location. Bartakia Railway station and Mirsarai Railway station is at distance of 9.5 & 10.0 km respectively in East direction to the site. The Shah Amanat International Airport at Chittagong is located south of the site at a distance of 79 Km, and, the seaport is 67 Km south of the site. Azampur Bazar, the nearest market, is only 2 Km north from the site.

Site is accessible through under development single lane road being constructed on CDSP & BWDB bund for Mirsarai EZ-I measuring 7 kms. It is planned to widen this road to 2 lane so as increased traffic due to Mirsarai EZ-II can be accommodated.

A bund/super dike will be constructed all along the proposed Mirsarai EZ-II boundary except in North direction to protect the site from the water ingress from Sea during high tide and monsoon. The bund shares boundary with existing bund developed for Mirsarai EZ-I and will be continued with the existing bund only. The bund/road will connect the site to under construction single lane road being constructed on CDSP/BWDB road (future 2 lane road) which is further connected to project road in North of direction and Abu Torab Beri Bandh Road in South direction of project site. Project road and Abu Torab road further connects to the Dhaka Chittagong highway. Connectivity and surroundings of the project site is given in table 3 below.

Table 3: Connectivity & Surroundings of Proposed Project Site

Connectivity	Name	Distance	Direction
Nearest Road/Highway	CDSP Bund	Abuts site	East
	BWDB bund	800 m	East
	Abu Torab Road	3.7 kms	SE
	Dhaka Chittagong Highway	10 kms	East
Nearest Railway Station	Bartakia Railway Station	9.5 km	East
	Mirsarai Railway Station	10 km	
Nearest Airport	Shah Amanat International Airport	79 km	South
Available inland water transport	Feny River	900 m	West
	Isakhali Canal	Within EZ site	Within EZ site
	Bamon Sundar Canal	2 kms	SE
Nearest Village/Residential Area	Nayapara Village	4 km	SW
	Charsharadh Village	3 km	SW
Nearest Port	Chittagong Port	67 km	South

Source: Based on analysis of area maps, satellite imageries and topo-sheets

There are no ecological sensitive locations such as National Park, Sanctuary, Elephant/Tiger Reserve, Migratory routes and wetlands within the 10 km radius of the study area. Mangroves plantation carried out by forest department along the coast line labuts the EZ site. River Feni is app. 1000 m from the site in West/NW direction. A rivulet from river Feni just abuts the western boundary of the site at one location. Isakhali canal traverse throughout the length of the site and divides it into two parts. Bamon Sundar canal also touches the SW boundary of site at one location.

1.5. Project Activities and Area Statement

BEZA has planned to develop a Mirsarai EZ-II on area of 1311 acres adjacent to under development Mirsarai EZ-I. Total area of the proposed EZ is approximately 1311 acres. BEZA has planned to develop the land and off-site facilities for the EZ site so as to make it easily accessible and buildable. Details of off-site planned to be undertaken by BEZA are given in table 4 below.

At present initial site feasibility study has been undertaken by BEZA for development of the proposed Mirsarai EZ-II. On the basis of the feasibility study, the sites is considered for development of EZ and as per recommendation of the study, above given off-site facilities are proposed to be developed at the site. Detailed planning for the EZ development will be carried out by developer to be appointed by BEZA as per EZ Act, 2010. It is estimated that type of industries which will come up in the area will be similar to those of Mirsarai EZ-I and are majorly industries like food processing, textile, petrochemical, ship building and light engineering.

Table 4: Details of Off-site facilities

S. No.	Proposed Infrastructure	Details
1	Administration building	Administration building will be constructed within EZ site. Building will have ground coverage of 1500 sq. m and built up area of 6000 sq. m. It will consist of 5 floors (G+4).
2	Widening of existing access road on CDSP & BWDB bund to 2 lane road (7 kms)	Site is accessible through under development single lane road being constructed on CDSP & BWDB bund for Mirsarai EZ-I measuring 7 kms. It is planned to widen this road to 2 lane so as increased traffic due to Mirsarai EZ-II can be accommodated.
3	Landfilling of 1311 acres	Site is flat land with various drainage channels in it and average elevation of 3 m amsl. Site will be leveled and filled to height of 1.15 m from NGL. Sand of 4863632cum will be required for filling the land. Sand for filling will be sourced from deep sea. Dredging will be carried out by licensed dredgers to be contracted by BEZA. BWDB will conduct a study to identify the locations suitable for carrying out dredging. Peripheral drain will be developed all along the boundary. This drain will accommodate storm water
4	Construction of bund for 1311 acres all around the boundary of new EZ length 7.8 km	<p>A bund/super dike will be constructed all along the proposed EZ boundary except in North direction to protect the site from the water ingress from Sea during high tide and monsoon. North direction is already protected by existing CDSP bund. Height of the proposed bund will be +10m amsl. Total length of the bund will be 7.8 km. Sand requirement for bund construction will be fulfilled from Feni river or from the Sand Mohal where sand is accumulated by various dredgers or from sea.</p> <p>This bund shares the boundary with the existing bund of the Mirsarai I EZ. Thus this bund will continue with the existing bund of Mirsarai EZ-I to cover the site from all the three direction (S, E & W). Top level of bund will be +10 m amsl. Portion which is common to Mirsarai EZ-I will also be raised to + 10 m amsl from existing level of + 8 m amsl.</p>
5	Sluice Gate	Sluice gate will be constructed at Entry point of channel within EZ from sea side to control the flow of water from Isakhali channel within EZ site.

1.6. Drainage System Development

To accommodate the rain water run-off it is proposed to provide the peripheral drain which will be finally connected to Isakhali channel. Rain water system should be developed within the site for storage and harvesting of rain water. Isakhali channel and Bamon Sundar channel will be maintained to ensure the drainage of the upstream areas. Since the EZ site will be filled the drainage pattern

existing at the site will be disturbed and flow of water to Mangroves will be obstructed. Pipeline will be laid to ensure the continuous flow of the water to manroves across the bunds. Rain water harvesting should be made mandatory for all the individual plot owners.

Project Schedule

Following table (table 5) presents the implementation schedule of the off-site infrastructure details at the proposed Mirsarai EZ site.

Table 5: Implementation Schedule of Off-site Infrastructural Details

S.No	Offsite infrastructure	Duration in months from start
1	Site Development (filling)	12
2	Peripheralbund of 7.8 km ad 5 m width	12
3	Administration building	12
5	Widening of access road on CDSP & BWDB bund	12
6	Sluice gate for Isakhali channel	6

1.7. Resources and Utilities Demandfor Off-Site Developments

Construction Materials Sourcing

Construction material like steel, cement, concrete, bricks, aggregates etc. will be required for each of the proposed off-site facility construction. The quantity of each of the raw materials is detailed in Chapter 4 of the EIA Report.

Water

Water requirement during construction phase is estimated to be app. 50 KLD, which includes Domestic water requirement of construction workers. For storing rain water during construction phase, temporary rain water harvesting ponds can be constructed at the site. Water for construction shall be sourced from rain water harvesting ponds, Feni River & Ground water. Water requirement for the operation phase will be app. 15 MLD. Initial demand will be fulfilled from ground water to be tapped through 6 nos. tube wells. Location for borewell are to be decided by DPHE after undertaking ground water potential study for the area and the study is already initiated. DPHE will develop the water supply system and will operate it as well. A lake of app 100 acres will be developed within the project site. This lake will receive the rain water from entire zone. This water after treatment can also be used for meeting the requirement as per availability. Mirsharai region receives good amount of rainfall (2540 mm annually). In long term either a desalination plant should be set up to meet the water requirement of zone or option for feasibility of getting water from Mahamaya lake through pipeline can be explored which is app 12 km from site in East direction.

Power Requirement

Power requirement for the zone is estimated to eb app. 110 mVA. Power can be sourced from the Power Grid Company of Bangladesh who is intending to set up a substation in Mirsharai. Provision of land has been made by BEZ to set up the substation within the EZ.

Street Lighting

Street lighting will be provided on the proposed road to be widening and peripheral ring road cum embankment. Solar street lights should be proposed in ratio of 1:2. Average illumination of 20 lux should be maintained on the roads.

Telecommunications

Mirsarai has mobile connectivity from almost all mobile companies. There is no fixed network. It is recommended to install BTCL (Bangladesh Telecom Company Limited) network, as fixed Phone Network of BTCL is the only reliable network.

Sewage & Effluent Treatment

All industries should be responsible for treatment of the sewage and effluent generated from their unit so that all industries are zero discharge. Sewage should be treated in the STP and effluent should be treated in the ETP. Treated water should be recycled and re-used within the site. Also provision should be made for CSTP and CETP at EZ site.

Storm water drainage system

For managing the storm water run-off, a storm water drainage network will be developed at the site by developer. Drainage will be channelized into the lake proposed for harvesting the rain water. Further a peripheral drain is proposed to be developed all along the project boundary. This drain will be connected to Isakhali channel and lake both to manage the flow. Sluice gate is proposed to be developed on entry point of Isakhali channel to prevent flow of saline water in the lake during high tide. BWDB will construct, design and maintain the sluice gates

Flood and Cyclone Protection

Several cyclones protection measures have been taken by Govt. of Bangladesh for protection of inland area from cyclones. Mirsarai coastline is protected by two bunds (BWDB & CDSP) constructed by Bangladesh water Development Board and under Char Development and Settlement Project. These two bunds protect inland area from tidal flooding. Also Mangrove plantation has been carried out along the coast line to further protect inland area by forest department. Recently a bund of height +8 m amsl has been constructed for under development Miresheroi EZ-I to protect the zone from cyclones. A cyclone shelter is also constructed by the Government in the area to provide shelter to people during cyclones. Flow in Isakhali canal is controlled with the help of sluice gates which helps in controlling the water flow in channel and prevent flooding of land area.

Proposed Mirsarai EZ-II site is seawards side of all the BWDB, CDSP bunds and newly constructed bund for Mirsarai EZ-I site. But to protect the site from inundation, it is proposed to construct superdike all along the periphery of the proposed site. Height of the bund will be +10 m amsl and width 10 m. This bund will also act as peripheral road to provide connectivity to the site. Further embankments of the bund are proposed to be provided with stone pitching on seaward side and glass turfing along with plantation in land ward site. To prevent flooding of site due to Isakhali channel, it is proposed to develop embankment of height +6.5 m along the Isakhali channel. A sluice gate will be developed on the Isakhali channel to manage the flow of water. The sluice gate will be developed, maintained and controlled by BWDB. Sluice will have 12 vents and is gated structure to control the flow of water from sea to canal. Peripheral drain will be constructed all along the periphery of the proposed EZ site to accommodate the storm water flow and it will be connected to Isakhali channel to drain the water. Green buffer of 30 m will be developed all along the project boundary and along Isakhali channel. . Also zone between sea and the project boundary (1km zone) will be planted with mangroves. This buffer and mangrove plantation will also reduce the impact of water ingress during cyclone.

Green Belt Development

Green buffer of 30 m width will be developed all around the EZ site. Green buffers and avenue plantation will be carried out by the developer. Also zone of 1000 m between EZ site and sea will be developed as green buffer. Avenue plantation will be developed all along the access road to be widened, bunds cum peripheral road and internal roads. In addition to this all industries will develop green belt all around their respective plots. Native plant species consuming less water and requiring less after care and monitoring should be considered. Such species include Neem, Chambol, Sirish, Palms, Gewa, Mango, Mahagony etc. Green buffer should consist of minimum 3 rows of vegetation. First row of green buffer should be small shrubs and herbs, second row of tall shrubs and small/medium height trees and last row of medium to tall heighted trees.

Solid Waste Generation from Proposed EZ Project

Waste to be generated during construction phase will be left out construction material like metal piece, wood piece, unused concrete, broken bricks, glass, ceramic, demolition waste etc. Quantity of the solid waste to be generated during construction phase may vary from 30-50 kg/day. This waste should be collected and segregated at the site itself. Recyclable and Re-usable waste should be separated and should be sent to recycler. Rejected waste should be disposed off at the designated sites by local authority.

Nature of solid waste generated during the operation phase will be highly variable due to presence of different kind of industries in the EZ. Majorly industries like food processing, textile, petrochemical, ship building and light engineering industries may come up in the EZ as planned for Mirsarai EZ-I. These industries are comparatively less polluting industries. Solid waste generated by industries should be managed by industries themselves. Solid waste can be of variable nature and will include industrial non-hazardous waste, hazardous waste, bio-degradable, non-biodegradable, e-waste, construction debris, hospital and bio-medical waste. A secured scientific landfill should be developed for disposal of municipal solid waste within the EZ site. Solid waste landfill site should be provided with the liners and drainage system for leachate. Liners prevent entry of leachate which may contaminate the underlying soil and ground water. Drainage system allows flow of leachate without accumulating in the landfill site. The leachate collected should be treated in CETP to be provided at site. Hazardous waste from industries should be disposed off only through authorized hazardous waste handling agencies by DoEB. No TSDF and hazardous waste recycling units exist in Bangladesh. But as the EZ development and coming up of industries may take time of app 3-4 years so by then hazardous waste rules will be formed in Bangladesh (in draft form at present) and some facilities may come up in Bangladesh for managing hazardous waste. Else all industries should incinerate the hazardous waste generated by them taking the required air pollution control measures.

Transportation System

Road Transportation System and Traffic Survey

At present project site is accessible through non motorable bund constructed as boundary/dike for Mirsarai EZ-I. This bund is further connected to under construction single lane road on CDSP & BWDB bund which is also being developed for Mirsarai EZ-I. This under construction single lane road connects to the Abu Torab road which is motorable. Abu Torab road is in a dilapidated condition and presently only 4 wheel drive vehicles can access the site. For movement of heavy traffic like trucks, Lorries, it is required to strengthen the existing Abu Torab road. Abu Torab road connects finally to N-1 (Dhaka Chittagong Highway). Dhaka Chittagong highway is one of the busiest highways in the country. Traffic is increasing every year on this highway. Bi-directional traffic volume on the highway in 2009 was recorded to be 5632798 whereas it was 3206277 in 2006. Average traffic growth rate of 21.03% is estimated as per the study carried out by BUET. High rate of accidents are reported on this highway. Total 840 accidents are reported on this highway between 2004-2009 and out of this 675 are fatal (Aalam & Ahsan, 2013)

Rail & Air Transportation System for Project Site

Nearest airport is Shah Amanat airport located in Chittagong at distance of 79 km in South direction from site. An unfinished Rampal airport is at 22 km from site in NNE direction. Nearest Railway station is Bartakia & Mirsarai Railway station which is at distance of 9.5 km & 10 kms respectively in East direction from site.

Water Transportation System

Inland water transportation system is well developed. Feni River is located at distance of 800 m from the site in west direction from the project site. Isakhali channel traverses through the site and Bamon Sundar Channel touches the site in SE direction. Site is located at 4.0 kms from Bay of Bengal in South direction. Chittagong port is deepest sea port of the country and is located at distance of 67 kms from the site (85 kms by sea route). A jetty should be developed for the EZ for transportation of men and material from Chittagong port to EZ site through sea, river Feni and channels.

1.8. Cost of the Project

The total estimated cost of the proposed off-site facilities is about 5237 million that includes the construction cost of off-site facilities. Details of cost of each component are given in table 6 below.

Table 6: Cost of the Development of Proposed Off-site Facilities

S. No.	Description of work	BDT (Million)
1	Embankment & Site Filling for 2A	2728
2	Embankment & Site Filling for 2B	1573
3	Access Road including Culverts	280
4	Admin Building	240
5	Sluice Gate	216
6	Water Supply	80
7	Electric Substation	120
Total		5237

1.9. Baseline and Social Environment

The monitoring of the existing environmental conditions of the proposed project site and of its close vicinity have been collected through secondary sources with respect to physical, biological and socio-economic environment. A zone of 10 km area around the EZ site and 100 m on either side of proposed alignments of access road to be widened is considered as project influence area.

The project area lies in the South-Eastern climate zone of the country. The climate is tropical in Chittagong. Chittagong has significant rainfall most months, with a short dry season. According to Köppen and Geiger, this climate is classified as Tropical Monsoon Climate (Am). The average temperature in Chittagong is 25.7 °C. In Mirsarai area temperatures vary from 6-9°C in winters and 37-41°C in summers. Humidity in the Chittagong varies from 40% in day time of February month to 90% in month of July & August. Rainy season is very prominent in this region like other coastal areas of the country. June July and August are month of highest rainfall in the area. Average yearly rainfall of the area is 3215 mm. Average annual rainfall of the Mirsarai region is 2540 mm. As per BMD,

windiest month is May with average wind speed of 4 m/s and least windy month is October with average wind speed of 2m/s.

Site is wetland area. As per inundation risk map, inundation depth varies from 5 m to 6 m. Area is highly prone to cyclone and has faced severe cyclones in past. Surface water system of the study area comprise of Feni River, Isakhali Canal & Bamon Sundar Canal. Flow in Feni River varies from 20.5 cu m in February to 164.3 cu m in August. Water level of the river varies from 3.47 m to 4.146 m. HFL level during the 1974 flood in Feni River at Mirsarai was +7.3 m amsl. Water of Feni River is fresh in upstreams and saline in downstreams. Salinity in downstreams varies with season. Maximum salinity recorded in the River is 21.2 ppt. Tidal surge during the cyclone at the site is +5.4 m amsl and maximum surge level in Chittagong are recorded to be maximum +8.8 m amsl. Ground water in Shallow aquifers in Mirsarai region is also saline. Fresh ground water is available at depth of 700-900 ft. No significant source of pollution exists within the study area. Construction and development of off-site facilities for Mireshorai zone-I is being undertaken which is adjacent to the site which adds to some of the emissions and noise at the site but the noise levels as observed were within the levels of 40-45 dB (A) at site as measured during the visit.

1.10. Environment and Social Impacts of the Proposed Project

Environmental impacts assessment was carried out considering present environmental setting of the project area, and nature and extent of the proposed activities. Proposed project involves development of upcoming Economic Zone at Mirsarai. Potential environmental impacts associated with each of the proposed facility are classified as: (i) impacts during design and construction phase and ii) impacts during operation phase/Post-construction phase. Sensitive environmental and social components were identified during the site visits and qualitative and quantitative techniques have been applied for direct and indirect assessment of impacts on the identified environmental and social sensitive components. Impacts are classified as being insignificant, minor, moderate and major.

Some of the important impacts associated with the proposed economic zone will be associated with land use (land acquisition), land stability (soil erosion), soil compaction and contamination, water availability, water quality of river/stream/canal, ground water contamination, waste and wastewater disposal, ambient air quality, ambient noise levels, vegetation, tree cutting (including social forestry tree), fauna (terrestrial and aquatic), drainage pattern, hydrology, climate change, socio economic, places of social/cultural importance (religious structures, community structure), construction material sourcing and occupational health and safety. Adequate mitigation measures are devised to mitigate/minimise all likely environmental impacts and the same have been presented along with the impacts.

Impacts due to Development of EZ & Off-site Facilities

Construction Phase: Development of the economic zone and proposed off-site facilities will involve clearance of site vegetation, leveling of site by filling and cutting, civil construction activities, storage of raw materials like fuel, sand, aggregates, cement, reinforcement etc., storage of debris, excavation of soil etc. All these activities have potential to impact the environment in one or other way. These activities can directly and indirectly impact the environment. Following environmental attributes will be impacted due to EZ & off-site development during construction. Impacts on these attributes is discussed in detail in sections below

- Impact on air quality
- Impact on water resources
- Impact on surface water quality
- Impact on hydrology & drainage

- Impact on noise environment
- Impact on Mangroves Plantation
- Impact on flora & fauna
- Impact on Land Use, drainage & hydrology
- Impact on topography, soil quality, soil erosion & geology
- Impact on Socio-Economy
- Impact on marine & riverine Eco-system

Operation Phase: After development of economic zone, it is expected that industries will start coming up in this region and EZ may reach its full capacity in 4-5 years time. Construction and operation of the industries may have impact on the environment and society. Following environmental attributes will be impacted due to EZ & off-site development during operation phase. Impacts on these attributes is discussed in detail in sections below

- Impact on Mangroves
- Impacts on Air Quality
- Impacts on Noise Level
- Impacts on Water Quality
- Impacts on Ground Water Resources
- Impacts on Socio-economy
- Impact on Land Use
- Impact on Agriculture Resources
- Impact on Fisheries

Impact on Air Environment

Pre-construction Phase: Pre-construction phase will involve site clearance, leveling & filling activities for development of EZ, widening of under construction single lane road and construction of peripheral bund around proposed EZ site. Clearance of site will involve removal of vegetation, land leveling & filling activities. However site does not support any vegetation thus impact due to clearance of vegetation is not anticipated. Some trees may be required to remove for widening of single lane road and for construction of new peripheral bund cum road. These activities will lead to dust generation. But these emissions will be limited to the site only and have impact for short duration only during clearance activity. To minimize the dust generation, water should be sprinkled regularly at the site and low sulphur diesel should be used in land leveling equipments to control the SO₂ emissions.

Construction Phase: The proposed project involves construction activities like site development, civil construction, construction material handling and stocking, and construction vehicle movement will generate fugitive dust and vehicular emissions. However, these ground sourced generation will be limited to the construction site and the impact will be short duration that too during construction activities only. The likely emission from construction vehicle, machinery, and generators is likely to be insignificant as the pollutant emission activities (point and area sources) will be limited within the project boundary and the activities will be short term (only for construction period). However, this impact may further be minimized by adopting following mitigation measures.

Mitigation Measures

- Sprinkling of water at construction site and haul roads
- Covering the scaffolding (in case of administration building) to reduce the dust emission in outside environment
- Provision of face mask to workers to minimize inhalation of dust particles
- Construction vehicles and machinery should be regularly serviced and check for pollution control
- Low sulphur diesel should be used for running construction equipment and vehicles
- Adequate parking space should be provided for the construction vehicles so as to prevent idling of the vehicles and the emissions generating from them
- Vehicles carrying construction material and debris should be covered with tarpaulin cover
- Raw materials, excavated soil and other debris should be stored under covered sheds
- Green buffer should be developed all along the EZ boundary
- Plantation should be carried out along the both side of access road to be widened and peripheral access road

Operation Phase: Widening of the under development single lane road to 2 lane road will ensure that no jams or congestion occurs in future and thus will significantly reduce the vehicular emissions. No adverse impact is anticipated on air quality during operation phase due to development of off-site infrastructure.

Post development of the economic zone & setting up of industries, there could be some impacts on the air quality of the area. 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. The industries proposed in line with the industries as anticipated for Mirsarai EZ-I are industries like food processing, textile, petrochemical, ship building and light engineering industries. These industries are comparatively less polluting than other industries like tanneries, distilleries etc

Emissions to be generated from Anticipated Industries:

Air emissions result from light-engineering industries. These are particulate matter, sulphur dioxide, metals and other criteria pollutants like ozone, oxides of nitrogen and carbon monoxide. Lead may be generated in some of the processes.

Air emissions from food processing industry will contain some volatile organic compounds but do not contain any hazardous compounds. These industries emit low process-air emissions. Most processes use electrical power and rarely emit harmful compounds to environment. But air emissions from water treatment plant of these industries are a major concern. Mal odour from these water deteriorate the air quality and disturbs the living condition in the area. No significant air emissions are generated from textile industries.

Petrochemical industries generate both ducted/channelized emissions and fugitive emissions. The main air pollutants from petrochemical processes and energy supply are: Sulphur oxides (SO₂, SO₃) and other Sulphur compounds (H₂S, CS₂, COS), Nitrogen oxides (NO_x, N₂O) and other nitrogen compounds (NH₃, HCN), Halogens and their compounds (Cl₂, Br₂, HF, HCl, HBr), incomplete combustion compounds such as CO and C_xH_y, Volatile organic compounds (VOC) and particulate matter (such as dust, soot, alkali, heavy metals). The main category of air pollutants from the production of Petrochemicals are combustion emissions, VOCs and acid gases. Ducted emissions can be treated by routing to control device like strippers, scrubbers, ESP, dust bags, cyclones etc. However the diffuse emissions can either be prevented or minimized by adopting best management practise.

Pharmaceutical industries also involve generation of emissions. Off-gases from distillation may contain volatile organic material in the form of vapour or entrained droplets/mist, although this can be reduced by the use of additional condensing areas. Non-condensable substances (e.g., oxygen, nitrogen, carbon dioxide, and low-boiling organics) are not usually cooled to their condensation temperature and will exit the condenser. Emission points from distillation are typically: the condenser, accumulator, hot wells, steam jet ejectors, vacuum pump and pressure relief valve. The total volume of gases emitted from a distillation operation depends upon air leaks into the column (increases with reduced pressure and increased size); volume of inert carrier gas; gases dissolved in the feed; efficiency/operation of the condenser or other recovery equipment; and physical properties of the organic constituents.

Dust and gaseous emissions are the main pollutants during operation of the cement plant. Air emissions in cement manufacturing process are generated by the handling and storage of raw, intermediate and final materials, and by the operation of kiln systems, clinker coolers, and mills. Air emissions are mainly gaseous or in the form of particles loaded by adsorbed gases; the latter can be regarded as a constituent of dust. The main releases from the production of cement are releases to air from the kiln system. These are derived from the physical and chemical reactions involving the raw materials and the combustion of fuels. The main gaseous pollutants relevant to cement manufacturing are NO_x , SO_2 , CO & CO_2 . Other pollutants are VOC, polychlorinated dibenzodioxins and dibenzofurans, metals & their compounds, HF & HCl.

Emissions to be generated from Increased Vehicle in the area

It is anticipated app. 600 PCU per day will be added after project development. 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 impact the air quality and increase the noise level in area if not managed properly. To accommodate this additional traffic it is proposed to widen the under construction 7 km road being developed on BWDB and CDSP bund from Abu Torab junction to EZ site. Further there are plans of Road Development Authority to widen the Abu Torab Road from N-1 to Abu Torab junction in near future. This widening of road will ensure easy movement of traffic and thus will reduce the congestion. Easy flow of traffic without congestion will not lead to traffic jams and associated air emissions and noise levels. Further avenue plantation is proposed to be carried out all along the road. A 30 m thick green belt will be developed all along the EZ boundary & Isakhali channel and 10 m thick green belt will be developed along the boundary of each of the industrial plot. This green belt will help in reducing the air pollution effect especially dust levels.

Mitigation Measures

Provision is made for peripheral green belt of 30 m all along the EZ boundary and along isakhali canal. Green belt shall have minimum of three rows of local variety of tree. Tree species shall be selected such that first inside row is of smaller height, middle row of tree is of medium height and last row of tree is of higher height so that green belt formed appears like a canopy. Apart from this green buffer of 1000 m will be developed between the EZ and the Sea. Avenue plantation will also be carried out along the access road, embankments, bunds and internal road. This entire green buffer will absorb the air pollutant and will help in purification of air and will provide sufficient surface area for settling of the dust. Other measures which can regulate air pollution are:

- Development of thick green belt (10 m) and organized greens within each industrial plot
- 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 DG sets should be used only in case of power failure (not more than 8 hours/day)

- Process emission if any shall be control with the installation of adequate air pollution control systems
- All industries should obtain clearance from DoE, Bangladesh as applicable. Air pollution control measures shall be adopted by respective industries in line with DOE permission
- Air pollution monitoring should be carried out quarterly by all industries to check the air pollution level.
- Preference of usage of clean fuel like LPG, low sulphur diesel should be explored
- Energy conservation should be adopted by adopting the alternate energy options like solar power.
- Odour should be managed at the site using odour suppressant and planting fragrant flowering trees.

Impact on Noise Environment

Pre-construction & Construction Phase:

Pre-construction phase will involve site clearance activity for development of propose off-site facilities and EZ. Clearance of site will involve removal of vegetation and land leveling activities. Operation of different machineries and equipments for construction activities, running of heavy load traffic for construction materials transportation, and regular traffic movement may generate noise during construction period. The produced noise may have impact on existing acoustic environment of rural category defined in ECR, 1997. Local inhabitants may feel disturbed due to noise from line sources (traffic movement).

Mitigation Measures:

- Machinery to be used should comply with the noise standards prescribed by DoE.
- DG set shall be acoustic treated
- Workers shall be given PPE (ear plugs), if working in high noise area
- No noise generating activity shall be carried out in the night.
- No construction activities to be undertaken during night hours to prevent any disturbance to nearby residents and labours in labour camps.
- Acoustic enclosures should be provided with DG sets and machinery to control the noise levels at construction site.
- Temporary noise barriers should be provided near the high noise generating areas

Operation Phase

Noise will be generated from the construction of individual industries, operation within in industrial units, running DG sets in each units and traffic movement within EZ zone and on the proposed access road. Noise pollution is related to several cement manufacturing phases, including raw material extraction; grinding and storage; raw material, intermediate and final product handling and transportation; and operation of exhaust fans. Following mitigation measures are required to be taken to minimize noise pollution:

Mitigation Measures

- Avenue plantation will be developed along both the side of access road to be widened/peripheral road/bund/internal roads which will act as noise buffer

- Green buffer of 30 m will be developed all along the EZ site& Isakhali channel. Green buffer will comprise of the 2-3 rows of plants of variable height and thick canopy so as to form continuous barrier. This will help in reducing the noise level significantly.
- Provision of barricade around construction site(for construction of individual industrial plot)
- Provision of 10 m thick green belt around each industrial plot
- All industries should obtain clearance from DoEB before establishing industrial unit and should comply with all the conditions mentioned in the letter of environment clearance
- All industries should install the new machinery of modern make which complies with the noise standards prescribed by DoEB in ECA, 1995.
- Acoustic treatment and temporary noise barrier should be provided in area generating higher noise levels
- Job rotations should be practiced for workers in industry to prevent prolonged exposure to high noise level as it may lead to deafness, fatigue, head ache, nausea and drowsiness
- Honking should be prohibited within the economic zone

Impacts on Water Resources

Pre-Construction & Construction Phase:

Impacts on Ground & Surface Water Resources:

Water will be required for various construction activities & domestic purpose. Source of water for these activities will be Feni River, temporary constructed storm water ponds by contractor or ground water. Excess withdrawal of ground water may lead to depletion of aquifers. Shallow water aquifers in the area are saline and fresh water is available at the depth of 210-270 m (700-900 ft). Measures should be taken to minimize the water extraction by reducing water consumption and wastage. Mitigation measures are given below.

Mitigation Measures

- Best management practices for conservation of water will be required to be adopted to minimize water wastage and water loss. Best management practices to be adopted are given below:
 - Temporary storm water drains and rain water harvesting ponds should be constructed so as to store rain water for construction activities.
 - Water for curing can be saved by carrying out curing in early morning or late evening and covering structures with gunny bag so as the moisture can be restored for longer time.
 - Regular inspections at site to monitor leakages in water storage tanks
 - Creating awareness among construction workers about the importance of water conservation
 - Adoption of the advance technologies and machinery which helps in minimizing water requirement for construction
 - Storing the curing run-off and waste from other construction activity and using the same for sprinkling.
 - Covering the water storage tanks at site to prevent evaporation losses.

Impacts on Surface Water Quality

Run-off from the construction site may carry the higher quantity of sediments and oil which may pollute the surface water and impact the aquatic life. Thus measures are required to be taken to minimize the surface water pollution

Mitigation Measures

- To avoid excavation activities during rains
- To prevent piling up of excavated soil, raw material and construction debris at site by proper management and disposal
- Minimize run-off by using sprays for curing
- Maintaining appropriate flow of water sprinklers at site
- Construction of storm water drains along with sedimentation tanks with sand bags as partition as barrier for direct flow of run off to river.
- Collection & Reusing of curing over flow, tyre wash water etc within the site
- Construction of adequate nos. of toilets and proper sanitation system to prevent open defecation along the river banks/water supply lines
- Construction of soak pits/septic tanks to dispose-off the domestic waste water generated from labour camps to prevent disposal of sewage in surface water bodies
- Proper collection, management and disposal of construction and municipal waste from site to prevent mixing of the waste in run-off and entering the water bodies
- No debris/construction material should enter the aquaculture ponds and other water body in the area

Impacts on Ground Water Quality

Ground water is saline in shallow aquifers of the study area. No significant impacts are anticipated on the ground water quality due to development of the off-site facilities for economic zone.

Mitigation Measures

- No sewage or waste water should be accumulated in any unlined structure
- Timely disposal of the construction/chemical/haz. waste so as to prevent leaching of any pollutant to ground

Impacts on Drainage Pattern & Hydrology

EZ site is bounded by existing EZ-I zone and CDSP bund in North & NE direction. Thus storm water from villages in up streams is drained only through Isakhali canal and Bamon Sundar canal. These canals will not be impacted due to development of EZ zone and will be retained in existing condition. However a sluice gate is proposed to be developed at Isakhali canal at point of entry of canal in EZ site from sea side to control the flow of water. This gate will control level of water entering Isakhali canal and will be closed only during high tide and high flow times and allowing the water movement in rest of the time. A zone of 30 m will be left on each side of the Isakhali channel as no development zone and thereafter embankment will be developed along the Isakhali channel. It will prevent direct exposure of the channel to the site and thus no hinderance to its flow is anticipated.

EZ site is wetland and is dissected by Isakhali canal. Site is connected with Feni River & Sea through Isakhali canal and Bamon Sundar canal. Rivulet from Feni River also abuts the site in NW boundary at one location. Dense drainage of Isakhali channel runs through the EZ site. Construction of EZ site will disrupt this natural drainage pattern on EZ site. To maintain the drainage at site adequate storm water collection & harvesting system should be developed at the site. Also peripheral drain is provided which will receive the storm water from EZ site and will drain finally into the Isakhali channel.

Aquaculture ponds exist all along the access road proposed to be widened. Expansion of the road may lead to filling of some of the ponds partially. But these ponds are filled during rains majorly. Thus due to filling of some of these ponds excess water will flow down to Isakhali and Bamon Sundar Channels which will be retained in its existing conditions. Construction of 7.8 km bund will prevent entry of water to the EZ site during flooding and cyclone but as the large area nearby is available this flow will be diverted to other areas. Thus no significant impact on drainage is anticipated due to development of EZ and its off-site facilities

Mitigation Measures

- Natural drainage pattern should be maintained. Run-off assessment shall be made of catchment area and peripheral/garland drains shall be constructed around EZ site based on the assessment of catchment area (frequency, and storage area).
- Adequate storm water collection and management network should be developed at the site
- Storm water harvesting storage should be developed at the EZ site so as this water can be used during both construction & operation phase.
- Storm water drain shall have the provision of de-siltation before discharge to river.

Operation Phase:

Impacts on Ground & Surface Water Resources:

App. 15 MLD of water will be required during operation phase for both the consumption and industrial operation purpose. 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 and fresh water is encountered at the depth of not less than 700-900 ft. Also extraction of ground water may affect the ground water resources. Thus to prevent the impact on ground water resources, it is required to look for other options like rain water harvesting and desalination. Further mitigation measures are discussed below to minimize the impact on water resources and water quality.

Mitigation Measures

- Feasibility shall be explored by BEZA of installing the desalination plant for the use of surface water.
- Rain water harvesting system and storage should be developed to minimize ground water construction
- Adoption of best management practices to prevent water wastage and minimize water loss
 - Usage of water conservation fixtures to minimize water consumption
 - Installation of leakage detection system to minimize the water loss
 - Usage of latest technologies in industries which requires lesser water
 - Provision of dual plumbing system so as STP/CETP treated water can be re-used for various purposes as per suitability of the quality
- Ground water aquifer assessment studies may be undertaken to assess the ground water potential. Piezometer shall be installed to monitor variation in ground water level in the area.

Impacts on Surface Water Quality

Industries are likely to generate domestic and industrial effluent. Liquid waste which can be generated from light engineering industries will include waste acid, waste alkali, grease, used/spent oil, liquid metal, spent solvents etc. Wastewater is not generated in significant amount from these industries. Majorly domestic and cleaning waste is likely to be generated. No significant liquid waste is generated from textile industry.

Source of wastewater in petrochemical plants is Ethylene crackers and aromatic plants. Major water pollutants are inorganic sulphides, mercaptans, soluble hydrocarbons, polymerised product, phenolic compounds, sulphide, cyanide, heavy oils, coke, spent caustic, SO_x, NO_x, hydrocarbons, particulates, water borne waste containing BOD, COD, suspended solids, and oil. Oily water is the main source of liquid effluent from cracker plant. Liquid effluents like pygas, pyrolysis fuel oil quench water, process water stripper bottoms give peculiar odour. These pollutants may contaminate the water quality if discharged without treatment. It is required to recover the solvents to reduce their concentration in waste stream and to minimize the wastage of solvents. Waste streams should be segregated so as to prevent the mixing of more and less polluted streams and streams containing pollutants of different chemical properties. The waste streams should be treated in ETP and STP and the treated water should be completely utilized again within the industrial unit.

Effluents from pharmaceutical industry may result either from aqueous bottom residues or from the top after condensation. Discharge depends on the efficiency of the distillation process and of additional steps for phase separation (preferably fractionated-condensation of top effluent, stripping of bottom residues)

Wastewater in cement plants results mainly from surface run off and utility operations for cooling purposes in different phases of the process (e.g., bearings, kiln rings) and causes no substantial contribution to water pollution. Process wastewater with high pH and suspended solids may be generated in some operations. The storage and handling of fuels is a potential source of contamination of soil and groundwater. Stormwater flowing through pet-coke, coal, and waste material stockpiles exposed to the open air may become contaminated.

Food processing industries similarly generate both liquid and solid waste. Concern with wastewater from the food processing industry is high BOD levels, high TSS, excessive nutrient loading like nitrogen and phosphorus compounds and pathogens. This water is to be treated essentially to achieve DoEB standards to prevent the soil, water and air quality pollution. Discharge of wastewater in soil will degrade its fertility and increase the toxicity which will make it unsuitable for growth of plants and survival of micro/macro organisms. If this water is discharge into water system, will pollute the water quality and have potential to threat the aquatic life. Uncontrolled discharge of these effluents to river may severally pollute the river water quality.

Pollutants from these industries may be discharged into Isakhali canal and may be carried away to Feni river estuary system which supports diverse variety of fish. Run-off may significantly increase post development of economic zone. It is required to manage storm water which will be generated from EZ site post development. Measures should also be taken to prevent contamination of storm water with any industrial pollutant. Following measures should be adopted during operation phase to minimize impacts of development of Economic zone on surface water quality:

Also it is anticipated that desalination plant will be installed in future for meeting the water requirement of the zone. Desalination plant also have certain environmental impact. Reject from desalination plant has more salinity, density and temperature than that of the sea water thus there may be impact of discharge of this water on aquatic organisms. Increased temperature and salinity may also reduce the solubility of oxygen in sea water. Thus measures should also be taken in future to prevent the impact of desalination plant on surface water quality and are discussed below.

Mitigation Measures

- Each industry should obtain consent of DoE Bangladesh before construction and operation and should comply to the conditions laid by them
- Each industry should treat the effluent and sewage generated by them so as to achieve zero discharge and no untreated effluent should be discharged into any water body
- Provision shall be made for Common Effluent Treatment Plant (CETP).

- Common STP (in modules) should be constructed within the EZ to treat sewage from residential and commercial areas
- Proper management of waste should be done to prevent any contact between the waste and storm water
- Common waste disposal sites should also be developed within EZ site as per the standards and prior permission of DoE should be taken before development.
- Each industry should practice rain water harvesting to minimize the water consumption and reduce run-off from the site
- Storm water drains should be lined separate from effluent drains
- Storm water system should be inspected & cleaned before monsoon every year
- Peripheral drain shall also be lined and shall not be connected to internal storm water drainage system.
- The top soil shall be preserved and used for covering the sand layer at EZ site. Vegetation turffing shall be made at the side slopes of the EZ areas to prevent erosion and siltation in the river.
- River water quality shall be monitored periodically.
- Chlorine should not be used for disinfection but other measures like polyamide membrane, ozone & monochloramine etc should be used in desalination plant
- Discharge of the desalination plant should be checked for heavy metal concentration before discharging into sea
- Filter backwash water could be diluted by continuous blending with the brine or alternatively it could be removed from the filters and transported to a landfill
- Antifoaming dosage should be regulated and dilution of the discharge should be done
- Neutralization of discharge of desalination plant should be carried out before discharging to sea

Impacts on Ground Water Quality

No impact on ground water quality is anticipated during operation phase due to off-site developments. After development of economic zone there may be some ground water pollution due to industrial activities. Following measures should be taken to minimize the ground water pollution.

Mitigation Measures

- Each industry should treat the effluents and sewage and should not discharge into ground.
- No leachate, waste water and waste material should be stored in pervious unlined area/pond.
- Ground water quality shall be monitored periodically.

Impacts on Land resources

Pre-construction & Construction Phase:

Impact on Land Use

EZ site is spread over an area of 1311 acres. Also it is proposed to widen the existing under construction single lane road which is being constructed for Mirsarai EZ-I. 1311 acres of the EZ land is Government land and thus will not involve any acquisition, however land use will change from char land (wetland) to Industrial area. Some of the measures are taken to prevent any impact on change in land use

Mitigation Measures

- Tree cutting will be avoided while widening access road, construction of peripheral bund cum road and development of EZ
- If any tree cutting is undertaken then compensatory plantation should be done in minimum ratio of 1:2
- Measures will be taken that no structure along the access road to be widened should be affected due to development of EZ

Impact on Topography & Geology

Site will be filled with deep sea sand to level of 1.15 m above NGL from existing level. This will impact the topography of the site by raising its existing level. Impact will be not be significant as the impact is restricted to EZ zone.

Impact on Top Soil & Soil Quality

Development of the structures and construction of the bund and widening of access road may disturb the soil profile of the area. Site will be filled to level of +1.15 m with deep sea sand. Land will be filled and compacted after filling. Also sand will be required for construction of bund, widening of access road and administration building which will be sources from nearby markets or Sand Mohal of Mirsarai. Sand should be purchased from authorized vendors only to minimize the illegal mining and dredging activities

Storage of raw material, fuel and construction debris may contaminate the soil thus measures should be taken to prevent the soil pollution. Mitigation measures to be adopted are mentioned below. Contractors are required to take all the proposed mitigation measures. PMC and BEZA will ensure that all the proposed mitigation measures are being incorporated in the bid document issued to the contractor and the implementation of the same during construction.

Mitigation Measures

- No piling of raw material at site
- Raw material will be stored under covered sheds and paved surface
- Fuel storage area should be paved
- Adoption of best management practices to prevent any spillage of raw materials
- Construction debris should be stored under covered sheds and paved surface and should be disposed off regularly to designated sites
- Waste from labour camps can be segregated at site. Food waste/wet waste should be composted in pits within the camp site. Recyclable waste should be sold to the authorized dealers and the remaining should be disposed off at designated sites through local agencies responsible for waste management in the area.

Impact on landscape and scenic beauty

All construction activities for off-site facilities and EZ site will be carried out within economic zone site and will not cause any impact on landscape and scenic beauty. A green buffer of 30 m (minimum three rows of trees) will be developed all around the project site and along Isakhali channel which will

enhance the scenic beauty of the area. Buffer of 1000 m will be developed between the sea and EZ as green belt. Also avenue plantation will be developed all along the internal roads, widened access roads and bund/road

Site clearance activities and piled construction materials, machinery and camp establishment on green field site may impact the scenic beauty. Nevertheless, the impact is for a short duration, and reversible as the project plan includes landscape planning, green belt development as well.

Operation Phase

Impact on Soil Quality

No impact due to off-site developments is anticipated on soil quality of the project site during operation phase.

After development of economic zone, disposal of industrial domestic and process waste may contaminate land and soil quality of the area. Improper disposal of waste (hazardous and non-hazardous waste) may degrade soil, water, noise, air quality and ecology of the area. As per the planning for Mirsarai EZ, it is planned that industries like food processing, textile, petrochemical, ship building and light engineering will come up in the EZ zone. These industries are not heavily polluting like tanneries, distilleries etc but generate waste both hazardous and non-hazardous in nature, which can pollute the environment if not managed properly. Nature of the waste which can be generated from these industries are discussed below.

Petrochemical plants generate a wide variety of solid waste streams. Basically, petrochemical solid waste streams fall into two main groups, i.e., intermittently generated wastes and continuously generated wastes. Waste includes spent catalyst, process vessel sludge, storage tank sediments, vessel scale etc. This waste should be recovered, recycled and re-used. In case it is not re-used/recycled/recovered, it should be disposed off to the waste disposal site within the project site if non-hazardous in nature or sent for disposal to hazardous waste management facility if is hazardous in nature.

Solid waste from pharmaceutical industry is highly concentrated still bottoms which should be recovered. These components may affect soil quality if not recovered or disposed properly. These sediments are required to be incinerated if unable to recover which will again add to the air emissions.

Waste to be generated from the light engineering industries can be solid and liquid in nature. Solid waste will include packaging waste, metal pieces, damaged electrodes, ends of coils, wires and spools, flux cored electrodes, greased clothes/cotton, damaged rods, burnt rods, scrap flux, slag (residue from flux reaction and composed of metal and non-metal oxides), Dross (oxidized metal expelled during thermal cutting and gouging operations), metal dust, dust collected in filter ventilation systems/air pollution control devices, floor sweepings, coal ash (if coal used as fuel), solid waste recovered from treatment of wastewater like sludge etc.

Sources of solid waste in cement manufacturing include clinker production waste, mainly composed of spoil rocks, which are removed from the raw materials during the raw meal preparation. Another potential waste stream involves the kiln dust removed from the bypass flow and the stack, if it is not recycled in the process. Filtrate from the filter presses used in the semi-wet process is fairly alkaline and contains suspended solids. Limited waste is generated from plant maintenance (e.g., used oil and scrap metal). Other waste materials may include alkali or chloride / fluoride containing dust buildup from the kiln.

Solid waste from the food processing industries includes both organic and packaging waste. Organic waste, that is, the rinds, seeds, skin, and bones from raw materials, results from processing operations. Inorganic wastes typically include excessive packaging items that are, plastic, glass, and metal. Solid waste from textiles majorly composed of resins, fabric, apparel, dye, discarded machinery and fibres. These waste required to be collected and disposed off periodically. Lub. oil/waste oil is

generated from the machineries as hazardous waste. Mitigation measures are required to be adopted to prevent soil pollution of the area.

Also there is a medical centre within the EZ site. Bio-medical waste will be generated from the medical centre which is required to be managed. Till date no bio-medical treatment and disposal facility is available in Bangladesh but the facility may come up in 2-3 years time. The bio-medical should be managed by medical centre themselves in case no such facility is developed. Autoclave, incinerators and other such facilities are to be installed for disposal of bio-medical waste.

Mitigation Measures

- Provision shall be made for proper storage and disposal of industrial waste by receptive industries.
- Common waste storage areas shall be designated for industrial domestic waste.
- 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 DoEB for the particular waste.
- Industrial waste generated should be stored on sealed surfaces and should be disposed off as per guidelines of DoE, Bangladesh.
- No chemical/hazardous raw material should be allowed to spill over the land and should be operated in covered systems
- Excessive packaging should be reduced and recyclable products such as aluminum, glass, and high-density polyethylene (HDPE) are being used where applicable.
- Organic waste should be resold to value addition industries or can be feeded to live stock.
- Advanced wastewater treatment should be adopted by industries
- Use of advanced techniques to control specific portions of the manufacturing process to reduce wastes and increase productivity.
- Use of radiation to kill pathogenic microorganisms.
- Reduction or total elimination of effluent from the manufacturing process
- At present no common hazardous waste handling and disposal unit exists in Bangladesh. Industries thus have to install the incinerators in the unit to dispose hazardous waste. The incinerator further should use the clean fuel and required air quality management measures should be adopted.
- A site for disposal of hazardous waste can be identified within the EZ and it should be developed as per the norms of DoEB and upcoming Hazardous Waste Management rules of Bangladesh.

Impact on Land Use

Land use of EZ site is wetland which will be changed to industrial land use after development of EZ site.

However, post development of economic zone change in land use is anticipated in the near-by area. At present there is no significant infrastructure at the EZ site and nearby areas. Majorly land use is agricultural land, wetland and Mangrove plantation area. Development of EZ will attract more infrastructural development around the project site to facilitate industrial growth changing the land use area from agriculture to industrial land use. Some of the other developments including construction of roads, housing facility, commercial areas including hotels, hospital, restaurants,

schools, ancillary industries, cottage industries, etc may also occur in nearby areas. This will lead to change in land use but will lead to significant development of the area.

Impacts on Agriculture resources

Pre-construction & Construction Phase

No agriculture land is proposed to be acquired for development of proposed off-site activities as well the economic zone at present.

Operation Phase

No impact on agriculture resources is anticipated from off-site infrastructure during operation phase. Some agro based or aquaculture based industries may come up in proposed economic zone. These industries will have positive impacts favouring the growth of agriculture and aqua culture.

Impacts on Fisheries

Pre-Construction & Construction Phase:

Spillage or disposal of waste or wastewater in the canals and river may impact the aquatic life of the area. Thus adequate measures should be taken to prevent any impact on fisheries which are listed below. No impacts on fisheries due to off-site developments are anticipated during the pre-construction phase. No significant impacts on fisheries are anticipated during construction of the proposed off-site developments.

Mitigation Measures

- Proper disposal and management of construction waste
- No waste should be dumped in water bodies during construction
- Wastewater from labour camp and construction site should not be disposed off in the water bodies
- Septic tank/soak pits should be provided to dispose off the wastewater from construction camp
- Site should be kept clean so as no pollutant from site should enter the water bodies along with run-off
- Excavation activities should not be undertaken during monsoon season
- Piling of raw material at construction site should be avoided
- Raw material, debris and fuel should be stored on paved surfaces under covered areas

Operation Phase:

Sluice gate will be developed on Isakhali canal to regulate flow of sea water in canal. This may impact the movement of fishes while gates are closed. Gates will be closed only during high tide and flood season thus no significant impacts are anticipated on fisheries due to development of off-site development during operation phase. Fishing will be restricted in Isakhali channel after development of teh EZ but since large no of water bodies are available in area to carry out fishing no major impact are antcticipated.

After development of economic zone, some of the aquaculture based industries may come up. This will help in boosting the aquaculture activities & fisheries development in the region.

The fisheries may get impacted if untreated industrial effluent or hazardous waste is discharged to river. Therefore effluent management system shall be implemented strictly. Fish kill may happen due to contamination of water due to discharge of untreated effluent. Effluent may contain toxic components like heavy metals etc which leads to fish poisoning and may lead to large scale fish death.

Also fishes contaminated with these pollutants if consumed may affect the consumer health (birds/bigger fishes/humans).

Mitigation Measures

- Adoption of adequate wastewater and industrial effluent management technology so no untreated sewage is discharged into surface water body
- Industrial, municipal and hazardous waste should be managed such that no waste is dumped or disposed in surface water body

Impacts on Eco-system

Pre-construction & Construction Phase:

Impact on Terrestrial Flora & Fauna at EZ Site

There is no significant vegetation at the economic zone site. Thus no vegetation removal will be required for construction of off-site facilities. Also some mud crabs were observed near the canal at the site, however it is proposed to leave zone of 30 m as no development zone along the Isakhali canal which is passing through the site. This no development zone will be developed as green buffer and this zone will continue to serve as habitat for the mud crabs thus the impact will not be significant. This no development zone will prevent direct exposure of the industries to the canal.

Impact on Avifauna (Birds at EZ Site)

During FGDs with the local people it was learned that some migratory birds are seen occasionally on EZ site along the canal area during winter season. But no such authentic evidence like journal/publication/book is obtained through the secondary published data which establishes presences of migratory birds in Mirsarai. But presence of migratory birds is reported in other regions of Chittagong District like near Karnaphuli River. Thus the presence of migratory birds in the region cannot be confirmed but various measures/safeguards are proposed which will ensure that there is minimal impact of project on any avifauna.

Buffer area of 30 m will be maintained all along the Isakhali canal which will continue to remain habitat for the birds visiting the canal. Further a lake is proposed to be developed within EZ site which covers app. 100 acres of area will serve as additional habitat for the birds. Green buffer of 30 m width will be developed all along the boundary of EZ which will continue to serve as habitat for the avifauna. As per the planning, it is proposed to plant the area between EZ site and Sea with the Mangroves. This mangroves planted area will serve as landing site for the birds and other ecological species.

An assessment is made to calculate the wetland area in the Chittagong District to study the effect of project development of project on the wetland area as the wetland are considered as habitat for various species of birds. It is found that, area under the EZ is 4.5 sq km which is app. only 10% of total wetland area in 10 km radius area of EZ site (48.86 sq km) and 0.16% of the total wetland area available in Chittagong District (1159 sq km). Thus significant wetland area is available in the District and within 10 km of the project site which will continue to serve as habitat to the birds.

Mitigation Measures:

- A zone of 30 m is to be left along the canal & periphery of the proposed EZ zone
- Plantation in 30 m buffer along the periphery and canal should be developed by planting the native species only including the Mangroves
- Embankments planned to be developed should be provided with grass which can survive in saline water also
- No tree cutting is proposed, even if any tree is to be cut then permission will be obtained from forest department and compensatory plantation should be undertaken in minimum ratio of 1:2.

- Development of a lake/water body of app. 100 acres within the EZ site
- Area between EZ site and sea will be planted with Mangroves

Impact on Aquatic Flora & Fauna of EZ Site

Run-off from construction site may contain sediments or contaminant which may pollute water quality of Isakhali canal which has potential to impact the aquatic life of Isakhali canal if measures for minimizing the impact are not undertaken

Mitigation Measures:

- Diesel, paints, cements etc should not be stored near the canal/water bodies
- No solid or liquid waste shall be discharged in water bodies
- Septic tanks/soak pit should be provided to treat sewage to be generated from labour camps and prevent its disposal in water body
- 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 EZ site
- Wastewater from the washing area should be collected and should be used for curing purpose or wheel washing purpose
- 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

Impact on Mangroves Plantation in Buffer Area (Bund Construction)

Project boundary has been designed so as to bypass all the Mangroves in the adjacent areas. No Mangrove tree cutting will be undertaken for development of EZ. Mangroves are developed all along the coastline of Chittagong district and along the canals by forest department to protect the inland area. These mangroves will not be disturbed for development of the project. However after development of bund, there may be few Mangrove planted area adjacent to the EZ site may become water deficient as flow of water to these mangroves will be reduced. This area may not receive the amount of water it is currently receiving due to construction of bund and development of EZ site. However measures are proposed to prevent the reduction of water supply to Mangroves. Pipelines will be laid through the bunds to ensure continued flow of water.

Mitigation Measures:

- Pipelines will be laid from the seaward side or from canal to the Mangrove area across the embankment so as to ensure the flow of water into the Mangrove area in current bed level itself so as flow is maintained. This pipeline is to be marked so as it is not affected in future due to construction of foundation of industrial buildings.
- No Mangrove cutting should be undertaken without prior permission of forest department
- No development buffer zone along the periphery and canal should be planted with native species and mangroves species

- No wastewater, construction waste and municipal waste should be dumped within the Mangrove area or nearby areas. Sewage generated should be treated through septic tank/soak pits, wastewater from construction site should be collected & re-used within the site. Construction & other waste should be disposed off to the site identified for waste disposal

Impact on Nearby River & Marine Eco-System

Development of off-site facilities and EZ site will involve excavation, filling, storage of raw material, storage of debris, establishment of site for machinery and equipment etc. These activities may lead to contamination of rainfall run-off due to mixing with excavated material, debris, raw materials like paints, fuel, rusting of iron etc. Site being in close vicinity to river and sea, rainfall-runoff water from site will directly enter to river & sea. This may impact the quality of the river & sea water and thus supported aquatic life. Thus it is required to minimize contamination of rainfall run-off to minimize impact on water quality & aquatic life supported by the water bodies. There are no marine protected areas within 10 km radius area of EZ site. No sensitive aquatic species like dolphins are also reported in the Feni River stretch within 10 kms radius of the EZ site.

Mitigation Measures:

- No solid or liquid waste shall be discharged in river, sea and any other water body
- Septic tanks/soak pit should be provided at construction site & labour camp to treat sewage to be generated from labour camps and prevent its disposal in water body
- Toilets should be provided at construction site & labour camp to prevent contamination of water due to open defecation in nearby areas.
- Vehicle washing/equipment cleaning should not be allowed near water bodies
- Wastewater from the washing area should be collected and should be used for curing purpose or wheel washing purpose and should not be allowed to enter the water bodies
- 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

Impact Due to Deep Sea Dredging

Site is intersected by various streams and small channels draining into the Isakhali Canal. These small drains are to be filled up so as to achieve a constant level of the site. It has been estimated that average filling of 1.15 m will be required for the whole development area, i.e. 1311 acres for which app. 48 lakh cum of sand will be required. Being large amount of sand requirement, it is difficult to obtain the sand from dredging the river & other water bodies and excavation of land. Thus deep sea dredging has been opted to obtain sand. Deep sea dredging can impact the marine eco-system by disturbing the benthos (dwelling on sea floor) especially to sessile organisms attached to sea floor/other physical structures and the submerged vegetation. Also deep sea dredging may release sediments causing high turbidity in the surrounding waters. High turbidity may impact the visibility of marine organisms, may choke gills of fishes and other aquatic organisms and impacts the oxygen level of surface layers by forming barrier between the water and the atmosphere.

Locations for deep sea dredging have not been finalized yet by BEZA. BWDB will undertake study to identify the locations suitable for dredging and dredging is to be undertaken on those locations only.

Contractors should carry out the dredge sediment quality analysis for checking the levels of heavy metals and contaminant at the time of dredging.

Operation Phase:

Green buffer of 30 m all around the project site and along Isakhali channel will be developed and also include most of the native plant species, which will significantly improve the ecology of the area. This green buffer will provide habitat for the avifauna, reptiles and small mammals and will enhance ecology of the area. Twice the number of trees fell, if any should be planted. Apart from this zone of 1000m will be developed between the EZ and sea.

Post development of the economic zone & setting up of industries, there could be some impacts on the ecosystem of the area. Industrial development will involve generation of emissions, effluents and increased vehicular movements. These altogether may have overall negative 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. But the industries proposed as per the pre-feasibility study are industries like food processing, textile, petrochemical, ship building and light engineering. These industries are not heavily polluting. If appropriate measures for preventing air, water, soil and noise pollution are taken there will be no significant impact on the eco-system of the area.

Mitigation Measures:

- Periodic monitoring shall be carried out as per the monitoring plan for air, water, noise and soil and ensure that no impact
- No waste shall be discharged in water bodies, i.e. Isakhali canal, Feni River, Bamon SUNDar canal, Sea, Aquaculture ponds etc.
- All industries should install STP & ETP to treat the effluent generated and to re-use and recycle it completely. No treated and untreated effluent should be discharged in water bodies, i.e. Isakhali canal, Feni River, Bamon SUNDar canal, Sea, Aquaculture ponds etc.
- Tree survival rate shall be monitored
- Native species should only be planted in the region
- Minimum twice the no. of tree fell (if any) should be planted

Impacts on Socio-Economy

Pre-construction & Construction Phase

Loss of Livelihood & Displacement of Families

No Resettlement and rehabilitation or land acquisition is involved for development of off-site facilities and EZ development as per current planning. Only 14 HHs (Squatters) and 5 temporary prayer places will be affected by the development of approach road. BEZA will ensure compensation as per approved ARP (Annexure- XVII)

Impact on Health, Aesthetics and Hygiene

Construction activities lead to generation of dust, unpleasant view, obstruction in access of public properties due to excavation etc which may impact the society. Adequate waste management plan, air, soil, noise and water pollution controls are required to be adopted to prevent any impact on society. Also various health hazards are associated with construction activity which may impact the workers if not taken care.

Impact on Utilities

Impact on Utilities & Traffic

No sensitive feature like school, hospital etc are located along the access road alignment to be widened. No major impact is anticipated on social sensitive receptors due to widening of access road only 14 temporary structures & 5 temporary prayer places are located along the proposed access road, which will be relocated. Traffic movements does not generate any significant vibrations which can affect integrity of any structure. These structures will be relocate for widening purpose so impact is not anticipated on integrity of structure and for the loss of structure and loss of livelihood, compensation will be given to the squatters. Further there could be impact on the utilities if resources being used by local communities will be diverted for development of EZ e.g ground water, roads etc. Thus ground water should not be used for construction purpose as this is the source of water for villagers. Temporary roads should be developed for transportation of material in place of using the village roads. If village roads are being used transportation should be carried in non-peak hours and regular maintenance should be carried out so as to minimize the impact.

Further during construction phase traffic on existing Abu Torab road and underconstruction single lane road on BWDB/CDSP bund is expected to increase. Increase in traffic will not be more than 10 trucks in a day. This traffic is required to be managed in non peak hours to prevent the congestion and traffic jams. Also traffic safety is to be ensured as per the traffic management plan.

Impact on Demographic structure

The demographic profile of Mirsarai Upzila would not undergo any changes during the construction phase of the EZ, because the inflow of daily labourers would be mainly be from Mirsarai Upzila or from some other nearby areas. However, during the commissioning phase, a large number of inward migrations are expected. The inward migration along with the infrastructure development in Mirsarai Upzila may lead to changes in the demographic profile of Mirsarai Upzila

Generation of Employment

Employment opportunities will be ensured through three channels (i) direct employment for unskilled labour, (ii) indirect employment to the local community; and (iii) 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. Employment generation, both direct and indirect, through Mirsarai EZ will have a tremendous impact on human development and poverty reduction in the Mirsarai area.

Furthermore, as an enhancement measure, it is recommended that equal employment opportunities should be given to women in the EZ, especially those who are now unemployed or are working in the service sector as daily wage workers. These recommendations should be included as a requirement in the contract to be prepared by BEZA for the construction works related to the proposed EZ. EZs further 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 the EZ will increase their employability and position in the household. In addition, Mirsarai EZ is expected to assist women in changing their occupation pattern and accessing better job opportunities and wages. But the child labour should not be encouraged in the area. Thus BEZA should make strict rules for industries and contractor for not employing child labour and there should be imposition of heavy fine, if anybody is found guilty.

Skill Enhancement of Local people

As the both skilled and un-skilled labour will be required during both construction and operation phase of the EZ, but Mirsarai and nearby area lack the skilled labour due to low literacy rate. BEZA

should provide the skill enhancement training to locals to carry out specific tasks and enhance the skill of local people so that they can be given employment.

Mitigation measures are required to be taken to minimize the impact of projects on the society and they are given below:

Mitigation Measures

- Widening of under construction single lane road on BWDB and CDSP bunds
- Provision of proper training to all workers for handling the construction equipment
- Provision of cautionary and guiding signage in local and English language indicating the hazard associated with the site
- Employment should be provided preferable to local & affected people
- Entry to the fuel storage area and construction equipment rooms should be restricted and should be allowed for trained personnel
- Wastewater from the toilet should be disposed off in septic tanks and soak pits and should not be allowed to accumulate at labour camp site or construction site
- Dustbins should be provided at labour camps for collection of waste and waste should be regularly disposed off through the concerned agency
- Temporary storm water drainage system should also be provided at camp site so as to drain the storm water and prevent accumulation of storm water at site and thus breeding of mosquitoes/flyies
- Arrangement of fire-fighting should be made at site and workers should be trained to use the system in case of fire
- Provision of personal protective equipment like safety jackets, helmets, gumboots, gloves, face mask, ear buds, goggles, safety shoes etc as per requirement and nature of job in which they are involved
- Job rotation should be carried out for workers exposed to high noise and dust areas
- Provision of First aid facility at the site and the labour camp
- Labour camps should be located at neat and clean location with no water logging issues
- Proper sanitation facility including toilets, bathing facility and washing facility should be provided at site and at labour camps for workers
- Clean drinking water supply should be provided to labour
- Crèche facility should be provided for kids if female workers are employed
- Regular inspection for hygiene and safety in labour camps should be done
- Compensation should be given to the people as per the policy for the planted tress
- Construction debris should not be allowed to enter into aquaculture ponds located along the road
- Entrance to any road/structure should not be blocked for widening of access road
- A major segment of the population on the area is unemployed. Construction activity will provide employment to huge nos. of people including skilled, unskilled and non-skilled workers. This will improve the quality of life of people.

Operation Phase

Impact on Health

Post development of the economic zone & setting up of industries, there could be some impacts on the Socio-economic conditions of the area. Industrial development will involve generation of emissions, effluents, waste and increased vehicular movements. These altogether may have overall negative impact on the health of the people and aesthetics of area. But the industries expected to come up in the zone are industries like food processing, textile, petrochemical, ship building and light engineering industries inline with the planning done for Mirsarai EZ-I. These industries are not heavily polluting. If appropriate measures for preventing air, water, soil and noise pollution are taken there will be no significant impact on the society.

Impact on Traffic

N-1 is at app. 10 km from the project site. At present project site is accessible through Abu torab road followed by BWDB and CPWD bund. Currently a single road of 7 km is being constructed on CDSP bund and BWDB bund for providing connectivity to Mirsharai EZ-I. Traffic is anticipated to increase after development of EZ-II. It is expected 600 PCU of traffic will generate after development of zone. However to accommodate the expected traffic it is planned to widen this road to 2 lane. Further the peripheral embankment to be developed along boundary of EZ-II will be developed as road. These roads development will help in minimizing the impact of increased traffic due to development of EZ-II.

Poverty alleviation and diversification in livelihood

Vast employment opportunities potentially created by the EZ will reduce poverty via increased income through various livelihood options. By means of industrialization and related trades, diversification of livelihood will occur for all strata of people. Diverse livelihood options for the locals and better wages for the employees of the industrial zone will reduce poverty for many poor households and will contribute to reducing the poverty level in the locality. So, this will enormously benefit cross section of population and both gender.

The investments required in the commissioning of Mirsarai EZ will directly enhance the local economy of the area by increasing cash flow which in turn will increase the purchasing power of the local population. Increased cash flow will create more employment opportunities for the local communities in Mirsarai EZ

Employment opportunities are expected to increase throughout the region during the commissioning phas. This will provide employment to high unemployed population of the area.

Education for children including Girls' Education

Due to the establishment of the EZ and better economic changes in the locality, the child education rate is likely to increase leading to a reduction in children's informal or agriculture-based labour.

Women's empowerment

Women are mostly in household work category. Thus, employment opportunities for women created by the proposed EZ directly or indirectly are expected to provide them better socioeconomic status. Through employment women will be empowered economically by being self-reliant and may become more socially aware. This could lead to their having more decision making power in their respective families and communities. This will also encourage the parents to send their children to schools and

withdraw them from wage earning activities. At the same time girl's education due to parents' better economic condition and awareness will prevent early and child marriage as girls' education will automatically retain them in school and will make social awareness and pressure of not marrying them off at early age and drop out for that.

Access to civic amenities and communication

The households that will be settled adjacent to the EZ area will access better civic amenities. However, due to the EZ construction overall traffic may be congested over the years. But industrialization will ensure better livelihood and increase ability to access better civic facilities.

Social mobility

With improved employment opportunities and higher and secured income, impoverished people will be able to move up the social ladder.

1.11. Cumulative Impact Assessment

Mirsharai is an upzila in Chittagong District. Chittagong city in the District is major coastal seaport city and financial centre in Bangladesh. The city has a population of more than 2.5 million while the metropolitan area has a population of over 6.5 million, making it the second largest city in the country. However Mirsharai is one of the backward area in the district with little or no development in the upazila. Now BEZA has identified this location for development of economic zones. A site measuring 610 acres has already been approved by DoE for development of the economic zone. Work for construction of off-site facilities like site filling, road development and construction of embankment has been started. Proposed EZ-II is proposed to be developed adjacent to the EZ-I. For development of EZ, various infrastructure facilities will be developed in the area like development of roads, water supply system, drainage system and power supply systems.

Development of the EZs in this area will attract various other developments in the area like development of the housing colonies/societies for workers/employee of the EZ area, development of schools, hospital and religious structures, development of hotels, service apartments and commercial areas, development of ancillary industries like transportation industries, packaging industries, logistic industries in the nearby area. Also there are possible chances of development of tourism and tourist related activities in the area as it is close to the sea. There is possibility of setting up of a thermal power plant in the area to cater the power requirement of the area.

All these developments will generate large scale direct and employment in the area which will attract migration of the population from nearby areas. Thus the demography of the area is expected to experience a change over the time after development of the EZ. Increase in population will lead to impact/stress the existing utilities and resources in the area which are required to be improved and upgraded time to time to prevent the degradation of their quality and quality of surrounding environment.

As per analysis of baseline environment, it is found that the status of air quality, water quality, soil quality and noise levels in the area are good at the site and in study area. Development of the EZs and other induced developments are expected to potentially impact all the baseline environmental and social components. Following are suggestive measures to be taken up apart from measures define above to manage the cumulative impacts in project influence area

Mitigation Measures

- BEZA should establish a environment management cell for implementation of the mitigation measures as proposed during each of the project development stage
- All mitigation measures shall be implemented as suggested

- Monitoring shall be carried out as suggested in the environmental monitoring plan and the results should be displayed on the website by BEZA
- Quarterly monitoring reports should be submitted as per requirement of DoE and the report should be available on website of BEZA so as it can be available to public
- BEZA should communicate all the upcoming developments in EZ, nature and nos. of industries coming up in the EZ to all the stakeholders by displaying it on website so as the stakeholders can assess this information for estimating pollution load in the area while carrying out the environment impact assessment study for their respective project.
- BEZA can organize six monthly meeting with concerned stakeholder agencies to discuss the type of impact which may result cumulatively due to EZ and the respective developments and the mitigation measures can be planned taking in consideration the cumulative impacts
- BEZA can organize the skill development programs for the skill enhancement if the society and can train the local people in the area to work in the upcoming EZs and the other developments which may come up in the area.

1.12. Environmental Management Plan

The Environmental Management Plan (EMP) is the synthesis of all proposed mitigation and monitoring actions, set to a time frame with specific responsibility assigned and follow-up actions defined. EMP is a plan of actions for avoidance, mitigation and management of the negative impacts of the project. Environmental enhancement is also an important component of EMP. A detailed set of mitigation measures have been compiled in view of the likely impacts associated with the proposed off-site development in Mirsarai EZ.

The EMP consists of a set of mitigation, monitoring and institutional measures to be taken during the design, construction and operation (post-construction) stages of the project. The EMP has been designed keeping in view the regulatory and other requirements to ensure the following:

- Minimum disturbance to the native flora and fauna
- Compliance with the air, water, soil and noise quality norms.
- Conservation of water to the extent possible through rain water harvesting, wastewater recycling

The detailed EMP is provided in Chapter 9.

Enhancement Plan

The proposed project involves development of EZ and off-site facilities for the upcoming Mirsarai EZ-II. These off-site facilities will be developed by BEZA. Development of these off-site infrastructure facilities will attract the investors and make the proposed site location more accessible for trading and business. Proximity of the proposed project site to the Chittagong Dhaka Highway and an already existing inland water transportation system further adds to the suitability of site for setting up the industries. As enhancement plan, it is proposed that BEZA should develop a thick green belt all around the EZ site, proper storm water drainage to prevent flooding and rain water harvesting system to harvest rain water and use it to meet daily water demand and reduce pressure on ground water resources. Thick green buffer of 30 m will be developed all along the EZ site and along the Isakhali channel. A zone of 1000 m between the EZ site and sea will be maintained as green buffers. These zones will serve as habitat for mud crabs and birds.

Contingency Plan

In order to be in a state of readiness to face adverse effects of accidents, a Contingency Plan is required to be prepared which includes on-site and off-site emergency plan by the individual industry

and industrial estate. BEZA is committed to develop a Contingency Plan in consultation with district authorities and industry association. Suggestive contingency plan is prepared for the project.

Compensation Plan

14 HHs and 5 temporary prayer places will be affected and displaced due to development of approach road of the EZ . BEZA will ensure compensation based on approved ARP. (Annexure- XVII)

Monitoring Plan

The objective of environmental monitoring during the construction and operation phases is to compare the monitored data against 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. A monitoring schedule has been sketched based on the environmental components that may be affected during the construction and operation of the project. Table7 presents the Environmental Monitoring Plan for the proposed project.

Table 7: Environmental Monitoring Plan

S. No.	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
1.0	Construction Phase					
1.1	Local Manpower Absorption	Construction Works	Contractor's report No. of people working in the project	Monthly	Civil Contract Awardees	BEZA & PMC
1.2	Soil Erosion	Excavation, disposal, cut & fill and land clearing activities for site levelling and internal roads, disposal	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	During Rainy Season	Contractor	BEZA & PMC
1.3	Greenbelt Development	-	Survival rate of species planted; Density of vegetation	Half Yearly	Contractor/BEZA	BEZA & PMC
1.4	Air Quality	Transportation of construction materials, road construction, construction of utilities	Survey & observations; Levels of PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO	Once in each season for twice a week for two weeks at 3 locations		BEZA & PMC
1.5	Waste Management	Restoration of disposal sites and construction areas	Status of protection measures	Quarterly	Contractors	BEZA & PMC
1.6	Noise Level	Noise levels compliance with respect to industrial standards	Ambient Equivalent continuous Sound Pressure Levels (L _{eq}) at day and Night time at 6 to 8 locations	Daily	Contractors	BEZA & PMC
1.7	Drinking	Contamination	All physio-	Once in	Contractor	BEZA & PMC

S. No.	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
	Water		chemical & biological parameters	month		
2.0	Operation Phase					
2.1	Noise Levels	Noise levels compliance with respect to industrial standards	Ambient Equivalent continuous Sound Pressure Levels (L_{eq}) at day and Night time at 6 to 8 locations	Once in every month		BEZA & PMC
			Plant periphery and near noise generation sources	Monthly	Individual Industrial Units	BEZA & PMC
2.2	Biological Environment	Horticulture/ Greenbelt Development	Survival rate of plants and shrubs in EZ	Quarterly	BEZA	BEZA & PMC
			Survival rate of plants and shrubs at individual unit	Quarterly	Individual unit	BEZA & PMC
2.3	Water quality Monitoring	Ground Water (if extracted for project)	All physio-chemical & biological parameters	Quarterly	BEZA & Individual unit in their respective locations	BEZA & PMC
		Feni River Water Quality	Heavy Metals and all physio-chemical & biological parameters	Quarterly	BEZA & Individual unit in their respective locations	BEZA & PMC
		Sea Water Quality	Heavy Metals and all physio-chemical & biological parameters	Quarterly	BEZA & Individual unit in their respective locations	BEZA & PMC

2. Introduction

2.1. Prelude

The Bangladesh Economic Zone Act, 2010, was passed by Government of Bangladesh to make provisions for the establishment of Economic Zones (EZs) in all the potential areas with an ambit to encourage rapid economic development and to instil confidence in investors.

To meet the above objective of rapid economic development, Government of Bangladesh with support from World Bank and the Department for International Development, United Kingdom (UK-DFID) has proposed to develop EZs at various potential locations in Bangladesh as Private Sector Development Support Project (PSDSP). The PSDSP design consists of the public sector portion of investment in land, infrastructure and services for a number of pilot EZs, selected to implement new approaches to EZs in Bangladesh. EZs identified under PSDSP will be developed on Public Private Partnership (PPP basis).

Bangladesh Economic Zone Authority (BEZA) is the overall agency responsible for establishments of EZs in all the potential areas including the backward and undeveloped regions. BEZA has identified various locations for development of EZs. One of the potential sites is located at Mirsarai Upzila and has total area of app. 1311 acres. One more site has also been proposed by BEZA at Mirsarai and is adjacent to the proposed EZ site. Approval from DoE has already been obtained for the previous EZ site. This site is being called as Mirsarai EZ-II.

Taking into consideration the site location, available infrastructure, existing industries, investors interest and infrastructure & logistic requirement of the proposed industries, Mirsarai Economic ZoneII is planned targeting comparatively less polluting industries like industries like food processing, textile, petrochemical, ship building and light engineering industries as planned for Mirsarai EZ-I. Options for other industries can also be explored by the developer at the time of development of EZ depending on the investor's interest and availability of resources. To ensure the environmental management and compliance to the legislation of Govt. of Bangladesh and EMF of PSDSP, BEZA intends to carry out Environment Impact Assessment Study for the propose Mirsarai EZ-II zone.

2.2. Project Background

BEZA is overall agency for identification and development of the economic zones. BEZA identifies the location and develop the necessary off-site infrastructure to make site accessible and buildable. Further a developer is appointed by BEZA to develop the EZ as per EZ Act, 2010. The off-site facilities as planned by the BEZA to be carried out for Mirsarai EZ-II zone are given below:

- Construction of Administration building
- Widening of existing access road on CDSP/BWDB bund to 2 lane road (7 kms)
- Site Preparation which includes
 - Landfilling of 1311 acres
 - Construction of bund for 1311 acres all around the boundary of new EZ length 7.8 km
 - Sluice Gate for managing flow of Isakhali Channel at entry point of channel at site

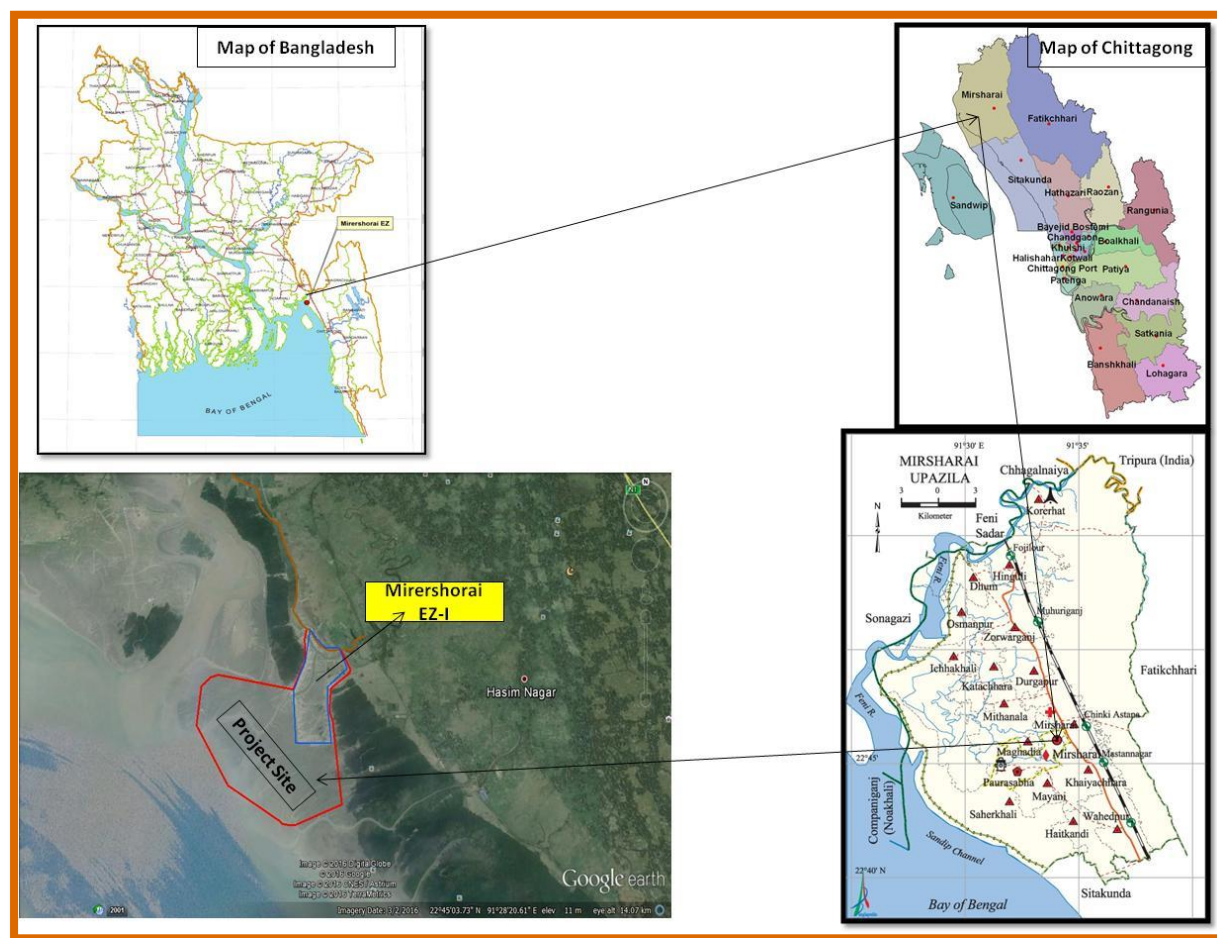
On-site facilities and Industrial area development will be planned by prospective PP developers on later stage. BEZA has appointed M/s Price Water Coopers Pvt. Ltd. to provide transaction advisory services for development of EZs in Bangladesh which also includes Environment Impact Assessment (EIA) study of the upcoming projects.

As per the procedure, an Initial Environment Examination (IEE) Report for development of Mirsarai EZ along with proposed Terms of Reference (ToR) was submitted to DOE on 04.04.2016. Approved ToR was granted by DoE vide Memo No. DoE/Clearance/5577/2016/174dated 2ndMay, 2016. Copy of

the approved ToR by DoEB is attached as Annexure I. The EIA study for the development of proposed Mirsarai EZ-II has been carried out as per the ToR issued by DoEB, World Bank's requirements and Environmental Management Framework of PSDSP.

2.3. Project Description

Mirsarai EZ –II is proposed to be located in Mirsarai Upzila of Chittagong district, Bangladesh near Abu Torab Village adjacent to under development Mirsarai EZ –I. Upcoming EZ covers area of 1311 acres. Project land is Government Land and land use is Char land (Wetland) as per revenue records. The proposed Mirsarai EZ II site is located at the end of the eastern side of the Bay of Bengal, surrounded by the coast and Mirsarai Town. The location map of the proposed EZ site is presented in Figure 2. Geographical coordinates of the corners and centre of the project site is given in table 8. Map showing geographical coordinates & boundary of EZ site is given in Figure 3.



Source: Google Earth and Google Maps

Figure 2: Location Map of Mirsarai EZ-II

Table 8: Coordinates of the EZ Site

Points	Latitude	Longitude
A	22°45'8.62"N	91°27'32.07"E
B	22°44'58.52"N	91°26'40.95"E
C	22°44'49.25"N	91°26'43.69"E

D	22°44'43.35"N	91°26'45.61"E
E	22°44'29.27"N	91°26'50.90"E
F	22°44'14.06"N	91°27'6.76"E
G	22°43'56.57"N	91°27'26.22"E
H	22°43'56.69"N	91°27'54.96"E
I	22°44'1.23"N	91°28'13.52"E
J	22°44'13.23"N	91°28'12.67"E
K	22°44'28.86"N	91°28'11.34"E

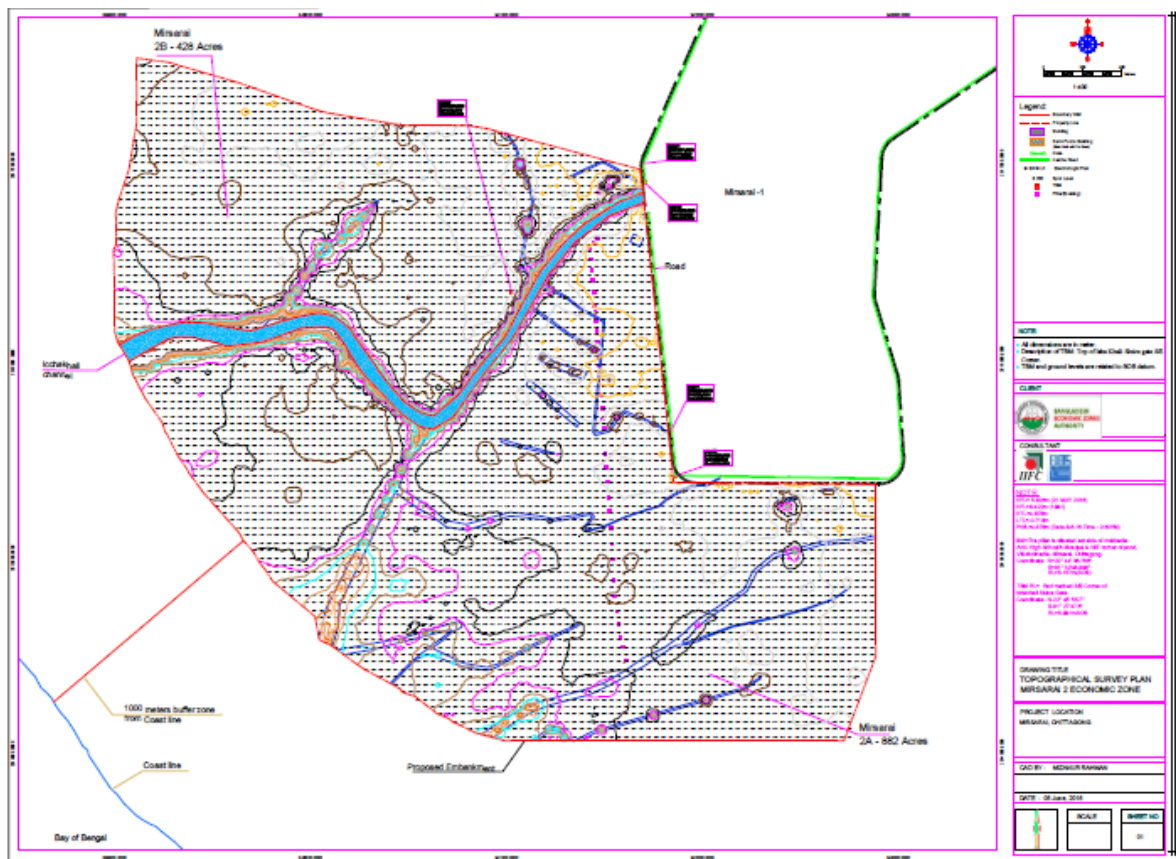


Figure 3: Map Showing Site Boundary and Geographical coordinates

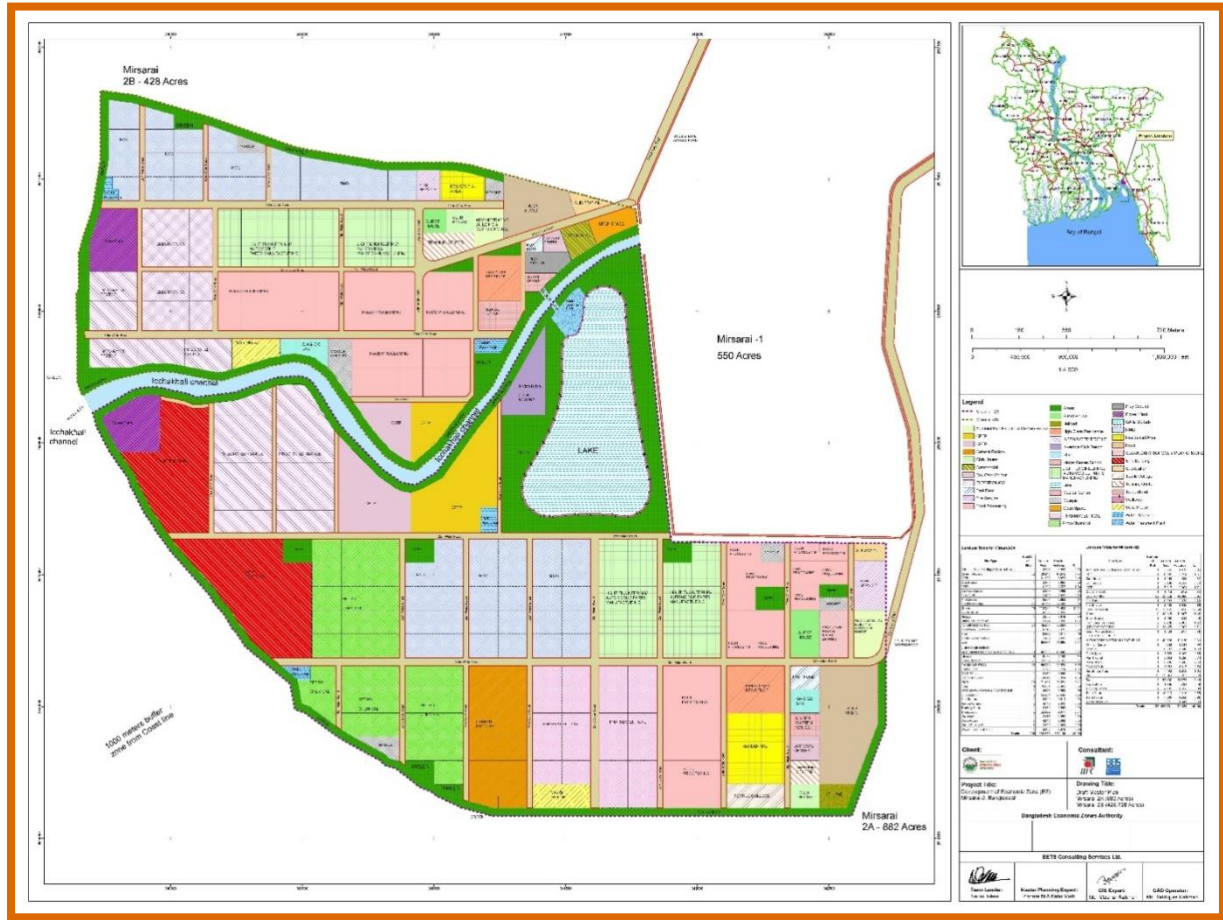


Figure 4 Master plan of the zone

2.4. Description of Project Site

Mirsarai EZ –II is proposed to be located in Mirsarai Upzila of Chittagong district, Bangladesh near Abu Torab Village adjacent to under development Mirsarai EZ –I. Project site is divided into two parts by Isakhali Channel. Isakhali channel enters the project site from SW direction (refer Figure 5). Water level in Isakhali canal is controlled by an existing sluice gate which is located in North direction at entry point of canal within EZ site. One more sluice gate is proposed to be constructed at entry point of Isakhali channel in SW direction of EZ site (sea side) to control flow of water in Isakhali channel. River Feni is app. 600 m from the site in West/NW direction. A rivulet from river Feni just abuts the western boundary of the site at one location. Bay of Bengal is located at distance of 1.0 km in South direction from project site. To protect the inland area, forest department has carried out Mangrove plantation along the coast boundary. Mangrove plantation is present in NW & SE direction by this mangrove forest. Mangroves plantation consists of plantation of three major species, i.e. Bain, Gewa and Kewda.



Source: Google Earth

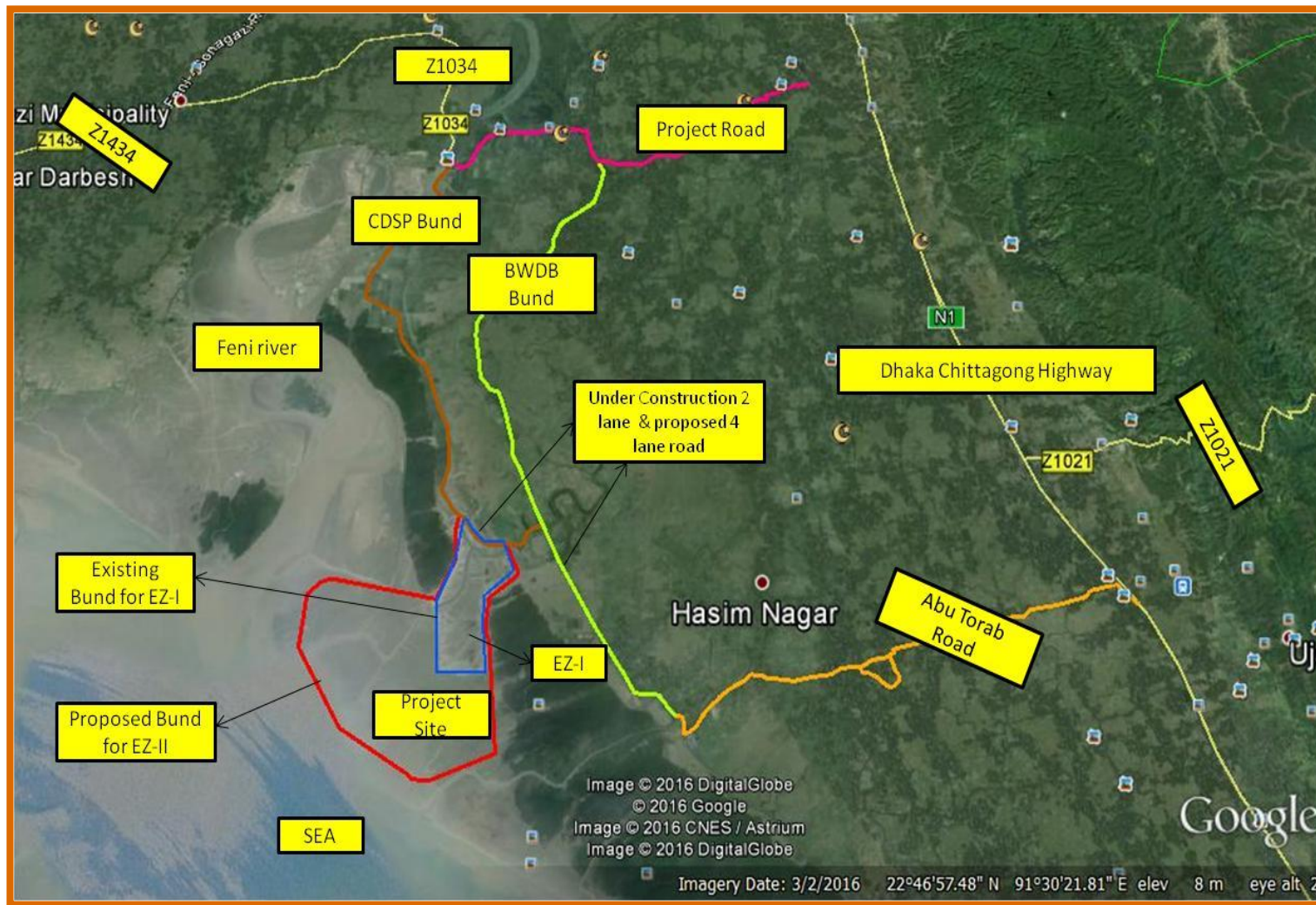
Figure 5: Map Showing Settings of project Site

Connectivity

Site is at 10 Km west of the national Highway (Dhaka-Chittagong Highway) with Chittagong City 60 Km south of this location. Bartakia Railway station and Mirsarai Railway station is at distance of 9.5 & 10.0 km respectively in East direction to the site. The Shah Amanat International Airport at Chittagong is located south of the site at a distance of 79 Km, and, the seaport is 67 Km south of the site. Azampur Bazar, the nearest market, is only 2 Km north from the site.

Site is accessible through under development single lane road being constructed on CDSP & BWDB bund for Mirsarai EZ-I measuring 7 kms. It is planned to widen this road to 2 lane so as increased traffic due to Mirsarai EZ-II can be accommodated. This road connects the site through a non-motorable bund which is constructed for the Mirsarai EZ-I.

A bund/super dike will be constructed all along the proposed Mirsarai EZ-II boundary except in North direction to protect the site from the water ingress from Sea during high tide and monsoon. The bund shares boundary with existing bund developed for Mirsarai EZ-I and will be continued with the existing bund only. The bund/road will connect the site to under construction single lane road being constructed on CDSP/BWDB road (future 2 lane road) which is further connected to project road in North of direction and Abu Torab Beri Bandh Road in South direction of project site. Project road and Abu Torab road further connects to the Dhaka Chittagong highway. Map showing the connectivity of the project site is given below in Figure 6.



Source: Google Earth

Figure 6: Map Showing Connectivity of the EZ site

2.5. Need for the Proposed Project

Bangladesh is primarily an agricultural economy with close to 50% of the labour force employed in agriculture. Industry sector contribution to Gross Domestic Product (GDP) has hovered around 25-30% only for past few years. Manufacturing sector of Industry shows predominance of export led garments and textile industries and comprise of 52% share of total exports in Bangladesh making it the world's second largest garment manufacturer.

But it also reveals relatively low emphasis and export competitiveness of its other items. Therefore, the country needs to bolster exports of other indigenous products, which will happen through enhanced industrial infrastructure, capacity building, and policy initiatives. Similarly, the country may choose to substitute imports of capital goods and other items of domestic consumption, provided there is adequate investment in industrial infrastructure to enable domestic manufacturing.

The Government of Bangladesh has, in the past, successfully provided tailored infrastructure services and business environment conditions through EPZs. EPZs were used as a strategic instrument for attracting Foreign Direct Investment (FDI) and dealing with the shortcomings of the overall investment climate, business registration, licensing, etc. which were restricting investments in the Domestic Tariff Area (DTA).

To overcome the limitations of EPZ model, new EZ regime has been adopted by the Government of Bangladesh so as more spill-over can be harnessed by local firms from FDI, additional investments can be encouraged within value chains, more local produce can be procured and better linkages can be established between manufacturing firms and educational institutions.

The EZ development, a zoned industrialization, is required in Bangladesh to maximize the growth benefits of agglomeration and ease the increasing urban congestion. More importantly, the project will enable new sources of growth, where investor will show their interest.

Mirsarai is one of the backward areas of Chittagong district. Development of EZ in such a backward area will boost not only the industrial development in the area but also the infrastructural facilities like improved power supply, roads, drainage etc. This will also supplement already under construction Mirsarai EZ-I. Employment generation for local people will enhance their living standard and quality of life. EZ development will lead to development of allied facilities and related developments in the nearby area. Also as per requirement for EZ development, location of Mirsarai is suitable. Adequate land is available for development of EZ. The land is government land and no further land acquisition is required for EZ development. Its location on the coast where draft in sea never exceeds 1 m, proximity to Chittagong-Dhaka Highway and Railway line makes it suitable location for development of EZ.

2.6. Need of Study

The proposed project comprises of development the economic zone measuring 1311 acres. BEZA at present will develop the off-site infrastructure to make site accessible and buildable. Off-site facilities include site filling, development of peripheral super dike of 7.8 km and 5 m width, expansion of under construction single lane road to 2 lane, sluice gate at entry point of Isakhali Channel, administration building and embankment along the Isakhali channel running across the site. Development of EZ & off-site facilities attracts the applicability of Environment Conservation Act (ECA), 1995 & Environmental Conservation Rules, 1997. The proposed project component is classified under red category as per Environmental Conservation Rules, 1997. Thus it is required to carry out EIA study for the proposed project as per ECA, 1995 & Environmental Conservation Rules (ECR), 1997 and obtain approval of DoEB before taking up any construction activity for the project.

Project is being implemented with the financial support of World Bank. As per the World Bank Policy O.P.4.01, development of the economic zone is classified as Category A project which requires a detailed environment assessment study prior development of zone to identify the potential threats of

project to environment and to frame mitigation and environment management plan to reduce the negative impact of the project. EIA study is required to be carried out as per the ToR issued by DoE, EMF for PSDSP and World Bank Policies.

2.7. Scope and Methodology of the Study

For the purpose of environmental assessment, area within 10 km radial zone of the proposed project have been studied and classified as Study Area. Following methodology has been adopted for the EIA study:

- Collection of primary and secondary baseline information
- Analysis of project component and its activities with respect to environmental aspects
- Public consultation to identify their concern and acceptance to the project
- Analysis of Alternatives
- Impact assessment and identification of mitigation measures for elimination, or minimisation of impacts
- Assessment of institutional aspects, and development of Environmental Management and Monitoring Plan.
- Identification of sources of pollution during construction and operation phases of the project at the proposed site
- Identification of utilisation of resources obtained during construction and operation phases of the project
- Assessment of extent of pollution and resource utilisation in the proposed area
- Recommend measures to optimise resource utilisation
- Develop an environmental monitoring plan to ensure effective implementation of the environmental management plan

The board diagram for impact identification and mitigation and management is shown below in Figure 7.

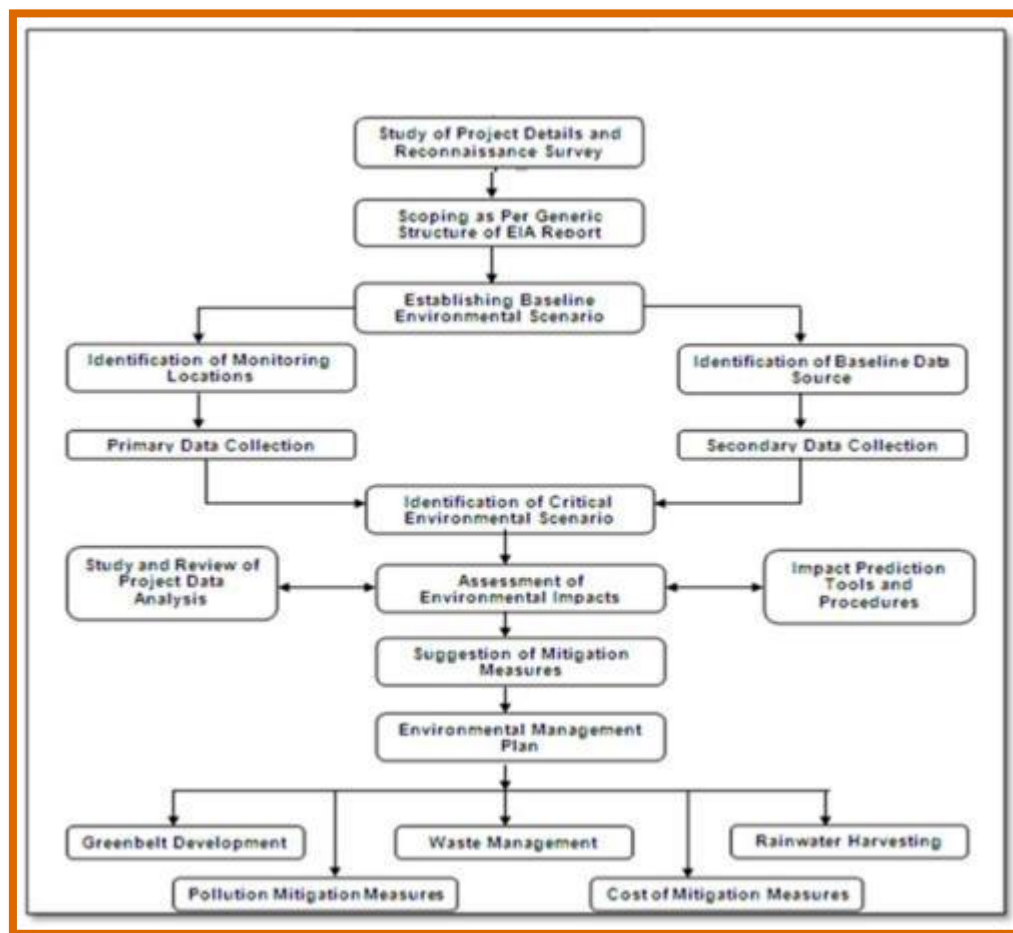


Figure 7: Methodology of EIA Study

2.8. Limitation of the Study

The present EIA Report has been prepared based on the Primary field investigations / assessment, and secondary data from data collected from Department of Public Health and Engineering (DPHE), Bangladesh Meteorological Department (BMD), Department of Environment, Bangladesh (DoEB), Geological Survey of Bangladesh, Department of Disaster Management of Bangladesh and published journals, and books, public consultation, existing studies and site observations. The environmental and social assessment is based on the information collected from the various Agencies, community consultations and observations. Professional judgement and subjective interpretation of facts and observations has been applied for the preparation of the EIA Report.

Additionally offsite facilities, EZ planning, sources of the basic utilities and alignments are not fixed till date, thus assessment is made on the basis of preliminary information available from BEZA and for all the options which could be explored. The onsite (industrial area detailed planning will be carried out by prospective private developer) information are available limited to initial feasibility assessment.

2.9. EIA Team

A multidisciplinary team of professionals having experience of conducting Environment & Social Impact Assessment Studies for Industrial Parks, Industrial Areas, Special Economic Zones, DTA, Economic Zones, Area development, Industrial Corridors etc was involved in carrying out EIA study for this project. Details of the professionals are given in the table 9 below and Annexure II.

Table 9: EIA Team Involved in Carrying out EIA Study for Proposed Mirsarai EZ-II

Name of Professional	Area of Expertise	Position Assigned
Sanjay Kumar Jain	Environment Impact Assessment, Environmental Management Plan and Environmental & Social management framework	Team Leader & Sr. Env. & EIA Specialist
Nisha Rani Singhal	Environment Impact Assessment & Environment Management Plan	Support Environmentalist
Ratnesh Kotiyal	Aquatic Ecology	Aquatic ecologist
Anil Kumar	Land Use Land cover & Remote Sensing	GIS & Land Use Specialist
Manoj Sharma	Soil Resources & Quality Assessment, Agricultural Resource Assessment	Soil Expert
K. Manivannan	Architecture & planning	Urban Planner

2.10. ToR Compliance Matrix

The EIA study has been conducted in accordance with the approved ToR issued by DOE (ToR letter is attached as Annexure I) and EMF for the PSDSP. Table 10 presents the point-wise compliance of the issued ToR.

Table 10: Compliance of TOR Points

S. No.	ToR Point	Compliance
I	The project authority shall conduct a comprehensive Environmental Impact Assessment (EIA) study considering the overall activity of the said project in accordance with this ToR and following additional suggestions	EIA study has been carried out in line with the ToR Approved by DoE, WB guidelines & EMF of PSDSP
II	The EIA Report should be prepared in accordance with following indicative outlines:	Agreed
1	Executive Summary	Refer Chapter 1
2	Introduction: (background, brief description, rationale of the project, scope of study, methodology, limitation, EIA team, references)	Refer Chapter 2
3	Legislative, regulation and policy consideration (covering the potential legal, administrative, planning and policy framework within which the EIA will be prepared)	Refer Chapter 3
4	Project Description	Refer Chapter 4
i.	Introduction	Section 4.1
ii.	Project objective	Section 4.2
iii.	Project options	Section 4.2
iv.	Interventions under selected options	Section 4.3
v.	Project activities: A list of the main project activities to be undertaken during site clearing, construction as well as operation	Section 4.5
vi.	Project schedule: The phase and timing for development of the project	Section 4.6
vii.	Resources and utilities demand: Resources required to	Section 4.7

S. No.	ToR Point	Compliance
	develop the project, such as soil and construction material and demand for utilities (water, electricity, sewerage, waste disposal and others), as well as infrastructure (road, drains, and others) to support the project	
viii.	Map and survey information Location map, cadastral map showing land plots (project and adjacent area), geological map showing geological units, fault zone, and other natural features	Section 4.8
ix.	Project plan, Design, Standard, Specification, Quantification, etc.	Section 4.5
5	Environmental and Social Baseline	Refer Chapter 5
5.1	Meteorology	Section 5.4
5.1.1	Temperature	Section 5.4.1
5.1.2	Humidity	Section 5.4.2
5.1.3	Rainfall	Section 5.4.3
5.1.4	Evaporation	Section 5.4.4
5.1.5	Wind Speed	Section 5.4.5
5.1.6	Sunshine hours	Section 5.4.6
5.2	Water Resources	Section 5.5
5.2.1	Surface Water System	Section 5.5.1
5.2.2	Tropical cyclones and Tidal Flooding	Section 5.5.2
5.2.3	Salinity	Section 5.5.3
5.2.4	Drainage Congestion and Water Logging	Section 5.5.4
5.2.5	Erosion and Sedimentation	Section 5.5.5
5.2.6	River Morphology	Section 5.5.6
5.2.7	Navigation	Section 5.5.7
5.2.8	Ground Water System	Section 5.5.9
5.3	Land Resources	Section 5.6
5.3.1	Archaeological Regions	Section 5.6.1
5.3.2	Land Types	Section 5.6.3
5.3.3	Soil Texture	Section 5.6.4
5.3.4	Land Use	Section 5.6.5
5.4	Agriculture Resources	Section 5.7
5.4.1	Farming Practice	Section 5.7.1
5.4.2	Cropping Pattern and Intensity	Section 5.7.2
5.4.3	Cropped Area	Section 5.7.3
5.4.4	Crop Production	Section 5.7.4
5.4.5	Crop Damage	Section 5.7.4
5.4.6	Main Constraints of Crop Production	Section 5.7.4
5.5	Livestock and Poultry	Section 5.8
5.5.1	Feed and Fodder Shortage	Section 5.8.1
5.5.2	Livestock/Poultry Diseases	Section 5.8.2
5.6	Fisheries	Section 5.9
5.6.1	Introduction	Section 5.9.1
5.6.2	Problem and Issues	Section 5.9.5
5.6.3	Habitat Description	Section 5.9.2
5.6.4	Fish Production and Effort	Section 5.9.4
5.6.5	Fish Migration	Section 5.9.3
5.6.6	Fish Biodiversity	Section 5.9.3
5.6.7	Fisheries Management	Section 5.9.5
5.7	Ecological Resources	Section 5.10
5.7.1	Bio-ecological Zone	Section 5.10.1
5.7.2	Common Flora and Fauna	Section 5.10.2 & 5.10.3
5.7.3	Ecosystem Services and Function	Section 5.10.4
5.8	Socio Economic Condition	Section 5.11

S. No.	ToR Point	Compliance
5.8.1	Socio Economic Condition	Section 5.11.1
5.8.2	Quality of Life Indicators	Section 5.11.2
5.8.3	Income and Poverty	Section 5.11.3
5.8.4	Gender and Women	Section 5.11.5
5.8.5	Common Property Resources	Section 5.11.6
5.8.6	Conflict of Interest and Law and Order Situation	Section 5.11.7
5.8.7	Historical, Cultural and Archaeological Sites	Section 5.11.8
6	Identification and Analysis of Key Environmental Issues (Analysis shall be presented with Scenarios, Maps, Graphics, etc. for the Case of Anticipated Impacts on Baseline)	Refer Chapter 6
6.1	Environmental Sensitivity Investigation	Section 6.1
6.2	Environmental Aspect	Section 6.2
6.1	Environmental Hot Spots	Section 6.3
6.1	Likely Beneficial Impacts	Section 6.4
6.1	Community Recommendations	Section 6.5
6.1	Alternate Analysis	Section 6.6
7	Environmental and Social Impacts	Refer Chapter 7
7.1	Introduction	Section 7.1
7.2	Impact on Water Resources	Section 7.5
7.2.1	Pre-construction Phase	Section 7.5.1
7.2.2	Construction Phase	Section 7.5.1
7.2.3	Post-construction Phase	Section 7.5.2
7.3	Impact on Land Resources	Section 7.6
7.3.1	Pre-construction Phase	Section 7.6.1
7.3.2	Construction Phase	Section 7.6.1
7.3.3	Post-construction Phase	Section 7.6.2
7.4	Impact on Agriculture Resources	Section 7.7
7.4.1	Pre-construction Phase	Section 7.7.1
7.4.2	Construction Phase	Section 7.7.1
7.4.3	Post-construction Phase	Section 7.7.2
7.5	Impact on Fisheries	Section 7.8
7.5.1	Pre-construction Phase	Section 7.8.1
7.5.2	Construction Phase	Section 7.8.1
7.5.3	Post-construction Phase	Section 7.8.2
7.6	Impact on Ecosystem	Section 7.9
7.6.1	Pre-construction Phase	Section 7.9.1
7.6.2	Construction Phase	Section 7.9.1
7.6.3	Post-construction Phase	Section 7.9.2
7.7	Socio Economic Impact	Section 7.10
7.7.1	Pre-construction Phase	Section 7.10.1
7.7.2	Construction Phase	Section 7.10.1
7.7.3	Post-construction Phase	Section 7.10.2
8.	Public Consultation and Disclosure	Refer Chapter 8
8.1	Introduction	Section 8.1
8.2	Objectives of Public Consultation and Disclosure Meeting	Section 8.1
8.3	Approach and Methodology of Public Consultation and Disclosure Meeting	Section 8.2
8.4	Public Consultation Meetings (PCMs)	Section 8.4
8.5	Public Disclosure Meetings (PDMs)	Section 8.4
9.	Environmental Management Plan and Monitoring Indicators	Refer Chapter 9
9.1	Introduction	Section 9.1
9.2	Mitigation Plan	Section 9.3

S. No.	ToR Point	Compliance
9.3	Enhancement Plan	Section 9.4
9.4	Contingency Plan	Section 9.5
9.5	Compensation Plan	Section 9.6
9.6	Monitoring Plan	Section 9.7
9.7	Monitoring Indicators	Section 9.8
10	Cost Estimation for Environmental Mitigation Measures and Monitoring	Refer Chapter 10
11.	Conclusions and Recommendations	Refer Chapter 11
III	Without obtaining approval of EIA report by the Department of Environment, the Project authority shall not be allowed to conduct earth filling or any kind of physical intervention in the proposed project site and also not be able to start the physical activity of the project.	Agreed
IV	This approval of the Terms of Reference (ToR) would not mean any acceptance or site clearance of the Project.	Agreed
V	The proposed EIA study would not establish any claim, right in favour of the proponent for getting site clearance or environmental clearance.	Agreed
VI.	Without obtaining Environmental Clearance, the project authority shall not be able to start the operation of the project.	Agreed
VII.	The project authority shall submit the EIA along with the No Objection Certificate (NOC) from the local authority, NOC from Forest Department (if it is required in case of cutting any forested plant, private or public) and NOC from other relevant agencies for operational activity etc. to the Chittagong District Office of DOE with a copy to the Head Office of DOE in Dhaka.	Agreed

2.11. Structure of the Report

This EIA report has been prepared strictly following the report structure desired by DOE as per TOR. The EIA report contains project features, baseline environmental conditions, assessment of environmental impacts, and formulation of mitigation measures along with environmental management and monitoring plan.

The report includes the following chapters:

Chapter 1: Executive Summary

The executive summary gives the synopsis of the EIA Report.

Chapter 2: Introduction

This chapter provides background information of the project proponent, need for the EIA study as per prevailing legislation, Location and brief description of the project, methodology adopted for EIA study and structure of the report.

Chapter 3: Legislative, regulation and policy consideration

This chapter deals with the details of the potential legal, administrative, planning and policy framework which have been used in the preparation of the EIA Report.

Chapter 4: Project Description

This chapter deals with the details of the proposed EZ such as location, connectivity, project requirements, Infrastructure development, environmental consideration, project cost, implementation schedule, etc.

Chapter5: Environmental and Social Baseline

This Chapter describes the baseline environmental conditions around the project site for various environmental attributes, viz. physical, biological and socio-economic, within the 10 km radial zone, which is termed as the study area. Topography, soil, water, meteorology, air, noise, and land constitute the physical environment, whereas flora and fauna constitute the biological environment. Demographic details and occupational pattern in the study area constitute socio-economic environment. Baseline environmental conditions are based on the information collected from the various agencies and the secondary data collected from published sources.

Chapter 6: Identification and Analysis of Key Environmental Issues

This chapter details the analysis of the key environmental issues.

Chapter 7: Environmental and Social Impacts

This chapter details the inferences drawn from the environmental impact assessment of the proposed project. It describes the overall impacts of the project activities and underscores the areas of concern, which need mitigation measures.

Chapter 8: Public Consultation and Disclosure Meeting

This Chapter provides an insight into the process & methodology followed for carrying out the public consultation meetings in study area and proceedings of public consultations

Chapter 9: Environmental Management Plan and Monitoring Indicators

This Chapter provides mitigation and control measures to attenuate and/or eliminate environmental impacts, which are likely to be caused by the proposed project. An Environmental Management Plan (EMP) has been developed to mitigate the potential adverse impacts and to strengthen the beneficial impacts. This chapter also provides the environmental monitoring plan proposed for the project.

Chapter 10: Cost Estimation for Environmental Mitigation Measures and Monitoring

This chapter concludes on the findings that emerged from the environmental assessment study and summarizes the key points to be addressed to ensure the environmental sustainability of the project during the construction and operation phases.

Chapter11: Conclusions and Recommendations

This chapter concludes on the findings that emerged from the environmental assessment study and summarizes the key points to be addressed to ensure the environmental sustainability of the project during the construction and operation phases.

2.12. References

List of secondary data used for carrying out EIA study and preparation of EIA report is given at the table 11 below.

Table 11: Reference Used for EIA Study

S. No.	Reference
Government Departments	
1.	Bangladesh Economic Zone Authority
2.	Bangladesh Water Development Board
3.	Department of Environment
4.	Bangladesh Meteorological Department
5.	Bangladesh Forest Department, Forest Department Mirsarai (I & II)

6.	Bangladesh Bureau of Statistics
7.	Bangladesh Food & Agriculture Department (FAO, Bangladesh)
8.	Geological survey of Bangladesh
9.	Disaster Management Bureau (DMB)
10.	Department of Disaster Management (DDM)
11.	Department of Agriculture Extension
12.	Bangladesh Rice Research Institute
13.	Department of Fisheries
14.	Rural Electricity Board, Mirsarai
15.	Land & Revenue Department, Mirsarai
Journals, Books & Existing Studies	
1.	Environment Impact Assessment Study of Mirsarai EZ-I site
2.	Alam, M.; Ahsan, H. M., Identification & Characterization of hazardous Road Locations on Dhaka Chittagong National Highway, 2013, University of Information Technology & Sciences, Bangladesh
3.	Dasgupta, S; Kamal, F.A.; Khan., Z, H; Choudhury, S., Nishat, River Salinity and Climate Change, evidence from coastal Bangladesh, The World Bank Development Research Group, Environment & Energy Team, March, 2014
4.	Akter, S; Rahman, S & Al-Amin, Chittagong University Campus: Rich in Forest Growing Stock of Valuable Timber Species in Bangladesh, journal of Forest Science, may, 2013
5.	Ullah, M. A; Hoque S & Nikraz, H, Department of Civil Engineering, Traffic Growth Rate and Composition of Dhaka Chittagong (N-1) of Bangladesh: The Actual situation
6.	Hossain, S; Das, N. G.; Sarker, S; Rahaman, Z, National Institute of Oceanography and Fisheries (Egyptian Journal of Aquatic Research), Fish Diversity and Habitat Relationship with Environmental Variables at Meghna River Estuary, Bangladesh, December, 2012
1.	Upazila Disaster Management Plan, Upzila Mirsarai District Chittagong, by Upzila Disaster Management Committee, Mirsarai, Chittagong, July, 2014
2.	Maps from Bangladesh Agriculture Research Council
3.	Community Report, Chittagong Zila, June, 2012, Population & Housing Census, 2011, Bangladesh Bureau of Statistics, Statistics & Information Division, Ministry of Planning
4.	Air Quality Management in Chittagong, Bangladesh by Air Quality Management Project, Air Quality Management Project, DoE, Govt. of People's Republic of Bangladesh, June, 2003
5.	Common Names of plants growing in Bangladesh and West Bengal (Bengali), Govt. of Bangladesh
6.	District Statistics, 2011, Chittagong, December, 2013, BBS, Statistics and Information Division, Ministry of Planning, Govt. of the people's republic of Bangladesh
7.	Fisheries Statistical Yearbook of Bangladesh, 2012-2013, department of Fisheries, Bangladesh, Ministry of Fisheries and Livestock
8.	Mahmood, N; Chowdhury, J. U; Hossain, M; Haider, S. M.; Chowdhury, S, R, Institute of Marine Sciences, University of Chittagong, Chittagong, Bangladesh
9.	Islam, R; Rahman, T; Das S; Sinan S; Lopa, F, G, R, Department of Urban and Regional Planning Chittagong University of Engineering and Technology, Chittagong, Natural resources and Environment Planning in Chittagong District of Bangladesh
10.	Ahmed, J; Haque R; Rahman M, Laboratory of Analytical Chemistry, Department of Chemistry, University of Chittagong, Chittagong, Bangladesh, Physio-chemical Assessment of Surface and Ground Water Resources of Noakhali Region of Bangladesh, 2011
11.	Sengupta, S; Kang, A; Jacob, September, 2012, Water Wealth-A Briefing Paper on the State of Ground Water Management in Bangladesh
12.	Sarker, S, U& Sarker, N, J, Department of Zoology, University of Dhaka, 1985, Migratory Raptorial Birds of Bangladesh
13.	Islam, I, 2012, Temporal pattern of Fish Assemblage of Feni River, Feni, Bangladesh-Fish Biodiversity of Feni River
14.	Amin, S, M, N; Ara, B; Rahman, M, A; Nahar, S; Haldar, G, C & Mazid, M, A, 2006, Catch Per Unit Effort (Cpue) and Hydrological Aspect of Major Spawning Site of Hilsa, Tenualosa Ilisha in bangladesh
15.	IEE Report, BAN: Irrigation Management Improvement Project, Muhuri Irrigation Project, Chittagong
16.	Support to Sustainable Management to the Bay of Bengal Large Marine Ecosystem (BOBLME)

	Project, Bangladesh Fisheries Research Institute, Mymensingh
17.	Annual Report 2010-2011, Bangladesh Agriculture Development Corporation Monitoring Division
18.	Chowdhury, A, H, September, 2012, Wind Power Prospects in Bangladesh, Department of EEE, Bangladesh University of Engineering and Technology
19.	Chowdhury, S, J, Department of Geology and Mining, University of Raishahi, Mapping of Ground Water Recharge Potential Bangladesh
20.	Ahsan, D, A & Del Valls, T, A, Impact of Arsenic Contaminated Irrigation Water in Food Chain: An Overview From Bangladesh, Nov, 2011
21.	Stroeve, Report of Final Thesis "The Feni River Closure Dam Reviewed", August, 1993
22.	Ullah, M, A; Dr. Hoque, S; Dr. Nikraz, H, Traffic Growth Rate and Composition of Dhaka Chittagong Highway (N-1) of Bangladesh: The Actual Situation
Website	
1.	Wikipedia
2.	Google maps
3.	http://www.bangladeshtourismdirectory.com/bangladesh-archaeological-sites-list.html
4.	Google earth imageries
5.	http://www.saarc-sadkn.org/countries/bangladesh/disaster_mgt.aspx (Bangladesh Disaster Knowledge Network)
6.	http://www.livingwiththejamuna.com/essayintroduction.html
7.	http://www.fao.org/docrep/field/003/AC360E/AC360E03.htm#anxA
Others	
1.	Site visits
2.	Pre-feasibility reports & Soil Analysis report from BEZA, PWC and Mahindra

3. Legislative, Regulation and Policy Consideration

3.1. Regulatory Requirements for the Proposed Project

The Government of Bangladesh has framed various laws and regulation for protection and conservation of natural environment. These legislations with applicability to this project are summarized below in the table 12 below.

Table 12: Applicability of Key Environmental Legislation at a Glance

Name	Key Requirement	Applicability	Remarks
Acts/Rules			
Bangladesh Environmental Conservation Act, 1995 (ECA, 1995) and Environment Conservation Rules 1997 (ECR, 1997)	Mandatory requirement of prior environment clearance for certain category of project for conservation and improvement of environment and control and mitigation of pollution of the environment. Standards are described under ECR, 1997	Applicable. Project classified under red category. EIA study required to be undertaken.	Site approval certificate is to be obtained from DoE prior carrying out EIA study. EIA study is carried out on basis of ToR approved by DoE.
ECA R amendment 2000	To ascertain responsibility for compensation in case of damage to ecosystem		
ECA & ECR amendment 2002	Restriction on polluting automobiles, sale and production of environmental harmful items.		
ECR amendment 2003			
ECA & ECR amendment 2010			
Environment Court Act, 2010	To give high priority to environment pollution prevention	Applicable, for all projects have potential of environmental threat	All the developments to be carried it as per ECA, 1995 & ECR, 1997 and amendments. Regulatory authority is Judiciary and Ministry of Environment & Forest
Bangladesh Wildlife Preservation Act, 1974 and Revision 2008 (Draft)	No person shall damage or destroy any vegetation in any wild life sanctuary & the wild Animals shall not be hunted or captured. For preservation of Wildlife Sanctuaries, parks, reserves.	Not Applicable. Project site is not located within any wildlife sanctuary/national park or any other protected area under this act.	Development activity will not have any interface with wildlife or wild habitat at any stage. Regulatory authority is Ministry of Environment and Forest Bangladesh Wild Life Advisory Board
The Forest Act 1927,Amendment	Declare any forests land or waste land as protected forests.	Not Applicable. No forest land	No forest land will required to be diverted

Name	Key Requirement	Applicability	Remarks
1982, 1989 & 2000 (Protected, village Forests and Social Forestry)	<p>May stop public or private way or watercourse in the interest of preservation of the forest</p> <p>Declare a reserved forest area as Village Forests</p> <p>Declare an area as Social forests or launch a social forestry programme in Govt. land or private land with permission</p>	diversion is involved.	
The Private Forests Ordinance Act, 1959	Conservation of private forests and for the afforestation on wastelands.	Not applicable	No tree cutting will be carried out
The Penal Code	<p>Chapter XIV of the Penal Code provides offences affective public health, safety, convenience, decency and morals; Section 277: Falling Water or Public Spring or Reservoir; Section 278: Making Atmosphere Noxious to Health; Section 284: Negligent Conduct with Respect to Poisonous Substance; Section 285: Negligent Conduct with Respect to Fire or Combustible Matter; Section 286: Negligent Conduct with Respect to Explosive Substance.</p> <p>Section 277: whoever voluntarily corrupts or fouls the water of any public spring or reservoir, to render it less fit for the purpose for which it is ordinarily used will be punished under the law.</p> <p>Section 278: whoever voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the Neighbourhood or passing along a public way will get punishment.</p>	Applicable.	It is required to take all the measures proposed and suggested by DoE, Bangladesh during both construction an operation phase to minimize the environmental pollution
The Protection and Conservation of Fish Act, 1950 as subsequent amendedments and The Protection and Conservation of Fish Rules, 1985	Prohibit or regulate the construction, temporary or permanent of weirs, dams, bunds, embankment and other structures	Applicable.	Necessary permission would need to be taken for road construction crossing water bodies. Regulatory authority is Ministry of Fishery
The Explosive Act, 1884	To prevent any accident due to explosive storage, use or transportation due to careless handling/management	May be Applicable depending on quantity of fuel storage	Fuel will be stored and used at site for running various construction machinery and equipment

Name	Key Requirement	Applicability	Remarks
Water Pollution Control Ordinance 1970	Prevention of water pollution	Applicable from the prospective of prevention of pollution	Applicable primarily during construction stage (e.g. sewage and equipment washing and maintenance liquid waste discharges at construction camps)
Water Supply and Sanitation Act, 1996	Management and Control of water supply and sanitation in urban areas.	Applicable for all development projects	Regulatory authority is Ministry of Local Government, Rural Development and Cooperatives
The ground Water Management Ordinance 1985	Management of Ground Water Resources. Tube well shall not be dug in any place without permission from UpzilaParishad.	Applicable, if tube wells will be dug to develop water supply system during operation phase	Permission should be taken if ground water is used, before digging tube wells
Natural Water Bodies Protection Act 2000	The character of water bodies i.e. rivers, canals, tanks, or floodplains identified as water bodies in the master plans or in the master plans formulated under the laws establishing municipalities in division and district towns shall not be changed without approval of concerned ministry.	Not applicable. No waterbody identified as water bodies in the master plans will be filled up	Regulatory authority is RAJUK/Town Development Authority/Municipalities
The Embankment and Drainage Act 1952	An Act to consolidate the laws relating to embankment and drainage and to make better provision for the construction, maintenance, management, removal and control of embankments and water courses for the better drainage of lands and for their protection from floods, erosion and other damage by water.	Applicable project involves development of embankment & sluice gate on Isakhali channel and embankment all along the proposed EZ boundary	Regulatory authority Ministry of Water Resources and FCD
Wetland Protection Act 2000	Adhere to a formal environmental impact assessment (EIA) process, as set out in EIA guidelines and manuals for water sector projects or related to alteration of natural drainage. No construction of roads if likely to effect the flow of navigable water ways without clearance from concerned authorities Upland flow in water channels to preserve eco-system Protection against degradation and resuscitation of natural water-bodies such as lakes,	Applicable, Site is wetland area.	Permission to be taken from the Ministry of Water Resources and DOE

Name	Key Requirement	Applicability	Remarks
	<p>ponds, beels, khals, tanks, etc. affected by man-made interventions or other causes.</p> <p>Completely stop the filling of publicly-owned water bodies and depressions in urban areas for preservation of the natural aquifers and environment.</p> <p>Stop unplanned construction on riverbanks and indiscriminate clearance of vegetation on newly accreted land.</p>		
Antiquities Act 1968	Governs preservation of the national cultural heritage, protects and controls ancient monuments, regulates antiquities as well as the maintenance, conservation and restoration of protected sites and monuments, controls planning, exploration and excavation of archaeological sites.	Not applicable as no structure of national cultural heritage will be affected due to project development	Regulatory authority is Ministry of cultural Affairs
The Building Construction Act 1952 (with subsequent amendments)	An Act to provide for the prevention of haphazard construction of building and excavation of tanks which are likely to interfere with the planning of certain areas in Bangladesh	Applicable as the project involves development of infrastructure	Regulatory authority is Ministry of Works
The Vehicle Act, 1927 The Motor Vehicles Ordinance, 1983 The Bengal Motor Vehicle Rules, 1940	To regulate vehicular exhaust emissions	Applicable as heavy vehicle movement is involved both during construction and operation phase	Regular maintenance and up keeping of the vehicles should be carried out. Regulatory authority is Bangladesh Road Transport Authority
The Land Acquisition Act, 1894 The Acquisition and Requisition of Immovable Property Ordinance 1982 and subsequent amendments in 1994, 1995, 2004	To provide appropriate compensation for the land acquired	Not Applicable. Only Govt. land	Regulatory authority is Revenue Department
The Factories Act, 1965 Bangladesh Labour Law, 2006	This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable work environment and reasonable working conditions.	Applicable as the workers will be employed during construction and operation phase of EZ	Regulatory authority is Ministry of labour
Policies			
National Environment	For sustainable development	Applicable for all development	Usage of energy efficient building material, fuel

Name	Key Requirement	Applicability	Remarks
Policy, 1992		projects	etc. should be encouraged
National Environment Management Action Plan 1995	Conservation of natural habitats, bio-diversity, energy, sustainable development and improvement of life of people	Applicable for all development projects	Usage of energy efficient material, green building techniques, reduction of carbon foot prints etc.
National Conservation Strategy	Sustainable development of Industrial Sector	Applicable for all development projects	Usage of energy efficient material, green building techniques, reduction of carbon foot prints etc.
The National Forest Policy (1994)	conserve the existing forest areas and to increase forest cover of country and increase the reserve forest	Not Applicable, no diversion of forest land is involved	Not applicable
The National Energy Policy, 1995	Protecting the environment by requiring an EIA for any new energy development project, introduction of economically viable and environment friendly technology.	Not Applicable. EIA study is to be carried out	Energy efficient materials and techniques should be explored
The National Water Policy, 2000 (1999)	To ensure efficient and equitable management of water resources, proper harnessing and development of surface and ground water, availability of water to all concerned and institutional capacity building for water resource management	Applicable. Ground water may be required to be withdrawn for fulfilling water requirement during operation phase	Conjunctive use of water should be explored
The National Water Management Plan, 2001	Addresses options for water quality, considerations behind measures to clean up industrial pollution, where effluent discharge monitoring and zoning regulations for new industries are emphasized	Applicable as it is industrial project and will involve generation of effluent and sewage	Installation of effluent treatment facility within the premises
World Bank's Safeguards			
OP 4.01 Environmental Assessment	Ensures sustainability and environmental feasibility of the project. Projects are classified into A, B & C category depending on the nature and extent of the impact.	Triggers	EZ development is classified as Category A as per this policy which requires detailed EIA study. Off-site development is classified as Category B considering nature of activities and impacts and requires site-specific EIA study
OP 4.04 Natural habitats	Appendix A. - Ensures conservation of natural habitats and discourages disturbance of any natural habitat due to project development by recommending adoption of alternative method/route/approach or adopting management	Not Triggered	Not applicable, no notified eco-sensitive zone lies within 10 km radius of the project area

Name	Key Requirement	Applicability	Remarks
	measures		
OP 4.36 Forests	Ensures that project activities does not disturbs/interfere with the forest, forest dwellers activities, fauna and flora of the forest. Prevents and discourages deforestation and impacts on rights of forest dependant people.	Not Triggered	No diversion of forest land is involved
OP 4.12 Involuntary Resettlement	Ensures minimal involuntary resettlement by considering feasible alternatives project design, assisting displaced people to improve their former living standard.	Triggered	14 squatters and 5 temporary prayer places will be affected. Land belongs to Government. 14 squatters will get compensation for loss of livelihood and loss of structures and 5 temporary prayer places will be relocated. Budget is kept for relocation of 5 temporary prayer places and compensation to be paid for loss of livelihood and loss of structures
OP 4.10 Indigenous people	Ensures protection of the dignity, right and cultural uniqueness of indigenous people and ensures they receive social and economic benefits	Not Triggers	No indigenous group of people will be affected
OP 4.11 Physical Cultural Resources	Ensures preservation of property of cultural and religious importance, heritage and property of natural importance and enhancement of cultural properties	Not Triggers	5 'temporary prayer place' since these are factually temporary makeshift prayer rooms and these are not cultural properties, but temporary structures provided for prayer facilities hence no property of cultural and religious importance, heritage and property of natural importance will be impacted
IFC EHS Guidelines			
IFC Guidelines- Environment, Health & Safety Guidelines (General)	Technical reference document for guidance of general health & safety measures to be taken for general industries, construction and other such activities	Should be followed	

Name	Key Requirement	Applicability	Remarks
IFC Guidelines- Environment, Health and Safety Guidelines for Ports, Harbors and Terminals	Act as reference document which provides guidance for incorporation of RHS measures during EIA study of the Ports, Harbours& Terminals	Should be followed	Annexure XVIII, (Page-2&3 of the Guideline)
Private Sector Development Support Project			
Environment Management Framework	Describes all the mandatory environmental and social clearances and purpose of the same required to be taken before development of the project	Triggers	EIA report is prepared referring to the guidelines mentioned in EMF
Social Management framework	Enhances positive social development outcomes of PSDSP with economic activities undertaken in the EZ, mitigating adverse social impacts, ensures participation of stakeholders and compliance to GoB policies	Triggers	EIA report is prepared referring to the guidelines mentioned in SMF

3.2. Procedure for Obtaining Environmental Clearance from DoE, Bangladesh

Bangladesh has very simple administrative framework regarding environmental aspect. It has strong interface between local government and federal Government. Department of Environment is responsible for grant of environmental clearance to a project. In addition to three are other ministries to deal with specific area of importance to the country like Forests, Water.

According to the Section 12 of the Environment Conservation Act 1995 no project will be established or undertaken without obtaining permission, in the manner prescribed by the Environment Conservation Rules 1997, an Environmental Clearance Certificate from the Director General. Therefore, every development projects/industries which are specified under the Schedule – 1 of the Environment Conservation Rules 1997 require obtaining site and environmental clearance from the Department of Environment. According to the Rule 7 (1) of the Environment Conservation Rules 1997; for the purpose of issuance of Environmental Clearance Certificate (ECC), every projects, in consideration of their site and impact on the environment and will be classified into the four categories, i.e. green, orange A, orange B and red. Development of economic zone will fall under red category. Thus EIA study is required to be carried out for the project. The present EIA study has been conducted for the proposed project complying with the ToR issued vide Memo No. DoE/Clearance/5577/2016/174 dated 2nd May, 2016, EMF of PSDS project and applicable World Bank guidelines. Focused group stakeholder consultation has also been conducted to discuss the environmental issues associated with the project. Proceedings of stakeholder consultation have also been included in the report. A schematic representation of the various steps involved in obtaining the Environment Clearance certificate from DoEB for red category projects is given in Figure 8 below.

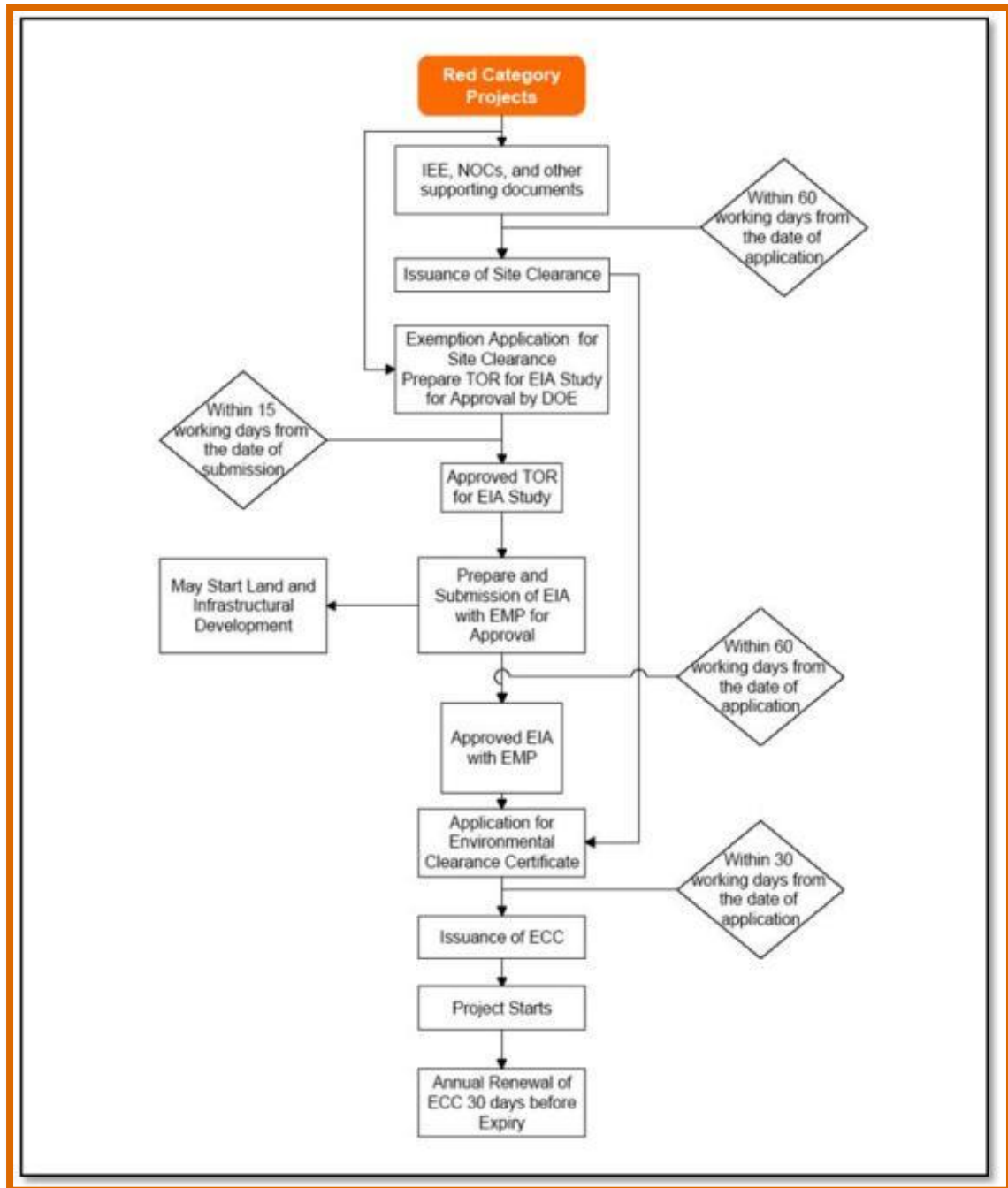


Figure 8: Steps for Obtaining Environment Clearance from DoEB

4. Project Description

4.1. Introduction

The proposed project involves development of EZ and associated off-site facilities for the upcoming Mirsarai EZ-II. At present off-site facilities will be constructed for the project site. EZ will be developed at later stage by the developer. The off-site development will include the following:

- Construction of Administration building
- Widening of existing single lane access road on CDSP/BWDB bund to 2 lane road (7 kms)
- Site Preparation which includes
 - Landfilling of 1311 acres
 - Construction of bund for 1311 acres all around the boundary of new EZ site -length 7.8 km
 - Sluice Gate for managing flow of Isakhali Channel at entry point of channel at site

The total area of the upcoming Mirsarai EZ is about 1311 acres out of which the development area is 1311 acres. Entire land belongs to BEZA and the land documents are attached as Annexure III. EZ can have following components as per EZ Act, 2010:

- Economic Processing Zone (EPZ), (It is proposed to have industries like food processing, textile, petrochemical, ship building and light engineering industries.
- Domestic processing area,
- Commercial area and
- Non processing area. The off-site components (administrative buildings) will be part of non-processing areas.

EZ development will be carried out by the developer at later stage that will be selected by BEZA as per EZ Act, 2010. The proposed Mirsarai EZ-II site lies adjacent to Mirsarai EZ-I site under development. As per the planning of the Mirsarai EZ-I site, the likely industries to come up in the zone are industries like food processing, textile, petrochemical, ship building and light engineering. Detailed project report will be prepared by the developer at later stage prior developing the EZ detailing the type of industries which may come, utility requirement for the industries and assessment of the environmental impacts of those industries.

4.2. Project Objective and Options

The project is aimed to develop economic zone of international standards with the support of the World Bank. The EIA study is also being undertaken with the intent of integrating best environmental management practices in the project design.

BEZA, the overall agency responsible for establishment of EZs in all the potential areas of Bangladesh including the backward and undeveloped regions, has identified four potential sites namely two at Mirsarai and one each at Sherpur and Mongla, for development of EZs. These areas has been identified considering factors such as land use, land ownership, accessibility & connectivity, linkage to economically important towns/cities, infrastructure availability and engineering, environmental and social feasibility of the site.

The proposed project site (1311 acres) identified for the upcoming Mirsarai EZ is a continuous section of land but is dissected by Isakhali channel into two parts. Both the portions will be connected in later stage through bridges. The land is Government land and registered land use of the land is Char land (Wetland). The proposed land site does not lie within any city Corporation, Municipality and Cantonment Board Area as per requirement of sub-section 3 of section 5 of Economic Zone Act, 2010.

A site suitability analysis was carried out for the development of EZ for assessing environment and social feasibility of the proposed project. As per the analysis, both limitations and benefits are associated with the land for developing EZ at the proposed site location. However, identified weakness and threats can be overcome by adopting alternative technologies and preventive measures. Identified strength and weakness of the site as carried out by BEZA are given in the table 13 below.

Table 13: Strength and Weakness of Site of Mirsarai EZ-II Site (as per BEZA)

Parameters	Strength	Weakness
Location, Contiguity & surroundings	<ul style="list-style-type: none"> Land area measuring 1311 acres is available which is sufficient for development of EZ Does not lie within any city Corporation, Municipality and Cantonment Board Area as per requirement of sub-section 3 of section 5 of Economic Zone Act, 2010 Location within coastal area, proximity Dhaka Chittagong Highway and the railway line Close proximity to Feni River & Isakhali channel & Bamon Sundar channel so well-developed inland water transport Agro based and marine culture industry can flourish well in this area as most of people are engaged in agriculture and aquaculture activities Availability of the waterfront for industrial operations Site is currently protected by earthen embankment in East direction, forest in North and SE direction. Bund proposed to be constructed in West direction, will protect the site from sea 	<ul style="list-style-type: none"> Region prone to flooding due to presence of Feni river Threats of cyclones associated due to the close proximity to Bay of Bengal (0.5 km from site) Requirement of high dikes and strong storm water management system Due to water logging, deep piling will be required which is a cost intensive Site criss crossed with deep streams and Isakhali channel traverses through the site. Also site is low lying. Due to these sand will be required for filling and raising the site level.
Accessibility	<ul style="list-style-type: none"> Site is well connected through roads (Project road & Abu Torab Roads) Chittagong port is app. 67 km from the site Dhaka Chittagong highway is at 16 km distance from the site Shah Amanat International Airport is at distance of 79 km Bartakia Railway station is at distance of 16 km Well-developed inland water transport 	<ul style="list-style-type: none"> Site is accessible only through the single lane road constructed over the CDSP/BWDB bund which will be insufficient to handle the traffic load from the existing Mirsarai EZ (under development) and upcoming proposed Mirsarai EZ. Stretch of 7 km of this road requires to be widened to 2 lane .
Proximity to urban hubs & industrial areas	<ul style="list-style-type: none"> Site is located along the strategic Dhaka-Chittagong industrial corridor and at the end of the eastern side of the Bay of Bengal. 	<ul style="list-style-type: none"> Competition from existing Dhaka and Chittagong industrial area
Available Infrastructure Facility	<ul style="list-style-type: none"> Availability of continuous Government land Land is flat and can be filled using 	<ul style="list-style-type: none"> Existing drainage pattern may be affected as the site gets fully inundated during monsoon although

Parameters	Strength	Weakness
	<ul style="list-style-type: none"> sea sand Nearness to highway Easy transportation of goods due to nearness to sea and Feni River No utility displacement like HT/LT line, religious structure, school etc is associated with the site Setting up of all infrastructure facilities will induce setting up of new townships and other developments Creation of flood protection infrastructure for EZ in form of super dike will protect the whole inland area of Mirsarai EZ. 	<ul style="list-style-type: none"> peripheral drains will be developed all around the EZ site to collect & drain the storm water from site If land filled with sea sand, then time requirement for compaction will be high Tidal effect of the Isakhali and Bamons Sundar channels at & near site may hamper the drainage system Busy Dhaka-Chittagong Highway will increase time to bring construction materials to the site and hence increase the construction time. Absence of urban living and recreational facilities in nearby areas.
Availability of Raw Material	<ul style="list-style-type: none"> Strong production of cash crops such as jute, cotton, rice, etc. Fishing is a major activity in the region, hence availability of raw material Large nos. of unskilled and semi-skilled labour available 	<ul style="list-style-type: none"> Rivers are saline and ground water is available at deeper levels say at 700-900 ft. Locals highly dependant on ground water for domestic purpose and irrigation. Thus no firm source of water in the area No source of gas & insufficient power supply Shortage of skilled labour Raw material can be supplied at present only from Dhaka or through Chittagong port Unavailability of fresh water as the fresh water in Feni river is used up in Muhuri irrigation scheme
Eco-sensitivity and threat to bio-diversity	<ul style="list-style-type: none"> No significant flora and fauna at site No eco-sensitivity associated within the site 	<ul style="list-style-type: none"> Area near the Isakhali Channel and Bamon Sundar Channel has mud crabs Birds are seen at site during Winters (December-January) as per consultation Mangroves afforestation located near to the site may be affected due to development of EZ zone
Quality of life & Employment generation	<ul style="list-style-type: none"> Creation of large nos. of direct and indirect jobs for skilled, semi-skilled and un-skilled labour Enhanced infrastructure facilities No land acquisition required and no displacement of families associated Developments in nearby area after development of EZ 	<ul style="list-style-type: none"> Unavailability of adequate skilled labour Seasonal aqua culture and agriculture practice at site

4.3. Interventions under selected options and Project Activities

Mirsarai site has been selected for development of economic zone. Initial site feasibility study has been undertaken by BEZA and on the basis of the same, necessary off-site facilities will be developed by BEZA. The EZ area will be developed by prospective developer who will be selected by BEZA as per EZ Act, 2010 and will undertake detailed planning study for development of EZ. Proposed off-site

facilities will help in improving the infrastructure of the area and will attract developers. Proposed interventions at the selected site are given below:

- Construction of Administration building
- Widening of existing single lane access road on CDSP/BWDB bund to 2 lane road (7 kms)
- Site Preparation which includes
 - Landfilling of 1311 acres
 - Construction of bund for 1311 acres all around the boundary of new EZ site length 7.8km
 - Sluice Gate for managing flow of Isakhali Channel at entry point of channel at site

Total area of selected site is 1311 acres out of which development area is 1311 acres . Isakhali runs through project site dividing it into two parts. A green buffer of 30 m all around the EZ site will be developed and green buffer of 30 m on either side of the Isakhali channel will be developed to protect the Isakhali channel from direct exposure to industrial units. Also zone of app width 1000 m between the upcoming Mirsarai EZ-II and sea will also be developed as green buffer.

4.4. Existing Infrastructure in and around the Project Site

Site does not support any infrastructure at present. Currently site is accessible only through single lane motorable road being constructed on CDSP & BWDB bund for Mirsarai I EZ in North direction. This road connects to the the proposed site through the non motorable bund constructed for under development Mirsarai I EZ. At present site is naturally drained into Isakhali channel through existing drainage system at site. The project land is low and flat and gets inundated during high tide and monsoon season especially. With reference to tidal surge data during cyclonic condition for last 56 years, it is observed that tidal surge in coastal areas of Chittagong varies from 1.83-6 m amsl except during cyclone of year 1991 during which surge level varies from 5-8 m. Flood level of Fenny River for last 50 years return period of flood has been recorded as +7.3 m amsl. Isakhali channel runs through the site and divides the project site is divided into two parts. The site is criss crossed with various small but deep drains arising from the Isakhali channel. Water level in Isakhali channel also rises during high tides and during monsoon. Fishing is practiced in Isakhali channel during high tide and monsoon season.

Current elevation level of the site is average 3 m amsl. As site is low lying, required to be filled to level of minimum 1.15 m above NGL. Sand required for filling will be 4863632cum. After filling finished level of the site will be 4.15 m amsl. Sand for filling the site will be procured from sea through dredging. Dredging will be carried out by licensed dredgers to be contracted by BEZA> Locations for dredging will be identified by BWDB. Site just abuts the Mirsarai EZ-I which is under development in East direction. Further the Mangrove plantation abuts the site in West and East direction. To the south of the site is wetland area and further 1000 m South is the Bay of Bengal. This 1000 m zone will be developed as green buffer area. River Feni is app. 1600 m from the site in West/NW direction. A rivulet from river Feni just abuts the western boundary of the site at one location. Surroundings details of project site are given in table 14 below. Photographs of the proposed EZ site and existing infrastructure are given in figure 9 below. Map showing EZ sites and existing facilities at site is given in figure 10below

Table 14: Existing Features surrounding the project site

Direction	Features
North	Mirsarai EZ-I followed by CDSP Bund And Agricultural land across CDSP bund
East	Mangrove plantation
South	Wetland followed by Bay of Bengal
West	Mangroves and Wetland followed by River Fenny



Under Development Access Road on BWDB Bund



Under Development Access Road on CDSP Bund



Non-Motorable Existing Bund For Mirsarai I EZ site



Temporary Prayer Places besides the Approach road to the site



Figure 9: Photographs of the project site



Source: Mahindra

Figure 10: Map showing location of project site and existing facilities

4.5. Project Activities and Area Statement

BEZA has planned to develop a Mirsarai EZ-II on area of 1311 acres adjacent to under development Mirsarai EZ-I. Total area of the proposed EZ is approximately 1311 acres. BEZA has planned to develop the land and off-site facilities for the EZ site so as to make it easily accessible and buildable. Details of off-site planned to be undertaken by BEZA are given in table 15 below. Map showing all the off-site facilities is given in figure 11 below.

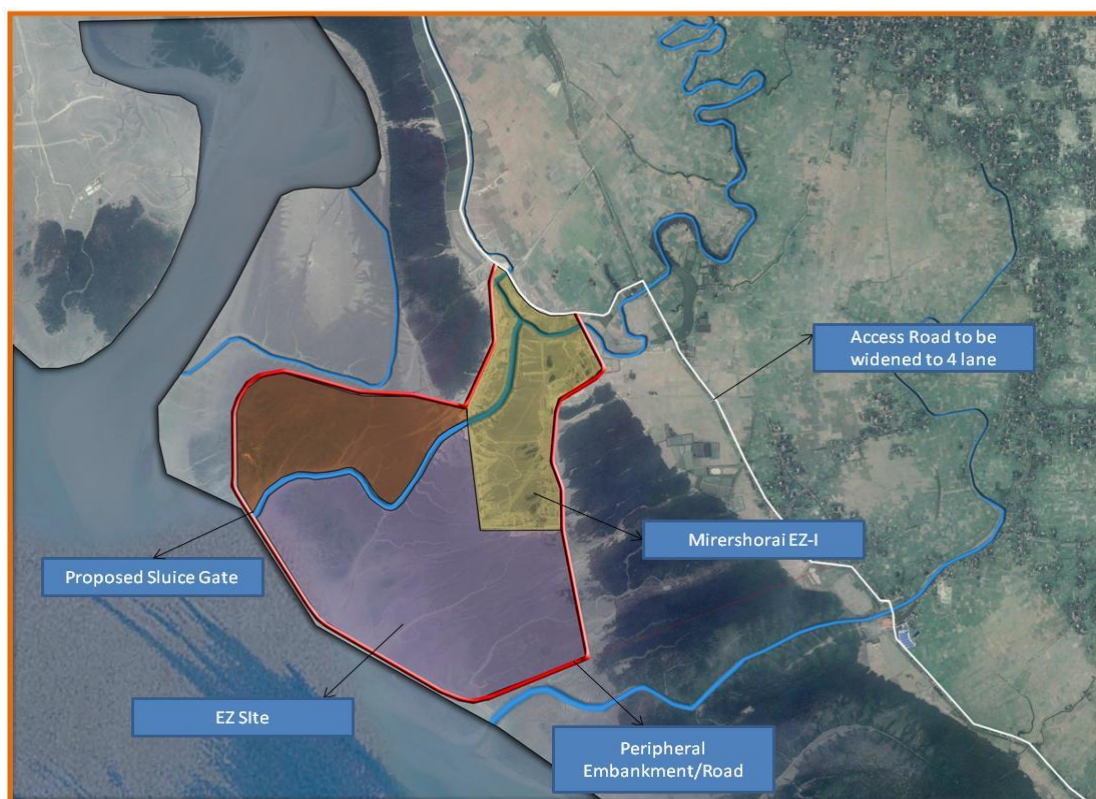


Figure 11: Map Showing Off-Site Facilities Planned for EZ

Table 15: Details of Off-site facilities

S. No.	Proposed Infrastructure	Details
1	Administration building	Administration building will be constructed within EZ site. Building will have ground coverage of 1500 sq. m and built up area of 6000 sq. m. It will consist of 4 floors (G+4). Site plan of the administration building is given in figure 12.
2	Construction of bund for 1311 acres all around the boundary of new EZ site length 7.8 km	A bund/super dike will be constructed all along the proposed EZ boundary except in North direction to protect the site from the water ingress from Sea during high tide and monsoon. North direction is already protected by existing CDSP bund. Height of the proposed bund will be +10m amsl. Total length of the bund will be 7.8 kms. Cross section of bund is shown in figure 13. Sand requirement for bund construction will be fulfilled from Feni river or from the Sand Mohal where sand is accumulated by various dredgers or from sea. Alignment

		of the peripheral boundary of EZ site is shown in figure 13-16. This bund shares the boundary with the existing bund of the Mirsarai I EZ. Thus this bund will continue with the existing bund of Mirsarai EZ-I to cover the site from all the three direction (S, E & W). Top level of bund will be +10 m amsl. Portion which is common to Mirsarai EZ-I will also be raised to + 10 m amsl from existing level of + 8 m amsl.
3	Widening of existing single lane access road on CDSP & BWDB bund to 2 lane road (7 kms)	Site is accessible through under development single lane road being constructed on CDSP & BWDB bund for Mirsarai EZ-I measuring 7 kms. It is planned to widen this road to 2 lane so as increased traffic due to Mirsarai EZ-II can be accommodated.
4	Landfilling of 1311 acres	Site is flat land with various drainage channels in it and average elevation of 3 m amsl. Site will be leveled and filled to height of 1.15 m from NGL. Sand of 4863632cum will be required for filling the land. Sand for filling will be sourced from deep sea. Dredging will be carried out by licensed dredgers to be contracted by BEZA. BWDB will conduct a study to identify the locations suitable for carrying out dredging. Peripheral drain will be developed all along the boundary. This drain will accommodate storm water
5	Sluice Gate	Sluice gate will be constructed at Entry point of channel within EZ from sea side to control the flow of water from Isakhali channel within EZ site. Also an embankment of +6.5 m will be developed all along the Isakhali channel (Figure 17)

Planning for EZ Development

At present initial site feasibility study has been undertaken by BEZA for development of the proposed Mirsarai EZ-II. On the basis of the feasibility study, the sites is considered for development of EZ and as per recommendation of the study, above given off-site facilities are proposed to be developed at the site. Detailed planning for the EZ development will be carried out by developer to be appointed by BEZA as per EZ Act, 2010. It is estimated that type of industries which will come up in the area will be similar to those of Mirsarai EZ-I and are majorly industries like food processing, textile, petrochemical, ship building and light engineering. No dyeing industry will be allowed within EZ site. A master plan prepared on basis of project feasibility study is given below in figure 18. Area break up for each facility is also given in table 16 below.

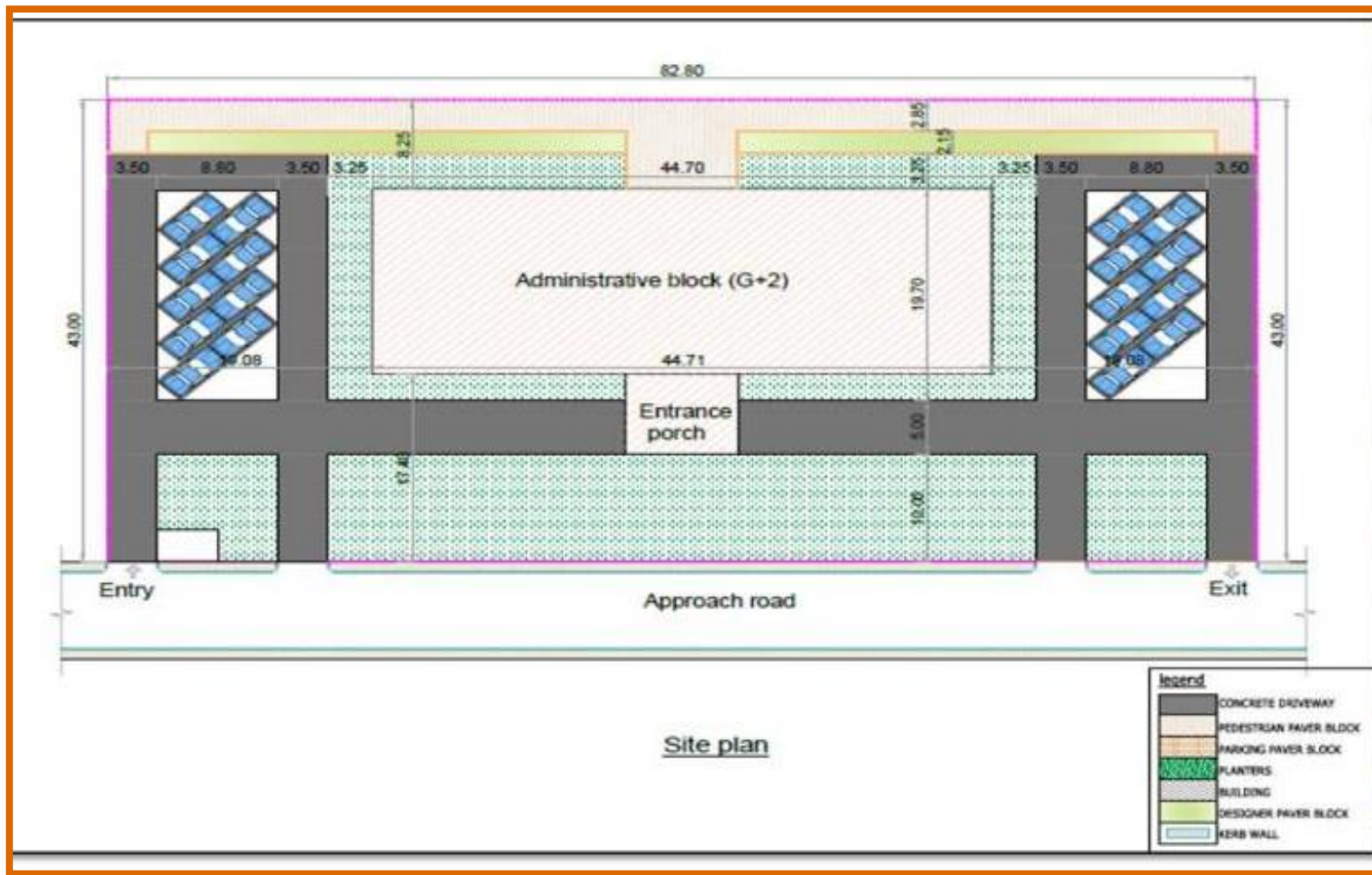
BEZA has made certain mandates for the developer to be followed during planning so as to make project environmentally sustainable. Environmental features of the project will include CETP, CSTP, Green buffer of 30 m all around the EZ site and all along Isakhali channel, avenue plantation all along the roads, Green buffer of 1000 m between EZ site and the Sea, solid waste collection and disposal site, water supply system, power supply system and storm water drainage system.

Table 16: Area Break-up Plan for Mirsarai II Economic Zone

Land Use Pattern of Mirsarai 2A Economic Zone					
Land Use Category	Plot Type	Number of Plot	Area in Acres	Area in Hectares	%
Processing Area (Industrial Sector)	Food Processing	25	60.761	24.586	6.89%
	RMG	29	71.601	28.971	8.12%
	Integrated Textile	24	56.553	22.884	6.41%
	Light Engineering/Automobile Parts Manufacturing	19	46.583	18.848	5.28%
	Pharmaceutical	22	54.32	21.978	6.16%
	Petro Chemical	31	79.532	32.181	9.02%
	Cement Factory	12	29.347	11.875	3.33%
	Ship Building	2	63.364	25.643	7.18%
(a) Total Industrial Area		164	462.06	186.97	52.39%
Processing Area (Specialized Infrastructure)	Ware House	1	4.94	1.999	0.56%
	Truck Stand	1	22.429	9.077	2.54%
	QA & QC Lab	1	2.469	0.999	0.28%
	Training Centre	1	2.469	0.999	0.28%
	CETP	1	21.925	8.873	2.49%
	CSTP	1	16.203	6.557	1.84%
	Power Plant	1	9.326	3.774	1.06%
	Lake/Water Reservoir	3	67.114	27.16	7.61%
	Road	4	76.604	31.001	8.68%
Green	9	111.049	44.939	12.59%	
(b) Total Specialized Infrastructure		23	334.528	135.378	37.93%
(c) Total Processing Area (a+b)		187	796.589	322.344	90.31%
Non-Processing Area	Administrative Building & Custom House	1	4.941	1.999	0.56%
	Commercial Area	1	2.69	1.088	0.30%
	Club House	1	2.47	1	0.28%
	Day Care Centre	1	2.469	0.999	0.28%
	Investors Club Resort	1	8.216	3.325	0.93%
	Fast Food	1	2.469	0.999	0.28%
	Fire Service	1	5.695	2.305	0.65%
	Guest House	1	4.937	1.998	0.56%
	Helipad	1	2.666	1.079	0.30%
	High Class Residence	1	9.874	3.996	1.12%
	Kindergarten School	1	2.469	0.999	0.28%
	Secondary School & Play Ground	1	4.925	1.993	0.56%
	Water Treatment Plant	1	3.406	1.378	0.39%
	Residential Area	1	14.811	5.994	1.68%
	Sub-Station	1	2.009	0.813	0.23%
	Textile College	1	4.94	1.999	0.56%
Walkway	1	2.616	1.059	0.30%	
Mosque	2	3.844	1.556	0.44%	
(d) Total Non-Processing Area		19	85.447	34.579	9.69%
GRAND TOTAL (c+d)		206	882.036	356.923	100%
Land Use Pattern of Mirsarai 2B Economic Zone					
Land Use Category	Plot Type	Number of Plot	Area in Acres	Area in Hectares	%
Processing Area (Industrial Sector)	Food Processing	29	75.165	30.416	17.54%
	RMG	20	59.043	23.893	13.78%
	Integrated Textile	10	24.475	9.905	5.71%

	Light Engineering/Automobile Parts Manufacturing	16	40.098	16.226	9.36%
	Electronics	12	29.628	11.988	6.91%
(a) Total Industrial Area		87	228.409	92.428	53.30%
Processing Area (Specialized Infrastructure)	Ware House	1	4.099	1.659	0.96%
	Truck Stand	1	10.913	4.416	2.55%
	QA & QC Lab	1	3.253	1.317	0.76%
	Training Centre	1	4.195	1.698	0.98%
	CETP	1	6.905	2.794	1.61%
	CSTP	1	7.317	2.961	1.71%
	Power Plant	1	9.996	4.045	2.33%
	Water Reservoir	2	2.571	1.041	0.60%
	Road	2	53.308	21.573	12.44%
	Green	10	48.945	19.807	11.42%
(b) Total Specialized Infrastructure		21	151.502	61.311	35.35%
(c) Total Processing Area (a+b)		108	379.911	153.739	88.65%
Non-Processing Area	Administrative Building & Custom House	1	3.655	1.479	0.85%
	Commercial	1	3.108	1.258	0.73%
	Club House	1	2.443	0.989	0.57%
	Day Care Centre	1	1.513	0.612	0.35%
	Fast Food	1	0.933	0.378	0.22%
	Fire Service	1	2.558	1.035	0.60%
	Guest House	1	2.058	0.833	0.48%
	High Class Residence	2	6.928	2.803	1.62%
	Kindergarten School	1	1.524	0.617	0.36%
	Residential Area	1	4.492	1.818	1.05%
	Sub-Station	1	1.856	0.751	0.43%
	Mosque	3	6.537	2.646	1.53%
	Medical Centre	1	4.253	1.721	0.99%
	Open Space	1	3.629	1.469	0.85%
	Play Ground	1	3.163	1.28	0.74%
(d) Total Non-Processing Area		18	48.65	19.689	11.35%
GRAND TOTAL (c+d)		126	428.561	173.428	100%
Total		334	1311.119	530.562	100.00

Source: IFC & BETS, Consultants



Source: Mahindra

Figure 12: Site plan of administration building

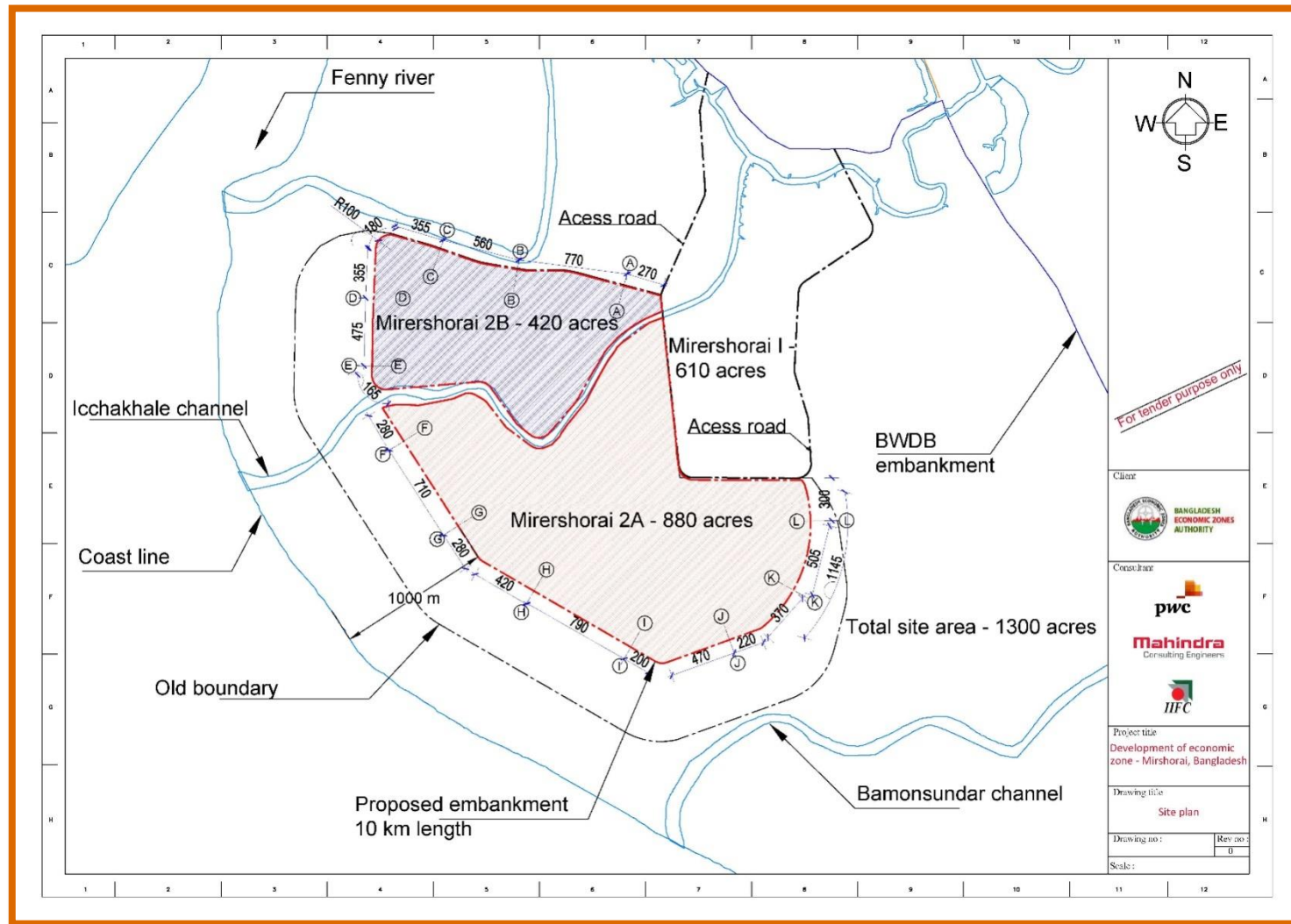
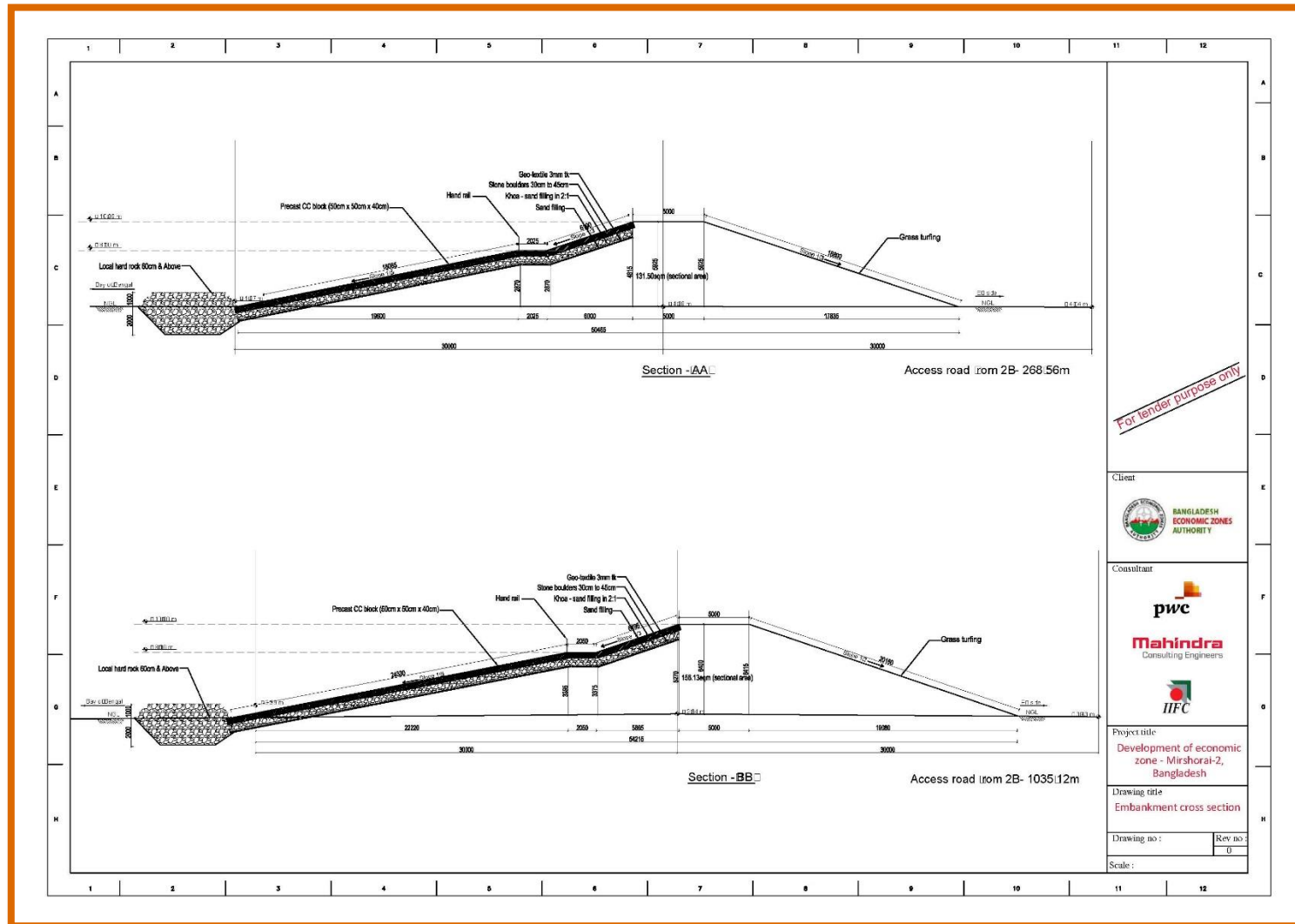






Figure 13: Alignment of the Peripheral Embankment (7.8 kms-5 m wide on top)



For tender purpose only

Client
 BANGLADESH ECONOMIC ZONES AUTHORITY

Consultant
 **pwc**
 **Mahindra** Consulting Engineers
 **IIFC**

Project title
 Development of economic zone - Mirshorai-2, Bangladesh

Drawing title
 Embankment cross section

Drawing no: _____ Rev no: _____
 Scale: _____

Figure 14: Cross Section of Peripheral 7.8 km Embankment (Section AA)

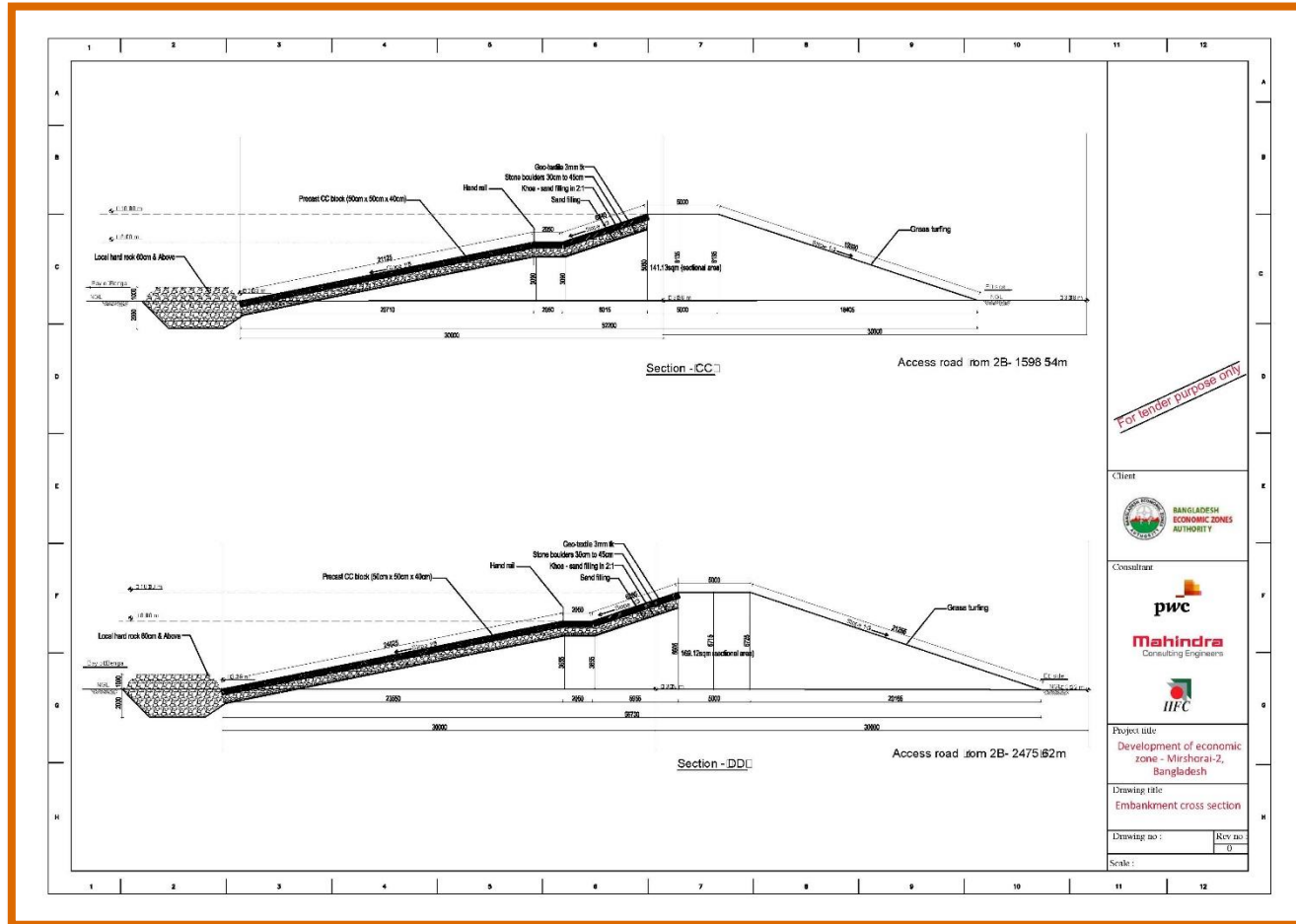


Figure 15: Cross Section of Peripheral 7.8 km Embankment (Section BB)

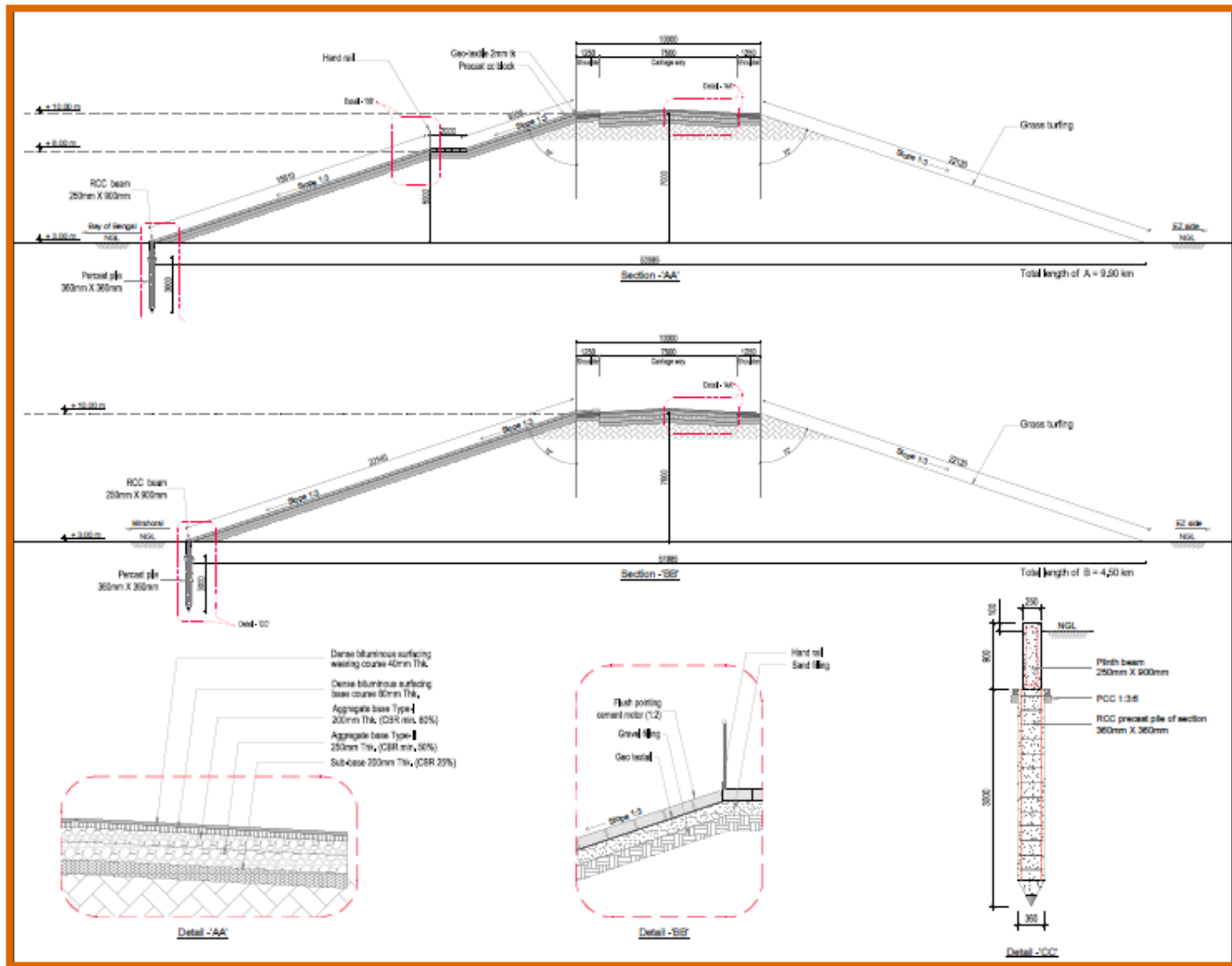


Figure 16: Cross-Section Peripheral Road (7.8 kms-5 m wide on top)

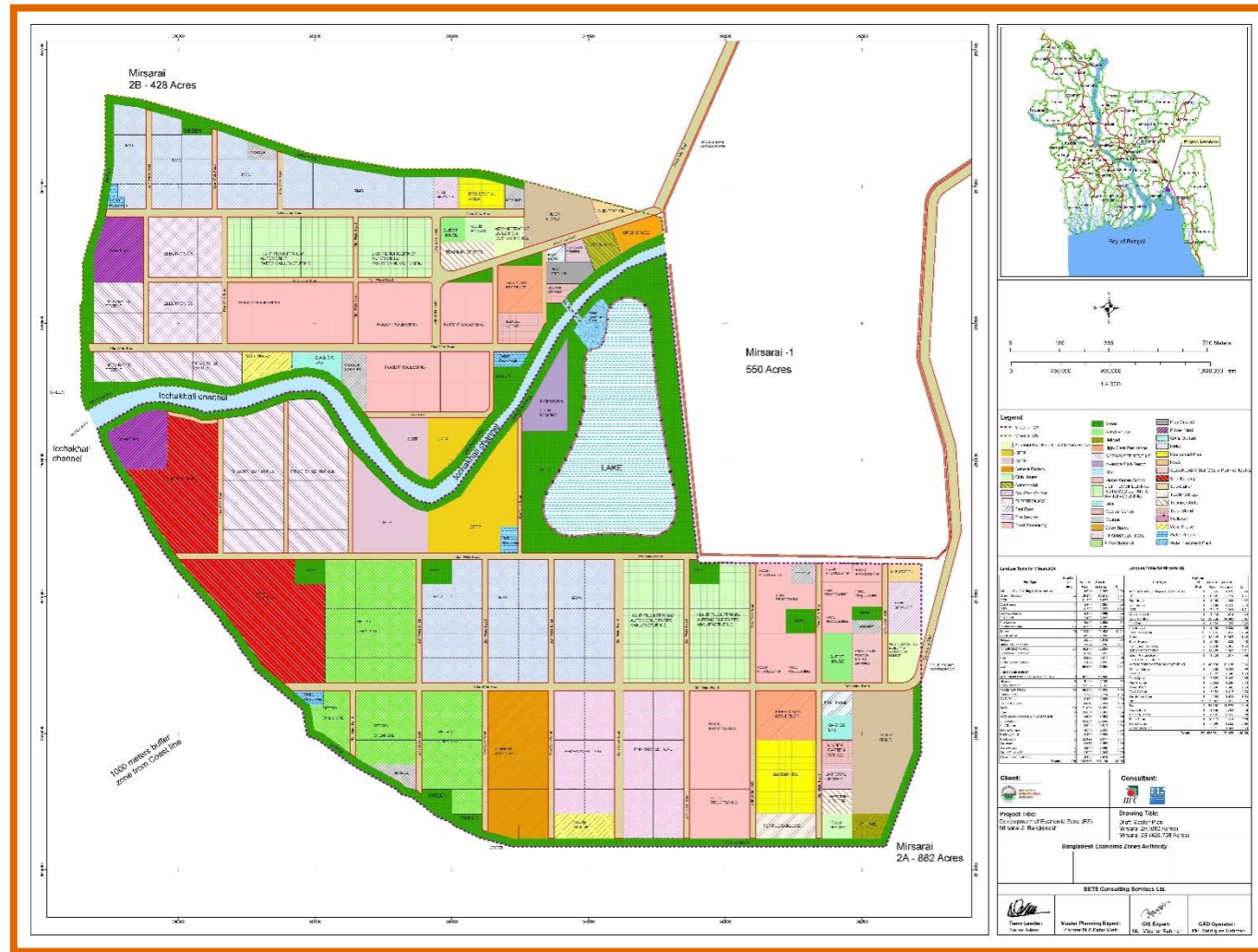


Figure 18: Master Plan of the Mirsarai EZ II

4.6. Project Schedule

Table 17 presents the implementation schedule of the off-site infrastructure details at the proposed Mirsarai EZ site.

Table 17: Implementation Schedule of Off-site Infrastructural Details

S.No	Offsite infrastructure	Duration in months from start
1	Site Development (filling)	12
2	Peripheralbund of 7.8 km ad 5 m width	12
3	Administration building	12
4	Widening of access road on CDSP & BWDB bund	6
5	Sluice gate for Isakhali channel	6

BEZA targets to start the work from September, 2016. The EZ development activities could be undertaken by the prospective developer following the off-site infrastructure development.

4.7. Resources and Utilities Demand

Construction Materials Sourcing

Construction material like steel, cement, concrete, bricks, aggregates etc. will be required for development of currently planned off-site facilities. Raw material requirement for the off-site facilities is given in the table 18.

Table 18: Construction Material Requirement for Off-site facilities

S. No.	Material	Quantity
Sluice gate		
1	Concrete	5875.8 cu m
2	Steel	1212.5 cu m
3	Sand	66 cu m
Widening of access road		
1.	Clearing and grubbing the right of way	144,000.00 sq m
2.	Roadway excavation	90,971.25 cum
3.	Bund	276981.0
4.	Embankment fill from borrow pits in contractors arranged land	43,200.00 cum
5.	Improved sub-grade through hydrated lime	28,800.00 cum
6.	Sub-base	21,600.00 cum
7.	Aggregate base type- II	27,000.00 cum
8.	Aggregate base type- I	21,600.00 cum
9.	Bituminous prime coat	108,000.00 sq m
10.	Bituminous tack coat	216,000.00 sq m
11.	Dense bituminous surfacing base course	8,640.00 cum
12.	Dense bituminous surfacing wearing course	4,320.00 cum
13.	Concrete class 10 for kerb foundation as shown in the drawing	648.00 cum
14.	Concrete class 30 for kerb as shown in the drawing	900.00 cum
15.	Formwork/shuttering, prop and necessary supports etc. (steel)	5,760.00 sq m
16.	Formwork/shuttering, prop and necessary supports etc. (steel)	14,400.00 sq m

S. No.	Material	Quantity
17.	Road marking- Thermoplastic material	14,400.00 sq m
Bund cum Peripheral road		
1.	Sand	31,21,596 cum
2.	360 X 360 m mm size pre-cast pile (1:1.5:3) with stone chips	12345 m
3.	Concrete for plint beam	3240 cum
4.	Formwork/shuttering prop	25920 sq m
5.	Grade 500 ribbed or deformed bar	427593.0 kg
6.	Precast blocks	356760 sq m
7.	Concrete block pitching for bund protection	53514
Administration Building		
1.	Sand	1098 cum
2.	Mass concrete	139.20 cum
3.	Polyethene sheet	84.5 kg
4.	RCC	777.0 cum
5.	Concrete	256 cum
6.	Steel	174674.30 kg
7.	Bricks (1.5 brick thickness)	557.00 cum
8.	Bricks (1 brick)	213 sqm
9.	Cement sand (6 mm thick plaster)	2514 sqm
10.	Cement sand (12 mm thick plaster)	4092.00 sqm
11.	Cement sand (12 mm thick plaster)	1178.00 sqm
12.	Plastic emulsion paint	6606.0 sqm
13.	Weather Coat Paint	589 sqm
14.	Textured Paint	589 sq. m
15.	Paint for door & windows	165.50 sqm
16.	Polish for door & windows	156.00 sqm
Site Preparation/Filling		
1.	Sand	21009651.00 cum
Embankment along Isakhali channel		
1.	Sand	276981 cum
2.	360 X 360 m mm size pre-cast pile (1:1.5:3) with stone chips	5427 m
3.	Cement concrete block for plint beam	7640
4.	Mass concrete for plint beam	253 cum
5.	Concrete for plint beam	1424
6.	Formwork/shuttering, prop and necessary supports etc. (steel) for plinth beam	11396 sq m
7.	Grade 500 ribbed or deformed bar	187944 kg
8.	Precast blocks	73870 sq m
9.	Concrete block pitching	73870 sq m

These materials will preferably be purchased/sourced from nearby markets.

Water

Water requirement during construction phase is estimated to be app. 50 KLD, which includes Domestic water requirement of construction workers. For storing rain water during construction phase, temporary rain water harvesting ponds can be constructed at the site. Water for construction shall be sourced from rain water harvesting ponds, Feni River & Ground water. Water requirement for the operation phase will be app. 15 MLD. Initial demand will be fulfilled from ground water to be tapped through 6 nos. tube wells. Location for borewell are to be decided by DPHE after undertaking ground water potential study for the area and the study is already initiated. DPHE will develop the water supply system and will operate it as well. BEZA has done a MoU with DPHE for developing and maintaining water supply system and the same is attached as Annexure IV. A lake of app 100 acres will be developed within the project site. This lake will receive the rain water from entire zone. This water after treatment can also be used for meeting the requirement as per availability. Mirsharai region receives good amount of rainfall (2540 mm annually). In

long term either a desalination plant should be set up to meet the water requirement of zone or option for feasibility of getting water from Mahamaya lake through pipeline can be explored which is app 12 km from site in East direction.

Power Requirement

Power requirement for the zone is estimated to be app. 110 mVA. Power can be sourced from the Power Grid Company of Bangladesh who is intending to set up a substation in Mirsarai. Provision of land has been made by BEZ to set up the substation within the EZ. BEZA has done MoU with Power Grid Company of Bangladesh for setting up power supply system and provision of power and the same is attached as Annexure V.

Street Lighting

Street lighting will be provided on the proposed road to be widening and peripheral ring road cum embankment. Solar street lights should be proposed in ratio of 1:2. Average illumination of 20 lux should be maintained on the roads.

Telecommunications

Mirsarai has mobile connectivity from almost all mobile companies. There is no fixed network. It is recommended to install BTCL (Bangladesh Telecom Company Limited) network, as fixed Phone Network of BTCL is the only reliable network.

Sewage & Effluent Treatment

All industries should be responsible for treatment of the sewage and effluent generated from their unit so that all industries are zero discharge. Sewage should be treated in the STP and effluent should be treated in the ETP. Treated water should be recycled and re-used within the site. Also provision should be made for CSTP and CETP at EZ site.

Flood and cyclone protection

Several cyclone protection measures have been taken by Govt. of Bangladesh for protection of inland area from cyclones. Mirsarai coastline is protected by two bunds (BWDB & CDSP) constructed by Bangladesh Water Development Board and under Char Development and Settlement Project. These two bunds protect inland area from tidal flooding. Also Mangrove plantation has been carried out along the coast line to further protect inland area by forest department. Recently a bund of height +8 m amsl has been constructed for under development Miresheroi EZ-I to protect the zone from cyclones. A cyclone shelter is also constructed by the Government in the area to provide shelter to people during cyclones. Flow in Isakhali canal is controlled with the help of sluice gates which helps in controlling the water flow in channel and prevent flooding of land area.

Proposed Mirsarai EZ-II site is seawards side of all the BWDB, CDSP bunds and newly constructed bund for Mirsarai EZ-I site. But to protect the site from inundation, it is proposed to construct superdike all along the periphery of the proposed site. Height of the bund will be +10 m amsl and width 10 m. This bund will also act as peripheral road to provide connectivity to the site. Further embankments of the bund are proposed to be provided with stone pitching on seaward side and glass turfing along with plantation in land ward site. To prevent flooding of site due to Isakhali channel, it is proposed to develop embankment of height +6.5 m along the Isakhali channel. A sluice gate will be developed on the Isakhali channel to manage the flow of water. Sluice will have 12 vents and is gated structure to control the flow of water from sea to canal. Peripheral drain will be constructed all along the periphery of the proposed EZ site to accommodate the storm water flow and it will be connected to Isakhali channel to drain the water. A MoU with BWDB is done for construction of sluice and its management, lining of canal slopes, embankment construction, designing water infrastructure, collect and share hydraulic information of nearby river, canal, sea & other water body and supervision of above mentioned works and is attached as Annexure VI. BWDB has proposed to develop another embankment in continuation with the proposed project embankment in

Southern direction to reclaim the lower land area. Proposed embankment design is as per BWDB embankment design. Copy of approved design by BWDB is attached as Annexure VII.

Green buffer of 30 m will be developed all along the project boundary and along Isakhali channel. . Also zone between sea and the project boundary (1km zone) will be planted with mangroves. This buffer and mangrove plantation will also reduce the impact of water ingress during cyclone

Green Belt Development

Green buffer of 30 m width will be developed all around the EZ site and along Isakhali canal. Avenue plantation will be developed all along the access road to be widened, bunds cum peripheral road and internal roads. Green buffers and avenue plantation will be carried out by the developer. Also zone of 1 km between EZ site and sea will be developed as green buffer. Green belt of 30 m should be 6 rows and 2 rows consisting of shrubs & herbs, 2 rows of small & medium trees and last 2 rows of tall trees.

In addition to this all industries will develop green belt of 10 m all around their respective plots. Native plant species consuming less water and requiring less after care and monitoring should be considered. Such species include Neem, Chambol, Sirish, Palms, Gewa, Mango, Mahagony etc. Green buffer should be 10 m in width & may consist of minimum 3 rows of vegetation. First row of green buffer should be small shrubs and herbs, second row of tall shrubs and small/medium height trees and last row of medium to tall heighted trees.

Solid Waste Generation from Proposed EZ Project

Waste to be generated during construction phase will be left out construction material like metal piece, wood piece, unused concrete, broken bricks, glass, ceramic, demolition waste etc. Quantity of the solid waste to be generated during construction phase may vary from 30-50 kg/day. This waste should be collected and segregated at the site itself. Recyclable and Re-usable waste should be separated and should be sent to recycler. Rejected waste should be disposed off at the designated sites by local authority.

Nature of solid waste generated during the operation phase will be highly variable due to presence of different kind of industries in the EZ. Majorly industries like food processing, textile, petrochemical, ship building and light engineering industries may come up in the EZ as planned for Mirsarai EZ-I. These industries are comparatively less polluting industries. Solid waste generated by industries should be managed by industries themselves. Solid waste can be of variable nature and will include industrial non-hazardous waste, hazardous waste, bio-degradable, non-biodegradable, e-waste, construction debris, hospital and bio-medical waste. A secured scientific landfill should be developed for disposal of municipal solid waste within the EZ site. Solid waste landfill site should be provided with the liners and drainage system for leachate. Liners prevent entry of leachate which may contaminate the underlying soil and ground water. Drainage system allows flow of leachate without accumulating in the landfill site. The leachate collected should be treated in CETP to be provided at site. Hazardous waste from industries should be disposed off only through authorized hazardous waste handling agencies by DoEB. No TSDF and hazardous waste recycling units exist in Bangladesh. But as the EZ development and coming up of industries may take time of app 3-4 years so by then hazardous waste rules will be formed in Bangladesh (in draft form at present) and some facilities may come up in Bangladesh for managing hazardous waste. Else all industries should incinerate the hazardous waste generated by them taking the required air pollution control measures.

4.8. Map and Survey Information

Project Location

Mirsarai EZ is proposed to be located in Mirsarai Upzila of Chittagong district, Bangladesh near Abu Torab Village. Mirsarai Upzila map showing location of the proposed project site is shown in figure 19 below. The project surrounding within 10 kms region is shown in figure 20 below.

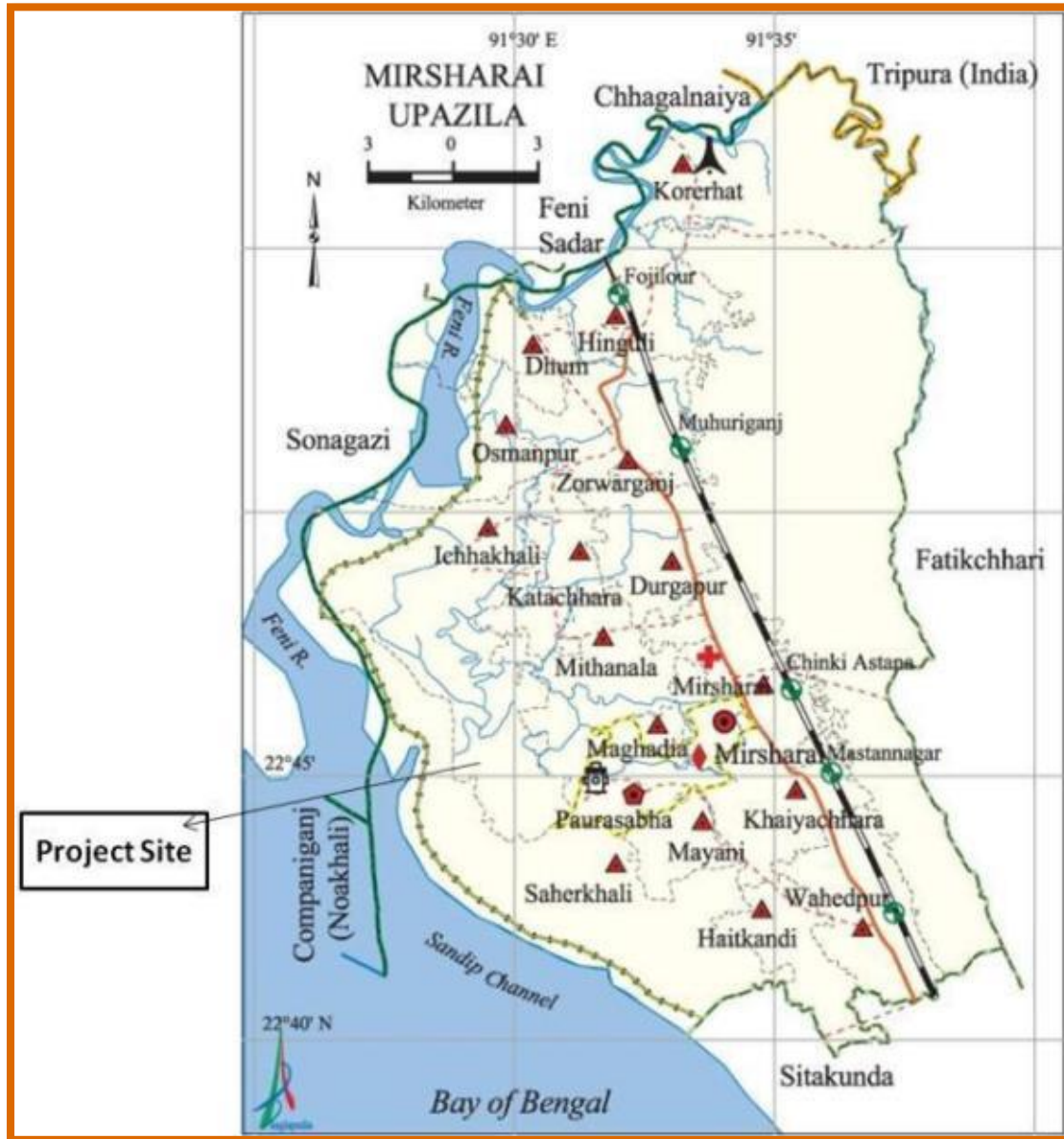
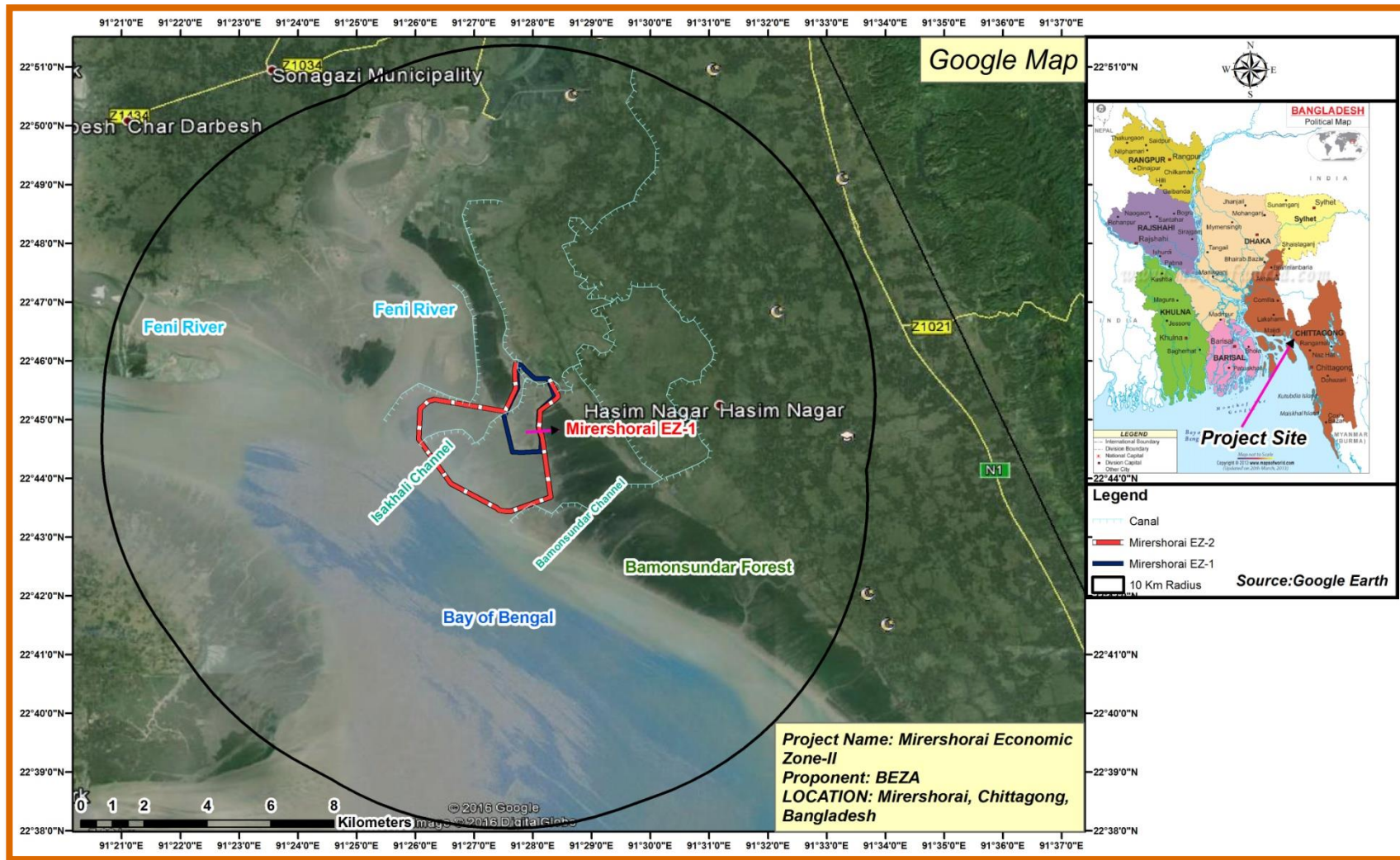


Figure 19: Mirsarai EZ-II site location on Mirsarai Upzila Map



Source: Google Earth

Figure 20: Project site and surroundings within 10 km radius

Topography of the Project Site

EZ site is generally flat. The land use of the project site is wetland. Area is classified as coastal plains of Chittagong. Network of deep channels, drains and streams is present at the site which gets flooded during the monsoon. Physiographic map of Bangladesh is given in figure 21 below. Site is required to be leveled and raised to a level of 1.15 m above NGL. At present average elevation of the site is 3 m amsl. The elevation of the land within the 10 km radius area varies from 0 m to 11 m. The area is covered by clayey deposits. Seasonal flooding of the site is observed due to stagnation of rain water and flooding of river and channel passing through the site. Soil is uniform at whole site and has low permeability. Contour maps of the 10 km radius study area are given in figure 22 below. Photographs showing the site conditions are given in figure 23 below.

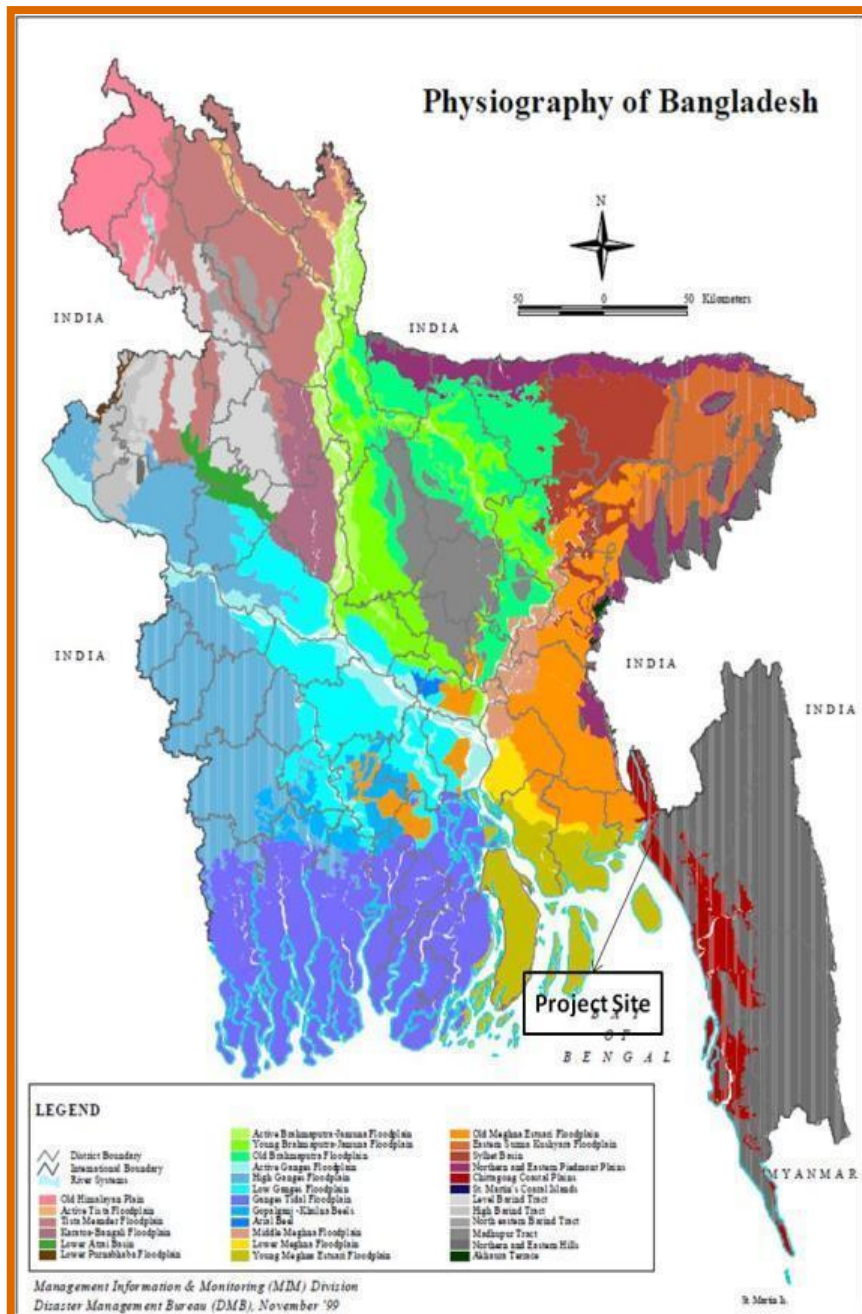
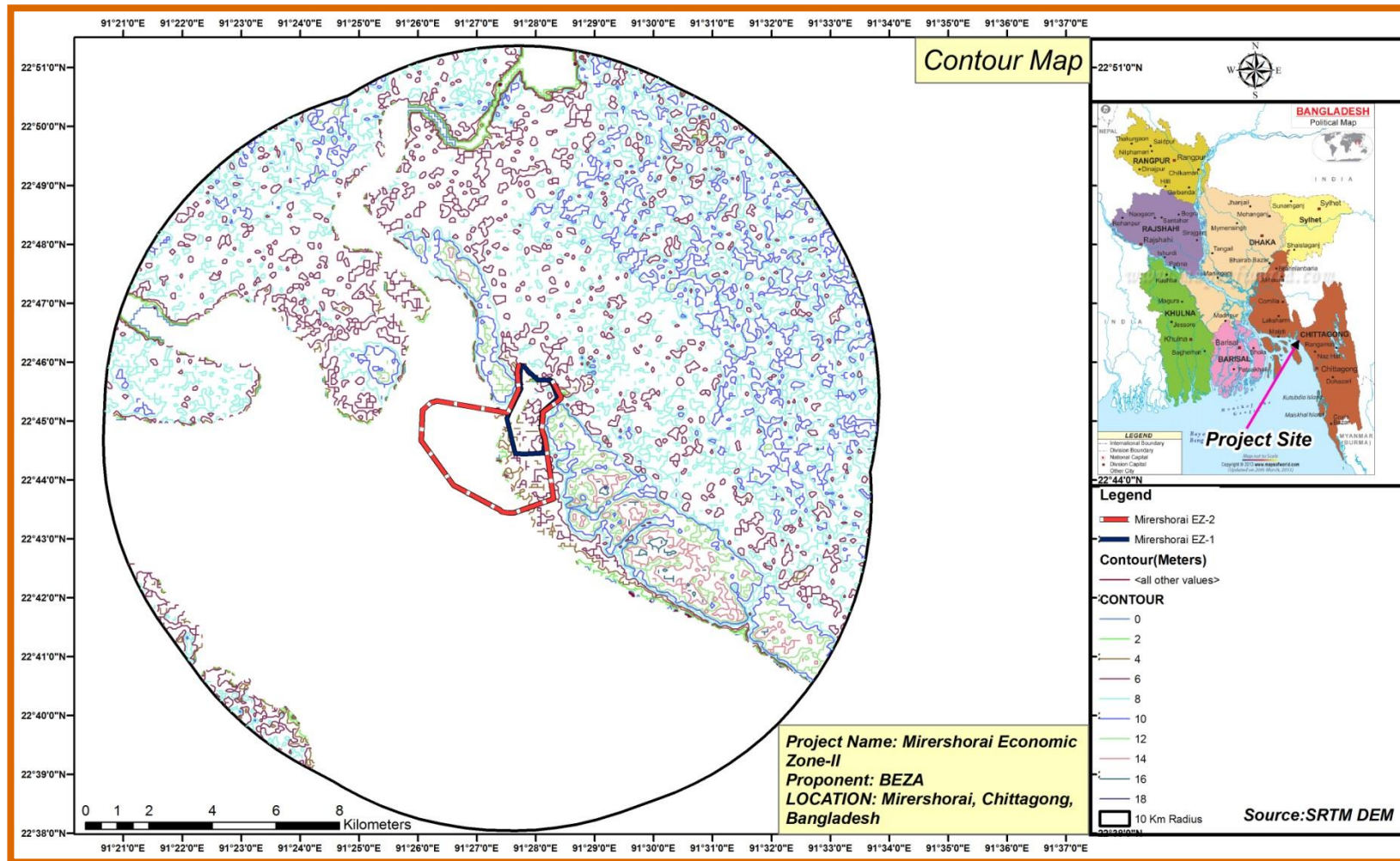


Figure 21: Physiographic Map of Bangladesh



Source: Mahindra

Figure 22: Contour Map of the 10 km radius of Mirsarai EZ-II

	
<p>Under Construction access road on CDSP Bund (to be widened to 2 lane)</p>	<p>Under Construction access road on BWDB Bund (to be widened to 2 lane)</p>
	
<p>Isakhali Channel</p>	<p>Bund Constructed for Mirsarai EZ Site-I (+8 m amsl) (Overlapping portion with proposed zone boundary to be converted to 10 m wide access road)</p>
	
<p>EZ Site</p>	

Figure 23: Topography of the Site and Off-site facilities

Eco Sensitivity

There are no ecological sensitive locations such as National Park, Sanctuary, Elephant/Tiger Reserve, Migratory routes and wetlands within the 10 km radius of the study area. Forests within 10 km radius area of project site are Bamon Sundar Forest (abuts project site), Domkhali Forest (9.0 kms, SE) and

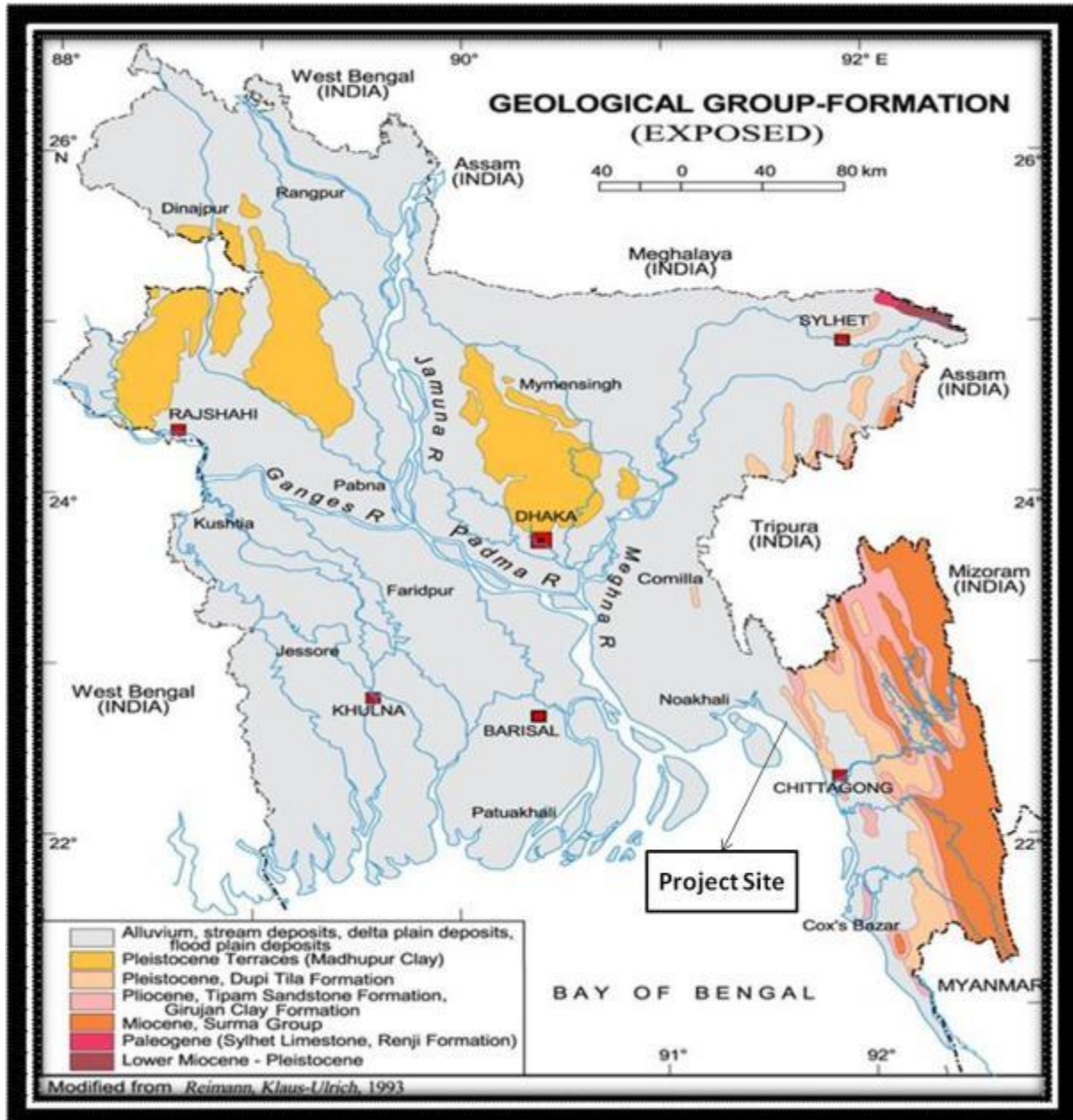
Mogadia forest (8.0 kms, NE). These are mainly planted Mangrove plantations by Forest Department to protect the inland areas from action of sea. Ramgarh Sitakund Reserve Forest is located at distance of 15 km in East direction. Mangrove plantation is carried out in Bamon Sundar Forest by forest department to protect inland area from cyclones and floods. Photographs of Bamon Sundar Forest are given below in figure 24.



Figure 24: Photographs of Bamon Sundar Forest

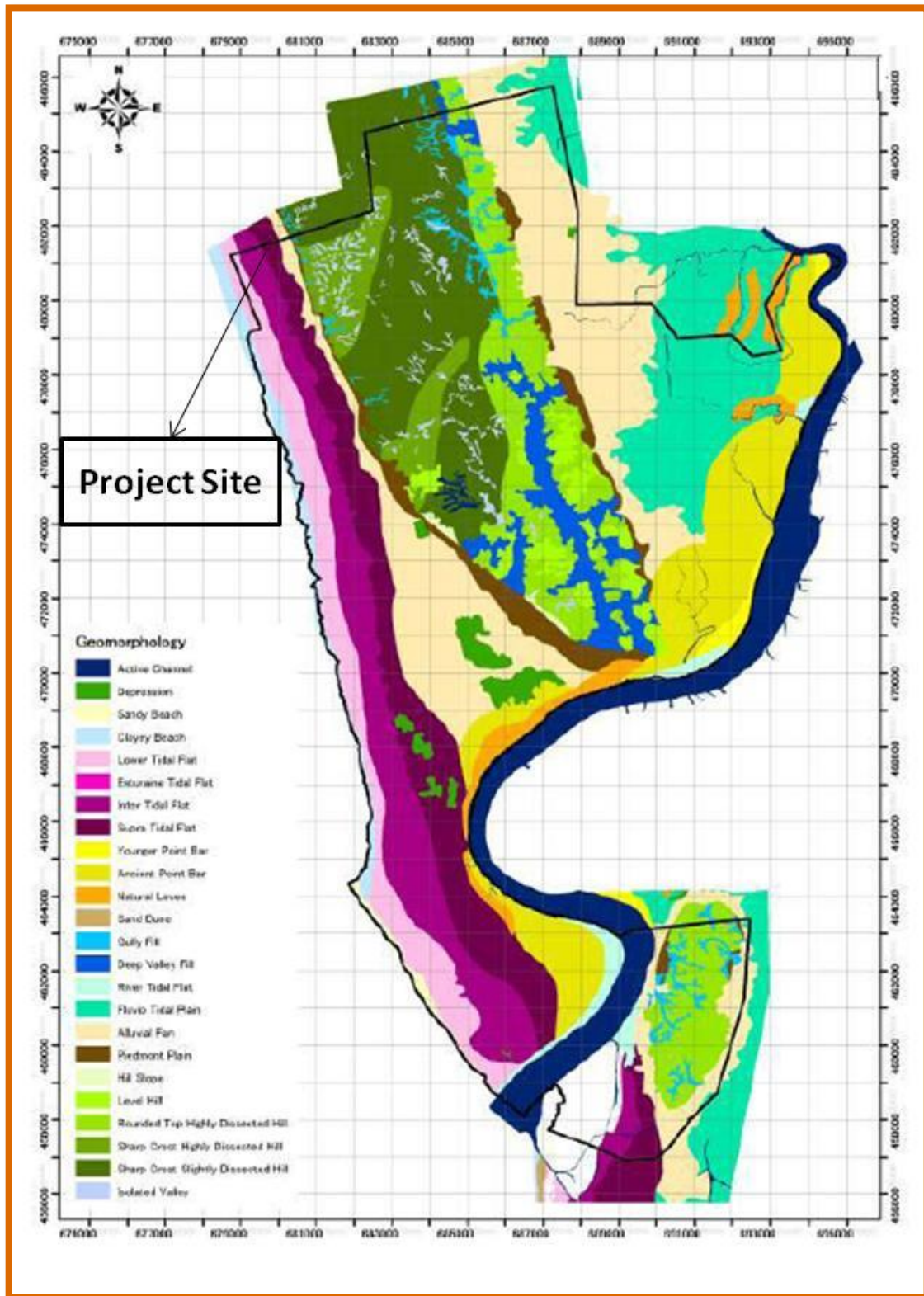
Geology

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 25), site is covered with stream and flood plain deposits and is classified as lower and inters tidal flats as per geomorphic map of Chittagong. Geomorphology map (figure 26) of Chittagong shows that project site is classified as inter tidal plains.



Source: Geological Survey of Bangladesh

Figure 25: Geological Map of Bangladesh



Source: Geological Survey of Bangladesh

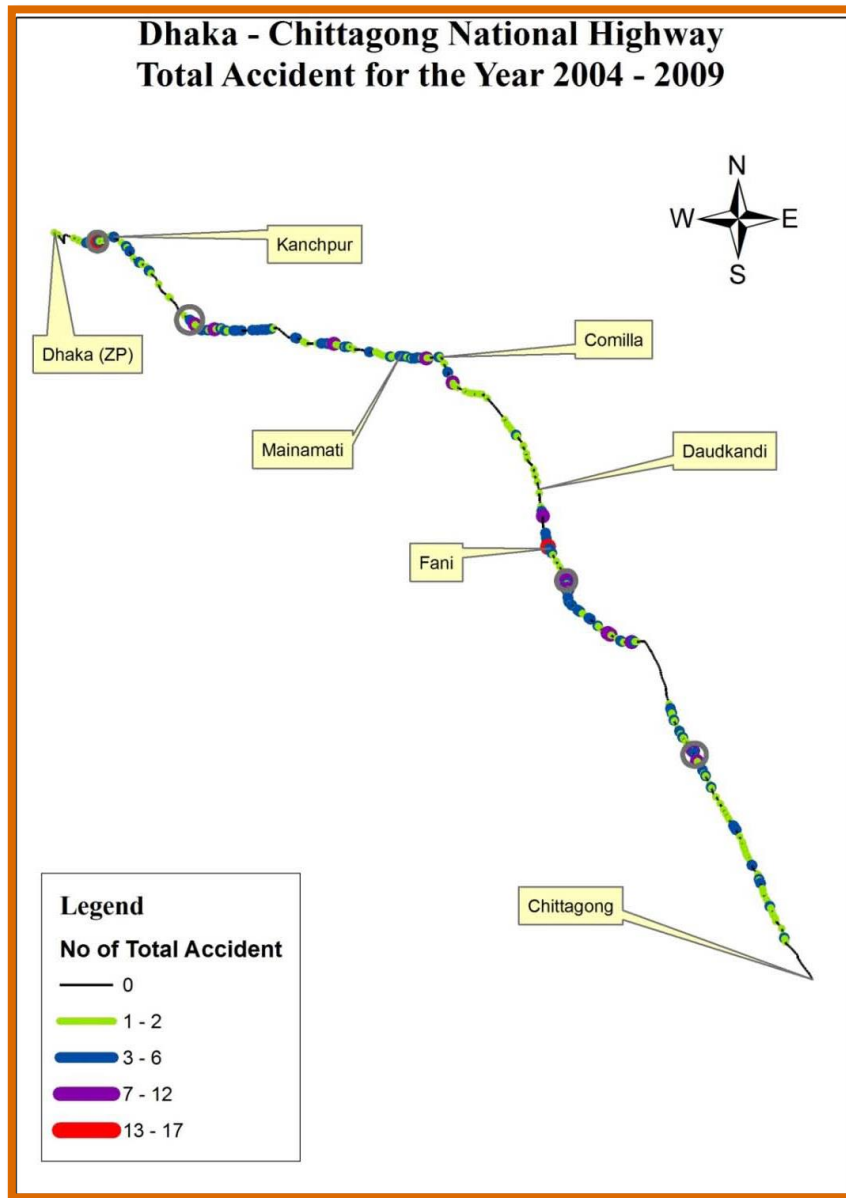
Figure 26: Geomorphologic Map of Chittagong

4.9. Transportation Options for the EZ

The EZ has options of road, rail, air and water ways transportation. Availability of seafront makes project more viable for industrial development. Project site has good road and rail connectivity as well. The details of available options are given in the following section. Current traffic and estimated traffic generation from EZ is also given in this section.

Road Transportation System and Traffic Assessment

At present project site is accessible through non motorable bund constructed as boundary/dike for Mirsarai EZ-I. This bund is further connected to under construction road on CDSP & BWDB bund which is also being developed for Mirsarai EZ-I. This under construction road connects to the Abu Torab road which is motorable. Abu Torab road is in a dilapidated condition and presently only 4 wheel drive vehicles can access the site. For movement of heavy traffic like trucks, Lorries, it is required to strengthen the existing Abu Torab road. Abu Torab road connects finally to N-1 (Dhaka Chittagong Highway). Dhaka Chittagong highway is one of the busiest highways in the country. Traffic is increasing every year on this highway. Bi-directional traffic volume on the highway in 2009 was recorded to be 5632798 whereas it was 3206277 in 2006. Average traffic growth rate of 21.03% is estimated as per the study carried out by BUET. High rate of accidents are reported on this highway. Map (figure 27) showing the accident prone locations on the highway is given below. Total 840 accidents are reported on this highway between 2004-2009 and out of this 675 are fatal (Aalam & Ahsan, 2013). Traffic is anticipated to generate due to development of proposed economic zone II. It is estimated traffic of app. 600 PCU will be generated due to project development. To accommodate this traffic it is propose to widen the under construction 7 km road from single land to two lane.



Source: Alam, M.; Ahsan, H. M., 2013

Figure 27: Map Showing Most Accident Prone Location on the Dhaka Chittagong Highway

Rail & Air Transportation System for Project Site

Nearest airport is Shah Amanat airport located in Chittagong at distance of 79 km in South direction from site. An unfinished Rampal airport is at 22 km from site in NNE direction. Nearest Railway station is Bartakia & Mirsarai Railway station which is at distance of 9.5 km & 10 kms respectively in East direction from site.

Water Transportation System

Inland water transportation system is well developed. Feni River is located at distance of 800 m from the site in west direction from the project site. Isakhali channel traverses through the site and Bamon Sundar Channel touches the site in SE direction. Site is located at 4.0 kms from Bay of Bengal in South direction. Chittagong port is deepest sea port of the country and is located at distance of 67 kms from the site (85 kms by sea route). A jetty should be developed for the EZ for transportation of men and material from Chittagong port to EZ site through sea, river Feni and channels.

4.10. Cost of the Project

The total estimated cost of the proposed off-site facilities is about 5237 million BDT that includes the construction cost for construction of administration building; widening of 7 km length, singlelane road to 2 lane; Embankment and land filling of 1311.11 acres for 2.5 m above NGL , water supply , electric substation and sluice gate. Details of cost of each component are given in table 19 below.

Table 19: Cost of the Development of Proposed Off-site Facilities

S. No.	Description of work	BDT (Million)
1	Embankment & Site Filling for 2A	2728
2	Embankment & Site Filling for 2B	1573
3	Access Road including Culverts	280
4	Admin Building	240
5	Sluice Gate	216
6	Water Supply	80
7	Electric Substation	120
Total		5237

5. Description of Environment (Environment and Social Baseline)

5.1. Prelude

The environmental status around the proposed project site is analyzed for valued environmental components viz., air, water, land, noise, soil, and ecology and socio-economic in a 10 km radial radius around the site. The baseline provides the basis for assessment of impact (likely changes in the baseline conditions) due to the proposed interventions (EZ development project).

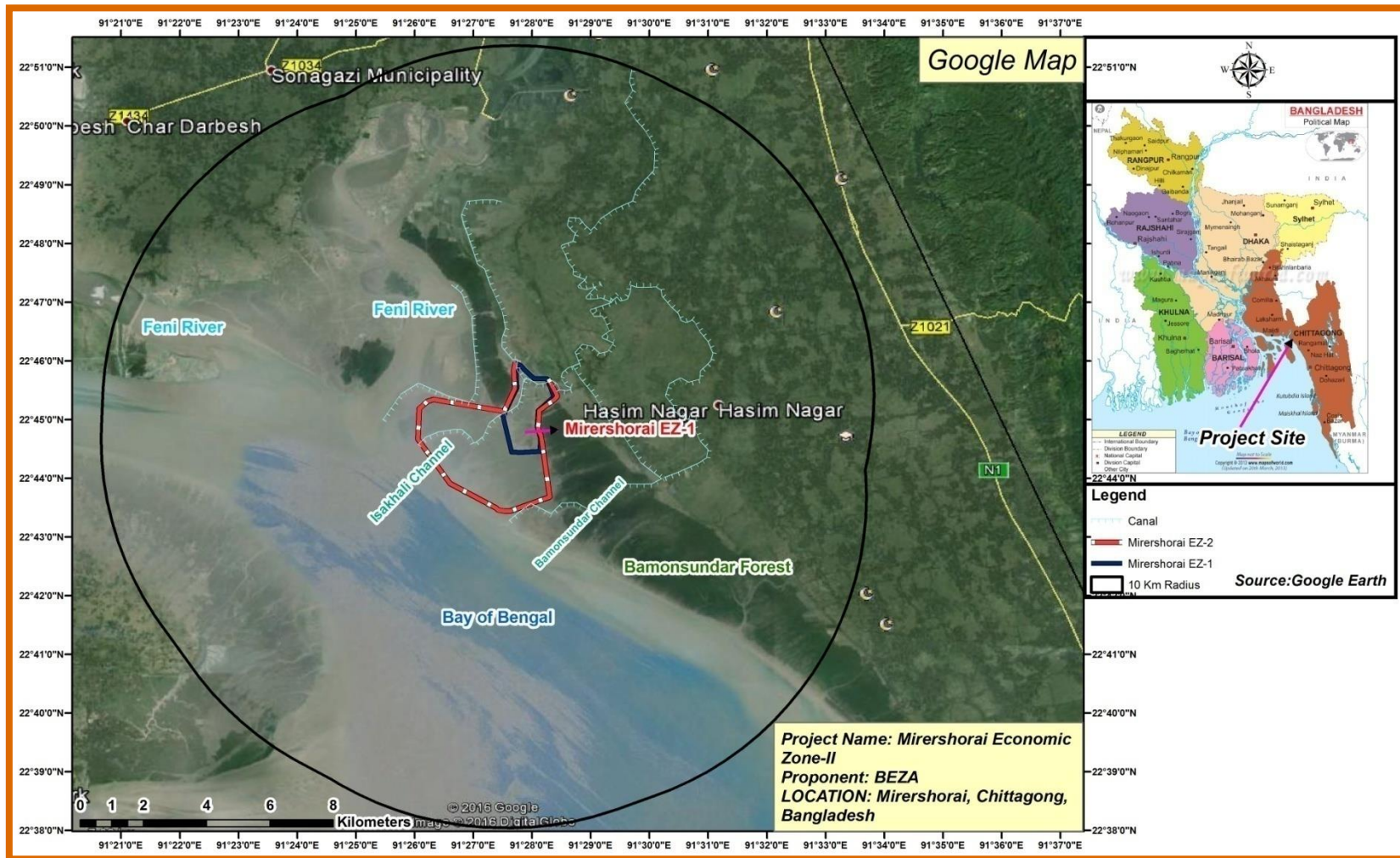
5.2. Site Description and Its Environs

The site and surrounding details have already been presented under chapter 4. The study area considered as 10 KM radius around the EZ site. The project activity areas are considered as core area and remaining study area as buffer zone. Environment setting of 10 km radius area around EZ site and surroundings of access road to be widened are given in table 20 and figures 28 & 29 below.

Table 20: Environmental Setting

Particulars	Details
Location	Near Village Abu Torab, Mirsarai upzila, District Chittagong, Bangladesh Latitude: 22° 44.951'N Longitude: 91° 27.792'E
Nearby Villages	Charsharadh Village (3.0 km, SW) Nayapara Village (4.0 km, SW)
Site Elevation	Undulating, elevation variation of 3-8 m amsl
Nearest Airport	Shah Amanat International Airport (79 km, NNW)
Nearest Railway Station	Mirsarai Rail Station (10 km, West) Bartakia Rail Station (9.5 km, West)
Nearest Port	Chittagong Port (67 km, S)
Climatic conditions	Avg. Daily wind speed – 2-7 m/s Monthly Min. Temp. – 13.9°C (January) Monthly Max. Temp. – 32.3°C (May) Annual Avg. Rainfall – 2540 mm Monthly Average Humidity – 70-85%
Seismic Zone	Zone II
Forests / National Parks	None within 10 kms Mangrove Plantation Forest in East & West Direction of EZ site
Archaeologically important places/monuments	None within 300 m from the EZ site

Source: Google Earth & Site Visits



Source: Google Earth

Figure 28: Map Showing Environmental Settings within 10 km Radius of Project Site



Source: Google Earth

Figure 29: Map Showing Surroundings of Road Alignment to be Widened from singlelane to 2 lane

5.3. Baseline Data Collection and Monitoring Stations

The present EIA Report has been prepared based on the Primary field investigations / assessment, and secondary data from data collected from Department of Public Health and Engineering (DPHE), Bangladesh Water Development Board, Forest Department, Bangladesh Meteorological Department, Bangladesh Bureau of Statistics, existing studies, Geological Survey of Bangladesh, DoEB, published journals, and books, public consultation, existing EIA study and site observations. Secondary data available on air quality, water quality and soil quality is used for the defining the baseline environment of the area.

5.4. Meteorology

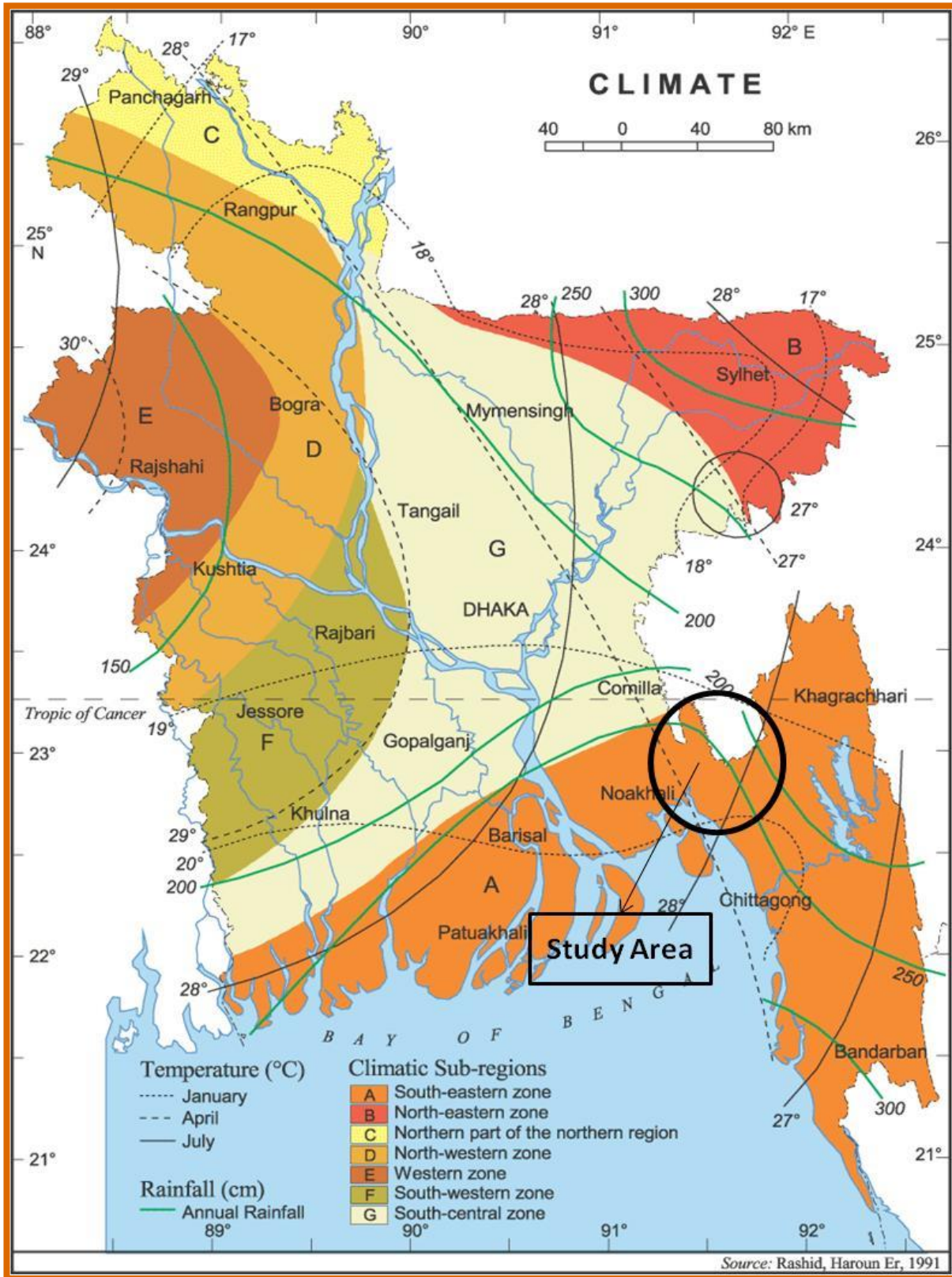
The project area lies in the South-Eastern climate zone of the country and shows three main seasons, i.e.

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 Chittagong. Chittagong has significant rainfall most months, with a short dry season. According to Köppen and Geiger, this climate is classified as Tropical Monsoon Climate (Am). Meteorological condition has been established using data on different metrological parameters accumulated from Bangladesh Meteorological Departmentfor Chittagong Division. Summary of the analysis of metrological parameters are given in the following sections.



Source: BMD

Figure 30: Climate Region Map of Bangladesh

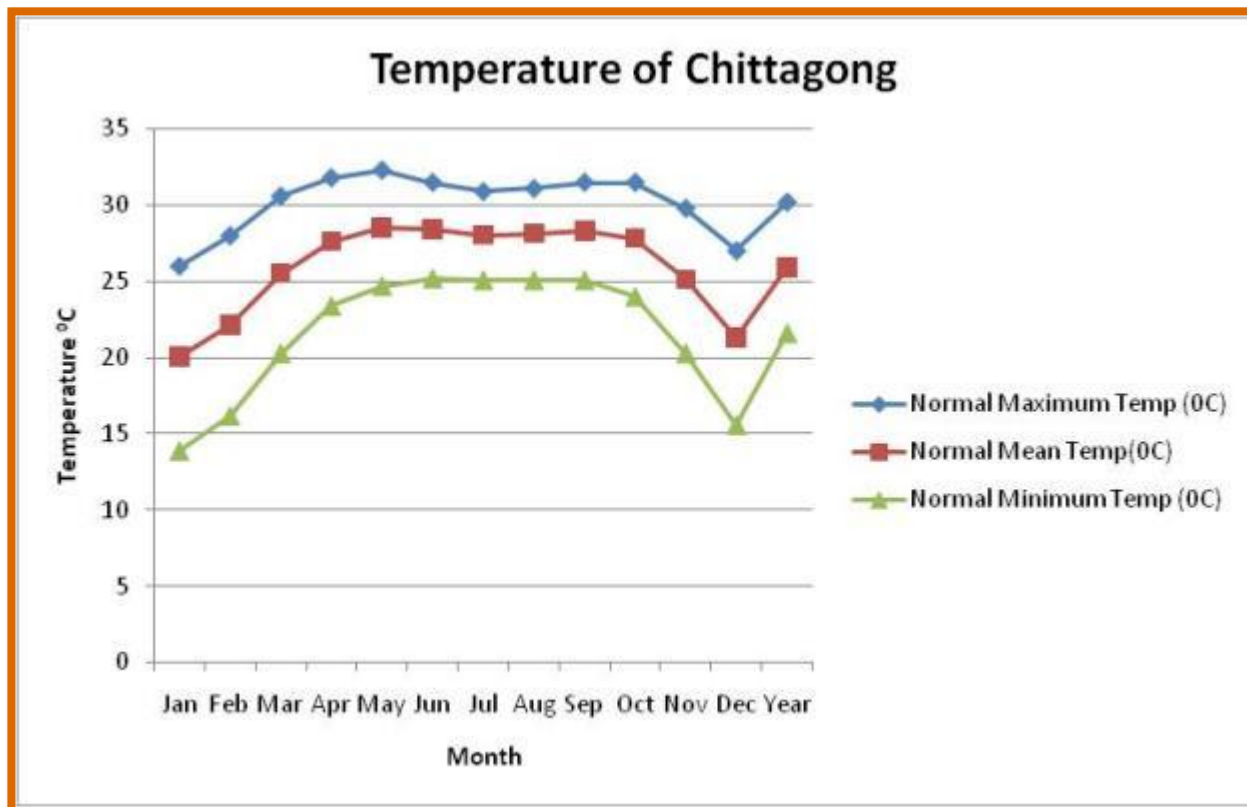
5.4.1. Temperature

The average temperature in Chittagong is 25.7 °C. In Mirsarai area temperatures vary from 6-9°C in winters and 37-41°C in summers. Temperature of Chittagong& Sitakunda area is given below in tables 21 & 22. Met stations in Chittagong city and Sitakunda area are at distance of app. 50.0 and 25.0 kms respectively from the site.

Table 21: Temperature Data of ChittagongCity

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Monthly Maximum (°C)	31.7	33.9	37.2	38.9	36.7	36.7	34.4	33.9	35	34.4	34.9	31.1	38.9
Normal Maximum (°C)	26.0	28.0	30.6	31.8	32.3	31.5	30.9	31.1	31.5	31.5	29.8	27.0	30.2
Normal Mean (°C)	20.0	22.1	25.5	27.6	28.5	28.4	28.0	28.1	28.3	27.8	25.1	21.3	25.9
Normal Minimum (°C)	13.9	16.2	20.3	23.4	24.7	25.2	25.1	25.1	25.1	24.0	20.3	15.6	21.6
Monthly Minimum (°C)	5.2	6.6	10.2	13.6	14.3	18.1	19.4	19.9	17.2	12.7	10.0	7.5	5.2

Source: BMD



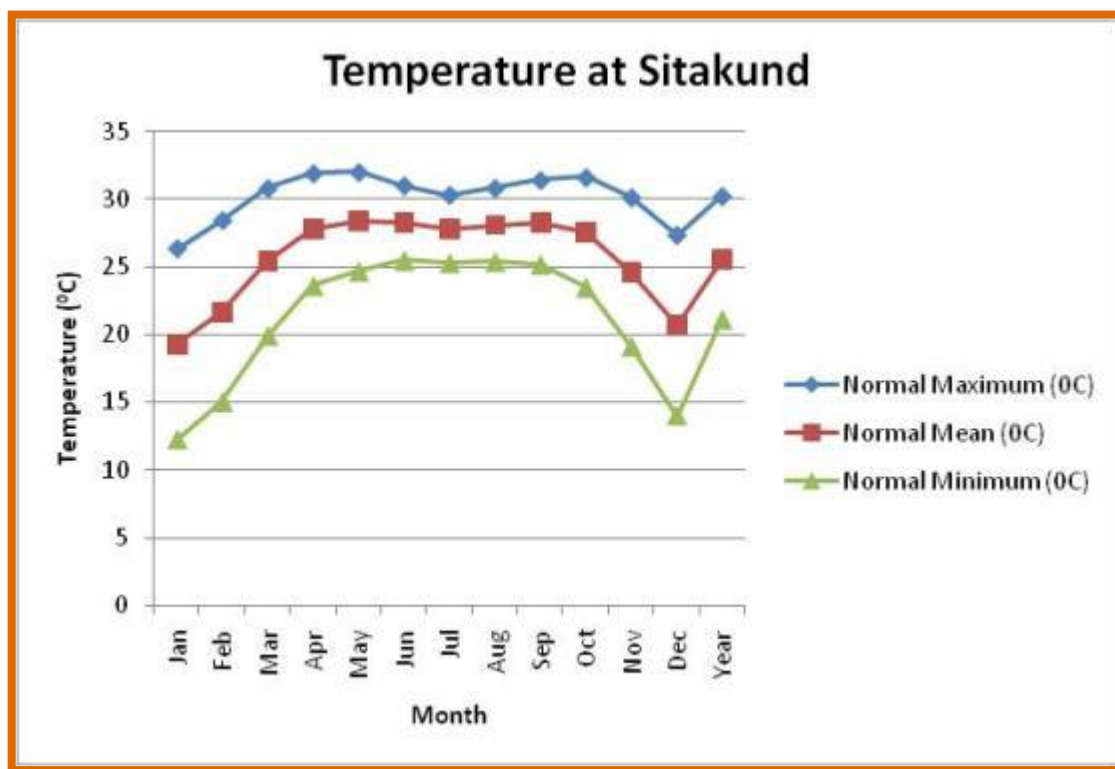
Source: BMD

Figure 31: Temperature of Chittagong City

Table 22: Temperature Data of Sitakund Area

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Monthly Maximum (°C)	26.6	28.0	32.5	32.4	32.4	31.2	30.4	31.3	31.5	32.7	29.1	27.4	30.5
Normal Maximum (°C)	26.3	28.4	30.8	31.9	32.0	31.0	30.3	30.8	31.4	31.6	30.1	27.3	30.2
Normal Mean (°C)	19.3	21.7	25.4	27.8	28.4	28.3	27.8	28.1	28.3	27.5	24.6	20.7	25.6
Normal Minimum (°C)	12.2	15.0	19.9	23.6	24.7	25.5	25.3	25.4	25.2	23.5	19.1	14.0	21.1
Monthly Minimum (°C)	11.2	14.6	18.3	24.0	26.9	25.9	25.6	25.5	25.5	24.5	21.0	13.5	21.3

Source: BMD



Source: BMD

Figure 32: Temperature of Sitakund Area

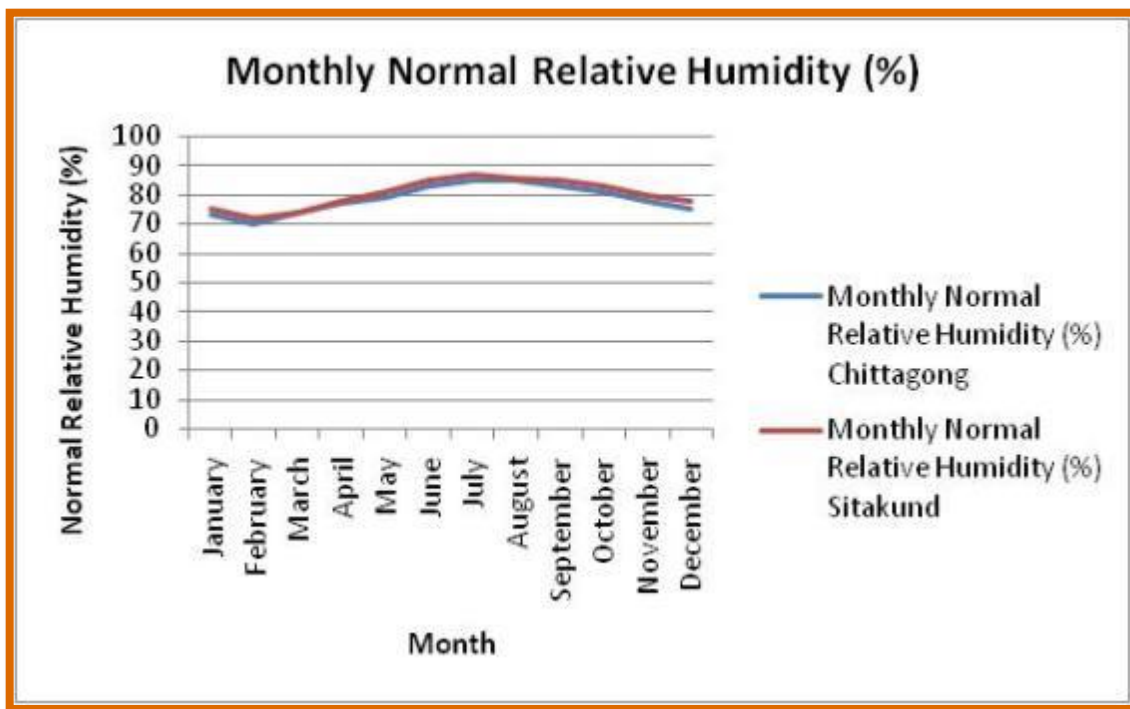
5.4.2. Humidity

Humidity in the Chittagong varies from 40% in day time of February month to 90% in month of July & August. Monthly normal humidity data of the Chittagong area is given in the table 23 below

Table 23: Monthly Normal Humidity in Chittagong District

S. No.	Month	Monthly Normal Relative Humidity (%)	
		Chittagong	Sitakund
1	January	73	75
2	February	70	72
3	March	74	74
4	April	77	78
5	May	79	81
6	June	83	85
7	July	85	87
8	August	85	86
9	September	83	85
10	October	81	83
11	November	78	80
12	December	75	78

Source: BMD



Source: BMD

Figure 33: Humidity of Chittagong

5.4.3. Rainfall

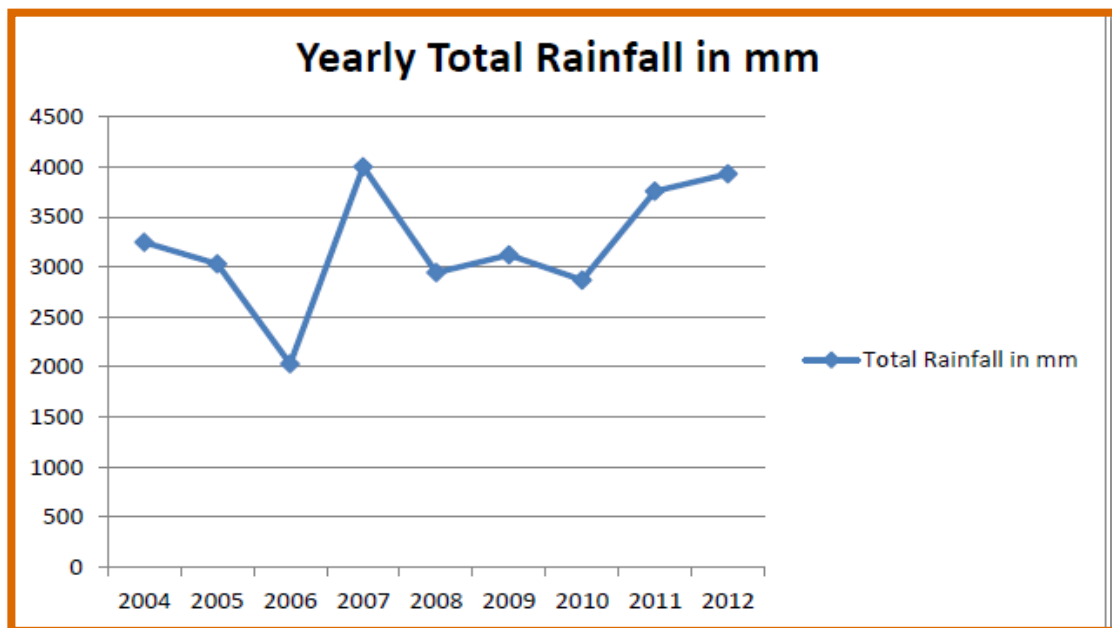
Rainy season is very prominent in this region like other coastal areas of the country. Nearest Meteorological station of BMD to the site is Sitakund which is app. 25.0 km to EZ site in SW direction. Average yearly rainfall of the area is 3215 mm. Average annual rainfall of the Mirsarai region is 2540 mm. June July and August are month of highest rainfall in the area. Highest rainfall in 2012 occurred in July of 1274 mm. Hourly maximum Average daily maximum rainfall in the area is 195.1 mm and the highest

recorded figure is 269 mm in August, 2012. Average rainfall observed in three hours was about 103.1 mm and highest three hourly rainfall observed is 180.5 mm recorded in 2008. Average hourly intensity of the rainfall of the area is 34.4 mm/hour. Highest hourly rainfall of 60.17 mm/hr was recorded in year 2008. Normal monthly rainfall data of Sitakund area and nos. of rainy day is given in table 24 below.

Table 24: Average Normal Rainfall of Sitakund

S. No.	Month	Rainfall (mm)	Nos. of rainy days
1	January	5.6	1
2	February	19.6	2
3	March	91.9	4
4	April	184.5	8
5	May	351.0	13
6	June	548.4	16
7	July	726.8	19
8	August	545.6	18
9	September	316.4	14
10	October	240.3	8
11	November	54.2	2
12	December	7.9	1

Source: BMD



Source: BMD

Figure 34: Yearly Total Rainfall of Sitakund

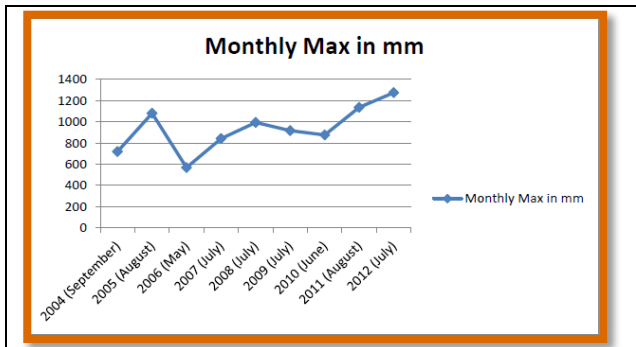


Figure 35: Monthly Maximum Rainfall of Sitakund

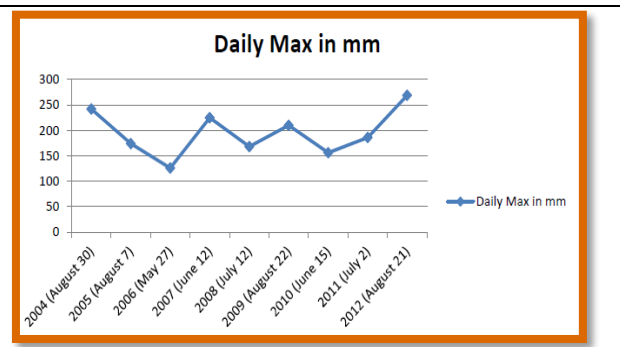


Figure 36: Daily Maximum Rainfall of Sitakund

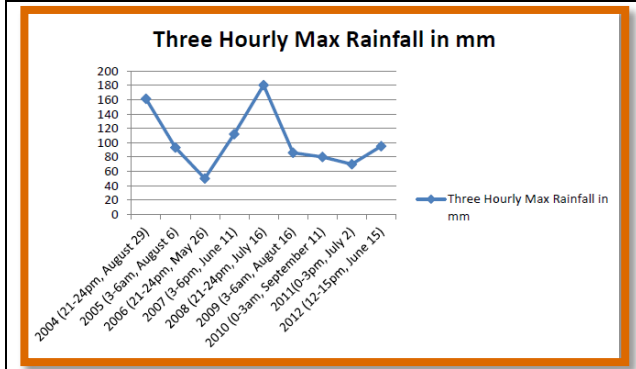


Figure 37: Three Hourly Maximum Rainfall of Sitakund

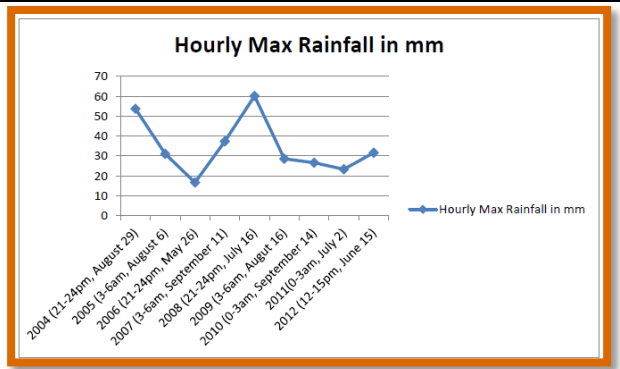


Figure 38: Hourly Maximum Rainfall of Sitakund

Source: BMD

5.4.4. Evaporation

Evapo-transpiration reaches its maximum level in April when temperature, sunshine and wind are all at, or close to, their maximum levels for the year. Potential evapo-transpiration data for 4 stations of the Chittagong Region are presented in table 25 below. Feni is nearest to the site at distance of app 15.0 km in NNW direction. In Feni evapo-transpiration varies from 68 to 145 mm/day and yearly evapo-transpiration in Feni is 1288 mm/day.

Table 25: Monthly Potential Evapo-Transpiration Data

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly
Chandpur	68	82	129	146	139	107	109	112	103	101	77	62	1235
Comilla	71	89	138	152	144	120	118	122	111	103	81	64	1314
Feni	72	89	130	143	145	115	113	117	110	106	81	68	1288
Maijdee	67	83	125	145	141	106	106	115	104	101	78	66	1238

Source: BMD

5.4.5. Winds

Like the country's wind characteristics, the region is characterized by Southerly wind from the Bay of Bengal during monsoon and Northwesterly wind from Himalaya during winter. As per BMD, windiest month is May with average wind speed of 4 m/s and least windy month is October with average wind speed of 2m/s. Data on normal windspeed of the Chittagong and Sitakund area is given in table 26 below

Table 26: Normal Wind Speed Data of Chittagong and Sitakund Area

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly
Chittagong	2.5	3.2	5.03	7.54	7.44	8.77	8.8	7.92	5.5	3.0	2.14	2.11	5.37

Sitakund	1.12	1.57	2.56	3.21	3.21	3.70	3.54	3.19	2.19	1.21	0.86	0.83	2.26
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Units: m/s& Source: BMD

5.4.6. Sunshine Hours

The monthly average sun-shine hour in Chittagong 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 sun-shine hour of 12 hour in a day is found in April, May& June.

5.5. Water Resources

5.5.1. Surface Water System& Drainage

Major water body within 10 km study area is river Feni, Feni reservoir, Isakhali canal and Bamon Sundar Canal. Project site lies in the flood plain of Feni River. Other waterbodies in the 10 km radius area are Kachoppia khal, Daburkhali khal, Jailiachora khal, Kananchori khal, Maidrchora khal and Lambakhali khal.

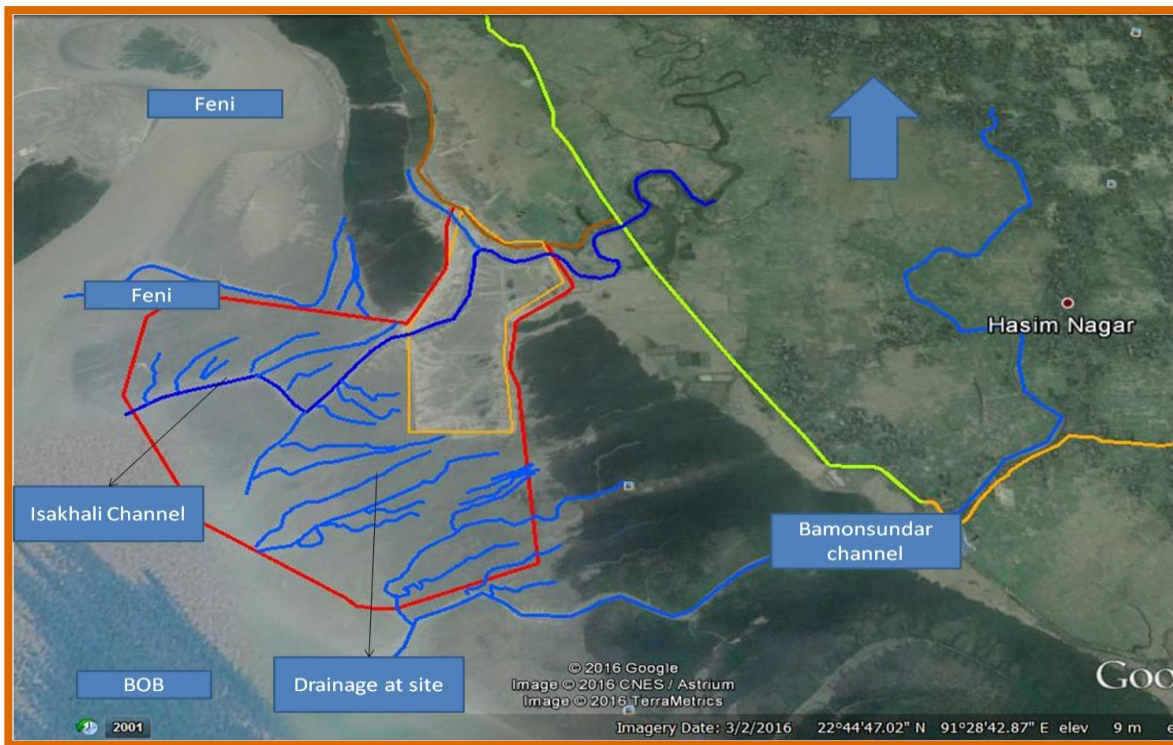
Feni River originates in the eastern hills of Tripura and enters Bangladesh at Belchhari of Matiranga Upzila of Khagrachhari District. It flows through Ramgarh (Khagrachhari), Fatikchhari (Chittagong) and then flows along the border of Chittagong (MirsaraiUpzila) and Feni (Chhagalnaiya, Feni, Sonagazi Upzila) 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. Flow data of Feni River North of project site is given in figure 39 below.

Project site is wet land and it gets inundated fully during monsoon season. Forest area within the site gets flooded during monsoon and high tide. The area geo-morphologically is classified as coastal plains. Isakhali canal runs through the proposed EZ site and divides the project site into three parts. The canal is source of water for various villages in upstream. Water in Isakhali channel 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. Whole site is criss cross with deep natural drains. Direction of flow is towards the Isakhali channel and the water from Isakhali channel is finally drained into the sea. Map showing drainage pattern within EZ and 10 km area is given below in figures 40& 41.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	20.2	14.0	11.0	16.7	147.3	170.3	293.0	212.9	206.1	126.3	52.0	34.9
1992	21.8	19.3	119.9	13.3	15.4	113.6	49.9	132.5	96.6	57.8	22.5	9.5
1993	16.4	18.0	25.3	18.1	83.1	56.1	190.3	90.7	120.9	76.7	53.2	35.7
1994	30.2	23.5	4.5	27.7	47.8	100.6	277.6	146.5	111.8	80.8	47.5	42.8
1995	25.0	17.8	49.3	16.4	197.4	127.1	245.3	327.8	66.8	69.3	26.6	28.9
1996	16.1	14.4	12.0	12.2	74.9	154.0	60.0	128.0	41.0	99.0	166.7	19.7
1997	19.3	15.8	14.5	26.8	48.1	68.6	138.8	158.5	112.1	39.8	13.0	15.4
1998	32.2	31.7	24.3	43.4	86.1	256.6	112.7	176.2	197.3	69.2	49.0	26.4
1999	32.4	17.5	24.2	28.5	28.5	94.8	70.4	134.3	93.4	84.4	50.0	38.2
2000	25.2	34.1	43.8	48.9	122.5	143.2	184.1	245.8	125.4	90.8	92.6	77.3
2001	43.8	35.2	34.2	53.7	19.3	28.1	22.9	35.4	43.6	37.6	23.0	8.1
2002	4.1	1.7	1.1	1.0	2.2	32.2	222.9	72.7	23.4	23.0	9.3	4.1
2003	1.8	0.9	1.1	3.5	0.9	48.1	11.0	25.3	29.7	27.0	20.1	4.7
2004	1.3	0.8	0.7	10.5	0.7	72.7	107.8	363.6	236.3	250.1	174.9	144.5
2005	69.5	12.9	14.7	18.0	73.9	135.7	147.9	224.4	163.1	203.6	160.3	119.3
2006	85.8	82.0	81.7	95.4	90.1	169.1	214.3	313.1	137.2	117.4	90.2	83.7
2007	77.4	15.8	30.8	53.0	179.9	227.1	82.7	20.8	89.0	74.2	-	-
2008	21.4	14.7	15.1	14.1	19.4	31.5	52.2	114.0	104.9	103.3	102.2	100.7
2009	3.3	2.1	2.5	3.2	7.2	5.9	79.6	213.0	166.7	110.8	110.0	104.8
2010	40.7	11.6	7.4	7.3	27.2	89.5	76.4	86.5	76.4	91.9	55.1	34.1
2011	38.5	39.5	44.1	44.7	48.1	46.8	111.4	227.5	107.1	47.9	24.2	35.9
2012	33.0	27.9	33.5	34.0	106.6	119.1	99.5	-	-	-	-	-
Average	30.0	20.5	27.1	26.8	64.8	104.1	129.6	164.3	111.9	89.6	63.9	46.1
75% dependable	16.5	11.4	10.0	14.1	21.1	58.3	68.8	105.2	61.9	50.4	30.5	20.1

Source: IEE, BAN: Irrigation Management Improvement Project, Muhuri Irrigation Project, Chittagong

Figure 39: Flow Data of Feni River



Source: Google Earth

Figure 40: Drainage Pattern of EZ Site

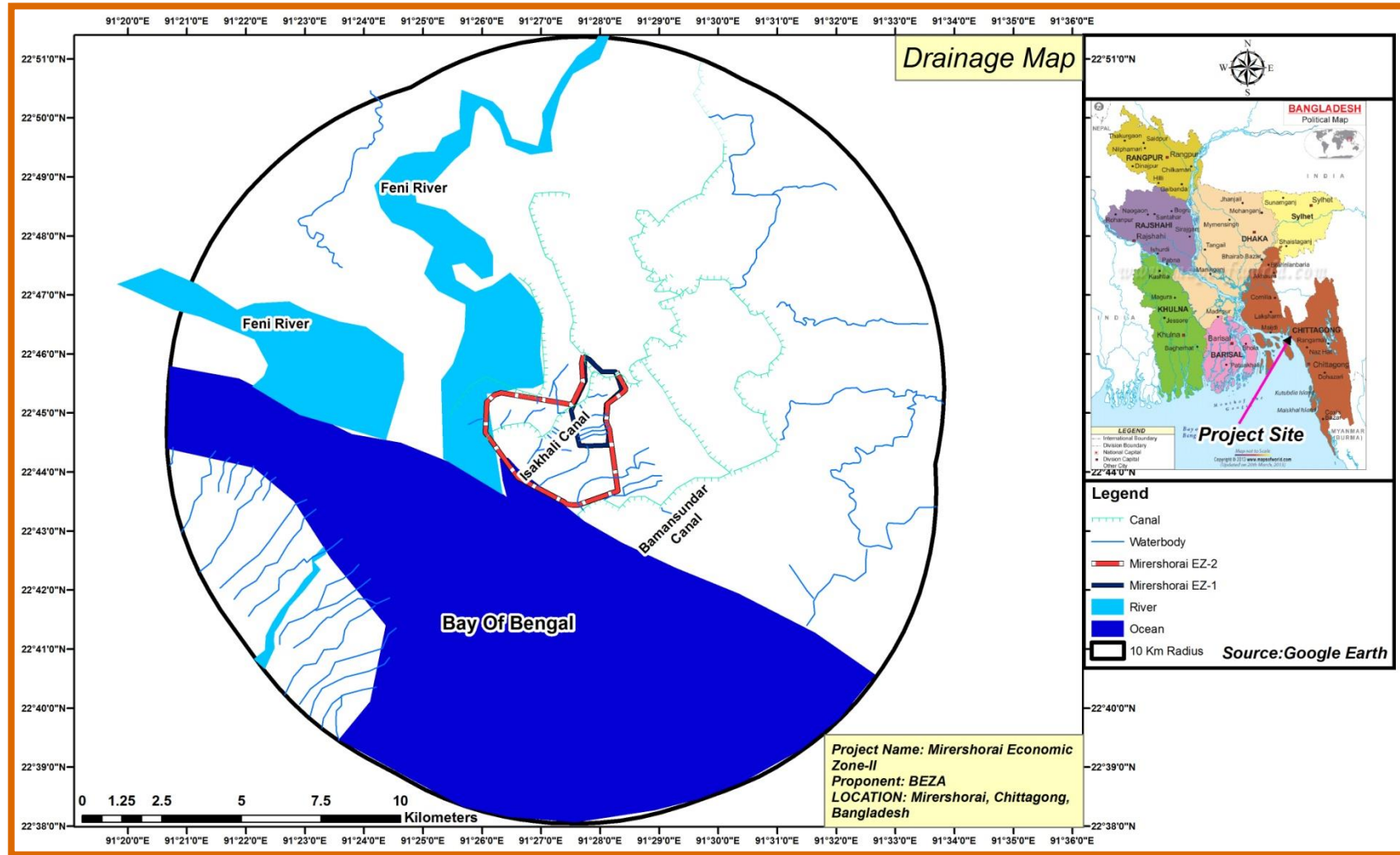


Figure 41: Drainage Pattern of 10 km Radius

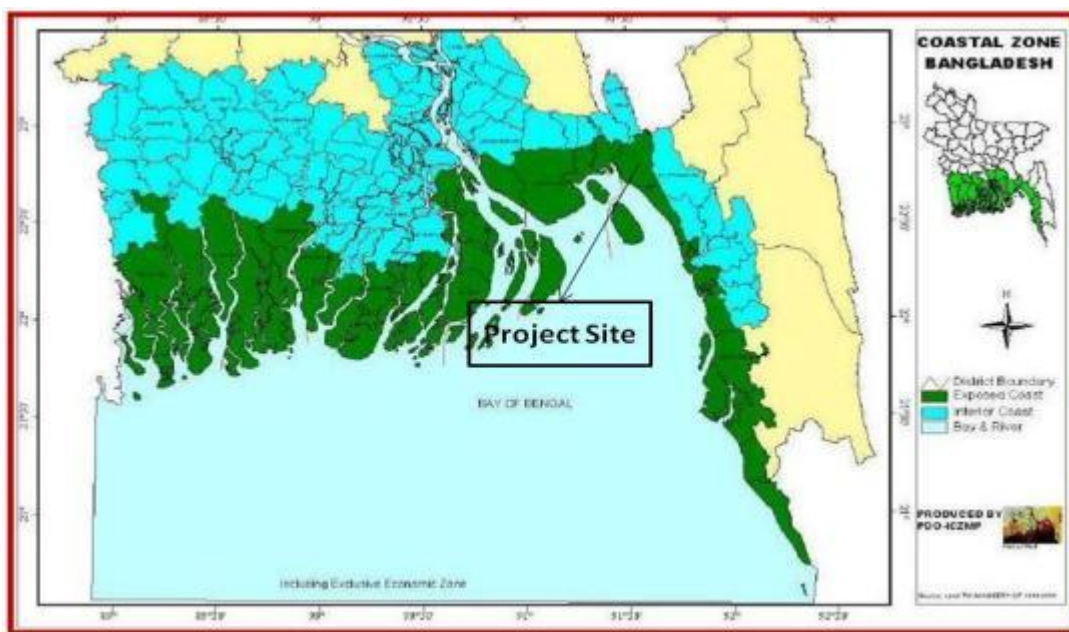
5.5.2. Tropical Cyclones & Tidal flooding

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 Chittagong and the offshore islands of Bhola, Hatiya, Sandwip, Manpura, Kutubdia, Maheshkhali, Nijhum Dwip, Urir Char and other newly formed islands. The coastal zone of Bangladesh is disaster prone and has subject to various cyclones in the past which has lead to damage of property and men. Project site is located in SE part of the coastal areas of Bangladesh in the Chittagong District. Map (figure 42) showing the coastal area of Bangladesh is given below. MirsaraiUpzilain Chittagong District where the project site is located falls in the exposed coastal zone. However the average level of the site is quiet high and it is app. 3 m amsl. Mean sea level has beenmeasured by JICA in 1993 & 1994 and the data has been given below in table 27

Table 27: Mean Sea Level Measured by JICA

Year	Total heights	Number of Values	Mean
1993	20,813.33	5,832	3.569
1994	26,944.64	7,866	3.425
Total	47,757.97	13,698	3.497 (average)

Source: JICA



Source: DMB

Figure 42: Coastal Map of Bangladesh

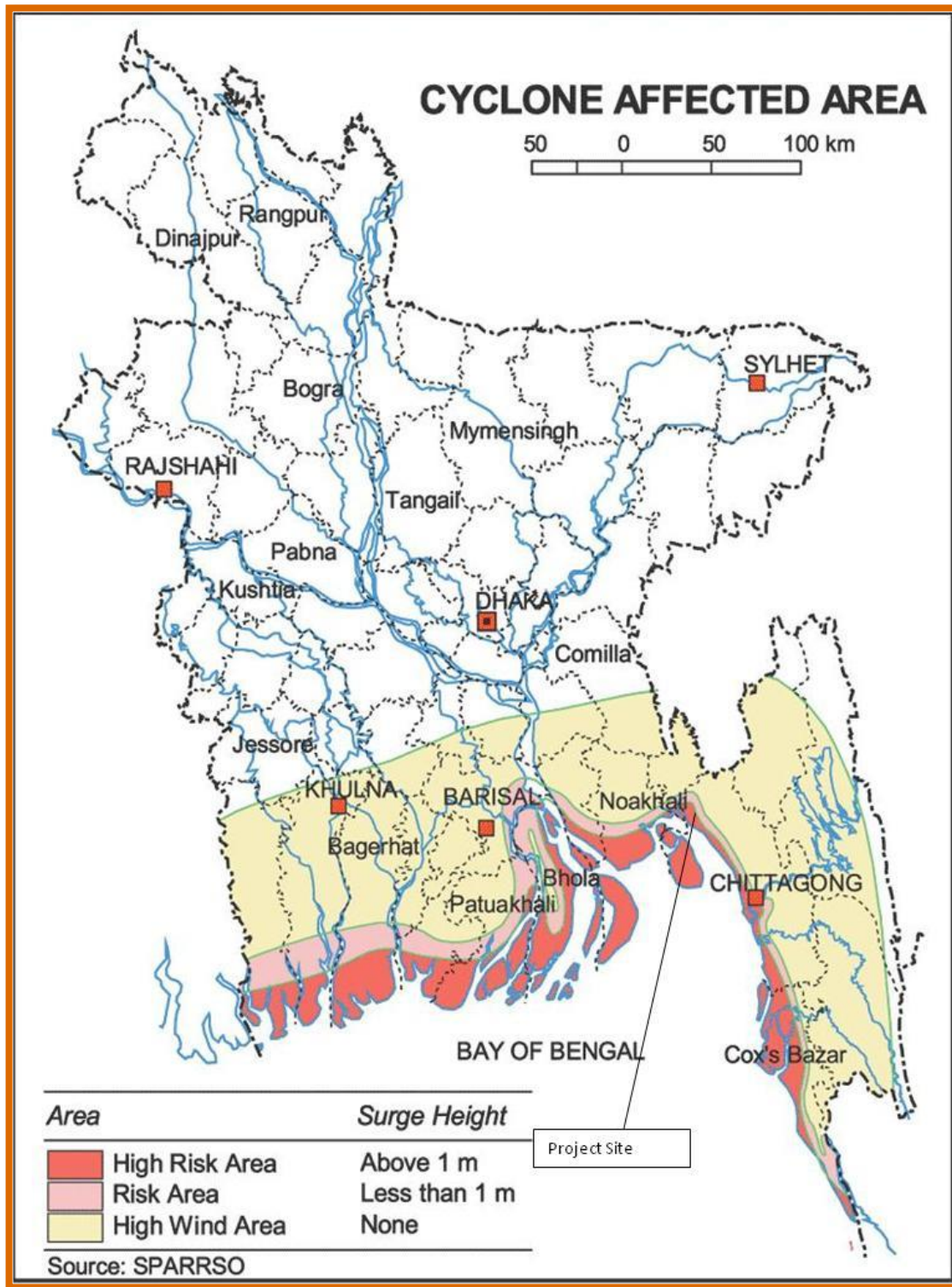
Historical cyclone data for Chittagong

Numbers of cyclones have struck Chittagong in past and has cause severe damages at few times. As per the cyclone risk zone map (figure 43) 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 figuresbelow. Twentyseven cyclones are recorded in last 56 years that had hit the Chittagong District of Bangladesh. List of the major cyclones that had hit the Chittagong, Bangladesh coast is given in table 28below.

Table 28: List of major cyclones at Chittagong Coast

S. No.	Date & Year	Maximum Wind Speed (Km/hr)	Coast	Storm Surge height (meter)
1.	30 th October, 1960	211	Chittagong	4.6-6.1
2.	30 th May, 1961	160	Chittagong-Noakhali coast	6.1-8.8
3.	26 th - 30 th October, 1961	200	Feni-Chittagong Coast	5.8
4.	28 th May, 1963	203	Chittagong,	4.2-5.2
5.	10 th -12 th May, 1965	161	Barisal-Chittagong coast (landfall between Barisal and Noakhali)	4
6.	31 st May-1 st June, 1965	--	Chittagong Coast (landfall near Chittagong)	1.6
7.	1 st October, 1966	145	Chittagong and Sandwip (landfall near Chittagong)	6-7
8.	23 rd -24 th October, 1967	130	Chittagong-Cox's Bazar coast (landfall in between)	2
9.	5 th -7 th May, 1970	148	Chittagong-Teknaf coast (landfall at Cox's Bazar)	2.3
10.	12 th -13 th November, 1970	222	Khulna-Chittagong coast (landfall at Hatia)	5.5
11.	5 th -6 th November, 1971	105	Chittagong coast (landfall near Chittagong)	2.1
12.	16 th -18 th November, 1973	165	Chittagong coast	3.5
13.	9 th -12 th May, 1975	110	Sunderban-Bhola-Chittagong coast	--
14.	9 th -12 th May, 1977	113	Sunderban-chittagong coast (landfall at Sunderban)	0.6
15.	15 th October, 1983	122	Chittagong-Feni coast (landfall near Chittagong)	--
16.	9 th November, 1983	136	Chittagong-Teknaf coast (landfall between Chittagong and Cox's Bazar)	2.5
17.	9 th November, 1986	110	Barguna-Chittagong coast	--
18.	29 th -30 th April, 1991 (Marian)	235	Patuakhali-Cox's Bazar coast (landfall north of Chittagong)	5.8-6.09
19.	31 st May-2 nd June, 1991	110	Patuakhali, Barisal, Noakhali and Chittagong	1.9
20.	16 th -19 th May, 1997	225	Coastal islands and chars near Chittagong, Cox's Bazar, Noakhali and Bhola districts	3.05
21.	25 th -27 th September, 1997	150	Coastal islands near Chittagong, Cox's Bazar, Noakhali and Bhola districts	1.83-3.05
22.	16 th -20 th May, 1998	150	Chittagong, Cox's Bazar, and Noakhali	1.83-2.44
23.	14 th -15 th May, 2007, (Akash)	115-120	South of Chittagong	--
24.	17 th April, 2009 (Bijli)	55	Chittagong & Cox's Bazar	2.1-3
25.	16 th -17 th May, 2013 (Viyaru)	85	Chittagong	--
26.	29 th July, 2015 (Komen)	75	Chittagong	1-2
27.	21 st May, 2016 (Roanu)	100	Chittagong	2

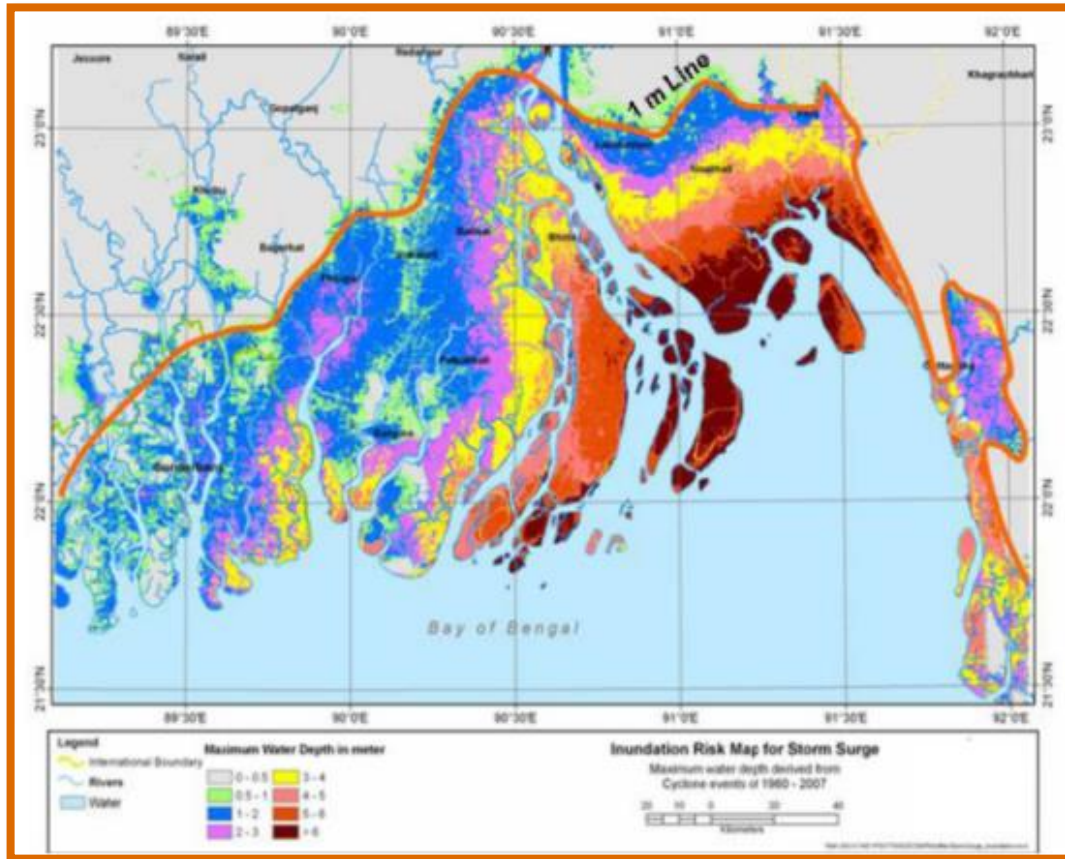
Source: Banglaesh Disaster Knowledge Network & BMD



Source: DMB

Figure 43: Cyclone Risk Zone Map

The inundation risk map (figure 44) 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.

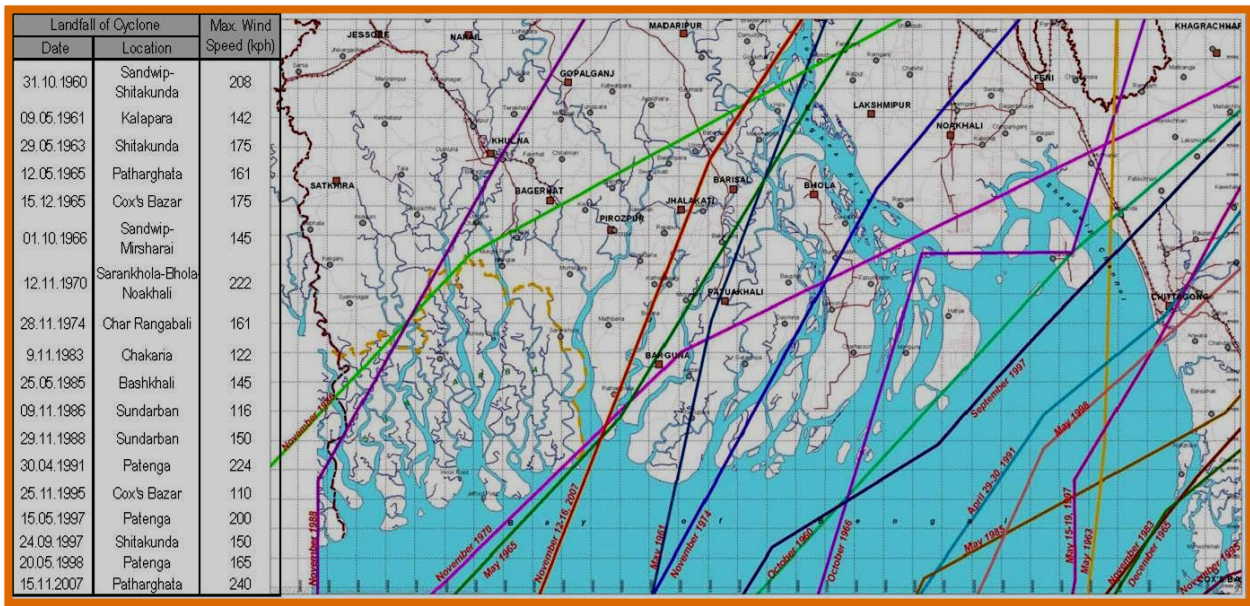


Source: IWM

Figure 44: Inundation Risk Map for Storm Surge

Going through the above collected historical data on wind velocity and storm surges during the cyclonic conditions in Chittagong District it is found the maximum height experienced by the coastal belt in the Chittagong 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 Chittagong 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 Mirsarai area. Cyclone tracking map (figure 45) 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.



Source: IWM

Figure 45: Cyclone Storm Track Map

Several cyclones protection measures have been taken by Govt. of Bangladesh for protection of inland area from cyclones. Mirsarai coastline is protected by two bunds (BWDB & CDSP) constructed by Bangladesh water Development Board and under Char Development and Settlement Project. These two bunds protect inland area from tidal flooding. Also Mangrove plantation has been carried out along the coast line to further protect inland area by forest department. Recently a bund of height +8 m amsl has been constructed for under development Miresheroi EZ-I to protect the zone from cyclones. A cyclone shelter is also constructed by the Government in the area to provide shelter to people during cyclones. Flow in Isakhali canal is controlled with the help of sluice gates which helps in controlling the water flow in channel and prevent flooding of land area. Photographs showing the protection measures taken by GoB for protection during Storms are given in figure 46below.





Cyclone Shelter Near EZ Site

Bund of height + 8 m amsl constructed for Mirsarai EZ-I

Figure 46: Cyclone Safety Measures in Area

Proposed Mirsarai EZ-II site is seawards side of all the BWDB, CDSP bunds and newly constructed bund for Mirsarai EZ-I site. But to protect the site from inundation, it is proposed to construct superdike all along the periphery of the proposed site. Height of the bund will be +10 m amsl and width 10 m. This bund will also act as peripheral road to provide connectivity to the site. Further embankments of the bund are proposed to be provided with stone pitching on seaward side and glass turfing along with plantation in land ward site. To prevent flooding of site due to Isakhali channel, it is proposed to develop embankment of height +6.5 m along the Isakhali channel. A sluice gate will be developed on the Isakhali channel to manage the flow of water. Peripheral drain will be constructed all along the periphery of the proposed EZ site to accommodate the storm water flow and it will be connected to Isakhali channel to drain the water. A MoU with BWDB is done for construction of sluice and its management, lining of canal slopes, embankment construction, designing water infrastructure, collect and share hydraulic information of nearby river, canal, sea & other water body and supervision of above mentioned works.

Tornado

It is the pre-monsoon period when most of the abnormal rainfall or drought conditions frequently occur in different parts of Bangladesh. Also there are severe local seasonal storms, popularly known as nor'westers (kalbaishakhi). Severe nor'westers is generally associated with tornadoes. Tornadoes are embedded within a mother thundercloud, and moves along the direction of the squall of the mother storm. The frequency of devastating nor'westers usually reaches the maximum in April, while a few occur in May, and the minimum in March. Nor'westers and tornadoes are more frequent in the afternoon. Nor'westers may occur in late February due to early withdrawal of winter from Bangladesh. The occasional occurrence of nor'westers in early June is due to the delay in the onset of the southwest

monsoon over the region (Karmakar, 1989). List of the nor'westers and tornadoes is given in table 29 below.

Table 29: List of Tornadoes had hit the Bangladesh

Date	Location
14th April, 1969	Demra (Dhaka)
17th April, 1973	Manikganj (Dhaka)
10th April, 1974	Faridpur
11th April, 1974	Bogra
9th May, 1976	Narayanganj
1st April, 1977	Faridpur
26th April, 1989	Saturia (Manikganj)
14th May, 1993	Southern Bangladesh
13th May, 1996	Tangail
4th May, 2003	Brahmanbaria
21st March, 2005	Gaibandha

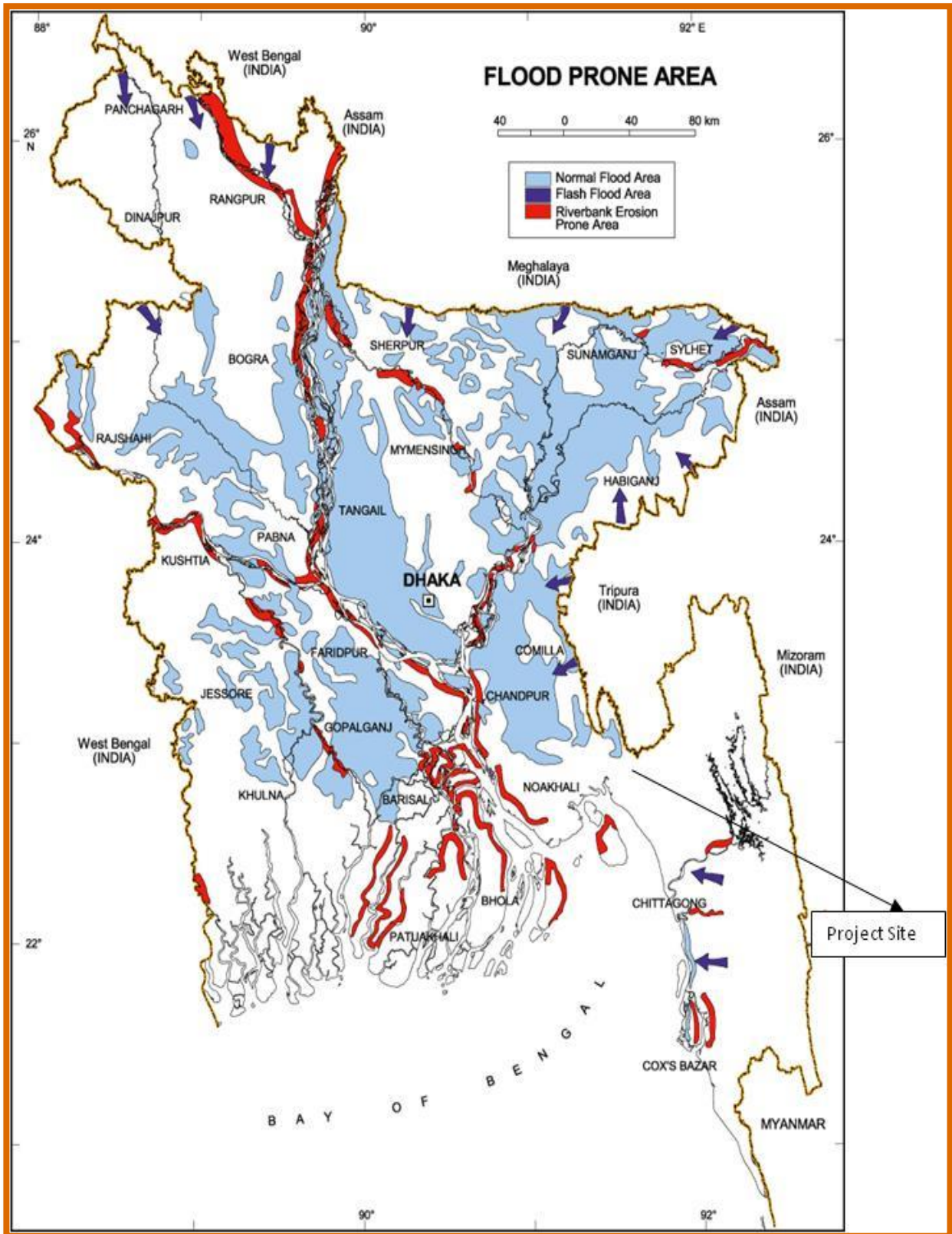
Source: Bangladesh Disaster Knowledge Network

Floods

Floods are the most significant natural hazard in the country causing extensive damage to human life and property. The country lies on the downstream part of three major river basins: Brahmaputra, Ganges and Meghna and thus is frequently flooded. There have been many destructive floods in Bangladesh, including very severe floods of 1987, 1988 and 1998. The 1988 flood set a new record for flooded area, while 1998 flood was unprecedented with its long duration. The flood damage potential in Bangladesh is increasing due to the possible causes of climate change, urban concentration in the three river basins, encroaching of settlements into flood prone areas, and overreliance on the safety provided by flood control works such as levees, reservoirs. There are two types of floods which occur in Bangladesh: annual floods (barsha) that inundate up to 20% of the land area; and low frequency floods of high magnitude that inundate more than 35% of the area (bonna). The major floods that occurred in 1954, 1955, 1974, 1984, 1987, 1988, 1993, 1998, 1999, 2000 and 2007 have been very destructive and caused serious threat to lives and economy. In the context of human exposure in flood hazard zones, nearly 19,279,960 people are present in these zones and Bangladesh ranks 1st among 162 nations. Similarly, the modeled amount of GDP in seismically hazardous zones puts Bangladesh 3rd among 162 countries. Flood hazard map of the Bangladesh is shown in figure 47 below. Major River in the study area is Feni River. Feni River receives flow from Muhuririver, Lemua canal and various other khals. As per BWDB, highest flood level in Feni River in Mirsarai region peaked to +7.3 m amsl during 1974 flood.

During the monsoon for the period 2000-2004, the mean and maximum ranges of the tide in the Feni estuary have been found to be 3.50m and 5.50m respectively. The tides have also been studied on the basis of annual maximum High Water Level data collected over the periods 1985 to 2004 at the gauge downstream of the Feni regulator in the Feni River. The maximum high water level and mean of annual maximum high water level of Feni River, near Feni regulator, is about 6.0m and 5.276m (SOB-Survey of Bangladesh) respectively over the 20 years period. The seasonal mean high water level of the Feni River near the Feni regulator for the period 2000-2004 is also shown in table 30 below. From this table it has been found that the average mean high water level during pre-monsoon, monsoon, post-monsoon and the dry period are 3.47m, 4.14m, 3.61m and 2.69m respectively. Analysis of the daily mean high water level of Feni River downstream of the Feni regulator from 2000-2004 shows that the monsoon high

water level exceeds 4.50m (PWD-Public Works Department) elevation few times a year (PWD= SOB + 0.46).



Source: DMB

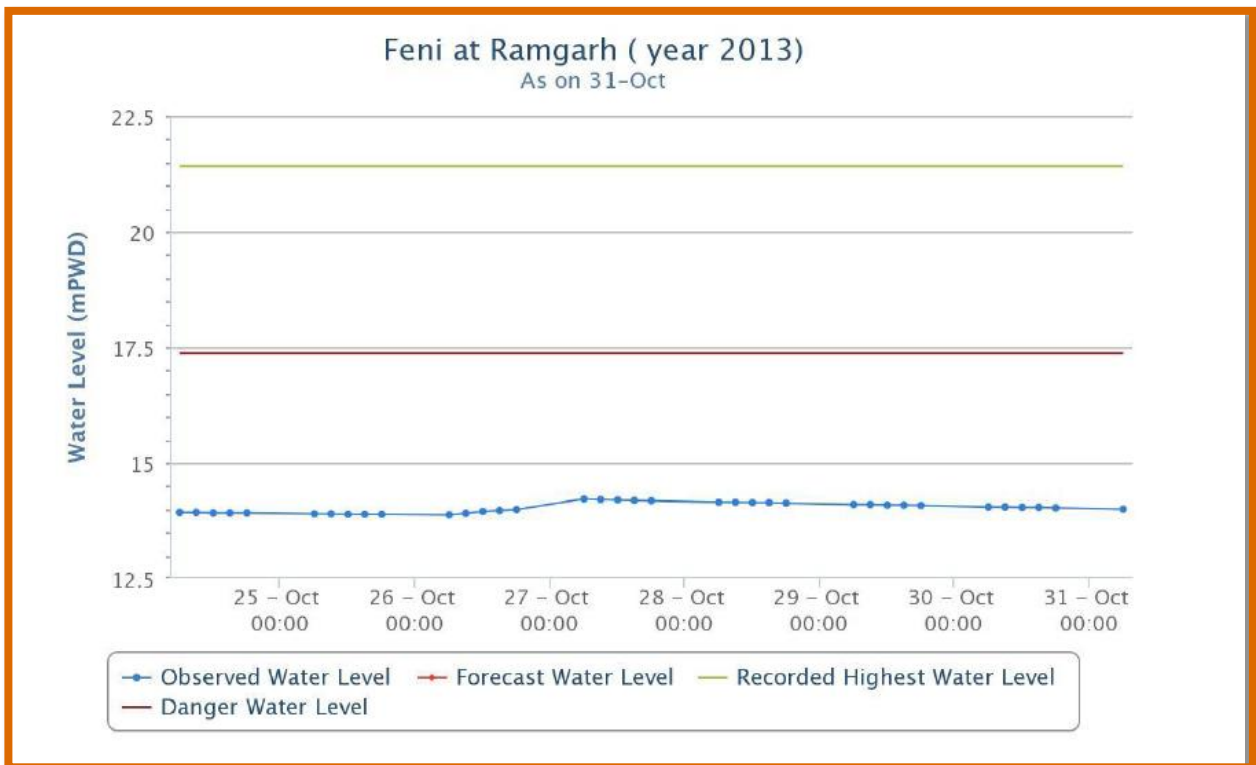
Figure 47: Flood Prone Area Map

Table 30: Mean High Water Level of Feni River Downstream of Feni River Regulator for the Period 2000-2004

Year	Mean Water Level in Meters			
	Pre Monsoon (March- May)	Monsoon (June- Sept.)	Post Monsoon (Oct.-Nov.)	Dry Period (Dec-Feb)
2000	3.46	4.3	3.62	2.79
2001	3.36	4.05	3.49	2.67
2002	3.38	4.04	3.55	2.56
2003	3.42	4.11	3.76	2.73
2004	3.73	4.23	--	--
Mean	3.47	4.146	3.605	2.6875

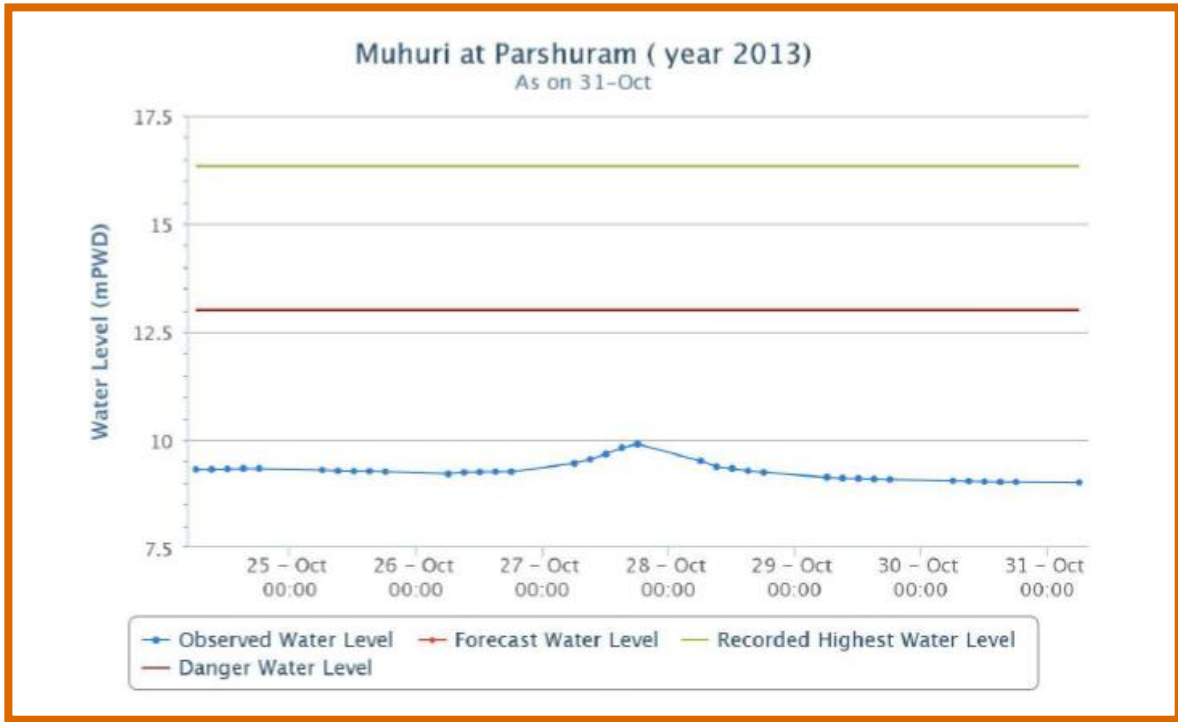
Source: IEE, BAN: Irrigation Management Improvement Project, Muhuri Irrigation Project, Chittagong

According to the web data from the Flood Forecasting & Warning Centre, the Bangladesh Water Development Board (BWDB), the past maximum water surface level is +17.49 m in Ramgarh. This point is 50 Km upstream of the EZ site. In Parshuram (80 Km upstream of EZ) the Muhuri River had a past highest water level of +13.0 m. These figures are critical for designing the flood protection system.



Source: BWDB

Figure 48: Past Maximum River Surface level at Ramgarh

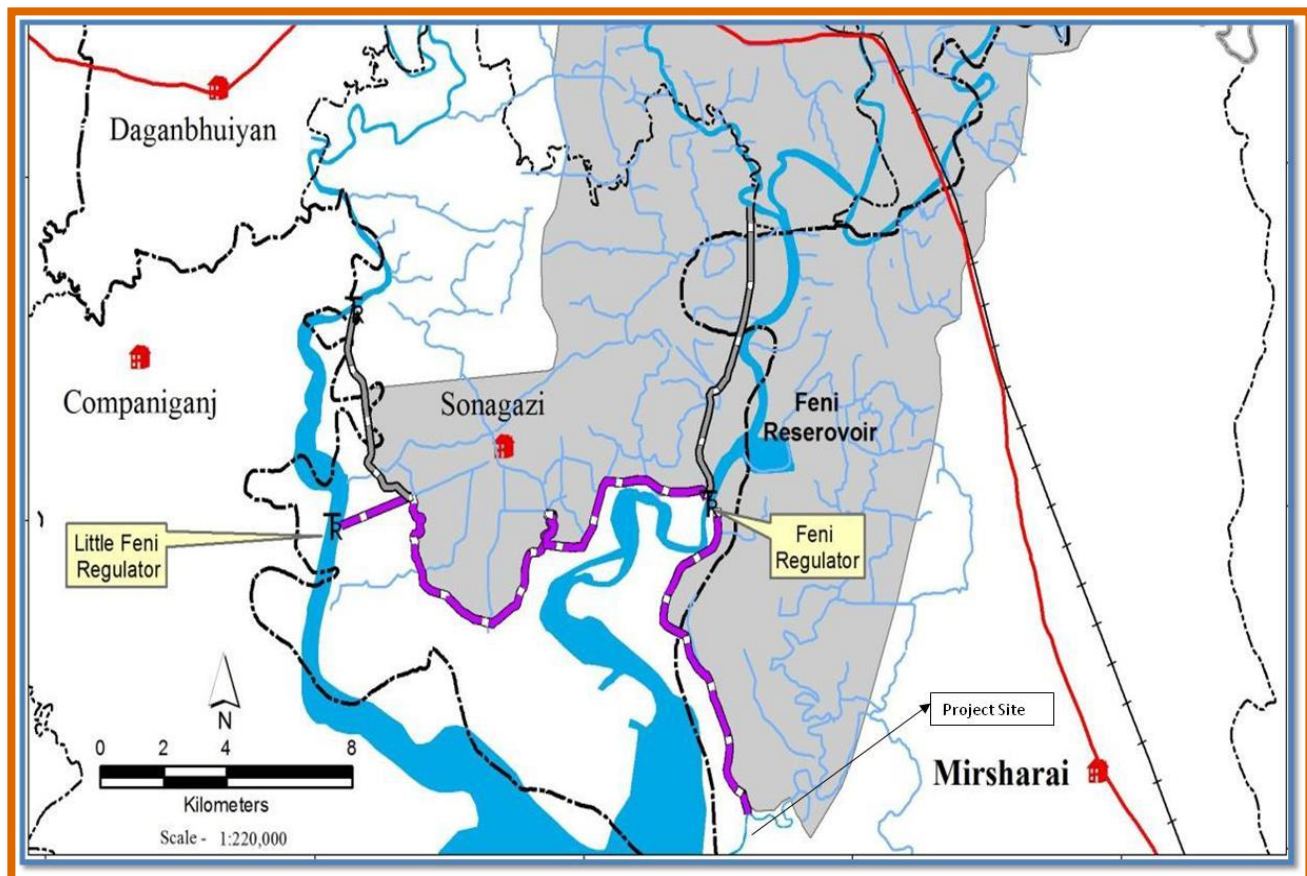


Source: BWDB

Figure 49: Past Maximum River Surface level at Parshuram

5.5.3. Salinity

River Feni is Major River in the study area. Feni River carries fresh water in upstreams, 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. Map (figure 50) showing location of regulators in Feni River is shown below. Maximum salinity in Feni River is 21.2 ppt (The World bank, Department Research Group, Environment and Energy Team, March, 2014)



Source: IEE, BAN: Irrigation Management Improvement Project, Muhuri Irrigation Project, Chittagong & Site Visit

Figure 50: Map showing location of Regulators in Feni River

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).

5.5.4. Drainage Congestion and Water Logging

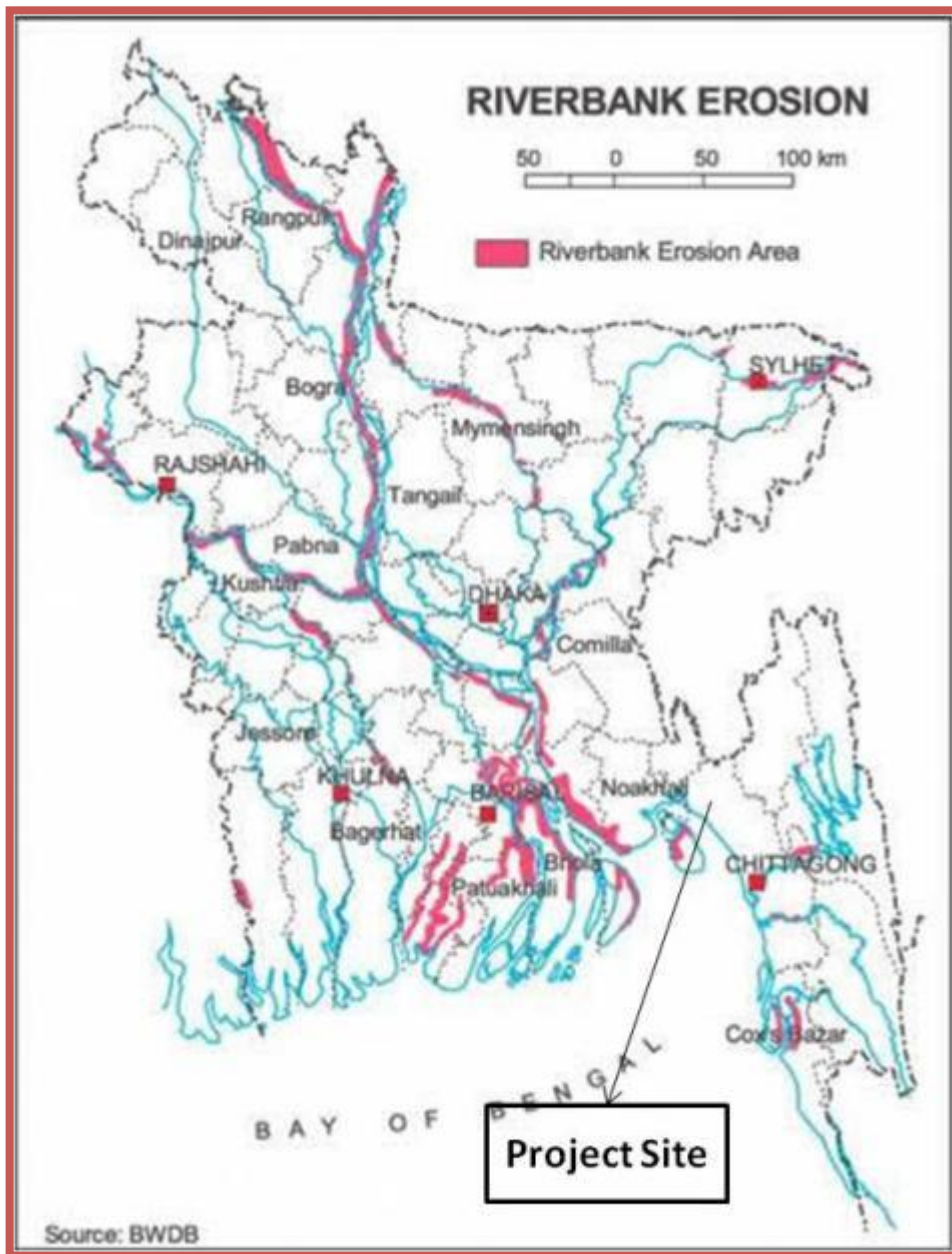
The project area is covered with the clay and sand deposits brought by the fenny river. Project site is wetland and gets inundated during monsoon. Water logging is observed at site during monsoon season. Water enters the site (in forest area) during high tide. According to the information collected through focus group discussions (FGD), the area is affected in normal floods. But during heavy rainfall and sometimes during high tide cause water stagnation in the area for some time. Drainage is good; as water drains out quickly through canal lines with insignificant water logging problem

Storm water on site drains through the Isakhali canal flowing on the site. Storm water in upstreams does not enter the site due to presence of BWDB & CDSP embankment. Storm water in upstreams drains through Isakhali and Bamon Sundar canal. Site is criss-crossed with deep drains which joins the Isakhali canal. Isakhali canal drains into sea. A sluice gate is located in SW direction from EZ site which control the water level in Isakhali canal.

5.5.5. Erosion and Sedimentation

No erosion site at EZ site and at river bank is observed. Map showing areas prone to river bank erosion is given below in figure 51. However to protect the erosion due to tidal action of sea and in Isakhali channel,

it is proposed to provide stone pitching on the peripheral embankment towards the side facing the sea and grass turfing along with plantation on the side facing the land. Longitudinal drains/chute drains will be provided on the embankments to facilitate flow of the storm water and preventing the flooding of the road. This water will flow into the peripheral drain/30 m & 500 m green buffer planned along the proposed EZ site. Embankment which will be constructed along the Isakhali channel will be protected by stone pitching on the side facing the Isakhali channel and will have slope ratio of 1: 3. 1: 3 ratios will prevent rapid flow of the water and soil of embankment during rains.



Source: <http://www.livingwiththejamuna.com/essayintroduction.html>

Figure 51: Map showing river bank erosion of Bangladesh

5.5.6. River Morphology

River Feni is morphologically stable. The change in river course since 1955 is presented in the following figures 52-55.

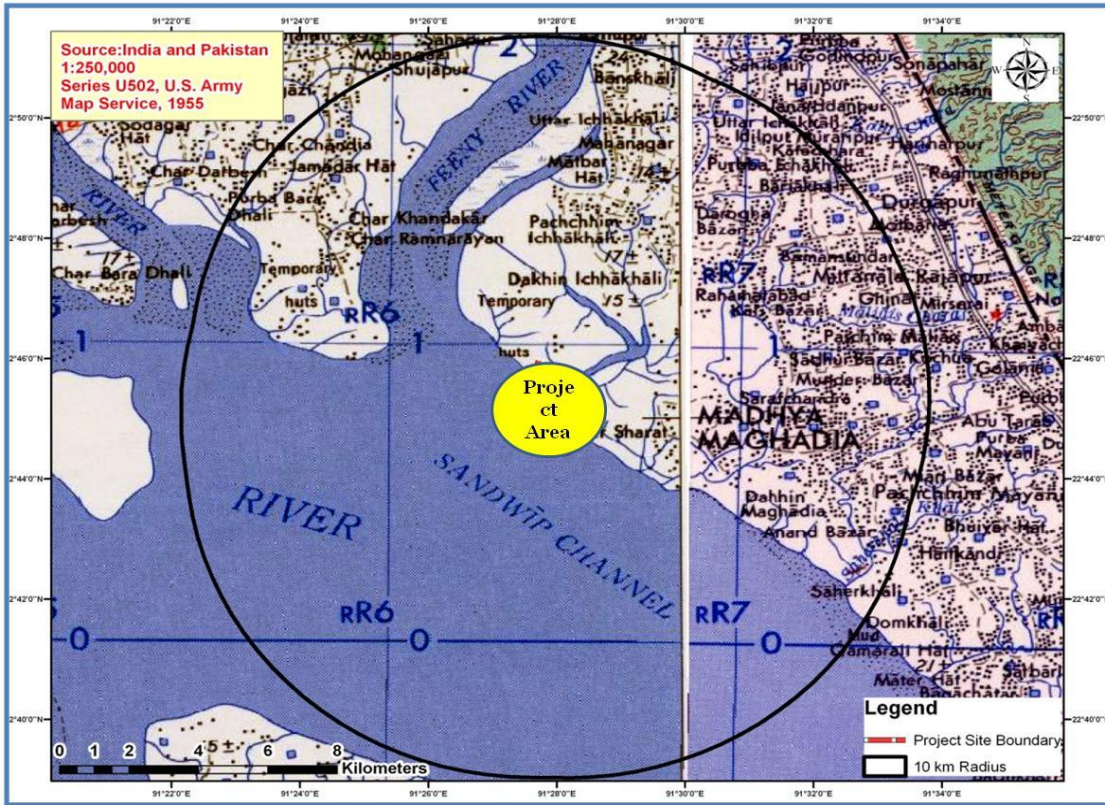
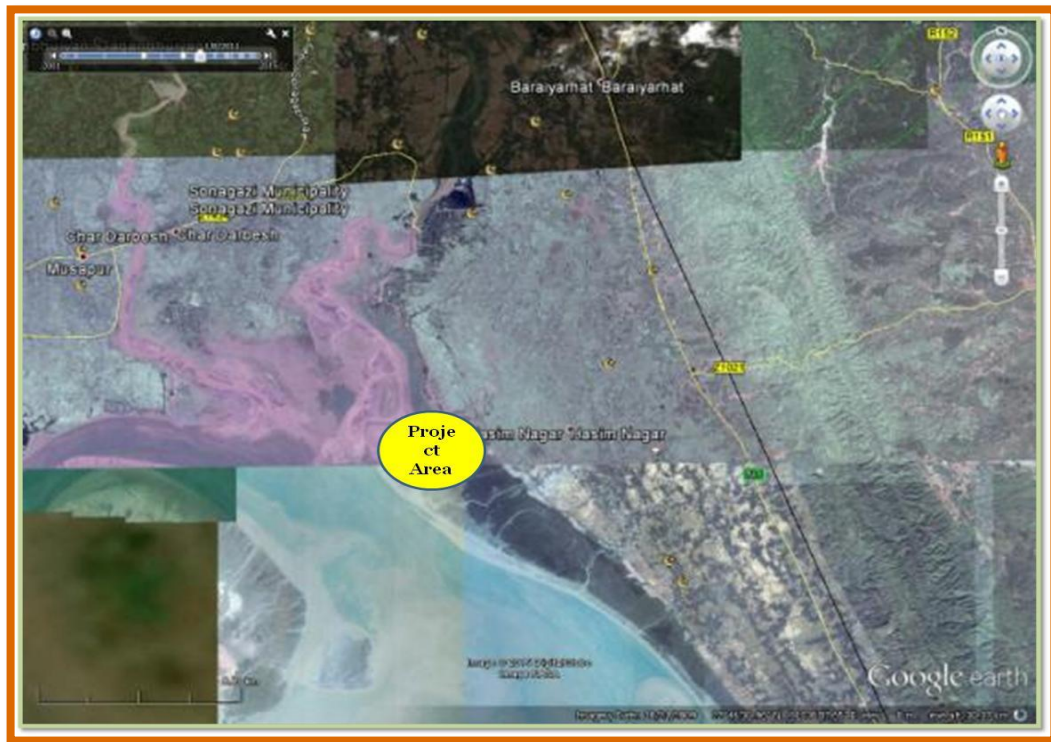


Figure 52: Toposheet Map (1955) showing course of Feni River



Source: Google Earth

Figure 53: Google Image (2006) showing course of Feni River



Source: Google Earth

Figure 54: Google Image (2011) showing course of Feni River



Source: Google Earth

Figure 55: Google Image (2014) showing course of Feni River

5.5.7. Navigation

Navigability of rivers in Bangladesh has been deteriorating steadily over the years. The withdrawal of water beyond the border and within Bangladesh for irrigation and other purposes has resulted in decreased navigability of rivers during dry season resulting in gradual channel decline.

The river network connects almost all the country's major cities, towns and commercial centers. Moreover, being cheap, safe and environmentally friendly, inland water transportation is often the only mode that serves the poor, proving especially useful during periods of widespread flooding.

Currently, container feeder service is available from Chittagong Port to Port Klang (daily); Port of Singapore (daily); and Colombo Port (every 2-3 days) for connecting the mother vessels serving international destinations. More than 5 feeder vessel operators with vessels capacity of 1,000 -1,500 boxes (containers) have deputed their feeder vessels in this circuit. The transit time is about 3-4 days from /to Chittagong Port to the hub ports. All international Shipping Lines have their presence in Bangladesh and some even operate their own feeder vessels.

Due to the steady growth in traffic volume, Chittagong Port performs well on the financial front. It is financing its 3rd Port development project at Paira Bandar with its own resources. Statistics of cargo handled at the Chittagong Port is given in the annex.

The third port, Paira Seaport, was inaugurated by the Prime Minister on 19th November 2013. It is on Rabnabad channel - which is 31 Km from the sea boundary, 316 Km from Chittagong, 130 Km from Mongla port and 340 Km from the capital. This port shall have draft of 8 -10 m when in operation.

In addition to the Pangaon ICT, the Government of Bangladesh granted approval to establish a container port on the bank of the Meghna River in Narayanganj District to the Ananda Group in November 2013. It will be the fifth inland container terminal (ICT) in the private sector. Approvals for establishing ICTs have already been granted to the Rupayan Group, Kumudini Welfare Trust, AK Khan and Company and Cemcor. Meanwhile, the Ministry of Shipping, GoB, is finalizing a draft of guidelines for establishing ICTs under private sector investment. A deep sea port is also proposed to be constructed at Sonadia, Cox Bazar. To develop inland waterway transportation, a jetty is also required to be proposed for the project.

5.5.8. Surface Water Quality

River Water Quality

Feni River is the main river in the study area. Water in upstreams of Muhuri Project Road in Feni River is fresh whereas in downstream it is saline due to tidal influence. Surface water quality data for Feni & Muhuri River for year 2008-2009 is given in table 31 below

Table 31: Surface Water Quality Data of Feni & Muhuri River

Parameters	Units	Feni River	Muhuri River	ECR-97 Standards (Suitable to Fisheries)	ECR-97 Standards (Suitable to Irrigation)
pH	-	7.47	7.16	6.5-8.5	6.5-8.5
Temperature	°C	30.60	31.60	25-30	25-30
EC	µScm ⁻¹	13710.00	65.90	--	--
TDS	mg/l	6854.95	32.70	--	--
DO	mg/l	7.45	4.88	>=5	>=5
Transperency	cm	30.0	25.0	--	--
Acidity	mg/l	13.26	8.84	--	--
Totalalkality	mg/l	99.86	66.82	--	--
Total hardness	mg/l	52.0	40.0	--	--
Chloride	mg/l	2720	11.48	--	--
BOD	mg/l	1.97	2.61	<=6	<=10

COD	mg/l	2.94	2.87	--	--
NO ₂ ⁻	mg/l	0.111	0.017	--	--
NO ₃ ⁻	mg/l	1.0	0.03	--	--
PO ₄ ³⁻	mg/l	1.77	0.86	--	--
SO ₄ ²⁻	mg/l	4.32	4.01	--	--
Ni	mg/l	BDL	BDL	--	--
Zn	mg/l	0.054	0.048	--	--
Cu	mg/l	BDL	BDL	--	--
Co	mg/l	0.042	0.044	--	--
Cr	mg/l	0.012	0.019	--	--
Cd	mg/l	BDL	BDL	--	--
Pb	mg/l	0.070	0.012	--	--
Fe	mg/l	0.730	0.835	--	--
Mn	mg/l	0.250	0.17	--	--
% NaCl	%	0.100	0.100	--	--

Source: Rahman, Haque & Ahmed, 2011, University of Chittagong

Average value of pH of the River Feni (7.47) & Muhuri (7.16) was found in the alkaline region. EC and TDS found for the Feni (13710.00 μ Scm⁻¹ and 6854.95 mgL⁻¹) & Muhuri (65.90 μ Scm⁻¹ and 32.70 mgL⁻¹) respectively. Higher values were found for the Feni River. This is due to the tidal effect of sea water into these rivers. DO found for the River Feni is 7.45 mgL⁻¹ and for Muhuri River is 4.88 mgL⁻¹. As per ECR standards DO should be equal to or more than 5 for purpose of irrigation and propagation of fisheries. DO in Feni river is more than 7 but DO of Muhuri river is slightly less than 5. For many fish and shellfish, extended periods of DO below 5mg L⁻¹ can cause adverse effects to larval life stages (EPA 1986). However project will not discharge any effluent in any river as project is going to be developed on zero discharge basis. Moreover the Muhuri river is upstream to the project site thus no discharge can be carried out in Muhuri river. Thus further impact due to project development on Muhuri River quality is not anticipated.

Acidity values found for the Feniriver is 13.26 mgL⁻¹ & Muhuri River is 8.84 mgL⁻¹. Total alkalinity of the Feni (99.86 mgL⁻¹) & Muhuri (66.82 mgL⁻¹) is within the acceptable limit of EPA freshwater aquatic life criteria. Total alkalinity of these rivers is mainly for carbonates and bicarbonates as phenolphthalein alkalinity was not detected in any of the samples.

Total hardness found for the Feni River is 2720.00 mgL⁻¹ and Muhuri River is 40.00 mgL⁻¹. According to EPA classification water of Muhuri river water is soft but the Feni River water is hard. Chloride content of the Feni (131.16 mgL⁻¹) & Muhuri (11.48 mgL⁻¹) is within the acceptable limit of criterion continuous concentration (CCC) (230 mgL⁻¹) and criterion maximum concentration (CMC) (860 mgL⁻¹) limit for freshwater.

BOD values found for the Feni (1.97 mgL⁻¹) & Muhuri (2.61 mgL⁻¹) are quite low and these rivers may be considered clean. Limits are below the BOD levels as mentioned in ECR standards, 1997 for irrigation and fisheries purpose. (Banerji, 1997). Biney (1982) has classified the pollution level into three categories on the basis of BOD levels as follows:

- unpolluted (BOD < 4 mg/l)
- moderately polluted (BOD = 4 to 12 mg/l)
- grossly polluted (BOD > 12 mg/l)

COD found for the Feni River is 2.94 mgL⁻¹ and Muhuri River is 2.87 mgL⁻¹. Nitrite-N value found for the Feni River is 0.111 mgL⁻¹ and Muhuri River is 0.017 mgL⁻¹. Average values found for o-phosphate-P of the Feni is 1.77 mgL⁻¹ & Muhuri River is 0.86 mgL⁻¹. Total phosphate-P concentrations in excess of 1.00 mgL⁻¹ P may interfere with coagulation in water treatment plants according to EPA, 1986. Excessive o-phosphate-P values were found due to the agricultural runoff and use of detergents in laundry purposes. Average values of sulphate-S found for the Feni is 4.32 mgL⁻¹ & Muhuri River is 4.01 mgL⁻¹.

Cadmium, Copper and nickel were not detected in any of the river water samples. Average values found for zinc for the Feni is 0.054 mgL-1 & Muhuri River is 0.039 mgL-1 was within the CMC and CCC limit (0.12 mgL-1) (EPA,2002). Cobalt found for the Feni River is 0.042 mgL-1 & Muhuri River is 0.024 mgL-1. Average values found for total chromium for the Feni River is 0.042 mgL-1 & Muhuri River is 0.024 mgL-1 was within the CMC and CCC limit for Cr (III) (0.570 mgL-1 and 0.074 mgL-1) and for Cr(VI) (0.016 mgL-1 and 0.009 mgL-1), respectively. Lead found for the Muhuri (0.012 mgL-1) was within the acceptable limit but for the Feni (0.07 mgL-1) exceeded the acceptable CMC limit (0.065 mgL-1) for freshwater.

Average values of iron of the Feni (0.730 mgL-1) & Muhuri River (0.835 mgL-1) was found within the limit (1.0 mgL-1) for freshwater aquatic life. Manganese content of the Feni (0.25 mgL-1) and Muhuri (0.17 mgL-1) exceeded the domestic water supplies limit (0.1 mgL-1). NaCl content found for the Feni River is 0.1 % & Muhuri River is 0.1%.



River Feni

Figure 56: Photographs of Feni River

Sea Water Quality

To study the concentration the quality of sea water in the coastal water of EZ site, sea water samples were withdrawn from 3 locations near the EZ site. Results of the sea water quality is presented in table 32 below.

Table 32: Water Quality of Coastal waters near Project Site

Parameters	Units	Site 1	Site 2	Site 3	EQS, 1991 (standard for coastal waters)
Suplhate	mg/l	695.87	683.56	764.97	--
Chloride	mg/l	4980	5206	5234	--
Calcium (Ca ⁺²)	mg/l	89	129	120	--
Magnesium (Mg ⁺²)	mg/l	39	54	45	3.605
HCO ²⁻	mg/l	593	623	675	--
Erosive CO ₂	mg/l	960	890	950	--
Free CO ₂	mg/l	840	780	870	--
pH	--	6.7	7.2	6.9	6.9

Source: BWDB

Also a study has been carried out to understand the impact of ship breaking industry on the sea water quality and aquatic life by Md. M. Maruf Hossain and Md. Atikur Rahman, Inst. of Marine Sciences and Fisheries, university of Chittagong, Chittagong, 2007-2008. The study includes sampling of sea water in the affected area due to ship breaking activities and at control point, i.e area unaffected. The control point considered for study is waters near Sandwip Island (near Muradpur). Location of Sandwip island is app.

18 kms away from project site. Water quality of the coastal waters of Sandwip Island is presented in table 33 below. Sea water samples are compared with the Bangladesh Environment Quality Standard, 1991 (EQS, 1991) for coastal water & sediment quality. As per results, total hydrocarbons of the sea water is more than the prescribed limits of EQS, 1991. Also the concentration of heavy metals including iron, copper, cadmium, chromium, lead and magnesium is higher than the prescribed limits of EQS, 1991. However as mentioned above location of Sandwip island is app. 18 kms away from project site (in direction opposite to the affected area) and between proposed EZ site and Sandwip Island no industrial activity or discharge of any industrial effluent is being undertaken. Thus the concentration in immediate vicinity of the project site is not expected to be equal to or higher than these values. The concentrations are expected to be diluted than these values. Further data from a study carried out by Islam and Hossain, 1986 on water quality near Sandwip Island is also presented in table 33 below. Location of sampling area is presented below in figure 57 below.

Table 33: Water Quality of Coastal waters near Sandwip Island

Parameters	Units	Water Quality near Sandwip Island-1986	Water Quality near Sandwip Island-2007-2008	EQS, 1991 (standard for coastal waters)
Turbidity	JTU	470-475	--	--
Transparency/ Secchi disc Depth	m	--	0.63	--
Total Solids	mg/l	2284-2335	NA	--
Chloride	mg/l	785-789	NA	--
pH	-	NA	8.10	6.9
DO	mg/l	6.2-6.36	6.25	>5
BOD	mg/l	4.08-4.3	5.00	<6
Total Hydrocarbon (Oil and grease)	mg/l	--	22.5	10
Organic Carbon (OC)	%	--	1.26	1.42
Organic matter (OM)	Organicmatter (OM)	--	2.4-3.2	--
Heavy Metal				
Fe	µg/ml	--	7.52	0.02
Cu	µg/ml	--	0.075	0.005
Zn	µg/ml	--	0.092	0.05
Cd	µg/ml	--	0.0105	0.0005
Cr	µg/ml	--	0.1575	0.0005
Ni	µg/ml	--	0.278	0.07
Mn	µg/ml	--	3.02-3.2	2.45
Al	µg/ml	--	ND	0.01
Pb	µg/ml	--	0.525	0.01
Mg	µg/ml	--	5.89-12.215	3.605
As	µg/ml	--	0.0065	<5

Source: Md. M. Maruf Hossain and Md. Atikur Rahman, 2007-2008

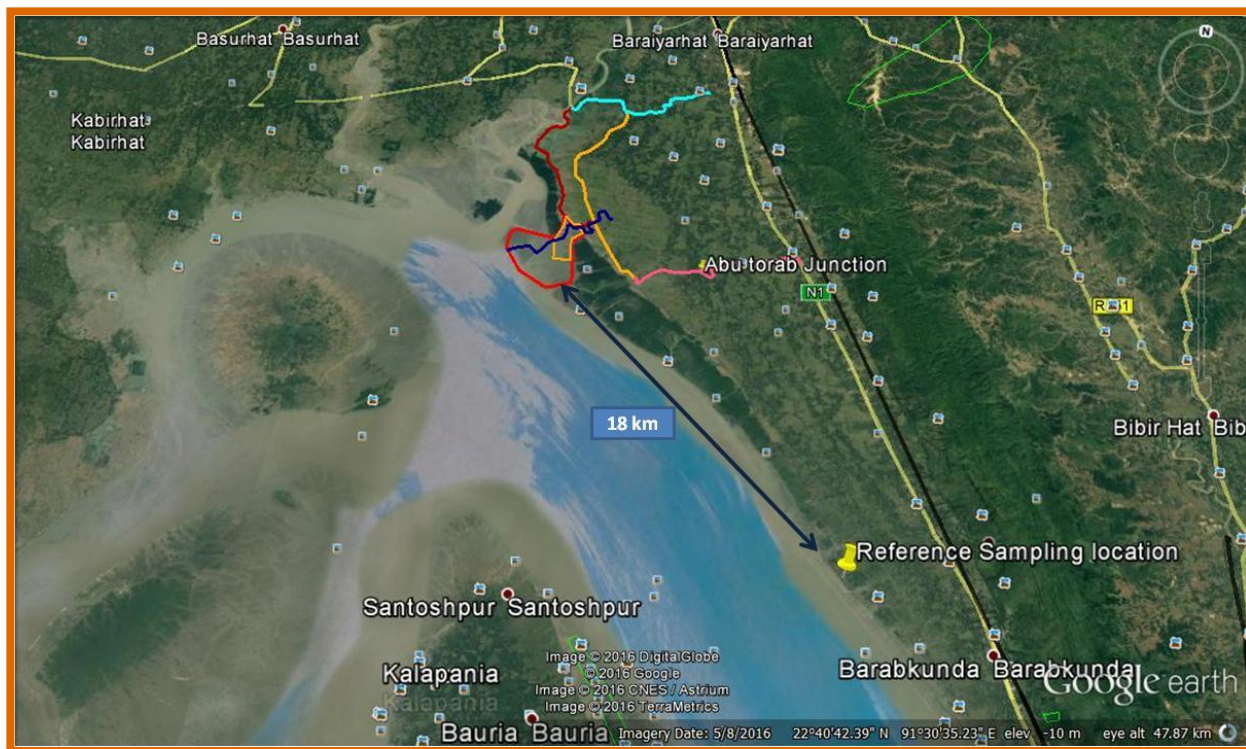


Figure 57: Map showing Sampling location of Sea Water near Sanwip Island and Project Site

5.5.9. Ground Water system

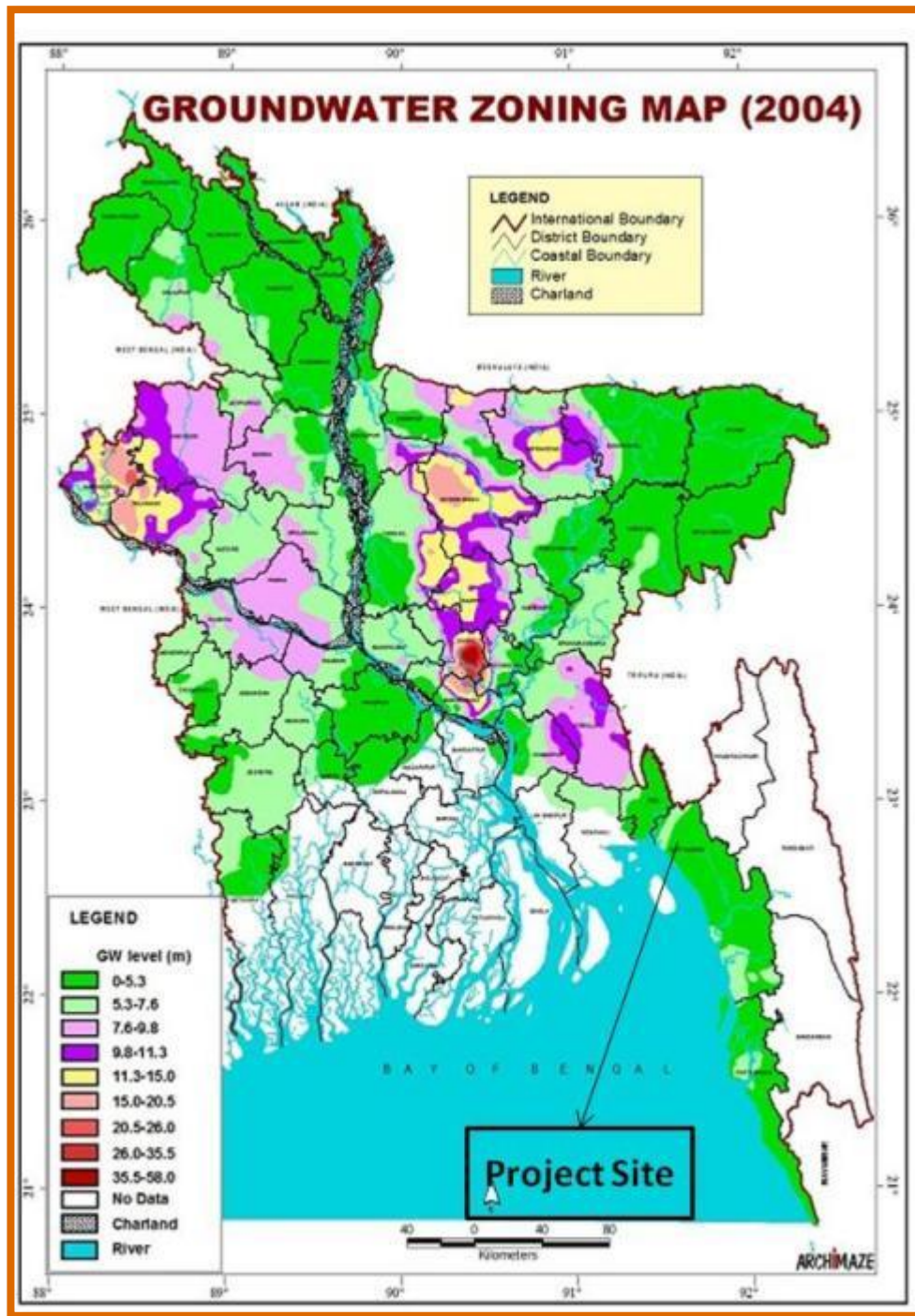
Chittagong District is covered with Piedmont and estuarine deposits. These deposits have transmissivity of 400 sqm/day. These deposits are not favorable aquifers for extensive withdrawal. Aquifer material is covered with 25-30 m thick zone of silt and clay. Clay thickness gradually increases towards the Bar. 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 the depth to the main aquifer is not precisely known. Aquifers are semi-confined to confine in nature. Transmissivity of the Chittagong district varies from 114-600 sq m/day. Storativity/storage coefficient varies from 0.0007 to 0.03. Permeability of the aquifer varies from 3-10 sq m/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 tubewells for irrigation and deep tubewells with hand pumps for drinking water. There are a few deep tubewells 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 Bangladesh is given below in the figure 58.

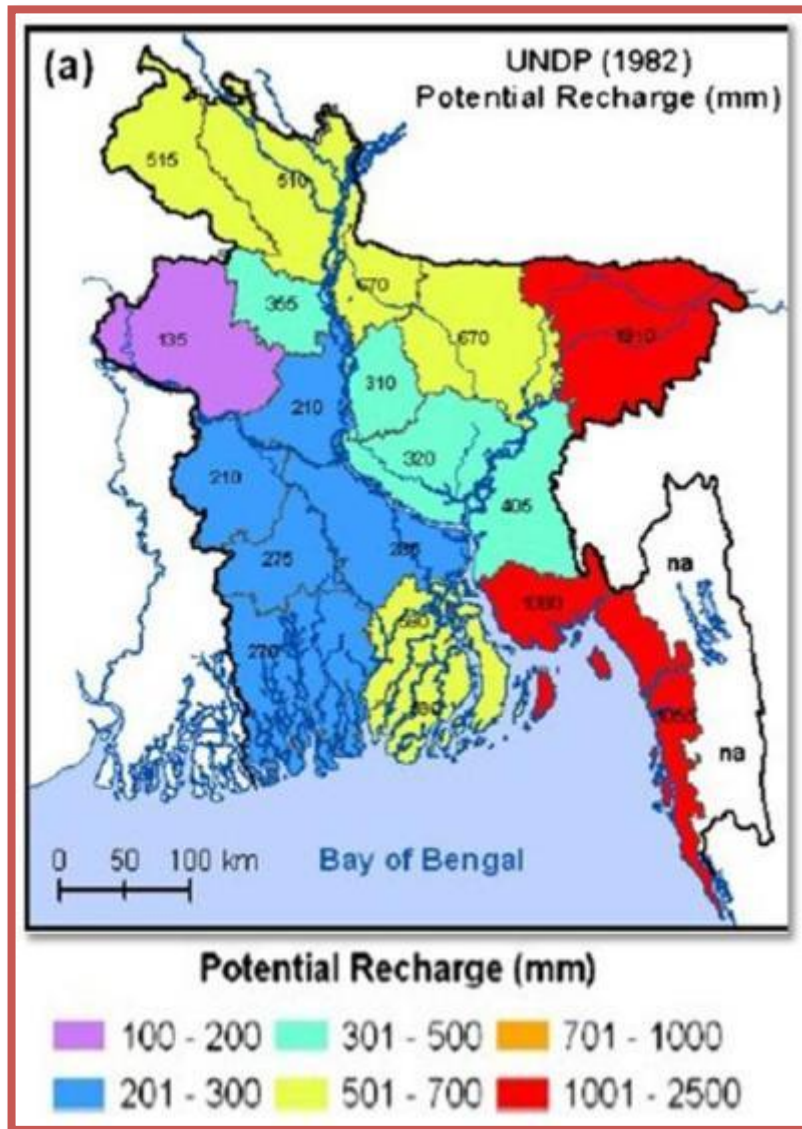
Recharge of groundwater in the project area occurs by slow vertical percolation of rain irrigation water, seepage loss of the run-off the rivers and stored water in canals, khals, streams and rivers in groundwater. There is net groundwater inflow from the uplands to the north which may be a main source 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 soils much of the potential recharge is rejected.



Source: Ahmed, J; Haque R; Rahman M, Department of Chemistry, 2011, University of Chittagong

Figure 58: Ground water Zoning Map of Bangladesh



Source: Ahmed, J; Haque R; Rahman M, 2011, Department of Chemistry, University of Chittagong

Figure 59: Potential Recharge Area in Bangladesh

Ground water quality testing has been done for the study area at 3 locations (site at app. 6 km from EZ site) and the results are presented in table 34 below.

Table 34: Ground Water Quality Data in Study area

Parameters	Units	Site 1	Site 2	Site 3	Standards as per ECR, 1997
Suplhate	mg/l	683.13	678.91	704.7	400
Chloride	mg/l	5150	5310	5420	160-600
Calcium (Ca ⁺²)	mg/l	132	87	56	75
Magnesium (Mg ⁺²)	mg/l	34	45	65	30-35
HCO ²⁻	mg/l	612	579	598	--
Erosive CO ₂	mg/l	620	750	640	--
Free CO ₂	mg/l	560	670	560	--
pH	--	6.8	6.9	6.8	6.5-8.5

As per above analysis it is found that sulphate and chloride concentration is more than the specified standards and thus the water required treatment for removal of these ions prior drinking.

Ground water quality data for Muhuri Irrigation project area is also available from secondary sources, i.e. study carried out for Muhuri Irrigation project. Muhuri irrigation project area is app. 9 km from the EZ site in north direction. Map showing Muhuri irrigation project area is given below in figure 60. Ground water quality data of the Muhuri Irrigation project is given in table 35 below.

Table 35: Ground Water Quality Data in Mirsarai Upzila

Parameters	Sample 1	Sample 2	Sample 3	Standards as per ECR, 1997
Total Hardness (as CaCO ₃)	36	45	44	200-500
Chloride (Cl ⁻)	26	69	32	160-600
Nitrate (NO ₃)	0.33	0.71	0.61	10
Sulphate(SO ₄)	1	<1	1	400
Arsenic (As)	0.007	0.018	0.007	0.05
Calcium (Ca)	9	10	9	75
Iron (Fe)	3.8	4.1	4.2	0.3-1.0
Magnesium (Mg)	6	8	7	30-35
Potassium (K)	3.3	4.1	4	12
Sodium (Na)	50.6	87.3	53.7	200
pH	6.45	6.86	6.98	6.5-8.5
Zinc (Zn)	<0.08	<0.08	<0.08	5
Boron (B)	0.2	0.2	0.22	1.0
EC (µs/cm)	247	426	308	--

Units-mg/l

Source:IEE Report, BAN:Irrigation Management Improvement Project



Source: Google Earth

Figure 60: Map Showing Muhuri Irrigation project Area

Arsenic contamination of groundwater is the prime concern in the Chittagong division. The problem was first discovered at the end of 1993; it is very much an issue in the Southeast region. The shallow aquifer has high arsenic concentrations including the, Feni districts. Studies by the Department of Public Health Engineering reveal that excess use of ground water for both irrigation and household use have lowered the ground water table. But recharging of ground water table is not occurring simultaneously due to delaying of rainfall, which could be attributed to climate change. The increased draw down in the ground water table has resulted in an increase in arsenic contamination due to increase in oxidation-reduction potential in the ground water table at shallow level. Summary of data for arsenic testing of water wells in the region is presented in table 36 below. Most affected of these aquifers lie beneath Meghna floodplains

Table 36: Contamination of Wells by Arsenic

Division	District	Number of Tests Carried Out				% o Wells Contaminated by			
		Field Tests	Pre-existing	Regional	All Tests	Field Tests	Pre-existing	Regional	All Tests
Chittagong	Brahmanb	536	51	51	638	42.9	43.1	37.3	42.5
	Chandpur	696	179	58	933	83.6	73.2	89.7	82.0
	Comilla	583	65	110	758	31.7	69.2	65.5	39.8
	Feni	80	38	50	168	42.5	28.9	34.0	36.9
	Lakshimpur	336	300	34	670	66.1	83.0	55.9	73.1
	Noakhali	679	430	48	1157	52.7	80.7	70.8	63.9

Source: IEE Report, BAN: Irrigation Management Improvement Project

Ground water quality data of the Feni district is also available from the study carried out by Rahman, Haque & Ahmed, 2011, University of Chittagong. Feni district is app. 25 kms from project site in NW direction. Ground water quality data for Feni district is given in table 37below

Table 37: Ground Water Quality Data of Feni District

Parameters	Units	Feni River	Standards as per ECR, 1997
pH	-	6.08-8.86	6.5-8.5
Temperature	°C	28.20-35.0	20-30
EC	µScm ⁻¹	172.2-2528.0	--
TDS	mg/l	85.301-262.0	1000
DO	mg/l	1.25-3.34	6
% NaCl	%	0.30-4.80	--
Acidity	mg/l	6.60-1023.77	--
Total alkality	mg/l	76.481-258.0	--
Total hardness	mg/l	26.0-554.0	200-500
Chloride	mg/l	8.17-481.76	150-600
NO ₂ -	mg/l	BDL-0.08	<!
NO ₃ -	mg/l	BDL-6.30	10
PO ₄ ³⁻	mg/l	BDL-6.65	6
SO ₄ ²⁻	mg/l	BDL-72.07	400
Ni	mg/l	BDL-0.020	0.1
Zn	mg/l	BDL-0.015	5
Cu	mg/l	BDL-0.010	1
Co	mg/l	BDL-0.008	--
Cr	mg/l	BDL-0.005	0.05
Cd	mg/l	BDL-0.011	0.005
Pb	mg/l	0.02-0.07	0.05
As	mg/l	0.10-0.50	0.05
Fe	mg/l	0.10-8.46	03-1.0
Mn	mg/l	BDL-3.74	0.1

Source: Rahman, Haque & Ahmed, 2011, University of Chittagong

5.6. Land Resources

5.6.1. Archaeological Resources

There is no archaeological resource present within 300 m radius of the project site. Archaeological resources present in the Chittagong District are Bronze statues (8th and 9th centuries, in Anwara Upzila), Fakira Mosque (Hathazari), Musa Khan Mosque (1658), Kura Katni Mosque (1806), Kala Mosque (16th century), Chhuti Khan Mosque (Mirsarai), Kadam Mobarak Mosque (1719), Andar Killah Mosque, Wali Khan Mosque (1790), Badar Awlia Dargah, Bakshi Hamid Mosque of Banshkhali (1568), Chittagong Court Building (1893), Collegiate School, Ethnological Museum (1974).

Out of these, archaeological resources within Mirsarai are Duari Mosque, Jagannath Dham (Abu Torab), Kali Mandir (Karerhat), Shantiniketan Vihara, Abhay Charan Vihara.

5.6.2. Historical Events

Chittagong had been a sea port since the ancient time. The Arab traders had business transactions with this port since 9th century AD. Chittagong region was under the kingdom of Arakan during sixth and seventh centuries. Before the Muslim rule Chittagong had been either under the control of the Arakans or under the kings of Burma. Sultan Fakruddin Mubarak Shah of Sonargaon conquered Chittagong in 1340. After the defeat of Sultan Giasuddin Mahmud Shah in the hands of Sher Shah in 1538, the Arakanise again captured Chittagong. From this time onward until its conquest by the Mughals this region was under the control of the Portuguese and the Magh pirates. The Mughal Commandar Bujurg Umed Khan expelled the Portuguese from the area in 1666 and established Mughal rule there. The Mughals renamed Chittagong as Islamabad

On 18th April 1930, the revolutionaries looted the Chittagong armoury under the leadership of Mastarda Surya Sen. During this time the leaders of the women revolutionaries were Pritilata Waddedar, Bina Das, Lila Ray, Kalpana Dutta etc. The Declaration of Independence of Bangladesh was announced from Swadhin Bangla Betar Kendra located at Kalughat.

Marks of the War of Liberation Mass graves and mass killing sites: Foy's Lake, Lalkhan Bazar, hilly area adjacent to Firoz Shah Colony, Kattoli Beach, CRB area, hills on the east of Sher Shah Colony, Patenga Air Port, hills around Nasirabad Residential Area and many other places.

5.6.3. Land Types

Land types are classified depending upon the depth of inundation during monsoon season due to normal flooding in an average year. SRDI has made the land type classification into five types, i.e. High land (Above flood level), Medium highland (Flooding depth 0-90 cm), Medium lowland (Flooding depth 90-180 cm), Lowland (Flooding depth 90-270 cm) and very lowland (Flooding depth >270 cm). Land type classification based on flooding during Monsoon Season by SRDI is given below in table 38:

Table 38: Land Type Classification

Land Type	Description	Flooding Depth	Flooding Characteristics
F0	Highland	0-30 cm	Non flooded to intermittent
F1	Medium Highland	30-90 cm	Seasonal
F2	Medium Lowland	90-180 cm	Seasonal
F3	Lowland	180-270 cm	Seasonal, but remains wet in early dry season
F4	Very Lowland	> 270 cm	Seasonal but remains wet in most of the dry season

Source: SRDI

As per the classification, project site will be covered under very lowland and study area will fall under both lowland and very lowland.

5.6.4. Soil Texture and Composition

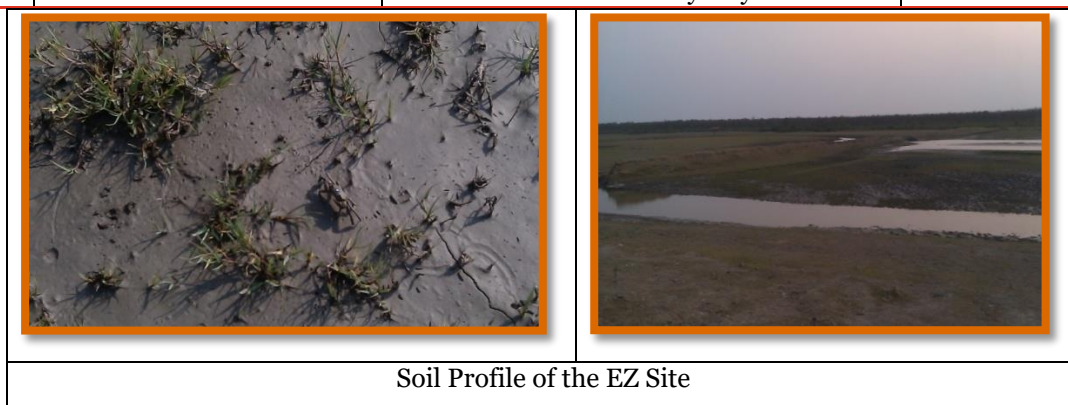
The soils of Mirsarai EZ are sandy loam to clay loamy soils in some areas. Most of the farmlands in nearby areas are on sandy loams with some black cotton soils in the low lands. Black cotton soils

characteristically host Acacia wood plant. Soils change to more sandy and gravel texture all the way to the foot of the escarpment. Likewise, the soil patches of sandy soil can be seen between Mirsarai EZ and Muhuri flood plain. The top soil near the EZ is mainly very soft to medium silt with clay or clay-laden silt and with a trace of fine sand. According to the sub-soil investigation record of this area (north-west of Chittagong District) the soil profile at shallow beyond shallow depth is mainly dominated by non-cohesive soil with a comparatively low SPT (Standard Penetration Test) value at the upper level.

To understand the soil profile of the EZ site a liquefaction analysis has been carried out at three locations near EZ site (app 2 km, SW direction). From the study it is found that the area is covered with the sediments brought in by River Feni and sea. Project site is covered with grey colour clayey soils for app. 1.5 m. Then upto 18.0-22.5 m depth soil is sandy in texture. After this depth upto 60 m soil is sandy with dense to very dense consistency. Results of analysis are presented in table 39 below. Soil profile of the EZ site is presented in figure 61. However, for better understanding, a field bore log data of a bridge site (bore hole location on the land) near Mirsarai EZ project (Morgang Khal on Morgang Road near Azampur Bazar app. 9.5 kms from site in EZ site in SW direction) is carried out. Bore log sheet of the area is shown in figure 62 below. As per the soil profile study of Azampur Bazar, it is observed that upto depth of 4 m soil is grey, very soft to medium silt, some clay and trace fine sand. Beyond 4 m upto 11 m, soil is grey, loose fine sand with some silt and trace clay. Beyond 11 m, soil is grey medium fine sand with some silt. Beyond 21 m soil is grey, medium to dense fine sand

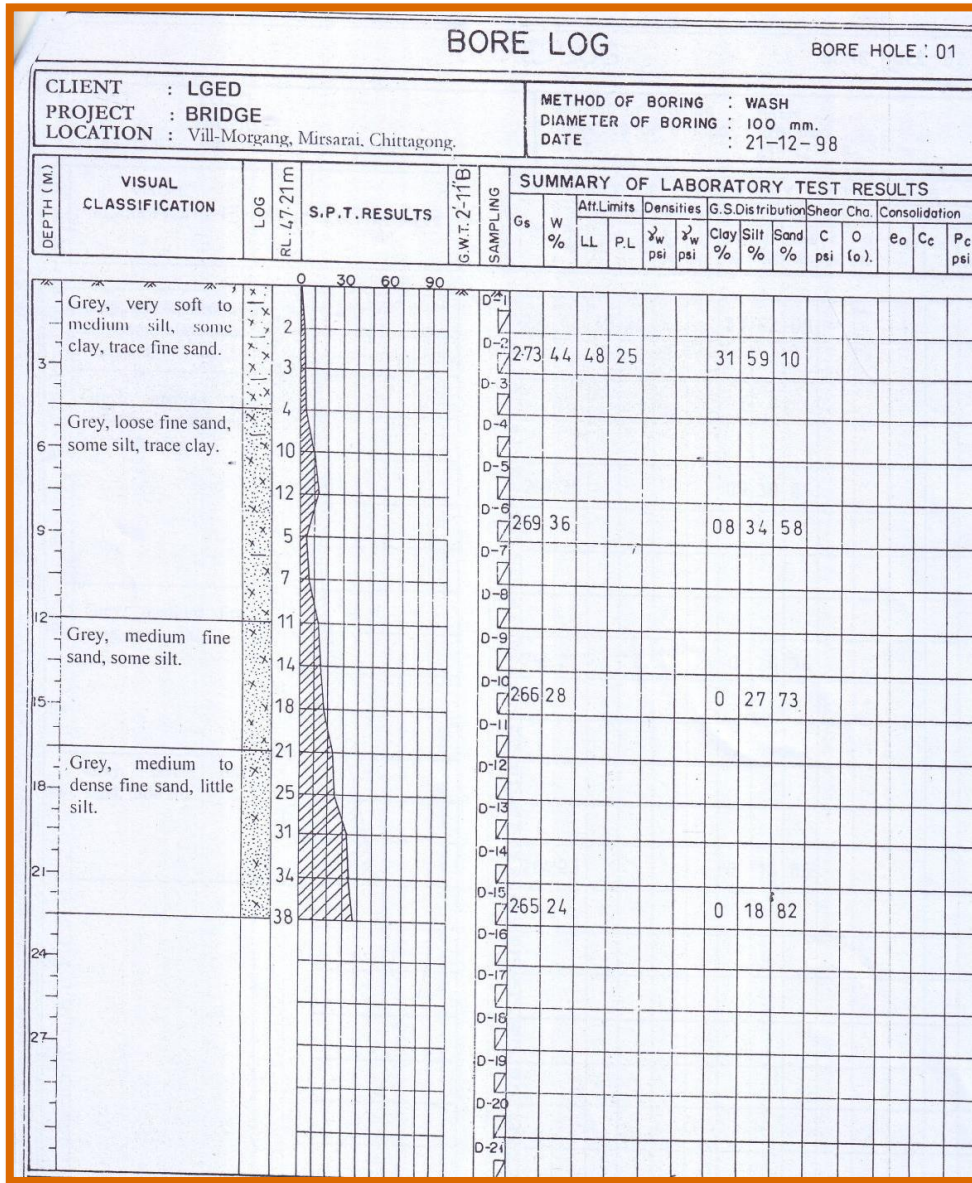
Table 39: Liquefaction Analysis if Soil Near EZ Site

BH No.	Depth	Soil Classification	Probability of Liquefaction
01	1.5m to 13.5m	Grey loose to medium dense inorganic fine to medium silty sand with clayey silt	High to Medium
	13.5m to 30.0m	Grey medium dense to dense inorganic fine to medium sand with silty clay	Medium
	30.0m to 60.0m	Grey dense to very dense inorganic fine to medium sand with silty clay	Low
02	1.5m to 22.5m	Grey loose to medium dense inorganic fine to medium silty sand with clayey silt	High to Medium
	1.5m to 13.5m	Grey dense inorganic fine to medium sand with silty clay	Medium
	30.0m to 60.0m	Grey dense to very dense inorganic fine to medium sand with silty clay	Low
03	10.5 m to 18.0 m	Grey loose to medium dense inorganic fine to medium silty sand with clayey silt	High to Medium
	18.0 to 30.0 m	Grey dense inorganic fine to medium sand with silty clay	Medium
	30.0 to 60.0 m	Grey dense to very dense inorganic fine to medium sand with silty clay	Low



Soil Profile of the EZ Site

Figure 61: Photographs Showing Soil Profile of Area



Source: Pre Feasibility Study, Mirsarai

Figure 62: Bore log data- Near Azampur Bazar

5.6.5. Soil and Sea Sediment Quality

Soil Quality

Soil quality study has been carried out at 3 locations around the EZ site and the result of the analysis are present below in table 40 below

Table 40: Soil Quality of EZ site

Parameters (Physico-Chemical Properties)	Units	EZ Site		
		Site 1	Site 2	Site 3
Suplhate	mg/kg	276.54	289.64	269.78
Chloride	mg/kg	440	476	455

Ca²⁺	mg/kg	670	750	640
Mg²⁺	mg/kg	121	129	138
HCO₃⁻	mg/kg	543	346	367
CO₃²⁻	mg/kg	434.65	456.94	398.76
pH	--	6.8	7.2	6.8

Sea Sediments

A study has been carried out to understand the impact of ship breaking industry on the sea water quality and aquatic life by Md. M. Maruf Hossain and Md. Atikur Rahman, Inst. of Marine Sciences and Fisheries, university of Chittagong, Chittagong, 2007-2008. The study also includes sampling of heavy metal concentration in sea sediments in the affected area due to ship breaking activities and at control point, i.e area unaffected. This control point is waters near Sandwip Island (near Muradpur). Sampling location at Sandwip Island is app. 18 kms away from project site. Between proposed EZ site and Sandwip Island no industrial activity or discharge of any industrial effluent is being undertaken. Thus the concentration expected to occur at site is less than the reported concentration at the referred sampling location. Heavy metal concentration in the coastal waters of Sandwip Island is presented in table 41 below.

Table 41: Heavy Metal Concentration in Coastal Sediments in Coastal waters of Sandwip Island

Parameters	Units	Sediment Quality near Sandwip Island-2007-2008	Standard Values (IAEA-a & GESAMP-b)
Fe	µg/gm	19.995	27.0-a
Cu	µg/gm	0.289	33.0-b
Zn	µg/gm	0.968	95.0-b
Cd	µg/gm	0.037	0.115-a & b
Cr	µg/gm	0.447	77.2-a
Ni	µg/gm	0.98	56.1-a
Mn	µg/gm	0.235	1.17-b
Al	µg/gm	0.297	--
Pb	µg/gm	3.265	22.8-b
Mg	µg/gm	2.355	--
As	µg/gm	ND	--

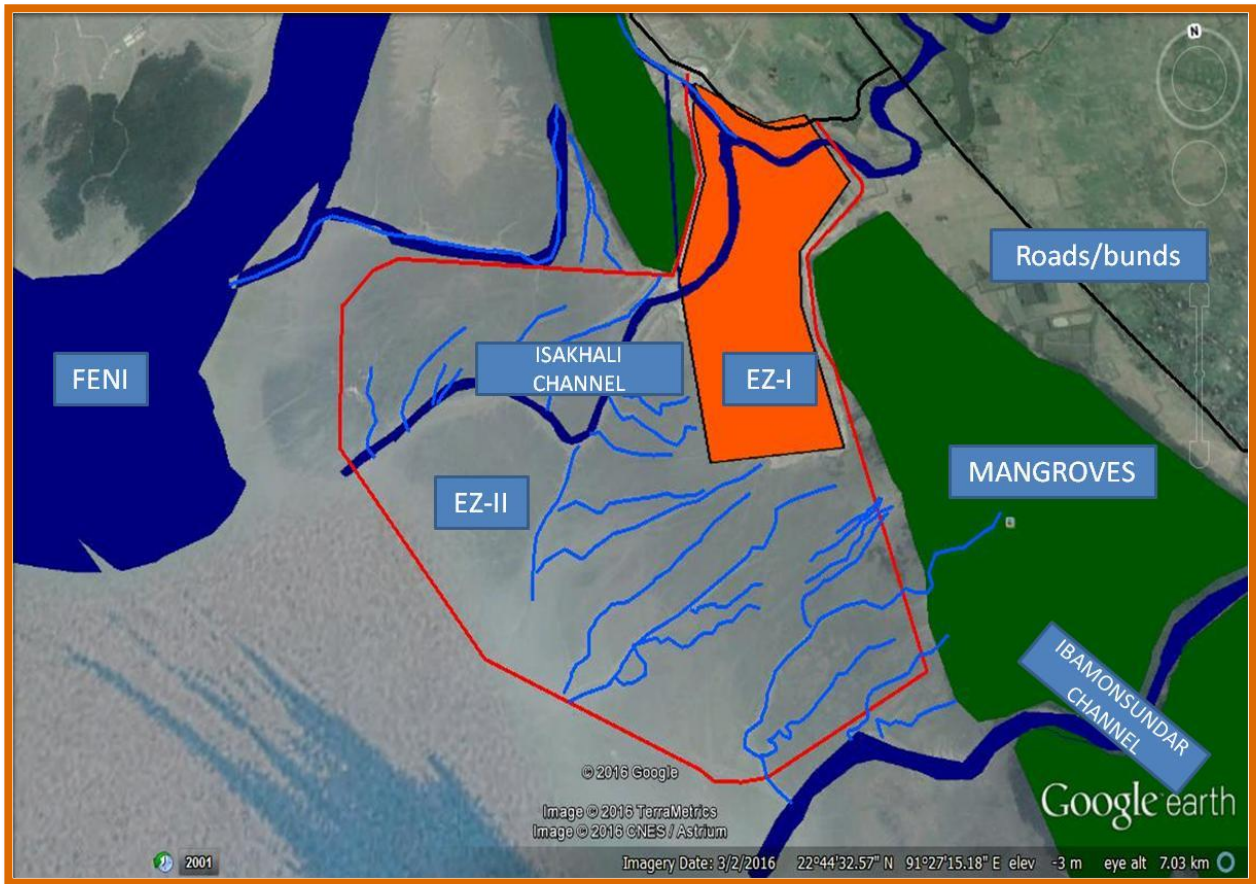
Source: Md. M. Maruf Hossain and Md. Atikur Rahman, 2007-2008

5.6.6. Land Use

EZ site is covered with sand and clay deposits. Site is app 1 km away from the sea. Total EZ site measures 1311 acres. Out of 1311 acres area of app. Thus the usable area is 1311 acres . Land use break up for the site is given in table 42 below.

Table 42: Land use Details of EZ site

Land Use Land Cover Class	Area (Acres)	Area Percentage (%)
Development Area	1200	84.39
Isakhali Canal	111	15.6
Total	1422	100



Source: Google Earth

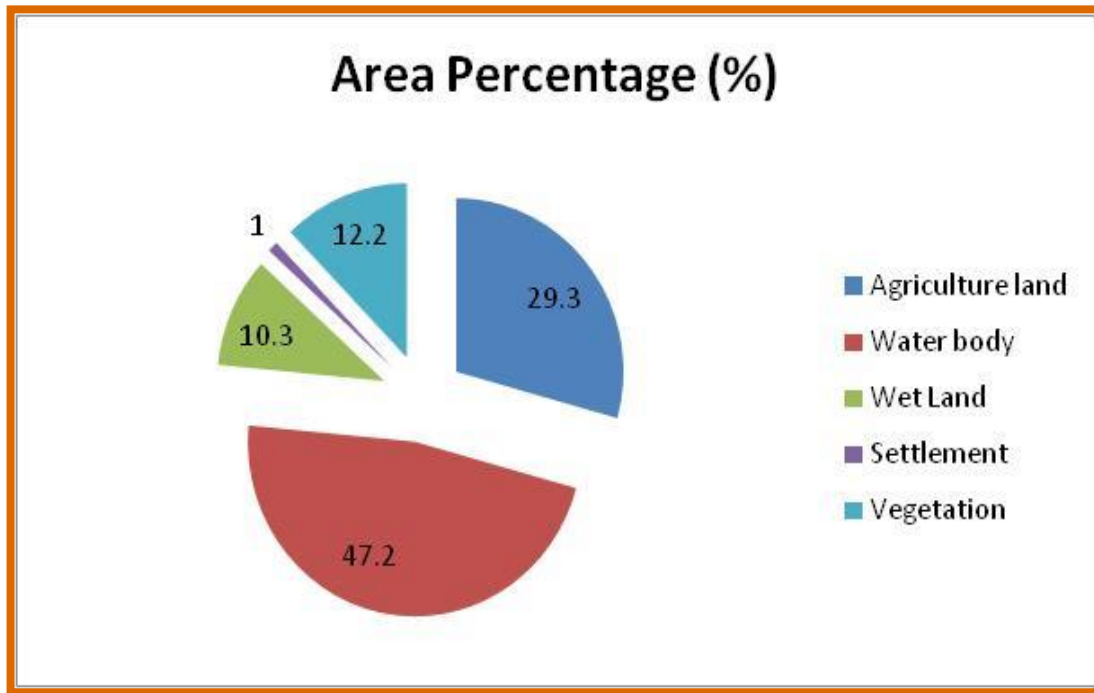
Figure 63: Land Use of EZ Site

Land use land cover study has been carried out for 10 km radius area of the EZ Site. Maximum area is covered by waterbodies (47.2%) including Sea, rivers, canal, small stream & channels followed by agriculture & aquaculture land (29.3%). Area under vegetation/forest area is 58.21 sq km (12.2%) and area under wetland is 48.86 sq km (10.3%). Area under settlements is least and is equal to 4.53 sq km (1.0%). Land use area break up of 10 km study area is given in table 43 below. Land use map of the 10 km radius area is given in figure 64 & 65 below.

Table 43: Land use Details of Study Area

Land Use Land Cover Class	Area (Sq. km)	Area Percentage (%)
Agriculture\Aquaculture land	139.4	29.3
Water body	224.1	47.2
Wetland	48.86	10.3
Settlement	4.53	1.0
Vegetation	58.21	12.2
Total	475.06	100

Source: Mahindra



Source: Mahindra

Figure 64: Area Percentage of land Use Class in Study Area

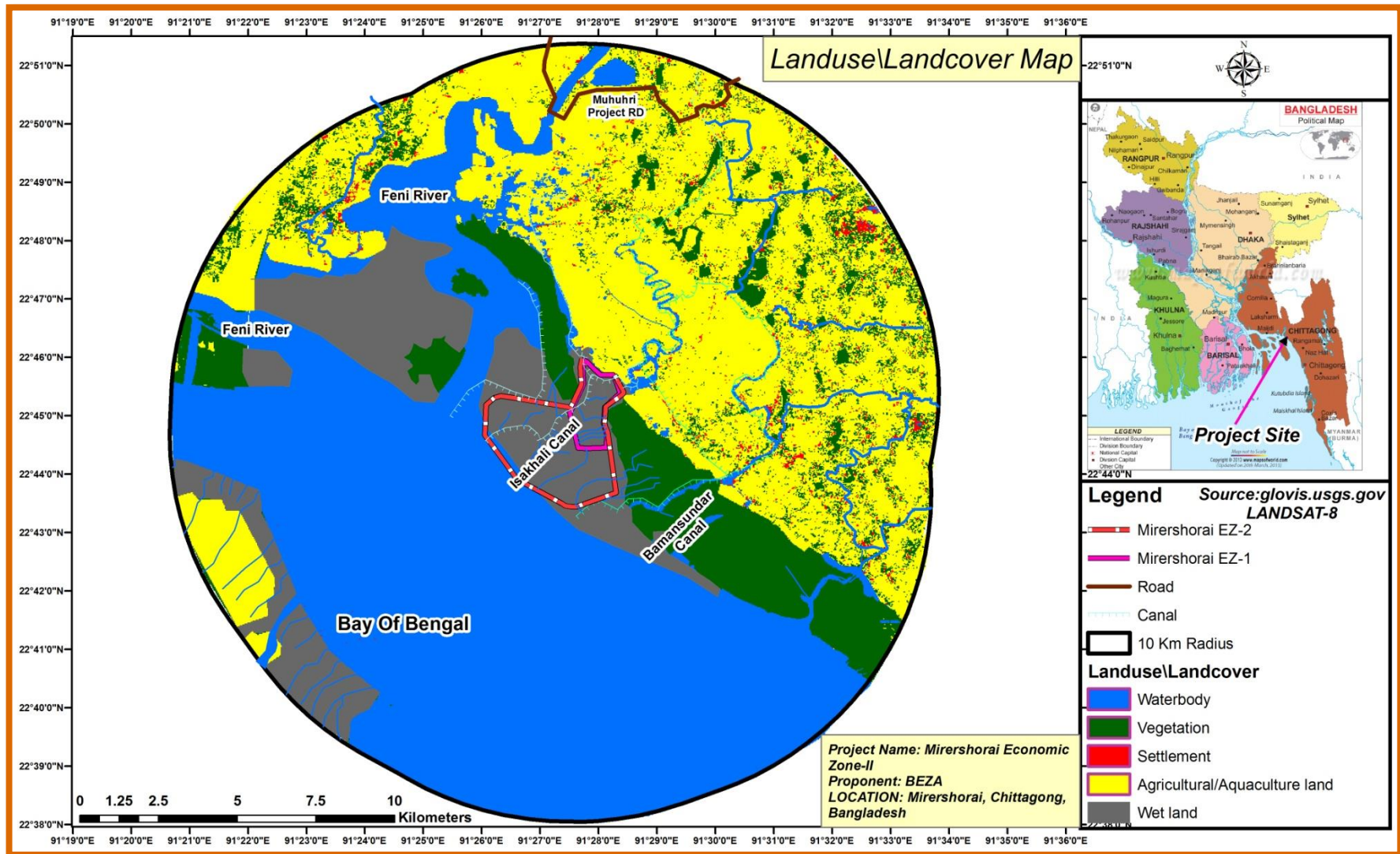


Figure 65: Land Use Map of the Study Area (10 km Radial Zone)

5.6.8. Seismicity

Bangladesh is possibly one of the most vulnerable to potential earthquake threat and damage. Earthquake vulnerability of any place largely depends on its geology and topography, population density, building density and quality, and finally the coping strategy of its people and it shows clear spatial variations. In the earthquake zoning map (figure 67) of 1993, 26 percent of Bangladesh falls in high risk, 38 percent moderate and 36 percent in low risk zone in terms of earthquake vulnerability. The distribution of recorded earthquakes indicate a major clustering of seismicity around the Dauki Fault and scattering of other events along other major fault systems of Bangladesh. The magnitude of the earthquakes are moderate (4-6) and majority of them are shallow depth.

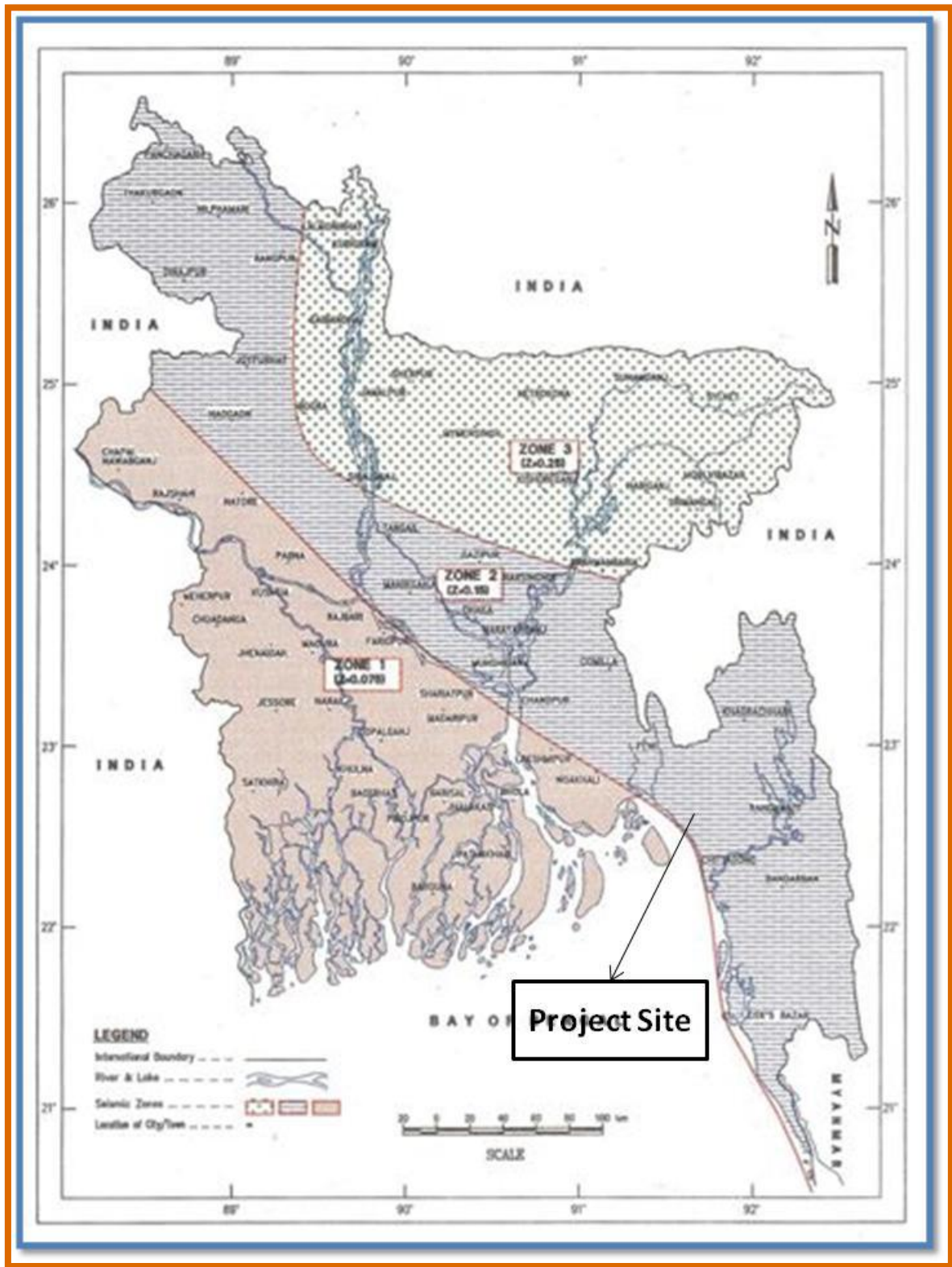
Most of the parts of Chittagong, the port city of Bangladesh consisting of fine sand and silt deposits are susceptible to liquefaction. Chittagong City is mostly a hilly region, but it also consists of alluvial flood plain and sandy sea-shore area. Although the hilly region is less susceptible to liquefaction, 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.

According to the Global Seismic Hazard Assessment Program (GSHAP), the most hazardous division in Bangladesh is the port city, Chittagong. Chittagong metropolis together with its surroundings is situated in the seismic zone 2, which has a basic seismic coefficient, $Z=0.15$ (BNBC, 1993). Distance of EZ site from Chittagong is app 55 km from EZ site. Seismic zoning map of Bangladesh is given in figure below. List of the major earthquake that hit Bangladesh are listed in table 44 below.

Table 44: List of Major Earthquake Affected Bangladesh

Date	Name	Magnitude (Richter)
10 January, 1869	Cachar Earthquake	7.5
14 July, 1885	Bengal Earthquake	7.0
12 June, 1897	Great Indian Earthquake	8.7
8 July, 1918	Srimongal Earthquake	7.6
2 July, 1930	Dhubri Earthquake	7.1
15 January, 1934	Bihar-Nepal Earthquake	8.3
15 August, 1950	Assam Earthquake	8.5
22 November, 1997	Chittagong Earthquake	6.0
22 July, 1999	Maheshkhali Earthquake	5.2
27 July, 2003	Rangamati Earthquake	5.1

Source: Bangladesh Disaster Knowledge Network

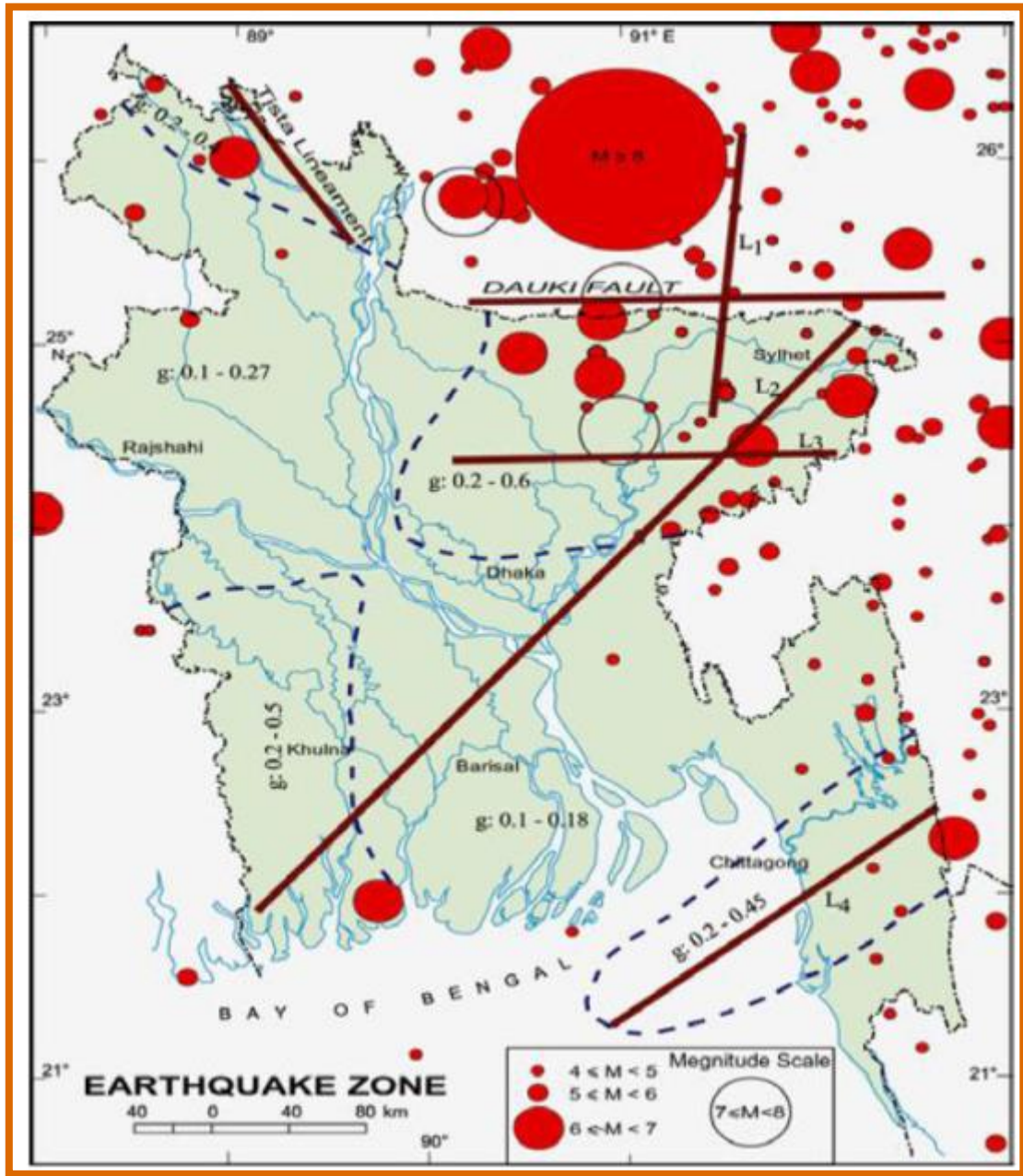


Source: Bangladesh Disaster Knowledge Network

Figure 67: Seismic zone map of Bangladesh (BNBC, 1993)

The most hazardous division in Bangladesh is Chittagong division. Northern and southern sections could expect to have maximum peak ground acceleration (PGA) ranging between 0.24g to 0.40g. The Chittagong Hill Tracts region can expect the highest PGA of up to 0.4g to 0.48g. In the basic seismic

zoning map of Bangladesh, Chittagong and its surrounding region has been shown under Zone II with basic seismic coefficient of 0.15 (BNBC-1993), but recent repeated shocking around this region indicating the possibilities of potential threat of even much higher intensity like 0.35g than projected. If the Indian seismic zones were extended across the border into Bangladesh, the country would lie in zones IV and V. The seismicity of Bangladesh is shown in figure 68 below.



Source: Bangladesh Disaster Knowledge Network

Figure 68: Seismic Activity of Bangladesh

5.7. Agriculture Resources

The physiographic unit of the project is: Chittagong Coastal Plain (AEZ# 23), sub-regions are Piedmont Plains and River Flood plain (23a) and Young Tidal Floodplain(23b) with general soil type Non-Calcareous Grey Floodplain Soils(non-saline) in both of the sub-region soils. The soil texture in both of

the sub-region soils is loamy. The landscape of the area-comprised of mainly medium high land to high land. The soil type pre-dominates with Non-Calcareous Grey floodplain soils(no-saline). Map showing Agro-economic zones of Bangladesh is given in figure 69 below



Source: FAO, Bangladesh

Figure 69: Agro-economic Zone of Bangladesh

As per the land use land cover study of 10 km radius of the project site, approx. 29.3% of the area is covered under agriculture & aquaculture land. No agriculture or aquaculture activity was found at the site during visit.

5.7.1. Farming Practice

Agriculture

Farmers practice agriculture in this region for 3 seasons, i.e. Rabi, Kharif I and Kharif II. Source of irrigation in this region are storm water are rain water harvesting ponds, ground water, khals/canal etc. Major crops of the region are paddy, betel leaf, betel nut, potato, corn, turmeric, tea, peanut, mustard, patol (heap), brinjal, ginger, cucumber and other vegetables.

Aquaculture:

During the 1960s, coastal aquaculture in the Chittagong region was normally a function of salt production. During the monsoon season, some salt producers would utilize their salt pans mainly for subsistence fishing but also occasionally to supplement their income through the sale of the shrimp and finfish surplus. With the increase of demand and price, this practice gained increased acceptance in the region. Harvesting of tiger shrimp is most practiced due to its demand.

Aquaculture is practiced extensively around the EZ site. Govt. has initiated various aquaculture programs to harvest fishes especially Ruhi, Catla and Korps near the EZ site for providing the livelihood to the people in Mirsarai. Fising is being done intensively in River Feni and Sea. Fishing is done in Isakhali Channel and Bamkn Sundar Channel during high tides and monsoon season.

Shrimps culture (Bagda and Golda) is also practiced in large scale. The culture period was typically four months for Bagda and six to seven months for Golda. Varieties of feeds such as cooked rice, fishmeal, oilcake and snail muscle are used for shrimp culture. Shrimp culture in teh area is affected by some viral disease which attacks shrimp culture and are responsible for the great loss of shrimp in this area. Mud crabs are also collected by people from the mudflats area, i.e. forest and along the canals.





	
<p>Agriculture Field</p>	
	
<p>Collected Mud Crabs</p>	<p>Fish Culture Pond</p>



Figure 70: Photographs Showing Agriculture Fields and Aquaculture Ponds

5.7.2. Cropping Pattern and Intensity

Major portion of the land within study area is under agriculture. Agriculture land comprise of fallow and agriculture land areas, seasonal gher and aquaculture ponds. There are three cropping seasons, i.e. Kharif-I, Kharif-II and Rabi. Major agriculture pattern in study area is Fallow-T.Aman (Local), local vegetables & fruits and B.Aus. Major crops of each cropping season are given in table 45 below

Table 45: Cropping Seasons in Area

S. No.	Cropping Season	Major Crops	Months
1.	Kharif-I	B.Aus, Jute and vegetables	March to May
2.	Kharif-II	T.Aman (HYV & L) and fallow land	June to October
3.	Rabi Season	Boro (HYV), vegetables, fruits and pulses	November to February

Source: FAO, Bangladesh

Crop Calendar

During Kharif 1 season HYV rice is the principal crop, during Kharif 2 medium Aman and Aus crops are grown or jute is cultivated in medium lowland. During the Rabi season, wherever the land dried up in early October to mid-October, farmers grow legumes, oil seed and vegetables. Vegetables are mostly confined to highland, oil seeds to medium land and pulses to medium lowland. Paddy is major cash crop of the farmers in the study area and requires year-round production activity. Oilseeds, vegetables and other seasonal crops are the significant crops in this area. Cropping patterns and crop diversity for kharif and Rabi seasons are scheduled according to land types, flooding frequency and duration of floods. The patterns in the study area are dictated by the local hydrologic regime and are essentially based on rice. Non-rice crops are grown mostly in the non-irrigated land in rotation with Rabi Aus and Aman, depending on the land type. Winter crops are intercropped with sugarcane. Irrigated HYV Boro is grown in winter in sequence with T. Aman on medium high land and T. Aman on medium lowland. Major vegetables in the area are tomato, potato, lady finger, brinjal, pumpkin, cabbage, cauliflower, radish, sweet potato, jackfruit etc. Legumes grown are arhar, masor, keshari and moong dal.

5.7.3. Cropped Area

As per the land use land cover study of 10 km radius of the project site, approx. 29.3% of the area is covered under agriculture land & aquaculture ponds. No agriculture land area will be used for development of EZ.

5.7.4. Crop Production, Damage and Constraints of Crop Production

Farmers of Chittagong district produce food crops, cash crops, fruits, vegetables, livestock and poultry, fish, timber and fuel wood. Majority of household also have poultry, livestock and produce poultry and livestock produce for daily consumption and selling.

Major constraints of agriculture in the study area is availability of arable land, crop damage, seasonal flooding of land, water logging, soil salinity and availability of high quality seeds and fertilizers. Crop damage is reported to occur during focused group discussions due to both excess and scanty rainfall. Pre-monsoon and post-monsoon drainage congestion limits crop production. In monsoon season, the duration of water logging thus limiting the crop choice

5.8. Livestock and Poultry

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.

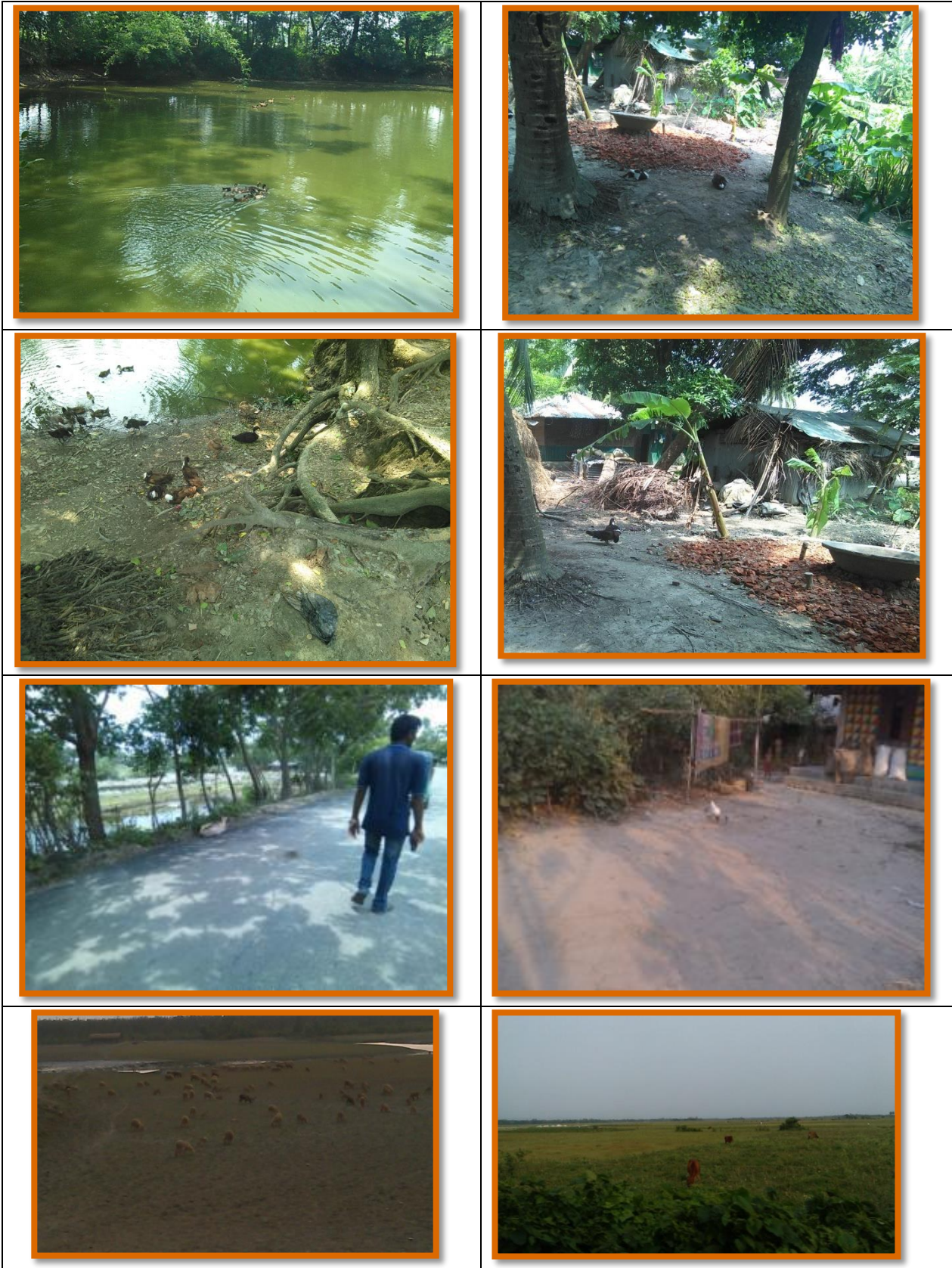


Figure 71: Photographs Showing Livestock & Poultry in the area

5.8.1. Feed and Fodder Shortage

The owners of the livestock population are facing problems in respect of availability of fodder and feeds during the month from March to December due to shortage of grazing fields. In dry and Kharif-I seasons, the lands are generally submerged with saline water especially in the project area and major portion of the study areas. During Kharif-II season, the fields are covered with T. Aman (Local). Rice straw is the main fodder for cattle. Bran of wheat and rice, oil cakes, powder of cereal crops etc. are the other common fodders, but the availability of these feed in these areas is rare. Shortage of grazing area throughout the year aggravates the feed problem to the animal population. Poultry population at family level survives by scavenging and generally, no feed supplements are provided. However, at times kitchen waste becomes feed to the poultry.

5.8.2. Livestock/Poultry Diseases

Most common livestock diseases found in the study area are foot and mouth disease (FMD), Anthrax, Diarrhoea, PPR etc. The got/cyst in head is common disease of goat. Major poultry diseases are Duck Plague, Paralysis, New Castle, Fowl pox, and Dysentery etc. The most vulnerable period is between July to October (rainy season) months for spreading diseases to livestock and poultry populations. The duck plague generally occurs in summer.

5.9. Fisheries

5.9.1. Introduction

Fisheries resources of the study area are rich and diversified. Study area consists of rivers, aquaculture ponds, canals and Khals. Details of the fisheries of the study are is given in sections below

5.9.2. Habitat Description

Fish habitats of the area are creeks, Khal, rivers, aquaculture ponds, natural ponds and beels. 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.

5.9.3. Fish Biodiversity & Migration in Feni River Estuary

Project site is app 800 m from the Feni River Estuarine system. From study of Halder, G.C; Haroon, A.K.Y; Khan, M.A.A.; Tsai, C.F., 1991, it was found that Feni River Estuary are used by 34 species of upstream fresh water fishes, 11 species of estuarine dependent fish water species and nine species of marine fishes for various purpose and at different stages of their life. From study of Md. Iftakharul Islam et.al., it was found that 29 species of fisheries from 20 families are reported in Feni River Estuary system. These species are from variable habitats like fresh water, brackish water and marine water. All these fisheries migrate to Feni River Estuary system to complete on or more stage of their life. Out of these 20 families of fisheries found by Md. Iftakharul Islam et.al., it was found that 18 are fishes, 9 are shrimp and 2 are crab. The most abundant species was found to be *Odontamblyopus rubicundus* that constitute 42.64% of the total species found in the Feni River estuary, followed by *Pseudapocryptes elongates* (10.14%), *Stolephorus sp.* (9.22%), *Trypauchen vagina* (6.38%). Abundance of species in Feni River varies with season as per study of Md. Iftakharul Islam et.al. and is given in following table 46. Also the fisheries diversity present in the Feni River Estuary along with their habitat is listed in the table 47.

Table 46: Dominant Fisheries in Different Seasons

S. No.	Season	Dominant Species
1	Premonsoon season	<i>Trypauchen vagina</i> (26.05%), <i>Exopalaemon styliferus</i> (15.21%), <i>Mugil cephalus</i> (8.28%), <i>Parapenaeopsis styliferus</i> (5.57%), <i>Macrobrachium rosenbergii</i> (4.37%), <i>Matapenaeus monoceros</i> (4.07%).
2	Monsoon season	<i>Odontamblyopus rubicundus</i> (58.21%), <i>Pseudapocryptes elongates</i> (13.50%), <i>Tenulosa toil</i> (4.79%), <i>Stolephorus sp.</i> (4.23%).
3	Post monsoon season	<i>Odontamblyopus rubicundus</i> (40.12%), <i>Pseudapocryptes elongates</i> (16.68%), <i>Stolephorus sp.</i> (7.44%), <i>Macrobrachium mirabeli</i> (5.33%), <i>Parapenaeopsis sculptelies</i> (4.28%).
4	Winter Season	<i>Odontamblyopus rubicundus</i> (48.11%), <i>Stolephorus sp.</i> (25.26%), <i>Mugil cephalus</i> (7.86%)

Source: Islam, I, 2012, Temporal pattern of Fish Assemblage of Feni River, Feni, Bangladesh-Fish Bio-diversity of Feni River

Table 47: Fish and Shrimp Species Recorded in the Feni River Estuary

Family	Scientific Name	Local Name	Habitat	Climate
Ambassidae	<i>Chanda nama</i>	Chanda	Benthopelagic Freshwater brakish	Tropical
	<i>Stolephorus sp.</i>	Mola	Benthopelagic Freshwater brakish	Tropical
Anguillidae	<i>Anguila sp.</i>	Kuicha	Marine, brakish	Tropical
Alpheidae	<i>Alpheaus spp.</i> (<i>Rafinesque, 1815</i>)	Alphaed shrimp	Marine, brakish	Tropical
Bagridae	<i>Mystus gulio</i> (<i>Hamilton, 1822</i>)	Guilla	Demarsal, anadromous, freshwater, brakish	Tropical
Clupeidae	<i>Tenuulosa toil</i> (<i>Valenciennes, 1847</i>)	Illish	Marine, freshwater, Brakish, Pelagic- neritic, anadromous	Subtropical
Cynoglossidae	<i>Cynoglossus lingua</i>	Kukur jeeb	Demarsal, amphidromus, Freshwater, brakish, marine	Tropical
Cyprinidae	<i>Puntius ticto</i>	Tit punti	Benthopelagic, Freshwater,	Tropical
Engrualidae	<i>Coila ramkorati</i> (<i>Hamilton, 1822</i>)	Alua	Pelagic- neritic, amphidromus, brakish, Marine	Tropical
Gobiidae	<i>Apocryptus bato</i> (<i>Hamilton, 1822</i>)	Chiring	Demarsal, Amphidromus, freshwater, brakish, Marine	Tropical

	<i>Pseudapocryptes lanceolatus</i> (Bloch- Schneider,1801)	Goby	Amphidromus, freshwater, brakish, Marine	Subtropical
	<i>Odontamblyopus rubicundus</i> (Hamilton, 1822)	Raja Cheoa	Marine brakish, benthopelagic, amphidromous	Subtropical
	<i>Oxyurichthys microlepis</i>	Nunabaila	Marine brakish,	Tropical
Leucosiidae	<i>Matuta victor</i> (fabricus,1781)	Kakra	Marine brakish,	Tropical
Mugilidae	<i>Mugil cephalus</i> (Linnaeus,1758)	Bata	Benthopelagic Amphidromus, freshwater, brakish, marine	Subtropical
Mastacembelidae	<i>Mastacembelus armatus</i>	Baim	Marine, Brackish, Freshwater	Subtropical
Polynemidae	<i>Polynemus peradiseus</i> (Linnaeus, 1758)	Taposi	Marine, freshwater, brakish, demersal, amphidromous	Tropical
Sciaenidae	<i>Johnius belangerii</i> (Cuvier, 1830)	Poa	Demarsal amphidromus brakish, marine	Tropical
Taenioididae	<i>Trypauchen vagina</i>	Lal cheoa	Marine brakish, benthopelagic, amphidromous	Subtropical
	<i>Pangassius pangassius</i>	Pangass	Freshwater, brakish,	Subtropical
Palaemonidae	<i>Macrobrachium rosenbergii</i>	Goldachingry	Fresh water, Esturine water	Subtropical
	<i>Macrobrachium villisimanus</i>	Dimuaicha	Brackish,	Tropical
Peneidae	<i>Penaeus monodon</i>	Bagda chingri	Marine brakish	Subtropical
	<i>Parapenaeopsis sculptelies</i>	Boro chama	Marine, brakish	Tropical
	<i>Matapenaeus monoceros</i>	Horina chingri	Marine, brakish	Tropical
	<i>Parapenaeopsis stylifera</i>		Marine, brakish	Subtropical
Palaemonidae	<i>Exopalaemon stylifera</i>		Marine, brakish	Subtropical
	<i>Macrobrachium mirabile</i>		Marine, brakish	Subtropical
Portunidae	<i>Scylla serrata</i>	Kakra		Subtropical

Source: Islam, I, 2012, Temporal pattern of Fish Assemblage of Feni River, Feni, Bangladesh-Fish Bio-diversity of Feni River

5.9.4. Fish Production & Effort

Total annual inland fish production of Chittagong district is 89988.86 MT. Out of this 12549 MT is produced from rivers, 21 MT from beels, 30367 MT from flood plains, 44132 MT from ponds, 459 MT from seasonally cultured water bodies and 2460.86 MT from aquaculture ponds. Out of total fish catch

from rivers (12549 MT) it is estimated that 15MT of fishes are major carps, 5 MT are other carps, 12439 MT is Hilsa, 11 MT are big prawns, 37 MT are small prawns and 42 MT are other fishes.

There are in total 11 Govt Hatcheries which yields 672 Kgs of Post larvae (PLs) and 236 private hatcheries which yield 59997 kgs of PLs and 4091 lakhs Tilapia Juveniles.

People in study area extensively practice aquaculture and pisciculture both. People practice shrimps Bagda pona (*Penaeus monodon*) & Goda pona (*Macrobrachium resenberil*) and crab (especially mud crab/*Scylla serrata*) cultivation in the study area. Crabs are collected from inter-tidal creeks, khals, mangrove area and rivers. Fishes mainly Ruhi, hilsa and Karpas are reared in fisheries project run by both Government and people. Government promote aquaculture and pisciculture activities extensively in coastal areas to provide livelihood to people and reduce their dependency on Mangrove forests planted along the coast line.

5.9.5. Fisheries Management, Problem and Issues

People practice fishing in Isakhali canal which runs through the EZ site. Development of EZ site will restrict the fishing activities in Isakhali canal section within EZ site. Also development of sluice gate in the downstream may restrict fish movement between sea and canal when the gates are closed during high tides. Due to presence of Bamon sundar canal and free fishing in upstream Isakhali channel, impact on fishing activities will be minimal. Also 5 m wide zone of no development and retaining wall will be developed along the Isakhali channel within EZ site which will check direct exposure of Isakhali channel to upcoming industries and will protect the quality of water in Channel and thus aquatic life. BEZA in future will monitor the industries to ensure that no waste is being thrown in Isakhali channel to restore its quality and aquatic life.

5.10. Ecological Resources

5.10.1. Bio-ecological zone

The baseline ecological surveys were carried out, based on various secondary sources (Forest Department Data, Scientific Studies and previous similar studies) which are further validated from through field observations and interaction with local people. Present biological assessment was carried out for core zone (at the economic zone site and offsite facilities areas) and buffer zone (10 km surrounding the core zone area).

5.10.2. Core Zone –Ecological assessment

Flora & Fauna of Economic zone site & Administration Building:

Upcoming economic zone is located at in Mirsarai Upzila under Chittagong district and is devoid of any plantation. Site is flat low land area covered with grey silty clay soil. Site is wetland and remains inundated in water during monsoon & high tide. Water from Sea enters the site and nearby Mangroves forest during high tides. This area serves as intertidal mud flats and thus provide habitat to Mud crabs. These mud crabs occur in forest area and other wet areas at site. Large variety of fishes and shrimps exists in the Isakhali channel passing through EZ site & Bamon Sundar channel abutting the site. Site does not support major vegetation, whereas trees are planted on the CDSP & BWDB bund which covers the site from North direction. Some of the trees planted on the bund are Akashmoni, Jhao Ghas, Karoi etc. Site is adjacent to Mangroves Forest in NW and SE direction. Majorly 3 species of Mangroves are planted in these forest and they are Kewda, Bain & Gewa. Apart from these species other weeds like Pan ghas, Lata shak, Noona Jhao, katar were also observed in these forests. Also a quantitative analysis was carried out to assess the density, abundance and frequency of the species in adjacent Mangroves forests through quadrat method. 10 nos. of 10 m X 10 m quadrates were laid in the Mangroves forests and the nos. and name of species occurring in the quadrat were noted down. In case of Gewa growing in bunch,

each shoot is considered as single tree. Measure of the girth and height were also done for all the three species. Girth was measured at breast height (app. 1.5 m from ground). Girth & height of Gewa was found to be varying from 2-8 cm and 0.5-3 m. Girth & height of Kewda tree was found to be varying from 40-65 cm and 3.5-4.6 m. Girth and height of Bain trees was found to be varying from 50-80 cm and 3.5-6 m. Quantitative analysis of the same is given in the following table48. Photographs of the site showing vegetation and adjacent Mangroves Forest (Bamon Sundar Forest) are given in figure 72 below. The peripheral embankment will be planted with trees towards the land side and also green buffers of 30 m will be developed all along the boundary of EZ site and along the Isakhali channel length passing through the site. Apart from this a 500 m green buffer will be maintained between the EZ site and the sea.



Tree Plantation on CDSP Bund (in section abutting EZ site)



View of Mangroves Forest from EZ Site





Vegetation of Adjacent Mangroves Forest

Quadrant Sampling in Mangroves Forest

Figure 72: Photographs Showing Vegetation & Fauna at EZ Site

Table 48: Quantitative Analysis of the Floral Species of Planted Mangroves Forest Adjacent to EZ Site

Species	No. of Species in 100 sq m of area										Total	Density	Frequency	Abundance
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10				
Bain	7	0	0	6	7	0	3	1	2	5	31	3.1	0.7	4.4
Kewda	1	17	12	2	0	16	2	12	8	0	70	7	0.8	8.75
Gewa	139	17	2	89	90	8	68	14	44	101	572	57.2	1	57.2
Total	147	34	14	97	97	24	73	27	54	106	673	--	--	--

Source: Site Visit

Flora & Fauna along under construction single road on CDSP/BWDB bund to be widened to 2 lane

Road on the CDSP bund and BWDB bund is being constructed for under development Mirsarai EZ-I. This road will be widened to 2 lane so as to accommodate expected increased traffic from the zone. The road to be widened is 7 km in length and 5 m width. This road will be made 2 lane . Various trees like Akashmoni, Jhao, coconut trees etc exists on the side of the road. No tree cutting anticipated, in case any tree required to be cut, permission should be taken from DoE. Plantation will be carried out all along the sides of the widened road. Trees which can be retained will be retained as part of median or side plantation. List of the trees along the access road to be widened is given in table 48 below. Photographs of the vegetation are also given below in figure 73.





Figure 73: Photographs Showing Vegetation along the Access Road to be Widened

Table 49: List of Trees along the Access Road to be Widened

Species Name	Local Name	Family
Acacia moniliformes	Akashmoni	Leguminosae
Areca catechu	Supari	Palmae
Avecenia alba/ Marinavierh	Baen	Aviceniaceae
Azadirachta indica	Neem	Meliaceae
Carica papaya	Pepey	Caricaceae
Cocos nucifera	Narikel	Palmae
Excoecaria agallocha	Gewa	Euphorbiaceae
Herritiera fomes	Sundari	Sterculiaceae
Mangifera indica	Aam	Anacardiaceae
Manilkara zapota	Safeda	Zapotaceae
Phoenix sylvestris	Khejur	Palmae
Psidium guajava	Peyara	Myrtaceae

<i>Sonneratia apetala</i>	Kewda/Keora	Lythraceae
<i>Spondias pinnata</i>	Amra	Anacardiaceae
<i>Swietenia mahagoni</i>	Mehogani	Meliaceae
<i>Syzygium cumini</i>	Jaam	Myrtaceae
<i>Syzygium samarengense</i>	Jamrul	Myrtaceae
<i>Tamarindus indica</i>	Tentul	Leguminosae
<i>Terminalia catapa</i>	Kathbadam	Combrataceae
<i>Tectonia grandis</i>	Teak	Lamiaceae
<i>Gmelina arborea</i>	Gamari	Verbenaceae
<i>Brassica juncea</i>	Raisharisha	Brassicaceae
<i>Olea europaea</i>	Olives	Oleaceae
<i>Terminalia bellirica</i>	Bohera	Combretaceae
<i>Terminalia chebula</i>	Horitoki	Combretaceae
<i>Phyllanthus emblica</i>	Amla	Phyllanthaceae
<i>Protium serratum</i>	Gutgutiya	Burseraceae
<i>Propolis cineraria</i>	Jand	Fabaceae
<i>Casuarina equisetifolia</i>	Jhao Ghas	Casuarinaceae
<i>Albizia lebeck</i>	Koroi	Fabaceae
<i>Delonix regia</i>	Krishnachura	Fabaceae
<i>Leucaena leucocephala</i>	Ipil Ipil	Fabaceae
<i>Carissa carandas</i>	Karamcha tree	Apocynaceae
<i>Artocarpus heterophyllus</i>	Jack fruit	Moraceae
<i>Polyalthia longifolia</i>	Pseudo Ashoka	Annonaceae
<i>Musa parasisiaca</i>	Banana	Musaceae
<i>Garuga pinnat</i>	Bhadi	Burseraceae
<i>Abelmoschus esculentu</i>	Bhendi	Malvaceae
<i>Erythrina indica</i>	Mandar	Fabaceae
<i>Acacia mangium</i>	Mangiam	Fabaceae
<i>Dalbergia sissoo</i>	Sheeshu	Fabaceae
<i>Lawsonia inermis</i>	Kat Mehndi	Lythraceae
<i>Swietenia mahagony</i>	Mahagony	Meliaceae
<i>Arundinaria</i>	Cane Ghas	Poaceae
<i>Samanea saman</i>	Rain Tree	Fabaceae
<i>Zizyphus mauritiana</i>	Boroi	Rhamnaceae
<i>Calotropis</i>	Calotropis	Apocynaceae

Ceriops decandra	Gora	Rhizophoraceae
Litchi chinensis	Litchi	Sapindaceae
Ficus benjamina	Dumur	Moraceae
Citrus maxima/Citrus grandis	Jambura	Rutaceae
Mimosa pudica	Lazzabati	Fabaceae
Pinus densiflora	Pine	Pinaceae
Excoecaria agallocha	Gewa	Euphorbiaceae
Nypa fruticans	Golpata	Arecaceae
Heritiera littoralis	Sundri	Lauraceae

Source: Site Visit

5.10.3. Buffer Zone: Ecological Assessment

Buffer area of 10 km 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.

Common Flora and Fauna in buffer zone

10 km area around EZ site majorly comprises of agricultural/aquaculture land followed by water bodies. Flora and fauna in the study area is given below. Ramgarh reserve forest & Mahamaya forest are other zones rich in bio-diversity but are not within 10 kms radius of EZ site.

Terrestrial Flora in Buffer Zone

There are no major forests apart from Dhoomkali forest, Bamon Sundar forest& Mogadia forest occurs 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 to be widened and are given in the table above. Apart from the trees mentioned in the above 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 ciliate*), Bokain (*Melia azedarach*) and Banyan (*Ficus benghalensis*). Photographs of flora of buffer zone are given below in figure 74. Varied variety of vegetation occurs along the Isakhali 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.





Figure 74: Photographs Showing Vegetation in Buffer Zone

Terrestrial Fauna in Buffer Zone

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 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. But Ramgarh forest does not falls within 10 km radius area. Apart from the mammals, reptiles like chameleon, garden lizard & Gohar Saanp were also observed during the visit. Apart from this villagers 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 (*Halcyon smyrensis*), Eagle, Koyal/Kokil (*Eudynamys scolopaceus*), 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 75 below. Some aquatic birds like Northern Pintail etc were also seen during visit.



Figure 75: Photographs Showing Birds in the Study Area

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 Chittagong region are Gaudy Baron, Golden Browing, 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.

Aquatic Ecology in Buffer Zone

FENI RIVER

Fisheries of Feni River and Estuary

Consultation was carried with the fishermen in study area to gain knowledge about the fish species in canals, River Feni, Khals, Beels, ponds etc. Fish species in Feni River Estuary system is discussed and detailed in Fisheries section given above in this chapter. 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, Lorika, Senuwa, Loitta, Nylostika, Mud crabs, Holona, mrigal, silver carp, gras carp, karpio, barbs (putis), Chitol, Folai, catfish (Tengra, Singi, Magur, Boal, Pungus), Snakehead (Shol, Taki), bele etc.

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 Mirsharai is one of potential spawning zone of Hilsa (*Tenualosa ilisha*) 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.

Planktonsof Feni River and Estuary

Planktons which occurs in waters of River Feni are of following genus: Spirogyra, Zygnema, Volvox, Pediastrum, Anabaena, Desmidium, Gonatozygon, Mougeotia and Microcystis and the zooplankton genera were, Asplanchna, Notholca, Daphnia, Filinia and Cyclops. Crustacean larvae (Nauplii) are also found in river water

BAY OF BENGAL (SEA)

A study carried out by NGO YPSA (Shipbreaking Activities in Bangladesh and collision of Marine Biodiversity by Prabal Barua) is available for Sandwip which is app. 18 from proposed EZ site. As per the study the ecological diversity in this section of sea is given below

Planktons

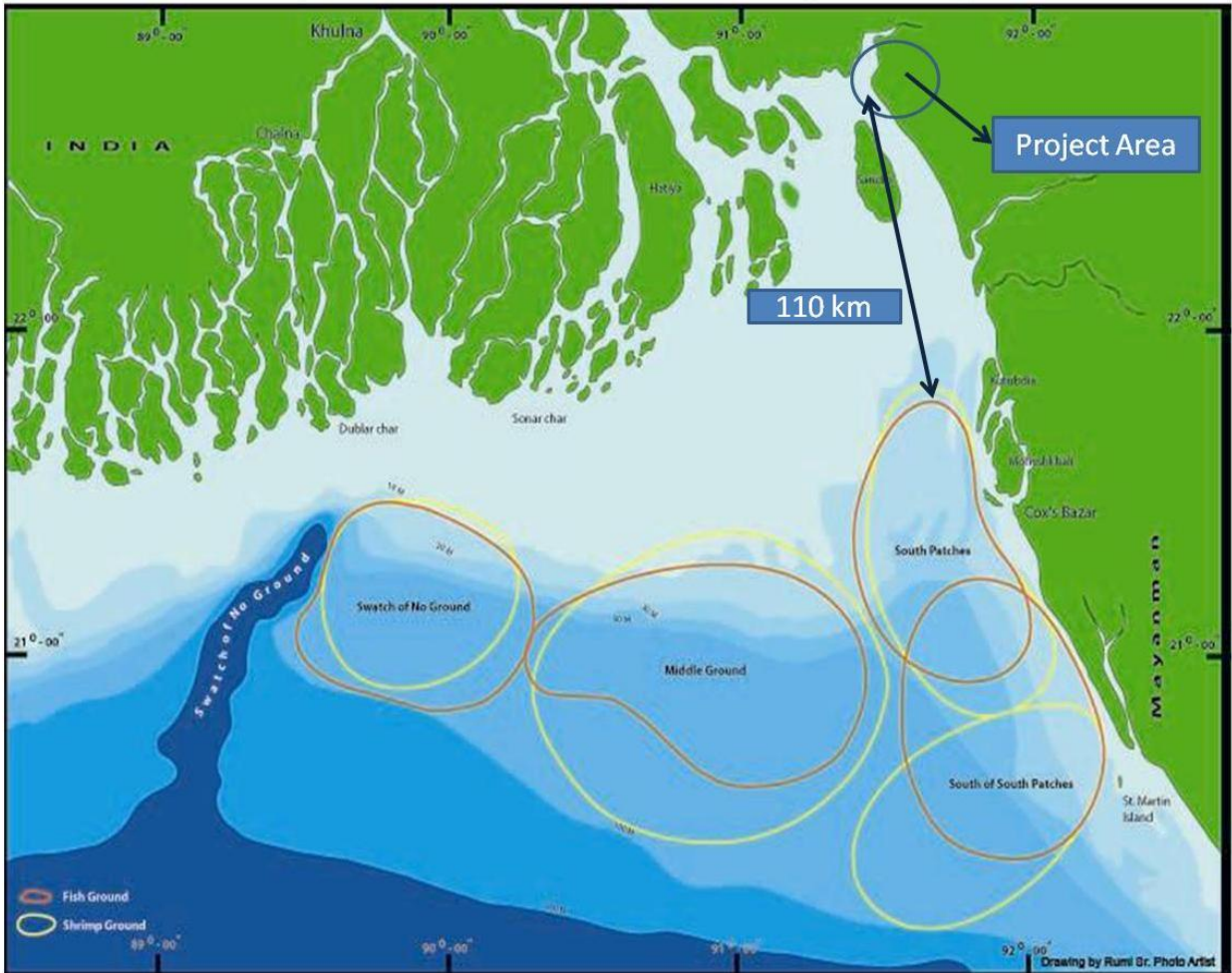
Major phytoplanktons in these waters are *Aanabena*, *Clostratrum*, *Coscinodiscus*, *Euglena* & *Zygnema*. Out of these *Aanabena* (30.41%) dominates during monsoon and *Coscinodiscus* (97.5%) dominates during post monsoon. Abundance of the phytoplanktons in the area is 411 cells/l in monsoon season and 190 cells / l in post monsoon season. Major zoo-planktons in these waters are *Calanoida*, *Cyclopedia*, *Sagitta*, *Lucifer*, *Zoea*, *Acetes shrimp* & *Cladocera*. Out of these *Calanoida*, *Cylpelpedia*, *Sagitta* and *Zoea* dominates during monsoon and *Calanoida*, *Acetes shrimp*, *Lucifer*, *Cladocera* and *Zoea* during post monsoon.

Among the macro benthos *Amphipod*, *Polychaete*, *Nemertina*, Fish egg, *Cladocera*, *Calanoida* and *Polychaete* are found. Out of these presence of *Amphipod*, *Polychaete*, *Nemertina*, Fish egg dominates during the monsoon and *Cladocera*, *Nemertina*, *Calanoida* and *Polychaete* dominates in the post monsoon season. Abundance of the macro benthos can be thus said to be 368.28 ind./ m³ in monsoon season and 14204.41 ind./ m³ in post monsoon season.

Fisheries

Some of the commercially important fishes of these waters majorly include Indian salmon (*Polynemus indicus*) commonly known as Lakhua; grouper (*Epinephelus lanceolatus*) known as bole coral; Long jew fish (*Otolithoides brunneus*) locally known as lombu fish; spanish mackerel (*Cybiium guttatum*) known as maitta; butter fish (*Psenes indicus*); River shad (*Tenualusa ilisha*); Jewelled shad (*Ilisha filigera*) locally known as choikka; mango fish (*Polynemus paradysius*) known as 'Hriska Machh'; silver pomfret (*Stromateus chinensis*); bombay duck (*Herpodon nehereus*); mullet (*Mugil cephalus*); Sea bass/Bhetki (*Lates calcarifer*) and Anchovy (*Coilia dussumeri*; *Coilia ramkorati*; *Setipinna taty*); mud skipper/Baila (*Gobius melanosoma*, *G. Sadanundio*); Koiputi mach (*Anodontostoma chacunda*); Kata mach (*Arius thalassinus*), Lahmuri mach (*Carangoides malbaricus*); Dora mach (*Apocryptes serperaster*) and

Lakkha (*Polynemus indicus*). Major marine fishing grounds and marine reserves in the Bay of Bengal are shown in figure 76.



Source: *Ecosystem Health and Management of Pollution in the Bay of Bengal (BFRI)*

Figure 76: Fishing Grounds and marine reserves in Bay of Bengal

Coral Reefs

Coral reefs are not expected to occur in this region of sea. St. Martin’s Island is the only coral reef island in Bangladesh, locally known as Jinjiradwip (Institute of Marine Sciences, University of Chittagong, Bangladesh). Little information is available on Bangladesh’s Off-shore coral presence. Off-shore corals are reported to be present around St. Martin’s Island area only.

5.10.4. Ecosystem Service and Function

Presence of rich flora and fauna of Mirsarai and river system and trees plantation provides good ecological balance situation currently for maintaining the climatic situation of the area. Since project development will be carried out taking all the measures for preventing or reducing environmental pollution, thus project development will not affect the ecosystem significantly.

5.11. Socio Economic

5.11.1. Socio Economic Condition

Mirsarai EZ-II covers an area of 210 acres out of which 1311 acres will be developed. Majorly as per preliminary assessment, three types of industries including industries like food processing, textile,

petrochemical, ship building and light engineering will come up in the EZ zone as predicted inline with planning for under development Mirsarai EZ-I.

Proposed Mirsarai EZ-II is located in Mirsarai Upzila under Chittagong district which further comes under Chittagong Division. Chittagong Division is geographically the largest of the seven administrative divisions of Bangladesh. Although Chittagong division as a whole is better off when compared to the other divisions in terms of the population below the poverty line, the picture is still grim. According to the World Bank report 26.2% of the population of Chittagong division lie below poverty line (SIA Report, Mirsarai EZ). The commissioning of the EZ will have a catalytic and transformative impact on the socio-economic and cultural life of people residing within this area and is expected to lead to substantial socio-economic benefits for the people living in the EZ and the surrounding influence zone. Social Impact Assessment (SIA) study of the project area was done by PwC India.

The proposed EZ lies approximately at a distance 79 km from Chittagong airport (Shah Amanat International Airport), 182 km from Dhaka city and 67 km from Chittagong port.

Mirsarai came into existence as a Thana in 1901 and was upgraded to an Upzila in 1983. The Upzila consists of 2 paurashava, 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 Chittagong, BBS 2011)

Demographic Profile of Mirsarai Upzila

Population

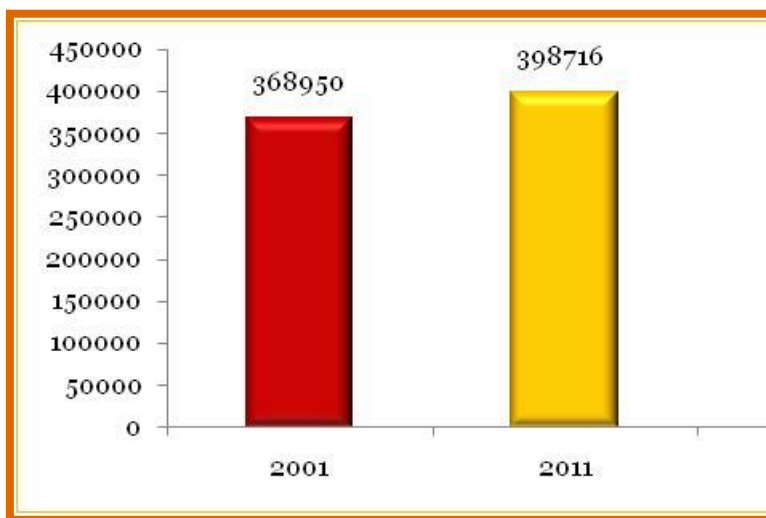
According to the Census 2011 report, the total population in Mirsarai Upzila is 398716 and the population density per sq. km of the area is 826 persons. The 2011 Census data reveals that the decadal population growth rate for the Upzila is 8.07% in comparison to the 2001 Census data.

Table 50: Demographic Details

Administrative Unit	Area (Sq.KM)	Total HH	Average HH size	Gender ratio*	Floating population (HHs)	Population Density
Mirsarai Upzila	482.88	79545	5	89	164	826

Gender ratio* = no. of Males/ 100 Females

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



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

Figure 77: Population of Mirsarai Upzila (number)

In MirsaraiUpzila, 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.

Table 51: Population- age wise details

Age Group	0-14	15-49	50-64	65+
% Population	34.2	50.4	9.6	5.7

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

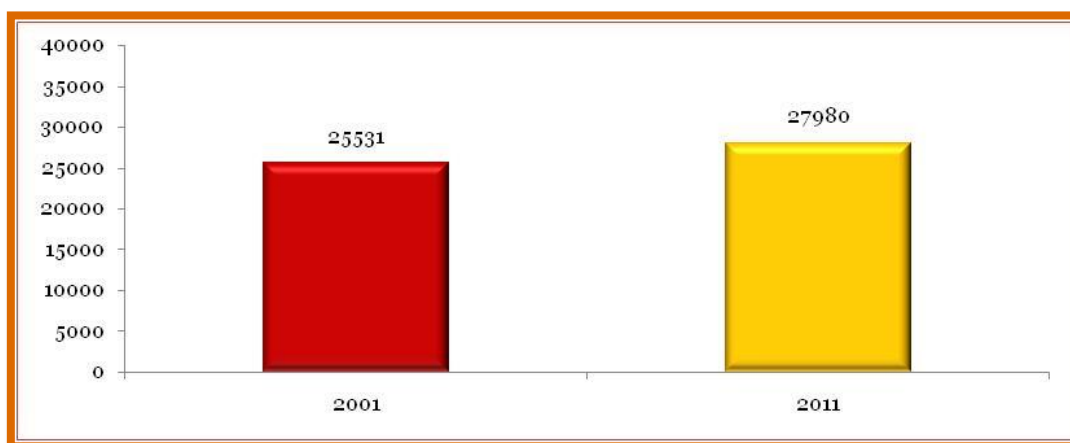
EZ zone falls within Isakhali Union of MirsaraiUpzila. According to the Census 2011 report, the total population in Isakhali Union is 27980. It is observed that the population density per sq. km of the area is 439 persons. The 2011 Census data reveals that the decadal population growth rate for the Union is 9.59% in comparison to the 2001 Census data.

Table 52: Demographic Details

Administrative Unit	Area (Sq.KM)	Total HH	Average HH size	Gender ratio*	Floating population (HHs)	Population Density
Ichhakhali Union	63.75	5205	5.37	84	16	439

Gender ratio* = no. of Males/ 100 Females

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



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

Figure 78: Population of Isakhali Union (number)

In Isakhali Union, majority of the population fall within the age group of 15-49. The percentage of young population is quite high than the dependent population. Therefore, this implies that the majority of the population belongs to the employable age group, which is vital for fuelling the economic growth of the local area.

Table 53: Population- age wise details

Age Group	0-14	15-49	50-64	65+
% Population	37.1	47.9	9.3	5.8

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

Religion & Culture

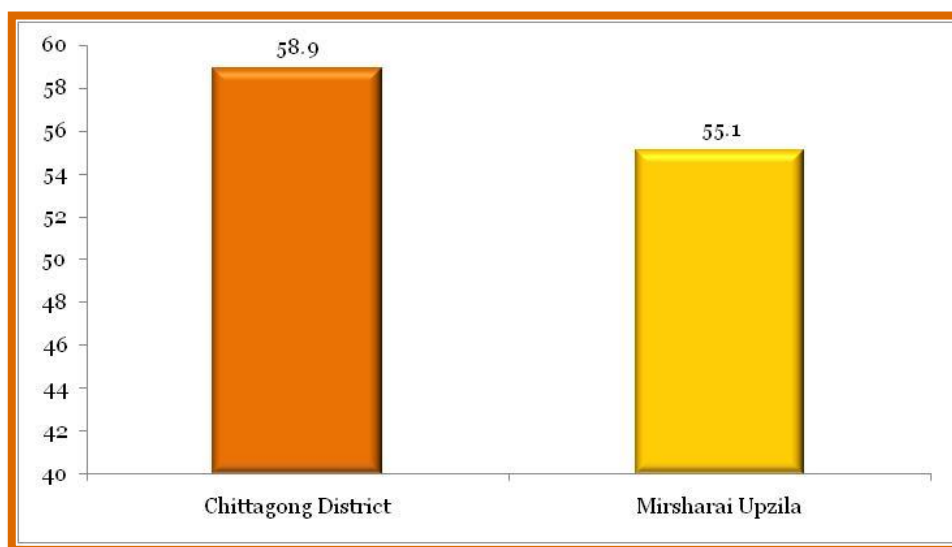
The majority of the population in Mirsarai Upzila is dominated by Muslims (86.12 %), followed by Hindus (12.36%), Buddhists (1.22 %) and Christians (0.018 %). The floating population of Upzila is 0.04% of the total population. Further, there are 1.14% indigenous people (tribal or ethnic minority) within these areas.

The majority of the population in Isakhali Union is dominated by Muslims (87.90 %), followed by Hindus (11.89%) and Buddhists (0.18 %). 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.

5.11.2. Quality of Life Indicators

Literacy rate and educational facilities

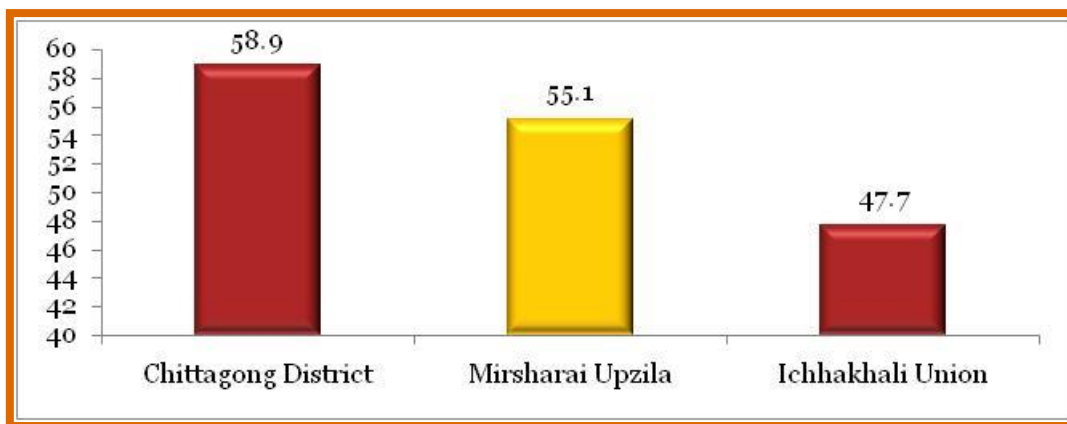
The literacy rate in Mirsarai Upzila (55.1%) is a little lower than the district level (58.9 %) but higher than the national level figure (51.8 %). The female literacy rate (53.3 %) is almost equal to the male literacy rate (57.1%).



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

Figure 79: Literacy rate in Mirsarai Upzila in comparison with the district level data (percentage)

The literacy rate in Isakhali Union (47.7%) is lowest among the MirsaraiUpzila (55.1%), Chittagong district (58.9 %) or the national level figure (51.8 %). The female literacy rate (47.2 %) is almost equal to the male literacy rate (48.3%).



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

Figure 80: Literacy rate in Isakhali Union in comparison with the Upzila and district level data (percentage)

5.11.3. Income & Poverty

Employment Status

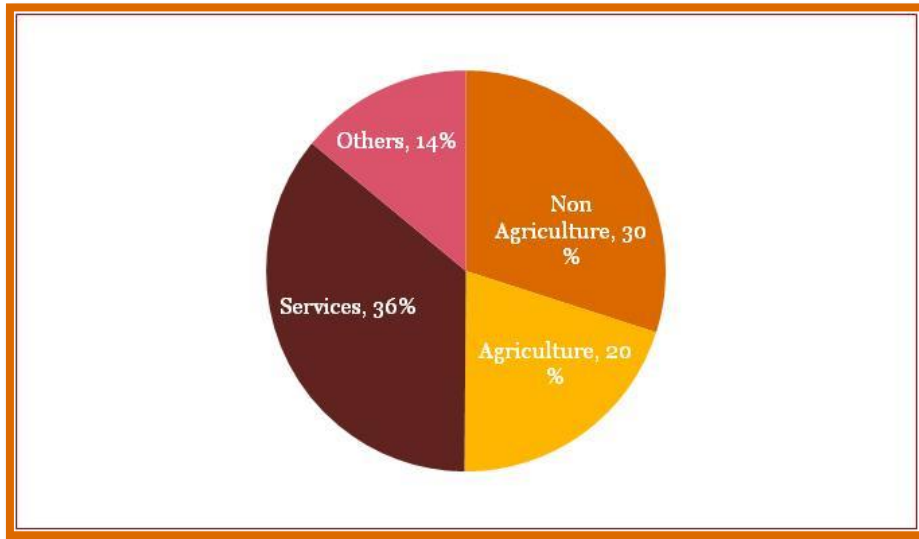
Households by Main Sources of Income

In Chittagong 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 54 analyses the scenario of major source of income of households at district level. Figure 81 illustrates Distribution of population by field of employment of Mirsarai Upzila as per Population and Housing Census 2011, Chittagong district.

Table 54: Households by Main Source of Income

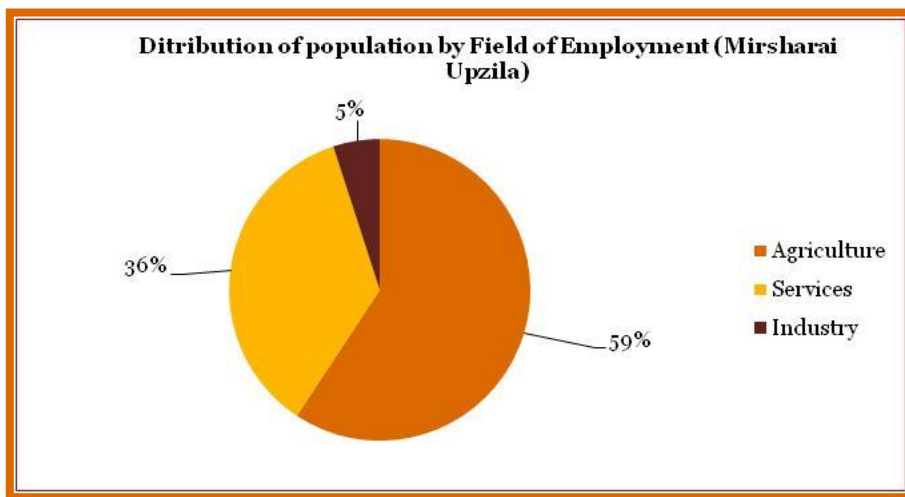
Administrative unit	Total Households	Main source of income of households (%)					
		Self employed (Agriculture %)	Self employed (Non-Agriculture %)	Service (%)	Day laborer (Agriculture %)	Day laborer (Non-Agriculture %)	Others (%)
Chittagong District	1567	13.47	17.10	35.93	6.7	12.89	13.98

Source: Labour Force Survey, Bangladesh 2011



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

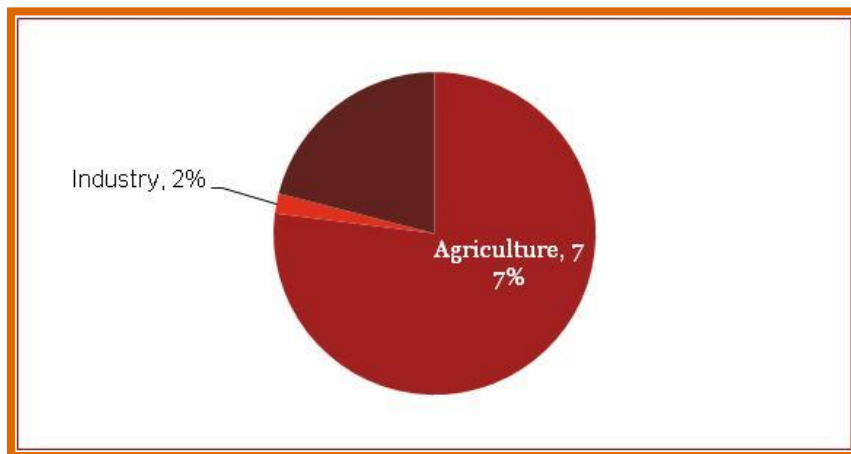
Figure 81: Source of employment (Chittagong District)



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

Figure 82: Field of Employment (MirsaraiUpzila)

On basis of above data, the negligence of industry sector in MirsaraiUpzila 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: Chittagong, BBS

Figure 83: Distribution of population employed by field of employment in Isakhali Union

In Isakhali Union it is found that 7% of population is engaged in agriculture activities and 2% are engaged in industrial activities.

Field of activities in Isakhali 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 job opportunities, which will change the scenario of the region and will contribute to a reduction in migration to the large cities such as the capital, Dhaka and the nearby mega-city of Chittagong. 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 Chittagong 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 55: 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
Chittagong District	4.91	2.45 (49.90%)	2.46 (50.10%)	2.759	1.967 (71.29%)	.793 (28.71%)	56.2	80.3	32.2

Source: Labour force survey, 2011

Wages

The scenario for wages, analysed at the Upzila level reveals that the daily average wage rate of male agriculture labourer at the Upzila level is BDT 500 and that for female labourers is BDT 300, as against the BDT 658 daily average wage rate of labour in the manufacturing sector. The details of the Upzila level wage rates of various categories of labourers as per the District Statistics 2011 report are given in table 56 below.

Table 56: Daily average wage rate of laborers in Mirsarai Upzila (Wages are in BDT)

Upzila	Type of labor	Mason	Helper	Carpenter	Color	Electric	Plumber
Mirsarai Upazila	Construction worker	500	300	500	600	400	500
	Non agriculture labor	Porter	Garden labor (male)	Garden labor (Female)	Other labor		
		500	350	300	350		

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

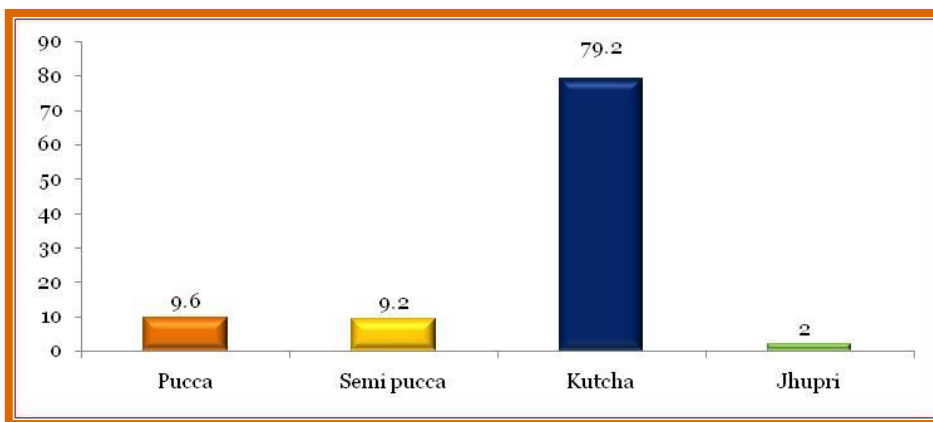
However, it has been observed through various studies on EZs and from primary consultations that the minimum wages at EPZs are generally set at a higher level than elsewhere in the economy and these are implemented effectively (Progress, Emerging Challenges, and Future Directions, Thomas Farole, Gokhan Akinci, the WB). BEPZA as per their circular dated 2013 has revised the minimum wages for the workers of the enterprises. Accordingly, a highly skilled worker is entitled to BDT: 11, 200/month and an unskilled worker is entitled to BDT: 5992/month. Accordingly, the setting of the Mirsarai EZ is expected to increase the average wage rate in the region.

Poverty information: No poverty related data is directly provided in the latest Census. But the data on occupations, education and household types are presented to give an idea of the locality. From these variables, the area seems impoverished and not many well-off families live in the proposed EZ area. Thus, the EZ will contribute to the improvement of all the unions within the Upzila, and also the adjacent ones. It can be expected to change the poverty scenario in a positive way.

5.11.4. Infrastructure facilities

Housing Condition

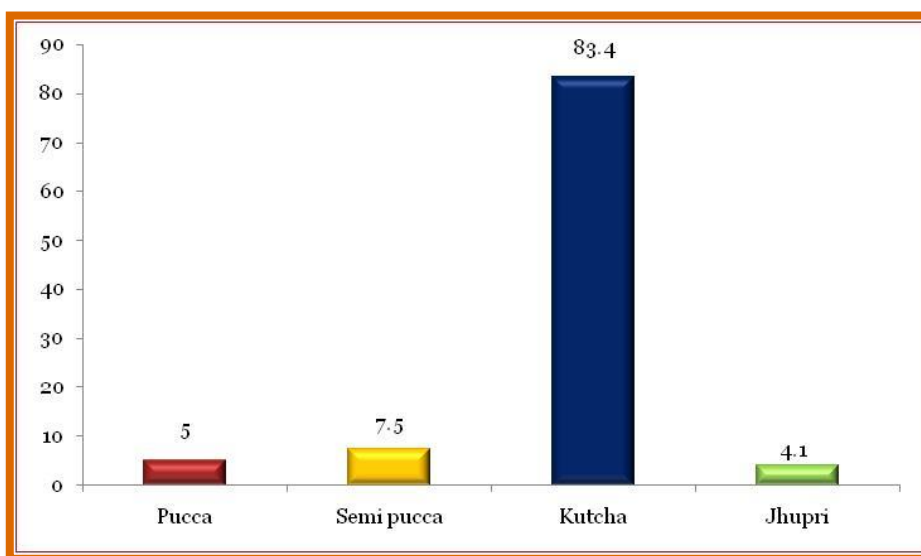
The quality of housing in the area shows that 79.2% people in MirsaraiUpzila have “kutcha” houses, indicating their low social and economic status. The kuccha houses are vulnerable and increase the risk to life in the event of natural disasters such as floods or cyclones. The need to provide good housing will be a challenge forthe administration and will have to be dealt with effectively.



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

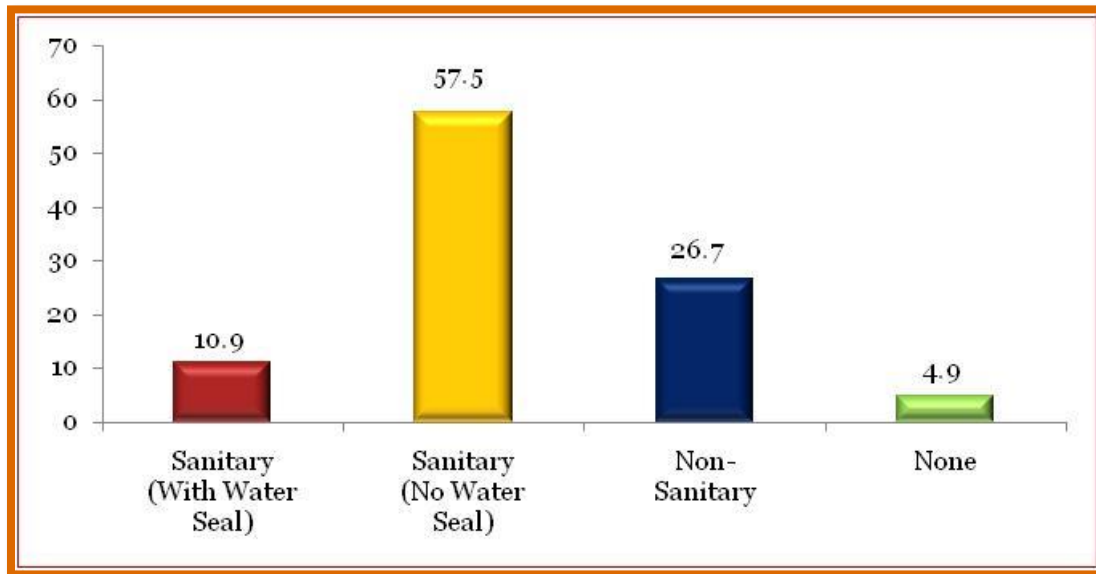
Figure 84: Housing pattern in Mirsarai upzila (percentage)

The quality of housing in the area shows that 83.4 percent people in Isakhali Union have “kutcha” houses, 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. The household pattern, sanitation facilities and behaviour shows a grim picture of poverty in the proposed EZ area. Most of the households have kutcha houses and a very low percentage of households have pucca houses. The number of people using proper sanitary toilets is small - most people having non-water sealed sanitary ones. 30%-35% of households either have non-sanitary toilets or no toilets at all.



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

Figure 85: Housing pattern in Isakhali Union (percentage)

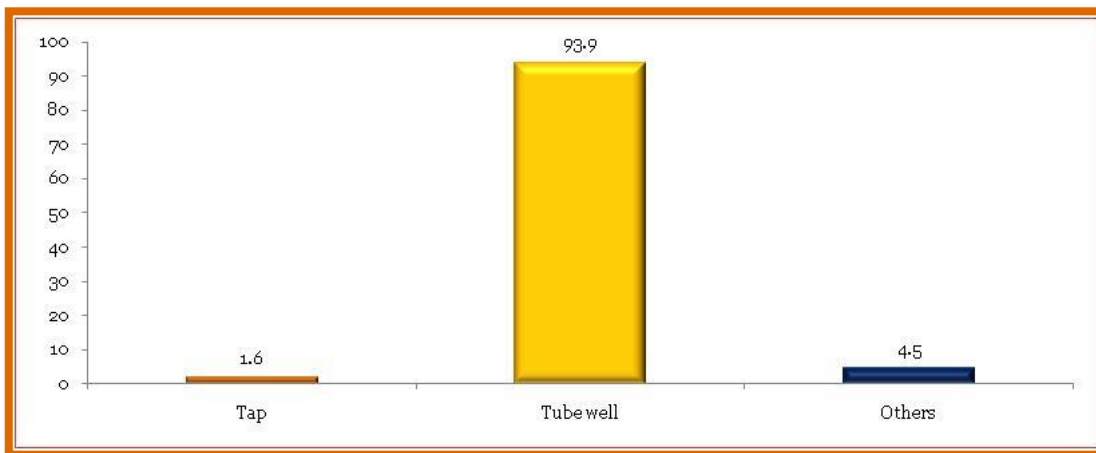


Source: Population and Housing census 2011, Community report: Chittagong, BBS

Figure 86: Sanitation facilities in Isakhali Union (percentage)

Services

A review of the project area highlights the fact that scarcity of safe drinking water is an acute problem faced in the region. Tapwater is available to only 1.6 percent of population. The majority 93.9 % of the population use Tube well and 4.5% relies on other sources for drinking water such as ponds. The scarcity of water intensifies during the summer season when the salinity of water increases and during cyclones when the water sources get damaged and, contaminated with saline water. In this situation people are forced to drink unsafe water or spend their limited financial resources on collecting or purchasing water from other sources. Women and the vulnerable population are the most affected during this situation.

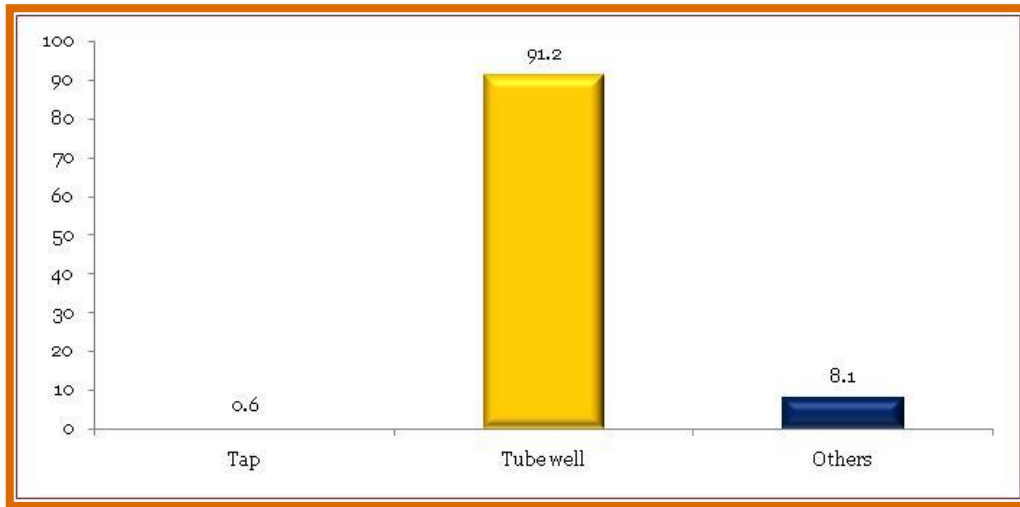


Source: Population and Housing census 2011, Community report: Chittagong, BBS

Figure 87: Source of drinking water (in percentage) in Mirsarai Upzila

A review of the project area highlights the fact that scarcity of safe drinking water is an acute problem faced in the region. Tap water is available to only 0.6 percent of population. The majority 91.2 % of the population use Tube well and 8.1% relies on other sources for drinking water such as ponds. The scarcity of water intensifies during the summer season when the salinity of water increases and during cyclones when the water sources get damaged and, contaminated with saline water. In this situation people are forced to drink unsafe water or spend their limited financial resources on collecting or purchasing water

from other sources. Women and the vulnerable population are the most affected during this situation. Only 38% of the households of Isakhali Union have electricity connection.



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

Figure 88: Source of drinking water (in percentage)

Other Infrastructure facilities

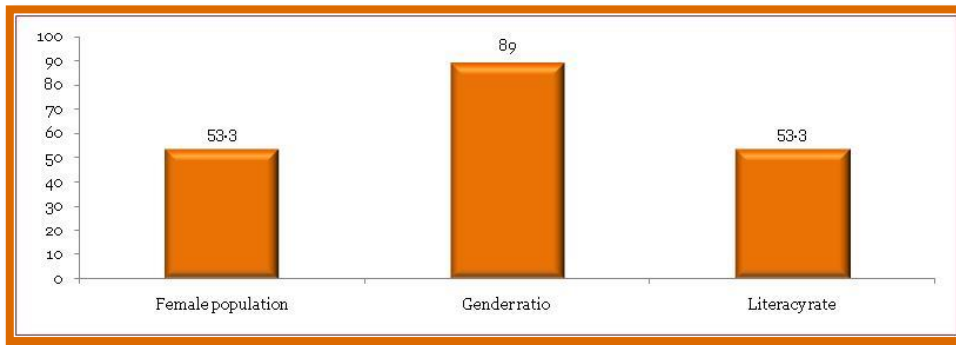
Transport is a major problem in the project area as there is no public service connectivity from the NH to the project site. People have to walk down 10 Km or to use the auto rickshaws for commutation. Further, health and education facilities are also not satisfactory as there are no schools or hospitals nearby.

5.11.5. Gender & 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 female in decision-making still leave gaps and this calls 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 following graphs depict the status of women in Mirsarai Upzila & Isakhali union.

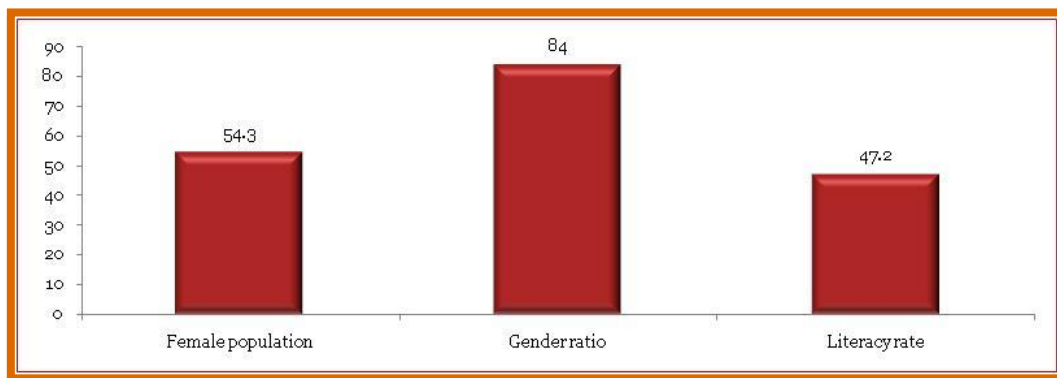
The female population in the Mirsarai Upzila constitute 53.3% of the total population. The gender ratio of 89 which has been tremendously decreased in 2011 as against 99 males in 2001, and female literacy rate of 53.3% is below the satisfactory level.



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

Figure 89: Female Population (percent), Gender ratio (no. of males per 100 female) and Female Literacy rate (percent) in MirsaraiUpzila

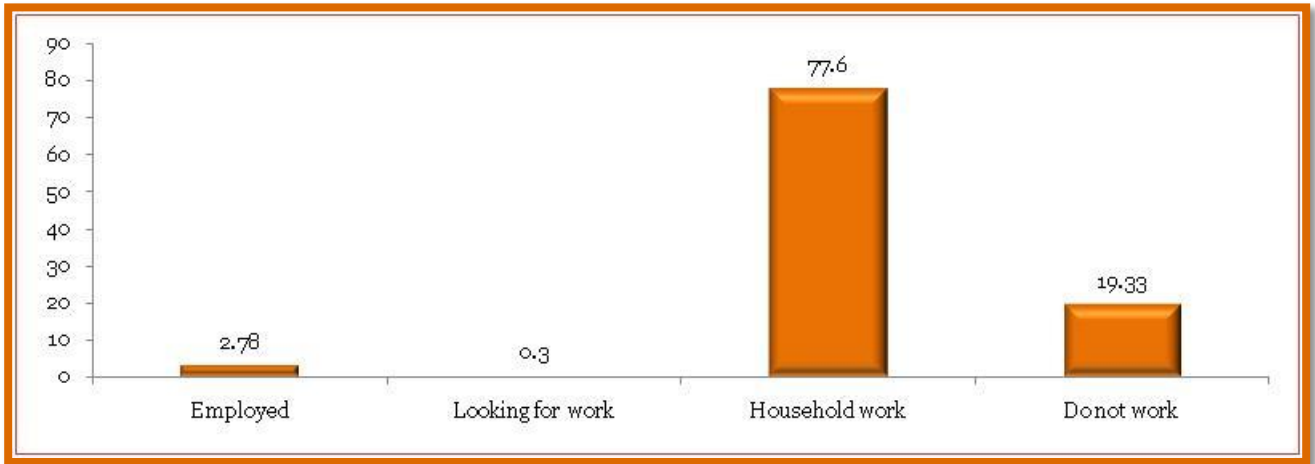
The female population in the Isakhali Union constitute 54.3 % of the total population. The gender ratio of 84 which has been tremendously decreased in 2011 as against 99 males in 2001, and female literacy rate of 47.2% is below the satisfactory level. The figure 90 below indicates that women have out-numbered men in Isakhali 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.



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

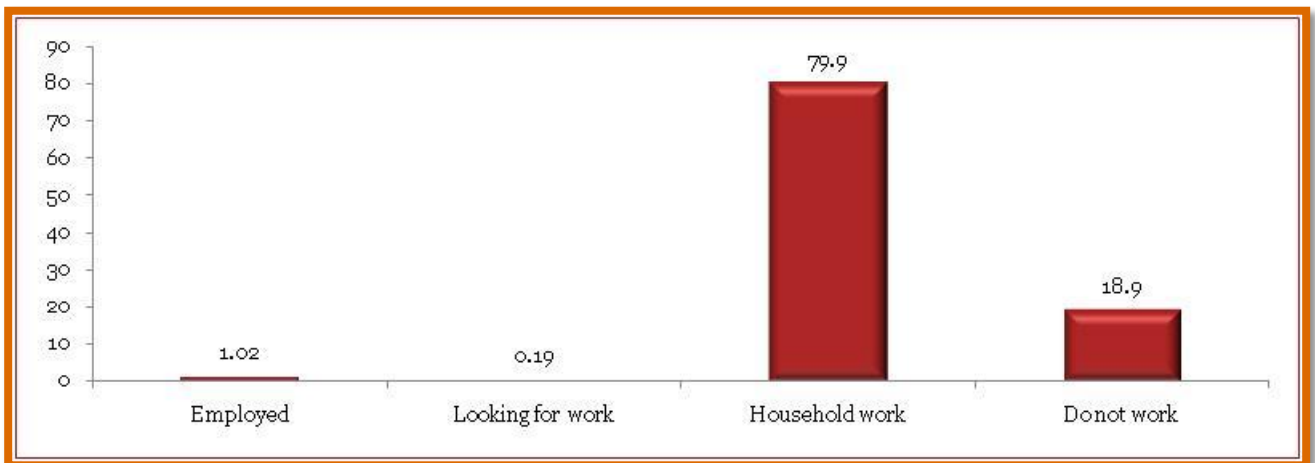
Figure 90: Female Population (percent), Gender ratio (no. of males per 100 female) and Female Literacy rate (percent) in Isakhali Union

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 Upzila. 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 the Isakhali Union. Women here are mainly engaged in household work (79.9%) and a mere 1% are employed.



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

Figure 91: Female Employment status (percentage)in MirsaraiUpzila



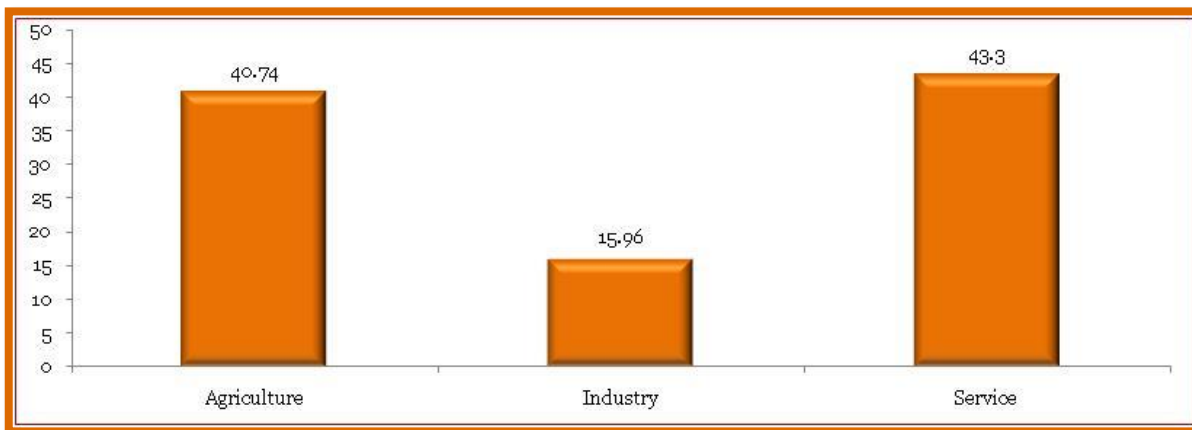
Source: Population and Housing census 2011, Community report: Chittagong, BBS

Figure 92: Female Population (percent), Gender ratio (no. of males per 100 female) and Female Literacy rate (percent)

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.

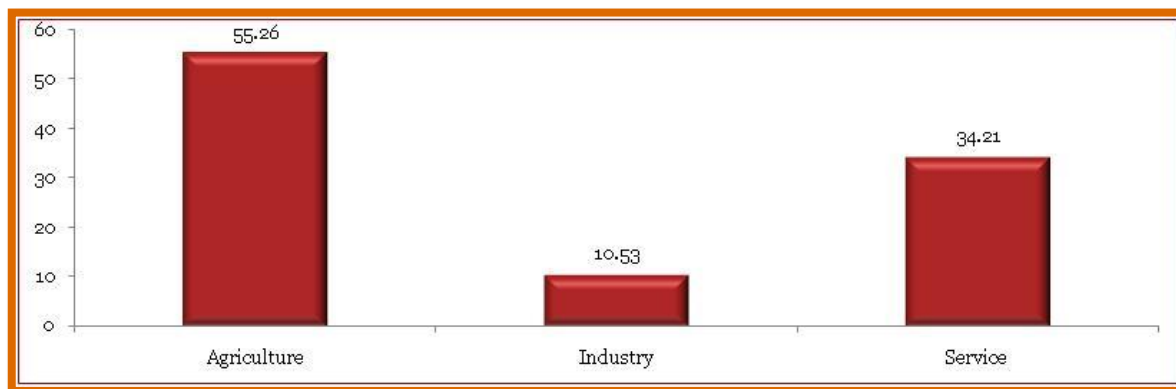
Women’s involvement in the EZ industrial zone will not only make their contributions visible in the productive sector, it will also empower them in all senses and will eventually have a positive impact on their own lives and that of their family members, particularly their children.

The occupation of women in Upzila is mainly centred upon the service and agriculture sector: 43.3% and 40.74% respectively in MirsaraiUpzila. The scenario also depicts that the presence of about 16% women in industry sector which is very low. Scenario is even worst in Isakhali union. Of the mere 1% employed females in Isakhali Union, the total number for which is only 38. Of whom 21 females are involved In Agricultural activities, only 4 in Industry sector and 13 in Services sector.



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

Figure 93: Field of Activity of women in MirsaraiUpzila(percentage)



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

Figure 94: Field of Activity of women in Isakhali Union (percentage)

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 mechanisation. Organised 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 MirsaraiUpzila to access employment opportunities.

5.11.6. Common Property Resources

No common property resources exist within EZ zone and proposed alignment for widening of access road thus no CPRs are being affected with the project development

5.11.7. Conflict of Interest and Law and Order Situation

No conflict of interest is associated with the EZ site or development of any other off-site facility.

5.11.8. Historical, Cultural and Archaeological sites

There is no archaeological resource present within EZ zone and widening road alignment. Details of archaeological structures within Mirsarai Upzila & Chittagong District are discussed in section 5.6.1

6. Identification and Analysis of Key Environmental Issues

6.1. Environmental Sensitivity Investigation

Environmental impact assessment has been carried out considering the impacts of proposed interventions with associated activities on important components of the environment and society. Firstly, all of the environmental components sensitive to proposed activities were identified during reconnaissance field visit based on expert observation, local people's perception and worldwide practice of EIA. The scoping process, followed to identify the environment and social sensitive features included professional judgments of the multi-disciplinary EIA team members and public consultation. The preliminarily identified environmental and social sensitive components are listed in sections below.

6.2. Environmental Asset

Environmental assets identified in the study area are listed below:

1. Air Quality of the area
2. Noise level of the area
3. Transportation system of the area
4. Fisheries of the study area
5. Ecosystem of study area
 - a. River Feni, Isakhali canal & Bamon Sundar Canal
 - b. Mangroves Plantation Forest
 - c. Agriculture land and Aquaculture pond

Identified environmental assets of the project are likely to be impacted due to development of Economic Zone at all the pre-construction, construction and operation stages of the project. Project activities which may have an impact on the environmental assets and the associated impacts are listed in table 57 below. The detailed impact identification and mitigation measures are given at Chapter 7.

Table 57: Environmental Assets of the project area

S. No.	Environmental Assets	Impact	Related Project Activity
Pre-Construction & Construction Phase			
1	Air Quality of Study Area	Degradation	Site clearance/ preparation Construction activities Excavation Exhaust from construction vehicles/machinery
2	Noise Level of Study Area	Increase in Noise levels	Construction activities Movement of construction vehicles/machinery
3	Transportation System	Traffic congestion on the village road (Abu Torab road,	Increased nos. of vehicles carrying construction raw

		Project road, BWDB & CDSP bund)	material and construction debris
4	Fisheries of Study Area	Increased sedimentation of water body	Increase in run-off from construction/excavated site. Construction of sluice gate on Isakhali channel may impact the fishing activities
5	Eco-system of Study area: River Feni, Isakhali Channel & Bamon Sundar Channel	Increased sedimentation of water body	Increase in run-off from construction/excavated site
6	Eco-system of Study area: Agriculture and Aquaculture activity	Loss of agriculture & aquaculture land	EZ area is Char land (Govt. Land) and is used seasonally by people to carry out aquaculture and agriculture activities
Operation Phase			
1	Air Quality of Study Area	Air pollution	Industrial emissions and movement of vehicular access
2	Noise Level of Study Area	Increase in Noise levels	Increased traffic movement and industrial operations
3	Transportation System	Traffic congestion	Increased nos. of vehicles carrying industrial raw materials and workers for existing roads. Access roads required to be widened further to accommodate the expected vehicles during operational stage of EZ.
4	Fisheries of Study Area	Improvement Entry of pollutant into the Isakhali Channel & other water bodies from upcoming industries in EZ zone may impact the aquatic life Restricted fishing activity in Isakhali Channel within EZ site after development of EZ Local people will not be able to collect mud crabs from EZ site	Setting up of aquaculture based industries may improve the Fisheries activities in the area Construction of Sluice gate to control flow of water in Isakhali channel may restrict fish movement in Isakhali channel Disposal of industrial waste may impact the fisheries of Isakhali channel, Bamon Sundar Channel and River Feni which are in direct interface to proposed EZ site
5	Eco-system of Study area:	Degradation of Water	Discharge of effluents from

	River Feni, Isakhali Channel & Bamon Sundar Channel	Quality & Aquatic life	the industries which are proposed to be located in economic zone
6	Eco-system of Study area: Mangroves Forest	Loss of Mangroves Plantation	Air emissions from the industries and vehicular emissions are likely to create air pollution. It may have impact Mangroves forest adjacent to EZ site Construction of bund to protect EZ site may also have impact on Mangroves plantation as it may affect the flow of sea water during high tide in the Mangroves plantation
7	Eco-system of Study area: Agriculture and Aquaculture	Improvement of agriculture and aquaculture production	Setting up of agriculture & aquaculture based industries may improve the agriculture and aquaculture activities in the region Development of paved surfaces may deplete the mud crabs species from EZ area, however 5 m wide zone of no development will be developed along Isakhali zone within EZ site.

6.3. Environmental Hotspot

EZ site and site for proposed off-site facilities lies in Mirsarai Upzila of Chittagong District & Division. EZ site does not lie within Eco-sensitive/Ecological critical area. Mangroves plantation carried out by Forest department along the coastline is near to upcoming EZ site. Mangrove plantation exists in NW & SE direction of EZ site. Major 3 varieties of Mangroves are planted within this zone which comprises of Gewa, Bain & Keora. Construction of bund & EZ may restrict flow of sea water in Mangroves in some portion which may have impact on the Mangroves plantation. But the impact will be insignificant as bund will be constructed along the exposed boundary of EZ only and water from sea may enter Mangroves from all other sides.

Also effluent and emissions from industries may impact these Mangroves. As per planning carried out for Mirsarai EZ-I, it is predicted similar kind of industries may come up in the proposed EZ also which are industries like food processing, textile, petrochemical, ship building and light engineering and are comparatively less polluting than dyeing, tanneries and distilleries etc. No dyeing unit will be set up in the zone. It will be ensured that the environmental management measures should be taken as per proposed EMP during all the phases of the project.

Other ecological fragile natural features are Isakhali channel, Bamon Sundar Channel and Feni River. No development zone/green buffer of 30 m width will be developed all along the Isakhali channel within EZ

site to prevent direct exposure of industries to Isakhali channel. Also it will be ensured that no waste or effluents are discharged into Isakhali channel, Bamon Sundar Channel & River Feni.

6.4. Likely Beneficial Impacts

The project involves development of EZ and off-site facilities for EZ. These off-site developments will make the site accessible and suitable for setting up of the industries. Development of the off-site infrastructure will attract the investors for setting up of the industries in the upcoming economic zone. Vicinity of the site to Chittagong Dhaka highway and well developed inland water transportation system further makes area suitable for EZ development. The likely benefits from the proposed development are listed as below:

1. Rapid Economic development (including enhancement and diversification of Industries, Enhancement of investments)
2. Large scale direct and indirect employment generation- improved quality of life
3. Development of infrastructure facilities
4. Technological enhancement for management of environmental management (like roads, water treatment, waste management, power supply, green belt, environmental monitoring)

Along with the development of EZ, it is also focussed to maintain the environment and make some facilities for community people. It is planned to develop thick green buffer all along the boundary of EZ of 30 m width and along the Isakhali channel. Also buffer of 500 m between proposed EZ site and sea will be maintained as green buffer. It is planned to develop the area facing River Feni as river front which can be used for recreational purpose. A platform/footpath of 2 m width will be developed on the proposed peripheral embankment which can be used for recreational purpose by nearby villagers. This platform will be accessible through staircase from top of the proposed road. Level of this platform will be 8 m which is again higher than the HFL of Feni River and tidal surge level during cyclones occurred in last 56 years.

6.5. Community Recommendations

No resettlement & rehabilitation is involved in land development for EZ zone as the land belongs to Government and is Char land. Also it is less probability that land acquisition requirement is there for widening of the under development access road as the bund belongs to BWDB and BWDB has land of 130 m ROW in that area. After detailed land survey requirement of land acquisition can be assessed. However at present in the land area adjacent to the under development road, villagers are practising agriculture. Thus widening of road may impact their activities and also removal of some of the trees. However side road side plantation will be carried out widening of the road. Requirement of acquisition of land will be assessed and if required compensation will be given to land owners and dependant people as per law of land of Bangladesh.

Focused group discussions are carried out with people of various groups including women, fishermen, students, business men etc and it was learned that people are in favour of development of EZ. They are expecting development in their area due to development of EZ. Also they expect large scale employment will be generated in the area for both male and females which will enhance their standard of living. But they stressed that the employment should be given to the local people preferably. Skill development trainings should be arranged for local people and jobs should be given to them during both construction and operation phase.

Some of them also shared that they expect development of infrastructure facilities like power supply, roads, water supply, educational facilities, and hospitals in the area which will further enhance standard of living. People suggested that only non/less polluting industries should

come up in the region and all industries should take pollution control measures so that EZ development does not have negative impact on environment and their health. Also they demanded that local industries should take the adequate measures for control of emissions, wastewater discharges, odours and noise due to industrial operations.

Focused group discussions were carried out with the villagers of Charshardh village, Nayapara Village and fishermen near the Bamon Sundar Channel to discuss their view on the project development, the benefits and the negative impact of the project on their life and their expectations from the project.

People also suggested that agro based and aquaculture industries should come up in this region so as it could be beneficial for people engaged in aquaculture activity.

6.6. Alternate Analysis

Various sites have been identified by BEZA or development of economic zone. Pre-feasibility study for various sites has been carried out to analyze suitability of site for EZ development by BEZA. As per pre-feasibility study it was found that Mirsarai is one of the most potential & suitable zone for development of EZ. Strength and weakness of the site are well discussed in Chapter 4. Sites considered for development of the economic zone other than Mirsarai are listed below:

- Area of app. 205 acres in Mongla Upzila, Bagerhat District
- Area of app. 353 acres in Sherpur, Maulvi Bazar
- Area of app. 1390 acres in Anwara, Chittagong

These sites are analyzed on 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 these sites. As per ranking it is found that Mirsarai has potential to be developed as EZ site due to its strategic location on Dhaka Chittagong Industrial Corridor. One of the site at Mirsarai&Mongla has already being approved for development of EZ. Factors responsible for selection of MirsaraiEZ-II site as site for development of economic zone are given below:

1. Contiguous stretch of Government Land (Disected by Isakhali Canal). Sufficient land area for development of EZ (1311 acres of development area)
2. No Resettlement & Rehabilitation Issues for EZ development
3. Located outside city Corporation, Municipality and Cantonment Board Area
4. Located Near to Chittagong Port (app. 70 km)
5. Close proximity to FeniRiver and also well-developed inland water transport. Isakhali Canal and Bamon Sundar Canal connects site to Feni River and Sea
6. Close vicinity to Dhaka Chittagong Highway (10 kms) connected through Abu Torab Road
7. Railway station close by (app 13 kms)
8. Project site does not lies within any eco-sensitive zone or ecological critical area
9. Availability of large nos. of un-skilled and semi-skilled labour

Alternative Sites considered for development of EZ in Mirsarai

Alternative 1

As per the planning and pre-feasibility study carried out by BEZA, it was decided to develop app. 7500 acres of area as EZ. Development of EZ on this area will involve large acquisition of agriculture and habituated land, displacement of people, resettlement and rehabilitation issues, large nos. of tree cutting (Mangroves). This zone is spread over large area and is accessible through 2 roads (Abu Torab and Project Road) thus would require widening of both the roads which would again require acquisition of agricultural and habituated land, tree cutting and social disturbance.

Alternative 2

Another site measuring 2100 acres was considered as an option for development of EZ. This is charland and belongs to Government. This site is to the south of the above selected land parcel and is adjacent to already approved EZ site of 610 acres. The land development will not involve any tree cutting or disturbance to society but this site is at 500 m from sea.

Alternative 3

This alternative considered is part of the alternative 2. Alternative 3 measures 1311 acres and is at app. 1 km distance from the sea. Further the entire land belongs to Government and does not involve any tree cutting and resettlement and displacement. The site is accessible through underconstruction single land road which further connects to N-1 through Abu Torab road. This under construction road will be further widened to 2 lane to accommodate traffic from proposed EZ. Widening of road will not cause any social disturbance as majorly land belongs to BWDB.

Since the alternative 3 is most suitable environmentally and socially so this option is being considered for development of the EZ. But development of EZ at alternative site 3 may obstruct flow of tidal water into the Mangrove zone adjacent to the EZ site which may lead to drying up of this Mangrove patch in long run. But to prevent this it is proposed to lay down the pipeline across the proposed embankment so as water from sea continues to flow in mangroves and prevent it from drying up. Further it is proposed to plant the entire zone between the embankment and sea with Mangroves. This will not only improve the mangroves growth but also will prevent inland area from flooding during cyclones. Map showing the initially planned EZ site of 7500 acres, already approved EZ-I site, proposed EZ-II site of 2100 acres and proposed EZ-II site of 1311 acres is given in figure 95 below.

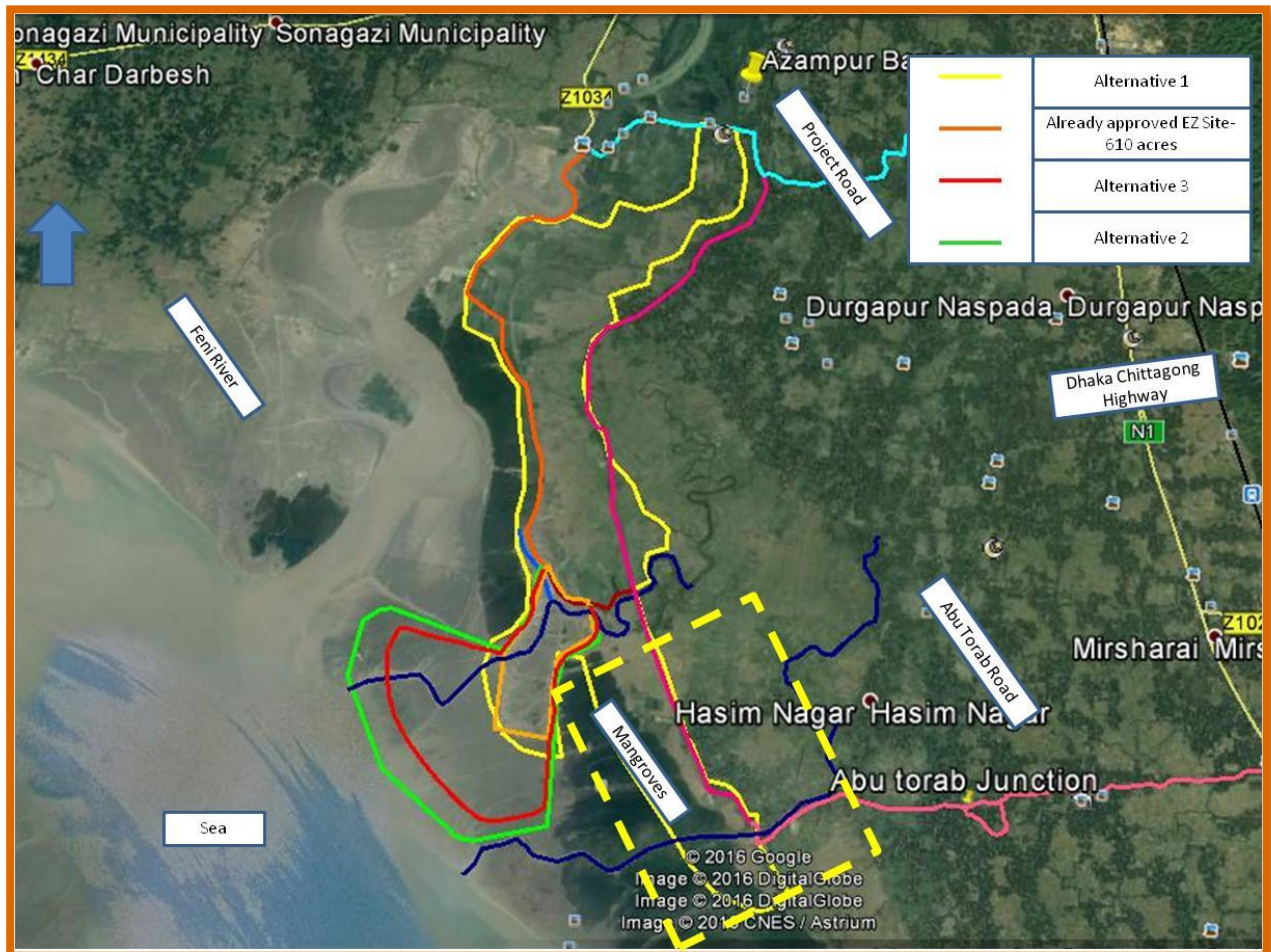


Figure 95: Map Showing Alternative 1, 2 & 3 and Already approved EZ-I site

Alternatives considered for construction technology

Alternative options are considered for selection of construction material and technologies of construction. Options considered are for construction of compound wall and administrative building as given below:

The soil investigation report necessitates minimum 30 m depth of pile foundation for administration building and minimum 8 m depth of pile foundation for compound wall. Considering the soil conditions, the nature of utilization, and the following alternate technology has been suggested for successful ground modification / improvement which will be determined depending upon the difficult soils, liquefaction potential, slope stability, bearing capacity and settlement, and seepage instability. The ground improvement include loading conditions and allowable deformations for the facility, as well as an assessment of the impacts of natural hazards, such as floods, earthquakes or hurricanes, and the performance required during these events.

- Unsliced Lime slurry filling on the pile bore before casting pile concrete for a depth of 2m instead of providing pile for a depth of minimum 6 m for compound wall
- Soil stabilization through lime injection at the bottom of the foundation for administration building.
- The above measures have brought down the project cost substantially apart from reduction in wastes of natural resources for the heavier foundation structure.

7. Environmental and Social Impacts

7.1. Introduction

Environmental impacts assessment was carried out considering present environmental setting of the project area, and nature and extent of the proposed activities. Proposed project involves development of EZ and off-site facilities for upcoming Economic Zone II at Mirsarai. Potential environmental impacts associated with EZ and each of the proposed EZs classified as: (i) impacts during design and construction phase and ii) impacts during operation phase/Post-construction phase. Sensitive environmental and social components were identified during the site visits and qualitative and quantitative techniques have been applied for direct and indirect assessment of impacts on the identified environmental and social sensitive components. Impacts are classified as being insignificant, minor, moderate and major.

Some of the important impacts associated with the proposed EZ and off-site facilities for economic zone will be associated with land use (diversion of land use), land stability (soil erosion), soil compaction and contamination, water availability, water quality of river/stream/canal, ground water contamination, waste and wastewater disposal, ambient air quality, ambient noise levels, vegetation, tree cutting (including Mangroves plantation by Forest Department), fauna (terrestrial and aquatic), drainage pattern, hydrology, socio economic, places of social/cultural importance (religious structures, community structure), construction material sourcing and occupational health and safety. Adequate mitigation measures are devised to mitigate/minimize all likely environmental impacts and the same have been presented along with the impacts.

During the field study, consultations were also held within study area including fishermen, students, women and other villagers. Outcome of these consultations were used in impact assessment and devising mitigation measures.

7.2. Impact Identification

During the site visit, various environment and socially sensitive features were identified which may potentially be impacted by the project at various stages. Identified impacts of the project activities on the environment and social components are given below in table 58 along with the activities associated.

Table 58: Impact Matrix for Proposed Off-site Infrastructure& Economic Zone-II

S. No.	Activities	Impacts	Negative Impact		Positive Impact		Not Applicable
			Short Term	Long Term	Short Term	Long Term	
A	Pre-Construction Phase						
i	Site Preparation (conversion of wetland for EZ development and filling of land)	<ul style="list-style-type: none"> Change in land cover and development of EZ zone Increased Run-off in surface water bodies Loss of floral and faunal diversity of the area Impact on Aesthetic aspects 		√			
ii	Acquisition of land for	<ul style="list-style-type: none"> Loss of livelihood 		√			

	widening of under construction single lane road to 2 lane road may be required	<ul style="list-style-type: none"> • Change in land use • Improved accessibility • Removal of existing vegetation • Development of new avenue plantation • Displacement of squatters 		√		√		
B	Construction Phase							
i	Development of EZ and Off-site facilities	Loss of Top soil		√				
		Soil contamination due to spillage of material	√					
		Surface water contamination	√					
		Air pollution	√					
		Noise pollution	√					
		Increase in traffic	√					
		Un pleasant view	√					
		Impact on Health & safety	√					
		Social impact	√				√	
	Felling of Trees (if any)			√				
C	Operational Phase- Offsite Infrastructure							
i	Development of EZ and Construction of off-site facilities like administration building, peripheral bund , embankment along Isakhali channel, site filling, widening of under construction single lane road to 2 lane road and development of sluice gate	Air Quality Improvement due to road widening				√		
		Economic Development					√	
		Accessibility					√	
		Improved drainage					√	
		Improved health and sanitation facilities					√	
		Increased Run-off			√			
		Generation of Employment					√	
		Natural drainage pattern	√					
		Mangroves			√			
	Available Land Area					√		
D	Operational Phase- Economic Zone							
i	Operation of Industries	<ul style="list-style-type: none"> • Air pollution • Noise pollution • Potential for river & canal water pollution from industrial waste discharges • Ground water depletion • Rain water harvesting • Health & Safety 		√				
				√				
				√				
						√		
						√		

		<ul style="list-style-type: none"> • Employment Generation • Potential for land contamination from industrial waste disposal • Change in Land Use of nearby areas • Development of Infrastructure • Improved Connectivity & Accessibility • Better Safety from Natural Disasters like Cyclone • Recreational facility 		√		√		
ii	Green Buffer development around each industrial plot, EZ boundary, along Isakhali channel, and between EZ boundary and sea	<ul style="list-style-type: none"> • Improved Ecology • Air Quality Improvement • Aesthetics 				√	√	√

7.3. Impact of Development of Economic Zone & Off-site Facilities

7.3.1. Pre-construction & Construction Phase

Development of the economic zone and the off-site facilities, i.e. administration building, peripheral bund cum road, embankment along Isakhali channel, site filling, widening of under construction single lane road to 2 lane road and development of sluice gate will involve clearance of site vegetation (insignificant), leveling of site by filling and cutting, civil construction activities, storage of raw materials like fuel, sand, aggregates, cement, reinforcement etc., storage of debris, excavation of soil etc. All these activities have potential to impact the environment in one or other way. These activities can directly and indirectly impact the environment. Direct & indirect impact of development of EZ and off-site facilities during pre-construction & construction phase are listed below

- **Impact on air quality** due to generation of dust and other gases like SO₂, NO_x & CO from construction activities, loading & unloading of material, operating construction equipment & vehicles, operating pumps for filling activity, transportation of men & material, storage of raw material and debris etc. Impact on Air Environment during construction phase due to development of EZ & Off-site facilities are discussed in detail in section 7.4.1 & 7.4.2 below
- **Impact on water resources** due to withdrawal of water for construction activities from the nearby surface water bodies Feni River & Isakhali Canal or usage of ground water for meeting the water requirement of construction labour. Detailed impacts are discussed in section 7.6.1 below
- **Impact on surface water quality** due to entry of contaminated rainfall run-off. Rainfall run-off will contain contaminants on mixing with sediments/silt from excavated site, raw material & debris storage site, with fuel in fuel storage area and pump operation area etc. Detailed impacts are discussed in section 7.6.1 below

- **Impact on hydrology & drainage** due to filling activity. Site is intersected by various streams and small channels draining into Isakhali canal which is finally draining into Sea. These small channels carry water from Isakhali canal to Mangrove forested area and to EZ site during high tide/monsoon season and viceversa during low tides and post-monsoon season. These channels will be filled up impacting the drainage pattern at site. The impact on hydrology & drainage is discussed in detail in section 7.6.1 below
- **Impact on noise environment** due to increased noise generation at EZ site and nearby area. At present EZ site is vacant land with no associated activities being carried out on it. EZ site is connected through under construction single lane road on CDSP bund & through non-motorable bund constructed for Mirsarai Zone-I. At current, noise is being generated near the site due to under construction Mirsarai Zone-II but the noise levels at site presently also varies from 40-45 dB(A) as measured during the visit. During pre-construction and construction phase noise levels will increase due to construction activities and transportation of materials. Detailed impacts are discussed in section 7.5.1 below.
- **Impact on Mangroves Plantation** will not be significant as no Mangrove is proposed to be removed or cut for development of the project. Mangroves are planted by forest department in areas adjacent to EZ site and along the Bamon Sundar canal area. These are planted to protect the EZ site from cyclone hazard. Mangrove plantation may be impacted due to discharge of exhaust gases from vehicles, pump, DG sets and construction machinery and disposal of wastewater & construction debris in mangroves plantation area. Thus air, water and solid waste management plan is required to be prepared for pre-construction and construction phase of the project. Detailed impact and mitigation measures are listed in section 7.10.1 below
- **Impact on flora & fauna** due to development of EZ will not be significant as EZ site is devoid of flora & fauna. No tree cutting is proposed to be undertaken for development of EZ and off-site facilities. Some however may be required for widening of access road and development of embankment along the periphery of the zone. Mud crabs are found on the EZ site in the areas close to Isakhali canal. Habitat of mud crabs will be affected due to development of EZ. But development of the no development zone of 30 m width all along the length of the Isakhali canal will minimize this impact as this zone will continue to serve the habitat for mud crabs. Also plantation will be carried out in this zone by developer. Detailed impacts are discussed in section 7.10.1 below.
- **Impact on Land Use, drainage & hydrology** due to diversion of large area of wetland into industrial use. This land is under water during high tides and monsoon season. However after development of EZ, wetland will be replaced by paved structure disturbing the natural drainage pattern, run-off and hydrology of the site. Detailed impacts on land use are discussed in section 7.7.1 below.
- **Impact on topography, soil quality, soil erosion & geology** due to filling & leveling of site. Detailed impacts are discussed in section 7.7.1 below. However to prevent soil erosion, it is proposed to provide stone pitching on peripheral embankment on seaward side and embankment of Isakhali channel on channel side. On the other side of embankments grass turfing will be provided along with plantation. Chute/longitudinal drains will be provided on embankment to facilitate flow of the storm water.
- **Impact on Socio-Economy** due to generation of employment. Skilled & unskilled labour will be employed for development of the project. Thus it may involve immigration of people from nearby area for work purpose in this area. Detailed impacts are discussed in section 7.11.1 below
- **Impact on marine & riverine Eco-system** due to deep sea dredging can occur. Deep sea dredging involves extracting sediments from sea floor which may impact the benthos habituating on the sea floor and other aquatic organisms. These organisms may be impacted due to deep sea

dredging process and generation of high amount of sediments. Thus a detailed study should be undertaken to assess the eco-sensitivity of marine environment for dredging and transportation of the sand. Further disposal of wastewater & waste material in river/sea may contaminate the water quality of river & sea. Mixing of wastewater, waste material and raw material with run-off may also lead to pollution of the rivers and the sea water as it will directly mix with river & sea water due to close proximity of site with sea & river. Detailed impacts are discussed in section 7.10.1 below.

7.3.2. Operation Phase

After development of economic zone, it is expected that industries will start coming up in this region and EZ may reach its full capacity in 4-5 years time. Construction and operation of the industries may have impact on the environment and society. The impacts which could affect environment and society are listed below:

- **Mangroves can be impacted due to bund construction.** After development of the bund some of the area of mangrove plantation in East direction of EZ site may become water deficient. As this area receives water through drains connected to Isakhali canal. These drains will be filled after development of EZ. Thus small portion of Mangrove plantation is expected to go dry or affected due to EZ development. Further Mangroves may also be impacted due to exhaust air from industries, DG sets and disposal of wastewater by industries in mangroves area or water bodies. To prevent the same it is planned to provide the pipeline through the peripheral bund which will ensure supply of the sea water during high tide to these Mangroves patches and also to prevent impact of air pollution to these Mnagroves, air pollution management measures are proposed in the EMP. Detailed impact on Mangroves and mitigation measures required are discussed in section 7.10.1 & 7.10.2 below
- **Impacts on Air Quality** due to discharge of exhaust gases from industries and vehicles. Industries like food processing, textile, petrochemical, ship building and light engineering industries may come in the planned EZ. All these industries generate exhaust gases and can pollute the air quality but are comparatively lesser polluting. Detailed impacts and associated mitigation measures are discussed in section 7.4.3 below.
- **Impacts on Noise Level** due to increase vehicular movement and industrial operations are anticipated. Detailed impacts are discussed in section 7.5.2 below.
- **Impacts on Water Quality** due to discharge of effluents/sewage from food processing, textile, petrochemical, ship building and light engineering industries. This can impact the ground and surface water quality by contaminating it and making it unfit for drinking and aquatic life. Detailed impacts are discussed in section 7.6.2 below.
- **Impacts on Ground Water Resources** due to extraction of water from ground to fulfill the daily water demand of the industries. This will highly impact the ground water aquifers by lowering the ground water level. Also ground water is the only source of water for domestic use other than rain water harvesting ponds. Thus depletion of ground water resources will have impacts on the people also. Detailed impacts are discussed in section 7.6.2 below.
- **Impacts on Socio-economy** due to shifting of population from nearby areas in search of jobs. Due to high level of unemployment, it is expected that large nos. of people may migrate to the project area from nearby areas changing the demographic profile of the area. This will exert pressure on existing resources and may degrade the environmental quality of the area. EZ will provide large scale employment for all skilled, semi-skilled and unskilled labour. This will improve the quality of life of the people in the nearby areas. Detailed impacts are discussed in section 7.11.2 below.

- **Impact on Land Use** due to development of EZ and off-site facilities is expected. Development of EZ will make more usable land area available in the area. Due to widening of the under construction single lane access road, development of peripheral road around proposed EZ site will make the area easily accessible and it is anticipated that area will experience significant development. Residential apartments, commercial hubs, hotels, restraints may come up in nearby areas to provide services to the industries set up in EZ. These developments may alter the land use of nearby area in coming future. Detailed impacts are discussed in section 7.7.2 below.
- **Impact on Agriculture Resources** are anticipated due to development of EZ. Agricultural land will be diverted for other uses like commercial, residential, industrial, roads and urban area etc. Also it is proposed food processing industries may come in EZ which will give boost to agricultural activities. Detailed impacts are discussed in section 7.8.2 below.
- **Impact on Fisheries** is anticipated due to development of EZ but not very significant. Isakhali canal within the EZ site will be closed for fishing activity. At present fishing in Isakhali channel is limited to monsoon and high tide duration only. However, fishing will not be restricted in upstream and downstream areas of canal. Also large nos. of canal and water bodies area present in study area so there will not be any significant impact on fisheries. Also a sluice gate is proposed to be developed on Isakhali canal to control amount of water entering Isakhali canal. Sluice gate will be closed only during high flow time & monsoon season. Detailed impacts are discussed in section 7.9.2 below.

7.4. Impact on Air Environment

7.4.1. Pre-construction Phase

Pre-construction phase will involve site clearance, leveling & filling activities for development of EZ, widening of under construction single lane road and construction of peripheral bund cum road around proposed EZ site. Clearance of site will involve removal of vegetation, land leveling & filling activities. However site does not support any vegetation thus impact due to clearance of vegetation is not anticipated. Some trees may be required to remove for widening of single lane road and for construction of new peripheral bund. These activities will lead to dust generation. But these emissions will be limited to the site only and have impact for short duration only during clearance activity. To minimize the dust generation, water should be sprinkled regularly at the site and low sulphur diesel should be used in land leveling equipments to control the SO₂ emissions.

7.4.2. Construction Phase

The proposed project involves construction activities like site development, civil construction, construction material handling and stocking, and construction vehicle movement will generate fugitive dust and vehicular emissions. However, these ground sourced generation will be limited to the construction site and the impact will be short duration that too during construction activities only. The likely emission from construction vehicle, machinery, and generators is likely to be insignificant as the pollutant emission activities (point and area sources) will be limited within the project boundary and the activities will be short term (only for construction period). However, this impact may further be minimized by adopting following mitigation measures.

Mitigation Measures

- Sprinkling of water at construction site and haul roads
- Covering the scaffolding (in case of administration building) to reduce the dust emission in outside environment
- Provision of face mask to workers to minimize inhalation of dust particles

- Construction vehicles and machinery should be regularly serviced and check for pollution control
- Low sulphur diesel should be used for running construction equipment and vehicles
- Adequate parking space should be provided for the construction vehicles so as to prevent idling of the vehicles and the emissions generating from them
- Vehicles carrying construction material and debris should be covered with tarpaulin cover
- Raw materials, excavated soil and other debris should be stored under covered sheds
- Green buffer should be developed all along the EZ boundary
- Plantation should be carried out along the both side of access road to be widened

7.4.3. Operation Phase

Offsite Facilities: Widening of the under development single lane road to 2 lane road will ensure that no jams or congestion occurs in future and thus will significantly reduce the vehicular emissions. No adverse impact is anticipated on air quality during operation phase due to development of off-site infrastructure.

EZ operation: Post development of the economic zone & setting up of industries, there could be some impacts on the air quality of the area. 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. The industries proposed in line with the industries as anticipated for Mirsarai EZ-I are industries like food processing, textile, petrochemical, ship building and light engineering. These industries are comparatively less polluting than other industries like tanneries, distilleries etc.

Emissions to be generated from Anticipated Industries:

Air emissions result from light-engineering industries. These are particulate matter, sulphur dioxide, metals and other criteria pollutants like ozone, oxides of nitrogen and carbon monoxide. Lead may be generated in some of the processes.

Air emissions from food processing industry will contain some volatile organic compounds but do not contain any hazardous compounds. These industries emit low process-air emissions. Most processes use electrical power and rarely emit harmful compounds to environment. But air emissions from water treatment plant of these industries are a major concern. Mal odour from these water deteriorates the air quality and disturbs the living condition in the area. No significant air emissions are generated from textile industries.

Petrochemical industries generate both ducted/channelized emissions and fugitive emissions. The main air pollutants from petrochemical processes and energy supply are: Sulphur oxides (SO₂, SO₃) and other Sulphur compounds (H₂S, CS₂, COS), Nitrogen oxides (NO_x, N₂O) and other nitrogen compounds (NH₃, HCN), Halogens and their compounds (Cl₂, Br₂, HF, HCl, HBr), incomplete combustion compounds such as CO and C_xH_y, Volatile organic compounds (VOC) and particulate matter (such as dust, soot, alkali, heavy metals). The main category of air pollutants from the production of Petrochemicals are combustion emissions, VOCs and acid gases. Ducted emissions can be treated by routing to control device like strippers, scrubbers, ESP, dust bags, cyclones etc. However the diffuse emissions can either be prevented or minimized by adopting best management practice.

Pharmaceutical industries also involve generation of emissions. Off-gases from distillation may contain volatile organic material in the form of vapour or entrained droplets/mist, although this can be reduced by the use of additional condensing areas. Non-condensable substances (e.g., oxygen, nitrogen, carbon dioxide, and low-boiling organics) are not usually cooled to their condensation temperature and will exit the condenser. Emission points from distillation are typically: the condenser, accumulator, hot wells,

steam jet ejectors, vacuum pump and pressure relief valve. The total volume of gases emitted from a distillation operation depends upon air leaks into the column (increases with reduced pressure and increased size); volume of inert carrier gas; gases dissolved in the feed; efficiency/operation of the condenser or other recovery equipment; and physical properties of the organic constituents.

Dust and gaseous emissions are the main pollutants during operation of the cement plant. Air emissions in cement manufacturing process are generated by the handling and storage of raw, intermediate and final materials, and by the operation of kiln systems, clinker coolers, and mills. Air emissions are mainly gaseous or in the form of particles loaded by adsorbed gases; the latter can be regarded as a constituent of dust. The main releases from the production of cement are releases to air from the kiln system. These are derived from the physical and chemical reactions involving the raw materials and the combustion of fuels. The main gaseous pollutants relevant to cement manufacturing are NO_x, SO₂, CO & CO₂. Other pollutants are VOC, polychlorinated dibenzodioxins and dibenzofurans, metals & their compounds, HF & HCl.

Emissions to be generated from Increased Vehicle in the area

It is anticipated app. 600 PCU per day will be added after project development. 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 impact the air quality and increase the noise level in area if not managed properly. To accommodate this additional traffic it is proposed to widen the under construction 7 km road being developed on BWDB and CDSP bund from Abu Torab junction to EZ site. Further there are plans of Road Development Authority to widen the Abu Torab Road from N-1 to Abu Torab junction in near future. This widening of road will ensure easy movement of traffic and thus will reduce the congestion. Easy flow of traffic without congestion will not lead to traffic jams and associated air emissions and noise levels. Further avenue plantation is proposed to be carried out all along the road. A 30 m thick green belt will be developed all along the EZ boundary & Isakhali channel and 10 m thick green belt will be developed along the boundary of each of the industrial plot. This green belt will help in reducing the air pollution effect especially dust levels.

Mitigation Measures

Provision is made for peripheral green belt of 30 m all along the EZ boundary and along isakhali canal. Green belt shall have minimum of three rows of local variety of tree. Tree species shall be selected such that first inside row is of smaller height, middle row of tree is of medium height and last row of tree is of higher height so that green belt formed appears like a canopy. Apart from this green buffer of 500 m will be developed between the EZ and the Sea. Avenue plantation will also be carried out along the access road, embankments, bunds and internal road. This entire green buffer will absorb the air pollutant and will help in purification of air and will provide sufficient surface area for settling of the dust. Other measures which can regulate air pollution are:

- Development of thick green belt (10 m) and organized greens within each industrial plot
- 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 DG sets should be used only in case of power failure (not more than 8 hours/day)
- Process emission if any shall be control with the installation of adequate air pollution control systems
- All industries should obtain clearance from DoE, Bangladesh as applicable. Air pollution control measures shall be adopted by respective industries in line with DOE permission
- Air pollution monitoring should be carried out quarterly by all industries to check the air pollution level.

- Preference of usage of clean fuel like LPG, low sulphur diesel should be explored
- Energy conservation should be adopted by adopting the alternate energy options like solar power.
- Odour should be managed at the site using odour suppressant and planting fragrant flowering trees.

7.5. Impact on Noise Environment

7.5.1. Pre-construction and Construction Phase

Pre-construction phase will involve site clearance activity for development of propose off-site facilities and EZ. Clearance of site will involve removal of vegetation and land leveling activities. Operation of different machineries and equipments for construction activities, running of heavy load traffic for construction materials transportation, and regular traffic movement may generate noise during construction period. The produced noise may have impact on existing acoustic environment of rural category defined in ECR, 1997. Local inhabitants may feel disturbed due to noise from line sources (traffic movement).

Mitigation Measures:

- Machinery to be used should comply with the noise standards prescribed by DoE.
- DG set shall be acoustic treated
- Workers shall be given PPE (ear plugs), if working in high noise area
- No noise generating activity shall be carried out in the night.
- No construction activities to be undertaken during night hours to prevent any disturbance to nearby residents and labours in labour camps.
- Acoustic enclosures should be provided with DG sets and machinery to control the noise levels at construction site.
- Temporary noise barriers should be provided near the high noise generating areas

7.5.2. Operation Phase

Noise will be generated from the construction of individual industries, operation within in industrial units, running DG sets in each units and traffic movement within EZ zone and on the proposed access road. Noise pollution is related to several cement manufacturing phases, including raw material extraction; grinding and storage; raw material, intermediate and final product handling and transportation; and operation of exhaust fans. Following mitigation measures are required to be taken to minimize noise pollution:

Mitigation Measures

- Avenue plantation will be developed along both the side of access road to be widened/peripheral road/bund/internal roads which will act as noise buffer
- Green buffer of 30 m will be developed all along the EZ site& Isakhali channel. Green buffer will comprise of the 2-3 rows of plants of variable height and thick canopy so as to form continuous barrier. This will help in reducing the noise level significantly.

- Provision of barricade around construction site (for construction of individual industrial plot)
- Provision of 10 m thick green belt around each industrial plot
- All industries should obtain clearance from DoEB before establishing industrial unit and should comply with all the conditions mentioned in the letter of environment clearance
- All industries should install the new machinery of modern make which complies with the noise standards prescribed by DoEB in ECA, 1995.
- Acoustic treatment and temporary noise barrier should be provided in area generating higher noise levels
- Job rotations should be practiced for workers in industry to prevent prolonged exposure to high noise level as it may lead to deafness, fatigue, head ache, nausea and drowsiness
- Honking should be prohibited within the economic zone

7.6. Impacts on Water Environment

7.6.1. Pre-Construction and Construction Phase

Impacts on Ground & Surface Water Resources:

Water will be required for various construction activities & domestic purpose. Source of water for these activities will be Feni River, temporary constructed storm water ponds by contractor or ground water. Excess withdrawal of ground water may lead to depletion of aquifers. Shallow water aquifers in the area are saline and fresh water is available at the depth of 210-270 m (700-900 ft). Measures should be taken to minimize the water extraction by reducing water consumption and wastage. Mitigation measures are given below.

Mitigation Measures

- Best management practices for conservation of water will be required to be adopted to minimize water wastage and water loss. Best management practices to be adopted are given below:
 - Temporary storm water drains and rain water harvesting ponds should be constructed so as to store rain water for construction activities.
 - Water for curing can be saved by carrying out curing in early morning or late evening and covering structures with gunny bag so as the moisture can be restored for longer time.
 - Regular inspections at site to monitor leakages in water storage tanks
 - Creating awareness among construction workers about the importance of water conservation
 - Adoption of the advance technologies and machinery which helps in minimizing water requirement for construction
 - Storing the curing run-off and waste from other construction activity and using the same for sprinkling.
 - Covering the water storage tanks at site to prevent evaporation losses.
 - Cost provisions are made in environment management cost for management of storm water during construction phase

Impact on Surface Water Quality

Run-off from the construction site may carry the higher quantity of sediments and oil which may pollute the surface water and impact the aquatic life. Thus measures are required to be taken to minimize the surface water pollution

Mitigation Measures

- To avoid excavation activities during rains
- To prevent piling up of excavated soil, raw material and construction debris at site by proper management and disposal
- Minimize run-off by using sprays for curing
- Maintaining appropriate flow of water sprinklers at site
- Construction of storm water drains along with sedimentation tanks with sand bags as partition as barrier for direct flow of run off to river.
- Collection & Reusing of curing over flow, tyre wash water etc within the site
- Construction of adequate nos. of toilets and proper sanitation system to prevent open defecation along the river banks/water supply lines
- Construction of soak pits/septic tanks to dispose-off the domestic waste water generated from labour camps to prevent disposal of sewage in surface water bodies
- Proper collection, management and disposal of construction and municipal waste from site to prevent mixing of the waste in run-off and entering the water bodies
- No debris/construction material should enter the aquaculture ponds and other waterbody in the area

Impacts on Ground Water Quality

Ground water is saline in shallow aquifers of the study area. No significant impacts are anticipated on the ground water quality due to development of the off-site facilities for economic zone.

Mitigation Measures

- No sewage or waste water should be accumulated in any unlined structure
- Timely disposal of the construction/chemical/haz. waste so as to prevent leaching of any pollutant to ground

Impacts on Drainage Pattern & Hydrology

EZ site is bounded by existing EZ-I zone and CDSP bund in North & NE direction. Thus storm water from villages in up streams is drained only through Isakhali canal and Bamon Sundar canal. These canals will not be impacted due to development of EZ zone and will be retained in existing condition. However a sluice gate is proposed to be developed at Isakhali canal at point of entry of canal in EZ site from sea side to control the flow of water. This gate will control level of water entering Isakhali canal and will be closed only during high tide and high flow times and allowing the water movement in rest of the time. A zone of 30 m will be left on each side of the Isakhali channel as no development zone and thereafter embankment will be developed along the Isakhali channel. It will prevent direct exposure of the channel to the site and thus no hinderance to its flow is anticipated.

EZ site is wetland and is dissected by Isakhali canal. Site is connected with Feni River & Sea through Isakhali canal and Bamon Sundar canal. Rivulet from Feni River also abuts the site in NW boundary at one location. Dense drainage of Isakhali channel runs through the EZ site. Construction of EZ site will disrupt this natural drainage pattern on EZ site. To maintain the drainage at site adequate storm water

collection & harvesting system should be developed at the site. Also peripheral drain is provided which will receive the storm water from EZ site and will drain finally into the Isakhali channel.

Aquaculture ponds exist all along the access road proposed to be widened. Expansion of the road may lead to filling of some of the ponds partially. But these ponds are filled during rains majorly. Thus due to filling of some of these ponds excess water will flow down to Isakhali and Bamon Sundar Channels which will be retained in its existing conditions. Construction of 14.4 km bund cum road will prevent entry of water to the EZ site during flooding and cyclone but as the large area nearby is available this flow will be diverted to other areas. Thus no significant impact on drainage is anticipated due to development of EZ and its off-site facilities

Mitigation Measures

- Natural drainage pattern should be maintained. Run-off assessment shall be made of catchment area and peripheral/garland drains shall be constructed around EZ site based on the assessment of catchment area (frequency, and storage area).
- Adequate storm water collection and management network should be developed at the site
- Storm water harvesting storage should be developed at the EZ site so as this water can be used during both construction & operation phase.
- Storm water drain shall have the provision of de-siltation before discharge to river.

7.6.2. Operation Phase

Impacts on Ground & Surface Water Resources:

15 MLD of water will be required during operation phase for both the consumption and industrial operation purpose. 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 and fresh water is encountered at the depth of not less than 700-900 ft. Also extraction of ground water may affect the ground water resources. Thus to prevent the impact on ground water resources, it is required to look for other options like rain water harvesting and desalination. Further mitigation measures are discussed below to minimize the impact on water resources and water quality.

Mitigation Measures

- Feasibility shall be explored by BEZA of installing the desalination plant for the use of surface water.
- Rain water harvesting system and storage should be developed to minimize ground water construction
- Adoption of best management practices to prevent water wastage and minimize water loss
 - Usage of water conservation fixtures to minimize water consumption
 - Installation of leakage detection system to minimize the water loss
 - Usage of latest technologies in industries which requires lesser water
 - Provision of dual plumbing system so as STP/CETP treated water can be re-used for various purposes as per suitability of the quality
- Ground water aquifer assessment studies may be undertaken to assess the ground water potential. Piezometer shall be installed to monitor variation in ground water level in the area.

Impacts on Surface Water Quality

Industries are likely to generate domestic and industrial effluent. Liquid waste which can be generated from light engineering industries will include waste acid, waste alkali, grease, used/spent oil, liquid

metal, spent solvents etc. Wastewater is not generated in significant amount from these industries. Majorly domestic and cleaning waste is likely to be generated. No significant liquid waste is generated from proposed textile industry as mainly RMG units are proposed.

Source of wastewater in petrochemical plants is Ethylene crackers and aromatic plants. Major water pollutants are inorganic sulphides, mercaptans, soluble hydrocarbons, polymerised product, phenolic compounds, sulphide, cyanide, heavy oils, coke, spent caustic, SO_x, NO_x, hydrocarbons, particulates, water borne waste containing BOD, COD, suspended solids, and oil. Oily water is the main source of liquid effluent from cracker plant. Liquid effluents like pygas, pyrolysis fuel oil quench water, process water stripper bottoms give peculiar odour. These pollutants may contaminate the water quality if discharged without treatment. It is required to recover the solvents to reduce their concentration in waste stream and to minimize the wastage of solvents. Waste streams should be segregated so as to prevent the mixing of more and less polluted streams and streams containing pollutants of different chemical properties. The waste streams should be treated in ETP and STP and the treated water should be completely utilized again within the industrial unit.

Effluents from pharmaceutical especially intermediates have high COD and TDS water, however Pharmaceutical formulation industries does not generate significant wastewater stream. These streams are required to be segregated and managed prior mixing with the other streams

Wastewater in cement plants results mainly from surface run off and utility operations for cooling purposes in different phases of the process (e.g., bearings, kiln rings) and causes no substantial contribution to water pollution. Process wastewater with high pH and suspended solids may be generated in some operations. The storage and handling of fuels is a potential source of contamination of soil and groundwater. Stormwater flowing through pet-coke, coal, and waste material stockpiles exposed to the open air may become contaminated.

Food processing industries similarly generate both liquid and solid waste. Concern with wastewater from the food processing industry is high BOD levels, high TSS, excessive nutrient loading like nitrogen and phosphorus compounds and pathogens. This water is to be treated essentially to achieve DoEB standards to prevent the soil, water and air quality pollution. Discharge of wastewater in soil will degrade its fertility and increase the toxicity which will make it unsuitable or growth of plants and survival of micro/macro organisms. If this water is discharge into water system, will pollute the water quality and have potential to threat the aquatic life. Uncontrolled discharge of these effluents to river may severally pollute the river water quality.

Pollutants from these industries may be discharged into Isakhali canal and may be carried away to Feni river estuary system which supports diverse variety of fish. Run-off may increase post development of economic zone. It is required to manage storm water which will be generated from EZ site post development. Measures should also be taken to prevent contamination of storm water with any industrial pollutant. Following measures should be adopted during operation phase to minimize impacts of development of Economic zone on surface water quality.

Also it is anticipated that desalination plant will be installed infuture for meeting the water requirement of the zone. Desalination plant also have certain environmental impact. Reject from desalination plant has more salinity, density and temperature than that of the sea water thus there may be impact of discharge of this water on aquatic organisms. Increased temperature and salinity may also reduce the solubility of oxygen in sea water. Thus measures should also be taken in future to prevent the impact of desalination plant on surface water quality and are discussed below.

Mitigation Measures

- Each industry should obtain consent of DoE Bangladesh before construction and operation and should comply to the conditions laid by them

- Each industry should treat the effluent and sewage generated by them so as to achieve zero discharge and no untreated effluent should be discharged into any water body
- Provision shall be made for Common Effluent Treatment Plant (CETP).
- Common STP (in modules) should be constructed within the EZ to treat sewage from residential and commercial areas
- Proper management of waste should be done to prevent any contact between the waste and storm water
- Common waste disposal sites should also be developed within EZ site as per the standards and prior permission of DoE should be taken before development.
- Each industry should practice rain water harvesting to minimize the water consumption and reduce run-off from the site
- Storm water drains should be lined separate from effluent drains
- Storm water system should be inspected & cleaned before monsoon every year
- Peripheral drain shall also be lined and shall not be connected to internal storm water drainage system.
- The top soil shall be preserved and used for covering the sand layer at EZ site. Vegetation turffing shall be made at the side slopes of the EZ areas to prevent erosion and siltation in the river.
- River water quality shall be monitored periodically.
- Chlorine should not be used for disinfection but other measures like polyamide membrane, ozone & monochloramine etc should be used in desalination plant
- Discharge of the desalination plant should be checked for heavy metal concentration before discharging into sea
- Filter backwash water could be diluted by continuous blending with the brine or alternatively it could be removed from the filters and transported to a landfill
- Antifoaming dosage should be regulated and dilution of the discharge should be done
- Neutralization of discharge of desalination plant should be carried out before discharging to sea

Impacts on Ground Water Quality

No impact on ground water quality is anticipated during operation phase due to off-site developments. After development of economic zone there may be some ground water pollution due to industrial activities. Following measures should be taken to minimize the ground water pollution.

Mitigation Measures

- Each industry should treat the effluents and sewage and should not discharge into ground.
- No leachate, waste water and waste material should be stored in pervious unlined area/pond.
- Ground water quality shall be monitored periodically.

7.7. Impacts on Land resources

7.7.1. Pre-construction and Construction Phase

Impact on Land Use

EZ site is spread over an area of 1311 acres (development area 1311 acres). Also it is proposed to widen the existing under construction single lane road which is being constructed for Mirsarai EZ-I. 1311 acres of the EZ land is Government land and thus will not involve any acquisition, however land use will change from char land (wetland) to Industrial area. Some of the measures are taken to prevent any impact on change in land use

Mitigation Measures

- Tree cutting will be avoided while widening access road, construction of peripheral bund cum road and development of EZ
- If any tree cutting is undertaken then compensatory plantation should be done in minimum ratio of 1:2
- Measures will be taken that no structure along the access road to be widened should be affected due to development of EZ

Impact on Topography & Geology

Site will be filled with deep sea sand to level of 1.15m above NGL (+3 m amsl) from existing level. This will impact the topography of the site by raising its existing level. Impact will be not be significant as the impact is restricted to EZ zone.

Impact on Top Soil and Soil Quality

Development of the structures and construction of the bund and widening of access road may disturb the soil profile of the area. Site will be filled to level of +1.15m with deep sea sand. Land will be filled and compacted after filling. Also sand will be required for construction of bund cum road, widening of access road and administration building which will be sources from nearby markets or Sand Mohal of Mirsarai. Sand should be purchased from authorized vendors only to minimize the illegal mining and dredging activities

Storage of raw material, fuel and construction debris may contaminate the soil thus measures should be taken to prevent the soil pollution. Mitigation measures to be adopted are mentioned below. Contractors are required to take all the proposed mitigation measures. PMC and BEZA will ensure that all the proposed mitigation measures are being incorporated in the bid document issued to the contractor and the implementation of the same during construction.

Mitigation Measures

- No piling of raw material at site
- Raw material will be stored under covered sheds and paved surface
- Fuel storage area should be paved
- Adoption of best management practices to prevent any spillage of raw materials
- Construction debris should be stored under covered sheds and paved surface and should be disposed off regularly to designated sites
- Waste from labour camps can be segregated at site. Food waste/wet waste should be composted in pits within the camp site. Recyclable waste should be sold to the authorized dealers and the remaining should be disposed off at designated sites through local agencies responsible for waste management in the area.

Impact on landscape and scenic beauty

All construction activities for off-site facilities and EZ site will be carried out within economic zone site and will not cause any impact on landscape and scenic beauty. A green buffer of 30 m (minimum three rows of trees) will be developed all around the project site and along Isakhali channel which will enhance

the scenic beauty of the area. Buffer of 1000 m will be developed between the sea and EZ as green belt. Also avenue plantation will be developed all along the internal roads, access roads and bund/road

Site clearance activities and piled construction materials, machinery and camp establishment on green field site may impact the scenic beauty. Nevertheless, the impact is for a short duration, and reversible as the project plan includes landscape planning, green belt development as well.

7.7.2. Operation Phase

Impact on Soil Quality

No impact due to off-site developments is anticipated on soil quality of the project site during operation phase.

After development of economic zone, disposal of industrial domestic and process waste may contaminate land and soil quality of the area. Improper disposal of waste (hazardous and non-hazardous waste) may degrade soil, water, noise, air quality and ecology of the area. As per the planning for Mirsarai EZ, it is planned that industries like food processing, textile, petrochemical, ship building and light engineering will come up in the EZ zone. These industries are not heavily polluting like tanneries, distilleries etc but generate waste both hazardous and non-hazardous in nature, which can pollute the environment if not managed properly. Nature of the waste which can be generated from these industries are discussed below.

Petrochemical plants generate a wide variety of solid waste streams. Basically, petrochemical solid waste streams fall into two main groups, i.e., intermittently generated wastes and continuously generated wastes. Waste includes spent catalyst, process vessel sludge, storage tank sediments, vessel scale etc. This waste should be recovered, recycled and re-used. In case it is not re-used/recycled/recovered, it should be disposed off to the waste disposal site within the project site if non-hazardous in nature or sent for disposal to hazardous waste management facility if is hazardous in nature.

Solid waste from pharmaceutical industry is highly concentrated still bottoms which should be recovered. These components may affect soil quality if not recovered or disposed properly. These sediments are required to be incinerated if unable to recover which will again add to the air emissions.

Waste to be generated from the light engineering industries can be solid and liquid in nature. Solid waste will include packaging waste, metal pieces, damaged electrodes, ends of coils, wires and spools, flux cored electrodes, greased clothes/cotton, damaged rods, burnt rods, scrap flux, slag (residue from flux reaction and composed of metal and non-metal oxides), Dross (oxidized metal expelled during thermal cutting and gouging operations), metal dust, dust collected in filter ventilation systems/air pollution control devices, floor sweepings, coal ash (if coal used as fuel), solid waste recovered from treatment of wastewater like sludge etc.

Sources of solid waste in cement manufacturing include clinker production waste, mainly composed of spoil rocks, which are removed from the raw materials during the raw meal preparation. Another potential waste stream involves the kiln dust removed from the bypass flow and the stack, if it is not recycled in the process. Filtrate from the filter presses used in the semi-wet process is fairly alkaline and contains suspended solids. Limited waste is generated from plant maintenance (e.g., used oil and scrap metal). Other waste materials may include alkali or chloride / fluoride containing dust buildup from the kiln.

Solid waste from the food processing industries includes both organic and packaging waste. Organic waste, that is, the rinds, seeds, skin, and bones from raw materials, results from processing operations. Inorganic wastes typically include excessive packaging items that are, plastic, glass, and metal. Solid waste from textiles majorly composed of resins, fabric, apparel, dye, discarded machinery and fibres. These waste required to be collected and disposed off periodically. Lub.oil/waste oil is generated from the machineries as hazardous waste. Mitigation measures are required to be adopted to prevent soil pollution of the area.

Also there is a medical centre within the EZ site. Bio-medical waste will be generated from the medical centre which is required to be managed. Till date no bio-medical treatment and disposal facility is available in Bangladesh but the facility may come up in 2-3 years time. The bio-medical should be managed by medical centre themselves in case no such facility is developed. Autoclave, incinerators and other such facilities are to be installed for disposal of bio-medical waste.

Mitigation Measures

- Provision shall be made for proper storage and disposal of industrial waste by receptive industries.
- Common waste storage areas shall be designated for industrial domestic waste.
- 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 authorize vendors for recycling and rejected waste should be disposed off as per the norms specified by DoEB for the particular waste.
- Industrial waste generated should be stored on sealed surfaces and should be disposed off as per guidelines of DoE, Bangladesh.
- No chemical/hazardous raw material should be allowed to spill over the land and should be operated in covered systems
- Excessive packaging should be reduced and recyclable products such as aluminum, glass, and high-density polyethylene (HDPE) are being used where applicable.
- Organic waste should be resold to value addition industries or can be feeded to live stock.
- Advanced wastewater treatment should be adopted by industries
- Use of advanced techniques to control specific portions of the manufacturing process to reduce wastes and increase productivity.
- Use of radiation to kill pathogenic microorganisms.
- Reduction or total elimination of effluent from the manufacturing process
- At present no common hazardous waste handling and disposal unit exists in Bangladesh. Industries thus have to install the incinerators in the unit to dispose hazardous waste. The incinerator further should use the clean fuel and required air quality management measures should be adopted.
- A site for disposal of hazardous waste can be identified within the EZ and it should be developed as per the norms of DoEB and upcoming Hazardous Waste Management rules of Bangladesh.

Impact on Land Use

Land use of EZ site is wetland which will be changed to industrial land use after development of EZ site. However, post development of economic zone change in land use is anticipated in the near-by area. At present there is no significant infrastructure at the EZ site and nearby areas. Majorly land use is agricultural land, wetland and Mangrove plantation area. Development of EZ will attract more infrastructural development around the project site to facilitate industrial growth changing the land use area from agriculture to industrial land use. Some of the other developments including construction of roads, housing facility, commercial areas including hotels, hospital, restaurants, schools, ancillary industries, cottage industries, etc may also occur in nearby areas. This will lead to change in land use but will lead to significant development of the area.

7.8. Impacts on Agriculture resources

7.8.1. Pre-construction and construction Phase

No agriculture land is proposed to be acquired for development of proposed off-site activities as well the economic zone at present.

7.8.2. Operation phase

No impact on agriculture resources is anticipated from off-site infrastructure during operation phase. Some agro based or aquaculture based industries may come up in proposed economic zone. These industries will have positive impacts favouring the growth of agriculture and aqua culture.

7.9. Impacts on Fisheries

7.9.1. Pre-construction and construction phase

Spillage or disposal of waste or wastewater in the canals and river may impact the aquatic life of the area. Thus adequate measures should be taken to prevent any impact on fisheries which are listed below. No impacts on fisheries due to off-site developments are anticipated during the pre-construction phase. No significant impacts on fisheries are anticipated during construction of the proposed off-site developments.

Mitigation Measures

- Proper disposal and management of construction waste
- No waste should be dumped in water bodies during construction
- Wastewater from labour camp and construction site should not be disposed off in the water bodies
- Septic tank/soak pits should be provided to dispose off the wastewater from construction camp
- Site should be kept clean so as no pollutant from site should enter the water bodies along with run-off
- Excavation activities should not be undertaken during monsoon season
- Piling of raw material at construction site should be avoided
- Raw material, debris and fuel should be stored on paved surfaces under covered areas

7.9.2. Operation Phase

Sluice gate will be developed on Isakhali canal to regulate flow of sea water in canal. This may impact the movement of fishes while gates are closed. Gates will be closed only during high tide and flood season thus no significant impacts are anticipated on fisheries due to development of off-site development during operation phase. Fishing will be restricted in Isakhali channel after development of teh EZ but since large no of water bodies are available in area to carry out fishing no major impact are antcipated.

After development of economic zone, some of the aquaculture based industries may come up. This will help in boosting the aquaculture activities & fisheries development in the region.

The fisheries may get impacted if untreated industrial effluent or hazardous waste is discharged to river. Therefore effluent management system shall be implemented strictly. Fish kill may happen due to contamination of water due to discharge of untreated effluent. Effluent may contain toxic components like heavy metals etc which leads to fish poisoning and may lead to large scale fish death. Also fishes

contaminated with these pollutants if consumed may affect the consumer health (birds/bigger fishes/humans).

Mitigation Measures

- Adoption of adequate wastewater and industrial effluent management technology so no untreated sewage is discharged into surface waterbody
- Industrial, municipal and hazardous waste should be managed such that no waste is dumped or disposed in surface water body

7.10. Impacts on Eco-system

7.10.1. Pre-construction and construction Phase

Impact on Terrestrial Flora & Fauna at EZ Site

There is no significant vegetation at the economic zone site. Thus no vegetation removal will be required for construction of off-site facilities. Also some mud crabs were observed near the canal at the site, however it is proposed to leave zone of 30 m as no development zone along the Isakhali canal which is passing through the site. This no development zone will be developed as green buffer and this zone will continue to serve as habitat for the mud crabs thus the impact will not be significant. This no development zone will prevent direct exposure of the industries to the canal.

Impact on Avifauna

During FGDs with the local people, it was learned that some migratory birds are seen occasionally on EZ site along the canal area during winter season. But during site visit in winter no such evidence is found or any authentic source like journal/publication/book is obtained through the secondary published data which establishes presences of migratory birds in the project site. But presence of migratory birds is reported in other regions of Chittagong District. Thus the presence of migratory birds in the project site cannot be confirmed but various measures/safeguards are proposed which will ensure that there is minimal impact of project on any avifauna.

Buffer area of 30 m will be maintained all along the Isakhali canal which will continue to remain habitat for the birds visiting the canal. Further a lake is proposed to be developed within EZ site which covers app. 100 acres of area will serve as additional habitat for the birds. Green buffer of 30 m width will be developed all along the boundary of EZ which will continue to serve as habitat for the avifauna. As per the planning, it is proposed to plant the area between EZ site and Sea with the Mangroves. This mangroves planted area will serve as landing site for the birds and other ecological species.

An assessment is made to calculate the wetland area in the Chittagong District to study the effect of project development of project on the wetland area as the wetland are considered as habitat for various species of birds. It is found that, area under the EZ is 4.5 sq km which is app. only 10% of total wetland area in 10 km radius area of EZ site (48.86 sq km) and 0.16% of the total wetland area available in Chittagong District (1159 sq km). Thus significant wetland area is available in the District and within 10 km of the project site which will continue to serve as habitat to the birds.

Mitigation Measures:

- A zone of 30 m is to be left along the canal & periphery of the proposed EZ zone
- Plantation in 30 m buffer along the periphery and canal should be developed by planting the native species only including the Mangroves
- Embankments planned to be developed should be provided with grass which can survive in saline water also

- No tree cutting is proposed, even if any tree is to be cut then permission will be obtained from forest department and compensatory plantation should be undertaken in minimum ratio of 1:2.
- Development of a lake/water body of app. 100 acres within the EZ site
- Plantation of area between EZ site and sea with the Mangroves

Impact on Aquatic Flora & Fauna of EZ Site

Run-off from construction site may contain sediments or contaminant which may pollute water quality of Isakhali canal which has potential to impact the aquatic life of Isakhali canal if measures for minimizing the impact are not undertaken

Mitigation Measures:

- No solid or liquid waste shall be discharged in water bodies
- Septic tanks/soak pit should be provided to treat sewage to be generated from labour camps and prevent its disposal in water body
- 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 EZ site
- Wastewater from the washing area should be collected and should be used for curing purpose or wheel washing purpose
- 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

Impact on Mangroves Plantation in Buffer Area (Bund Construction)

Project boundary has been designed so as to bypass all the Mangroves in the adjacent areas. No Mangrove tree cutting will be undertaken for development of EZ. Mangroves are developed all along the coastline of Chittagong district and along the canals by forest department to protect the inland area. These mangroves will not be disturbed for development of the project. However after development of bund, there may be few mangrove planted area adjacent to the EZ site may become water deficient as flow of water to these mangroves will be reduced. This area may not receive the amount of water it is currently receiving due to construction of bund and development of EZ site. Area to be impacted due to bund development is given in figure 96 below

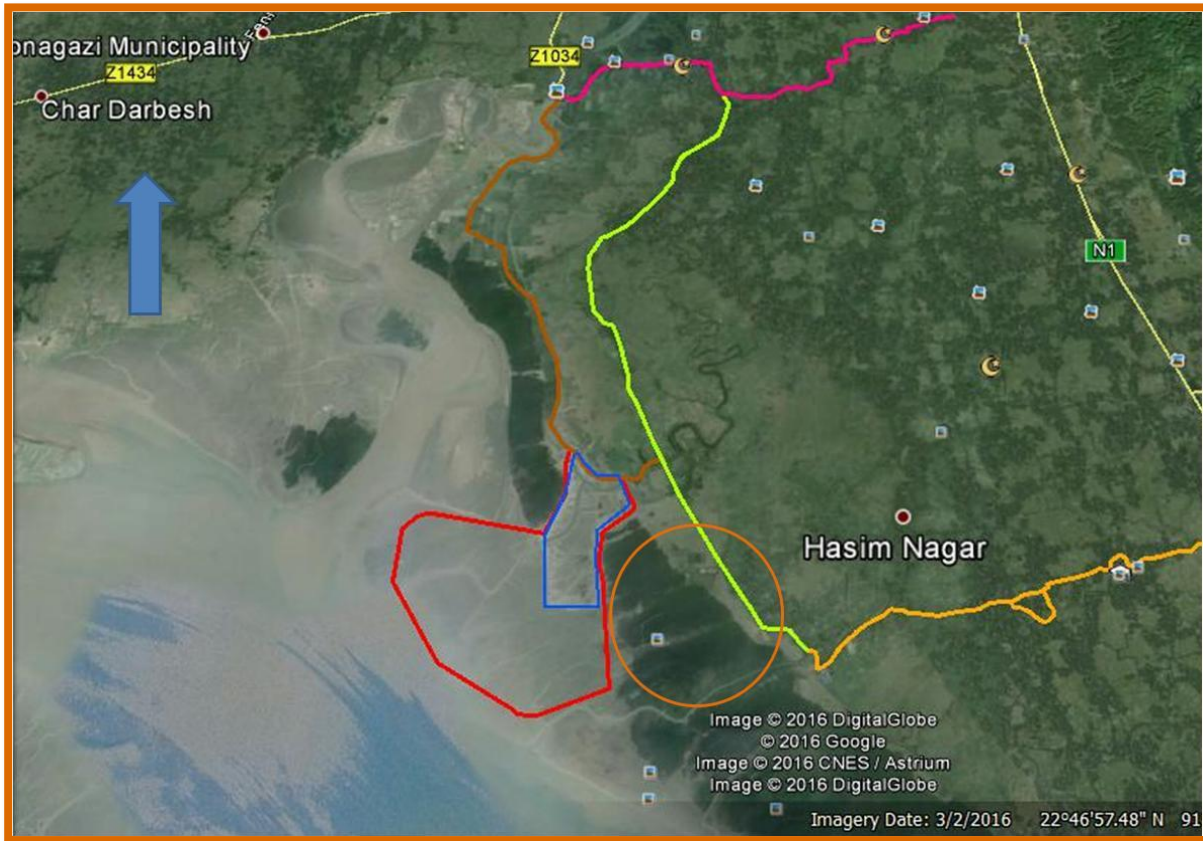


Figure 96: Map Showing Impacted Mangrove Area

Area circled in orange currently receives water from streams within the EZ site which drains into Isakhali canal. Mangroves in this area may be impacted due to reduction in amount of water reaching this area. This may lead to drying up of these trees. To mitigate the impact it is proposed to lay down the pipelines across the embankments which will ensure the flow of water from sea to the mangrove plantation area. These pipelines will maintain the flow of water into the mangroves and will prevent the drying up of the mangroves. Additional mitigation measures are proposed which will minimize the impact on mangroves.

Mitigation Measures:

- Pipelines will be laid from the seaward side or from canal to the Mangrove area across the embankment so as to ensure the flow of water into the Mangrove area in current bed level itself so as flow is maintained. This pipeline is to be marked so as it is not affected in future due to construction of foundation of industrial buildings.
- No Mangrove cutting should be undertaken without prior permission of forest department
- No development buffer zone along the periphery and canal should be planted with native species and mangroves species
- No wastewater, construction waste and municipal waste should be dumped within the Mangrove area or nearby areas. Sewage generated should be treated through septic tank/soak pits, wastewater from construction site should be collected & re-used within the site. Construction & other waste should be disposed off to the site identified for waste disposal

Impact on Nearby River & Marine Eco-System

Development of off-site facilities and EZ site will involve excavation, filling, storage of raw material, storage of debris, establishment of site for machinery and equipment etc. These activities may lead to contamination of rainfall run-off due to mixing with excavated material, debris, raw materials like paints, fuel, rusting of iron etc. Site being in close vicinity to river and sea, rainfall-runoff water from site will directly enter to river & sea. This may impact the quality of the river & sea water and thus supported

aquatic life. Thus it is required to minimize contamination of rainfall run-off to minimize impact on water quality & aquatic life supported by the water bodies. There are no marine protected areas within 10 km radius area of EZ site. No sensitive aquatic species like dolphins are also reported in the Feni River stretch within 10 kms radius of the EZ site.

Mitigation Measures:

- No solid or liquid waste shall be discharged in river, sea and any other water body
- Septic tanks/soak pit should be provided at construction site & labour camp to treat sewage to be generated from labour camps and prevent its disposal in water body
- Toilets should be provided at construction site & labour camp to prevent contamination of water due to open defecation in nearby areas.
- Vehicle washing/equipment cleaning should not be allowed near water bodies
- Wastewater from the washing area should be collected and should be used for curing purpose or wheel washing purpose and should not be allowed to enter the water bodies
- 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

Impact Due to Deep Sea Dredging

Site is intersected by various streams and small channels draining into the Isakhali Canal. These small drains are to be filled up so as to achieve a constant level of the site. It has been estimated that average filling of 1.15 m will be required for the whole development area, i.e. 1311 acres for which app. 48 lakh cum of sand will be required. Being large amount of sand requirement, it is difficult to obtain the sand from dredging the river & other water bodies and excavation of land. Thus deep sea dredging has been opted to obtain sand. Deep sea dredging can impact the marine eco-system by disturbing the benthos (dwelling on sea floor) especially to sessile organisms attached to sea floor/other physical structures and the submerged vegetation. Also deep sea dredging may release sediments causing high turbidity in the surrounding waters. High turbidity may impact the visibility of marine organisms, may choke gills of fishes and other aquatic organisms and impacts the oxygen level of surface layers by forming barrier between the water and the atmosphere.

Locations for deep sea dredging have not been finalized yet by BEZA. BWDB will undertake study to identify the locations suitable for dredging and dredging is to be undertaken on those locations only. Contractors should carry out the dredge sediment quality analysis for checking the levels of heavy metals and contaminant at the time of dredging.

7.10.2. Operation Phase

Green buffer of 30 m all around the project site and along Isakhali channel will be developed and also include most of the native plant species, which will significantly improve the ecology of the area. This green buffer will provide habitat for the avifauna, reptiles and small mammals and will enhance ecology of the area. Twice the number of trees fell, if any should be planted. Apart from this zone of 1000m will be developed between the EZ and sea.

Post development of the economic zone & setting up of industries, there could be some impacts on the ecosystem of the area. Industrial development will involve generation of emissions, effluents and increased vehicular movements. These altogether may have overall negative 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. But the industries proposed as per the pre-feasibility study are industries like food processing, textile, petrochemical, ship building and light engineering. These industries are not heavily polluting. If appropriate measures for preventing air, water, soil and noise pollution are taken there will be no significant impact on the eco-system of the area.

Mitigation Measures:

- Periodic monitoring shall be carried out as per the monitoring plan for air, water, noise and soil and ensure that no impact
- No waste shall be discharged in water bodies, i.e. Isakhali canal, Feni River, Bamon SUNDar canal, Sea, Aquaculture ponds etc.
- All industries should install STP & ETP to treat the effluent generated and to re-use and recycle it completely. No treated and untreated effluent should be discharged in water bodies, i.e. Isakhali canal, Feni River, Bamon SUNDar canal, Sea, Aquaculture ponds etc.
- Tree survival rate shall be monitored
- Native species should only be planted in the region
- Minimum twice the no. of tree fell (if any) should be planted

7.11. Impacts on Socio-Economy

7.11.1. Pre-construction and construction Phase

Loss of Livelihood & Displacement of Families

No Resettlement and rehabilitation or land acquisition is involved for development of off-site facilities and EZ development as per current planning. Only 14 HHs (Squatters) and 5 temporary prayer places will be affected by the development of approach road. BEZA will ensure compensation as per approved ARP

Impact on Health, Aesthetics and Hygiene

Construction activities lead to generation of dust, unpleasant view, obstruction in access of public properties due to excavation etc which may impact the society. Adequate waste management plan, air, soil, noise and water pollution controls are required to be adopted to prevent any impact on society. Also various health hazards are associated with construction activity which may impact the workers if not taken care.

Impact on Utilities & Traffic

No sensitive feature like school, hospital etc are located along the access road alignment to be widened. No major impact is anticipated on social sensitive receptors due to widening of access road only 14 temporary structures & 5 temporary prayer places are located along the proposed access road, which will be relocated. Traffic movements does not generate any significant vibrations which can affect integrity of any structure. These structures will be relocate for widening purpose so impact is not anticipated on integrity of structure and for the loss of structure and loss of livelihood, compensation will be given to the squatters. Further there could be impact on the utilities if resources being used by local communities will be diverted for development of EZ e.g ground water, roads etc. Thus ground water should not be used for construction purpose as this is the source of water for villagers. Temporary roads should be developed for transportation of material in place of using the village roads. If village roads are being used transportation should be carried in non-peak hours and regular maintenance should be carried out so as to minimize the impact.

Further during construction phase traffic on existing Abu Torab road and underconstruction single lane road on BWDB/CDSP bund is expected to increase. Increase in traffic will not be more than 10 trucks in a day. This traffic is required to be managed in non peak hours to prevent the congestion and traffic jams. Also traffic safety is to be ensured as per the traffic management plan attached as Annexure VIII during construction phase.

Impact on Demographic structure

The demographic profile of MirsaraiUpzila would not undergo any changes during the construction phase of the EZ, because the inflow of daily labourers would be mainly be from Mirsarai Upzila or from some other nearby areas. However, during the commissioning phase, a large number of inward migrations are expected. The inward migration along with the infrastructure development in Mirsarai Upazila may lead to changes in the demographic profile of MirsaraiUpazila

Generation of Employment

Employment opportunities will be ensured through three channels (i) direct employment for unskilled labour, (ii) indirect employment to the local community; and (iii) 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. Employment generation, both direct and indirect, through Mirsarai EZ will have a tremendous impact on human development and poverty reduction in the Mirsarai area.

Furthermore, as an enhancement measure, it is recommended that equal employment opportunities should be given to women in the EZ, especially those who are now unemployed or are working in the service sector as daily wage workers. These recommendations should be included as a requirement in the contract to be prepared by BEZA for the construction works related to the proposed EZ. EZs further 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 the EZ will increase their employability and position in the household. In addition, Mirsarai EZ is expected to assist women in changing their occupation pattern and accessing better job opportunities and wages. But the child labour should not be encouraged in the area. Thus BEZA should make strict rules for industries and contractor for not employing child labour and there should be imposition of heavy fine, if anybody is found guilty.

Skill Enhancement of Local people

As the both skilled and un-skilled labour will be required during both construction and operation phase of the EZ, but Mirsarai and nearby area lack the skilled labour due to low literacy rate. BEZA should provide the skill enhancement training to locals to carry out specific tasks and enhance the skill of local people so that they can be given employment.

Mitigation measures are required to be taken to minimize the impact of projects on the society and they are given below:

Mitigation Measures

- Widening of under construction single lane road on BWDB and CDSP bunds
- Provision of proper training to all workers for handling the construction equipment
- Provision of cautionary and guiding signage in local and English language indicating the hazard associated with the site
- Employment should be provided preferable to local & affected people

- Entry to the fuel storage area and construction equipment rooms should be restricted and should be allowed for trained personnel
- Wastewater from the toilet should be disposed off in septic tanks and soak pits and should not be allowed to accumulate at labour camp site or construction site
- Dustbins should be provided at labour camps for collection of waste and waste should be regularly disposed off through the concerned agency
- Temporary storm water drainage system should also be provided at camp site so as to drain the storm water and prevent accumulation of storm water at site and thus breeding of mosquitoes/flies
- Arrangement of fire-fighting should be made at site and workers should be trained to use the system in case of fire
- Provision of personal protective equipment like safety jackets, helmets, gumboots, gloves, face mask, ear buds, goggles, safety shoes etc as per requirement and nature of job in which they are involved
- Job rotation should be carried out for workers exposed to high noise and dust areas
- Provision of First aid facility at the site and the labour camp
- Labour camps should be located at neat and clean location with no water logging issues
- Proper sanitation facility including toilets, bathing facility and washing facility should be provided at site and at labour camps for workers
- Clean drinking water supply should be provided to labour
- Crèche facility should be provided for kids if female workers are employed
- Regular inspection for hygiene and safety in labour camps should be done
- Compensation should be given to the people as per the policy for the planted tress
- Construction debris should not be allowed to enter into aquaculture ponds located along the road
- Entrance to any road/structure should not be blocked for widening of access road
- A major segment of the population on the area is unemployed. Construction activity will provide employment to huge nos. of people including skilled, unskilled and non-skilled workers. This will improve the quality of life of people.

7.11.2. Operation Phase

Impact on Health

Post development of the economic zone & setting up of industries, there could be some impacts on the Socio-economic conditions of the area. Industrial development will involve generation of emissions, effluents, waste and increased vehicular movements. These altogether may have overall negative impact on the health of the people and aesthetics of area. But the industries expected to come up in the zone are industries like food processing, textile, petrochemical, ship building and light engineering inline with the planning done for Mirsarai EZ-I. These industries are not heavily polluting. If appropriate measures for preventing air, water, soil and noise pollution are taken there will be no significant impact on the society.

Impact on Traffic

N-1 is at app. 10 km from the project site. At present project site is accessible through Abu torab road followed by BWDB and CPWD bund. Currently a single road of 7 km is being constructed on CDSP bund

and BWDB bund for providing connectivity to Mirsharai EZ-I. Traffic is anticipated to increase after development of EZ-II. It is expected 600 PCU of traffic will generate after development of zone. However to accommodate the expected traffic it is planned to widen this road to 2 lane. Further the peripheral embankment to be developed along boundary of EZ-II will be developed as road. These roads development will help in minimizing the impact of increased traffic due to development of EZ-II. Traffic management plan for operation phase is given in Annexure VIII.

Poverty alleviation and diversification in livelihood

Vast employment opportunities potentially created by the EZ will reduce poverty via increased income through various livelihood options. By means of industrialization and related trades, diversification of livelihood will occur for all strata of people. Diverse livelihood options for the locals and better wages for the employees of the industrial zone will reduce poverty for many poor households and will contribute to reducing the poverty level in the locality. So, this will enormously benefit cross section of population and both gender.

The investments required in the commissioning of Mirsarai EZ will directly enhance the local economy of the area by increasing cash flow which in turn will increase the purchasing power of the local population. Increased cash flow will create more employment opportunities for the local communities in Mirsarai EZ

Employment opportunities are expected to increase throughout the region during the commissioning phas. This will provide employment to high unemployed population of the area.

Education for children including Girls' Education

Due to the establishment of the EZ and better economic changes in the locality, the child education rate is likely to increase leading to a reduction in children's informal or agriculture-based labour.

Women's empowerment

Women are mostly in household work category. Thus, employment opportunities for women created by the proposed EZ directly or indirectly are expected to provide them better socioeconomic status. Through employment women will be empowered economically by being self-reliant and may become more socially aware. This could lead to their having more decision making power in their respective families and communities. This will also encourage the parents to send their children to schools and withdraw them from wage earning activities. At the same time girl's education due to parents' better economic condition and awareness will prevent early and child marriage as girls' education will automatically retain them in school and will make social awareness and pressure of not marrying them off at early age and drop out for that.

Access to civic amenities and communication

The households that will be settled adjacent to the EZ area will access better civic amenities. However, due to the EZ construction overall traffic may be congested over the years. But industrialization will ensure better livelihood and increase ability to access better civic facilities.

Social mobility

With improved employment opportunities and higher and secured income, impoverished people will be able to move up the social ladder.

7.12. Cumulative Impact Assessment

Mirsharai is an upzila in Chittagong District. Chittagong city in the District is major coastal seaport city and financial centre in Bangladesh. The city has a population of more than 2.5 million while the metropolitan area has a population of over 6.5 million, making it the second largest city in the country. However Mirsharai is one of the backward area in the district with little or no development in the upazila. Now BEZA has identified this location for development of economic zones. A site measuring 610 acres has already been approved by DoE for development of the economic zone. Work for construction of off-site facilities like site filling, road development and construction of embankment has been started. Proposed EZ-II is proposed to be developed adjacent to the EZ-I. For development of EZ, various infrastructure facilities will be developed in the area like development of roads, water supply system, drainage system and power supply systems.

Development of the EZs in this area will attract various other developments in the area like development of the housing colonies/societies for workers/employee of the EZ area, development of schools, hospital and religious structures, development of hotels, service apartments and commercial areas, development of ancillary industries like transportation industries, packaging industries, logistic industries in the nearby area. Also there are possible chances of development of tourism and tourist related activities in the area as it is close to the sea. There is possibility of setting up of a thermal power plant in the area to cater the power requirement of the area.

All these developments will generate large scale direct and employment in the area which will attract migration of the population from nearby areas. Thus the demography of the area is expected to experience a change over the time after development of the EZ. Increase in population will lead to impact/stress the existing utilities and resources in the area which are required to be improved and upgraded time to time to prevent the degradation of their quality and quality of surrounding environment.

As per analysis of baseline environment, it is found that the status of air quality, water quality, soil quality and noise levels in the area are good at the site and in study area. Development of the EZs and other induced developments are expected to potentially impact all the baseline environmental and social components. A matrix is developed to assess the impacts of EZ development and other induced development of the valued environmental and social components of the project influence area (Mirsharai upzila) and is given in Table 59 below

These impacts will result due to cumulative development in the influence area (Mirsharai upazila). Measures are proposed which can be taken up by BEZA to mitigate the anticipated cumulative impacts

Mitigation Measures

- BEZA should establish an environment management cell for implementation of the mitigation measures as proposed during each of the project development stage
- All mitigation measures shall be implemented as suggested
- Monitoring shall be carried out as suggested in the environmental monitoring plan and the results should be displayed on the website by BEZA
- Quarterly monitoring reports should be submitted as per requirement of DoE and the report should be available on website of BEZA so as it can be available to public
- BEZA should communicate all the upcoming developments in EZ, nature and nos. of industries coming up in the EZ to all the stakeholders by displaying it on website so as the stakeholders can assess this information for estimating pollution load in the area while carrying out the environment impact assessment study for their respective project.

- BEZA can organize six monthly meeting with concerned stakeholder agencies to discuss the type of impact which may result cumulatively due to EZ and the respective developments and the mitigation measures can be planned taking in consideration the cumulative impacts
- BEZA can organize the skill development programs for the skill enhancement of the society and can train the local people in the area to work in the upcoming EZs and the other developments which may come up in the area.

Table 59: Impact Matrix to Assess the Cumulative impacts Due to EZs and Induced Development on VECs of Project Influence Area (Mirsharai EZ)

VECs	Development of EZs (EZ-I & EZ-II)	Development of ancillary Industries (Transportation, packaging, hospitality, logistic, housings, hotels, etc.)	Development of Roads	Development of thermal power plant and power supply system	Development of tourist destinations and activities	Development of Ports/jetties
Air Quality	-ve (increased emission generation from upcoming industries and transportation of material)	-ve (increased emission due to transportation of men & material and movement of vehicle)	-ve (increased vehicular movement due to development of better roads)	-ve (emissions from thermal power plants, material transportation within the plant site)	-ve (movement of men and material)	-ve (movement of men and material)
Ground Water Quality and Resources	-ve (extraction of ground water for construction and operation of industries, degradation of quality due to leaching of chemicals and waste material which may be stored in industries and sewage)	-ve (extraction of ground water for construction and operation of industries, degradation of quality due to leaching of sewage)	-ve (extraction of ground water for construction of road)	-ve (extraction of ground for domestic purpose and degradation of ground water quality due to leaching of flyash)	-ve (extraction of ground water to meet domestic, landscaping and amusement park water requirement)	-ve (extraction of ground water for domestic purpose and dust suppression)
Surface Water Quality and Resources	-ve (extraction of surface water to meet	-ve (extraction of surface water to meet domestic	-ve (degradation of quality due to	-ve (extraction of surface water for	-ve (increased movement of ferry	-ve (degradation of quality due to

	domestic and industrial water requirement after desalinization and degradation of quality due to discharge of effluent and contaminated run-off)	and industrial water requirement after desalinization and degradation of quality due to discharge of effluent and contaminated run-off)	mixing of contaminated run-off)	generation of steam and discharge of heated water)	& speed boats)	development of jetties, berthing of boats/ships/vessels, discharge of waste from vessels, run-off from port, oil spillage due to accidents)
Soil quality	-ve (contamination of soil due to leakage of fuel and chemicals, spillage of industrial and domestic waste)	-ve (contamination of soil due to leakage of fuel and chemicals, spillage of industrial and domestic waste)	-ve (leakage of oil from the vehicles)	-ve (contamination of soil due to deposition of fly ash and leaching of fly ash)	-ve (contamination of soil due to spillage and littering of waste, leakage of fuel from vehicles and DG sets)	-ve (contamination of soil due to spillage of oil/fuels/chemicals stored at the terminal site)
River/Sea Bed sediments	-ve (contamination of sediments due to inflow of effluents/run-off from EZ)	-ve (contamination of sediments due to inflow of effluents/run-off from industries)	-ve (contamination of sediments due to inflow of run-off contaminated with leaked fuel)	-ve (contamination of sediments due to inflow of run-off contaminated with fly-ash and coal dust)	-ve (contamination of sediments due to inflow of contaminated sediments with leaked fuel)	-ve (contamination of sediments due to inflow of run-off contaminated with chemicals, fuel, coal ash, oil etc)
Noise levels	-ve (increased noise level due to industrial activities and increased vehicular movement)	-ve (increased noise level due to industrial activities and increased vehicular movement)	-ve (increased noise level due to increased vehicular movement)	-ve (increased noise level due to industrial activities and increased vehicular movement)	-ve (increased noise level due to increased vehicular movement and human activities)	-ve (increased ambient and underground noise level due to material transportation, vehicular movement)
Terrestrial ecology	-ve (tree cutting may be required to develop	-ve (tree cutting may be required to develop	-ve (tree cutting may be required to develop	-ve (tree cutting may be required to develop	-ve (tree cutting may be required to develop	-ve (tree cutting may be required to develop

	EZ)	industries)	road)	TPP and ancillary facilities)	tourism facilities)	ports and ancillary facilities)
Agriculture	-ve (acquisition of agricultural land may be required for development of ancillary facilities for EZ)	-ve (acquisition of agricultural land for setting up industries and development of ancillary facilities)	-ve (acquisition of agricultural land for development of roads)	-ve (acquisition of agricultural land for development of TPP)	-ve (acquisition of agricultural land for development of Tourism facilities)	-ve (acquisition of agricultural land for development of ancillary facilities for port)
Mangrove Plantation	-ve (clearing of mangroves and obstruction of inflow of sea water into mangroves)	-ve (clearing of mangroves and obstruction of inflow of sea water into mangroves)	No impact anticipated	-ve (clearing of mangroves and obstruction of inflow of sea water into mangroves if developed near the sea shore)	-ve (clearing of mangroves and obstruction of inflow of sea water into mangroves if developed near sea shore)	-ve (clearing of mangroves and obstruction of inflow of sea water into mangroves)
Avifauna	-ve (loss of habitat due to tree cutting and loss of wetland which is source of food and habitat to avifauna)	-ve (loss of habitat due to tree cutting and loss of wetland which is source of food and habitat to avifauna)	ve (loss of habitat due to tree cutting)	-ve (loss of habitat due to tree cutting and loss of wetland which is source of food and habitat to avifauna)	-ve (loss of habitat due to tree cutting and loss of wetland which is source of food and habitat to avifauna)	-ve (loss of habitat due to tree cutting and loss of wetland which is source of food and habitat to avifauna)
Aquatic ecology	-ve (degradation of habitat of the aquatic ecology and direct impact on aquatic ecology due to construction of jetty, contamination of surface water quality, movement of vessels)	-ve (degradation of habitat of the aquatic ecology due to contamination of surface water quality)	-ve (degradation of habitat of the aquatic ecology due to contamination of surface water quality)	-ve (degradation of habitat due to contamination of surface water quality and discharge of heated water into the river)	-ve (degradation of habitat of the aquatic ecology due to contamination of surface water quality)	-ve (degradation of habitat of the aquatic ecology and direct impact on aquatic ecology due to construction of jetty, contamination of surface water quality, movement

	for transportation of the material)					of vessels for transportation of the material)
Existing Infrastructure	+ve (development of infrastructure in the area)	-ve (pressure on the developed infrastructure)	+ve (improvement of the infrastructure and connectivity)	-ve (pressure on the developed infrastructure)	-ve (pressure on the developed infrastructure)	-ve (increased pressure on existing roads)
Wetland area	-ve (acquisition fo wetland)	-ve (acquisition fo wetland)	-ve (acquisition fo wetland)	-ve (acquisition fo wetland)	-ve (acquisition fo wetland)	-ve (acquisition fo wetland)
Land Use	-ve (land use will be changed)	-ve (land use will be changed)	-ve (land use will be changed)	-ve (land use will be changed)	-ve (land use will be changed)	-ve (land use will be changed)
Generation of Sewage and effluents	-ve (increased sewage and effluent generation)	-ve (increased sewage and effluent generation)	Nil	-ve (increased sewage and effluent generation)	-ve (increased sewage and effluent generation)	-ve (increased sewage and effluent generation)
Transportation System	+ve (improved transportation system)	-ve (increased stress on transportation system)	+ve (improved transportation system)	-ve (increased stress on transportation system)	-ve (increased stress on transportation system)	-ve (increased stress on transportation system)

8. Public Consultation and Disclosure

8.1. Introduction

Public consultation is one of the key components of the environmental assessment. The ESA team conducted public consultations in project and study area. The approach involved a mix of conventional as well as participatory/ rapid rural appraisal (PRA/ RRA), focus group discussions (FGD), meeting with NGOs, local administration and one-to-one interviews. Accordingly, as first step, the literature and secondary data was reviewed. Local people and concerned Govt. officials were consulted. Public consultations were held during the site visit in different times of the study. A national level workshop in planned on February, 2017 based on the clearance of the Draft EIA report from World Bank. After the clearance of the EIA report, the report will be disclosed in BEZA and WB website.

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

8.2. Approach and Methodology of Pubic Consultation and Disclosure Meeting

Consultations were conducted on informal and interview based.. The discussions were primarily focused on receiving maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the project. Consultation was started with the short description of the upcoming EZ projects and proposed off-site developments for EZ project. The objectives, proposed developments and the possible impacts of the project and the connectivity links of the study area with the project were also explained. The study team recorded their perceptions, demands and recommendations, about the project.

8.3. Location of Public Consultation Meetings

Locations where focused group discussion and consultations were taken up are given in table 60 below.

Table 60: Location of Stakeholder Consultation

Location	Proposed Development	Remarks	Date
Village Nayapara & Village Charsharad	Economic zone, Peripheral bund/road	Nearby Village to EZ and access road to be widened	28.05.2016
Ward.6, Char Sarat Village	Economic zone, Peripheral bund/road	Gender issues and Environment for the	03.07.2016

		development of EZ	
Ward no.6 & 10 Ichhakali Union	Local community	Social and Environmental Impact	16 Apr'16
Upazila Parishad, Mirsharai	Consultation with NGOs and CSO	Social and Environmental Issues	25 May'16

8.4. Public Consultation and Disclosure Meetings

Discussions carried out during public consultation meeting, response of local people and government officials and conclusions are given below in table 61. Photographs of public consultation are also presented in this report in figure 97. Attendance sheet of the participants of Public consultation held at villages Nayapara & Charshardh are attached as Annexure IX.

Table 61: Proceedings of Public Consultation and Disclosure Meetings

S. No.	Village/Venue	Villagers comment/ Discussion Point	Conclusion
1	NayaPara Village	<ul style="list-style-type: none"> No problem is being faced by people due to construction of EZ-I and single lane access road on CDSP/BWDB bund It is nearby village with 700 HH & 100% Muslim population. Major occupation of people is agriculture/aquaculture, small business and jobs like drivers etc. Av. Income per family is 5000-6000 TK/month. Most of the HHs rear poultry and cattle. No factory emitting bad odour should come up in the EZ area like CB factory (poultry farm & feed factory) Local people should be provided employment in the industries in upcoming EZ preferably Skill enhancement training should be given to villagers by industries so that they can work in those industries People expect agro based industries to come up in region which will help them selling their products easily. Also they expect upcoming industries will train them to enhance their productivity by using HYV seeds and modern equipments Only non-polluting industries should come up in this region and measures should be taken by industries to control the pollution levels 	<p>People are aware about the upcoming EZ-II project and proposed widening of access road. Source of information is surveys carried out by SIA team and newspapers. Majority of people have positive attitude towards the project</p> <p>People expect employment generation for them from upcoming EZ project</p> <p>People also expect infrastructure development such as good roads, water supply, power supply in their area after coming up of EZ zone</p> <p>People expects overall development of the area after development of EZ project</p> <p>People expects coming up of less polluting industries so as no pollution related problems are observed in the area.</p>
2	Charshardh Village	<ul style="list-style-type: none"> No problem is being faced by people due to construction of EZ-I and single lane access road on CDSP/BWDB bund 	

		<ul style="list-style-type: none"> • It is nearest village with 1400 HH & app 45% families are Muslims and rest are Hindu families. 1-2 Buddhist families also resides in this village. Major occupation of people is agriculture/aquaculture, small business and jobs like drivers etc. Av. Income per family is 5000-6000 TK/month. Most of the HHs rear poultry and cattle. Agriculture is rain fed and heavy crop losses occur due to heavy rains and delays in rains • People are educated. Most of the people obtain basic education minimum but high level of unemployment is in the area • People are aware about the project and expect good employment generation from the EZ • They emphasised that polluting industries should not be set up in the EZ zone • Pollution should be managed by upcoming industries so that no health hazards should be generated for local people • Employment should be given to women also as they are educated and interested in working 	
3	Discussion with local fishermen near Bamon Sundar Canal	<ul style="list-style-type: none"> • Fishermen catch 8-10 kg of fish per day by fishing and earn 2500-3000 Tk per week. • They insisted that jobs should be given to locals during both construction and operation phase preferably as there is large scale unemployment • Nearby CP factory causes lot of odour and skin diseases and same should not happen in the EZ zone • Fish based industries should be promoted • No problem is being faced by people due to construction of EZ-I and single lane access road on CDSP/BWDB bund 	
	Ward.6, Char Sarat Village (Women Group)	<ul style="list-style-type: none"> • Women believe that they can access employment opportunities in the EZ even if the gender inequality is deep rooted in the area; • EZ will be able to provide stable employment opportunities throughout the year for communities dependent on seasonal income opportunities. • Extend the employment 	

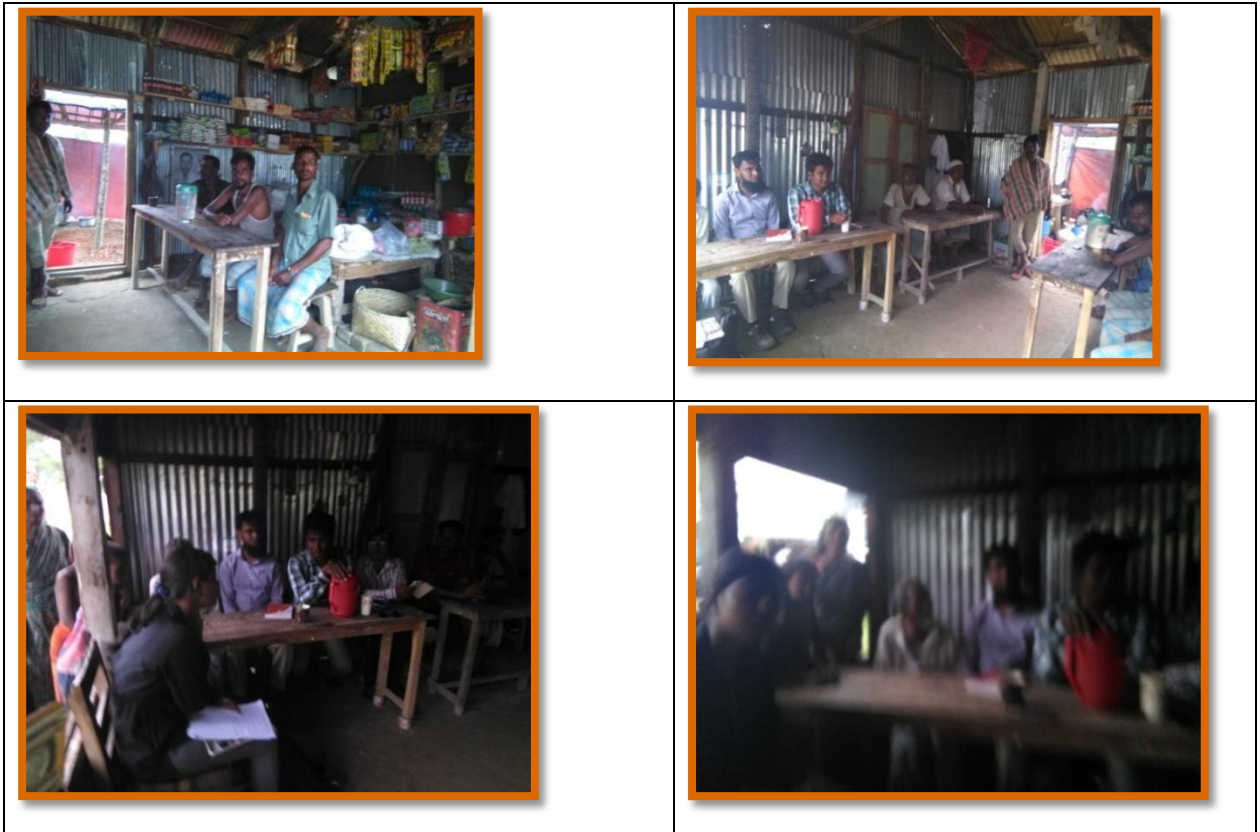
		<p>opportunity to the women in the area especially in the construction works (unskilled), cleaning etc.</p>	
	Ward no.6 & 10 Ichhakali Union	<ul style="list-style-type: none"> • Majority of the people are currently engaged in agriculture and aquaculture and does not have technical skills to undertake jobs in the EZ • In case necessary training is provided for jobs, the local people are also willing to take up such new kind of jobs • The local people should be given preference for allocation of jobs. • Involving local people who are living near the approach road in the construction works. (Especially construction workers and unskilled labours). • The local communities wanted that opportunities be given to the local workforce during the construction phase. • Use of goods and services from/within the Upazila area to develop the approach road. 	
	Consultation with NGOs and CSO at Mirsarai	<ul style="list-style-type: none"> • EZ will raise standard of living, thereby increasing the earning capability of locals, which, in turn, will enhance the investment opportunity for Grameen Bank • The establishment of EZ will help land value to appreciate • Environment-polluting industries should be encouraged within the EZ • Local people should be given preference during recruitment in EZs; selection should be solely based on merit / capability 	
		•	
4	Tea-shop near Forest Office, Mirsharai	<ul style="list-style-type: none"> • Although construction of a wide road will be beneficial for the area, but many landowners would be displaced landless if the road is widened on the eastern side of the existing un-metalled road • The local people unanimously supported the construction of the road if it is done on the western side, since the land on the western side is government land. • Who will compensate for the difference in Mouza rate and market price of the land 	



Discussion with fishermen



Discussion in Charsharadh Village



Discussion with local community and NGOs





Figure 97: Photographs of Stakeholders Consultation

9. Environmental Management Plan and monitoring indicators

9.1. Introduction

The Environmental Management Plan (EMP) is the synthesis of all proposed mitigation and monitoring actions, set to a time frame with specific responsibility assigned and follow-up actions defined. EMP is a plan of actions for avoidance, mitigation and management of the negative impacts of the project. Environmental enhancement is also an important component of EMP. A detailed set of mitigation measures have been compiled in view of the likely impacts associated with the proposed Mirsarai EZ-II.

9.2. The Environmental Management Plan

The EMP consists of a set of mitigation, monitoring and institutional measures to be taken during the design, construction and operation (post-construction) stages of the project. The EMP has been designed keeping in view the regulatory and other requirements to ensure the following:

- Minimum disturbance to the native flora and fauna
- Compliance with the air, water, soil and noise quality norms.
- Conservation of water to the extent possible through rain water harvesting, wastewater recycling

9.3. Mitigation Plan

The proposed EZ development may have some impacts on the environment and society such as change in land use, removal of vegetation, increased dust emissions etc. Health & Safety Plan along with the EMP has been drafted. Details of which are given below. All offsite facilities shall be constructed by BEZA. EMP implementation shall also be BEZA who will in turn implement it through contractor. EZ will be developed by the developer appointed by BEZA and shall be responsible for implementation of EMP during development

9.3.1. Mitigation Plan for Site Development & Administration Building

Site development works includes land filling & levelling, peripheral bund/road and widening of access road. Bund will be constructed to protect site from sea. Peripheral bund/road is 14.4 km in length and 10 m in width. 7 km of single lane under construction access road will be widened to 2 lane road. Site will be filled with deep sea sand upto 1.15m to achieve finished level of 4.15 m. Administration building will cover an area of 1500 sq m. Ground coverage of administration building is 1500 sq m. G + 4 level will be developed so that office space and related facilities will be there on ground and first floor and guest rooms at fourth floor.

Impacts associated with site development and construction of administration building along with proposed mitigation measures are given below. No impacts are anticipated during operation phase due to site development and construction of administration building. The Contractor shall take up all

mitigation and enhancement measures (including those related to mitigation of air/noise/water pollution; drainage/traffic congestion) as specified in the EMP tabulated below in table 62.

Table 62: Environmental Impacts and Mitigation Plan for Site Development & Construction of Administration Building

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
Removal of Vegetation	<ul style="list-style-type: none"> • Vegetation which has been identified & approved to be removed shall only be removed for site clearance • No tree should be cut without taking prior permission of BEZA & PMC • No Mangrove plants should be cut without permission of Forest Department 	Pre-construction phase	Contractor	BEZA/PMC
Setting up of construction camps/labour camps	<ul style="list-style-type: none"> • The construction camps should be at least 500 m distance from habitations from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. • Location for stockyards for construction materials will be identified at least 1 km from water sources • Store house for haz material like diesel should be at distance from construction labour camps. • The living accommodation and ancillary facilities for labour shall be erected and maintained to standards and scales approved by the resident engineer • All sites used for camps will be adequately drained. They will not be subject to periodic flooding, nor located within 300 feet of pools, sink holes or other surface collections of water unless such water surface can be subjected to mosquito control measures • The camps will be located such that the drainage from and through the camps will not endanger any domestic or public water supply • All sites will be graded, ditched and rendered free 	Pre-construction phase	Contractor	BEZA/PMC

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
	<p>from depressions such that water may get stagnant and become a nuisance</p> <ul style="list-style-type: none"> • Construction camps shall be provided with sanitary latrines (1 per 25 pax), bathing facility and urinals. • Construction camps should be electrified and well ventilated • No electrical wire should be left on the floor of camp or site. Proper system should be developed and entry to the site of electricity meter should be restricted and should be allowed for authorized personnel only • Sanitary latrines shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings • Adequate and suitable facilities for washing clothes and utensils shall be provided and maintained for the use of contract labour employed therein. • Sewerage drains will be provided for the flow of used water outside the camp. • Drains and ditches will be treated with bleaching powder on a regular basis. • The sewage system for the camp will be properly designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place. • Clean potable drinking water facility should be provided at the site and the water quality should be monitored regularly • Crèche facility should be provided for children if female workers are employed • First aid facilities should be made available at 			

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
	<p>construction camp. First aid box should contain small, medium and large sized sterilized dressings, sterilized burns dressings, 2 % alcoholic solution of iodine, bottle containing salvolatile, snakebite lancet, , bottle of potassium permanganate crystals, scissors, Ointment for burns & surgical antiseptic solution</p> <ul style="list-style-type: none"> • 1 first aid box should be available per 50 labour • A person trained in first-aid treatment shall be made in charge who shall always be readily available during the working hours at the work place • A suitable motor four wheeler transport shall be kept readily available to carry injured or ill person to the nearest hospital. 			
Identification of dumping sites for debris	<ul style="list-style-type: none"> • The dumping sites shall not be located within designated Forest/protected areas • Residential facility or sensitive facilities like hospitals, schools etc shall not be located in downwind direction of the identified dumping sites • Dumping shall not impact natural drainage courses • Dumping sites should be located at least 1 km from sensitive locations • Permission from concerned local body should be taken before finalizing the location • Agriculture lands should be avoided & waste lands should be preferred • Selected site should not support significant vegetation • The area should be sprinkled with water to suppress the dust emissions 	During Construction	Contractor	BEZA/PMC

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
	<ul style="list-style-type: none"> Plant species suitable to grow in that conditions should be planted at the time of closure 			
Soil Erosion and Sedimentation control	<ul style="list-style-type: none"> To avoid soil compaction along the transportation routes, only identified haul roads would be used for transportation. Sedimentation tanks should be provided in line with storm water drains to trap the sediments from run-off. Sand bags can be used to trap sediments more effectively 	During Construction	Contractor	BEZA/PMC
Disposal of Debris and any waste generated	<ul style="list-style-type: none"> Waste from construction camp should be segregated at site. Food/wet waste should be composted in pit at the site, recyclable should be send to authorized recyclers and rejected waste should be disposed regularly through responsible agency in the area Dustbins should be provided at the site and construction camps to prevent littering of waste Storage area of minimum 2 days should be provided at construction camp for storage of the waste generated from labour camps Construction debris should also be segregated at the site. This debris should be used for filling to the extent possible. Recyclable waste should be sold through authorized dealers and reject waste should be sent to the identified debris disposal site All arrangement for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary will be considered incidental. 	During Construction	Contractor	BEZA/PMC

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
	<ul style="list-style-type: none"> • Construction debris should be stored under covered sheds on paved surfaces to prevent leaching • Any hazardous waste generated during construction activity shall be stored at suitable place and then disposed off in consultation with the guidelines. • Contaminated runoff from storage areas shall be captured in ditches with an oil trap at the outlet. • Utmost care shall be taken to ensure that the Municipal Corporation norms are met for the safe collection, transport and disposal of construction waste and debris. 			
Dust Generation	<ul style="list-style-type: none"> • Routes for transportation of material within the site should be covered with brick bed so as to minimize the dust generation • Inventory of the material entering and going outside the site should be maintained at site. This will help in knowing the raw material available and prevent piling up of raw material and thus dust generation • Raw material stored should be covered. Debris and excavated soil should also be kept covered. • Cement and sand should be stored under covered sheds only • Vehicles delivering materials should be covered to reduce spills and dust blowing off the load. • Compaction of prepared site to re-strain the fugitive emissions. • Water should be sprayed in the cement and earth mixing sites as well as after compaction. • Clearing and grubbing to be 	During Construction	Contractor	BEZA/PMC

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
	<p>done, just before the start of next activity on that site</p> <ul style="list-style-type: none"> • In high dust areas, workers should be provided and encouraged to use masks. • Regular maintenance, servicing of the vehicles and periodic emission check for equipment and machinery would be carried out in conformity with the Central Motor Vehicles Rules, 1989. • Water will be sprayed on the haul road. • All the vehicles entering the project site will be checked for Pollution-Under-Control Certificates. • Air quality monitoring to be carried out during construction phase to check the pollutants level in the air 			
Contamination of surface & ground water	<ul style="list-style-type: none"> • Isakhali canal at site should be retained and no waste should be disposed off in the canal • A drain connecting Isakhali canal to Mangrove plantation area in East direction of the site should be retained to ensure flow of water into the Mangrove forest. • Material mixing, material storing, washing of equipment and vehicles and other activities close to water bodies shall be avoided • Car washing / workshops near water bodies will be avoided. • Avoid excavation during monsoon season • Loosened soil will be stabilized by Contractor through landscaping and developing vegetation, wherever possible, once construction activity is completed at any site. • Sanitation facility with septic tank followed by 	During Construction	Contractor	BEZA/PMC

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
	<p>soak pit will be developed. Common toilets will be constructed on site during construction phase and the waste water would be channelized to the septic tanks and soak pits in order to prevent waste water to enter into the water bodies.</p> <ul style="list-style-type: none"> • Provision of oil & grease traps upstream of storm water drains • Surface run off due to construction activity will not be discharged in open without treatment. It should be collected and re-used for wheel washing and spraying at site for dust suppression • Provision of garland drains around the excavated area to prevent entry of storm water into the excavated area • Temporary storm water drains should be provided for whole site. These drains should be connected to Isakhali canal. These drains should be provided with stilt trap so as to arrest sediments from run-off before discharging into canal. • Stilt should be removed periodically from these stilt traps to avoid choking and overflow. • Septic tank & soak pit should be provided to dispose off the sewage to be generated from temporary toilets constructed for labour usage 			
Noise from Vehicles, Plants and Equipment	<ul style="list-style-type: none"> • Construction activities would be carried out in the daytime only. • The construction equipment would be provided with adequate noise control measures and should comply with the noise standards as prescribed by DoE 	Throughout construction		

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
	<ul style="list-style-type: none"> • Regular maintenance of vehicles and equipment would be carried out and corrective action taken in case of any deviation. • Ear muff/ear plug shall be given to the workers working around or operating plant and machinery emitting high noise levels. • DG sets if installed should be provided with acoustic enclosures • Labour working in noise prone area should be provided with ear plugs and job rotation should be practiced to prevent the prolonged exposure of any workers to high noise levels • Honking should be prohibited at site • Speed limits for vehicles should be restricted 			
Accidents	<ul style="list-style-type: none"> • Safety officer should be appointed at site to ensure all the safety guidelines are being followed at site • Cautionary guidance should be provided at site to aware people about the associated risk with the area. Entry to the fuel storage room or machinery operation room should be restricted only to authorized trainer personnel • All Accidents shall be reported immediately and incident analysis, preventive measures shall be implemented. • A gate should be provided at site and record for entry & exit of vehicles should be maintained at the site • Fuel should be stores at site away from construction camps • Adequate lightning should be provided at site especially during night time 	During Construction	Contractor	BEZA/PMC
Clearing of	<ul style="list-style-type: none"> • Contractors shall prepare 	Post	Contractor	BEZA/PMC

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
Construction Camps & Restoration	<p>site restoration plans. The plans shall be implemented prior to demobilization.</p> <ul style="list-style-type: none"> On completion of works, all temporary structures shall be cleared, all rubbish burnt, excreta or other disposal pits or trenches filled in and sealed and the site left clean and tidy,. 	Construction		
Occupational Health & Safety Plan	<ul style="list-style-type: none"> Contingency Plan as given in Annexure XV, EHS Guidelines General and EHS guidelines or ports, harbour and terminals should be followed for preparation of site specific emergency management plan All construction worker should wear a safety jacket and other protective equipment like helmet, gloves, gum boots, ear plugs, mask while working at the site Workers should be made aware about the health issues related with open defecation Training to workers should be provided for handling the construction equipment and machinery Training to the workers should be provided to handle the emergency situations like fire, floods etc. First aid facility and sufficient nos. of trained personnel should be available at all the time at construction camp Cautionary signage and notice should be displayed in local language and English at the required places like fuel storage area so that hazards can be avoided. A security guard should be deputed in these areas and entry should be restricted 	During Construction	Contractor	BEZA/PMC
Disaster	<ul style="list-style-type: none"> All reasonable precaution 	During	Contractor	BEZA/PMC

Activity/Impact	Mitigation Measures	Time Frame	Implementation of Mitigation Measures	Supervision & Monitoring
Management	<p>should be taken to prevent danger of the workers and the public from fire, flood, drowning, etc.</p> <ul style="list-style-type: none"> • Fire-fighting facility, i.e. sand filled buckets and portable fire extinguishers should be available at site • Workers should be trained how to use fire extinguisher • Workers should be made aware of nearest located cyclone shelter and measures to be taken by them in case of cyclone or flood. • No construction activity should be taken during rainy season 	Construction		

9.3.2. Mitigation Plan for Deep Sea Dredging for Construction of Bund

Dredging in the deep sea will be carried out by the contractors to be hired by BEZA. Dredged sand will be used for filling the site as mentioned in Chapter 4 of the report. Generic management plan for the dredging is given in Table 63 below. Since the site for dredging is not finalized so it is suggested that contractor should prepare site specific dredging management plan considering IFC EHS guidelines for Ports, Harbors and Terminals & General EHS guidelines and below suggested generic dredging management plan. This site specific dredging management plan should be submitted to BEZA for approval prior start of dredging operations. As per BWDB recommendations, it is suggested to carry out dredging at minimum 600 m distance form the proposed bund site (which is in line with proposed BWDB bund alignment).

Table 63: Generic Management Plan for Dredging

Impacted Environmental Component	Mitigation Measures During Construction Phase
Impact on Soil Quality	<ul style="list-style-type: none"> • Dredged material to be used should be checked for toxicity of the heavy metals prior carrying out dredging and its usage for filling the land and any other construction purpose. Parameters to be tested should include heavy metals like Fe, Cu, Zn, Cd, Cr, Ni, Mn, Al, Pb, Mg, As through authorized agency by DoE. Concentration of the heavy metals should be checked against the limits as specified in Table 41 of EIA report. This report should be submitted to BEZA prior starting land filling and dredging operations. After approval of BEZA only, land filling should be started. • Excess dredged material should not be disposed at any location other than the project location
Impact on Water Quality	<ul style="list-style-type: none"> • Dredging should be carried out only by licensed dredgers of Inland Water Authority of Bangladesh • Dredging should be carried out in stretches identified by BWDB • Dredged material extracted should be tested for toxicity & contamination

Impacted Environmental Component	Mitigation Measures During Construction Phase
	<ul style="list-style-type: none"> • Usage of silt or air bubble screens/curtains should be explored to minimize the sediment release during dredging operations. • Dredger should be selected as per the strata to be dredged • To minimize the sediment dispersal during disposal of dredge sediments, cutter should be placed as close to the bed as possible preferable at a level of 1m above the bed to minimize the dispersal of sediments • Regular servicing and maintenance of dredgers should be taken up so as to prevent any leakage of the dredged material. Leakage detection of the sediment transportation pipe should be carried out regularly to prevent any sediment loss and water pollution at leakage location. Corrective actions should be taken immediately after detection of such leaks.
Aquatic Ecology	<ul style="list-style-type: none"> • Dredging should not be carried out during breeding & spawning season of fishes (September to October) • Measures like provision of bubble curtains or creation of agitation in water should be carried out prior carrying out dredging operations so as to provide avoidance time and let the species move away from dredging point and to prevent any injury/mortality. Dredging operations should be halted in case of sighting of RET species, if any • Contractors should submit SOPs and action time chart with risk management plan prior to any dredging work. Dredging sub-contractor should follow the defined safety procedures to avoid accidents and spills, and BEZA should ensure that other vessel users are provided with adequate information and instruction to avoid conflict with the dredgers.
Socio-economy	<ul style="list-style-type: none"> • Dredging operations should be restricted to day time only, i.e. 6:00 Am-10:00 Pm only to minimize noise impacts on the residents of nearby settlements. Dredgers should be equipped with the noise reduction/masking equipment to reduce the noise generation • Dredgers should be placed in consultation with the fishermen so as to minimize the impact on their equipment/gears and their fishing activities • Log book should be maintained for recording the accidents at site/mortality of the any aquatic mammal should be maintained. Analysis shall be carried out to assess the reason for the accident/mortality and measures should be taken to prevent repetition of the event. • Contractors having experience of dredging and well trained staff should only be allowed to carry out dredging. This will help in prevention of spillage of dredged material or any accidents during the dredging operations • Dredging plan should be prepared by contractor and submitted to BEZA for approval prior to carrying out dredging operations. • Contractors should submit method statement & risk assessment plan prior to carrying out any dredging work. Dredger should follow the defined safety procedures to avoid accidents and spills, and BEZA should ensure that other vessel users are provided with adequate information and instruction to avoid conflict with the dredgers. • Timely intimation to fishermen about dredging operation and location can minimize the disturbance to fishermen. Dredgers should be placed in consultation with the fishermen so as to

Impacted Environmental Component	Mitigation Measures During Construction Phase
	<p>minimize the impact on their equipment/gears and their fishing activities</p> <ul style="list-style-type: none"> • Adoption of safety measures for prevention of any accidents during dredging. Safety measures include floats, air jackets, emergency light, extra boats, fire-ighting system etc. EHS Guidelines General and EHS guidelines or ports, harbour and terminals should be followed for preparation of site specific emergency management plan

9.3.3. Mitigation Plan for Widening of Access Road

It is proposed to widen the under construction single lane access road on CDSP/BWDB bund to 2 lane road. This road measures 7 km in length. This access road connects the EZ site to the Abu Torab road and then to Dhaka Chittagong Highway. Impacts associated with widening of access road along with proposed mitigation measures are given below. The Contractor shall carry out all mitigation and enhancement measures (including those related to mitigation of air/noise/water pollution; drainage/traffic congestion) as specified in the Environmental Management Plan (EMP) as below in table 64.

Table 64: Environmental Impacts and Mitigation Plan for Widening of Access Road

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
Pre-Construction					
Acquisition of Land	•	RoW	Pre-Construction	Contractor	BEZA/PMC
Removal of Vegetation	<ul style="list-style-type: none"> • Removal of as little vegetation as possible during the development and re-vegetation of bare areas after the project. • Tree cutting should be minimized (if any). Twice the nos, of tree cut should be planted 	RoW	Pre-Construction	Contractor	BEZA/PMC
Procurement & Setting up of Crushers, Hot-mix plants, other Vehicles, Equipment	<ul style="list-style-type: none"> • Specifications of crushers, hot mix plants and batching plants, other Construction 	Areas in vicinity of construction site	Pre-Construction	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
and Machinery	<p>Vehicles, Equipment and Machinery to be procured should comply to the relevant Standards/norms and with the requirements of the relevant current emission control legislations</p> <ul style="list-style-type: none"> • Hot mix plants, crushers and batching plants shall be located at distance of app. 1 km from nearest habitation, archaeological site, sensitive areas, forests etc. • Residential facility or sensitive facilities like hospitals, schools etc shall not be located in downwind direction of the identified plant site • Adequate stack height and emission control devices such as bag house filters, cyclone separators, water scrubbers etc., should be attached with HMP • Impervious platform for storage of 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>bituminous and other liquid hazardous chemical</p> <ul style="list-style-type: none"> • Pollution control measures for Diesel Generator (DG) set i.e. stack height, acoustic enclosure etc. • Proper lighting arrangement shall be made around plant site if the plants are operated during dark hours. • Provision of readily available first aid kit, fire fighting equipments at the plant site at appropriate location to respond in case of accident. • Periodical monitoring of air quality and noise levels as per conditions stipulated under the statutory clearance from DoE. Whenever the emission exceeds the permissible level the plants should be stopped and necessary repairing works of faults should be done 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	to bring down the emission levels.				
Setting up of construction/ labour camps	<ul style="list-style-type: none"> The construction camps should be at least 500 m distance from habitations from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. Location for stockyards for construction materials will be identified at least 1 km from water sources Store house for haz material like diesel should be at distance from construction labour camps. The living accommodation and ancillary facilities for labour shall be erected and maintained to standards and scales approved by the resident engineer All sites used for camps will be adequately drained. They will not be subject to periodic flooding, nor located within 	Areas in vicinity of construction site	Pre-construction phase.	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>300 feet of pools, sink holes or other surface collections of water unless such water surface can be subjected to mosquito control measures</p> <ul style="list-style-type: none"> • The camps will be located such that the drainage from and through the camps will not endanger any domestic or public water supply • All sites will be graded, ditched and rendered free from depressions such that water may get stagnant and become a nuisance • Construction camps shall be provided with sanitary latrines (1 per 25 pax), bathing facility and urinals. • Construction camps should be electrified and well ventilated • No electrical wire should be left on the floor of camp or site. Proper system should be developed and entry to the site of electricity 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>meter should be restricted and should be allowed for authorized personnel only</p> <ul style="list-style-type: none"> • Sanitary latrines shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings • Adequate and suitable facilities for washing clothes and utensils shall be provided and maintained for the use of contract labour employed therein. • Sewerage drains will be provided for the flow of used water outside the camp. • Drains and ditches will be treated with bleaching powder on a regular basis. • The sewage system for the camp will be properly designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>takes place.</p> <ul style="list-style-type: none"> • Clean potable drinking water facility should be provided at the site and the water quality should be monitored regularly • Crèche facility should be provided for children if female workers are employed • First aid facilities should be made available at construction camp. First aid box should contain small, medium and large sized sterilized dressings, sterilized burns dressings, 2 % alcoholic solution of iodine, bottle containing salvolatile, snakebite lancet, , bottle of potassium permanganate crystals, scissors, Ointment for burns & surgical antiseptic solution • 1 first aid box should be available per 50 labour • A person trained in first-aid treatment shall be made in charge who 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>shall always be readily available during the working hours at the work place</p> <ul style="list-style-type: none"> • A suitable motor four wheeler transport shall be kept readily available to carry injured or ill person to the nearest hospital. 				
Identification of debris dumping sites	<ul style="list-style-type: none"> • The dumping sites shall not be located within designated Forest/protected areas • Residential facility or sensitive facilities like hospitals, schools etc. shall not be located in downwind direction of the identified dumping sites • Dumping shall not impact natural drainage courses • Dumping sites should be located at least 1 km from sensitive locations • Permission from concerned local body should be taken before finalizing the location 	Waste lands in nearby area	Pre-Construction	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<ul style="list-style-type: none"> • Agriculture lands should be avoided & waste lands should be preferred • Selected site should not support significant vegetation • The area should be sprinkled with water to suppress the dust emissions • Plant species suitable to grow in that conditions should be planted at the time of closure 				
CONSTRUCTION STAGE					
Land					
Soil Erosion and Sedimentation control	<ul style="list-style-type: none"> • Contractor should plan the activities so that no naked / loose earth surface is left out before the onset of monsoon. • Top soil from debris disposal sites & along the road side should be stripped and kept under covered shed for plantation • After the construction activity is over, top soil will be utilized for landscaping activity. • To avoid soil compaction along the 	Throughout Project Corridor, Service roads and equipment storage sites, etc.	During Construction	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>transportation routes, only identified haul roads would be used for transportation.</p> <ul style="list-style-type: none"> • Along sections abutting Isakhali canal, no development should be carried out and a retaining wall should be constructed • Retaining wall should be constructed all along the Isakhali canal section running through EZ site • Bund embankments should be provided with turfing & longitudinal drains to minimize erosion • Turfing of low embankments and plantation of grasses and shrubs should be done in slope stabilization. • Soil erosion checking measures as the formation of sediment basins, slope drains, etc, should be carried out. • Construction of Side Slope of Filled Land of 1:2 by suitable soils with 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	proper compaction as per design. Slope surface should be covered by top soils/ cladding materials and grass turfings with suitable grass.				
Contamination of soil	<ul style="list-style-type: none"> • Impervious platform and oil and grease trap for collection of spillage from construction equipment vehicle maintenance platform will be appropriately provided at construction camp, servicing area and liquid fuel and lubes at storage areas. • Proper management of waste from labour camps and construction site • Proper disposal of wastewater generated from labour camp and construction site 	At fuel storage areas – usually at construction camps	During Construction.	Contractor	BEZA/PMC
Material sources	<ul style="list-style-type: none"> • Adequate safety precautions shall be ensured during transportation of quarry material from quarries to the 	Nearest Quarry Site	During construction	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>construction site.</p> <ul style="list-style-type: none"> • Vehicles transporting the material shall be covered to prevent spillage. • No excavation of earth should be carried out prior obtaining permission from DoEB 				
Disposal of Debris	<ul style="list-style-type: none"> • Waste from construction camp should be segregated at site. Food/wet waste should be composted in pit at the site, recyclable should be send to authorized recyclers and rejected waste should be disposed regularly through responsible agency in the area • Dustbins should be provided at the site and construction camps to prevent littering of waste • Storage area of minimum 2 days should be provided at construction camp for storage of the waste generated from labour camps 	Identified debris disposal location during preconstruction phase	During Construction	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<ul style="list-style-type: none"> • Construction debris should also be segregated at the site. This debris should be used for filling to the extent possible. Recyclable waste should be sold through authorized dealers and reject waste should be sent to the identified debris disposal site • All arrangement for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary will be considered incidental. • Construction debris should be stored under covered sheds on paved surfaces to prevent leaching • Any hazardous waste generated during construction activity shall be stored at suitable place and then disposed off in consultation 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>with the guidelines.</p> <ul style="list-style-type: none"> • Rubbish, debris and bitumen wastes remaining after blacktop works shall be cleaned and disposed off in a safe place. • Contaminated runoff from storage areas shall be captured in ditches with an oil trap at the outlet. • Utmost care shall be taken to ensure that the Municipal Corporation norms are met for the safe collection, transport and disposal of construction waste and debris. 				
Air					
Dust Generation	<ul style="list-style-type: none"> • Routes for transportation of material within the site should be covered with brick bed so as to minimize the dust generation • Inventory of the material entering and going outside the site should be maintained at site. This will help in knowing the raw material available and 	Throughout Project Corridor, all access roads, temporarily sites.	During Construction Phase	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>prevent piling up of raw material and thus dust generation</p> <ul style="list-style-type: none"> • Raw material stored should be covered. Debris and excavated soil should also be kept covered. • Cement and sand should be stored under covered sheds only • Vehicles delivering materials should be covered to reduce spills and dust blowing off the load. • Compaction of prepared site to re-strain the fugitive emissions. • Water should be sprayed in the cement and earth mixing sites as well as after compaction. • In laying sub-base, water spraying is needed to aid compaction of the material. After the compaction, water spraying should be carried out at regular intervals to limit the dust to below • Every 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>equipments and machinery will be fitted with dust suppression devices such as water sprinklers, dust bags, cyclone etc. as appropriate.</p> <ul style="list-style-type: none"> • Road surface should be cleaned with air compressor and vacuum cleaners prior to the construction works. Manual labour using brooms should be avoided, if used labour to be provided masks. • The Contractor shall take every precaution to reduce the level of dust emission from the hot mix plants and the batching plants. • Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of DoEB • The Contractor will submit PUC 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>certificates for all vehicles/equipment/machinery used for the project. Monitoring results will also be submitted to 'PIU' through the 'Engineer'.</p> <ul style="list-style-type: none"> Air quality monitoring to be carried out during construction phase to check the pollutants level in the air 				
Water					
Loss of water bodies/ surface / ground	<ul style="list-style-type: none"> No waste to be disposed off in Isakhali canal, Feni River and aquaculture ponds along the CDSP bund and BWDB bund No excavation from the bund of the water bodies. No earth will be excavated for development of any off-site facility No debris disposal near any water body. Prior written permission from authorities is required for use of water for construction activity. Construction labours to be 	Near all water bodies	During construction	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>restricted from polluting the source or misusing the source.</p> <ul style="list-style-type: none"> • Labour camps will be located away from water bodies. • Open defecation should not be allowed. Sanitary toilets should be provided at the site & in labour camps. • Bathing & Washing should not be done near waterbody, whereas proper facility should be provided for this purpose • Provision of the septic tank with soak pit to dispose off the water from construction labour camp • Surface run-off due to construction activities should be collected & re-used for wheel washing & sprinkling for dust suppression • All raw material, excavated soil & debris to be kept covered so as they do not mix with rain water during rains and does not 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>contaminate the rainfall run-off which may enter the nearby water bodies</p> <ul style="list-style-type: none"> No excavation work to be undertaken during monsoon season 				
Drainage and runoff	<ul style="list-style-type: none"> The Contractor will always clear all the cross drainage structures and natural drainage before onset of monsoon in order to keep all drainage unblocked. Earth, stones, wastes and spoils will be properly disposed off, to avoid blockage of any drainage channel. All necessary precautions will be taken to construct temporary or permanent devices to prevent inundation or ponding. 	Throughout the stretch	During Construction	Contractor	BEZA/PMC
Silting / sedimentation	<ul style="list-style-type: none"> Silt fencing shall be provided around aquaculture ponds & Isakhali canal along the access road to be widened to prevent runoff of sediment 	Throughout Project Corridor and at all locations of water bodies	Construction Phase	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>from construction site</p> <ul style="list-style-type: none"> Sedimentation tanks should be provided in line with the storm water drains to prevent soil loss/erosion 				
Contamination of water	<ul style="list-style-type: none"> Construction activities & material storage close to water bodies (Isakhali canal, Bamon Sundar canal & Feni River) shall be avoided Car washing / workshops near water bodies will be avoided. Wastewater generated from labour camp and construction sites should not be discharge in water bodies and should be channelized to septic tanks/soak pits Construction wastewater can be re-used for sprinkling and curing 	Throughout Project Corridor and at all locations of water bodies	Construction Phase	Contractor	BEZA/PMC
Noise					
Noise from Vehicles, Plants and Equipment	<ul style="list-style-type: none"> All vehicles and equipment used in construction will be fitted with exhaust silencers. Noise standard at processing 	Throughout Project Corridor and at all construction sites, hot mix plant etc.	During Construction	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>sites, eg. hot mix plant , machinery will be strictly monitored to prevent exceeding of noise standards.</p> <ul style="list-style-type: none"> • Workers in vicinity of loud noise, shall wear earplugs and working time should be limited as a safety measure. Job rotations should also be carried out to prevent continuous exposure • Construction activities to be taken up during day time only • Servicing of all construction vehicles and machinery should be done for exhaust silences and should be checked and if found defective should be replaced. • No noisy construction activities should be permitted around educational institutions/health centers (silence zones) up to a distance of 100 m from the sensitive receptors. 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<ul style="list-style-type: none"> Monitoring shall be carried out at the construction sites Environmental Expert will be required to inspect regularly to ensure the compliance of EMP. 				
Flora and Fauna					
Loss or damage to vegetation	<ul style="list-style-type: none"> No tree cutting should be carried out for widening of access road without permission from BEZA & PMC Compensatory plantation should be carried out in the ratio of 1:2 minimum Plantation should be carried out all along the access road to be widened 	Throughout Project Corridor	During Construction Phase	Contractor	BEZA/PMC
Compaction of vegetation	<ul style="list-style-type: none"> Construction vehicles, machinery and equipment will move or be stationed in the designated area only (RoW or CoI, as applicable), to prevent compaction of vegetation outside the RoW. While operating on temporarily rental land for 	Throughout Project Corridor	During Construction Phase	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	traffic detours, storage, material handling or any other construction related or incidental activities, it will be ensured that the trampling of soil and damage to naturally occurring herbs and grasses will be avoided.				
Loss, damage or disruption to fauna	<ul style="list-style-type: none"> Construction workers will be directed not to disrupt or damage the fauna. Construction vehicles will run along specified access to avoid accidents to cattle. 	Throughout Project Corridor	During Construction Phase	Contractor	BEZA/PMC
Socio-Economic Environment					
Accidents	<ul style="list-style-type: none"> Safety officer should be appointed at site to ensure all the safety guidelines are being followed at site Cautionary guidance should be provided at site to aware people about the associated risk with the area. Entry to the fuel storage room or machinery operation room should 		During Construction	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>be restricted only to authorized trainer personnel</p> <ul style="list-style-type: none"> • All Accidents shall be reported immediately and incident analysis, preventive measures shall be implemented. • A gate should be provided at site and record for entry & exit of vehicles should be maintained at the site • Fuel should be stores at site away from construction camps • Adequate lightning should be provided at site especially during night time 				
Occupational Health & Safety					
Construction Safety	<ul style="list-style-type: none"> • Contingency Plan as given in Annexure XV, EHS Guidelines General and EHS guidelines or ports, harbour and terminals should be followed for preparation of site specific emergency management plan • All 	Entire Project site.	During Construction	Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>construction worker should wear a safety jacket and other protective equipment like helmet, gloves, gum boots, ear plugs, mask while working at the site</p> <ul style="list-style-type: none"> • All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. • Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Stonebreakers will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals • Workers should be made aware about the health issues related with open defecation • Training to workers should be provided for handling the 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<p>construction equipment and machinery</p> <ul style="list-style-type: none"> • Training to the workers should be provided to handle the emergency situations like fire, floods etc. • First aid facility and sufficient nos. of trained personnel should be available at all the time at construction camp • Cautionary signage and notice should be displayed in local language and English at the required places like fuel storage area so that hazards can be avoided. A security guard should be deputed in these areas and entry should be restricted • A register of all toxic chemicals delivered to the site shall be kept and maintained up to date. The register shall include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, 				

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	safe handling and storage procedures, and emergency and first aid procedures for the product.				
Disaster Management	<ul style="list-style-type: none"> All reasonable precaution should be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. Fire-fighting facility, i.e. sand filled buckets and portable fire extinguishers should be available at site Workers should be trained how to use fire extinguisher Workers should be made aware of nearest located cyclone shelter and measures to be taken by them in case of cyclone or flood. No construction activity should be taken during rainy season 	Entire Project site	During Construction	Contractor	BEZA/PMC
Clearing of Construction of Camps & Restoration	<ul style="list-style-type: none"> Contractors shall prepare site restoration plans. The plans shall be implemented prior to demobilization 	All Workers' Camps		Contractor	BEZA/PMC

Impact	Mitigation Measures	Location	Time Frame	Implementation of Mitigation Measures	Monitoring & Supervision
	<ul style="list-style-type: none"> On completion of works, all temporary structures shall be cleared, all rubbish burnt, excreta or other disposal pits or trenches filled in and sealed and the site left clean and tidy. 				

9.3.4. Mitigation Plan for EZ

The detailed plan shall be prepared by prospective developers. However following measures shall mandatorily form part of EMP for EZ development and operation:

- Industries should obtain environment clearance individually from DoEB prior to establishment and commencement.

Measures that should be taken by developer and individual industrial owners vehicle development and operation phase is tabulated in table 65 & 66 below

Table 65: Mitigation Measures Suggested for Developer

Impact	Mitigation Measures During Construction Phase
Identification of Site for Disposal of construction Debris, construction labour camp and plant site	<ul style="list-style-type: none"> Site identified should be 1.0 km away from settlement, sensitive locations, like school, hospital, religious structures, reserve forest and any other eco-sensitive zone etc. Site identified should be approved by BEZA and PMC Site should be located in downwind direction from settlement area Fertile agricultural land and community land should be avoided for setting of these facilities
Air Pollution	<ul style="list-style-type: none"> Sprinkling of water during construction phase on all unpaved roads, site and haul roads Avoiding excess piling of raw material and debris at site Storage & transportation of raw material and debris in covered conditions Cutting of only identified trees after obtaining permission of forest department Regular cleaning of site Provision of adequate parking space at site so as to prevent idling of vehicles during construction phase Up keeping and maintenance of all the construction vehicles, machinery and equipment used for construction purpose All vehicles entering the EZ site should carry PUC Guiding signage should be provided at the site for vehicles entering the site to minimize the movement of vehicle within the site Timings of the construction material vehicles should be fixed

Impact	Mitigation Measures During Construction Phase
	<p>and should be during non-peak hours to prevent traffic congestion and traffic jams</p> <ul style="list-style-type: none"> • Speed limits should be restricted within the site for all the construction vehicles • Usage of low energy intensive building material like fly ash mix cement and bricks • Usage of low sulphur diesel for running DG sets, construction vehicles and equipments • Obtaining temporary electricity connection during construction phase and operating DG sets only during power failure • Provision of wheel washing facility at exit point of site • Adequate air pollution control measures like provision of bag filters, stacks of adequate height should be provided with WMM, hot mix plant, batching plant etc. • Open burning of wood or any other material should be prohibited at site and all the workers should be made aware about the same • Zonation of EZ should be carried out such that high polluting industries should be located in downwind direction
Water Pollution & water Conservation	<ul style="list-style-type: none"> • Minimizing the run-off from the site by construction of sediment basins for collection of storm run-off and re-using that water for curing purpose and wheel washing • Curing of structures to be done by spraying and during early morning and evening hours only to minimize the water requirement • Maintaining the flow of water sprinklers so as to avoid wastage of water • No debris should be thrown or disposed off in any water body like river, pond, canal etc or ground water source like functional or abandoned well • Excavation should not be carried out during monsoon • Provision of temporary storm water drainage system during construction phase to drain the storm water and should be connected to nearest surface water body • Excavated pits should be provided with garland drains to prevent entrance of water inside the pit • Provision of oil & grease traps with the storm water drains draining the parking and fuel storage area • Provision of septic tanks and soak pits at the site & labour camps for disposal of sewage generated by construction labour • Waste generated by construction camps should be disposed off regularly at the identified site for debris disposal • Provision of cross drainage structures like balancing for maintaining the drainage pattern • Stone & bricks should be purchased only from licence vendors • Keeping provision of land for development of CSTP and CETP in future. CETP should essentially be developed to ensure treatment of 100% of the wastewater as all industries may not be able to provide efficient systems for treatment of their effluent • Rain water harvesting tank should be developed at the site so as that water can be used for meeting daily water demand • Tank alarms should be installed so as to prevent overflow of water

Impact	Mitigation Measures During Construction Phase
	<ul style="list-style-type: none"> • CETP & CSTP should be atleast 30 m away from the water pipeline, water storage tank and rain water storage tank
Soil Quality	<ul style="list-style-type: none"> • Top soil, if excavated from the project site should be stored in covered condition and should be used later for landscaping purpose • Storage of raw materials, debris and fuel on paved surfaces • Training the workers to handle the material so as to minimize spillage of material on soil • Provision of cross drainage structures to prevent water logging and soil erosion • Stone pitching with grass turfing should be done for the high embankment close to water body • Disposal of construction debris, municipal waste from labour camps and hazardous waste from site should be disposed off at the identified site • Keeping provision of land for development of solid waste management facility within the EZ site • No open area should be left without the vegetation to protect the soil. • Mulching of soil should be done regularly to prevent direct exposure of soil to wind and water
Noise Pollution	<ul style="list-style-type: none"> • Construction vehicles, machinery and equipment used for construction purpose should meet the standards prescribed by DoE • Upkeeping and regular maintenance of all the construction vehicles, machinery and equipment used for construction purpose • Speed limits should be restricted for all construction vehicles and equipment • Honking should be prohibited at the site • Provision of acoustic enclosures, noise mufflers, silencers etc with the DG sets and any noise generating machinery • Provision of temporary noise shield/barrier in areas where more noise will be generated
Ecology	<ul style="list-style-type: none"> • Only identified trees (if any) should be fell down after obtaining permission from forest department • Compensatory plantation should be carried out in ratio of min 1:2 under guidance of forest department • Development of 10 m (minimum) thick green buffer all along the periphery of EZ • Bund constructed around the EZ site will prevent trespassing of the animals • Native plant species requiring should be considered for plantation • Timber should be purchased only from authorized vendors • No waterbody should be filled outside the EZ site
Socio-economy and aesthetics	<ul style="list-style-type: none"> • Contingency Plan as given in Annexure XV, EHS Guidelines General and EHS guidelines or ports, harbour and terminals should be followed for preparation of site specific emergency management plan • All proposed air, water, noise and soil pollution control measures should be taken • Provision of employment opportunity during construction phase to local people

Impact	Mitigation Measures During Construction Phase
	<ul style="list-style-type: none"> • Provision of personal protective equipment to all the workers • Job rotation should be practiced for workers exposed to high noise levels • Site should be covered from all the site during construction phase • Drinking water facility, adequate nos. of toilet, septic tank/soak pit, bathing facility, lighting should be provided in labour camps • Storm water drainage system should also be provide in labour camps to prevent water ponding and breeding of mosquitoes • LPG should be provided as fuel in the labour camps • Provision of facility like guest house, community building, commercial area, ATM, Bank, hospital and parking should be made within the EZ site
Disaster and Risk Management	<ul style="list-style-type: none"> • Provision of first aid kit and first aid room and well trained first aid practioner at the site all the time • Ambulance facility should be provided at the site • Tie-ups with local hospital should be made to handly emergency case, if any • Availability of safety officers and supervisors at all the time on the site • Workers should be given training for handling construction vehicles, equipment and handling emergency situations like fire, floods, earthquake and cyclone • Cautionary signage should be provided in the areas associated with risks like storage of explosives, fuels, heavy construction material etc. Entry for only trained authorized personnel should be allowed in such areas with adequate safety measures • Emergency handling cell & room should be developed at the site and should be headed by project & safety manager • Contact no. of nearest fire-station and hospitals should be displayed within the emergency handling room

Table 66: Mitigation Measures Suggested for Individual Plot Owners

Impact	Mitigation Measures During Construction Phase	Mitigation Measures During Operation Phase
Air Pollution	<ul style="list-style-type: none"> • Sprinkling of water during construction phase on all unpaved roads, site and haul roads • Avoiding excess pilling of raw material and debris at site • Storage & transportation of raw material and debris in covered conditions • No trees should be fell down without permission of BEZA and forest department • Regular cleaning of site • Provision of adequate parking space at site so as to prevent idling of vehicles during construction phase • Upkeeping and maintenance of all the construction vehicles, machinery and equipment used for construction purpose 	<ul style="list-style-type: none"> • Installation of air pollution control devices like Electro-static precipitator, bag filters, separators, cyclones, multi-level condensers & evaporators, scrubbers, quenchers, stacks of height as per DoE norms • Disposal of the waste material at the designated site for waste disposal in covered condition • All the roads within the plot should be paved & water sprinkling should be practiced to minimize dust generation. • Adequate stack height should be provided for dispersion of the emissions • Chemicals having potential to release VOCs should be stored, handled and used in closed system

Impact	Mitigation Measures During Construction Phase	Mitigation Measures During Operation Phase
	<ul style="list-style-type: none"> • All vehicles entering the EZ site should carry PUC • Guiding signage should be provided at the site for vehicles entering the site to minimize the movement of vehicle within the site • Timings of the construction material vehicles should be fixed and should be during non-peak hours to prevent traffic congestion and traffic jams • Construction vehicles should follow the speed limits set up for EZ zone • Usage of low energy intensive building material like fly ash mix cement and bricks • Usage of low sulphur diesel for running DG sets, construction vehicles and equipments • Obtaining temporary electricity connection during construction phase from BEZA and operating DG sets only during power failure • Provision of wheel washing facility at exit point of site • Open burning of wood or any other material should be prohibited at site and all the workers should be made aware about the same 	<ul style="list-style-type: none"> • Quarterly monitoring should be carried out for testing ambient air quality • Development of thick green belt of 10 m all along the industrial plot periphery
Water Pollution & water Conservation	<ul style="list-style-type: none"> • Minimizing the run-off from the site by construction of temporary storm water drainage, sediment basins for collection of storm run-off and re-using that water for curing purpose and wheel washing • Curing of structures to be done by spraying and during early morning and evening hours only to minimize the water requirement • Maintaining the flow of water sprinklers so as to avoid wastage of water and ponding of water • No debris should be thrown or disposed off in any water body like river, pond, canal etc or ground water source like functional or abandoned well • Excavation should not be carried out during monsoon • Excavated pits should be provided with garland drains to prevent entrance of water inside the pit • Provision of septic tanks and soak pits at the site for disposal of sewage generated by construction labour 	<ul style="list-style-type: none"> • Provision of ETP & STP for treatment of sewage and industrial effluent • Provision of dual plumbing system so as treated water from STP can be re-used for flushing, horticulture and cooling purpose • Separation of the effluent streams depending on the nature of pollutants • Monitoring the quality of sewage, treated water, drinking water quality and ground water quality regularly • Tank alarms should be installed so as to prevent idle running of pumps • Provision of storm water drainage system at site and it should be connected to rain water harvesting system. Storm water drains should also be connected to the nearest surface water body to drain excess flow, if any • Provision of rain water harvesting system so that water can be collected and used to meet daily water demand.

Impact	Mitigation Measures During Construction Phase	Mitigation Measures During Operation Phase
	<ul style="list-style-type: none"> • Waste generated during construction should be disposed off regularly at the identified site for debris disposal • Stone & bricks should be purchased only from licensed vendors 	<ul style="list-style-type: none"> • Provision of oil & grease traps with the storm water drains draining the parking and fuel storage area • Leakage detection system should be provided and the water supply system should be regularly inspected to detect leakages • Distance of STP/ETP and RWH pits should be minimum 30 m to prevent contamination of collected storm water • Untreated effluent should not be discharged into surface water body or any abandoned ground water source or to ground. • No hazardous waste, municipal waste, industrial waste should be disposed off in the water bodies or in ground • Leachates, if any or untreated sewage should be stored only in lined ponds to prevent contamination of ground water
Soil Quality	<ul style="list-style-type: none"> • Top soil, if excavated from the project site should be stored in covered condition and should be used later for landscaping purpose • Storage of raw materials, debris and fuel on paved surfaces • Training the workers to handle the material so as to minimize spillage of material on soil • Disposal of construction debris, municipal waste and hazardous waste at designated sites 	<ul style="list-style-type: none"> • All industries should use best technologies for optimal utilization of the raw material and re-use & recycling of waste material in the process to reduce waste generation as well as raw material demand for the project. • All industries should be responsible for management of the solid and hazardous waste generated from their plots. Industries should be liable to pay penalty in case of non compliance of conditions laid down by DoE • It should be mandatory for all industries to provide storages for different category waste, its processing and safe disposal. Options for composting of compostable waste, segregation and selling recyclable waste should be opted • Waste storage area should be paved surfaces and covered • No open area should be left without the vegetation to protect the soil. • Haz. Waste should be disposed off through authorized vendors only. However, no TSDF and haz.waste recycling units exists in Bangladesh. But as the EZ development and coming up of industries may take time of app 3-4 years so by then haz

Impact	Mitigation Measures During Construction Phase	Mitigation Measures During Operation Phase
		waste rules will be formed in Bangladesh (in draft form at present) and some facilities may come up in Bangladesh for managing hazardous waste. Else all industries should incinerate the hazardous waste generated by them taking the required air pollution control measures.
Noise Pollution	<ul style="list-style-type: none"> • Construction vehicles, machinery and equipment used for construction purpose should meet the standards prescribed by DoE • Upkeeping and regular maintenance of all the construction vehicles, machinery and equipment used for construction purpose • Speed limits should be restricted for all construction vehicles and equipment • Honking should be prohibited at the site • Provision of acoustic enclosures, noise mufflers, silencers etc with the DG sets and any noise generating machinery • Provision of temporary noise shield/barrier in areas where more noise will be generated 	<ul style="list-style-type: none"> • Usage of machineries of modern make and adoption of latest available technology which compiles to noise levels standards laid by DoE • Provision of personal protective equipment to workers exposed to noisy operations. Audiometric tests should be carried out for workers exposed to high noise levels. Job rotation should be practiced to prevent continual exposure. • Noise levels in industries should be monitored regularly using noise meters. • Minimal usage of horns within industrial plot. Specification of speed limits on roads made by BEZA should be followed. Provision of speed breakers at regular intervals to regulate speed of vehicles • Regular maintenance of vehicles & construction machinery involved in industrial operation • Noisy operation should be taken up in covered conditions so that no disturbance due to noise is caused • Thick green belt should be developed within each industrial plot that will act as noise barrier..
Ecology	<ul style="list-style-type: none"> • Only identified trees should be fell down after obtaining permission from forest department • Compensatory plantation should be carried out in ratio of min 1:2 under guidance of forest department • Native plant species requiring should be considered for plantation • Timber should be purchased only from authorized vendors 	<ul style="list-style-type: none"> • Green belt of 10 m thickness should be developed all along the periphery of the industrial plot • Native plant species requiring should be considered for plantation
Socio-economy and aesthetics	<ul style="list-style-type: none"> • Contingency Plan as given in Annexure XV should be followed for preparation of site specific emergency management plan • All proposed air, water, noise and soil pollution control measures 	<ul style="list-style-type: none"> • Contingency Plan as given in Annexure XV should be followed for preparation of site specific emergency management plan • Social welfare activities shall be carried out by each industrial

Impact	Mitigation Measures During Construction Phase	Mitigation Measures During Operation Phase
	<p>should be taken</p> <ul style="list-style-type: none"> • Provision of employment opportunity during construction phase to local people • Provision of personal protective equipment to all the workers • Job rotation should be practiced for workersexposed to high noise levels • Site should be covered from all the site during construction phase • Drinking water facility, adequate nos. of toilet, septic tank/soak pit, bathing facility, lighting should be provided for construction labour • Storm water drainage system should also be provide at site to prevent water ponding and breeding of mosquitoes 	<p>owners in nearby areas of EZ like development of cattle sheds, arranging trainings for villagers for best agriculture practices, providing skill generation training to locals so as they can be employed in industries</p> <ul style="list-style-type: none"> • Providing employment to local people preferably • Adoption of all proposed air, noise, soil and water quality measures • All the units should get certifications for IS:9000, IS:14000 and OHSAS:18000 • Sector specific EHS guidelines should be followed by the industries for development and operation of the project
Disaster and Risk Management	<ul style="list-style-type: none"> • Provision of first aid kit and first aid room and well trained first aid practioner at the site all the time • Ambulance facility should be provided at the site • Tie-ups with local hospital should be made to handling emergency case, if any • Availability of safety officers and supervisors at all the time on the site • Workers should be given training for handling construction vehicles, equipment and handling emergency situations like fire, floods, earthquake and cyclone • Cautionary signage should be provided in the areas associated with risks like storage of explosives, fuels, heavy construction material etc. Entry for only trained authorized personnel should be allowed in such areas with adequate safety measures • Emergency handling cell & room should be developed at the site and should be headed by project & safety manager • Contact no. of nearest fire-station and hospitals should be displayed within the emergency handling room 	<ul style="list-style-type: none"> • Provision of first aid kits at the site • Tie-ups with local hospital should be made to handling emergency case, if any • Regular medical check-ups of the employees • Training should be given to workers for handling the equipment and managing emergency situations • Material safety data sheets of chemicals to be used should be displayed on local languages at work station • Provision of personal protective equipment to the workers as per requirement • Cautionary signage should be provided in the areas associated with risks like storage of chemicals, explosives, fuels etc. Entry for only trained authorized personnel should be allowed in such areas with adequate safety measures

9.4. Environmental Codes of Practises

All the above mentioned development activities will involve setting up of some facilities and carrying out some activities which would have impact during installation and restoration of such facilities. Those activities will involve setting up labour camps and plant site, development of borrow areas, disposal of construction debris and development of the green belt. Following management plans are prepared to manage the impact of these activities

- Construction and labour camp management plan-Annexure X
- Construction debris management plan-Annexure XI
- Borrow area management plan-Annexure XII
- Green belt development plan-Annexure XIII
- Contingency plan-Annexure XIV

9.5. Enhancement Plan

The proposed project involves development of EZ and off-site facilities for the upcoming Mirsarai EZ-II. These off-site facilities will be developed by BEZA. Development of these off-site infrastructure facilities will attract the investors and make the proposed site location more accessible for trading and business. Proximity of the proposed project site to the Chittagong Dhaka Highway and an already existing inland water transportation system further adds to the suitability of site for setting up the industries. As enhancement plan, it is proposed that BEZA should develop a thick green belt all around the EZ site, proper storm water drainage to prevent flooding and rain water harvesting system to harvest rain water and use it to meet daily water demand and reduce pressure on ground water resources. Thick green buffer of 30 m will be developed all along the EZ site and along the Isakhali channel. A zone of 1 km between the EZ site and sea will be maintained as Mangrove zone. Cost for development of green buffer is given in Table 68 below in Chapter 10. Also a lake will be developed at site measuring 100 acres. Green buffer and lake site will act as landing site for water birds and habitat for mudcrabs and other species.

It is planned to develop the area facing River Feni as river front which can be used for recreational purpose. A platform/footpath of 2 m width will be developed on the proposed peripheral embankment which can be used for recreational purpose by nearby villagers. This platform will be accessible through staircase from top of the proposed road. Level of this platform will be 8 m which is again higher than the HFL of Feni River and tidal surge level during cyclones occurred in last 56 years.

9.6. Contingency Plan

In order to be in a state of readiness to face adverse effects of accidents, a Contingency Plan is required to be prepared which includes on-site and off-site emergency plan by the individual industry and industrial estate. BEZA is committed to develop a Contingency Plan in consultation with district authorities and industry association. A suggestive contingency plan is attached as Annexure XIV.

9.7. Compensation Plan

Only 14 Squatters and 5 temporary prayer places will be affected for widening of access road. Compensation will be pay based on approved ARP. BEZA prepared a abbreviated Resettlement Plan for those affected HHs and temporary prayer places.

9.8. Grievance Redressal Mechanism

BEZA will establish a Grievance Redressal Mechanism (GRM) to answer to queries and address complaints and grievances about any irregularities in using the guidelines adopted in the RSMF and for implementation of this ARP. BEZA will form a Grievance Redressal Committee (GRC) for the EZ consisting of memberships to ensure proper presentation of complaints and grievances, as well as

impartial hearings and transparent decisions. As suggested in the RSMF, the GRC will have the following memberships:

- A BEZA Representative (Convener)
- An elected member of the Union Parishad or Upazila Parishad
- A female member of the Union or Upazila Parishad
- A representative of the PAPs in the EZ/subproject
- Headmaster of local higher secondary school
- Resettlement Specialist of the Supervision Consultant (Member Secretary)
- An Area Representative of an NGO working in the area

Based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly, saving the aggrieved persons resorting to expensive, time-consuming legal actions. The RSMF contains certain procedural conditions, which BEZA will observe to safeguard integrity of the GRM. The GRM will however not pre-empt an aggrieved person's right to go to the courts of law.

9.9. Monitoring Plan

The objective of environmental monitoring during the construction and operation phases is to compare the monitored data against 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. A monitoring schedule has been sketched based on the environmental components that may be affected during the construction and operation of the project and is given below in table 67.

Table 67: Environmental Monitoring Plan

S. No	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
1.0	Construction Phase					
1.1	Local Manpower Absorption	Construction Works	Contractor's report No. of people working in the project	Monthly	Civil Contract Awardees	BEZA & PMC
1.2	Soil Erosion	Excavation, disposal, cut & fill and land clearing activities for site levelling and internal roads, disposal	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	During Rainy Season	Contractor	BEZA & PMC
1.3	Greenbelt Development	-	Survival rate of species planted; Density of vegetation	Half Yearly	Contractor/BEZA	BEZA & PMC
1.4	Air Quality	Transportation of construction materials, road construction, construction of utilities	Survey & observations; Levels of PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO	Once in each season for twice a week for two weeks at 3 locations		BEZA & PMC

S. No	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
1.5	Waste Management	Restoration of disposal sites and construction areas	Status of protection measures	Quarterly	Contractors	BEZA & PMC
1.6	Noise Level	Noise levels compliance with respect to industrial standards	Ambient Equivalent continuous Sound Pressure Levels (L_{eq}) at day and Night time at 6 to 8 locations	Daily	Contractors	BEZA & PMC
1.7	Drinking Water	Contamination	All physio-chemical & biological parameters	Once in month	Contractor	BEZA & PMC
1.8	Quality of dredged sediment	Contamination	For PAHs, heavy metals, PVCs and other toxic chemicals/compounds	At the time of dredging	Contractor	BEZA & PMC
2.0	Operation Phase					
2.1	Noise Levels	Noise levels compliance with respect to industrial standards	Ambient Equivalent continuous Sound Pressure Levels (L_{eq}) at day and Night time at 6 to 8 locations	Once in every month	Individual Industrial Units	BEZA & PMC
			Plant periphery and near noise generation sources	Monthly	Individual Industrial Units	BEZA & PMC
2.2	Biological Environment	Horticulture / Greenbelt Development	Survival rate of plants and shrubs	Quarterly	BEZA	BEZA & PMC
			Survival rate of plants and shrubs at individual unit	Quarterly	Individual unit	BEZA & PMC
2.3	Water quality Monitoring	Ground Water (if extracted for project)	All physio-chemical & biological parameters	Quarterly	BEZA & Individual unit in their respective locations	BEZA & PMC
		Feni River Water Quality	Heavy Metals and all physio-chemical & biological parameters	Quarterly	BEZA & Individual unit in their respective locations	BEZA & PMC
		Sea Water Quality	Heavy Metals and all physio-chemical & biological parameters	Quarterly	BEZA & Individual unit in their respective locations	BEZA & PMC

9.10. 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 levels
- 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

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

9.11. Institutional 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 Environmental and social cell which will coordinate for implementation of environment management plan. BEZA will appoint PMC for monitoring the contractor activities and implementation of EMP. PMC should have the certain responsibilities and are detailed in Annexure XV.

EHS cell of BEZA should be headed by an experienced EHS professional having national and international experience in construction supervision and safety for minimum 25 years. Environmental and safety experts should be deputed under EHS head who will be working in close coordination with the contractor's team to ensure implementation of the EMP an occupational health and safety plan and PMC team monitoring the performance of the contractor. These officers should carry out minimum 1 visit at site in a week and should submit monthly report on progress of work and status of implementation of suggestive EMP by contractor and including observations of PMC.

9.12. Effective Implementation of EMP During Construction Phase

Pre-construction and construction activities are taken by the contractor to whom work will be awarded. For implementation of Environmental Management Plan during pre-construction and construction phase, it is necessary that EMP for construction phase for off-site facilities and EZ development should be shared with the contractor so as he is aware of the environmental provision he has to keep during construction phase and he can do budgeting accordingly. This will ensure effective implementation of the EMP. Thus BEZA should include the EMP as environmental and social safeguard measures in the bid document. EMP implementation by contractor can be achieved by following ways:

- Incorporation of contractor's EMP in bid document and instructing him to keep environmental provisions in planning while budgeting
- Contractor should have full-fledged environment health and safety management cell (EHS Cell) to ensure the implementation of the EMP and the SHE policy aiming at achieving the goals of safety, health and environmental management. The contractor EHS cell should have all the expertise in the field of Environment Health and Safety. The designated EHS officers should have adequate experience for implementing and monitoring the similar nature of EMPs. The contractor EHS cell should function in close coordination with BEZA

and PMC to the project. The contractor EHS cell should submit the EMP compliance on monthly basis to PMC and BEZA.

- Contractor should submit Environment Management Action Plan (EMAP) based on this EIA document including their work methodology, work force involvement, equipment's standard, work scheduling etc.
- Contractor should carry out environmental monitoring as per suggestive environmental monitoring plan in the EMP chapter
- Mandatory Deputation of environmental and social expert (by contractor) at site
- Environmental & social experts to be deputed should have broad experience of working in similar field
- Linking payments of the contractor to environmental performance
- Assigning penalties in case the environmental safeguard measures are not taken up adequately
- Appointing PMC to monitor the performance of contractor and compliance of the EMP by contractor. PMC is responsible to communicate the status of compliance/non-compliance of EMP by contractor to project proponent and suggest the measures to be taken to contractor to meet the gaps/non-compliances. PMC can be appointed by BEZA through tendering process again and the company's having experience of managing similar kind of projects should only be appointed for the PMC work only.

10. Cost Estimation for Environment Mitigation Measures and Monitoring

10.1. Environment Management Cost

Environment management cost includes the cost of mitigation measures as proposed under impact identification chapter. Most of the costs are part of construction costs. Detailed cost breakup for the project is given below in the table68.

Table 68: Environment Management Cost of Project during Construction and Operation phase

S. No.	Environment Management Measure	Capital Cost	Recurring Cost (Annual)	Responsible Institution
Construction Phase				
1.	CETP Development	100 Lakh BDT	5 Lakh BDT	Developer& BEZA
2.	CSTP Development	80 Lakh BDT	5 Lakh BDT	Developer& BEZA
3.	Green Belt Development	100 Lakh BDT	15 Lakh BDT	Developer& BEZA
4.	Provision of Personal protective Equipment to all labour involved in construction of proposed off-site developments (4-5 camp)	10 Lakh BDT	2 Lakh BDT	Contractor, PMC & BEZA
5.	Construction of Toilets & Septic Tanks/Soak Pits (4-5 camp)	5 Lakh BDT	1 Lakh BDT	Contractor, PMC & BEZA
6.	Construction of Temporary storm water drainage system and sedimentation Tank	4 Lakh BDT	1 Lakh BDT	Contractor, PMC & BEZA
7.	Construction waste management and disposal	5 Lakh BDT	5 Lakh BDT	Contractor, PMC & BEZA
8.	Provision of clean drinking water supply	5 Lakh BDT	5 Lakh BDT	Contractor, PMC & BEZA
9.	Water sprinkling	4 Lakh BDT	4 Lakh BDT	Contractor, PMC & BEZA
10.	Environmental monitoring <ul style="list-style-type: none"> • Air quality • Noise level • Drinking water quality 	2 Lakh BDT	2 Lakh BDT	Contractor, PMC & BEZA
11.	Safety & Quality inspections	5 Lakh BDT	5 Lakh BDT	Contractor, PMC & BEZA
12.	Environmental Training	2 Lakh BDT	2 Lakh BDT	Contractor, PMC & BEZA
13.	Cost of PMC	30 Lakh BDT	30 Lakh BDT	Contractor, PMC & BEZA
Total Cost		352 Lakh BDT	82 Lakh BDT	
Operation Phase				

14.	Environmental monitoring <ul style="list-style-type: none"> • Air quality • Noise level • Ground Water Quality at Nearby Villages • Ground Water level at 4 locations (withdrawing stations & nearby area) 	3 Lakh BDT	3 Lakh BDT	BEZA
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11. Conclusion and Recommendation

11.1. Conclusions

EZ project has been proposed by Govt. of Bangladesh for rapid economic development in the area including the backward and undeveloped areas. BEZA, formed under EZ Act, 2010 is overall agency for implementation of EZ projects. EZ will be developed following PPP approach. This will make development less reliant on Government fiscal subsidies. BEZA will invest in land and related off-site infrastructure development so as to make zone accessible and resourceful. Thereafter economic zone development will be responsibility of private developers. Off-site facilities proposed to be developed by BEZA include development of administration building, site filling, construction of peripheral bund and 5 m width at top, widening of under construction single lane access road of 7 km to 2 lane, and sluice gate on Isakhali canal.

The project subject to its nature of activities falls under Red category as per ECA, 1995 and requires prior environment clearance from DoE, Bangladesh. To obtain approval of DoEB, an Initial Environment Examination (IEE) Report for development of Economic zone along with proposed Terms of Reference (ToR) was submitted vide letter dated 04.05.2015. Site clearance certificate for the project has already been obtained from DoE. Approved ToR was granted by DoE vide Memo No. DoE/Clearance/5577/2016/174 dated 2nd May, 2016. EIA study has been carried out as per the approved ToR by DoE, World Bank guidelines and EMF of PSDSP.

Upcoming EZ lies in Mirsarai Upzila lies adjacent to under development Mirsarai EZ-I. Upcoming zone is name as Mirsarai EZ-II and measures 1311 acres out of which 1311 acres will be developed into economic zone. EZ site of Government land and land use is Char Land (Wetland). Site is app. 10 km distance from Chittagong Dhaka highway and is connected to highway through Abu Torab road and single lane under construction road being constructed for Mirsarai EZ-I on BWDB and CDSP bund. Proposed peripheral 7.8 km and 5 m wide embankment will provide connectivity to the EZ-II site. EZ site is surrounded mainly by agricultural land, aquaculture pond and water bodies. Isakhali canal traverse whole length of site and divides into two parts. Flow in Isakhali canal is controlled by sluice gate and one more sluice gate is proposed to be constructed sea side to control flow of water in Isakhali canal. Administration building will be constructed within EZ site at this stage. Site will be filled to level of +1.15 m above NGL so as finished level will be 4.15 m amsl. Height of peripheral embankment will be +10 m amsl which is more than HFL of Feni River and storm surges during cyclone as per Historical data of 56 years. At present only above mentioned off-site facilities will be developed. Remaining infrastructure and EZ development will be carried out in later stages.

To carry out impact assessment, baseline data was collected for the site and study area through the site visits, existing studies of the area and published literature. Detailed baseline of the project site and study area is given in Chapter 5 of the report. Project site and site for proposed off-site development is flat. EZ site is devoid of vegetation whereas naturally grown/planted trees exist on the CDSP/BWDB bund which may be disturbed due to widening of the single lane access road. Mangrove plantation forest abuts the EZ site in NW & SE direction. Attempts were made to assess all the predicted environmental and social impacts with evaluating the nature, temporal and spatial extent, reversibility and likelihood of the predicted impacts. Finally, the predicted impacts were summarized in a qualitative scale of consequence. The assessment includes impacts on physical setting, impacts on air quality, impacts on water resources, impacts on land and agricultural resources, impacts on fisheries, impacts on ecosystem resources, and impacts on socio-economic environment.

Key impacts anticipated for the project are increased dust emission from construction activity, generation of employment, surface water pollution and change in land use. Being infrastructure project

major impacts anticipated during construction phase are generally site specific & temporary i.e. exists for short period. No significant impacts are anticipated due to off-site developments on Mangroves plantation. During operation phase, impacts could be there if pollution control measures are not adopted by industries. Bund should be constructed in such a manner that Mangrove plantation should not be affected by bund construction. Isakhali canal should be retained and drainage connection should be maintained to Mangroves in East direction of EZ site so as they do not face water deficiency. Impacts identified are moderate and can be mitigated with appropriate mitigation measures.

Management plan has been prepared to address the issues identified during impact assessment. Mitigation plan for the environmental and social issues is given in Chapter-9 of the report in detail.

11.2. Recommendations

Recommendations made for the project development on the basis of EIA study are given below:

- The green buffers as proposed should be adequately maintained as they will be provide aesthetic value to the area.
- Isakhali canal should be retained in its natural position, leaving 30 m no development zone in both the sides throughout the length of the canal of the portion passing through the site.
- Pipelines should be laid so as to ensure flow of sea water to Mangroves which may become wayer deficient aafter construction of peripheral bund.
- Material for bund construction should be selected taking in consideration the cyclone hazard at site. Height should not be less than +10 m in any case
- Proposed environment management plan should be implemented strictly both during operation and construction phase of the project
- Compensatory plantation should be carried out in case any trees is fell (if any)
- Suggestions & requests made by public for employment shall be taken into consideration
- Proper training of maintaining environment, health and safety should be given to Project management unit in both construction an operation phase
- Provision of garland drain, thick green belt, CETP, STP, segregated storm water shall be adhered.
- Rain water harvesting should be carried out to reduce the pressure on surface and ground water resources during both construction and operation phase
- Construction activities for proposed off-site developed should only be started after obtaining environment clearance certificate from DoE, Bangladesh
- Environmental monitoring should be conducted as proposed in environment management plan

Annexures

Annexure-I-ToR Letter

Government of the People's Republic of Bangladesh
Department of Environment
Head Office, E-16 Agargaon
Dhaka-1207
www.doc.gov.bd

Memo No: DoE/Clearance/5577/2016/ 174

Date: 02/05/2016

Subject: Approval of Terms of Reference (TOR) for EIA of Mirsharai-2 Economic Zone at Mirsharai under Chittagong District and Sonagazi under Feni District.

Ref: Your Application dated 04/04/2016.

With reference to your application dated 04.04.2016 for the subject mentioned above, the Department of Environment hereby gives approval of the Terms of Reference (ToR) for Environmental Impact Assessment (EIA) Study of the proposed Mirsharai-2 Economic Zone at Mirsharai under Chittagong District and Sonagazi under Feni District subject to fulfilling the following terms and conditions:

- I. The project authority shall conduct a comprehensive Environmental Impact Assessment (EIA) study considering the overall activity of the said project in accordance with this ToR and following additional suggestions.
- II. The EIA report should be prepared in accordance with following indicative outlines :
 1. Executive summary
 2. Introduction: (Background, brief description, rationale of the project, scope of study, methodology, limitation, EIA team, references)
 3. Legislative, regulation and policy consideration (covering the potential legal, administrative, planning and policy framework within which the EIA will be prepared)
 4. Project Description
 - i. Introduction
 - ii. Project Objective
 - iii. Project Options
 - iv. Interventions under Selected Options
 - v. Project activities: A list of the main project activities to be undertaken during site clearing, construction as well as operation
 - vi. Project schedule: The phase and timing for development of the project
 - vii. Resources and utilities demand: Resources required to develop the project, such as soil and construction material and demand for utilities (water, electricity, sewerage, waste disposal and others), as well as infrastructure (road, drains, and others) to support the project
 - viii. Map and survey information
Location map, cadastral map showing land plots (project and adjacent area), geological map showing geological units, fault zone, and other natural features.
 - ix. Project Plan, Design, Standard, Specification, Quantification, etc.
 5. Environmental and Social Baseline
 - 5.1 Meteorology
 - 5.1.1 Temperature
 - 5.1.2 Humidity



1/4


- 5.1.3 Rainfall
- 5.1.4 Evaporation
- 5.1.5 Wind Speed
- 5.1.6 Sun Shine Hours
- 5.2 Water Resources
 - 5.2.1 Surface Water System
 - 5.2.2 Tropical Cyclones and Tidal Flooding
 - 5.2.3 Salinity
 - 5.2.4 Drainage Congestion and Water Logging
 - 5.2.5 Erosion and Sedimentation
 - 5.2.6 River Morphology
 - 5.2.7 Navigation
 - 5.2.8 Ground Water System
- 5.3 Land Resources
 - 5.3.1 Agroecological Regions
 - 5.3.2 Land Types
 - 5.3.3 Soil Texture
 - 5.3.4 Land Use
- 5.4 Agriculture Resources
 - 5.4.1 Farming Practice
 - 5.4.2 Cropping Pattern and Intensity
 - 5.4.3 Cropped Area
 - 5.4.4 Crop Production
 - 5.4.5 Crop Damage
 - 5.4.6 Main Constraints of Crop Production
- 5.5 Livestock and Poultry
 - 5.5.1 Feed and Fodder Shortage
 - 5.5.2 Livestock/Poultry Diseases
- 5.6 Fisheries
 - 5.6.1 Introduction
 - 5.6.2 Problem and Issues
 - 5.6.3 Habitat Description
 - 5.6.4 Fish Production and Effort
 - 5.6.5 Fish Migration
 - 5.6.6 Fish Biodiversity
 - 5.6.7 Fisheries Management
- 5.7 Ecological Resources
 - 5.7.1 Bio-ecological Zone
 - 5.7.2 Common Flora and Fauna
 - 5.7.3 Ecosystem Services and Function
- 5.8 Socio Economic Condition
 - 5.8.1 Socio Economic Condition
 - 5.8.2 Quality of Life Indicators
 - 5.8.3 Income and Poverty
 - 5.8.4 Gender and Women
 - 5.8.5 Common Property Resources
 - 5.8.6 Conflict of Interest and Law and Order Situation
 - 5.8.7 Historical, Cultural and Archaeological Sites
- 5.9 Ecological Resources
 - 5.9.1 Bio-ecological Zone
 - 5.9.2 Common Flora and Fauna
 - 5.9.3 Ecosystem Services and Function
- 6. Identification and Analysis of Key Environmental Issues (Analysis shall be presented with Scenarios, Maps, Graphics, etc. for the Case of Anticipated Impacts on Baseline)
 - 6.1 Environmental Sensitivity Investigation



- 6.2 Environmental Asset
 - 6.3 Environmental Hot Spots
 - 6.4 Likely Beneficial Impacts
 - 6.5 Community Recommendations
 - 6.6 Alternate Analysis
 - 7. Environmental and Social Impacts
 - 7.1 Introduction
 - 7.2 Impact on Water Resources
 - 7.2.1 Pre-Construction Phase
 - 7.2.2 Construction Phase
 - 7.2.3 Post-Construction Phase
 - 7.3 Impact on Land Resources
 - 7.3.1 Pre-Construction Phase
 - 7.3.2 Construction Phase
 - 7.3.3 Post-Construction Phase
 - 7.4 Impact on Agriculture Resources
 - 7.4.1 Pre-Construction Phase
 - 7.4.2 Construction Phase
 - 7.4.3 Post-Construction Phase
 - 7.5 Impact on Fisheries
 - 7.5.1 Pre-Construction Phase
 - 7.5.2 Construction Phase
 - 7.5.3 Post-Construction Phase
 - 7.6 Impact on Eco System
 - 7.6.1 Pre-Construction Phase
 - 7.6.2 Construction Phase
 - 7.6.3 Post-Construction Phase
 - 7.7 Socio Economic Impact
 - 7.7.1 Pre-Construction Phase
 - 7.7.2 Construction Phase
 - 7.7.3 Post-Construction Phase
 - 8. Public Consultation and Disclosure
 - 8.1 Introduction
 - 8.2 Objectives of Public Consultation and Disclosure Meeting
 - 8.3 Approach and Methodology of Public Consultation and Disclosure Meeting
 - 8.4 Public Consultation Meetings (PCMs)
 - 8.5 Public Disclosure Meetings (PDMs)
 - 9. Environmental Management Plan and Monitoring Indicators
 - 9.1 Introduction
 - 9.2 Mitigation Plan
 - 9.3 Enhancement Plan
 - 9.4 Contingency Plan
 - 9.5 Compensation Plan
 - 9.6 Monitoring Plan
 - 9.7 Monitoring Indicators
 - 10. Cost Estimation for Environmental Mitigation Measures and Monitoring
 - 11. Conclusions and Recommendations
- III. Without obtaining approval of EIA report by the Department of Environment, the project authority shall not be allowed to conduct earth filling or any kind of physical intervention in the proposed project site and also not be able to start the physical activity of the project.
- IV. This approval of the Terms of Reference (TOR) would not mean any acceptance or site clearance of the project.



- V. The proposed EIA study would not establish any claim, right in favour of the proponent for getting site clearance or environmental clearance.
- VI. Without obtaining Environmental Clearance, the project authority shall not be able to start the operation of the project.
- VII. The project authority shall submit the EIA report along with the No Objection Certificates (NOCs) from the local authority/ies, NOC from Forest Department (if it is required in case of cutting any forested plant, private or public), NOC from concerned authority for cutting/razing/dressing of hill or hilly land (if it is required), the applicable fee in a treasury chalan and NOC from other relevant agencies for operational activity etc. to the Chittagong Regional Office of DOE in Chittagong with a copy to the Chittagong/Feni District office of DoE and the Head Office of DOE in Dhaka.


02.05.2016

(Syed Nazmul Ahsan)
Director (Environment Clearance, c.c)
Phone # 02-8181673

Project Director

Mirsharai-2 Economic Zone
Support to Capacity Building of Bangladesh Economic Zones Authority Project
Bangladesh Economic Zones Authority (BEZA)
BDBL Bhaban, Level # 15
12, Kawran Bazar, Dhaka-1215.

Copy Forwarded to:

- 1) PS to Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
- 2) Director, Department of Environment, Chittagong Regional Office, Chittagong.
- 3) Deputy Director/Office in-charge, Chittagong/Feni District Office, Chittagong/Feni.
- 4) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

Annexure II- EIA Team**EIA Team**

A multidisciplinary team of professionals having experience of conducting Environment & Social Impact Assessment Studies for Industrial Parks, Industrial Areas, Special Economic Zones, DTA, Economic Zones, Area development, Industrial Corridors etc was involved in carrying out EIA study for this project. Details of the professionals are given in the table below:

Name of Professional	Area of Expertise	Position Assigned
Sanjay Kumar Jain	Environment Impact Assessment, Environmental Management Plan and Environmental & Social management framework	Team Leader & Sr. Env. & EIA Specialist
Nisha Singhal	Environment Impact Assessment & Environment Management Plan	Support Environmentalist
Ratnesh Kotiyal	Aquatic Ecology	Aquatic ecologist
Anil Kumar	Land Use Land cover & Remote Sensing	GIS & Land Use Specialist
Manoj Sharma	Soil Resources & Quality Assessment, Agricultural Resource Assessment	Soil Expert
K. Manivanan	Architecture & planning	Urban Planner

Annexure III: Land Document

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
উপজেলা ভূমি অফিস
মিরসরাই, চট্টগ্রাম

দখল হস্তান্তর নামা

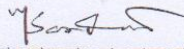
মিরসরাই উপজেলায় অর্থনৈতিক অঞ্চল প্রতিষ্ঠার লক্ষ্যে বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ (বেজা), প্রধানমন্ত্রীর কার্যালয়, বিভিন্নবিএল ভবন, ১২-কারওয়ান বাজার, ঢাকা এর অনুকূলে নিম্নোল্লিখিত তফসিলভুক্ত ভূমি দীর্ঘমেয়াদী বন্দোবস্ত মামলা নং ০২/১৪, ০১/১৫, ০২/১৫, ০৩/১৫ ও ০৪/১৫ মূলে অকৃষি খাস জমি বন্দোবস্ত নীতিমালা, ১৯৯৫ আলোকে ভূমি মন্ত্রণালয়, খাস জমি-১ এর স্মারক নং- ৩১.০০.০০০০.০৪২.৪১.১৩৭.১৪-১৪১, ৩১.০০.০০০০.০৪২.৪১.০১৬.১৫-১৭৭ এবং ৩১.০০.০০০০.০৪২.৪১.০৪০.১৫-২২৩ অনুসারে দীর্ঘমেয়াদী বন্দোবস্ত প্রদান করা হয়। প্রার্থিত সংস্থার অনুকূলে জেলা প্রশাসন কর্তৃক কবুলিয়ত সম্পাদন করে দেয়া হয়। পরবর্তীতে জেলা প্রশাসকের কার্যালয়, চট্টগ্রাম এর স্মারক নং ০৫.৪২.১৫০০.৩০২.১২.০২২.১৫-৩২৮৭, তারিখঃ ২৬/১১/২০১৫ খ্রিঃ মূলে প্রার্থিত সংস্থার অনুকূলে দখল হস্তান্তর করার জন্য নির্দেশ প্রদান করা হয়।

দখল হস্তান্তরকৃত জমির বিবরণঃ

ক্রমিক নং	দীর্ঘমেয়াদী বন্দোবস্ত মামলা নং	মৌজার নাম	জেএল নং	বিএস খতিয়ান নং	বি.এস দাগ নং	বন্দোবস্তকৃত জমির পরিমাণ (একরে)
০১	০১/১৫	বাঁশখালী	৩৯	০১	২০১ (আংশিক)	৩.০০
০২	০২/১৪, ০৪/১৫	পীরের চর	১১০	০১	০১, ০২, ০৩, ০৪, ০৫, ২০১ (আংশিক), ৩০১	১৩১৬.১৮৩০
০৩	০৩/১৫	সাধুর চর	১১১	০১	১, ১০১, ২০১, ৩০১	১৬৪৪.১০৩৯
০৪	০২/১৫	শিল্প চর	১১২	০১	১, ১০১, ২০১, ৩০১	১৮৫২.৫৩৮৫
মোট						৪৮১৫.৮২৫৪
কথায়				চার হাজার আটশত পনের দশমিক আট দুই পাঁচ চার একর		

উক্ত নির্দেশনার আলোকে বন্দোবস্তকৃত ভূমি কানুনগো ও সার্ভেয়ার দ্বারা সরেজমিনে পরিচিহ্নিত করে আজ ২৯/১১/১৫ খ্রিস্টাব্দে বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ (বেজা) এর অনুকূলে সরেজমিনে দখল বুঝিয়ে দেয়া হলো এবং এই দখল হস্তান্তরনামা সম্পাদন করা হলো।

দখল অর্পণকারীর স্বাক্ষরঃ


সরকার আবদুল্লাহ আল মামুন বার
সহকারী কমিশনার (ভূমি)
মিরসরাই, চট্টগ্রাম
উপজেলা ভূমি অফিস
মিরসরাই, চট্টগ্রাম।

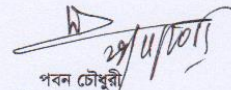
অনুলিপিঃ সদয় জ্ঞাপনার্থে ও কার্যার্থে

স্মারক নংঃ উঃভূঃঅঃ- ৬৪৯

১। জেলা প্রশাসক, চট্টগ্রাম।

২। উপজেলা নির্বাহী অফিসার, মিরসরাই, চট্টগ্রাম।

দখল গ্রহণকারীর স্বাক্ষরঃ


পবন চৌধুরী
নির্বাহী চেয়ারম্যান
বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ
প্রধানমন্ত্রীর কার্যালয়, ঢাকা

তারিখঃ ২৯/১১/১৫ খ্রিঃ

Annexure IV: Memorandum of Understanding with DPHE



৬৯৯৮৯৬০

Memorandum of Understanding (MoU)

Between

The Department of Public Health Engineering (DPHE)

and

Bangladesh Economic Zones Authority (BEZA)

Handwritten signature

This Memorandum of Understanding (MoU) together with all its terms and conditions, hereinafter called the MoU, is made on this 11th day of October, 2015 between the Department of Public Health Engineering, hereinafter REFERRED to AS DPHE, and Bangladesh Economic Zone Authority, hereinafter called BEZA, towards installation of water supply facilities by DPHE for BEZA in Mirersharai, Chittagong and Sreehatta (Sherpur), Maulavibazar.

WHEREAS, BEZA, for ensuring water supply as part of the off-site infrastructural facilities for Mirersharai, Chittagong and Sreehatta (Sherpur) Maulavibazar with the financial support from IDA/DFID, intends to have technical support from DPHE for installation of water supply facilities at those designated areas;

Whereas, the DPHE has agreed to provide the technical support as intended by BEZA;

WHEREAS, objectives of this MOU is to obtain/provide technical support for BEZA by DPHE through carrying out the following activities :

- (i) Assessing the hydrogeological situation of the area to find water supply source;
- (ii) Installation of Production Tube wells including Test Tube wells; and
- (iii) Construction of Water Treatment Plants;
- (iv) Installation of water pipelines

THEREFORE, both the DPHE and BEZA have agreed as follows:

ARTICLE 1- Definitions

In this MoU, unless anything repugnant to the subject or context,-

- (a) "DTW" means Deep Tube well;
- (b) "PTW" means Production Tube well;
- (c) "PARTIES" means Bangladesh Economic Zones Authority (BEZA) and the Department of Public Health Engineering (DPHE);
- (d) "TTW" means Test Tube well;

ARTICLE 2: GENERAL PROVISION:

The parties agree to join efforts and to maintain close working relationships in order to achieving the objective of the contract.



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ARTICLE 3: SPECIAL PROVISIONS:

- 3.1. DPHE shall provide technical support to and conduct the activities :
- Secondary data analysis to find the water supply sources;
 - Installation of TTW including geophysical logging;
 - Design and construction of PTW;
 - Construction of Treatment Plant;
 - Construction of Pipeline; and
 - Documenting the generated water quality data and reporting.
- 3.2. The DPHE shall:
- Submit the indent of fund to BEZA;
 - Submit the expenditure statement to BEZA;
 - Submit the progress report to BEZA; and
 - Hold the progress review meeting with BEZA.
 - Complete all the facilities and handover it to BEZA
 - May provide any/all the design/s on request from BEZA
- 3.3. BEZA shall provide DPHE and its contractors the right to access to the construction sites and necessary funding towards smooth implementation of the works.
- 3.4. BEZA shall:
- Provide the design of Treatment Plants and Pipelines;
 - Ensure timely funding for construction, honorarium, professional fees against implementation and supervision as and when required; and
 - Supplement the task with BEZA officials, if necessary.

[Handwritten signature]
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ARTICLE 4- DURATION OF THE MoU:

- 4.1. This MoU shall be effective from the date of signing and shall remain valid till December 31, 2017.
- 4.2. The duration of this MoU may be extended upon mutual consultation of both the parties.
- 4.3. This MoU may be terminated by either of the parties by a prior notice of 60(sixty) days.
- 4.4. Upon termination of this MoU, the parties shall come to an amicable settlement of and after settlement of all dues, duties and responsibilities of either parties.
- 4.5. New Economic Zones may be added subsequently, under the same terms and conditions.

ARTICLE 5: FUND MANAGEMENT, SERVICE CHARGES, COSTS AND MODE OF PAYMENT:

5.1. BEZA will pay the charges/fees including the construction cost to DPHE and the service providers as applicable against the assigned task. In this regards tentative costing shall be prepared by DPHE in consultation with BEZA that might vary on field situation. This costing shall be inclusive of VAT, tax, duties, levies etc. Based on the total investment cost, BEZA shall provide 2% (two percent) professional fees on cost excluding VAT, Tax, duties, levies etc to DPHE in favor of design, supervision, inspection and contingency purpose.

5.2. Additional Chief Engineer, Planning, shall work as a focal office for overall coordination, liaison, funding, supervision towards smooth implementation of the program on behalf of the Chief Engineer, DPHE. Superintending Engineer, will provide technical support to focal office.

5.3. BEZA shall disburse the portion of total funding as per following schedule based on the fund request from DPHE, following the prevailing government rule. Bank transfer will be the preferred mode of payment and DPHE shall arrange a dedicated bank account to deal with this matter.

Annexure V: Memorandum of Understanding with PGCB



Government of the People's Republic of Bangladesh

MEMORANDUM OF UNDERSTANDING

BETWEEN

BANGLADESH ECONOMIC ZONES AUTHORITY

PRIME MINISTER'S OFFICE

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

AND

POWER GRID COMPANY OF BANGLADESH LTD.

21 April 2016



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**MEMORANDUM OF UNDERSTANDING
BETWEEN
BANGLADESH ECONOMIC ZONES AUTHORITY
PRIME MINISTER'S OFFICE
GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
AND
POWER GRID COMPANY OF BANGLADESH LTD.**

This Memorandum of Understanding hereinafter called the MoU, is made on this 21st day of April, 2016 between Bangladesh Economic Zones Authority, hereinafter referred to as BEZA, Prime Minister's Office, Government of the People's Republic of Bangladesh and the Power Grid Company of Bangladesh Ltd., hereinafter referred to as PGCB, an enterprise of the Bangladesh Power Development Board, towards setting up and maintenance of a Grid Substation in the Mirsarai Economic Zone with the contents, background, objectives and terms and conditions as set forth below.

Introduction:

Bangladesh Economic Zones Authority (BEZA) has been striving to enhance the economic growth through industrialization, creating employment opportunities and increasing export by establishing economic zones in different parts of Bangladesh. The Power grid Company of Bangladesh (PGCB) has been facilitating supply of Electricity to the consumers including industrial sectors by setting up and maintaining Grid Substations in the potential locations of Bangladesh. BEZA needs uninterrupted supply of Electricity to Mirsarai Economic Zone and for this purpose a Grid Substation should be established in a suitable location within this Economic Zone. Upon mutual discussions and correspondence BEZA and PGCB have come to a consensus that PGCB will establish and maintain a Grid Substation at its own cost in BEZA's Land within Mirsarai Economic Zone for which PGCB has the requirement of 50 acres land. Meanwhile the place has been primarily identified in presence of officials of BEZA and PGCB. Now BEZA and PGCB agree to proceed forward for this purpose under an instrument of understanding.

Objectives:

The general objective of this understanding is rapid economic growth of Bangladesh by mutual cooperation by two government bodies and the specific objective is to provide facility for uninterrupted supply of electricity to all the requiring consumers of Mirsarai Economic Zone.



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Terms and Conditions:

1. BEZA will provide 50 acres developed land to PGCB in the Mirsarai Economic Zone as per PGCB's layout, specifically shown in the sketch map attached herewith. BEZA will remain as the owner of this land and PGCB shall enjoy the user's right thereover for such long period as may be necessary for maintaining the Grid Substation.
2. PGCB will establish a 230/132/33 kV Grid Substation with provision of expansion up to 400 KV in the land so provided by BEZA.
3. The Grid Substation shall be used for facilitating uninterrupted supply of electricity to Mirsarai Economic Zone.
4. BEZA will ensure transmission line corridor inside Mirsarai Economic Zone area, if necessary.
5. To meet further power demand of Mirsarai Economic Zone, BEZA will keep land provision for additional 132/33 kV Grid Substation inside the area.

Relationship and cooperation between the parties:

The relationship between BEZA and PGCB will be Collegial each recognizing and respecting the role and responsibilities of the other. Subject to other provisions of this MoU and applicable laws, rules and regulations, both BEZA and PGCB will cooperate with each other in establishing and maintaining the Grid Substation.

Cost and Financial Arrangement:

All cost and expenditure for setting up and maintaining the Grid Substation will be borne and fund will be explored by PGCB.

Applicable laws:

For carrying out the purposes of this MoU, BEZA and PGCB shall follow the applicable laws, rules and procedure.



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Settlement of dispute:

In the event of any disagreement on any issue involving implementation of this MoU, BEZA and PGCBL shall resolve such issue through mutual consultation keeping in view the greater national interest.

Amendment Procedure:


Any amendment or modification to this MoU, if required, may be made upon mutual consultation between the parties or at the instance of either of the parties with consent of the other party and it will be effected in writing.

Effective date and duration:


This Memorandum of Understanding will come into effect from the date of signing by the parties and will remain valid for the whole period which may be necessary for implementation of the purpose of this MoU.

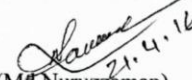
Done and signed on the date as hereinbefore mentioned in duplicate both being equally authentic.


- Attachment :** 1. PGCBL Grid Substation Layout
2. Sketch Map- one sheet


21.04.16
(Masum-Al-Beruni)
Managing Director, PGCBL


Witness :



21/4/16
(Md. Ashraf Hossain)
Company Secretary, PGCBL


21.4.16
(Md Nuruzzaman)
Superintendent Engineer (Planning),
PGCBL


Mohammed Ayub (Joint Secretary)
Secretary, BEZA.

Witness :


(Hariprasad Paul)
General Manager (Admin & Finance)


(Md. Hasunur Rashid)
Project Director (BEZA)

Annexure VI: Memorandum of Understanding with BWDB



Government of the People's Republic of Bangladesh

Memorandum of Understanding (MOU)

Between

Bangladesh Economic Zones Authority (BEZA)

And

Bangladesh Water Development Board (BWDB)

Towards

Implementation of Water Resource /Control Structures

&

Sharing of Hydraulic Information Regarding Zones

July 2016



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Memorandum of Understanding (MOU)
between
Bangladesh Economic Zones Authority (BEZA)
and
Bangladesh Water Development Board

This Memorandum of Understanding (MOU) together with all its terms and conditions, hereinafter called the MOU, is made on this 26th July, 2016 between Bangladesh Economic Zones Authority, hereinafter called BEZA and Bangladesh Water Development Board, hereinafter called BWDB towards implementation of water development/control structure and sharing of hydraulic information by BWDB for BEZA in Economic Zones.

WHEREAS, BEZA, for ensuring water resource/control structure as part of infrastructural facilities for Economic Zones, in different areas of the country with the financial support from IDA/DFID, intends to have procurement and technical support from BWDB at those designated areas;

WHEREAS, the BWDB has agreed to act as an executing agency as per Rule 12 of the Public Procurement Rules-2008 and provide procurement and technical support for water resource/control installations as intended by BEZA;

WHEREAS, objectives of this MOU are to obtain by BEZA and provide procurement of delegated works, technical support and sharing of hydraulic information by BWDB through carrying out the following activities:

- I. Procurement of water related infrastructure;
- II. Share hydraulic information;
- III. Any other relevant activities;

THEREFORE both the BEZA and BWDB have agreed as follows:

ARTICLE 1: DEFINITIONS

In this MOU, unless anything repugnant to the subject or context:

- a) "BWDB" means Bangladesh Water Development Board;
- b) "Delegated procurement" as defined by Rule 1(4) of the Public Procurement Rules-2008;
- c) "Executing Agency" means BWDB in this case, as defined by Rule 12(1) of the Public Procurement Rules-2008 for the procurements;
- d) "PARTIES" means Bangladesh Economic Zones Authority (BEZA) and Bangladesh Water Development Board (BWDB);

ARTICLE 2: GENERAL PROVISION

The parties agree to join efforts and to maintain close working relationships in order to achieving the objective of this MoU.

ARTICLE 3: SPECIAL PROVISIONS

3.1 The BWDB will provide procurement and technical support to BEZA and conduct following activities:

- I. Procurement of sluice, regulator or similar structure;
- II. Procurement of excavation, re-excavation and/or lining to canal slopes;
- III. Procurement of embankment construction;
- IV. Design the water infrastructure or review any similar design, if requested by BEZA;
- V. Share hydraulic information of nearby river, canal, sea or any water bodies;
- VI. Supervision and inspection of embankments/canals excavation/slope lining/sluices/regulators or similar structures during construction, if requested by BEZA;



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3.2 The BWDB will:

- I. Submit requests to BEZA to release fund;
- II. Submit the expenditure statement to BEZA;
- III. Submit the progress report to BEZA;
- IV. Progress review meeting with contractors in presence of BEZA representative if necessary;
- V. Complete all the assignments within BEZA designated areas; and within probable time;
- VI. Provide any design/s or review design/s of water related structures, if requested by BEZA;
- VII. Share hydraulic information of nearby rivers, canals, sea or any water bodies, if requested by BEZA;
- VIII. Supervision and inspection of embankments/canals excavation/slope lining/sluiques/regulators or similar structures during construction, if requested by BEZA;

3.3 The BEZA Will:

- I. Delegate the assignments time to time in writing to carry out as per Section 3.1 of this MOU;
- II. Provide BWDB and its related contractors the right to access to the construction sites;
- III. Provide BWDB necessary funding towards smooth implementation of works;
- IV. Ensure timely funding for construction works, honorarium, professional/consultancy fees to BWDB as per existing rules and regulations for implementation and supervision as required;
- V. Supplement the task of BWDB with BEZA officials, if necessary; and
- VI. Provide location maps, design, drawing or may request BWDB to provide technical support;
- VII. Provide necessary support for impact assessment by Hydraulic Study/Modelling Study/ EIA Study for assessing impact on project area for construction of Infrastructure Facilities

ARTICLE 4: DURATION OF THE MOU

- I. This MOU shall be effective from the date of signing and shall remain valid till 30 JUNE, 2021;
- II. The duration of this MOU may be extended upon mutual consultation of both the parties;
- III. This MOU may be terminated by either of the parties by a prior notice of 60(sixty) days;
- IV. Upon termination of this MOU, the parties shall come to an amicable settlement of and after settlement of all dues, duties and responsibilities of either party.

ARTICLE 5: FUND MANAGEMENT, SERVICE CHARGES, COSTS AND MODE OF PAYMENT

- 5.1 BEZA will pay the charges/fees including the construction cost to BWDB and the service providers as applicable against the assigned task. In this regard tentative cost estimate shall be prepared by BWDB in consultation with BEZA that might vary on practical situation. Such costing shall include VAT, tax, duties, levies etc. Based on the total investment cost, BEZA shall provide 2% (two percent) on costs excluding VAT, Tax, duties, levies etc. to BWDB in favor of design, supervision, inspection and contingency purpose.
- 5.2 Executive Engineer, Chittagong O&M Division-2, BWDB, Chittagong shall work as a "focal point" for overall coordination, liaison, funding and supervision towards smooth implementation of the program on behalf of BWDB.
- 5.3 BEZA shall disburse the portion of total funding as per schedule in Section 5.5 (below) based on the fund request from BWDB following existing government rules and procedure. Bank transfer will be the preferred mode of payment and BWDB shall arrange a dedicated bank account to deal with this matter.
- 5.4 BWDB shall prepare, produce and certify all evidences for audit purpose and shall comply with the provisions of the Public Procurement Act-2006 and Public Procurement Rules-2008 in this regard.
- 5.5 The payment schedule shall be as under:
 - I. 50% upon submitting the indent of fund intent to sign of contract;
 - II. 30% upon completion of the 50% work; and
 - III. 20% upon completion of 80% work.

Note: The modality of payment may vary based on mutually agreed terms and conditions.



কএঃ ৫৫৫৬৬০৫

ARTICLE 6: PROCUREMENT

Based on the clearance of BEZA regarding the works, the approved design, technical specification and official estimate, BWDB shall arrange all sorts of procurement under this MOU as per PPA 2006 and PPR 2008 or any guidelines from donor agencies.

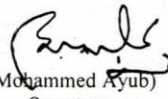
ARTICLE 7: AMENDMENT

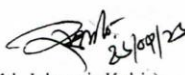
- 7.1 This MOU may be modified or amended on written consent of both the parties. Both the parties reserve the right to negotiate on any issue involved in the MOU.
- 7.2 Nothing in this MOU shall be interpreted as limiting, superseding or otherwise affecting the parties' normal operations or decisions. This MOU does not limit or restrict the parties from participating in similar activities or arrangement with other entities.

ARTICLE 8: DISPUTE RESOLUTION


In case of any dispute(s), BEZA and BWDB will resolve amicably. If the dispute cannot be resolved amicably, the dispute shall be referred to the Secretaries of the two concerned ministries and the decision of the Secretaries on the dispute shall be final.

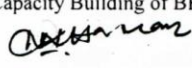
IN WITNESS WHEREOF, the parties hereto, acting through their representatives here onto duly authorized, have, on behalf of the parties hereto, signed this MOU in DHAKA as of the day and year first above mentioned.


(Mohammed Ayub)
Secretary,
BEZA Executive Board

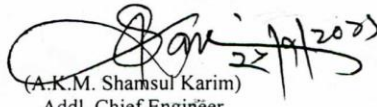

(Md. Jahangir Kabir)
Director General, BWDB

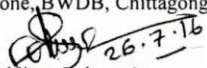
Witness:


(Md. Harunur Rashid)
Project Director
Support to Capacity Building of BEZA Project

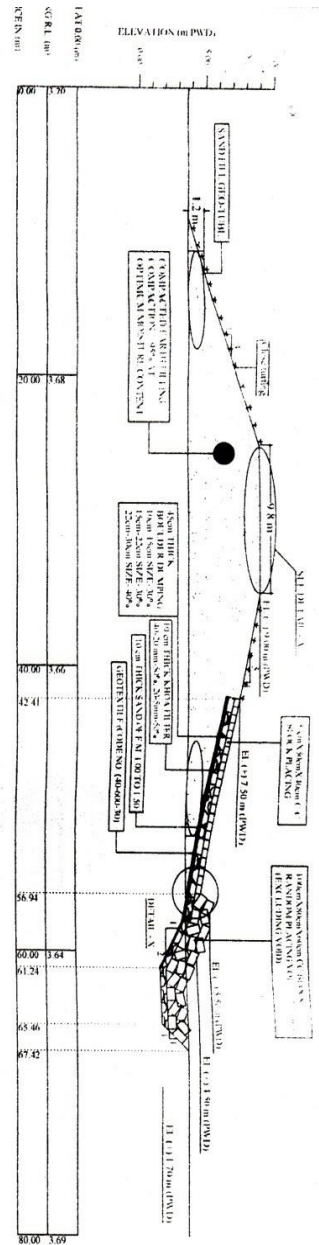

(Md. Mostaque Hassan ndc)
General Manager (Planning & Development)

Witness:

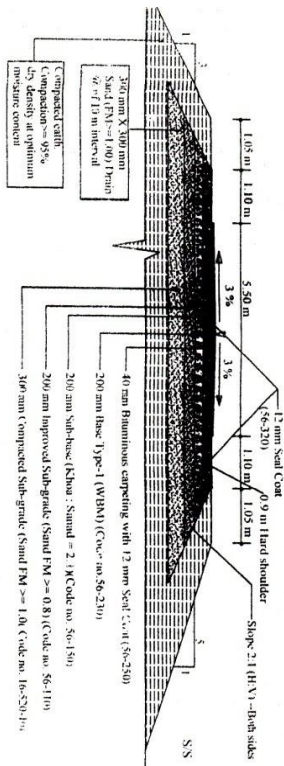

(A.K.M. Shamsul Karim)
Addl. Chief Engineer
South-Eastern Zone, BWDB, Chittagong.


(Md. Siddiqueur Rahman)
Superintending Engineer
Chittagong O&M Circle, BWDB, Chittagong.

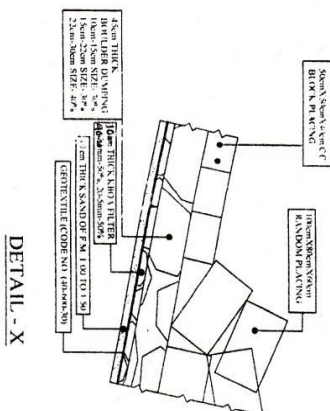
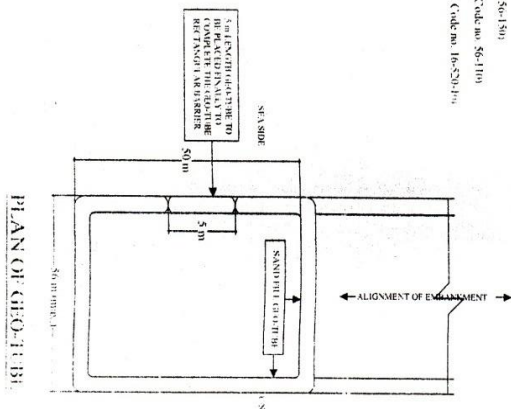
Annexure VII: BWDB Embankment Design



X-SECTION AT Km 9.050
CABLE FROM Km 0.000 TO Km 18.488



DETAIL - A
(NOT TO SCALE)



DETAIL - X

BWDB OFFICE OF THE SUPERINTENDING ENGINEER DESIGN CIRCLE - IV, DHAKA	
DESIGN FOR THE CONSTRUCTION OF COASTAL EMBANKMENT WITH SLOPE PROTECTIVE WORK WITH MOTORABLE PAVEMENT ALONG THE CHAR MOSSARAF, SHILPACHAR, SHADURCHAR AND PHERCHAR FROM Km.0.000 TO Km. 18.488 = 18.488 Km. TO PROTECT ECONOMIC ZONE OF MIRSARAI UPAZILA OUTSIDE THE EXISTING COASTAL EMBANKMENT OF FOLDER NO-6/2 AT UPAZILA - MIRSARAI DISTRICT CHITTAGONG IN CONNECTION WITH BANGLADESH ECONOMIC ZONES AUTHORITY (BEZA) UNDER CHITTAGONG O&M DIVISION-II, BWDR, CHITTAGONG.	DRAWN & DESIGNED Saeedul Bishwas (Graduate Engineer, A.E.)
CHECKED (Mr. Jibon Kumar Sarkar, J.E.) DATE: 07/05/2015	RECOMMENDED Saeedul Bishwas, S.E. (Saeedul Bishwas), S.E.
APPROVED (Mr. Jibon Kumar Sarkar, J.E.) DATE: 07/05/2015	APPROVED (Mr. Jibon Kumar Sarkar, J.E.) DATE: 07/05/2015

Annexure VIII: Traffic management Plan

1.0 Objective of the Plan

The objective of this plan is to provide guidance for management of traffic during construction and operation phase. This plan should be followed for management and smooth flow of the traffic and to prevent the accidents during construction and operation phase of the project

2.0 Current scenario of traffic in project area

At present project site is accessible through non motorable bund constructed as boundary/dike for Mirsarai EZ-I. A single lane road is being constructed on this bund for Mirsarai EZ site I. For Mirsarai EZ-II, it is proposed to widen the road to double lane to accommodate the traffic from EZ-II. This road will connect site to N-1 (Dhakka Chittagong Highway) through Abu Torab Road. The road is proposed to be widened in future by GoB. Traffic is increasing every year on this N-1. Bi-directional traffic volume on the highway in 2009 was recorded to be 56,32,798 whereas it was 32,06,277 in 2006. Average traffic growth rate of 21.03% is estimated as per the study carried out by BUET. Thus at present traffic with this growth rate at this highway is expected to be 5,75,12,557. The highway is has now been expanded from 2 lane to 4 lane which has improved the traffic condition drastically and has reduced travel time between the two cities (Dhaka & Chittagong)

3.0 Responsibility and Authority

EHS cell head, environmental & safety officers along with traffic Marshals will be responsible for safe traffic operation during the construction and operation phase of the project. Roles and responsibility is defined below.

Activity	Responsibility and Supervision
Construction Phase	
Managing hours of vehicle movement carrying material and debris (non peak hours), designating the route & marking the ways	Environment and safety officers & EHS cell head
Provision of boards and signage for guiding the way and instruction for speed limits, no honking & safe driving practice along the access road and haulage roads	Environment and safety officers & EHS cell head
Provision of self defensive training to rivers	Environment and safety officers & EHS cell head
Provision of traffic management training to traffic marshals	Environment and safety officers & EHS cell head
Checking the records of the vehicles enter and left from the register kept at entry gate	Environment and safety officers & EHS cell head
Ensuring vehicles and pedestrians are following the designated paths	Traffic Marshals & Environment and safety officers
Minimizing the vehicular movements within the site	Traffic Marshals & Environment and safety officers
Ensuring parking of the vehicle and construction equipment at designated place	Traffic Marshals & Environment and safety

	officers
Turning vehicle, sign and no honking at site	Traffic Marshals & Environment and safety officers
Ensuring all vehicles entering the premises carry PUC	Traffic Marshals & Environment and safety officers
Operation Phase	
Survey of vehicles on the access road to the project to know the traffic count and the condition of the road	Environment and safety officers
Ensuring the signage are provided everywhere for safe driving practices, speed limits, directions	Environment and safety officers
Ensuring the parking lots are being used for parking and no parking is being undertaken at unauthorized location	Traffic Marshals & Environment and safety officers
Checking entry and exit register of the vehicles	Traffic Marshals & Environment and safety officers
Ensuring all vehicles entering the premises carry PUC	Traffic Marshals & Environment and safety officers

4.0 Traffic Control Devices

Traffic control device used to regulate the traffic in Road Construction Zones include

1. Road sign
2. Delineators
3. Barricades
4. Cones
5. Pylons
6. Pavement marking
7. Audio visual flash lights
8. Electric rope lights

Suggested plan for designing signage at minimum sightline distance is given below

Average speed (km/hr)	Distance of first sign in advance of the first channelizing device (m)	Size of Warning Sign (mm)	Minimum no of signs in advance of the hazard
Under 50	100	600	3
51-60	100-300	750	3
61-80	120-300	900	3/4
81-100	300-500	1200	4
Over 100	1000	1200-1500	4

5.0 Dress code and necessary qualification of Flagmen

Flagmen are required for guiding and maintaining the flow of the traffic. Flagmen should have some minimum qualification and should be mentally alert and good in physical condition. Dress code of the flagmen should be as follows

1. Yellow helmet with green reflective sticker fixed around and reflective jacket along with hand signalling devices such as flags/batten Lights/sign paddles.
2. Flagman shall stop the traffic for a short while whenever required (e.g. For entry and exit of construction equipment in to work zone)
3. Flagman should be positioned in a place where he is clearly visible to approaching traffic and at a sufficient distance to enable the drivers to respond for his flagging instructions. A flagman never leaves his post until properly relieved
4. The standard distance shall be maintained at 60 – 100 m but can be altered depending upon the approach speed and site conditions. In urban areas this distance shall be taken as 20 m to 50 m.

6.0 Traffic Management for Construction Phase

Construction equipment and vehicle expected at the site majorly includes Road rollers, graders, compactors, excavators (back hoe), hydra/loading truck, transit mixers, crane, dumpers and trucks. Following things will be checked for every equipment and vehicle and driver

1. Valid Driving license
2. PUC Certificate
3. Maintaining speed limits (10 kmph within site and 15-20 kmph outside site)
4. Vehicle fitness (brakes, mirrors, lights, wind screen, indicators, horns, exhaust, tyres etc)
5. Parking of vehicle to be undertaken at authorized location and for authorized vehicle
6. Following of designated path by the vehicle within the site
7. Fastening of Seat belt for the driver and the person sitting in the front seat of a vehicle is a must. Drivers of cranes, fork lift trucks and similar vehicles are exempted from this requirement of the seat belt. If seat belt is available in the back seat, this must be used
8. No overtaking of any vehicle is permitted inside & outside of construction site. However heavy vehicles like crane, tractors, dumpers and others can be overtaken with proper warnings, signals and considering the movement of the traffic nearby.
9. Use horn to warn the nearby traffic judiciously. It is desirable to blow horn in 2 or 3 small blasts instead of one full blast so that traffic ahead may not panic and lead to an accident. Condition of the horn should be perfect and can be checked as an item of daily checklist. Every vehicle must have a reversing horn.
10. No speed breakers within the site but rumble strips will be provided to check the speed
11. No driver noted consuming alcohol, drugs, sleeping pills, anti histamins and other item will be allowed within the site
12. Drivers should be given self defence training from time to time which should focus on do's and don'ts for the drivers like regarding alertness, awareness, driving during bad weather conditions & night time and safety guidelines.

Apart from the above checklist items, a system of permit should be developed at construction site. The vehicle should be given permit to enter within the site only if it meets the following requirement

- a. All the vehicles entering the site should be in good condition which is ensured by security department
- b. Any vehicle entering the site shall undergo necessary security check as per security requirements and will be issued a vehicle access permit

- c. All permanent vehicles, which are required to ply in the site regularly, are issued a VAP for specific period decided by the security department.
- d. All temporary vehicles also will be issued VAP as per security guidelines
- e. The vehicle access permit should be visibly displayed on the windshield
- f. All vehicles involved in the excavation and/or demolition process and departing the property with demolition materials, spoil or loose matter must have their loads fully covered before entering the public roadway
- g. The vehicle entering in the site can be inspected by the environment and safety officers

6.1 Special guidelines for heavy construction equipment and vehicles

All the heavy vehicles like cranes, trucks, tractors and others should be run in a safe manner so other traffic is not exposed to any accidental hazard.

- a. Proper warning signals like a flag of red cloth and lights on all the sides of the vehicle to guide nearby traffic.
- b. All cranes above 75 tones capacity should be protected in the front as well as back to guide the traffic on the road.
- c. Speed should be maximum 10 km/ph and at turning proper care should be taken
- d. Vehicle entry permits to be raised for entry into sites.
- e. The driver of heavy vehicle must report to the security guard at the entry gate. The guard shall check the necessary details and if satisfied, then allows the entry. These checks however shall not relieve the driver from his responsibilities of meeting other legal provisions that may cover the transportation of such vehicles.
- f. Cargo on trucks and trailers should be properly secured so that they should not fall out from truck / trailer. No material should protrude out of truck, which can cause injury or damage to property
- g. Whenever a crane is moving from one place to another, the boom or jib must be hooked onto the crane's body. When not in use, all cranes must be parked in a safe manner

6.2 Pedestrian Safety

Pedestrians are exposed to many dangers on the road and have become victims of many accidents. On a road, the maximum danger is to the pedestrian. The following are some basic rules to be complied with by pedestrians and traffic managers at site for avoiding any accident.

- a. Traffic marshals and flagmen at site should ensure that pedestrian always walk on the edge of the road, marked by white line or on the designated routes only and keep vehicles off from pedestrian walkway
- b. If no marking, walk single file on the extreme edge of the road facing the oncoming traffic, so that you can keep a watchful eye on the traffic and not get hit from behind.
- c. Keep your eyes on pot holes and other obstacles in your way.
- d. While crossing the road use zebra crossing wherever available. If a zebra crossing is not available, choose a safe point where traffic is clearly visible on both sides. Never cross at a blind curve.
- e. At an intersection, never try to cross diagonally.

7.0 Traffic Management for Operation Phase

It is anticipated traffic of app. 600 PCU will increase after project development. Thus it is required to manage the traffic to prevent congestion and the accidents on access roads and in internal roads. Following should be done for managing the traffic

- 1. Position of flagmen at required locations like entry/exit, turns, diversions etc
- 2. It should be ensured that signage is provided adequately regarding directions, speed limits, diversions, turns etc.
- 3. Speed on access roads and internal roads should be 10-15 kmph
- 4. Vehicle entering the site should be checked for fitness and availability of PUC prior entering the site by traffic marshal/environment or safety officers

5. Use of horn should be prohibited at the site
6. Parking area should be kept free always and no vehicle should be allowed to park on road
7. Every industry should provide dedicated loading and unloading area to prevent parking of vehicle on road
8. Checklist for vehicle entering the site should be maintained
9. Accident in case, if it occurs should be recorded and reported in monthly SHE report

Annexure IX: Attendance Sheet of PCM

Village Charsharad

24/5/16

Distance from access road = 200 m
" " EZ = 6 km.

Occupation - Housewives, agriculture (farmers), student.

① ~~Manoj~~

① Nural Islam - কুরআন শিক্ষা - 01720549698

② Protisha Kani das - সত্যিনাথ দাস

③ Shojib Chandra das - সজিব দাস - 01864535688

④ Laha

④ Lalul das - লালুল দাস

⑤ Milon das - মিলন দাস - 01811624891

⑥ Nidhir das - নিখির দাস

⑦ Badul das - বাদুল দাস - 01827475088

⑧ Shadesh das - শাহেশ দাস

⑨ Uthpal das - উতপাল দাস

⑩ Depak das - দিপক দাস

⑪ Shojib das - সজিব দাস

⑫ Ranjit das - রঞ্জিত দাস

⑬ Mintu das - মিন্টু দাস - 01817710773

⑭ Dilip das - দিলিপ দাস

Charshand - 2nd

Name	Phone	Occupation	Signature
Aysey Begum	01832809442		আয়স বেগম
সাহিনা বেগম	নাই		সাহিনা
সাহিনা বেগম	01839396025		সাহিনা
সুমনা বেগম	নাই		
আব্বাস খান	নাই		
আমীয়া বেগম	01826152474	সহকারী	আমীয়া বেগম
সুকিয়া বেগম	01813833076	চাকরী	সুকিয়া আব্বাস
Jahonor Begum		housewife	
Aisha Begum Begum		housewife	
Halima Begum		housewife	
Abdul Johar		student	আব্দুল জাহার
Ruma Akthar		housewife	
Rayan hagg			রায়ান হাগ
Rehman Otalaka		Tree culty labour	
Jalaka		Fisher man housewife	

Mamata Das	Home wife	}	}	32/10/15
Sujata Das	"			
Mayuri Das	"			
Fatima Rani Das	"			
Shashi Rani Das	"			

happin agriculture

24/5/16

PCM- Near Baman Sunder.
Canal Sluice Gate - near Site.

Fishermen + Local People.

Jahangir Alam. - JAHANGIR ALAM.

Mohammad Zabal. ZABIHULLAH

Mohammad Shahidul Hussain - SHAHIDUL HUSSAIN

Mohammad Shahidul Hussain

Jagathosi -

Mohammad Ashraf ul - ASHRAF UL HASAN

Mohammad Shahidul Alam

Mohammad Azad Ali - AZAD ALI

Rish - Rishon

Ali

Dilwar Hussain -

Date: 12/11/2018

Sl. No.	Name	Mobile No.	Signature
1	MR. BELAL HUSSAIN	01827075264	
2	MR. EASHED	01819110157	
3	MR. MATHAAR HUSSAIN	01816326125	
4	MR. AHAMUL HAQ	01824543585	
5	MR. ROHUL AMIN	01810302390	
6	MR. NURUL AMIN		
7	MR. ABDUL KHALAK	01881014865	
8	MR. JHODUL DELAM	01857226671	
9	MR. OBISUL HAQ	01857826609	
10	MR. NUR KORIM		
11	MR. ABUL KHARA	01874414488	
12	MR. SHAMUS HAQ	01859027432	
13	MR. JONAL ABDIN	01877318572	
14	MR. JAMAL UDDIN	01881474503	
15	MR. KAMAL UDDIN	01860148307	
16	MR. SHOBUR	01892308120	
17	MR. SHARUK FAHMAN	0180022607	
18	MR. JHODUL HAQ	01850154861	
19	MR. FARUK		
20	MR. ANWARA BAGUM	01876684006	
21	MR. EALISH		
22	MR. MUCANA BAGUM		
23	MR. RASHIDARA		
24	MR. JAHADA AKTAR		
25	MR. NUR NAHAR		
26	MR. MOMENA KARTUN		
27	MR. SHARUK AKTAR	01846774357	
28	MR. RUMA	01851673264	
29	MR. NUR HUSSAIN	01884107115	
30	MR. DAMRAN UDDIN	01850196397	
31	MR. BOSTER HUSSAIN	0186762278	

WARD: 07 UNION: TEHRAHAWALI - 6 NAUKA, EAST JAMARU, DISTRICT: CHANDERNAGAR

TIME: 07:45 PM 25 MAY 16

Sl. No	NAME	MOBILE NO.	SIGNATURE
01	MD. TOFAR HANMAD	-	-
02	M. MANIK	-	-
03	" EBRAHIM	- 01858681711	-
04	" SAIFUL ALOM	- 01829566025	-
05	" ABDE RAHMAN	- 01794668229	- <i>Abdur Rahman</i>
06	" KHOSRA ALOM	-	- <i>Khosra</i>
07	" SALISH	-	- <i>Salish</i>
08	" RAZUL HAQ	- 01815702252	- <i>Razul Haq</i>
09	" ABDUL HALIM	- not	-
10	" MIJBOUL HAQ	- 01854997201	- <i>Mijboul Haq</i>
11	" ABDUL HALIM FARUK	- 01818950477	- <i>Abdul Halim Faruk</i>
12	" YEAC HIN	- 01892809742	- <i>Yeac Hin</i>
13	" YUSUB	- 01876812976	- <i>Yusub</i>
14	" ABDEL ARZISE	- not	-
15	" ABDUS SATTA	- 01868907405	- <i>Abdus Satta</i>
16	" ALI	- 01826152474	- <i>Ali</i>
17	" SALHUDDIN	- 01854350489	- <i>Salahuddin</i>
18	" BAGUL CHANDRO	- 01827475088	- <i>Bagul Chandro</i>
19	" MD APON	- 01819120548	- <i>MD Apon</i>
20	" EBRAHIM KHOLIL	- 01897595815	- <i>Ebrahim</i>

Annexure X-Construction and Labour Camp Management Plan

1.0 Objective of the Plan

The objective of this plan is to provide guidance to the contractor or other agency involved in setting up of the construction and labour camp for keeping the health & Safety of workers and impacts of setting up such camps on the local community in consideration while developing and establishing such camp. This plan is prepared in reference to the Workers accommodation: processes and standards (A guidance note by IFC and EBRD). The plan aims to promote “safe and healthy working conditions, and to protect and promote the health of workers.”

2.0 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 500 m shall be maintained from the habitations, sensitive locations like temple, school & hospitals, forest areas and other eco-sensitive zones for setting up such facilities.

3.0 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
- 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
- Fire-fighting Facility
- Emergency Response Area

3.1 Attendance & Working hours

Supervisor of the camp should take the attendance of the employee at each camp twice in a day (morning and evening) and should maintain the record. Further work hours of the workers should be maintained in accordance to the labour law and as mentioned in the labour licence. 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.

3.2 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. 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, no smoking zone and associated risks. Plant operation shall be restricted to 6:00 Am to 10:00 PM

3.3 Clean Water Facility

Potable water shall be provided for construction labour for drinking & cooking purpose. Clean water shall be provided for bathing, cleaning and washing purpose. Water quality

testing for drinking water provided for workers shall be carried out on monthly basis. Water dispensers should be cleaned on monthly basis. Adequate water per person should be provided at site for drinking, cooking, bathing, cleaning and other use purpose

3.4 Clean Kitchen Area

Provision of clean kitchen area for cooking and storage of eatables shall be provided. Clean fuels like LPG shall be provided for cooking purpose. Burning of firewood, garbage, paper and any other material for cooking or any other purpose shall strictly be prohibited at the site. Separate utensil washing area should be provided with proper drainage system. Kitchen waste should be daily cleaned and disposed off. Water storage facility at kitchen should be covered and cleaned on monthly basis. Kitchen area should be away from washing, toilets and bathing area.

Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.

3.5 Clean Living Facility for the Workers

Workers should be provided with proper bedding facility. Single bed should be provided to each workers and each bed should be at least 1 m apart from another. Double deck bedding should be avoided, in case provided, 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 caused 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, PPE should be provided. Proper ventilation through mechanical systems and lighting system should be ensured in construction camps.

3.6 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 exceed 1 unit per 15 person. Toilets and bathing facility should be closed 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 sewage generated. 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. The area should be guarded by security guard to minimize the crime and thefts.

3.7 Waste Management Facilities

Waste generated 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 authority responsible in area 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.

3.8 Rest Area for Workers at Site

A rest area/shelter shall be provided at the site for construction workers where they can rest after lunch time and shall not 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 provided shall be on the basis of at least 1.0 Sq. m per head.

3.9 Adequate Illumination & Ventilation

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

3.10 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.

3.11 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 Factory's Law. Ambulance/ 4 wheeler motorized vehicle shall be available at the site for carrying injured to the nearby hospital. Tie-ups should be made with nearby hospital to handle emergency, if any. Nos. of ambulance, doctors and nearby hospitals shall be displayed in first-aid room, site office & 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.

3.12 Crèche Facility & Play School

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.

3.13 Fire-Fighting facilities

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 NBC norms. Personnel trained in handling fire fighting 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.

3.14 Emergency Assembly Area

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

4.0 Activities prohibited at site

Activities which should be strictly prohibited at site shall include

- Open burning of wood, garbage and any other material at site for cooking or any other purpose
- Disturbance to the local community.
- Adoption of any unfair means or getting indulgence in any criminal activity

- Non compliance of the safety guidelines as communicated by safety officials and during the trainings
- Adoption and proper usage of PPEs all the time as required
- Operation of the plant and machinery between 10 pm to 6 am unless approved by team leader
- No animal (wild or domestic or bird) shall be harmed by any construction worker in any condition at site and nearby areas
- Cutting of tree without permission of team leader/authorized person
- No indigenous population shall be hurt or teased

5.0 Guidelines for night time working at the site.

No activity generating noise shall 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 be well illuminated to 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.

6.0 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.

7.0 Auditing & Inspection

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

8.0 Grievance redressal System

CA 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.

9.0 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 practice happening at site and nearby area. Guards should be trained to handle emergency situations like fire fighting and should be responsible to contact the emergency personnel in case of any emergency.

10.0 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

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

5. Tree plantation to be carried out, if any required for stabilizing the area
6. Any pit excavated shall be filled back
7. Closure of the site and labour camp shall be approved by authorized person.

Annexure XI-Construction Debris Management Plan

1.0 INTRODUCTION

Waste will be generated from the construction site and labour camps during the construction phase. Type of the waste to be generated during construction phase is given below.

Dredged Material

Dredging shall be carried out in the sea for obtaining sand for filling the land. Dredged sand should be as per the requirement only. Excess dredged material shall not be disposed off near the shore or along the Isakhali canal. Dredged material should be tested for toxicity prior usage for filling purpose. No dredging should be carried out during spawning period of Hilsa (September to October) and should strictly be avoided during 15-24 October which is peak season for Hilsa spawning (Fifth National Report of Bangladesh to the Convention on Biological Diversity, DoE, MoEF, GoB).

Construction Waste

Construction waste will comprise of broken bricks, dry cement, discarded timber, metal piece, cement bag, dry asphalt/bitumen, glass, paint/varnishes box etc. These wastes should be segregated into recyclable and non-recyclable waste. Recyclable waste shall be stored in the covered area and shall be sold to authorized vendors regularly. Non-recyclable waste shall be disposed at approved debris site in covered vehicles.

Municipal Waste

Municipal waste will be generated from labour camp. Dustbins for recyclable and non-recyclable waste shall be provided in labour camp area. Recyclable waste shall be sold to authorized vendors and non-recyclable shall be disposed through authorized agency in area responsible for waste collection and management.

Waste generated requires proper management so as to minimize the negative impacts on environment. Concept of reduce, re-use and recycle shall be followed at site. The rejected waste should be disposed in a secured manner. Thus a site should be identified for disposal of the rejected waste.

1.1 SELECTION OF DISPOSAL SITES:

The locations of Disposal sites have to be selected such that:

- Disposal sites are located at least 1000 m away from sensitive locations like settlements, water body, notified forest areas, wildlife/bird/dolphin sanctuaries or any other sensitive locations.
- Disposal sites shall not contaminate any water sources, rivers, sea etc so the site should be located away from water body and disposal site should be lined properly to prevent infiltration of water.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location.
- Permission from the village/local community is to be obtained for the Disposal site selected.
- Environment Engineer of PMC and Executive Engineer of Contract Management Unit must approve the Plan before commencement of work.

1.2 PRECAUTIONS TO BE ADOPTED DURING DISPOSAL OF DEBRIS / WASTE MATERIAL

The Contractor shall take the following precautions while disposing off the waste material.

- During the site clearance and disposal of debris, the Contractor will take full care to ensure that public or private properties are not affected, there is no dwellings around the dumpsite and that the traffic is not interrupted.
- The Contractor will dispose debris only to the identified places or at other places only with prior permission of Engineer-in-Charge of works.
- In the event of any spoil or debris from the sites being deposited on any adjacent land, the Contractor will immediately remove all such spoil debris and restore the affected area to its original state to the satisfaction of the Engineer-in-Charge of works.
- The Contractor will at all times ensure that the entire existing canal and drains within and adjacent to the site are kept safe and free from any debris.
- Contractor will utilize effective water sprays during the delivery and handling of materials when dust is likely to be created and to dampen stored materials during dry and windy weather.
- Materials having the potential to produce dust will not be loaded to a level higher than the side and tail boards and will be covered with a tarpaulin in good condition.
- Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after the discussion with local people and with the permission of Engineer-in-Charge of works.
- During the debris disposal, Contractor will take care of surrounding features and avoid any damage to it. The debris should not be disposed along the bridges & culverts and near the water bodies.
- While disposing debris / waste material, the Contractor will take into account the wind direction and location of settlements to ensure against any dust problems.
- Contractor should display the board at disposal site stating the name of project, usage of the site and type of debris being disposed.
- A guard shall be kept at disposal site to prevent any unauthorized disposal of waste at the debris disposal site
- Material should be disposed through covered vehicles only
- No contaminated/hazardous/e-waste shall be disposed at the debris disposal site

1.3 RECORD KEEPING

Site approved by site engineer only can be used as disposal site. Record of all such site should be maintained along with the area of disposal site, type & quantity of material disposed daily and capacity of disposal site.

1.4 GUIDELINES FOR REHABILITATION OF DISPOSAL SITES

The dumpsites filled only up to the ground level could be rehabilitated as per guidelines below and to be decided by the Engineer and the supervision consultant.

- The dumpsites have to be suitably rehabilitated by planting local species of shrubs and other plants. Local species of trees has also to be planted so that the landscape is coherent and is in harmony with its various components.
- In cases where a dumpsite is near to the local village community settlements, it could be converted into a play field by spreading the dump material evenly on the ground. Such playground could be made coherent with the landscape by planting trees all along the periphery of the playground.
- Closure of the disposal site should be upto the satisfactory level of site engineer

1.5 PENALTIES

Stringent action & penalties should be imposed off on contractor for dumping of materials in locations other than the pre-identified locations. Grievance Redressal mechanism should be in place for taking note and action on such complaints.

Annexure XII-Borrow Area Management Plan

1.0 Introduction

Borrow areas will not be required for project as source of sand is sea and river. In case borrow area are required following plan should be followed. Borrow areas shall be finalized as identified by Contractor as agreed by the PMC and BEZA as per the requirements of the contract. Consent from land owners shall also be taken prior undertaking any excavation. The Contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations. Contractor should submit borrow area establishment plan along with the locations marked in map and the environmental settings of the planned area to PMC/BEZA for approval of the “Engineer” through RFI.

- 1) The borrow area should not be located in agriculture field unless unavoidable i.e. barren land is not available.
- 2) The borrow pits should not be located along the roads, close to project site
- 3) The loss of productive and agricultural land should be minimum.
- 4) The loss of vegetation is almost nil or minimum.
- 5) Sufficient quality of soil is available.
- 6) The Contractor will ensure the availability of suitable earth.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme as approved by the concerned Engineer. It shall be ensured that the fill material compacted to the required density. The Contractor shall submit the following information to the Engineer for approval at least 7 working days before commencement of compaction.

- The values of maximum dry density and optimum moisture content obtained in for each of the fill materials he intends to use.
- A graph of density plotted against content from which, each of the values in (i) above of maximum dry density and optimum moisture content are determined.

After identification of borrow areas based on guidelines and full filling the following requirements are to be fulfilled

- Quantification of Earth
- Land Agreement with land owner
- Clearance from local authorities

After receiving the approval Contractor will begin operations keeping in mind following:

- Haulage of material to the areas of fill shall proceed only when sufficient spreading and compaction plants are operating at the place of deposition.
- No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material from

the site to suit his operational procedure, then he shall make good any consequent deficit of material arising there from.

- Where the excavation reveals a combination of acceptable and un-acceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.
- The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.

1.1 Borrow Area Management

Borrow areas located in different land will require different management. Management measures to be taken in different land types are given below.

1.1.1 Borrow Areas located in Agricultural Lands

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrowing of earth will be carried out up to a depth of 1.5m from the existing ground level.
- Borrowing of earth will not be done continuously throughout the stretch.
- Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
- Small drains will be cut through the ridges, if necessary, to facilitate drainage.
- The slope of the edges will be maintained not steeper than 1:4 (Vertical: Horizontal).

1.1.2 Borrow Areas located in Agriculture Land in un-avoidable Circumstances:

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.

1.1.3 Borrow Areas located on Elevated Lands

- The preservation of topsoil will be carried out in stockpile
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- At location where private owners desire their fields to be levelled, the borrowing shall be done to a depth of not more than 1.5m or up to the level of surrounding fields.

1.1.4 Borrow Areas near Riverside

- The preservation of topsoil will be carried out in stockpile

- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrow area near to any surface water body will be at least at a distance of 15m from the toe of the bank or high flood level, whichever is more.

1.1.5 Borrow Areas near Settlements

- The preservation of topsoil will be carried out in stockpile
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrow pit location will be located at least 0.75 km from villages and settlements. If unavoidable, the pit will not be dug for more than 30 cm and drains will be cut to facilitate drainage.
- Borrow pits located in such location will be re-developed immediately after borrowing is completed. If spoils are dumped, that will be covered with layers of stockpiled topsoil in accordance with compliance requirements with respect MOEF&CC/CPCB guidelines.

1.1.6 Borrow Pits along the Roads

- The preservation of topsoil will be carried out in stockpile
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrow pits along the road shall be discouraged.
- If permitted by the Engineer; these shall not be dug continuously.
- Ridges of not less than 8m widths should be left at intervals not exceeding 300m.
- Small drains shall be cut through the ridges of facilitate drainage.
- The depth of the pits shall be so regulated that its bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of bank, the maximum depth of any case being limited to 1.5m.
- Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10m.
- Minimum distance from road/ railway should be 50 metres.

1.1.7 Re-development of Borrow Areas

The objective of the rehabilitation programme is to return the borrow pit sites to a safe and secure area, which the general public should be able to safely enter and enjoy. Securing borrow pits in a stable condition is fundamental requirement of the rehabilitation process. This could be achieved by filling the borrow pit approximately to the road level.

Re-development plan will be prepared by the Contractor before the start of work in line with the owner's will and to the satisfaction of owner.

The Borrow Areas will be rehabilitated as follows

- Borrow pits will be backfilled with rejected construction wastes (unserviceable materials) compacted and will be given a turfing or vegetative cover on the surface. If this is not possible, then excavation slope should be smoothed and depression is filled in such a way that it looks more or less like the original ground surface.
- Borrow areas might be used for aquaculture in case landowner wants such development. In that case, such borrow area will be photographed after their post-use restoration and Environment Expert of Supervision Consultant will certify the post-use redevelopment.
- The Contractor will keep record of photographs of various stages i.e. before using materials from the location (pre-project), for the period borrowing activities (Construction Phase) and after rehabilitation (post development), to ascertain the pre and post borrowing status of the area.

Annexure XIII-Green Belt Development Plan

1.0 Introduction

No tree cutting is proposed to be undertaken as per the current proposal of the EZ development. It is proposed to develop green buffer along the periphery and along the canal. The plantation in the green buffer should be carried out in accordance to the following guidelines

1.1 Pattern of the green belt

A green belt of width 30 m is suggested to be developed all along the boudary of EZ and along Isakhali channel. 6 rows of plantation can be planted in this buffer. Native plantation of the region should be planted. The green belt should consist of herbs, shrubs, short-medium height trees and tall trees. First two rows should be planted with herbs and shrubs. Next two rows should be short to medium heighted trees and last two rows should be planted with tall trees. Space of 1X1 m should be kept for planting herbs, space of 3X 3 m should be kept for planting shrubs and small heighted trees and space of 5X 5 m should be kept for planting medium and tall trees. The pits are then filled with earth, sand, silt and manure in pre-determined proportions. Saplings planted in such pits are watered liberally during dry months. The pits are to be filled with earth, sand, silt and manure in pre-determined proportions. Saplings planted in such pits are watered liberally during dry months.

1.2 Selection of Tree Species

The Project involve movement of vehicle for transportation of material Thus emissions like particulate matter, SO₂, NO_x & CO shall be generated at site. Also there is potential of generation of coal dust while unloading the materials at stock piles. Thus the plantation species tolerant to these pollutants and mitigate these from air shall be planted. Species selecting criteria is given below:

1. Native species including Mangroves
2. Tolerant to expected pollutants at site
3. Longer duration of foliage
4. Freely exposed foliage (adequate height of crown, openness of foliage, big leaves, small stomata apertures, stomata well exposed)
5. Leaves supported on firm petioles

1.3 Recommended Plant species

Based on nature of pollutants following tree species are recommended to be planted

Species Name	Local Name	Family
Acacia moniliformes	Akashmoni	Leguminosae
Areca catechu	Supari	Palmae
Avecenia alba/ Avicennia Marinavierh	Baen	Aviceniaceae
Azadirachta indica	Neem	Meliaceae
Carica papaya	Pepay	Caricaceae
Cocos nucifera	Narikel	Palmae
Excoecaria agallocha	Gewa	Euphorbiaceae
Herritiera fomes	Sundari	Sterculiaceae
Mangifera indica	Aam	Anacardiaceae
Manilkara zapota	Safeda	Zapotaceae

<i>Phoenix sylvestris</i>	Khejur	Palmae
<i>Psidium guajava</i>	Peyara	Myrtaceae
<i>Sonneratia apetala</i>	Kewda/Keora	Lythaceae
<i>Spondius pinnata</i>	Amra	Anacardiaceae
<i>Swietenia mehogoni</i>	Mehogani	Meliaceae
<i>Syzygium cumini</i>	Jaam	Myrtaceae
<i>Syzygium samarengense</i>	Jamrul	Myrtaceae
<i>Tamarindus indica</i>	Tentul	Leguminosae
<i>Terminalia catapa</i>	Kathbadam	Combrataceae
<i>Tectonia grandis</i>	Teak	Lamiaceae
<i>Gmelina arborea</i>	Gamari	Verbenaceae
<i>Brassica juncea</i>	Raisharisha	Brassicaceae
<i>Olea europaea</i>	Olives	Oleaceae
<i>Terminalia bellirica</i>	Bohera	Combretaceae
<i>Terminalia chebula</i>	Horitoki	Combretaceae
<i>Phyllanthus emblica</i>	Amla	Phyllanthaceae
<i>Protium serratum</i>	Gutgutiya	Burseraceae
<i>Propospis cineraria</i>	Jand	Fabaceae
<i>Casuarina equisetifolia</i>	Jhao Ghas	Casuarinaceae
<i>Albizia lebbeck</i>	Koroi	Fabaceae
<i>Delonix regia</i>	Krishnachura	Fabaceae
<i>Leucaena leucocephala</i>	Ipil Ipil	Fabaceae
<i>Carissa carandas</i>	Karamcha tree	Apocynaceae
<i>Artocarpus heterophyllus</i>	Jack fruit	Moraceae
<i>Polyalthia longifolia</i>	Pseudo Ashoka	Annonaceae
<i>Musa parasisiaca</i>	Banana	Musaceae
<i>Garuga pinnat</i>	Bhadi	Burseraceae
<i>Abelmoschus esculentu</i>	Bhendi	Malvaceae
<i>Erythrina indica</i>	Mandar	Fabaceae
<i>Acacia mangium</i>	Mangiam	Fabaceae
<i>Dalbergia sissoo</i>	Sheeshu	Fabaceae
<i>Lawsonia inermis</i>	Kat Mehndi	Lythraceae
<i>Swietenia mahagony</i>	Mahagony	Meliaceae
<i>Arundinaria</i>	Cane Ghas	Poaceae
<i>Samanea saman</i>	Rain Tree	Fabaceae
<i>Zizyphus mauritiana</i>	Boroi	Rhamnaceae
<i>Calotropis</i>	Calotropis	Apocynaceae

Ceriops decandra	Gora	Rhizophoraceae
Litchi chinensis	Litchi	Sapindaceae
Ficus benjamina	Dumur	Moraceae
Citrus maxima/Citrus grandis	Jambura	Rutaceae
Mimosa pudica	Lazzabati	Fabaceae
Pinus densiflora	Pine	Pinaceae
Excoecaria agallocha	Gewa	Euphorbiaceae
Nypa fruticans	Golpata	Arecaceae
Heritiera littoralis	Sundri	Lauraceae

1.4 Plantation Methodology

Components of green belts on roadside fence should be both absorbers of gases as well as of dust particles, including even lead particulates. Thus the choice of plants should include pollution tolerant shrubs of height 1 to 1.5 m and trees of 3 to 5m. The intermixing of trees and shrubs should be such that the foliage area density in vertical is almost uniform. For effective removal of pollutants, it is necessary that (i) plants should grow under conditions of adequate nutrient supply, (ii) absence of water stress and (iii) plants are well exposed to atmospheric conditions (light & breeze).

Multiple rows of green belt shall be developed. Green belt should be pyramidal in shape. Plantation pattern shall be kept as given below:

- Short trees and tall shrubs shall be planted as first row (from road) followed by tall tree plantation which will be followed by another row of medium and small trees and tall shrubs.
- Planting of trees should be in appropriate encircling rows, each rows alternating the previous one to prevent further fanning and horizontal pollution dispersion;
- Since tree trunks are normally devoid of foliage, it would be appropriate to have small shrubs in front and in between the tree spaces;
- The open areas between the process installations where trees cannot be planted should be covered with lawn grasses for effective trapping and absorptions of air pollutants.
- Fast growing trees with thick canopy and perennial foliage should be selected so that the effective tree height with envisaged objective will be attained in minimum span of time

1.5 Time of Plantation

Plantation of the tree sapling should be done only after the first shower during the rainy season. The best time for plantation is after 15 days from the day of first shower during rainy season.

1.6 Protection of Tree saplings

Circular tree guard should be placed after the plantation of the saplings for the protection of these young plants from the ravages of cattle, sheep and goat and other animals. If tree saplings died or damage occur after placing the circular tree guard, timely replacements of damaged plant and thereafter care is important.

1.7 After Care & Monitoring

The growing plants are cared at least for the first two years under favourable conditions of climate and irrigation. Nutrients in pits are supplemented and the juveniles provided protection.

Thinning shall start after the stand is 3-4 years old and repeated every 4 years until the stand is 15 years old. Between 15-25 years old, thinning should be conducted every 5 years and after 25 years old, thinning shall be done after every 10 years. When the canopy closes, at about 6 years, 30-40% of the stems shall be thinned to selectively remove suppressed, diseased and badly formed trees.

Periodic assessment shall be carried for survivability of the trees. Minimum 70% survival rate shall be achieved.

1.8 Records Keeping & Reporting

The following records shall be maintained:

1. Record of Tree plantation
2. Record of Survivability rate

Inspection shall be carried out at site to know the survival rate of the plantation. The tree plantation and survivability report shall be prepared every six monthly.

1.9 Responsibility

Compensatory plantation shall be carried out by forest department. Survival rate of plantation shall be inspected of the by BEZA. Plantation within the terminal/jetty/lock site shall be carried out by BEZA and shall be monitored by BEZA.

Annexure XIV-Contingency Plan

1.1. INTRODUCTION

Disaster or emergency can be defined as any condition, man-made or natural, which results in a significant disruption to human life and materials. The on-set of most disasters is considered to be very rapid, allowing a minimum of time for preparation. The scale of a “disaster” is determined by the potential for loss of life, damage to facilities, and the amount of external resources necessary for the place of occurrence to return to its normal activities.

Many emergencies/disasters can occur on any construction site and need to be effectively handled. The environmental and occupational health and safety aspects and related emergency can include incidence such as Collapse / subsidence of soil / Fire / Explosion / Gas Leak, Collapse of Building / Equipment and other Occupational Accidents. On site and off site emergency management plan shall be developed to effectively handle them.

Thus every contractor shall have an approved on-site emergency plan. The contractor should submit a copy of this plan to BEZA and Supervision consultant before the start of the work. Contractor shall develop the onsite emergency plan considering the potential environmental, occupational health and safety emergency situation at site and activities involved. This plan shall include a list of these potential emergency situations in the onsite emergency preparedness & response plan. Contractor shall get the plan approved from BEZA/PMC

1.2. OBJECTIVES OF PLAN

The disaster control procedure lays down the efforts to be made to prevent fatal accidents, physical harm or injury to personnel and damage to equipment facilities materials during demolition and construction phase and protection against natural calamities in operational (post construction) phase.

Emergency prevention through good design, operation, maintenance and inspection are essential to reduce the probability of occurrence and consequential effect of such eventualities. However, it is not possible to totally eliminate such eventualities and random failures of equipment or human errors, omissions and unsafe acts cannot be ruled out. An essential part of major disaster/risk control has therefore, to be concerned with mitigating the effects of such Emergency and restoration of normalcy at the earliest.

The overall objective of a disaster management plan is to make use of the combined resources at the site and outside services to achieve the following:

- To localize the emergency and if possible eliminate it;
- To minimize the effects of the accident on people and property;
- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Evacuate people to safe areas (emergency assembly area should be provided);
- Informing and collaborating with statutory authorities;
- Initially contain and ultimately bring the incident under control;
- Preserve relevant records and equipment for the subsequent enquiry into the cause and circumstances of the emergency; and
- Investigating and taking steps to prevent reoccurrence

The DMP has therefore to be related to the identification of sources from which hazards can arise and the maximum credible loss scenario that can take place in the concerned area. Emergency need to be well planned so as they would require less effort and resources to control and terminate emergencies, should the same occur

1.3. REFERENCE DOCUMENTS

The potential emergency situations have been defined below for guidance purposes. The contractors can follow these for developing site specific on site emergency preparedness plan. The guidelines to be referred are tabulated below

Reference Document	Remarks
IFC Guidelines- Environment, Health & Safety Guidelines (General)	Technical reference document for guidance of general health & safety measures to be taken for general industries, construction and other such activities
IFC Guidelines- Environment, Health and Safety Guidelines for Ports, Harbors and Terminals	Act as reference document which provides guidance for incorporation of RHS measures during EIA study of the Ports, Harbours& Terminals

1.4. ANTICIPATED EMERGENCIES AT CONSTRUCTION SITE

The potential emergency situations have been defined below for guidance purposes. The contractors can follow these for developing site specific on site emergency preparedness plan.

Emergency conditions / situations	Sources
Collapse / subsidence of soil	<ul style="list-style-type: none"> ▪ Civil structures
Bulk spillage	<ul style="list-style-type: none"> ▪ Hazardous substance / inflammable liquid storage ▪ Vehicular movement on highway
Fire and explosion	<ul style="list-style-type: none"> ▪ Inflammable Storage Areas ▪ Gas Cylinder Storage Areas ▪ Electrical Circuits ▪ Isolated Gas Cylinders (LPG / DA) ▪ Welding / Gas Cutting Activity
Electrical Shock	<ul style="list-style-type: none"> ▪ HT line ▪ LT distribution ▪ Electrically Operated Machines / Equipment / Hand Tools / Electrical Cables
Gaseous Leakage	<ul style="list-style-type: none"> ▪ Gas Cylinder Storage Areas ▪ Gas Cylinder used in Gas Cutting / Welding Purposes
Accidents due to Vehicles	<ul style="list-style-type: none"> ▪ Heavy Earth Moving Machinery ▪ Cranes ▪ Fork Lifts ▪ Trucks ▪ Workman Transport Vehicles (cars / scooters / motor cycles / cycles) ▪ Collapse, toppling or collision of transport equipment
Slips & Falls (Man & Material)	<ul style="list-style-type: none"> ▪ Work at Height (Roof Work, Steel Erection, Scaffold, Repair & Maintenance, Erection of equipment, Excavation etc.) ▪ Slips (Watery surfaces due to rain) ▪ Lifting tools & Tackles (Electric Hoist & Forklifts)
Collision with stationary/ moving objects	<ul style="list-style-type: none"> ▪ Vehicular movement

Other Hazards	<ul style="list-style-type: none"> ▪ Cuts & Wounds ▪ Confined Space (under & inside machinery etc.) ▪ Hot Burns ▪ Pressure Impacts (Plant contains several Pressure Vessels & pipefitting containing CO₂, air, water, product & steam, which can cause accidents & injuries to person around.)
Natural Hazards	<ul style="list-style-type: none"> ▪ Earthquake ▪ Flood/Cyclone

1.5. EMERGENCY RESPONSE PLAN

- Any emergency starts as a small incident and may become a major accident if not controlled in time. An adequate response by emergency response team is absolutely essential. The site coordinator will maintain a list of emergency handling equipment including details of fire extinguishers, protective clothing, and personal protective equipment for emergency handlers etc. In addition, details of the nearest fire management services and hospitals will be available with site controller in his operating checklist. Some of the emergencies anticipated at site apart from mentioned in section 1.3.

-

1.5.1. Emergency Response for Fire

- Immediate action is the most important factor in the emergency control because the first few seconds count. Take immediate steps to stop fire and raise alarm simultaneously. As fires develop and spread quickly, so all out efforts should be made to contain the spread of fire.

- Information about the fire should be given to the emergency control personnel immediately
- Fire brigade should be informed immediately about the fire incident
- Trained personnel in fire fighting should use the suitable fire extinguisher to fight the fire in safe manner
- All people should accumulate at emergency assembly point
- All vehicles except those that are required for emergency use should be moved away from the operating area in an orderly manner at pre nominated route.
- Electrical system except the lighting and fire fighting system should be isolated.
- Block all roads in the adjacent area and enlist police support for the purpose, if required.
- Any person injured should be given first-aid immediately and should be taken to hospital immediately in emergency vehicle/ambulance
- **Fire in Diesel Storage Area**
 - A fire at a small leak in pipeline must be attacked promptly with nearest available fire extinguisher before it has a chance to spread and get out of control. Call for help from all the available employees at the same time.
 - Work to keep the fire from spreading.
 - Shut off flow of oil in line by closing valves and by stopping pumping.
 - Cover the oil pool by sand and build up the pile of sand so as to cover the leak.
 - Put foam on the burning oil pool. Apply the foam gently so as not to scatter the burning oil.
 - Build earth dykes around the oil pool to prevent spreading of burning oil.
 - Do not leave oil trapped in short lengths of pipe exposed to fire between the closed valves, since, oil so trapped and heated often bursts the pipe and spills out spreading the fire.
 - Wet down adjacent structures to keep them cool.
-

1.5.2. Emergency Response for Earthquake

- Measures are different for different location in case of earthquake
- ***If in Outdoors***
 - Response Procedures for workers at site
 - Move into the open, away from buildings, streetlights, and utility wires. Once in the open, stay there until the earthquake stops.
- ***If in a moving vehicle:***
 - Stop quickly and stay in the vehicle. Move to a clear area away from buildings, trees, overpasses, or utility wires. Once the shaking has stopped, proceed with caution. Avoid bridges or ramps that might have been damaged by the quake.
- ***After the quake***
 - After the quake, be prepared for aftershocks.
 - Although smaller than the main shock, aftershocks cause additional damage and may bring weakened structures down. Aftershocks can occur in the first hours, days, weeks, or even months after the quake.
 - Help injured or trapped persons.
 - Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.
 - Remember to help those who may require special assistance--infants, the elderly, and people with disabilities.
 - Stay out of damaged buildings.
 - Use the telephone only for emergency calls.
- ***Response Procedure***
 - Inform the necessary authorities for aid.
 - Ensure no one is stuck beneath any debris, in case of a structural failure.
 - Ensure that all the people standing outside or near the buildings are taken to open areas.
 - Ensure that the first aid ambulance and fire tender vehicles are summoned if necessary.
 - Inform the nearby hospitals if there are any injuries.
 - Check the utilities and storage tanks for any damage.
-
- At the time of the emergency, the site coordinator and other workers along with the security personnel within the group housing shall take position to perform their duties. The following resources should be available with the site coordinator.
 - Copies of the DMP
 - Layout Plan of the site and fire evacuation plan
 - Location of emergency assembly area
 - Information regarding Safety Equipment, Fire Fighting material
 - List of emergency contact numbers like emergency contact person, fire brigade, nearby hospitals
 - Copies of the local Telephone Directories.
 - Personal Protective Equipment.
 - First-aid Kit.
 - Communication system like alarm system for fire, cyclone, flood and earthquake. The communication equipments should be checked periodically to ensure that they are functional.

1.5.3. Emergency Response for Cyclone/Flood

- Site lies in cyclone and fire prone area. Thus necessary measures are required to be undertaken in cyclone and flood conditions to manage the damage during emergency situation

- Regular contact to be maintained with local meteorological department to get the information regarding cyclone and flood
- In case of alert is issued the entire site should be evacuated
- The material which may release pollutants should be removed from site and should be shifted to safe location
- The site should not be occupied or work should not be started unless the danger is settled completely
- Information about the location of nearest cyclone shelter should be given to all the workers at site
- Entry to the site should be closed through barricading in case of flood and cyclones

1.6. DESIGN OF 'ON-SITE EMERGENCY PLAN'

- The 'On-site emergency plan' to be prepared by contractor and shall include minimum the following information:
 - Name & Address of Contractor
 - Updation sheet
 - Project Location
 - Name, Designation & Contact Numbers of the organization, nearby hospitals, fire agencies etc. and key personnel including their assigned responsibilities in case of an emergency.
 - The roles and responsibilities of executing personnel
 - Site Layout Diagram showing location of fire extinguishers, emergency collection area and fire alarm
 - Identification of Potential Emergencies Situations/ preventive measures / control & response measures
 - Location of Emergency Control Centre (or designated area for emergency control / coordination) with requisite facilities.
 - Medical services / first aid
 - List of emergency equipment including fire extinguishers, fire suits etc.

1.7. EMERGENCY CONTROL TEAM

- In order to combat emergencies, an organizational chart assigning different responsibilities to be carried out during emergency shall be prepared by contractor. The chart shall be periodically reviewed and updated. Following coordinators shall be identified to coordinate various activities during emergency. Each coordinator shall identify a Disaster Response Team, which shall step into action in the event of a disaster.

S.N.	Coordinator	Name	Phone No.		Address
			Office	Residence	
1.	Chief Coordinator				
2.	Fire Fighting Coordinator				
3.	Safety Coordinator				
4.	Security Coordinator				
5.	Communication Coordinator				
6.	Medical Coordinator				
7.	Transport Coordinator				
8.	Public Relation Coordinator (for providing relief and rehabilitation)				
9.	Provisioning Coordinator				

1.8. ROLES AND RESPONSIBILITIES OF EMERGENCY CONTROL TEAM

- Roles and responsibilities of the emergency control team are discussed below

1.8.1. Responsibility of Chief Coordinator

- The responsibilities of the chief coordinator are as follows:
 - To maintain a list of different coordinators and updating it periodically.
 - To assign responsibilities to different coordinators.
 - To convene meetings of coordinators periodically, to discuss various aspects such as in-house maintenance, safety, health services, availability of emergency materials, emergency training, external services etc. to be required in case of an emergency.
 - To maintain up to date information of local, district, state and central organization and voluntary bodies whose services are likely to be required during emergency as highlighted in the following table:
 - To determine the category of disaster.
 - To inform higher authorities of the organization about the disaster.
 - To inform the local/district/state or central authorities about the disaster and help to be required, depending upon the nature of the disaster.

1.8.2. Responsibility of Fire Fighting Coordinator

- The responsibilities of the fire fighting coordinator are as follows:
 - To arrange mock drills and periodical firefighting exercises periodically.
 - To inspect periodically all firefighting equipments, sprinklers, fires detectors along with respective alarms, water pumps, if these remain in working state and ready to use.
 - On receiving formations of emergency to ensure if all the in-house fire fighting and safety materials are adequate or some additional fire tenders are needed to combat the emergency.
 - To inform the chief coordinator, the information regarding time and place of occurrence, casualties, loss of property, methods adopted to combat the fire, if fire effectively controlled, what external help required, etc.
 - To contact outside agencies for necessary additional help to control the fire hazards.
 - To inform the medical officer about the tentative assessment of casualties occurred and likely to occur who in turn will inform the medical coordinator for provision of external or in house medical help, ambulance, etc. if any loss of life or injury to occupants is apprehended.
 - To supervise control and rescue operation as directed by the chief coordinator.
 - To ensure that no information is passed on to outside agencies without clearance from the chief coordinator.

1.8.3. Responsibility of Safety Coordinator

- The responsibilities of the Safety coordinator are as follows:
 - Systematic search for and recognition of dangers and their origin.
 - Compliance of statutory requirement.
 - Training of personnel.
 - To arrange audio-visual programme and incorporate safety awareness among occupants through their involvement and participation.
 - To ensure that all accidents and incidents occurring in the group housing are duly investigated, reported and corrective measures implemented.
 - To identify need for suitable safety programme to bridge up the gap on information concerning safety.
 - To review effectiveness of personal protective appliances and their use.

- Conducting mock drills in order to keep the equipments and personnel in readiness to face the crisis.
- Arrange display safety posters and efficient communications of the safety awareness through display of posters and slogans.
- On hearing the information of emergency he will reach immediately to the emergency site and coordinate safety of personnel in consultation with fire fighting and medical coordinators.
- To ensure that the danger is completely eliminated before allowing the 'all-clear' signal for resumption of activity.
- To ensure that the concerned authorities are kept informed about progress of the situation.

1.8.4. Responsibility of Security Coordinator

- The responsibilities of the Security coordinator are as follows:
 - To instruct all the security personnel to help in maintaining the law and order.
 - To find out the circumstances which have been responsible for the emergency and ensure whether correct methods have been employed.
 - To ensure that the men engaged in combating the hazard has taken proper safety precautions.
 - To ensure that efforts launched are systematic and effective and those engaged do not create "free for all" situation.
 - To arrange for additional emergency fighting aids. If it is apparent, that the situation would go, out of control and greater danger is imminent, to take immediate action to move out all the men involved to safety as far as he can.
 - To close all visitors' gate control traffic and allow only authorized persons to enter.
 - To inform Plant Medical Coordinator for first-aid.
 - To send out all those who are not involved in emergency operations.
 - To pool departmental transport with the help of transport coordinator and keep vehicles ready for use.
 - To cordon off the area of accident and coordinate with external security coordinators if additional security measures required.
 - To direct the external help/authorities to respective coordinators.

1.8.5. Responsibilities of Communication Coordinator

- On hearing/receiving emergency signal/message he shall immediately report at emergency control room (where message can be imparted to outside organizations/departments on telephone, telex, radio etc) to perform the following duties:
 - To keep contact with the chief coordinator to act on his instructions based on the level of emergency.
 - In case of major emergency to inform all the local authorities from whom help is required specifying the requirement and the place of requirement.
 - To inform -the security superintendent at emergency gate about arrival of any external help of outside personnel/VIP/consultants, etc. for assisting in the emergency, if prior information is received.
 - To attend the local calls and impart suitable reply regarding persons who are inside the disaster zone.
 - The following points may be kept in mind:
 - a. If possible, communication should take place in privacy so that it is not interrupted and distorted by others. Information imparted should be factual and prompt.
 - b. The calling person should be ensured that additional information will be supplied as and when available.

1.8.6. Responsibilities of Medical Coordinator and Emergency Services

- The responsibilities of the medical coordinator are as follows:
 - The responsibility of providing medical care should be invested in first aid central first aid facility to be set up within the campus. Medical aspects can be planned for minor disasters. In case of major disaster, where whole campus is involved, extraneous help from all sources has to be taken.
 - The medical coordinator has to identify in the city, the full-fledged emergency services with facilities to look after emergent cases. Proper liaison shall be maintained with these and they will have communication links with the medical services at the group housing.
 - During normal/non-emergency days, to organize suitably trained first-aiders force to handle such emergency situations. Mock drill shall be carried out from time to time so that the system is kept toned up at all times.
 - On getting information of the disaster and its level, he will inform the in-house first-aid facility to report at incident site immediately. For major emergency he will request for necessary external aid for medical services.
 - He will arrange hospitalization of the injured persons and post mortem of fatal casualties and keep count of persons injured sent to hospitals from time to time.
 - He will inform authorities of major hospitals for treatment of serious cases, if any.
 - He will communicate to the transport coordinator for requirement of vehicles.
 - To remain at his place of duty until clearance is given by chief coordinator.

1.8.7. Role of Transport Coordinator

- On hearing or getting information of the emergency he will keep all the vehicles and drivers in readiness and will send vehicles as per the requirement of different coordinators and officials.
 - The permission of chief coordinator is to be sought under following conditions:
 - To provide vehicle for transporting casualties.
 - To provide vehicles to necessary non-supervisory staff.
 - To keep a list of local transport agencies and to be in touch with them.
 - If there is any additional requirement of vehicles, he will requisite vehicles from outside agencies on telephone or through some volunteer.

1.8.8. Responsibility of Public Relation Coordinator (for providing relief and rehabilitation)

- On hearing or receiving emergency message he will proceed to the site and take following action:
 - To assist in in-house evacuation operation and neighboring people, if necessary.
 - To make known the latest situation to communication coordinator and chief coordinator.
 - To provide relief and rehabilitation to the affected persons in coordination with provisioning coordinator.
 - To call insurance people to assess the damage.
 - To arrange rebuilding damaged property estimating the damages, payment of compensation, etc.
 - To remain in touch, continuously, with concerned authorities (in-house or external) to provide relief and rehabilitation to the affected persons (this activity may be coordinated with provisioning coordinator).

1.8.9. Responsibility of Provisioning Coordinator

- The responsibilities of the medical coordinator are as follows:
 - To provide financial/material help for the victims.
 - To provide essential items such as eatables, drinking water, etc during emergency.

- To provide immediate finance for the purchase of fire fighting and safety materials, for hiring transports and labour and keep provision for unforeseen financial assistance.
- To estimate and sought approval of the annual budget for incurring expenditure on Environment Management Plan and likely on Disaster Management Plan.

1.9. EMERGENCY CONTROL CENTRE

- The emergency control centre shall be equipped with following facilities
 - Copy of current on-site emergency plan
 - Display of the name of site emergency controller
 - Two numbers of artificial respiratory sets
 - Two numbers of Stretchers
 - Vehicle for 24 hours (for large construction sites)
 - Inter personnel/section telephone (2 numbers)
 - Site layout diagram with entry and exit routes / Assembly points
 - Directory of internal / external emergency phone Numbers
 - A set of fire extinguishers (DCP type / Foam Type / CO₂)
 - List of fire extinguishers installed in the construction site including maintenance record
 - A set of personal protective equipment (PPE)
 - Two numbers of first-aid boxes with prescribed first-aid medicines
 - List of competent first-aiders
 - List of fire trained personnel
 - Two numbers of blankets
 - Drinking water
 - Two numbers of rescue ropes
 - Two numbers of high beam torches
 - Two numbers of gas leak detectors
 - Life boat & jackets (if working in or near water course)

1.10. Response Evaluation, Testing & Updating of the Plan

Formulation of a Disaster Management Plan cannot possibly be an end by itself. The plan should be for times to come; hence it must be reviewed at periodic intervals. The plan should be also reviewed and updated when:

- Major alteration or any extension work at the group housing is carried out.
- Major change in habitation or land use of the neighbourhood takes place.
- Important telephone numbers used are altered, facilities are changed.

The site coordinator and the other key staff at the site will ensure its efficiency during emergency as well as need for refinement and updation required at any point of time

1.11. RECORDS

The following records shall be maintained:

1. Record of emergency preparedness plan with emergency contact numbers
2. Mock drill/emergency preparedness exercise records
3. Corrective preventive action record after emergency is occurred

1.12. REPORTING

The accident and incident records and emergency preparedness drill reports shall form part of quarterly report to EA

Annexure XV-Terms of Reference for PMC

PMC is an agency responsible for monitoring the contractor's activities and to ensure adequate implementation of the EMP by contractor. PMC will also be responsible in providing guidance to the BEZA whenever required, should update the BEZA for the amendment in the existing laws and development of new laws as applicable for project for environment & social management and management of labour and their rights and facilitate BEZA in obtaining the clearances as and when required. PMC should keep track of contractors day to day activities, their commitment for implementation of EMP, assurance of the quality of the material used for construction, assurance for following of waste management system, compliance to the laws, adherence to safety guidelines and method statements and reporting of accidents occurring on and off-site. PMC also have right to suggest BEZA to take punitive action against contractor in case of non compliance of the EMP. Following tasks should be undertaken by PMCs

2. PMC should have environment health and safety management cell which should have adequate expertise in field of environment, social and safety management
 - a. EHS head-25 years of national & international experience
 - b. Sr. Safety Health Officers-10 years
 - c. Sr. Env Expert-10 years
 - d. Jr. Safety Health Officers-5 years
 - e. Jr. Env Expert-5 years
 - f. Ecologist/Horticulturist-5 years
3. PMC quality expert/engineer will assure the construction material used should be as per the prescribed relevant national and international codes. PMC should ensure that raw material is procured by contractor from authorized suppliers only. Tag in tag out system should be in place at the raw material storage site
4. PMC will monitor the quality of construction and construction of the structures and facilities and it should be as per the method statement submitted by contractor based on national & international codes PMC will assure the suggestive EMP in the EIA is being implemented.
5. No construction activity by contractor should be carried out without approval of the PMC
6. PMC will review the Environment Management Action Plan submitted by contractor and should check adequacy as per this EIA document and ESMF prepared for this project. This EMAP should be amendable and can be updated time to time by PMC
7. A comprehensive SHE plan covering various construction activities, health of workers/labours should be submitted by contractor for each activity. This plan should include evacuation plan, emergency management & response plan
8. PMC should 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,
9. PMC should ensure that all construction and site vehicles should abide by the latest emission norms of the country
10. PMC should monitor that all workers & labour of contractor should have valid ID cards to assess the site
11. PMC should 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
12. PMC should assure that vehicle operators should have valid license & should be given self defensive driving by contractor
13. PMC should assure that contractor has carried out proper TPI inspection for lifting equipment like crane.

14. PMC should be authorized to take punitive action in non compliance of EMP & SHE Plan
15. PMC should submit monthly performance report of contractor showing level of compliance & non-compliance

Annexure XVI: Documents for detailed public consultation and NOC from Local Union Chairman

বাংলাদেশ বিহুমিল্লাহির রাহমানির রাহিম জিন্দাবাদ

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
চেয়ারম্যান-এর কার্যালয়

৬নং ইছাখালী ইউনিয়ন পরিষদ
থানা : জোরারগঞ্জ, উপজেলা : মীরসরাই, জেলা : চট্টগ্রাম, বাংলাদেশ।
মোহাম্মদ নূরুল আবছার - চেয়ারম্যান

সূত্র : ১৪/ইছাখালী/২০১১ তারিখ : ২৭/০৬/২০১১

অর্থনৈতিক অঞ্চলের অবস্থানগত/পরিবেশগত ছাড়পত্রের জন্য স্থানীয় কর্তৃপক্ষ কর্তৃক প্রদেয় অনাপত্তিপত্র প্রেরণ

১. আবেদনকারীর নামঃ বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ (বেজা)

২. পিতা/স্বামীঃ প্রযোজ্য নহে।

৩. আবেদনকারীর ঠিকানাঃ বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ (বেজা), প্রধানমন্ত্রীর কার্যালয়
বিভিবিএল ভবন (সেতেন ১৫), ১২ কারওয়ানবাজার, ঢাকা-১২১৫।

৪. প্রকল্পের অবস্থানগত ঠিকানাঃ ইউনিয়নঃ ইছাখালী, উপজেলাঃ মীরসরাই, জেলাঃ চট্টগ্রাম।

৫. প্রকল্পের তফসিলঃ


জেলার নাম	থানার নাম	জে এল নং	মৌজার নাম	মোট জমির পরিমাণ
চট্টগ্রাম	মীরসরাই	১১০	পীরের চর	৯০০ একর
		১১১	সাদুর চর	

৬. কারখানা/প্রকল্পের উৎপাদিত/উৎপাদিতব্য পণ্যের সম্ভাব্য নামঃ গার্মেন্টস, ইন্ফরমেশন টেকনোলজি, টেক্সটাইল, কেমিক্যাল, ফার্মাসিউটিক্যাল, ফুড ও বেভারেজ, সিরামিকস, ইলেকট্রিক মেশিন, গোল্ড ইত্যাদি।

উপরোক্ত তথ্যাদির আলোকে অর্থনৈতিক অঞ্চল প্রকল্পের জন্য নিম্নবর্ণিত শর্তসাপেক্ষে অনাপত্তিপত্র প্রদান করা হল।

শর্তাবলীঃ

১. প্রকল্প/শিল্প স্থাপন ও পরিচালনার ক্ষেত্রে পরিবেশ সংরক্ষণ আইন ও বিধি যথাযথভাবে অনুসরণ করতে হবে।
২. পরিবেশ অধিদপ্তর হতে বিধি দ্বারা নির্ধারিত পদ্ধতিতে প্রাপ্ত প্রাপ্তি গ্রহণ করতে হবে।
৩. কর্মরত শ্রমিকের পেশাগত স্বাস্থ্য ও নিরাপত্তা নিশ্চিত করতে হবে।
৪. উপযুক্ত অগ্নিনির্বাপক ব্যবস্থা রাখতে হবে এবং অগ্নিকাণ্ড কিংবা অন্য কোন দুর্ঘটনার সময় জরুরী নির্গমন ব্যবস্থা করতে হবে।
৫. বায়ু ও শব্দ দূষণ করা যাবে না।
৬. কারখানা/প্রকল্প সৃষ্ট তরল বর্জ্য অপরিশোধিত অবস্থায় বাহিরে নির্গমন করা যাবে না।


 মোঃ নূরুল আবছার
 চেয়ারম্যান
 ৬নং ইছাখালী ইউনিয়ন পরিষদ
 জোরারগঞ্জ, মীরসরাই, চট্টগ্রাম।

উনিয়ন/মীর/এমআম-৫০৯

বাংলাদেশ

বিহুমিদ্দাহির রাহমানির রাহিম

জিন্দাবাদ

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

চেয়ারম্যান-এর কার্যালয়

৬নং ইছাখালী ইউনিয়ন পরিষদ

থানা : জোরারগঞ্জ, উপজেলা : মীরসরাই, জেলা : চট্টগ্রাম, বাংলাদেশ।

মোহাম্মদ নুরুল আবছার - চেয়ারম্যান

সূত্র : ১৪/ইছাখালী/২০১১

তারিখ : ২৭/০৬/২০১১

অর্থনৈতিক অঞ্চলের অবস্থানগত/পরিবেশগত ছাড়পত্রের জন্য স্থানীয় কর্তৃপক্ষ কর্তৃক প্রদেয় অনাপত্তিপত্র প্রেরণ

১। আবেদনকারীর নামঃ বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ (বেজা)

২। পিতা/স্বামীঃ প্রযোজ্য নহে।

৩। আবেদনকারীর ঠিকানাঃ বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ (বেজা), প্রধানমন্ত্রীর কার্যালয়
বিভিবিএস ডবল (সেভেন ১৫), ১২ কারওয়ানবাজার, ঢাকা-১২১৫।

৪। প্রকল্পের অবস্থানগত ঠিকানাঃ ইউনিয়নঃ ইছাখালী, উপজেলাঃ মীরসরাই, জেলাঃ চট্টগ্রাম।

৫। প্রকল্পের তথ্যসিদ্ধ

জেলার নাম	থানার নাম	জে এল নং	মৌজার নাম	মোট জমির পরিমাণ
চট্টগ্রাম	মীরসরাই	১১০	পীরের চর	৯০০ একর
		১১১	সাপুর চর	

৬। কারখানা/প্রকল্পের উৎপাদিত/উৎপাদিতব্য পণ্যের সন্মুখ্য নামঃ গার্মেন্টস, ইনফরমেশন টেকনোলজি, টেক্সটাইল,কেমিক্যাল, ফার্মাসিউটিক্যাল, ফুড ও বেভারেজ, পিরামিকস, ইলেকট্রিক মেশিন, গেমদার গুড ইত্যাদি।

উপরোক্ত তথ্যাদির আলোকে অর্থনৈতিক অঞ্চল প্রকল্পের জন্য নিম্নবর্ণিত শর্তসাপেক্ষে অনাপত্তিপত্র প্রদান করা হয়।

শর্তাবলীঃ

১। প্রকল্প/শিল্প স্থাপন ও পরিচালনার ক্ষেত্রে পরিবেশ সংরক্ষণ আইন ও বিধি মনোযোগসহকারে অনুসরণ করতে হবে।

২। পরিবেশ অধিদপ্তর হতে বিধি দ্বারা নির্ধারিত পদ্ধতিতে ছাড়পত্র গ্রহণ করতে হবে।

৩। কর্মরত শ্রমিকের পেশাগত স্বাস্থ্য ও নিরাপত্তা নিশ্চিত করতে হবে।

৪। উপযুক্ত অগ্নিনির্বাপক ব্যবস্থা রাখতে হবে এবং অগ্নিকাণ্ড কিংবা অন্য কোন দুর্ঘটনার সময় জরুরী নির্গমন ব্যবস্থা করতে হবে।

৫। বায়ু ও শব্দ দূষণ করা যাবে না।

৬। কারখানা/প্রকল্প সৃষ্টি তরল বর্জ্য অপরিশোধিত অবস্থায় বাহিরে নির্গমন করা যাবে না।

উলিঅ/মীর/খনাম-৫০৯

মোঃ নুরুল আবছার
চেয়ারম্যান
৬নং ইছাখালী ইউনিয়ন পরিষদ
জোরারগঞ্জ, মীরসরাই, চট্টগ্রাম।



৭নং সোনাগাজী ইউনিয়ন পরিষদ

উপজেলাঃ সোনাগাজী, জেলাঃ ফেনী।

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সূত্র: ১৭

তারিখঃ ২৮/০৩/২০১৬ ইং

জনগণের সহিত মত বিনিময়

অদ্য ২৮/০৩/২০১৬ইং ফেনী জেলায় সোনাগাজী উপজেলার সোনাগাজী ইউনিয়ন পরিষদ দপ্তরে অর্থনৈতিক অঞ্চল প্রতিষ্ঠার জন্য স্থানীয় জনগণের সংগে এক মত বিনিময় সভার আয়োজন করা হয়।

সভায় আমি নিম্ন স্বাক্ষরকারী সভাপতিত্ব করি। সভায় অন্যান্যের মধ্যে নিম্নবর্ণিত বিশিষ্ট গন্যমান্য ব্যক্তিবর্গ উপস্থিত ছিলেনঃ

ক্রমিক নং	উপস্থিত ব্যক্তিবর্গের নাম	পদবী	মোবাইল নাম্বার	স্বাক্ষর
১	বাহাদুর উদ্দিন রুইস	সভাপতি	০১৮১৪২৪৪৫২২	স্বাক্ষর
২	শ্রীঃ মুহাম্মদ হোসেন	কর্মসম্পন্ন	০১৭৬৩৭৭৫৫৭	স্বাক্ষর
৩	সোনাগাজী মোহাম্মদ	কর্মসম্পন্ন	০১৭০৭১৩৫৫৫	স্বাক্ষর
৪	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৭১৭৩৭৬২১	স্বাক্ষর
৫	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮১৮৪৩৩৬৭৭	স্বাক্ষর
৬	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮১৮৩৩৩১১৭	স্বাক্ষর
৭	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮২১৫০৪৬১১	স্বাক্ষর
৮	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮১১৭০৩৭৫	স্বাক্ষর
৯	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮৩০৭১৬৬৬৬	স্বাক্ষর
১০	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮৩৩৭৭৭২২২	স্বাক্ষর
১১	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮২৪০৭১৭৫৬	স্বাক্ষর
১২	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮১৭২৫২৬০০	স্বাক্ষর
১৩	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮২২৩৬৭৩৪৩	স্বাক্ষর
১৪	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮১৭৪৭২৬৬	স্বাক্ষর
১৫	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন		স্বাক্ষর
১৬	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮২০৩১২৩৫৬	স্বাক্ষর
১৭	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮৪৫৫৪৬০৪৫	স্বাক্ষর
১৮	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮১৭০৭০৭৬৭	স্বাক্ষর
১৯	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮১২৩৭৭৪৪	স্বাক্ষর
২০	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন	০১৮২৩০১২৬৭	স্বাক্ষর
২১	শ্রীঃ মোহাম্মদ হোসেন	কর্মসম্পন্ন		স্বাক্ষর

২২	মোঃ আমান উদ্দিন	ইন্ডিয়ান	০১৪১২২১৪২২১	চেন্নাই
২৩	মোঃ ফকরুল হক	সহকারী	০১৪৩১২২১৬২৪	চেন্নাই
২৪	মোঃ আব্দুল হক	সহকারী	০১৪০৩৬৫৪৫৬৪	চেন্নাই
২৫	মোঃ ইমরান	ইন্ডিয়ান	০১৪০৭৫৬৭২৬	চেন্নাই
২৬	মোঃ ইমরান	ইন্ডিয়ান	০১৪১৪০৭১৪	চেন্নাই
২৭	মোঃ ইমরান	ইন্ডিয়ান	০১৪১১৪১৫২৪	চেন্নাই
২৮	মোঃ ইমরান	ইন্ডিয়ান	০১৪১৩৫১৭৫৫	চেন্নাই
২৯	মোঃ ইমরান	ইন্ডিয়ান	০১৪৩৪১৭৭২৬	চেন্নাই
৩০	মোঃ ইমরান	ইন্ডিয়ান	০১৪১১৪১৫২৪	চেন্নাই
৩১	মোঃ ইমরান	ইন্ডিয়ান	০১৪২৫২২৫৭২২	চেন্নাই
৩২	মোঃ ইমরান	ইন্ডিয়ান	০১৪১৩৭৭০০	চেন্নাই
৩৩	মোঃ ইমরান	ইন্ডিয়ান	০১৪১৩৭৭১৩০	চেন্নাই

সভায় সম্মানিত ইউনিয়ন পরিষদ সদস্যগণ বক্তব্য গ্রহণ করেন এবং সবাই সন্তোষভাবে সোনগাজী ইউনিয়নে অর্থনৈতিক অঞ্চল প্রতিষ্ঠায় সন্তোষ, আগ্রহ এবং ইতিবাচক মনোভাব প্রকাশ করেন। মত প্রকাশকালে তারা এই প্রকল্পের মাধ্যমে স্থানীয়ভাবে বেকারত্ব হওয়া ছাড়া ও জনগণের জীবন ধারণের মানের উন্নতি হবে বলিয়া আশা প্রকাশ করেন।

তবে পরিবেশের ভারসাম্য বজায় রাখতে তারা পানি ছিটিয়ে রাস্তার সম্ভাব্য ধূলিকণা দূষণ রোধ, রাস্তার গাড়ির উচ্চগতি রোধে গাড়িতে যথাযথ সাইলেন্সারের ব্যবহার এবং গাড়ি চলাচলে সুনির্দিষ্ট সময় বেধে দেয়া এবং পরিবেশ দূষণ রোধকল্পে সার্বিক পদক্ষেপের পক্ষে মত দেন।

প্রস্তাবিত এই অর্থনৈতিক অঞ্চল সরকারী খাস জমির অন্তর্ভুক্ত বিধায় ক্ষতিপূরণ ও পুনর্বাসনের প্রয়োজন হবে না বলে সবাই মতামত ব্যক্ত করেন। তবে স্থানীয়রা যেন অধিধিকার ভিত্তিতে কাজের সুবিধা পান সেদিকে সূনজর রাখতে বক্তারা সবাই বিশেষভাবে অনুরোধ করেন। স্বাভাবতঃই এই অর্থনৈতিক অঞ্চল প্রতিষ্ঠায় এই অঞ্চলে বহিরাগতদের সমাগম বাড়বে। এই জনসমাগম যাতে সামাজিক অবক্ষয়ের কারণ না হয় সেজন্য বৃদ্ধির উপর প্রত্যেকে মত দেন। বিকাল ৩.০০ টায় শুরু হওয়া এই সভা বিকাল ৫.০০ টায় সবাইকে ধন্যবাদ জানিয়ে শেষ হয়।

৩১/০৩/২০২১
 শামছুল আরেফিন
 (চেয়ারম্যান)
 ৭নং সোনগাজী ইউনিয়ন পরিষদ
 উপজেলা সোনগাজী, চেন্নাই
 ৩নং সোনগাজী ইউনিয়ন পরিষদ
 সোনগাজী, চেন্নাই

Annexure XVII: Abbreviated Resettlement Plan (ARP)

Executive Summary

Introduction

The ARP has been prepared in accord with the process and provisions of the Resettlement and Social Management Framework (RSMF) which has been adopted to comply with the safeguards requirements of the Bank's operational policy on Involuntary Resettlement (OP 4.12). The policy requires that all unavoidable adverse impacts are mitigated with appropriate measures to enhance, or at least to preserve, the current living standards of those who would be affected by any subproject under PSDSP.

Social Safeguard Impacts

The Mirsharai EZ phase 2 is being developed in 2100 acres of khas land owned by the BEZA. According to the SIA, the lands were barren without any vegetation and human activities at the time the site was selected, and there has been no change until now. The SIA and the site visits undertaken at different times have confirmed that there were no indigenous peoples either on the site or in its vicinities - or even in the general area of the EZ. As such, the SIA has concluded that there was no need for preparing an Indigenous Peoples Plan (IPP).

As far as the 2100 -acre site is concerned, the Mirsharai EZ phase 2 did not cause any adverse impacts. But BEZA will develop support infrastructures both within and outside the EZ. In addition to a boundary wall around the site, other facilities that are going to be developed inside, have no social safeguard implications. But the development of the existing access road into two lanes will cause impacts on a total of 14 households and 5 mosques that are to be mitigated in accord with Bank's operational policy on Involuntary Resettlement and specific provisions adopted in the RSMF. Below is a brief account of the major infrastructures that will be developed outside the EZ.

Community/Stakeholder Consultations

As the project does not cause major adverse impact on people in the given geographical area, consultations were held primarily with the local communities along with the PAPs and PAHs to identify their perceptions on opportunities and risks associated with the commissioning of the EZ. The stakeholders contacted for the consultations were the 14 Project Affected Households (PAPs), Local community members, Project Affected Households, Shop owners staying near the approach road in temporary structures, Fishermen, Women, Union Parishad officials, NGOs, Students, Small businessmen, District administrators, and Elected representatives.

Impact Mitigation

BEZA has proposed to use only the government land available on the western side of the access road so as to avoid the displacement of around 90 private households who could have been affected on the eastern side of the road.

ARP Implementation Budget

BEZA has prepared a budget of **BDT 2.11 lakh** to pay for the costs of house and mosques for transfer and reconstruction.

Grievance Redress Mechanism

As provided in the RSMF, BEZA will establish a Grievance Redressal Mechanism (GRM) to answer to queries and address complaints and grievances about any irregularities in using the guidelines adopted in the RSMF and for implementation of this ARP. BEZA will form a Grievance Redressal Committee (GRC) for the EZ consisting of memberships to ensure proper presentation of complaints and grievances, as well as impartial hearings and transparent decisions.

Public Disclosure of ARP

Any changes, expansions, or revisions to this document after clearance by the Bank would be subject to Bank's concurrence and approval. BEZA will disclose Bangla translation of this ARP to the public in Bangladesh by posting it in its website, and authorize the World Bank to disclose it at its Country Office Information Center and in its Infoshop. BEZA will also ensure that copies of the translated document are made available at its headquarters and site offices established for the Mirsharai EZ phase 2, local government offices and public libraries in the project districts, and other places accessible to the general public. As to disclosure, BEZA will inform the public through notification in two national newspapers (Bangla and English) about the ARP and where it could be accessed for review and comments.

Budget

Sl. No.	Loss Category	Total land acquired (in sq.ft)	Entitlement (Tk in Lakh)	Basis for calculation
1.	Loss of Squatters	14 nos. (7357.28 sq. ft.)	0.70	Shiftable structures: House Transfer Grant (HTG) and House Construction Grant (HCG), @ Tk 50 per sq. ft of floor area, with a minimum of Tk 3,500 and maximum of Tk 5,000. Non-shiftable structures: HCG @ Tk 70 per sq.ft of floor area with a minimum of Tk 4000 and maximum of Tk 6000.
2.	Compensation for loss of income		1.16	Compensation for loss of income(Compensation, based on 30 days' average daily net income, for the actual number of days the businesses remain closed
3.	Relocation of mosques	2 nos. (1542.02 sq. ft.)	0.25	Shiftable structures: House Transfer Grant (HTG) and House Construction Grant (HCG), @Tk 50 per sq.ft of floor area, with a minimum of Tk 3,500 and maximum of Tk 5000. Non-shiftable structures: HCG @ Tk 70 per sq.ft of floor area with a minimum of Tk 4,000 and maximum of Tk 6,000.
	Grand total		2.11	

Annexure XVIII: IFC Guidelines-Environment, Health and Safety Guidelines for Ports, Harbors and Terminals (For Dredging)



Environmental, Health, and Safety Guidelines
PORTS, HARBORS, and TERMINALS



Environmental, Health, and Safety Guidelines for Ports, Harbors, and Terminals

Introduction

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP)¹. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the **General EHS Guidelines** document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. For complex projects, use of multiple industry-sector guidelines may be necessary. A complete list of industry-sector guidelines can be found at:

www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them.

The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative

¹ Defined as the exercise of professional skill, diligence, prudence and foresight that would be reasonably expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility.

capacity of the environment, and other project factors, are taken into account. The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons.

When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

Applicability

The EHS Guidelines for Ports, Harbors, and Terminals are applicable to commercial ports, harbors, and terminals for cargo and passengers transfer. Shipping (including repair and maintenance of ships), fuel terminals, or railways are addressed in separate industry sector EHS Guidelines, specifically the EHS Guidelines for Shipping, Crude Oil and Petroleum Product Storage, Railways, respectively. Annex A provides a summary of industry sector activities. This document is organized according to the following sections:

Section 1.0 — Industry-Specific Impacts and Management
Section 2.0 — Performance Indicators and Monitoring
Section 3.0 — References
Annex A — General Description of Industry Activities



1.0 Industry-Specific Impacts and Management

The following section provides a summary of EHS issues primarily associated with port and terminal construction and operations, along with recommendations for their management. Recommendations for the management of EHS issues common to most large industrial and infrastructure projects, including siting and cumulative impact considerations, are provided in the **General EHS Guidelines**.

1.1 Environmental

Environmental issues in port and terminal construction and operation primarily include the following:

- Dredged materials management
- Air emissions
- General waste reception
- Wastewater
- Solid waste management
- Hazardous materials and oil management
- Noise
- Biodiversity

Dredged Materials Management

Construction and maintenance dredging, and dredge spoil disposal, may impact habitats and pose a significant hazard to human health and the environment, particularly if the sediments are contaminated by historical deposition and accumulation of hazardous materials, whether due to on-site or off-site activities.²

The following recommendations should be adopted to avoid,

² Hazardous materials that may typically accumulate in sediments include heavy metals and persistent organic pollutants from urban surface or agricultural runoff.

minimize, or control impacts from dredged materials, as part of a Marine Dredging Management Plan.³

Dredge Planning Activities

- Dredging should only be conducted if necessary, and based on an assessment of the need for new infrastructure components or port navigation access to create or maintain safe navigations channels, or, for environmental reasons, to remove contaminated materials to reduce risks to human health and the environment;
- Prior to initiation of dredging activities, materials should be evaluated for their physical, chemical, biological, and engineering properties to inform the evaluation of dredge materials reuse or disposal options.⁴

Dredging

- Excavation and dredging methods should be selected to minimize suspension of sediments, minimize destruction of benthic habitat, increase the accuracy of the operation, and maintain the density of the dredge material, especially if the dredge material includes contaminated areas. There are several dredging methods which are commonly used depending on the depth of the sediments and environmental concerns such as the need to minimize sediment suspension and increase dredging accuracy.⁵
- Areas sensitive for marine life such as feeding, breeding, calving, and spawning areas should be identified. Where sensitive species are present, dredging (and blasting)

³ The environmental risk further depends on the concentration and type of hazardous materials, the dredging method, the intended disposal option, and the potential exposure to humans and living organisms during the dredge materials management cycle. Therefore, dredging activities should be conducted based on a careful assessment of potential impacts and in consultation with experts.

⁴ Additional information on dredge materials evaluation methods is provided in the Commission for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Guidelines for the Management of Dredge Materials (1998) and Guidelines for the Beneficial Use of Dredge Material (1996).

⁵ Examples of dredging methods include grab, backhoe, trailing section hopper, and water injection / suction dredgers.



- should be conducted in a manner so as to avoid fish migration or spawning seasons, routes, and grounds;
- Use techniques (e.g. silt curtains), to minimize adverse impacts on aquatic life from the re-suspension of sediments;
 - Inspection and monitoring of dredging activities should be conducted to evaluate the effectiveness of impact prevention strategies, and re-adjusted where necessary.

Disposal of Dredged Material

- Dredged material should be analyzed in order to select appropriate disposal options (e.g. land reclamation, open water discharge, or contained disposal). Beneficial reuse of uncontaminated, dredged material should be considered (e.g. for wetland creation or enhancements, habitat restoration, or creation of public access / recreational facilities);
- Use of submerged discharges should be considered for hydraulic disposal of dredged material;
- Use of lateral containment in open water disposal should be considered. Use of borrow pits or dikes reduces the spread of sediments and effects on benthic organisms;
- Use of cap containment sediments with clean materials should be considered. Level bottom capping or a combination of borrow pits / dikes with capping reduces the underwater spread of contaminated material;
- Confined disposal facilities should be used, either near-shore or upland, when open water disposal is not feasible or desirable. If dredge spoil is contaminated, confined disposal facilities should include liners or other hydraulic containment design options to prevent leaching of contaminants into adjacent surface or groundwater bodies. Treatment of dewatering liquids (e.g. metals and persistent organic pollutants) may be required prior to discharge. Site-specific discharge quality standards should be established depending on the type and toxicity of the effluents and the discharge location;

- Since much sediment contamination originates from land use practices in the surrounding watershed, port managers should work with national and local authorities, as well as facility owners and operators in the watershed, to reduce sources of key contaminants. This may involve informing the authorities as to the difficulties in disposal of dredged material; actively participating in watershed protection programs sponsored by local or state agencies or in surface water discharge permitting efforts, if any, for sources in the port's watershed; and actively participating in zoning procedures.^{6, 7}

Air Emissions

The most significant sources of air pollutants from port operations include combustion emissions from ships' propulsion and auxiliary engines and boilers, mainly consisting of sulfur dioxide (SO₂), nitrogen oxides (NO_x), greenhouse gases (e.g. carbon dioxide [CO₂] and carbon monoxide [CO]), fine particulate matter [PM], and volatile organic compounds [VOC]), followed by combustion source emissions from vehicles and land-based engines and boilers contributing similar pollutants.

Volatile organic compounds (VOC) may also be emitted from fuel storage and transfer. Storage and handling of dry bulk cargo, as well as from onshore construction activities and vehicle traffic on unpaved roads, may also contribute to particulate matter emissions.

Recommended air emissions management strategies include:

⁶ Based on recommendations of the American Association of Port Authorities.

⁷ See also the International Maritime Organization (IMO), London Convention on Prevention of Marine Pollution by Dumping of Wastes and Other Matter (and its 1996 Protocol) and the guidelines developed for disposal of dredged materials at sea.

Annexure XIX: Abstract of SOCIAL SAFEGUARD

PRIVATE SECTOR DEVELOPMENT SUPPORT PROJECT (PSDSP)

A. SOCIAL SAFEGUARD ISSUES AND IMPLICATIONS

GRIEVANCE REDRESS MECHANISM

- The Land Acquisition Ordinance allows landowners object to acquisitions in the beginning of the legal process. Once the objections are heard and disposed of, there is virtually no provision to address grievances and complaints that individual landowners may bring in the later stages of the acquisition process. As the ordinance does not recognize them, no mechanism is there to hear and redress grievances of people who do not have legal titles to the lands (khas/public), which they may have been using to live in or making a livelihood. As seen in various projects, complaints and grievances may range from disputes over ownership and inheritance of the acquired lands to affected persons and assets missed by the censuses; valuation of the affected assets; compensation payment; and the like. Considering the need, BEZA will establish a Grievance Redress Mechanism (GRM) to answer to queries and address complaints and grievances about any irregularities in using the guidelines adopted in this RSMF for assessment and mitigation of adverse impacts. Based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly, saving the aggrieved persons resorting to expensive, time-consuming legal actions. *The mechanism will however not pre-empt an aggrieved person's right to go to the courts of law.*
- BEZA will form one Grievance Redress Committee (GRC) for each subproject depending on the administrative and local government jurisdiction (Districts, Upazila Parishads, Municipalities, and Union Parishads), as well as ease in accessibility by the project affected persons (PAPs). The GRCs will consist of memberships (below) to ensure proper presentation of complaints and grievances, as well as impartial hearings and transparent decisions. Membership composition of the GRCs, where IPs are among the affected persons, will take into account any traditional conflict resolution arrangements that IP communities may have in practice. *If the aggrieved person is a female, BEZA will ask a female UP Member or Municipal Ward Commissioner to participate in the hearings.*

GRC Membership

- A BEZA Representative (Convenor)
 - An Elected Member of the Union Parishad or Upazila Parishad
 - A Female Member of the Union or Upazila Parishad
 - A Representative of the PAPs in the EZ/subproject
 - Headmaster of local Higher Secondary School
 - Resettlement Specialist of the Supervision Consultant (Member Secretary)
 - An Area Representative of an NGO working in the area
-
- During consultations in the subproject areas significantly inhabited by IPs (Chittagong Hill Tracts and elsewhere), BEZA, assisted by the consultant, will identify any existing

traditional conflict resolution mechanisms used by the IP communities. If they exist, and the IPs intend, the GRCs will include at least one person from such 'traditional conflict resolution bodies' replacing one (who is unlikely to be knowledgeable of IP issues and concerns) from the memberships suggested above.

- If a resolution attempt at the local level fails, the GRC will refer the complaint with the minutes of the hearings to the Project Director (PD) for further review. With active assistance of the social safeguard professional of ESC, the PD will make a decision and communicate it to the concerned GRC. If a decision at this level is again found unacceptable by the aggrieved person(s), BEZA can refer the case to the higher authority with the minutes of the hearings at local and BEZA levels. *A decision agreed with the aggrieved person(s) at any level of hearing will be binding on BEZA.*
- The persons overseeing RSMF implementation at the local levels will review and sort the cases in terms of nature of grievances and urgency of resolution, and schedule hearings in consultation with the GRC convenor. All cases at the local level will be heard within four weeks of their receipt; but those related to matters like compensation for poor and vulnerable PAPs will be heard in two weeks or earlier. PD's decisions on unresolved cases will be communicated to the GRC in one week of their receipt. Decisions, if any, on unresolved cases at the levels above BEZA will be made in no more than four weeks.
- To ensure that grievance redress decisions are made in formal hearings and in a transparent manner, the convenor will use the following guidelines:
 - Reject a grievance redress application with any recommendations written on it by a GRC member or others, such as politicians and other influential persons;
 - Remove a recommendation by any person that may have been written separately and submitted with the grievance redress application;
 - Disqualify a GRC member who has made a recommendation on the application or separately before the formal hearing;
 - Where a GRC member is removed, appoint another person in consultation with the Project Director, and keep the World Bank informed about the change and the reason to do so; and
 - The convenor will also ensure strict adherence to the impact mitigation policies and guidelines adopted in this RSMF and the mitigation standards, such as compensation rates, established through market price surveys.
- To ensure impartiality and transparency, hearings on complaints will remain open to the public. The GRCs will record the details of the complaints, the reasons that led to acceptance or rejection of the particular cases, and the decision agreed with the complainants. BEZA will keep records of all resolved and unresolved complaints and grievances and make them available for review as and when asked for by the World Bank and other interested persons/entities.

B. GUIDELINES FOR PRIVATE LAND ACQUISITION,

USE OF PUBLIC LANDS AND RESETTLEMENT

- *Avoid impacts on Physical Cultural Resources.* BEZA will not select EZ sites that are known to have structures/objects of historical or cultural significance, and design and

implement all off-site support infrastructures in compliance with the World Bank's *OP 4.11 on Physical Cultural Resources*.

Annexure XX: RESETTLEMENT & SOCIAL MANAGEMENT FRAMEWORK (RSMF)

DEFINITION OF SELECTED TERMS

USED IN THIS RSMF

Compensation: Payment made in cash to the project affected persons/households for the assets acquired for the project, which includes the compensation provided in the *Acquisition and Requisition of Immovable Property Ordinance 1982* and others stipulated in this Resettlement and Social Management Framework (RSMF).

Compensation-Under-Law (CUL): Refers to the compensation assessed for the acquired lands and other assets, such as trees, houses/structures, etc., by Acquiring Body (District land administration, headed by Deputy Commissioners) as per the methods provided in the Land Acquisition Ordinance, and paid by the Deputy Commissioners.

Consultation Framework: In view of their stakes and interests in the project or subprojects, the framework is prepared to guide the project preparation team about who are to be discussed / consulted about the overall project and its positive and negative social impact implications and to seek their inputs and feedbacks in the different stages of the project cycle.

Cut-off Dates: These are the dates on which censuses of the affected persons and their assets are taken. Assets like houses / structures and others, which are created and the persons or groups claiming to be affected, after the cut-off dates, become ineligible for compensation and assistance. For private lands, these dates will however not constitute 'cut-off dates', if the legal Notice-3 is already issued before the censuses are taken. In such a situation, the Notice-3 dates are considered 'cut-off dates', as the acquisition ordinance prohibits changes in the appearance of the lands after issuance of Notice 3.

Entitlement: Refers to mitigation measures, which includes cash payments by DCs and project implementing agencies, as well as any non-cash measures stipulated in this

RSMF (e.g., allowing the affected persons to keep felled trees, salvageable building materials, etc., for which compensation is already paid).

Income Restoration: Refers to re-building the capacity of the project affected households to re-establish income sources at least to restore their living standards to the pre-acquisition levels.

Tribal Peoples: Unless they are already recognized, the Tribal Peoples are identified in particular geographic areas based on these four characteristics: (i) self-identification as members of a distinct tribal cultural group and recognition of this identity by others; (ii) collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; (iii) customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and (iv) an tribal language, often different from the official language of the country or region.

Involuntary Resettlement: The situation arises where the State's power of eminent domain requires people to acquiesce their rights to personal properties and re-build their lives and livelihood in the same or new locations.

Participation/Consultation: Defined as a continuous two-way communication process consisting of: 'feed-forward' the information on the project's goals, objectives, scope and social impact implications to the project beneficiaries, and their 'feed-back' on these issues (and more) to the policymakers and project designers. In addition to seeking feedback on project specific issues, participatory planning approach also serves the following objectives in development projects: public relations, information dissemination and conflict resolution.

Physical Cultural Resources: Defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below the ground, or under water. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices.

Project-Affected Person/Household: Persons / households whose livelihood and living standards are adversely affected by acquisition of lands, houses and other assets, loss of income sources, and the like.

Rehabilitation: Refers to improving the living standards or at least re-establishing the previous living standards, which may include re-building the income earning capacity, physical relocation, rebuilding the social support and economic networks.

Relocation: Moving the project-affected households to new locations and providing them with housing, water supply and sanitation facilities, lands, schools and other social and healthcare infrastructure, depending on locations and scale of relocation. [Homestead losers may also relocate on their own in any location they choose.]

Replacement Cost: The World Bank's OP 4.12 on Involuntary Resettlement describes "replacement cost" as the method of valuation of assets that helps determine the

amount sufficient to replace lost assets and cover transaction costs. In applying this method of valuation, depreciation of structures and assets are not taken into account. For losses that cannot easily be valued or compensated for in monetary terms (e.g., access to public services, customers, and suppliers; or to fishing, grazing, or forest areas), attempts are made to establish access to equivalent and culturally acceptable resources and earning opportunities. Where domestic law does not meet the standard of compensation at full replacement cost, compensation under domestic law is supplemented by additional measures necessary to meet the replacement cost standard.

Stakeholder: Refers to recognizable persons, and formal and informal groups who have direct and indirect stakes in the project, such as affected persons/households, shop owners, traders in sidewalks/kitchen markets, non-titled persons, community-based and civil society organizations.

Top-Up Payment: Refers to Implementing Agency's payment in cases where the compensation-under-law (CUL) determined and paid by DCs falls short of the replacement costs/market prices of the affected lands and other assets.

Vested Non-Resident Properties: Originally known as "enemy properties", these have been left behind by the people of minority communities who migrated to India and other countries since the independence and partition of India in 1947. Some of these properties have been identified thru 1984, and have since been leased to private citizens or allocated to various government agencies. The act is known to be controversial and have been widely abused.

EXECUTIVE SUMMARY

BACKGROUND

1. This Resettlement and Social Management Framework (RSMF) is prepared by Bangladesh Economic Zones Authority (BEZA) under the Prime Minister's Office (PMO) to deal with social safeguard issues and impacts that may arise during implementation of the Private Sector Development Support Project (PSDSP). The project is designed to help the Bangladesh private sector to increase its competitiveness in the global market by diversifying the country's export basket. The provisions adopted in the RSMF are in accord with the World Bank's project financing policy that requires the borrowers to assess potential social safeguard issues and impacts in project preparation, and adopt and implement appropriate measures to mitigate them, in compliance with its specified policies. *Although prepared by BEZA with reference to subprojects like EZs it would implement, this RSMF will apply to all potential subprojects under PSDSP, regardless of whichever agencies/authorities implementing them.*

2. It is determined that PSDSP would involve issues and impacts that are to be addressed during selection of sites for EZs, including those required to improve the existing offsite support infrastructures, or to build new ones, and preparation and implementation of the land-based works. Lands for the EZ sites would be made available from *khas* and others owned by various government agencies, as well as from private ownerships. This triggers the Bank's OP 4.12 on Involuntary Resettlement. Applicability of OP 4.10 on Indigenous Peoples¹ will remain unknown until an EZ is located in areas inhabited by tribal peoples and it affects them in manners contradictory to their traditional and cultural way of life. BEZA has nevertheless decided that the RSMF should also take into account the OP 4.10 on indigenous peoples. As such, consistent with the Bank's OP 4.10 and OP 4.12, the RSMF proposes principles, policies, guidelines and procedure to identify and address impact issues concerning both involuntary resettlement and tribal peoples.

RSMF OBJECTIVES

3. The RSMF provides principles, policies, guidelines, and procedures to help BEZA and other authorities/agencies, which might also intend to undertake subprojects under PSDSP, to select, design and implement them with the following objectives:

- Enhances social development outcomes of the project as a whole and the individual subprojects;
- Avoid/minimize and mitigate adverse social impacts, including loss of livelihood that may result from loss of private lands and the use of public lands and common property resources;

¹ The Government of Bangladesh (GOB) does not recognize any community as "indigenous". The communities, which conform to the World Bank's definition of "indigenous peoples", are a group of GOB's "ethnic minorities" that may include various other minority groups. In this document, they are being referred to as "Tribal Peoples" in keeping with some of the HPNSDP documents. For operational purposes, the Bank's definition of indigenous peoples has been strictly adhered to.

- Ensure participation of local communities and stakeholders in the selection of EZ sites, clarifying procedures that the project would establish to address grievances that may result from activities undertaken in the EZs; and
- Ensure compliance with the relevant GOB policies and those of the World Bank on social safeguards and other social issues, including gender integration.

PSDSP AND SOCIAL SAFEGUARD ISSUES

4. The project is proposed to have the following three main components, each of which in turn may consist of multiple subcomponents: (a) *Technical Assistance and Capacity Building*, which is intended to support the institutions responsible for developing the EZs and carry out the reforms required to improve the business environment for local and foreign entrepreneurs; (b) *Public Investment Facility (PIF)*, improving/building physical infrastructures which are not funded by the private sector, but are a prerequisite to attract and support private investments in the EZs; and (c) *Grants for Training, Investment in Sustainable Technology and Firm-level Innovation*.

5. Of these, PIF is the likeliest component to involve issues that are to be addressed in compliance with the Bank's social safeguard policies. As noted above, the project triggers the OP 4.12, but applicability of OP 4.10 would be determined as BEZA continues to select EZ sites in different parts of the country. In addition to developing certain onsite physical facilities, PIF will improve the existing offsite infrastructures and/or build new ones to support economic activities in the EZs. These may include access roads; water supply and sanitation facilities; sewerage systems; power distribution; rail connections and landings; landings for riverine transport; etc. Although the majority of lands for the individual EZ sites are expected to be khas or owned by various government agencies, there will still be a need to acquire private lands. Use of khas / public lands, unless they are completely free of authorized / unauthorized private users, will also involve resettlement issues. Acquisition of private lands in large parcels, especially for the EZ sites, may cause significant impacts on landowners and may render some households completely landless, including loss of their homesteads. Including social safeguard screening, BEZA will undertake all necessary process tasks to assess and mitigate the impacts that may result from individual EZs.

BASIC PLANNING PRINCIPLES

6. The EZs would characteristically require large parcels of lands that may come from khas and other public lands, as well as from private ownerships. Khas and other public lands rarely remain found vacant; most often they are in use by private citizens with or without authorization. As to private lands, acquisition in large parcels (or 'chunks') may render some landowners completely landless -- which may even include homesteads. Considering potentials of such impacts, BEZA will adhere to the following principles:

- Prior to selection of specific EZ sites, will undertake community/stakeholder consultations about the subproject objectives and social impacts, especially those that would result from private land acquisition and displacement from khas and other public lands.
- Unless absolutely required, will do its best to avoid land acquisition from private ownerships and will always try to find khas and other public lands whenever it considers alternative sites in a given district, upazila, union or municipality.
- Will always avoid creating an EZ relying only on private land acquisition, but try to find sites where khas/public lands would account for most of the site and private lands for the least.

- Will try its best not to displace private homesteads (*vitaa-baari*) where acquisition from private ownerships is absolutely unavoidable.
- Will avoid, to the extent feasible, locating an EZ in an area inhabited by tribal peoples that will threaten their traditional and cultural way of life; severely restrict their access to common property resources and livelihood activities; and affect places/objects of cultural and religious significance.
- Will undertake social screening of all EZs, including the lands that would be needed to build support infrastructures, to identify potential social safeguard issues and impacts, and adopt and implement impact mitigation measures consistent with the relevant GOB policies and the World Bank's OP 4.12 and OP 4.10.

SAFEGUARDS SCREENING & MITIGATION GUIDELINES

7. Where social screening (a Social Screening Form is provided in *Annex A1* of RSMF) results indicate potentials of adverse impacts, BEZA's action on an EZ will be consistent with the following sets of guidelines.

- *Guidelines for Land Acquisition & Resettlement* (Section B, Pages 11-24). Contains principles, policies and guidelines for private land acquisition and use of khas and other public lands and adverse impact mitigation; mitigation measures; and implementation and monitoring arrangements for mitigation plans;
 - *Direct Purchase*. Provides guidelines for purchase directly from the landowners, in situations where BEZA urgently needs to use small amounts of private lands that may not have been included in the land acquisition proposals (LAPs) submitted to the Acquiring Body.
- *Guidance Note for Integration of Gender Issues* (Section D, Pages 31-36). Intended to help BEZA and other authorities to take into account social (non-safeguard) and gender issues into subproject selection, preparation and implementation.

RSMF IMPLEMENTATION ARRANGEMENT

8. There are multiple authorities, such as HTPA, BEPZA, BEZA and others which are expected to undertake activities/subprojects under PSDSP – all aiming to develop the Bangladesh private sector. Although the principles and guidelines adopted in this RSMF will apply to the project as a whole, implementation arrangements may vary to some extents from one authority to another, depending on the nature of social issues and scale of impacts, as well as their existing in-house capacity. It is decided that the concerned authorities would consult the Bank about the implementation arrangements as and when they undertake any development activities under PSDSP.

9. In its case, BEZA will form an Environmental and Social Cell (ESC) within the Project Management Unit (PMU) to oversee implementation of the RSMF and Environmental Management Framework (EMF) for all EZs/subprojects that have been planned under PSDSP. Guided by highly experienced professionals – one each for environment and social -- the ESC, with the required support staff, will ensure that the RSMF and EMF are implemented in their entirety, and coordinate all process tasks that are undertaken to prepare and implement EZ-specific EMPs and RPs/ARPs.

GRIEVANCE REDRESS MECHANISM (GRM)

10. The Land Acquisition Ordinance allows landowners object to acquisitions in the beginning of the legal process. Once the objections are heard and disposed of, there is virtually no provision to address grievances and complaints that individual landowners may bring in the later stages of the acquisition process. As the ordinance does not recognize them, no mechanism is there to hear and redress grievances of people who do not have legal titles to the lands (khas/public), which they may have been using to live in or making a livelihood. As seen in various projects, complaints and grievances may range from disputes over ownership and inheritance of the acquired lands to affected persons and assets missed by the censuses; valuation of the affected assets; compensation payment; and the like.

Considering the needs, BEZA will establish a Grievance Redress Mechanism (GRM) to answer to queries and address complaints and grievances about any irregularities in using the guidelines adopted in this RSMF for assessment and mitigation of adverse impacts. Based on consensus, the procedure will help to resolve issues / conflicts amicably and quickly -- saving the aggrieved persons resorting to expensive, time-consuming legal actions. The GRCs will consist of memberships to ensure proper presentation of complaints and grievances, as well as impartial hearings and transparent decisions. Membership composition of the GRCs, where IPs are among the affected persons, will take into account any traditional conflict resolution arrangements that IP communities may have in practice. A decision agreed at any level of hearing would be binding on BEZA. But a GRC decision will not preempt a complainant's right to seek redress in the courts of law. (For membership composition of the GRC, monitoring, and other details, see Pages 8-10 of RSMF.)

PRIVATE SECTOR DEVELOPMENT SUPPORT PROJECT (PSDSP)

A. SOCIAL SAFEGUARD ISSUES AND IMPLICATIONS

INTRODUCTION

1. This Resettlement and Social Management Framework (RSMF) is proposed to deal with social safeguard issues and impacts that may arise during implementation of the Private Sector Development Support Project (PSDSP), as well as the social development concerns that the project could address within its scope of works. The project is designed to help the Bangladesh private sector to increase its competitiveness in the global market by diversifying the country's export basket. As suggested by a number of international development agencies², the Government of Bangladesh (GOB) has undertaken the project to improve investment climate of the country through regulatory reforms, establishing Special Economic Zones and building/strengthening the capacity of the concerned authorities. The Bangladesh Economic Zones Authority (BEZA) under the Prime Minister's Office (PMO) is one of such authorities responsible for identifying suitable locations for Economic Zones (EZs) in different parts of the country, and preparing and implementing the 'subprojects' that would be financed under PSDSP. Accordingly, BEZA has proposed this RSMF as an integral part of the EZ development process and would apply all applicable policies and guidelines while selecting individual EZ sites and developing all off-site infrastructures that might be needed to support activities within the EZs. As the Bank proposed, this RSMF will also apply to all potential subprojects under PSDSP regardless of whichever agencies/authorities implementing them.

2. The provisions of this RSMF are proposed in view of the World Bank's project financing policy that requires the borrowers to assess potential social safeguard issues and impacts in project preparation, and adopt and implement appropriate measures to mitigate them, in compliance with the specified policies. In this regard, since the locations and the nature and scale of safeguards impacts under the specific EZs remain to be assessed, the issues and impacts addressed in the RSMF are largely based on past experience with the Bank supported projects implemented by various agencies of the Bangladesh Government. Once the general location (district, upazila, union, etc.) of an EZ is decided, the proposed RSMF will provide the basis to select the exact site, assess the social safeguard issues and impacts, and prepare the necessary plans to mitigate the adverse impacts.

3. The RSMF is divided into four sections. This section (A) introduces the project as a whole with analyses of the potential social safeguard aspects; outlines the principles and guidelines for site selection and design of land-based works and social screening thereof; community and stakeholder consultations; implementation arrangement; grievance redress mechanism; and other aspects that have bearings on social development issues and outcomes. Section B provides principles and guidelines for private land acquisition and using public lands, including *khas* lands that have been under authorized/unauthorized private uses. Some guidelines are also provided for purchase of private lands directly from the landowners. Considering the possibility of adverse impacts, which could be rare, on tribal peoples, a

² The recommendations were made in a roundtable conference on December 14 and 15, 2004 organized by the Bangladesh Enterprise Institute (BEI) and the Foreign Investment Advisory Service (FIAS), and supported by the World Bank, the UK Department for International Development (DfID), the Canadian International Development Agency (CIDA), the European Commission (EC), the International Finance Corporation (IFC) and the Japanese Government.

Framework for Tribal Peoples Plan (FIPP) is also proposed in Section C. Additionally, the RSMF includes a Gender Integration Guidance Note in Section D to address the issues that are often faced by female and low-skilled workers in the industrial sectors, including readymade garments.

THE PROJECT AND ITS SCOPE OF WORK

4. The recommendations of the roundtable conference have been translated into *project development objectives* of the proposed PSDSP, and are aimed at increasing employment opportunities for men and women, by facilitating investments (both FDI and local) in the manufacturing and services sectors of the economy. The project is proposed to have three main components, each of which consists in turn of multiple subcomponents. The three main components are as follows:

- *Technical Assistance (TA) and Capacity Building.* To support the institutions that would be responsible for developing the Economic Zones (EZs) and carry out the reforms required to improve the business environment for local and foreign entrepreneurs;
- *Off-site Infrastructure Development for EZs,* which are not funded by the private sector, but are a prerequisite to attract and support private investments; and
- *Grants for Training, Investment in Sustainable Technology and Firm-level Innovation*

Component 1: Technical Assistance and Capacity Building

5. *Capacity Building for Economic Zone Related Institutions.* This subcomponent will provide TA and capacity building support to some 7 institutions crucial to establishing and operating EZs in Bangladesh³. Capacity building will focus, among other specified tasks, on developing and applying economic and infrastructure criteria in the selection of EZ locations; conducting environmental and social assessments; and developing the necessary background and marketing materials for attracting developers and investors to the EZs.

6. *Creating a Conducive Business Environment within Economic Zones.* This subcomponent will provide TA to develop a “unique value” improvement, by creating a “first class” business-friendly environment that will also act as a pilot for wider business environment reforms. The TA will also support, among other efforts, legal and institutional reviews and capacity building to establish these services from within the zone.

Component 2: Public Investment Facility (PIF)

7. This component will invest in developing off-site infrastructure (last-mile infrastructure), as well as internal infrastructure of public-good nature, for targeted EZs, that started with the Kaliakoir Hi-Tech Park. These investments may include land preparation and development; access roads; water supply; sewerage systems; power distribution; rail connections and landings; landings for riverine transport; etc. The PIF can also fund some

³ These will include the EZ Authority; BEPZA; the PPP unit in the PMU; Board of Investment (BOI); the Department of Environment (DOE); as well as specialized institutions such as the Hi-Tech Park Authority (HTPA) and the Bangladesh Computer Council (BCC).

on-site investments, such as internal road networks, water and drainage systems, and supporting private investments in common user facilities, such as effluent treatment plants.

8. Where land acquisition is required, the Requiring Bodies, such as BEZA, will acquire the lands and mitigate the adverse impacts on the landowners and other project affected persons (PAPs) as per the *Acquisition and Requisition of Immovable Property Ordinance, 1982* and, as noted above, the World Bank's social safeguard policies, such as Operational Policy 4.12 on Involuntary Resettlement and, depending on EZ location, the OP 4.10 on Indigenous Peoples. As noted earlier, this RSMF provides the impact mitigation principles, policies, guidelines and procedures to assess the impacts associated with land acquisition and displacement, prepare and implement the impact mitigation plans, and undertake other tasks that are involved in the land acquisition and resettlement process. The RSMF also takes into account the experience gained during implementation of EPZ in Comilla and Hi-Tech Park in Kaliakoir.

Component 3: Business Linkages and Product/Process Improvement

9. This component will support better linkages between firms/industries located in the economic zones and local suppliers/businessmen, by increasing information exchange between the firms, improving supplier product standards, and ensuring compliance with international labor and environmental standards. Local sourcing, social and environmental audits, and new product development process will be among the target areas that the TA would support through training and research institutions working with groups of firms.

Probable Activities under PSDSP

10. The project is expected to support planning and overseeing the process for appointing private master developers and public financing components of EPZs to be developed by BEPZA and other GOB agencies. Wherever private developers are involved, design, construction and commissioning of EPZs will also be supported under PSDSP. The activities that are likely to be supported are as follows:

- (a) Economic Zones (Readymade Garments, Information Technology or others) development by HTPA/BEPZA/BEZA;
- (b) Site and infrastructure development for EZs and similar activities by publicly financed subcomponents, such as rail and road links, and the like;
- (c) Publicly financed common infrastructure in EZ offices, training centers, research centers and similar support facilities;
- (d) Environmental infrastructure, such as power generation; water supply and distribution; sewerage and drainage; industrial and other effluent treatment facilities; domestic/ industrial hazardous waste disposal facilities, etc; and
- (e) Other ancillary facilities for publicly and privately developed EZs.

SOCIAL ISSUES AND IMPLICATIONS

11. The socioeconomic benefits that BEZA expects from development of the EZs have long been known to Bangladesh, since the creation of the Export Processing Zones (EPZs) and development of the readymade garments sector by local entrepreneurs and investments. The

EPZs have been able to attract foreign direct investments that have created employment opportunities for a large number of Bangladeshi workers, most notably for women. Most workers in the garments sector are women (estimated to be some 80 percent) who most often come from rural areas and, unlike the women of previous generations, get a chance to work outside the households and earn an income which is not only crucial to their families, but this also adds to their self-respect and social dignity. There is no doubt about the extent to which the activities proposed under the PSDSP would benefit the local workers and economy wherever the EZs are established.

12. Depending on locations, provision of infrastructure for EZs and the economic activities therein may as well encourage new entrepreneurs to set up suitable industrial units outside the EZs. The nearby communities would see an increase in non-local population coming to work in the EZs or to start businesses catering to various demands of the newcomers and live in the vicinities. What would also be expected is an additional demand for local goods and services, including housing. An EZ in a rural setting with the potential developments around it would most likely to have notable urbanizing impacts, all of which may not turn out to be quite positive. The nonlocal workers may bring in customs and habits that were previously unknown to the local people, and some of them could as well be potential sources conflicts and risks. Intrusion of outsiders into the local communities may pose a risk of exposure to various health risks, including sexually transmitted diseases (STDs), HIV/Aids and the like.

13. As to social safeguard compliance, it is likely that the project would involve issues and impacts that are to be addressed during selection of sites for the individual EZs, including those required to improve the existing support infrastructure, or to build new ones, and preparation and implementation of the land-based works. As indicated for Public Investment Facilities under Component 2, lands for the EZs would be made available either from khas lands owned by the Ministry of Land, other public lands owned by different government agencies, and/or by acquisition from private ownerships. While private land acquisition would certainly trigger OP 4.12 on Involuntary Resettlement, use of khas and other public lands – unless they are completely free of authorized/unauthorized private uses – would do the same. If an EZ is located in lands used by indigenous peoples, or affects them in manners contradictory to their tradition and culture, the EZ would also trigger the OP 4.10 on Indigenous Peoples. However, applicability of these social safeguard policies would remain unknown until an EZ site is actually selected and screened to determine the nature and scale of social impacts.

12. RSMF OBJECTIVES

14. The principles, guidelines, and procedures provided in this RSMF are intended to ensure that all EZ sites under PSDSP, including any lands needed to build support infrastructures, are selected, developed, and the entire range of physical works are designed and implemented in view of the following objectives:

- Enhance positive social development outcomes of PSDSP with the economic activities undertaken in the Economic Zones;
- Avoid/minimize and mitigate adverse social impacts, including loss of livelihood that may result from loss of private lands and the use of public lands and common property resources;
- Ensure participation of local communities and stakeholders in the selection of EZ sites, clarifying procedures that the project would establish to address grievances that may result from activities undertaken in the EZs; and
- Ensure compliance with the relevant GOB policies and those of the World Bank on social safeguards and other social issues, including gender integration.

BASIC PLANNING PRINCIPLES

15. The EZs would characteristically require large parcels of lands that may come from khas and other public lands, as well as from private ownerships. Khas and other public lands rarely remain found vacant; most often they are in use by private citizens with or without authorization. As to private lands, acquisition in large parcels (or ‘chunks’) may render some landowners completely landless -- which may even include homesteads -- unless their ownerships consist of good number scattered plots and some of them remain unaffected by the acquisition⁴. Considering the potentials of such impacts associated with acquisition and displacement of private activities from public lands, BEZA will select the EZ sites, and design and implement all off-site infrastructures required to support the economic activities within the EZs (henceforth, *Subproject* that includes all off-site infrastructures), adhering to the following principles:

- Prior to selection of specific EZ sites, BEZA will undertake community and stakeholder consultations about the objectives and the planned economic activities in the EZ, as well as the social impacts, especially those that would result from private land acquisition and displacement from khas and other public lands. Consultations will include, inter alia,
 - All formal/informal local entities, such as Union Parishads/Upazila Parishads and other local bodies with direct and indirect stakes in the project and are deemed key actors to influence availability of lands for the EZ and design and implementation of the subproject.
 - Individuals, such as private landowners and those, especially the vulnerable who use public lands to live in and/or earn a living with or without authorization, as well as others who would be directly affected by the subproject.

⁴ For example, where the acquisitions are linear for widening an existing or build a new road, the acquisitions are quite unlikely to make a landowner completely landless. He/she may have multiple plots that may not have been affected by the acquisitions.

- Individuals, who would be affected indirectly in terms of loss of livelihood and/or access to common property resources which may have been a substantial support to their livelihood.
- Unless absolutely required, BEZA will do its best to avoid land acquisition from private ownerships and will always try to find khas and other public lands whenever it considers alternative sites in a given district, upazila, union or municipality.
- BEZA will always avoid creating an EZ relying only on private land acquisition, but try to find sites where khas/public lands would account for most of the site and private lands for the least.
- BEZA would try its best not to displace private homesteads (*vitaa-baari*) where acquisition from private ownerships is absolutely unavoidable.
- BEZA will avoid, to the extent feasible, locating an EZ in an area inhabited by indigenous or tribal peoples that will threaten their traditional and cultural way of life; severely restrict their access to common property resources and livelihood activities; and affect places/ objects of cultural and religious significance (places of worship, ancestral burial/cremation grounds, etc.).
- BEZA will undertake social screening (see below) of all EZs, including the lands that would be needed to build support infrastructures, to identify potential social safeguard issues and impacts, and adopt and implement impact mitigation measures consistent with the relevant GOB policies and the World Bank's OP 4.12 and OP 4.10.

SAFEGUARDS SCREENING & MITIGATION GUIDELINES

16. BEZA will screen each EZ site and its surroundings, and all physical works that might be undertaken to provide infrastructure support (e.g., access roads, electricity, water supply, etc.) to identify the associated safeguards issues and impacts, in order to determine applicability of the OP 4.12 and OP 4.10 and the required impact mitigation plans (a Screening Form is provided in *Annex A1*). Where land acquisition from private ownerships and displacement from public lands could not be avoided entirely, BEZA will establish the EZs and build any required land-based infrastructure in accord with the following guidelines:

- *Guidelines for Land Acquisition & Resettlement.* Contains principles, policies and guidelines for private land acquisition and use of khas and other public lands and adverse impact mitigation; mitigation measures; and implementation and monitoring arrangements for mitigation plans (Section B);
 - *Direct Purchase.* Provides guidelines for purchase directly from the landowners, in situations where BEZA urgently needs to use small amounts of private lands that may not have been included in the land acquisition proposals (LAPs) submitted to the Acquiring Body.
- *Guidance Note for Integration of Gender Issues (Section D).* Intended to help BEZA and other authorities to take into account social (non-safeguard) and gender issues into subproject selection, preparation and implementation.

COMMUNITY PARTICIPATION & CONSULTATIONS

17. As a continuous two-way communication process, this 'feed-forward' the information on the subproject's goals, objectives, scope and social impact implications to the beneficiaries, is aimed to garner their 'feed-back' on these issues (and more) for

the policymakers and project designers. In addition to feedbacks on specific issues, such a participatory planning approach is expected to enhance public relations, information dissemination and conflict resolution. Under PSDSP, community/stakeholder consultations will be conducted throughout the project cycle, with varying focus on issues relating to the subproject activities and the people who may have stakes therein. More formal consultations, focus group discussions and interviews of knowledgeable local persons will start with feasibility study, social (and environmental) screening, PAP census and impact assessment, and preparation and implementation of the impact mitigation plans. Focus of consultations will generally shift from wider audience to specific groups who have direct stakes in the project.

18. Under PSDSP, while general location of an EZ in a district or upazila may depend on various socioeconomic and political considerations, identification of a particular EZ site – be it on khas and/or private lands -- and other support infrastructures like access roads that might be needed outside the EZ would invariably require consultations with the local communities. Yet the issues that would require community participation are likely to vary from one subproject to another and, as a result, so would the scope of consultations and participants. BEZA and the consultant will be adequately diligent to gather all relevant information as and when any unique or unforeseen issues crop up during consultations. Irrespective of such possibilities, community consultations will always include the following as they relate to subproject preparation and implementation:

- The objectives, scope and implications with respect to the PSDSP's -- especially EZ's -- beneficial socioeconomic impacts, as well as the adverse impacts that are likely to be caused on users of khas and other public lands and private landowners;
- Gather community inputs/feedbacks as to how adverse impacts could be minimized; and the rights and responsibilities on the parts of the communities themselves and the agencies involved in preparation and implementation, such as GOB, BEZA, World Bank, the consultant, etc.
- Potential impacts and their sources relating to the location and scope of the civil works required to build infrastructures in order to support the various economic activities within the EZ.
- Inform the community of BEZA's Grievance Redress Mechanism and the Grievance Redress Committee (details below) that would be constituted at the subproject level, its membership composition, and explain its functions and limitations and how an aggrieved person could lodge complaints and grievances.
- BEZA/consultant will always invite female community members and make an effort to have them participate in discussions. Depending on the prevalence and practice of gender differentiation in the subproject locales, BEZA will hold separate consultations with women. The main objective is to explore the possibilities of introducing economic activity in the EZ that would benefit the local women. (Recording and analysis of inputs/feedbacks and other information will always be gender disaggregated.)

19. BEZA/consultant will ensure that community consultations are open to all and conducted in an environment which is non-threatening and where participants from all

socioeconomic strata of the subproject locales could speak and express their opinions freely without the fear of any adverse consequences. For the record, BEZA/consultant will prepare a brief stand-alone report with the following information and share it with the Bank:

- Consultation dates and venues, with the number of male and female participants;
- A brief description of the participants' socioeconomic background (at least as much could be understood from a person's demeanor and other noticeable characteristics);
- A list of the issues that were explicitly discussed, indicating the ones that received most attention from the male and female participants and the opinions they may have expressed;
- An account of any particular suggestions the male and female participants may have made for consideration by BEZA, to minimize adverse impacts, as well as to maximize the beneficial ones.
- An annex to the report should contain the names and contact numbers (if available) of all participants, and some photographs of the discussion meetings. It is also a good practice to save the field notes so that they are available for review by any institutional stakeholders.

20. It is to be noted that stakeholder consultations will be carried out throughout the subproject preparation and implementation period and BEZA will consider stakeholder inputs and feedbacks to minimize the adverse impacts at any stage of the project cycle. (Additional guidelines for community/stakeholder consultations relating to involuntary resettlement are provided in Sections B.)

RSMF IMPLEMENTATION ARRANGEMENT

21. There are multiple authorities, such as HTPA, BEPZA, BEZA and others which are expected to undertake activities/subprojects under PSDSP aiming to develop the Bangladesh private sector. Although the principles and guidelines adopted in this RSMF will apply to the project as a whole, implementation arrangements may vary to some extents from one authority to another, depending on the nature of social issues and scale of impacts, as well as their existing in-house capacity. It is decided that the concerned authorities would consult the Bank about the implementation arrangements as and when they undertake any development activities under PSDSP.

22. As to establishing Economic Zones, BEZA will form an Environmental and Social Cell (ESC) within the Project Management Unit (PMU) to oversee implementation of the RSMF and Environmental Management Framework (EMF) for all EZs/subprojects that BEZA has planned to implement under PSDSP. Guided by highly experienced professionals – one each for environment and social -- the ESC, with the required support staff, will ensure that the RSMF and EMF are implemented in their entirety, and coordinate all process tasks that are undertaken to prepare and implement EZ-specific EMPs and RPs/ARPs.

GRIEVANCE REDRESS MECHANISM

23. The Land Acquisition Ordinance allows landowners object to acquisitions in the beginning of the legal process. Once the objections are heard and disposed of, there is virtually no provision to address grievances and complaints that individual landowners may bring in the later stages of the acquisition process. As the ordinance does not recognize them, no mechanism is there to hear and redress grievances of people who do not have legal titles to the lands (khas/public), which they may have been using to live in or making a livelihood. As seen in various projects, complaints and grievances may range from disputes over ownership and inheritance of the acquired lands to affected persons and assets missed by the censuses; valuation of the affected assets; compensation payment; and the like. Considering the need, BEZA will establish a Grievance Redress Mechanism (GRM) to answer to queries and address complaints and grievances about any irregularities in using the guidelines adopted in this RSMF for assessment and mitigation of adverse impacts. Based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly, saving the aggrieved persons resorting to expensive, time-consuming legal actions. *The mechanism will however not preempt an aggrieved person's right to go to the courts of law.*

24. BEZA will form one Grievance Redress Committee (GRC) for each subproject depending on the administrative and local government jurisdiction (Districts, Upazila Parishads, Municipalities, and Union Parishads), as well as ease in accessibility by the project affected persons (PAPs). The GRCs will consist of memberships (below) to ensure proper presentation of complaints and grievances, as well as impartial hearings and transparent decisions. Membership composition of the GRCs, where IPs are among the affected persons, will take into account any traditional conflict resolution arrangements that IP communities may have in practice. *If the aggrieved person is a female, BEZA will ask a female UP Member or Municipal Ward Commissioner to participate in the hearings.*

GRC Membership

- A BEZA Representative (Convenor)
- An Elected Member of the Union Parishad or Upazila Parishad
- A Female Member of the Union or Upazila Parishad
- A Representative of the PAPs in the EZ/subproject
- Headmaster of local Higher Secondary School
- Resettlement Specialist of the Supervision Consultant (Member Secretary)
- An Area Representative of an NGO working in the area

25. During consultations in the subproject areas significantly inhabited by IPs (Chittagong Hill Tracts and elsewhere), BEZA, assisted by the consultant, will identify any existing traditional conflict resolution mechanisms used by the IP communities. If they exist, and the IPs intend, the GRCs will include at least one person from such 'traditional conflict resolution bodies' replacing one (who is unlikely to be knowledgeable of IP issues and concerns) from the memberships suggested above.

26. If a resolution attempt at the local level fails, the GRC will refer the complaint with the minutes of the hearings to the Project Director (PD) for further review. With active assistance of the social safeguard professional of ESC, the PD will make a decision and communicate it to the concerned GRC. If a decision at this level is again found unacceptable by the aggrieved person(s), BEZA can refer the case to the higher authority with the minutes of the hearings at local and BEZA levels. *A decision agreed with the aggrieved person(s) at any level of hearing will be binding on BEZA.*

27. The persons overseeing RSMF implementation at the local levels will review and sort the cases in terms of nature of grievances and urgency of resolution, and schedule hearings in consultation with the GRC convenor. All cases at the local level will be heard within four weeks of their receipt; but those related to matters like compensation for poor and vulnerable PAPs will be heard in two weeks or earlier. PD's decisions on unresolved cases will be communicated to the GRC in one week of their receipt. Decisions, if any, on unresolved cases at the levels above BEZA will be made in no more than four weeks.

28. To ensure that grievance redress decisions are made in formal hearings and in a transparent manner, the convenor will use the following guidelines:

- Reject a grievance redress application with any recommendations written on it by a GRC member or others, such as politicians and other influential persons;
- Remove a recommendation by any person that may have been written separately and submitted with the grievance redress application;
- Disqualify a GRC member who has made a recommendation on the application or separately before the formal hearing;
- Where a GRC member is removed, appoint another person in consultation with the Project Director, and keep the World Bank informed about the change and the reason to do so; and
- The convenor will also ensure strict adherence to the impact mitigation policies and guidelines adopted in this RSMF and the mitigation standards, such as compensation rates, established through market price surveys.

29. To ensure impartiality and transparency, hearings on complaints will remain open to the public. The GRCs will record the details of the complaints, the reasons that led to acceptance or rejection of the particular cases, and the decision agreed with the complainants. BEZA will keep records of all resolved and unresolved complaints and grievances and make them available for review as and when asked for by the World Bank and other interested persons/entities.

PUBLIC DISCLOSURE OF RSMF

30. BEZA will disclose Bangla translation of this RSMF to the public in Bangladesh by posting it in its website, and authorize the World Bank to disclose it at its Country Office Information Center and in its Infoshop. BEZA will also ensure that copies of the translated document are made available at its headquarters and site offices established for the individual subprojects, public libraries and local government offices in the project districts, and other places accessible to the general public. As to disclosure, BEZA will inform the public through notification in two national newspapers (Bangla and English) about the RSMF and where it could be accessed for review and comments.

B. GUIDELINES FOR PRIVATE LAND ACQUISITION, USE OF PUBLIC LANDS AND RESETTLEMENT

LAND REQUIREMENTS AND RESETTLEMENT ISSUES

1. One of the most important activities under PSDSP is identifying locations and making the required lands available for the Economic Zones. Although the land area for the individual EZs will vary in terms of location, land availability and the preferred economic activities, the required amounts are expected to be very large and have to be in one parcel for each EZ. Off-site lands may also be needed to develop support infrastructures like new access roads, or improving/widening the existing ones to connect the EZs with the major highways; sewerage systems; power distribution; water supply; and the like. In any case, BEZA has planned to obtain the lands from the khas under the Ministry of Land; unused lands belonging to various GOB agencies; and by acquisition from private ownerships. It is also possible that in rare situations, especially where the required private lands are very small in amounts and are to be urgently made available for civil works, BEZA may as well go for direct purchase from the landowners. Barring those with direct purchase, the potential resettlement issues are expected to be associated with,

- Displacement of persons/households who may have been using, without authorization, the khas and other public lands to live in and/or earn a living (non-titled persons);
- Resumption of leased-out khas and other public lands from private citizens, which may have been in use for residential, commercial or other purposes; and
- Acquisition of private lands which may cause displacement from whatever economic activities presently are there, including loss of homesteads. Given that the EZs would use lands in large parcels, it is also possible that some households may become completely landless, if they have all their lands in the selected sites.

2. Considering the potential impacts, BEZA proposes to obtain khas/public lands, which may have been under authorized and unauthorized private uses, and private lands by using the following means:

Khas and Other Public Lands

- *Under Authorized Use:* If the required lands are presently under lease from the Deputy Commissioner (in cases of khas) or any other GOB agencies, BEZA may seek to use them by fulfilling the lease stipulations.
- *Under Unauthorized Use:* BEZA will take them back by mitigating the associated adverse impacts consistent with the World Bank's OP 4.12 and OP 4.10.

Private Lands

- Wherever found absolutely necessary, BEZA will use the present *Acquisition and Requisition of Immovable Property Ordinance 1982* and any other applicable legislations, and mitigate the associated adverse impacts in compliance with the Bank's OP 4.12 on Involuntary Resettlement and OP 4.10 on Indigenous Peoples.

- Direct purchases from private landowners in compliance with the Bank's specified guidelines.

DIRECT PURCHASE FROM LANDOWNERS

3. Simplest of the means to obtain private lands is direct purchase from the landowners and resolve the resettlement issues, if any, in the transaction process. However, given the possibility that the private landowners would be quite large in number and not all would be willing to sell, the remaining means is to use the state's power of eminent domain and acquire the lands according to the established legal framework. While all private lands will be acquired, there might be occasions, however rare, when BEZA may need to urgently use small amounts of private lands that may not have been included in the LAPs submitted to the Acquiring Body and the legal acquisition process is already well underway or completed. In situations like this and considering the lengthy acquisition process, BEZA may decide to purchase the lands directly from the owners in accord with the following guidelines:

- All direct purchases must be on a '*willing buyer-seller*' basis. That is, the landowners cannot be forced or intimidated directly or indirectly to sell and at prices that are lower than the current market rates for similar lands.
- Prices for lands and other assets created or grown on them are to be negotiated and paid transparently in the presence of community leaders and organizations, NGOs, and others who are respected by the local people for their fairness and integrity. BEZA will always try to avoid dealing with middle-men (dalal) and remain fair and transparent by having the communities and individuals, as suggested, participate in the transaction process.
- Documentations consisting of minutes of price negotiations indicating location, amount, and any assets built or grown (structures, trees, etc.); names, addresses and telephone numbers of persons participated in the negotiations; and the purchase records are required to be submitted to the Bank for its review and clearance.

LAND ACQUISITION & IMPACT MITIGATION OBJECTIVES

4. The principles and guidelines proposed in this RSMF are to avoid or minimize adverse impacts on private landowners and khas/public land users; mitigate the adverse impacts that are unavoidable; and assist the project affected persons (PAPs) to improve, or at least to restore, their living standards and income earning and production capacity to the pre-acquisition levels. To achieve these objectives, BEZA will consistently adhere to the following guidelines:

- Avoid or minimize private land acquisition;
- Avoid or minimize displacement from private homesteads;
- Avoid or minimize displacement of persons and households who may have been using khas/public lands for residential, commercial and other purposes; and
- Mitigate the adverse impacts associated with private land acquisition; displacement from khas/public lands; use of common property resources; and temporary displacement/closure of businesses and livelihood activities during implementation of the civil works.

RSMF & IMPACT MITIGATION PLANS

5. *The principles, policies and guidelines as proposed in this RSMF will apply, irrespective of PSDSP components, to all EZs and similar subprojects, and their off-site support infrastructures that will involve private land acquisition and use of khas/public lands that may have been under authorized/unauthorized uses by private citizens for residential, agricultural, commercial or other purposes.*

6. As provided in OP 4.12, BEZA will prepare and implement one of the following instruments in order to mitigate the adverse impacts as and when caused by the EZ development activities, including the off-site support infrastructures:

- Resettlement Plan (RP). Where land acquisition from private ownerships and resumption of khas/public lands for an EZ and its support infrastructures affect 200 or more persons; or
- Abbreviated Resettlement Plan (ARP). Where all activities for an EZ affect fewer than 200 persons, documenting the affected persons and valuation of affected assets, impact mitigation measures and budget, and an ARP implementation schedule.

The number of project affected persons (PAPs) consists of all affected persons and their household members, irrespective of their tenure status to the lands they use for any purposes.

LAND ACQUISITION & IMPACT MITIGATION PRINCIPLES

7. In the absence of a national policy for resettlement, social safeguard issues associated with land acquisition and displacement are presently addressed by using the Bangladesh *Acquisition and Requisition of Immovable Property Ordinance 1982*, together with the Bank's OP 4.12 on Involuntary Resettlement⁵. The ordinance is used to legalize acquisition in the country's land administration system, and the OP 4.12 provides the basis to define resettlement policy objectives, and adopt and implement impact mitigation measures. In keeping with the OP 4.12, BEZA will apply the following principles and guidelines to acquire private lands and resume khas and other public lands from private uses, and adopt appropriate measures to mitigate the adverse impacts.

Land Acquisition/Use Principles

8. BEZA will select the EZ sites and location of support facilities with a strong emphasis on avoiding or minimizing adverse impacts on private landowners and those who have been using khas and other public lands -- with and without formal authorization. In

⁵ Provisions of the acquisition ordinance do not fully satisfy the requirements of the OP 4.12. Most important of the inadequacies are: the compensation determined in accord with the ordinance most often falls short of the replacement value of the affected lands; no provisions are there to ensure payment and receipt of compensation before the lands are used for works; complete indifference to the post-acquisition short- and long-term socioeconomic changes that the affected households may face; and no provisions for compensation and assistance for PAPs who do not have legal titles to the acquired lands.

this regard, BEZA will unfailingly adhere to the following principles (*also refer to paragraph 15 on Basic Planning Principles in Section A*):

- Try its best to avoid acquisition of private lands and keep the EZs limited to the amount of khas/public lands available at the selected locations;
- Use as much khas and other public lands as possible, while building off-site infrastructures to support the economic activities inside the EZ;
- Avoid or minimize:
 - Displacement from homesteads,
 - Loss of lands valued higher in terms of productivity and uses,
 - Loss of buildings/structures that are used for permanent business/commercial activities.
 - Dislocation of non-titled persons and encroachers; and
 - Impacts on community facilities, such educational institutions, places of worship, cemeteries, etc., and buildings/structures that are known to be socially and historically important.
- *Option to offer residual plots to acquisition:* Where portion of a plot remaining after acquisition becomes economically unviable, the landowner will have the option to offer the entire plot to acquisition.

9. *Avoid or minimize adverse impacts on Tribal Peoples.* Where adverse impacts are found unavoidable, BEZA will adopt appropriate mitigation measures as per the Bank's *OP 4.10 on Indigenous Peoples* (Section C provides a planning framework).

10. *Avoid impacts on Physical Cultural Resources.* BEZA will not select EZ sites that are known to have structures/objects of historical or cultural significance, and design and implement all off-site support infrastructures in compliance with the World Bank's *OP 4.11 on Physical Cultural Resources*.

Impact Mitigation Principles

11. Where adverse impacts are found unavoidable, BEZA will plan to mitigate them in accord with the following the principles:

- Resettlement of the project affected persons will be planned and carried out as an integral part of developing the EZs and their off-site support infrastructures.
- Absence of legal titles in cases of khas and other public land users will not be considered a bar to resettlement assistance, especially for the socioeconomically vulnerable groups.
- Vulnerability, in terms of socioeconomic characteristics of the affected persons/households will be identified and mitigated according to the provisions adopted in this RSMF.
- Homestead losers, including the poor and vulnerable households squatting on khas and other public lands, will be assisted with physical relocation and provision of basic facilities like water supply, sanitation, etc.
- In order to preserve their social support networks, private homestead losers who have been living in groups will be relocated, to the extent possible, together in the designated sites.

- Assets like equipment, machineries or parts/components thereof that can be dismantled and moved away intact will not be eligible for compensation, but the owners will be paid the actual costs for dismantling and moving them to the new locations.
- No compensation will be paid for facing temporary inconveniences by business operators and traders, unless they are required to completely stop their operations during the construction period, or if it leads to loss of income or livelihood during that period.
- Where EZs and their off-site support infrastructures cause community-wide impacts, affecting community facilities, access to common property resources, etc., BEZA will rebuild them and/or provide alternatives in consultation with the user communities.

ELIGIBILITY FOR COMPENSATION & ASSISTANCE

12. Regardless of their tenure status to the lands used for an EZ and its off-site support infrastructures, the affected persons/households will be eligible for compensation and assistance. Pending further investigations on any other impacts and impacted persons for individual EZs and off-site works, BEZA will mitigate impacts on the following:

- Private Landowners. Persons who have legal rights to the acquired lands and other assets, such as houses/structures, trees, etc, built and grown on them.
- All Non-titled Persons. Socioeconomically vulnerable persons/households who do not have legal rights to the affected lands, but use them for residential, commercial and livelihood purposes.
- Owners of Displaced Businesses. Compensation for income loss from businesses that are (a) displaced from private lands and khas/public lands; and (b) required to temporarily close down during construction period. In both cases, compensation / assistance will apply to the actual owners of the affected businesses.
- Employees of Affected Businesses -- who are employed in the above two types of affected businesses for at least six months up to the cut-off dates on which censuses are taken. *(If such an employee quits before the business is required to move or stop operation, he/she will no more be eligible for compensation/assistance.)*
- Rental Income Earners, from built premises situated on private lands. *(Those who earn rental income by erecting buildings/structures on khas and other public lands will not be eligible for compensation/assistance.)*
- Vested and Non-resident Property Owners/Users. Current users of the acquired lands and other properties designated 'vested and non-resident properties' during acquisition for the individual EZs.
- Leaseholders. Owners of affected business, agricultural, fisheries and other activities on formally leased-in khas or other public lands, where leases stipulate compensatory conditions if the lands are taken back or acquired before lease expiration.
- Community and Groups. Where local communities and groups are likely to lose income earning opportunities or access to crucial common property resources used for livelihood purposes.

COMPENSATION PRINCIPLES & STANDARDS

BEZA will use the following principles and standards to determine compensation and assistance for persons / households in different loss/impact categories.

13. Acquired Lands and Other Assets

- Replacement costs for an equal amount of land of same use and quality, including the registration costs and stamp duties.
- Replacement costs of houses/structures and other immovable built items (e.g., sanitation, drainage, etc.) at the current market prices of same building materials, plus the current costs of labor to build them.
- Current market prices of trees and other assets which are irreplaceable.
- If the acquired lands are agricultural and amount to 20% or more of the total productive area, a transition allowance at three times the value of the crops produced in one year in the acquired portion of land.

Methods to determine the replacement costs of lands, houses/structures and other replaceable assets, and market prices of trees, crops and other irreplaceable affected assets are suggested in Annex B1.

14. Homestead Loss

- Relocation assistance for households displaced from private homesteads either in lands they can personally arrange to buy, or in those arranged by BEZA.
- Relocation assistance for socioeconomically vulnerable households displaced from the khas and other public lands, in public lands arranged by BEZA.
- Provision of pre-acquisition level basic utilities, such as water supply, sanitation, electricity, etc.

15. Loss of Business, Employment and Rental Income

Temporarily Closed Businesses:

Where business activities come to a complete closure during construction, the owners will be paid for income loss at rates based on average daily net income for a period needed to re-open the individual businesses, or for the duration of the civil works.

Partially Affected Businesses:

Where business premises are partially dismantled and the remainders are structurally safe and useable, compensation, calculated as above, for smaller of the number of days needed to repair and reopen the individual businesses, or complete the civil works.

Businesses Completely Displaced from Private Premises:

- Relocation in public lands, *plus* compensation, calculated as above, for a period of 30 days; or
- Compensation, calculated as above, for the number of days the business owners need to find alternative locations themselves, for a maximum of 90 days.

Loss of Employment Income from Displaced & Temporarily Closed Businesses:

Persons who have been continuously employed by the displaced and temporarily closed businesses for at least six months up to the day of PAP census (*cut-off date*), will be compensated for the period until their employers restart their operations, or for a maximum of 30 days. The daily rates will be based on their monthly salary paid by the employers.

Loss of Income from Rented-out Private Premises:

Six months' rent at the current rates for loss of rental income from premises affected on private lands.

16. Vested and Non-Resident Properties

Lands and other properties that have not been declared 'vested and non-resident' (previously 'enemy properties' under the *Enemy Properties Act of 1965*)⁶ through 1984, and are found to be 'vested and non-resident' during acquisition for any EZ and its off-site support infrastructures under PSDSP, the following guidelines will apply:

- *Agricultural lands:* Present users/owners will qualify for compensation two times the value of all crops grown on the acquired portion in a year.
- *Acquired business premises:* For *temporarily closed* and *partially affected* businesses, the same measures as proposed for such impacts in the preceding paragraph will apply.
 - For premises that are to be dismantled completely: Relocation in public land in the same general area, *plus* compensation based on daily net income for a period needed to reopen the individual businesses, for a maximum of 30 days, or
 - Compensation, calculated as above, for the number of days the business owners need to find alternative locations themselves, for a maximum of 90 days
- *Loss of Income from Rented-out Premises:* Three months' rent at the current rates for loss of rental income from premises affected on VNR lands.

⁶ These properties have been left behind by the people of minority communities who migrated to India and other countries since the independence and partition of India in 1947. An investigation through 1984 designated some of such properties as 'vested and nonresident (VNR)'. There still remains an unknown amount of such properties, which are used by people claiming to be legal heirs of the original owners. If the legal documents possessed by the present users are found unsatisfactory during acquisition for PSDSP, DCs would declare them VNR and disqualify them for the compensation-under-the-law. The law is known to be controversial and has been widely abused by the influential people. BEZA will however implement the proposed mitigation measures on the ground that without the EZs the current users would still be using these properties.

- *Acquired homesteads* (including houses/structures): BEZA will make alternative arrangements in consultation with the present users/owners. *Where acquisitions partially affect lands and other properties, the present owners/users will be allowed to use the remainders.*

17. Unforeseen Impacts

BEZA will adopt and implement policies, in consultation with the affected persons/stakeholders and the Bank, to mitigate any adverse impacts that are unique to a particular EZ and may have so far remained unknown, and not covered in this RSMF.

COMPENSATION PAYMENT

18. In cases of acquisition, a part of the compensation for lands and other affected assets built or grown thereon will be assessed and paid to the title holding PAPs by the Deputy Commissioners (DCs), the heads of the Acquiring Bodies. If this payment, 'compensation-under-law' (CUL), is found smaller than their replacement costs and/or market prices, BEZA will directly pay the difference or 'top-up' to make up for the shortfall.

19. With or without acquisition compensations/assistance due to all other PAPs, such as non-titled persons, business owners and employees and those, who are not covered by the acquisition ordinance, but eligible according to this RSMF, will also be directly paid by BEZA.

20. *Top-up Determination and Payment:* Where an owner loses lands and other assets in more than one *mouza* or land administration unit, the person will be counted once, and his/her top-up will be paid together. The amount of top-up due to the affected person will be determined by comparing the *total amount of CUL* paid by the DCs for lands and other assets acquired in all *mouzas* with the *total replacement costs and/or market prices thereof*.

21. *Compensation/entitlement due to the PAPs, including those who are not covered by the acquisition ordinance, but eligible according to this RSMF, will be paid in full before they are evicted from the acquired private and khas/other public lands.*

22. Based on the principles proposed for impact mitigation, the following matrix defines the specific entitlements for different types of losses, entitled persons, and the institutional responsibility to implement them. Further explanations and application guidelines are given in *Annex B2*.

ENTITLEMENT MATRIX

1. LOSS OF LANDS (AGRICULTURAL, HOMESTEAD, COMMERCIAL & OTHERS)

Ownership Type	Entitled Person	Entitlement	Responsibility
<i>Private</i>	<i>Legal Owners</i> , as determined by DCs, or by courts in cases of legal disputes	Compensation-under-law (CUL) or replacement costs, whichever is greater. <i>If applicable (subject to paragraph 18)</i> <ul style="list-style-type: none"> • Top-up equal to the difference between CUL and replacement costs. • Transition allowance (TA) for income loss (see Loss Category 5 below). 	CUL paid by DC Top-up & TA paid by Project
<i>Khas & Other Public Lands Under Lease.</i>	<i>Leaseholders</i>	<ul style="list-style-type: none"> • Contractual obligations with the public agencies, as determined by DCs, and / or • Contractual obligations with other GOB agencies. 	Paid by DC and/or Project
<i>Vested Non-Resident</i>	<i>Current Owners/Users</i>	Transition allowance for income loss (see Loss Category 5).	Paid by Project

2. LOSS OF HOMESTEAD LANDS

Location	Entitled Person	Entitlement	Responsibility
<i>Homesteads on Private Lands</i>	<i>Legal Owners</i> , as determined by DC, or by courts in cases of legal disputes	<i>In addition to CUL & applicable top-up (as for Loss of Lands above):</i> <ul style="list-style-type: none"> • Assistance to move and rebuild the houses in the same homesteads, in cases of partial acquisitions • Relocation assistance, including land development, where PAPs choose to relocate on their own, <u>or</u> developed plots if they choose to relocate in public lands to be arranged by BEZA, where acquisitions require relocation elsewhere. • Provision of pre-acquisition level basic utilities (water supply, sanitation, electricity, etc.). 	By Project
<i>Homesteads on Khas & Other Public Lands</i>	<i>Vulnerable Non-titled persons</i>	<ul style="list-style-type: none"> • Relocation assistance, including developed plots in their own or other public lands, to be arranged by BEZA. • Provision of water supply & sanitation facilities. 	By Project
<i>Homesteads on VNR</i>	<i>Present Owners/Use</i>	<ul style="list-style-type: none"> • Assistance to move and rebuild the houses in the same homestead, in cases of partial acquisitions. 	By Project

<i>Lands</i>	<i>rs</i>	<ul style="list-style-type: none"> • Assistance to settle in developed plots in public lands arranged by BEZA, <u>or</u> six months' rent for comparable living accommodations, where acquisition requires relocation elsewhere. • Provision of water supply and sanitation facilities. 	
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3. LOSS OF HOUSES/STRUCTURES USED FOR LIVING, BUSINESS & OTHER ACTIVITIES

Type & Location	Entitled Person	Entitlement	Responsibility
<i>All Houses/ Structures on Acquired Private Lands</i>	<i>Legal owners, as determined by DCs, or by courts in cases of legal disputes.</i>	Compensation-under-law (CUL) or replacement cost, whichever is greater.	CUL paid by DC
		<ul style="list-style-type: none"> • Transfer Grant (TG) to cover the carrying costs of household goods, at one-eighth of the replacement costs of the affected structures. • Allowed to keep the salvageable materials 	TG paid by Project
<i>Shiftable & Non-shiftable Structures on Khas & Other Public Lands</i>	<i>Vulnerable Non-titled persons</i>	<ul style="list-style-type: none"> • <i>Shiftable structures:</i> House Transfer Grant (HTG) and House Construction Grant (HCG), @ Tk 50 per sft of floor area, with a minimum of Tk 3500 and maximum of Tk 5000. • <i>Non-shiftable structures:</i> HCG @ Tk 70 per sft of floor area with a minimum of Tk 4000 and maximum of Tk 6000. • Allowed to keep the salvageable materials. 	HTG & HCG paid by Project
<i>Houses/ Structures on VNR Lands</i>	<i>Current Owners/Users</i>	HTG and HCG (amounts are to be determined in consultation with the current owners/users). <ul style="list-style-type: none"> • Allowed to keep the salvageable materials. 	HTG & HCG paid by Project

3. LOSS OF TREES ON ACQUIRED PRIVATE & PUBLIC LANDS

Location	Entitled Person	Entitlement	Responsibility
<i>On private Lands</i>	<i>Legal owners as determined by DCs, or by courts in cases of legal disputes</i>	<ul style="list-style-type: none"> • Current market value of trees, based on species, size and maturity. • Current harvest prices of fruits on trees, if they are felled before harvest. • Owners are allowed to fell the trees and keep them. 	By BEZA (included in the CUL) and/or By Project (included in the top-up)
<i>On Khas & Other Public Lands</i>	<ul style="list-style-type: none"> • <i>Non-titled persons, encroachers</i> • <i>Private groups, NGOs, etc.*</i> 	As those stipulated above for trees and fruits on trees, on private lands.	By Project
<i>On VNR Lands</i>	<i>Present Owner/User</i>	As those stipulated above for trees and fruits on trees, on private lands..	By Project

* Public lands, especially along the roads, are sometimes leased out to private groups and NGOs for tree plantation under income generation programs.

5. LOSS OF AGRICULTURAL, BUSINESS, EMPLOYMENT & RENTAL INCOME

Impact Type	Entitled Person	Entitlement	Responsibility
Agricultural Income: <ul style="list-style-type: none"> If acquisition amounts to 20% or more of the total productive area If acquired VNR lands are agricultural 	Legal Owners, as determined by DCs, or by courts in cases of legal disputes.	Transition allowance equal to three times the harvest prices of one year's crops produced in the acquired parts of the lands.	By Project
	Present Owners/Users	Transition allowance equal to three times the harvest prices of one year's crops produced in the acquired parts of the lands.	By Project
Business Income: <ul style="list-style-type: none"> Temporary closure of businesses in existing premises Partially affected businesses Businesses requiring removal from the existing premises and spots 	Business Owners (premise / land owners & tenants)	Compensation, based on 30 days' average daily net income, for the actual number of days the businesses remain closed <u>or</u> complete the civil works.	By Project
	Business Owners (premise/land owners & tenants)	Compensation, calculated as above, for <u>smaller</u> of the number of days needed to repair and reopen the individual business premises, <u>or</u> complete the civil works.	By Project
	Business Owners (premise/land owners & tenants)	<ul style="list-style-type: none"> Relocation in khas/public lands, <i>plus</i> compensation, calculated as above, for a period of 30 days; <u>or</u> Compensation, calculated as above, for the number of days the business owners need to find alternative locations themselves, but for a maximum period of 90 days. 	By Project
Loss of employment income	Business Employees	Compensation at current daily wage rates for the period needed to reopen the businesses, or for a maximum of 30 days.	By Project
Loss of income from rented-out	Legal Owners and Current	<ul style="list-style-type: none"> Six months' rent at the current rates to the owners of the 	By Project

premises on private & VNR lands	Owners/Users of VNR lands	premises on <u>private lands</u> . • Three months' rent at the current rates to the owners/users of premises on <u>VNR lands</u> .	
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6. UNFORESEEN LOSSES

Impact Type	Entitled Person	Entitlement	Responsibility
<i>As may be identified during subproject preparation & implementation</i>	<i>As Identified</i>	As determined in consultation with World Bank and the stakeholders.	By Project

PREPARATION OF IMPACT MITIGATION INSTRUMENTS

23. Availability of khas and other public lands for EZ itself and any required off-site support infrastructures will basically determine the location of an EZ. Once a decision is finalized about the EZ site and land requirements for off-site infrastructures -- in view of the basic principles and guidelines stipulated to minimize adverse impacts -- the major preparation tasks will consist of,

- **Preparing the land acquisition proposals (LAPs).** Where lands from private and public ownerships are to be acquired, LAPs will be prepared as per the standard requirements of the Acquiring Body.
- **Taking the PAP censuses and fixing the cut-off dates.** To prepare RPs and ARPs, censuses will assess details of the impacts and impacted persons/households with respect, but not limited, to the impact categories and compensation/assistance eligibility criteria proposed in this RSMF. The dates on which censuses are taken will constitute the cut-off dates for non-titled persons, and the dates on which the acquisition notice under Section 3 of the acquisition ordinance (Notice-3) is served will be the cut-off dates for private landowners. (Private landowners are not allowed to alter appearance of the lands by erecting new structures or otherwise, after the Notice-3 is served.)
- **Identifying and developing the relocation sites for homestead losers.** The relocation sites will be selected well in advance and will be as close as possible to the EZs, wherein they currently live and know all about the income and livelihood sources around them.
- **Conducting the market price surveys.** To determine the replacement costs of lands, houses/structures and other replaceable, and market prices of irreplaceable affected assets, which are all required to prepare the land acquisition and resettlement budget (Survey methods suggested in *Annex B1*).

CONTENTS OF RP & ARP

24. The RPs or ARPs will be prepared in view of the number of persons affected by resumption of khas and other public lands from private uses, and acquisition from private ownerships. With the principles and guidelines proposed in this RSMF, the mitigation plans will include the following:

Resettlement Plan (RP)

- Description of the general location and the details of the khas and other public lands, as well as any private lands that will be used for the proposed EZ and for the land-based support infrastructures. The description will include details of whatever movable and immovable objects and activities existing on the ground;
- Details of the adverse impacts as gathered by censuses of the affected persons/households and the affected assets. (PAP/household level data will be computerized to prepare the entitlement files.);
- An account of the alternatives considered to avoid and/or minimize the adverse impacts;

- An account of the consultations with the would-be affected persons/households about the mitigation measures and implementation procedure;
- An institutional mechanism including GRM, disclosure, M&E, etc.
- An account of the entitlements and entitled persons/households for different types of losses as per the principles and guidelines adopted in this RSMF;
- An account of the households made vulnerable by displacing them from khas/public lands, and/or by acquisition of lands they owned, and the kinds of special assistance that would be provided;
- A resettlement budget with breakdowns by impact/loss categories and the number of persons entitled to compensation / assistance; and
- A RP implementation schedule, coordinated with the civil works schedule.

Abbreviated Resettlement Plan (ARP)

- Documentation of the private and khas/public lands required for the EZ and the related works, affected persons, and valuation of the affected assets;
- Description of compensation and other resettlement assistance that will be provided according to the principles and guidelines adopted in this RSMF;
- An account of consultations with the displaced persons/households for agreement on mitigation measures;
- An institutional mechanism including GRM, disclosure, M&E, etc.
- A resettlement budget with breakdowns by loss categories and the number of persons entitled to compensation/assistance; and
- An ARP implementation schedule, coordinated with the civil works schedule.

COMMUNITY/STAKEHOLDER CONSULTATIONS

25. With varying intensity and coverage of issues, community/stakeholder consultations are conducted throughout the project cycle. Formal consultations and interviews of knowledgeable local persons generally start during feasibility study, social screening, PAP census and impact assessment, and preparation and implementation of the impact mitigation plans. Focus of consultations shifts from wider audience to specific groups who have direct stakes in the project. As to preparation and implementation of the RP and ARP, consultations will often concentrate on persons/households who have been affected because of land acquisition, as well as others displaced from khas/public lands.

26. Once the would-be PAPs are identified, BEZA will,

- Consult and provide information to the PAPs on specifics of the mitigation measures and the processes that will be followed to implement them;
- Inform the affected landowners of the legal documents required to claim compensation from the Acquiring Body, and explain the procedure where the

- landowners may need to have them processed anew (BEZA will actively assist the landowners procure any documents required for CUL payment); and
- Explain the functions and limitations of the Grievance Redress Mechanism, and how an aggrieved PAP could lodge their complaints and grievances with the Grievance Redress Committees.

27. Stakeholder consultations will be carried out throughout the RP/ARP preparation and implementation period and BEZA will consider stakeholder inputs and feedback to minimize the project's adverse impacts at any stage of the project cycle.

DOCUMENTATIONS

28. While RPs/ARPs will include summary of the impacts and impacted persons/households, BEZA, assisted by the project consultant, will ensure availability of the following and any other documentations as and when requested by the World Bank:

- Minutes of the stakeholder consultations on selection of EZ sites and support infrastructures, social safeguard implications of displacement from khas and other public lands, private land acquisition, mitigation measures adopted in the RSMF, etc.
- Inventory of different categories of PAPs based on the census of affected persons/households and their assets.
- Replacement costs and current market prices of different types of affected assets, as determined through market prices surveys.
- Evidence of CUL payment by the Acquiring Body, and top-up and any other entitlements paid by BEZA itself.
- Records of complaints and grievances, and the decisions (both positive and negative) given by Grievance Redress Committees, BEZA, or by the line ministry.

MONITORING & REPORTING

29. Monitoring will consist of an array of steps relating to social screening; transfer and acquisition, respectively of khas/public and private lands; and preparation and implementation of impact mitigation plans, like RP and ARP. (The major tasks that are to be monitored are provided in *Annex B3*.) The project consultant will assist BEZA to set up and operate a computerized system to monitor and report progress and performance with regard to the tasks involved in the land transfer and acquisition process.

30. BEZA will provide the Bank with the following information for its review of performance and compliance with the OP 4.12 under the individual EZs, including the off-site works that might be undertaken to build the support infrastructures:

- Bi-Monthly updates indicating progress in land transfer and acquisition and CUL payment for the acquired private lands by DCs, and any issues that are to be addressed to facilitate transfer and acquisition process;
- Bi-Monthly updates on BEZA's part of the payment: (a) top-up and other applicable entitlements to the CUL recipients; (b) compensation/entitlements to the affected non-titled persons; and (c) compensation/entitlements to any other persons/groups not covered in this RSMF, but found later to be affected by the works undertaken for the EZ.
- Bi-monthly updates on Entitlement Matrix and activities related to Grievance Redress Mechanism.
- Detailed report for World Bank supervision missions covering all EZs, which will include, among other information, the latest status of khas transfer, land acquisition and compensation payment by DCs and BEZA; implementation of any other stipulations adopted in the RP; an account of the GRC activities; and any issues that are to be addressed to improve performance of the resettlement program.

31. BEZA will conduct an independent review to assess how the khas identification and transfer process has worked and how efficiently land acquisition has been carried out, impact mitigation plan like RPs or ARPs have been prepared and implemented; and efficacy of the mitigation policies and measures adopted in this RSMF.

LAND ACQUISITION & RESETTLEMENT BUDGET

32. Since the land acquisition needs and the associated impacts will be known with the selection of specific EZs or subprojects and scope of works therein, preparing a budget for the entire project or all EZs is not feasible at this stage. Under the circumstances, BEZA proposes to ensure the following:

- The RP or ARP prepared for each EZ, including off-site support infrastructures, which will be subjected to Bank review and clearance prior to accepting it for financing, will include a budget for land acquisition and resettlement; and
- The project funding approval process of the GOB, which may involve other ministries, will provide funds to finance land acquisition and resettlement activities that could not be budgeted at this stage of project preparation.

The budget for each EZ and off-site infrastructures will be detailed with breakdowns in terms of various types of losses with their replacement costs/market prices and the number of persons entitled to compensation in each loss category.

C. GUIDANCE NOTE ON GENDER INTEGRATION

SOCIAL AND GENDER ISSUES

1. This guidance note on gender integration is intended to make Bangladesh Economic Zones Authority (BEZA) and other similar authorities⁷ aware of the World Bank's concerns for gender-based inequalities and indignities prevalent in workplaces where men and women work together. It is observed that development effectiveness of projects can be enhanced by addressing such gender issues that are considered serious obstacles to inclusive and sustainable development. In this regard, the Bank considers it most important that development programs and projects should always explore feasible alternatives to enable the disadvantaged, especially women, to share in the benefits generated by the projects it supports. And it is expected that BEZA and other authorities will most certainly explore all feasible alternatives in the design and implementation of all subprojects like Economic Zones (EZs) and others under the Private Sector Development Project (PSDSP).

2. With regard to gender-related concerns, Bangladesh has gained a great deal of knowledge and experience about various issues associated with the employment and treatment of women. On the positive side, various manufacturing units established in the Export Processing Zones (EPZs) and those outside these enclaves have brought about a profound socioeconomic change in the lives of millions of poor men and women by creating work opportunities that have also immensely benefited the country in terms foreign trade and export income. Establishment of BEZA and other similar authorities under the Prime Minister's Office (PMO) is aimed at expanding and distributing work opportunities in different parts of the country and facilitating diversification in domestic and foreign investments. But there are still a lot of issues regarding gender-based disparities and unfair treatment that continue to remain unaddressed.

Economic Zones & Expected Benefits

3. Governmental efforts have been underway to attract and diversify the manufacturing sector as a whole. Given its significance, promotion of garments manufacturing still remains at the top of the priority enterprises in the BEZA's list of industrial activities that would be encouraged in EZs irrespective of their locations. The EZs that BEZA has decided to develop in different parts of the country will be provided with lands and other support infrastructures like access roads, power and water supply, water treatment plants and the like are a significant part of the incentives to encourage domestic and foreign investments. BEZA has already selected sites for four EZs in three different districts: Mongla in Bagerhat, Sherpur in Moulvibazaar, and Mirersharai and Anowara in Chittagong, and has also been studying other possible locations.

⁷ Bangladesh Export Processing Zones Authority (BEPZA); Bangladesh Economic Zones Authority (BEZA); Private Export Processing Zone Cell (PEPZC); and Bangladesh Computer Council (BCC) under the Prime Minister's Office; as well as Bangladesh Hi-Tech Parks Authority (BHTPA) under the Ministry of Post, Telecommunications and Information & Communication Technology.

4. It is expected that the economic activities, that BEZA would encourage in EZs and provide operational guidance, will variously benefit local workers and economies. While promotion of garments manufacturing remains the topmost enterprise that employ largest number of female workers, electronics, pharmaceuticals, leather and shoes, textiles, food processing, toy making and the like are also known to employ female workers in considerable numbers. Employment possibilities could also be there for maintenance of the physical facilities and other works where employees could be trained on the job. EZ locations that are proximate to urban centers, or easily accessible by public or company-arranged transports, could find suitably educated women to work on jobs that do not require much of technical skills. Again, depending on locations it is also possible to find women suitable to perform managerial jobs. A careful consideration of the tasks involved in a particular production process may indicate where women in particular could be employed.

RMG Sector and Its Significance

5. When it comes to employment and wellbeing of female workers in Bangladesh, readymade garments (RMG) sector figures at the top -- with none anywhere close to it. Since the early 1980s garments manufacturing has been the most prominent sector to have grown fast and created employment opportunities for a large number of Bangladeshi workers and will continue to do so for years to come. It is estimated that Bangladesh has some 4,800 to 5,000 garments factories across the country, and they together employ 3.5 to 4.0 million people, of which more than 80% are women. In 2012 the RMG sector alone accounted for more than 80% of the country's export income, mainly from the United States and European countries⁸. Garments exports tripled between 2005 and 2010 and are expected to triple again by 2020, to almost \$50 billion in annual exports⁹. The Bangladesh RMG sector is second only to China in terms of employment, and the fourth largest exporter of readymade garments in the world¹⁰. Recently, the Bangladesh Ministry of Commerce claimed that Bangladesh is presently the second largest exporter of readymade garments and would become the largest in the near future, dislodging China¹¹.

6. It is also noted that the huge majority of the female workers come from the rural areas where survival -- with bare minimum of the requirements -- was a continuous struggle. For them even the poorly paid jobs in the garment factories are an escape from worse poverty in remote villages around the country. (An important reason for the rapid growth of the RMG sector in Bangladesh is attributed to the lowest worker wages compared to other major garments making countries like China, Vietnam, Indonesia and many other countries in the world¹².) Nevertheless, it is widely recognized that unlike women of the previous generations, they now get an opportunity to work outside the households and earn an income which is not only crucial to their families, but also adds to their self-respect and social dignity.

⁸ Annie Kelly (2012). *Urbanization in Bangladesh proves a double-edged sword for women*, The Guardian (<http://www.theguardian.com/global/development/2012/nov/05/urbanization-bangladesh-women>).

⁹ The Bloomberg Business Week (<http://www.businessweek.com/articles/2013-05-09/bangladesh-paradox-for-poor-women-workers>).

¹⁰ War on Want (undated). *Sweatshops in Bangladesh* (<http://www.waronwant.org/overseas-work/sweatshops-and-plantations/sweatshops-in-bangladesh>).

¹¹ Commerce Minister. *Banglades Pratidin*, May 6, 2015, page 1 and 6.

¹² War on Want (undated). *Sweatshops in Bangladesh* (<http://www.waronwant.org/overseas-work/sweatshops-and-plantations/sweatshops-in-bangladesh>). In December 2010 a new national minimum wage came into force, the first wage increase for 4 years. Previously, the lowest paid garment workers earned a meagre £15 a month (1,662 taka) but they will now be able to earn £25 a month (3,000 taka), an increase of 80%. However, this is still short of a living wage, calculated to be £45 a month (5,000 taka).

Gender Integration Issues

7. Despite its huge contribution to the national economy, the RMG sector has become synonymous with discrimination and abuse of workers -- most notably of female workers. Although very little or no attention has been paid to other industrial sectors, which also employ women in considerable numbers, it is reasonable to assume that conditions in those workplaces are most likely to be similar also. Given the paucity of information on other sectors, the lessons learned in the RMG sector should provide a strong basis to address the gender integration issues across all enterprises, including RMG that would be established and run by the private investors. The following are widely known issues that are to be addressed for fair treatment of workers in general and the female workers in particular.

- *Women workers* – especially unskilled and lowly skilled -- are particularly vulnerable to discrimination and abuse. In a situation where the wages are already very low and considered far less than living wage¹³, female workers are known to be paid at considerably lower rates than the males for similar jobs.
- *Sexual harassment and indignities*, which range from verbal abuse to “touching” are rarely talked about -- but goes on quietly. Physical assault of workers is not too rare.
- *Freedom of association and collective bargaining* are still not allowed in all factories. (After years of rallies and agitations, which often turned violent, workers' unions are allowed in some of the privately-run factories. It is still not allowed in the enterprises in EPZs where investments are mostly foreign.)
- *Lack of safety* in the factories, which has been widely known and caused hundreds of deaths over the years, due to fire and structurally unsafe buildings that housed many of the factories. (Almost all of the fatal accidents have occurred in factories outside the EPZs. It is expected that BEZA will have an effective arrangement to examine and ensure that structural design of each and every building is sound and has incorporated all required safety measures to prevent fire and other hazards.)

8. As to addressing many of the issues, the most instructive lesson was learned two years ago after collapse of the Rana Plaza that killed 1,129 garments workers and aroused worldwide concerns, especially in countries (USA and European Union) that import readymade garments from Bangladesh. In order to improve the working conditions the Government of Bangladesh, under the auspices of European Commission (EC), United States (US) and International Labor Organization (ILO), agreed to reform and amend its Labor Law to safeguard the workers' rights, safety and other interests, which are all contained in the EC's *Bangladesh Sustainability Compact* report¹⁴. However, according to the EC's status review, there is still a lot to be done, including application of the amendments made to the labor law. The report

¹³ *In December 2010 a new national minimum wage came into force, the first wage increase for 4 years. Previously, the lowest paid garment workers earned a meagre Taka 1,662 a month, but they will now be able to earn Taka 3,000 a month -- an increase of 80%. However this is still short of a living wage, calculated to be Taka 5,000. (War on Want (undated). Sweatshops in Bangladesh, (<http://www.waronwant.org/overseas-work/sweatshops-and-plantations/sweatsops-in-bangladesh>))*

¹⁴ European Commission – Directorate-General for Trade (Brussels, 24 April 2015). *Bangladesh's labor right progress two years after Rana Plaza tragedy* (<http://trade.ec.europa.eu/doclib/press/index.cfm?id=1296>)

and a press release¹⁵ were issued on 24 April 2015 -- the second anniversary of the Rana Plaza disaster. *In this respect, pending reform and amendments to the labor law BEZA can play a proactive role aligning its guidelines and regulations to the provisions of the EC's Bangladesh Sustainability Compact.*

Social and Gender Analysis

9. The objective is to help BEZA and other authorities, as well as the potential investors with information about men and women who would be potential job-seekers in enterprises that will be located in the EZs. This would help BEZA to formulate and institute pragmatic guidelines and regulations to ensure effective integration of gender issues into the economic activities that would possibly be recommended for the individual EZs. On the other hand the investors, who have already decided on certain types of industrial activities, could readily get an idea about whether or not, or the extent to which they could profitably undertake those and, at the same time, integrate gender issues into their operations. Other entrepreneurs could choose from among the activities BEZA might have already identified to offer better possibilities of employing female workers.

10. The issues relating to gender integration and equity can be addressed with: (a) *General guidelines at overall project level* -- which will apply to all EZs irrespective of locations and types of economic activities; and (b) *Guidelines for individual EZs*, which will be complementary to the general guidelines, but extended to ensure benefits for the local workers, including women. BEZA may consider the extended guidelines when an EZ is located in regions/districts that are economically depressed with high incidence of poverty.

General Guidelines at Overall Project Level

11. BEZA will have all required guidelines and regulations about investments and investors; economic activities and allocation of land in EZs; incentive systems; safety and security of workers; and the like, to ensure effective administration and operation of the EZs. All of this will utilize the experiences that have been gained from operation and administration of EPZs over the last three decades and, *most importantly from operations run by the private entrepreneurs*. In this respect, BEZA will also take into account the provisions/improvements agreed in the EC's *Bangladesh Sustainability Compact* jointly prepared by GOB and ILO.

12. BEZA has been aware of the concerns that directly affect the female workers at workplaces, including garments factories. As to EZs, the challenge is integrating gender issues into the administrative and operational guidelines and creating as much opportunities as possible for women, and treating them equitably in terms of wages and other benefits offered to the male workers with similar skills and outputs; ensuring protection against sexual harassment and other forms of indignities prevalent in workplaces across the sectors.

Extended Guidelines at Individual EZ Level

13. Benefiting the local communities and workers at this level will require careful analyses of the current situation which may vary from one EZ to another. Gender analysis at this level

¹⁵ European Commission Statement (Brussels, 24 April 2015). *Joint statement by European Commission/HRVP and US agencies on the Second Anniversary of the Rana Plaza disaster in Bangladesh* (http://europa.eu/rapid/press-release_STATEMENT-15-4849_en.htm)

would help BEZA to adopt appropriate guidelines to ensure gender integration into the economic activities selected to locate in EZs that are aimed at improving the local economies. This will require analyzing the existing economic and socio-demographic conditions that will indicate economic characteristics and vulnerability of the different community groups, including women; social acceptance of women working outside the households; education that may make an important difference when it comes to suitability for particular jobs, including ease in training to perform particular tasks that the enterprises may require; and other factors that would enable BEZA and the investors to make decisions about the kinds of industrial activities they want to undertake in a particular EZ. Analysis may include, but not limited to, the following information.

- *EZ location*, describing physical characteristics (topography and other physical features) of the individual EZs; proximity to existing urban centers; accessibility to the EZ site; existing/potential transport networks; power and water supply; and others that are usually considered important for setting up manufacturing enterprises.
- *Community consultations*, including women, about objectives of the project and the kinds of enterprises, with job prospects for men and women, which would be set up in the individual EZs. BEZA will consider all inputs and feedbacks received from the communities, and record and analyze all information in terms of gender -- men and women. (Depending on local custom, consultations with women may have to be conducted separately.)
- *Community profile*, indicating population size; ethnicity; education and related facilities; prevalence/practice of gender differentiation; major economic activities; availability and use of common property resources; occupational groups; formal/informal institutions and rules and behavior that may influence gender integration into the industrial activities; and any other information relevant to particular activities identified for the individual EZs.
- *Social acceptability*, existing and potential issues and concerns related to the roles women play in the household and the prospects that they could work outside the households, without causing social conflicts.
- *Other information* that are considered important to make decision on choice of particular EZs and enterprises.

14. In addition to general guidelines and regulations, BEZA could prepare brochures compiling information on the individual EZs. They will contain the above information and more, if required to satisfy the needs of the prospective investors.

Monitoring Gender Integration Issues

15. Monitoring gender integration and other issues will be treated as a continuing activity. Once the general and extended guidelines are in place, BEZA will begin monitoring in line with the stipulations made therein. At the same time, BEZA will make certain whether or not, or the extent to which gender issues have been integrated in the design and operation of the individual enterprises proposed to locate in EZs. In this respect, BEZA will have special focus on the problems and issues discussed in paragraph 7, in order to ensure:

- That the entrepreneurs have implemented minimum labor wages fixed in December 2010 for both male and female workers. (BEZA will always actively encourage the entrepreneurs to pay what is known as “living wage”.)

- Parity in wages (and festival bonuses, if any) between male and female workers for performing similar tasks, which has long been a concern in the RMG sector, but might also be true in other sectors.
- Protection of female workers from all forms of sexual harassment and indignities, committed by male supervisors, co-workers and others working in any other enterprise in the EZ.
- Provision of separate facilities, such as toilets, dining hall, resting rooms, etc. within the factory buildings.

Grievance Redress Mechanism (GRM)

16. BEZA will establish a mechanism to address grievances and complaints brought by the workers employed in the individual EZs. The GRM will deal with the cases that the Human Resources department in the individual enterprises could not resolve, or resolved in manners not acceptable to the aggrieved person. The GRM will formulate a set of principles to ensure full transparency of the hearing and fairness in the decision-making process, and constitute an EZ-level *Grievance Redress Committee (GRC)* to actually deal with the grievances and complaints. *The GRM will however not pre-empt a worker's right to go to the courts of law.*

GRC and the Redress Process

17. With two positions – Convenor and Member-Secretary – for itself, BEZA will consider feasible alternatives about the total membership, but will always ensure that male and female workers are equally represented.

- BEZA will hold the hearing within a week of receiving the complaint, keep detailed records of complaints, hearing and the decision -- acceptance and rejection, with reasons.
- If the decision made at this level is not acceptable to the aggrieved person, GRC will refer the case to the BEZA headquarters with details of the complaint and minutes of the hearings at the EZ level. BEZA will review the case and send its decision within four weeks or earlier.
- If a decision at any level is accepted by the aggrieved person, it will be binding on the enterprise where the perpetrator is employed.

18. The GRC at the EZ level will establish a simple computerized system to record the complaints; information on the complainants and perpetrators with names of the enterprises they are employed in; acceptance/rejection of the complaints by GRC/BEZA headquarters and the reasons thereof; follow-up information on implementation of the decisions; and other relevant information that might be sought for periodic review of the EZ development activities.

Annex A1: SCREENING FORM FOR SOCIAL SAFEGUARD ISSUES

[To be filled in jointly by BEZA and Consultant for each EZ site and all other physical works proposed to support the EZ. The Consultant will summarize the impacts and mitigation requirements in the Screening Report and attach copies of the filled-in screening forms. Wherever necessary, the Consultant can use multiple screening forms for each EZ and related works, and add any important information that may not have been included in this form.]

A. NAME & LOCATION OF ECONOMIC ZONE

1. *Proposed EZ Name:* *District:*
Upazila: *Union/Municipality:*
2. *Distance (km) from:* *District headquarters:* *Nearest city/trading Center:*
3. *Distance (km) of the EZ from the nearest highway:*
4. *Proposed EZ is accessible by existing road:* Yes No
5. *New access road needed:* Yes *Existing road to be widened:* Yes No
No
6. *Brief physical & natural description of the proposed EZ site & its surroundings:*
7. *Brief account of predominant economic activities of local communities around the EZ:*
8. *Proposed EZ and off-site support infrastructures are located in an area where residents are:*
 All Mainstream or Non-tribal peoples
 All Tribal peoples
 Majority Mainstream or Non-tribal peoples
 Majority Tribal peoples
9. *Brief description of the physical works, including those required outside the EZ:*

B. PARTICIPATION IN SCREENING *Screening Date(s):*

10. *Names of Consultant’s representatives who screened the EZ and other related works to identify social safeguard and other issues:*
11. *Names of BEZA officials who participated in screening:*

12. Local Government representatives and community members & organizations participated in screening: *List them in separate pages with names, addresses, signatures, mobile phone numbers and any other information to identify them during preparation of impact mitigation plans.*
13. Would-be affected persons participated in screening: *List them in separate pages with names, addresses, signatures and mobile phone numbers and any other information to identify them during preparation of impact mitigation plans.*

C. LAND AVAILABILITY AND OWNERSHIPS

14. *Total amount of land (acre) to be used for: EZ: Works outside EZ:*
15. *Landownership in EZ: Khas: Other GOB agencies: Private lands:*
16. *Amount of lands under lease to private citizens: Khas: Other public lands:*
17. *Amount of land legally transferred to BEZA: Khas: Other GOB agencies:*
18. *Land (private) Acquisition Proposal (LAP) prepared?: [] Yes [] No*

D. LAND USE AND POTENTIAL IMPACTS

Khas & Other Public Lands

19. *Present use of Khas & Other public lands that will be used for the EZ (Indicate all that apply):*
 - Agricultural purposes # of persons/household using the land:
 - Residential purposes
 - Commercial purposes # of households living on the land: # of shops:
 - Other purposes # of persons/household using the land: # of users:

(Indicate)

of persons/household using the land:
20. *Number of users who have lease agreement for using: Khas: Other public lands:*
21. *Are there any natural resources in EZ that are used by poor as food items for free?: [] Yes [] No*
22. *If 'Yes', a brief account of such resources:*
23. *Are there any homesteads (vita-bari) in the Khas? [] Yes [] No If 'Yes', how many:*
24. *Are there any economic/business activities in the Khas & other public lands? [] Yes [] No*
25. *If 'Yes', number of businesses that will be displaced:*
26. *Proportion of the Khas presently under agriculture (%):*
27. *Any other issues that policymakers should be informed of:*

Private Lands

- 28. Total number of private landowners who will be affected:
- 29. Present use of private lands (Indicate all that apply):
 - Agricultural purposes # of persons/household using the land:
 - Residential purposes
 - Commercial purposes # of households living on the land: # of shops:
 - Other purposes # of persons/household using the land: # of users:
 - (Indicate)
 - # of persons/household using the land:
- 30. Number of homesteads on private lands that will be affected:
 - Entirely, requiring relocation: Partially, but can still live in same homestead:
- 31. Number of businesses/shops that will be affected on private lands:
 - Entirely, will require relocation: Partially, but can still use the same premise:
- 32. Does this EZ, with all the lands it requires, affect any community groups' access to any resources that are used for livelihood purposes?: Yes No
- 33. If 'Yes', describe the resources:

- 34. Do this EZ and related works affect community facilities like school, cemetery, mosque, temple, or any objects that are of religious, cultural and historical significance?: Yes No
- 35. If 'Yes', describe the facilities:

- 36. Describe any other impacts that have not been covered in this screening form:

- 37. Describe alternatives, if any, to avoid or minimize displacement from private and public lands:

- 38. Which of the following impact mitigation plans will required for this EZ & supportive works?
 - Resettlement Plan Abbreviated Resettlement Plan None

E. ADDITIONAL INFORMATION ON TRIBAL PEOPLES

(This section must be filled in if EZ & supportive works are located in areas that are also

inhabited by tribal peoples.)

39. *Names of IP community members and organizations who participated in screening:*
40. *Have the IP community and would-be affected IPs been made aware of the potential positive and negative impacts and consulted for their feedback and inputs?* Yes No
41. *Has there been a broad base community consensus on the EZ site & supportive works?* Yes No
42. *Total number of IP households which will be affected:*
43. *The would-be affected IP households have the following forms of rights to the required lands:*
- | | |
|---|------------------------|
| <input type="checkbox"/> Legal | # of households: |
| <input type="checkbox"/> Customary | # of households: |
| <input type="checkbox"/> Lease agreements with GOB agencies | # of households: |
| <input type="checkbox"/> Other arrangements | # of households: |
44. *Do this EZ and related works affect any objects that are of religious and cultural significance to the IPs?* Yes No
45. *If 'Yes', describe the objects:*
46. *The following are the three main economic activities of the would-be affected IP households:*
- (a)
- (b)
- (c)
47. *Social concerns expressed by IP communities/organizations about the works proposed under this EZ:*
48. *Perception of the IP community and organizations about social outcomes of this EZ:* Positive Negative Neither positive, nor negative
49. *In respect of any conditions that may have been agreed for the broad base community consensus, and the social impacts on IPs and their concerns, is there a need to:*
- Undertake an in-depth Impact Assessment study? Yes No
 - Prepare an Tribal Peoples Plan? Yes No

On behalf of the Consultant, this Screening Form is filled in by:

50. Name: Designation:

51. Signature: Date:

Annex B1: APPLICATION GUIDELINES FOR MITIGATION MEASURES

[The following guidelines are based on the compensation eligibility of PAPs, mitigation principles and standards, and correspond to the entitlements proposed in the Entitlement Matrix.]

1. LOSS OF AGRICULTURAL & OTHER LANDS

Entitlements for Legal Landowners

Compensation-Under-Law (CUL): As per Land Acquisition Ordinance, CUL covers lands and other assets, such as house/structures, trees, and other items of value, that are built and grown on the acquired lands.

CUL is assessed by the Deputy Commissioners (DCs) and paid only to the persons who have legal titles (and legal agreements in cases of leased-in assets) to the acquired lands and other assets.

Replacement Cost: Current cost of purchasing land of same quality and use, equal to the amount acquired, PLUS the registration cost and stamp duty.

Current cost will be determined by BEZA through local market price surveys for different types of lands, by using the methods suggested in Annex B2.

Stamp Duty and Registration Cost: Charged on the price at which the land is being bought or sold.

Stamp duty and registration cost will be calculated on the current market prices that will be determined through land market surveys.

Top-Up: Equals the positive difference between the total replacement cost and the total CUL paid by DCs.

- Top-up will apply only to the landowners who have legal titles (DCs identify the titleholders) to the affected lands and other assets.*
- Top-up will be paid in cases where total CUL paid by DC to an affected property owner is found smaller than the total replacement costs/market prices of all affected assets determined through the market price surveys.*
- Individual top-ups will be determined by taking into account all acquired assets, but will be paid for the parts for which CUL is paid by DCs. (Partial CUL and top-up payment may occur in situations where lands are acquired from an owner are located in more than one mouza, or are under more than one daag, or involve legal disputes.)*

Top-up will be determined in the following manner:

Sum of the replacement costs and market prices (as may apply) of all affected assets, minus the total amount of CUL paid by DC to a landowner for lands and other assets affected in any number of mouzas.

Transition Allowance: Will apply to certain landowners and 'vested non-resident (VNR)' land owners/users. Operational guidelines are provided under Loss Category 5 below.

Leaseholders of Khas/Public Lands

If such lands come under acquisition, the DCs, who execute the lease agreements, will determine and settle the contractual obligations in the form of CUL.

2. LOSS OF HOMESTEAD LANDS (VITAA)

Homesteads on Private Lands: For homesteads on private lands, the proposed assistance measures will apply in addition to the compensation for the lands as per provisions described above, and for the houses and other assets as per the provisions described below.

Where the affected households can no longer live in the present homesteads (vitaa), they can either directly purchase replacement lands at locations of their choice, or relocate on public lands that BEZA would arrange. Wherever they decide to relocate, additional relocation assistance will consist of:

- Development of the lands to the level of other homesteads in the locality and provision of access roads.
- Restoration of pre-acquisition level basic utilities, such as water supply and sanitation, electricity, etc.

Homesteads on Public Lands (Non-titled persons): Relocation assistance will apply to poor and vulnerable households, and consist of:

Development, as above, of public lands that BEZA would designate for their relocation, as well as provision of water supply and sanitation facilities.

Homesteads on VNR Lands: Relocation assistance as follows:

- *Where parts are acquired and the remainders of the homestead lands are adequate to shift and rebuild the houses:* Compensation/assistance will consist of moving and rebuilding costs.
- *Where acquisitions require physical relocation elsewhere –* Relocation assistance will consist of relocation plot in public lands to be arranged and developed by BEZA, and moving and rebuilding costs; OR
- Six months' rent for living accommodations comparable to the affected ones. The rent will be determined based on the prevailing rates in the nearby towns/urban settlements, including Upazila headquarters and the like.

3. LOSS OF HOUSES/STRUCTURES

Legal Owners

Compensation-Under-Law: Assessed by the DCs on all houses/structures standing on the acquired private lands during joint verification by DC and BEZA following the issuance of Notice-3 under the Land Acquisition Ordinance.

Replacement Costs: Assessed by BEZA, will include current costs of the same building materials, labor and any other cost items to rebuild the affected houses/structures.

- *Costs of materials, labor and other cost items will be determined by surveying their current prices in the local markets by using the methods suggested in Annex B2.*
- *Where houses/structures are partially affected and the remainders are structurally safe and useable, replacement costs will be determined on the affected portions.*

Non-titled persons on Khas & Other Public Lands

Socioeconomically vulnerable non-titled persons are entitled to House Transfer Grant (HTG) and House Construction Grant (HCG) for shiftable and non-shiftable houses.

- *HTG and HCG will apply to shiftable houses/structures built with materials/components that can be dismantled without much damage and the materials can be used to rebuild them. Shiftable houses/structures are generally built with bamboo thatch, GI sheets, wood, plastic sheets, and other inexpensive, generally non-breakable materials.*

- *HCG applies to non-shiftable houses/structures generally built with materials/components that cannot be dismantled intact. These are likely to be built with mud walls, mud-plastered walls of straw/bamboo/jute stalks and similar cheap materials, and straw roofs.*

The following exceptions will apply for HTG and HCG:

- *Both shiftable and non-shiftable houses/structures will be ineligible for compensation if (a) they are not used by the owners themselves, or (b) rented out to others.*
- *No affected structures built after the cut-off dates will be eligible for compensation.*

Vested Non-Resident Property Users/Owners

Are eligible for HTG and/or HCG, which will be determined in consultation with the present users/owners.

- *Both HTG and HCG will apply where houses/structures are to be moved and rebuild.*
- *HCG will apply where houses/structures are partly affected and the remainders are structurally safe and usable.*
- *Where houses/structures are partly acquired, the current users will be allowed to use the remainder.*

4. LOSS OF TREES ON ACQUIRED PRIVATE & PUBLIC LANDS

Compensations for trees affected on private lands will be assessed by the District Forestry Department, and those grown on public and VNR lands by BEZA.

Compensation for Trees: Will be based on the survey of current prices in the local markets by using the methods suggested in Annex B2. The compensation will take into account the species, size, maturity and other characteristics of the affected trees that influence their market value.

In addition to the above compensation, the owners will be allowed to fell the trees and keep them. The owners will not fell the trees unless BEZA asks them to do so after it verifies, as and when necessary, the assessment by the Forestry Department.

Compensation for Fruits on Trees: Will apply if the trees need to be felled before the fruits are harvested.

BEZA will use the standards of Agriculture Department to estimate the amount of fruits on individual trees, and determine their value based on the survey of current harvest prices in the local markets (as suggested in Annex B2).

5. LOSS OF AGRICULTURAL, BUSINESS, EMPLOYMENT & RENTAL INCOME

Agricultural Income: The transition allowance (TA), three times the value of crops grown a year, will be applied as follows: (a) *Legal Owners:* if acquisition amounts to 20% or more of the total productive area; and (b) *VNR Owners/Users:* for any amount of land acquired. The TA will be determined as follows:

In cases of multiple crops: *Sum of the harvest prices of the crops produced in the acquired land in each cropping season in the year, multiplied by three.*

In cases of single and perennial crops: *Total harvest price of the crop, multiplied by three.*

BEZA will use the standards of Agriculture Department to determine the amount of various crops produced per unit of land, and the market surveys for harvest prices (as suggested in Annex B2).

Business Income: Applies to the owners of all businesses affected on private and public lands.

Unless proper bookkeeping is practiced by the business owners, use of the method suggested for determining loss of business income may become difficult. In order to corroborate the income loss determined based on information given by the owners, BEZA will examine previous year's income tax returns and VAT payment records.

Compensation for Temporarily Closed Businesses: Average daily net income, exclusive of expenses like rent, staff salary, utilities, etc., based on a period of 30 days.

Compensation will be paid for the number of days needed to reopen the individual businesses, or complete the civil works, whichever is smaller.

Compensation for Partially Affected Businesses: Applies to those which are affected partially and can still operate from the remainders of the premises.

Compensation, calculated as above, will be paid for the number of days needed to repair and reopen the individual businesses, or complete the civil works, whichever is smaller.

Compensation for Businesses Requiring Physical Relocation: Applies to businesses that are to be removed entirely from the present spots.

- In public lands arranged by BEZA, in consultations with the affected business owners, and the municipal committees, Union Parishads and haat/bazaar committees.
- Compensation based on average daily net income, exclusive of expenses like rent, staff salary, utilities, etc., based on a period of 30 days. Compensation will be paid as follows:
 - Self-relocation: For the number of days needed to reopen the individual businesses in locations the business owners choose, for a maximum of 90 days.
 - Relocation on Public Lands: For the number of days needed to reopen the individual businesses, for a maximum of 45 days.

Employment Income Loss: Will apply to persons who would be (a) found continuously employed in the affected businesses for at least six months up to the date of PAP census (cut-off date); and (b) remain employed in those establishments at the time the businesses are required to vacate the lands.

- *Employees of businesses requiring temporary closure during construction will be compensated for the actual number of days needed to reopen the individual businesses, or for a maximum of 30 days.*
- *Employees of businesses requiring relocation will be compensated for the actual number of days needed to relocate them, or for a maximum of 45 days.*

The daily compensation rates will be based on the individual employee's current monthly salary or daily wages.

Rental Income Loss: Applies to the legal owners of the affected built premises located on private lands, which have been rented out to others. *The three months' compensation will be based on monthly rent paid by the current tenants.*

6. UNFORESEEN LOSSES

BEZA will take into account any impacts/losses that are unique to any subprojects and not covered in this RSMF, and consult to adopt measures and application guidelines required to mitigate them.

Annex B2: SUGGESTED METHODS FOR MARKET PRICE SURVEYS

[In line with the proposed compensation principles, BEZA, assisted by the consultant, will conduct market price surveys to determine replacement costs of the acquired lands, houses/structures and other replaceable assets and market prices of irreplaceable assets by using the methods suggested below.]

LANDS OF ALL KINDS

The market price surveys will begin as soon as locations of the required acquisitions are identified on the ground. BEZA will document the replacement costs and market prices of various affected assets and make them available as and when asked for review by the World Bank.

The surveys will explicitly take into consideration the quality of the lands under acquisition. Quality will take into account current uses, cropping intensity and value of crops produced, accessibility from the existing roads, and any other characteristics that influence the lands' market value. The surveys will be conducted on the following three groups of respondents:

- A random sample of 10-15 landowners in the *mouza* in which the lands under acquisition are located and in those adjacent to it;
- As many of most recent buyers and sellers of similar lands can be found in the same and adjacent *mouzas*; and
- Deed writers, as many can be found and agree for interviews, at the land registration offices, who recently handled transactions of lands in the same or adjacent *mouzas*. (They will be asked about the actual prices, not those written in the deeds.)

Market value of the lands will be determined in the following manners:

- *If variations in average prices reported by the three respondent groups are insignificant (or, are 10% or less), current value of the lands will be fixed at the average of the prices reported by the three groups.*
- *In cases of significant differences (more than 10%), the current prices will be negotiated in open meetings with the affected and other landowners, community leaders, CBOs/NGOs and the like.*

Replacement costs of land will equal the market price, plus the registration cost and stamp duty. The registration cost will be calculated on the current market price.

HOUSES AND OTHER BUILT STRUCTURES

Replacement costs will be based on the current prices of various building materials, labor and other cost items in the local markets. The costs of building materials, such as bricks, cement, steel, sand, bamboo, timber, GI sheet, roofing materials like straw, golpata, etc, and labor will be based on:

- Survey of current prices of different types of materials with five or so dealers/manufacturers in the local markets.
 - *The replacement cost of the house/structure will be based on the lowest quoted price for each type of material, plus their carrying costs to the sites.*

- The current costs of labor with different skills will be determined by interviewing local contractors and construction workers.

Replacement costs of any other replaceable affected assets will also be based on the current prices of materials, transportation and labor costs, etc.

TREES & OTHER IRREPLACEABLE ASSETS

Market prices of different varieties of trees will be determined by surveying the prevailing prices paid by five or so lumber and fuel-wood traders in the local markets. *The compensation for trees will be fixed at the highest prices offered by a trader.*

Compensation for all other irreplaceable assets will also be based on survey of their prevailing prices with dealers/traders in the local markets.

FRUITS AND OTHER CROPS

Compensation will be fixed at the harvest prices of the fruits and other crops. Harvest prices of different varieties of fruits and crops will be collected from a sample of 7-10 dealers in the local markets. *The compensation for each type of fruit and crop will be fixed at the highest price offered by a trader.*

Annex B3: MONITORING LAND ACQUISITION, AND PREPARATION & IMPLEMENTATION OF IMPACT MITIGATION PLANS

The following indicators will be used to monitor status of major tasks involved in land acquisition, and preparation and implementation of resettlement activities.

A. LAND ACQUISITION

Except for the EZ site itself, *engineering designs* are a pre-requisite to starting the land acquisition activities outside an EZ. Once the design decisions are finalized determining the acquisition needs and their ground locations, the following tasks will be monitored to assess progress in land acquisition:

- Preparation of the Land Acquisition Proposals (LAPs), by using standard formats required by the Acquiring Body.
- Date LAPs submitted to the line Ministry (PMO for BEZA) for administrative approval.
- Date LAPs submitted to the Deputy Commissioner (DC).
- Date LAPs approved by the District Land Allocation Committees (DLAC) and, if required, the Ministry of Land.
- Date Notice-3 issued by DC of the project district (This date serves as cut-off date for the legal owners of the lands under acquisition).
- Identification and development of relocation sites
- Date Joint Verifications by acquisition officials and BEZA completed.
- Date Notice-6 issued by DC of project district.
- Date Compensation Estimates submitted by DC to BEZA.
- Date BEZA submits the Compensation Estimates to the PMO.
- Date the PMO approved the Compensation Estimates.
- Date BEZA placed the compensation funds with DC.
- Date Notice-7 issued by DC to the affected landowners.
- Dates DC started CUL payment process.
- Continuing monitoring of progress in CUL payment by DC.

B. PREPARATION & IMPLEMENTATION OF MITIGATION PLANS.

Preparation process for impact mitigation plans begins, once decision on the EZ site and other physical works are finalized and ground locations of the acquisitions are identified. The following are the major tasks that will be monitored during preparation and implementation:

- Census of the project affected persons and assets, and fixing of the cut-off dates for non-titled persons.
- Survey of replacement costs and market prices of the affected lands and other assets.
- Consultation and information dissemination with regard to compensation payment procedure and the documents required to claim compensation from the DC (a continuing activity).
- Formation of the Grievance Redress Committees (GRCs).

- Preparation of Compensation Budgets for non-titled persons and others not covered by the acquisition ordinance, and top-up for titleholders.
- Preparation and submission of RP/ARP for Bank review and clearance.
- Preparation of the individual entitlement files for different PAP groups, with all applicable entitlements.
- Approval of the Compensation Budgets by BEZA.
- Continuing monitoring and reporting progress in payment of CUL, top-up and other applicable entitlements to titleholders and non-titled persons and similar PAPs; and relocation of homestead losers, and displaced businesses and other activities.

Any other tasks that may have remained unknown will be included in the monitoring system. Progress in land acquisition and resettlement planning and implementation activities will be reported in appropriate formats.

