PWCPL

Support to Capacity Building of Bangladesh Economic Zones Authority Project (under Private Sector Development Support Project)

March 16, 2019

Strictly Private and Confidential

Bangladesh Economic Zones Authority

Final Report

Proposed Economic Zone at Feni, Bangladesh

pwc

March 16, 2019

To
Mr. SM Nurul Alam
Project Director (Joint Secretary),
Support to Capacity Building of Bangladesh Economic Zones Authority
Bangladesh Economic Zones Authority

Sub: Support to Capacity Building of Bangladesh Economic Zones Authority Project (under Private Sector Development Support Project) - Pre Feasibility Study of Moheshkhali EZ, Feni Economic Zone, Shariatpur Economic Zone (Jajira), Gopalgonj Economic Zone-2 and Jessore-2 Economic Zone

Dear Sir,

Greetings from PricewaterhouseCoopers Private Limited.

Through this letter, we are glad to submit the revised Final Report for the proposed Economic Zone at Feni, Bangladesh. We have attempted to capture all sections mandated as per the agreed Terms of Reference for this project. This report also takes into cognizance the suggestions/ observations discussed with your good office and the World Bank.

We trust you find the report in order.

For any clarifications, please feel free to contact us.

Thank you.

Yours sincerely,

Manish R Sharma
Team Leader
PricewaterhouseCoopers Private Limited
17th Floor, Building No 10, Tower C, DLF Cyber City
Gurgaon – 122002, India

Encl: Final Report

Disclaimer

The report has been prepared by PricewaterhouseCoopers Pvt Ltd (PwC) for Bangladesh Economic Zones Authority (BEZA). This is pursuant to the Scope of Work under the contract document "*Support to Capacity Building of Bangladesh Economic Zones Authority Project (under Private Sector Development Support Project)*" executed between PwC and BEZA. PricewaterhouseCoopers Pvt. Ltd. (PwC) has been appointed by BEZA to undertake pre-feasibility study for five selected economic zones in Bangladesh. PwC would be undertaking the commercial aspects of the scope of work and the technical aspects have been sub contracted to Mahindra Consulting Engineers Ltd. (MACE). Any third party should obtain prior consent of PwC before copying or reproducing, in whole or in part, the contents of this report. PwC disclaims any responsibility for any loss or damage suffered by any third party by taking reliance of this report. Furthermore, PwC will not be bound to discuss, explain or reply to queries raised by any agency other than the intended recipients of this report. All information in the report is intellectual property of BEZA.

PwC does not accept any liability or responsibility for the accuracy, reasonableness or completeness of, or for any errors, omissions or misstatements, negligent or otherwise, and does not make any representation or warranty, express or implied, with respect to the information contained in this document. The information contained in this document is selective and is subject to updating, expansion, revision and amendment. It does not, and does not purport to contain all the information that a recipient may require. Further this is not an audit report and no reliance should be based on this report for the purposes of audit.

Our assessment and review are based on the facts and details provided to us during our discussions specific to the Project and may not be similar across the organization / state. If any of these facts or details provided to us are not complete or accurate, the conclusions drawn from subsequent complete or accurate facts or details could cause us to change our opinion. The conclusions drawn and recommendations made are based on the information available at the time of writing this report.

Important message to any person not authorized to have access to this report

Any person who is not an addressee of this report or who has not signed and returned to PricewaterhouseCoopers Pvt Ltd a Release Letter is not authorized to access to this report.

Should any unauthorized person obtain access to and read this report, by reading this report such person accepts and agrees to the following terms:

1. The reader of this report understands that the work performed by PricewaterhouseCoopers Pvt Ltd. was performed in accordance with instructions provided by our Addressee Client and was performed exclusively for our Addressee Client's sole benefit and use.

2. The reader of this report acknowledges that this report was prepared at the direction of our Addressee Client and may not include all procedures deemed necessary for the purposes of the reader.

3. The reader agrees that PricewaterhouseCoopers Pvt Ltd., its Partners, Principals, Employees and Agents neither owe nor accept any duty or responsibility to it, whether in contract or in tort (including without limitation, negligence and breach of statutory duty), and shall not be liable in respect of any loss, damage or expense of whatsoever nature which is caused by any use the reader may choose to make of this report, or which is otherwise consequent upon the gaining of access to the report by the reader. Further, the reader agrees that this report is not to be referred to or quoted, in whole or in part, in any prospectus, registration statement, offering circular, public filing, loan, other agreement or document and not to distribute the report without prior written consent of PricewaterhouseCoopers Pvt. Ltd. and the World Bank.

List of Abbreviations

Abbreviation	Full Form
ADB	Asian Development Bank
AMSL	Average Mean Sea Level
API	Active Pharmaceutical Ingredients
AQ	Air Quality
ASEAN	Association of South East Asian Nations
BBIN	Bangladesh Bhutan India Nepal
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh Taka
BEPZA	Bangladesh Export Processing Zone Authority
BEZA	Bangladesh Economic Zone Authority
BIDA	Bangladesh Investment Development Authority
BIWTA	Bangladesh Inland Water Transportation Authority
BMD	Bangladesh Meteorological Department
BOD	Biological Oxygen Demand
BOI	Board of Investment
BRRI	Bangladesh Rice Research Institute
BTCL	Bangladesh Telecom Company Limited
CAGR	Compound Annual Growth Rate
CBR	California Bearing Ratio
CETP	Central Effluent Treatment Plant
CMP	Current Market Price
CPA	Chittagong Port Authority
CUL	Cash Compensation under Law
CWTP	Central Water Treatment Plant
Db(A)	Audible Decibel
DoE	Department of Environment
DPHE	Department of Public Health and Engineering
DSCR	Debt Service Coverage Ratio
ECA	Environment Conservation Act
ECC	Environment Clearance Certificate
ECR	Environment Conservation Rules
EIA	Environment Impact Assessment
EIRR	Equity Internal Rate of Return
ELSR	Elevated Level Service Reservoir
EMP	Environmental Management Plan
EPZ	Export Processing Zone
ETP	Effluent Treatment Plant

Abbreviation	Full Form
EXIM	Export Import
EZ	Economic Zone
F&B	Food & Beverages
FDI	Foreign Direct Investment
FMCG	Fast Moving Consumer Goods
FY	Financial Year
G2G	Government to Government
GDP	Gross Domestic Product
GIS	Geographic Information System
GoB	Government of Bangladesh
GTCL	Gas Transmission Company Limited
HDPE	High Density Polyethylene
HSIA	Hazrat Shah Jalal International Airport
HFL	Highest Flood Level
HT	High Tension
H&S	Health & Safety
ICT	Information and Communication Technology
IRR	Internal Rate of Return
ISA	Initial Site Assessment
ITC	International Trade Centre
JICA	Japan International Cooperation Agency
JV	Joint Venture
KEI	Knowledge Economic Index
KLD	Kilo Liter Per Day
KVA/MVA	Kilo Volt Ampere / Mega Volt Ampere
KwH	Kilo Watt Hour
LDC	Least Developed Countries
MACE	Mahindra Consulting Engineers Limited
MBR	Membrane Bio Reactor
MSA	Million Standard Axles
MSL	Mean Sea Level
MLD	Million Liters per day
MRSS	Main Receiving Sub-Station
MNCs	Multi-National Companies
MSW	Municipal Solid Waste
MT	Metric Tonne
MVA	Mega Volt Ampere
MW	Mega Watt
NAS	National Accounts Statistics
NOx	Oxides of Nitrogen

Abbreviation	Full Form
OSSC	One Stop Service Centre
PAP	Project Affected Persons
POL	Petroleum Oil & Lubricant
PM_{10}	Particulate Matter less than 10 micron size
$PM_{2.5}$	Particulate matter less than 2.5 micron size
PPP	Public Private Partnership
PPP	Purchasing Power of Parity
PUC	Pollution Under Control Certificate
PwC	PricewaterhouseCoopers Private Limited
QA	Quality Assessment
QC	Quality Control
QIIP	Quantum Index of Industrial Production
QIIP	Quantum Index of Industrial Production
RCC	Reinforced Cement Concrete
REB	Rural Electricity Board
RMG	Ready Made Garments
R&D	Research & Development
SBR	Sequencing Batch Reactor
SEZ	Special Economic Zone
SITC	Standard International Trade Classification
SME	Small & Medium Enterprises
SMI	Survey of Manufacturing Industries
SPM	Suspended Particulate Matter
STP	Sewage Treatment Plant
SWM	Solid Waste Management
TBT	Tributyltin
TDS	Total Dissolved Solids
TEU	Twenty Foot Equivalent
ToR	Terms of Reference
TPD	Tonnes Per Day
TVET	Technical and Vocational Education and Training
UDC	Union Digital Centre
UNCTAD	United Nations Conference on Trade & Development
UNO	Upazila Nirbahi Officer
USD	United States Dollar
VAT	Value Added Tax
VFD	Variable Frequency Drive
VOC	Volatile Organic Compounds
WB	World Bank
$\mu g/m^3$	microgram per cubic meter

Table of Contents

Table of Figures

Table of Tables

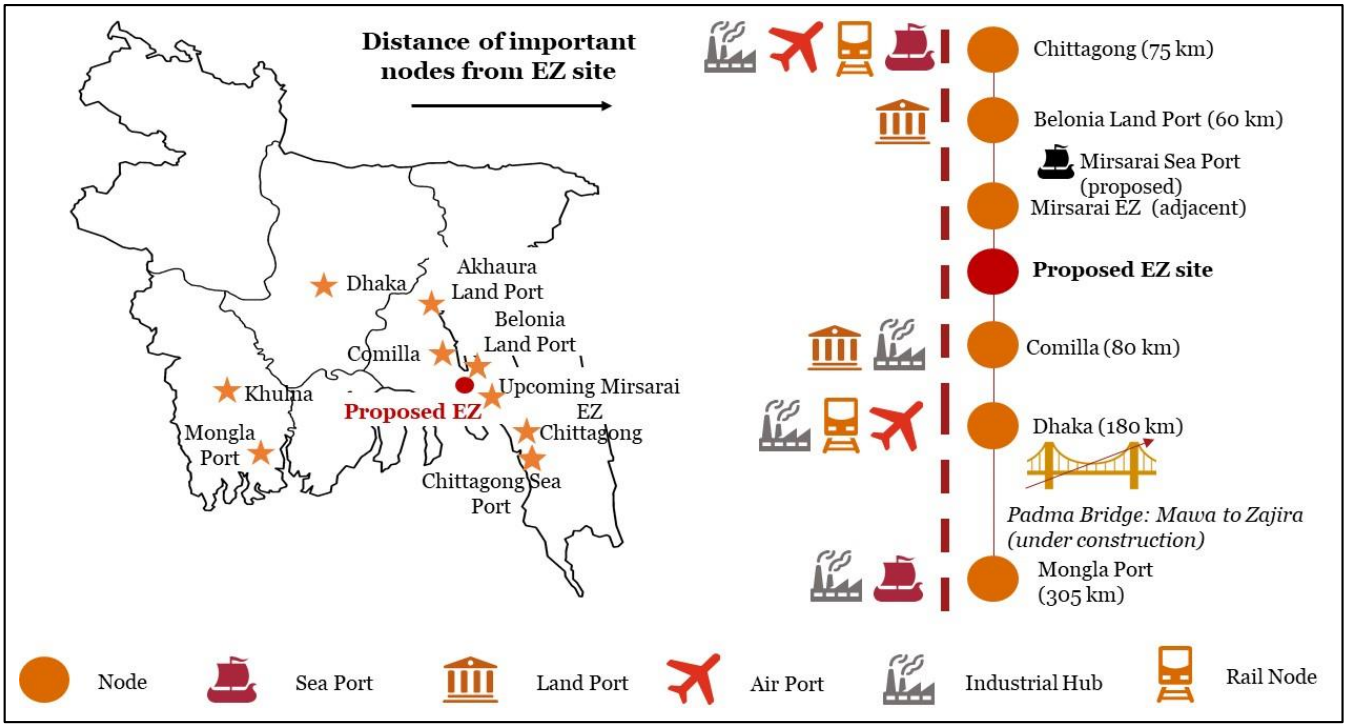
1. Executive Summary

Changing global dynamics depict the tremendous growth prospect in Bangladesh and how this country is shaping up as an attractive investment destination. Country's specialisation in Readymade Garments (RMG) sector is a success story for which Bangladesh has been able to effectively leverage its demographic dividend. However, the country has been over dependent on this sector and is not being able to diversify its export basket. Government of Bangladesh (GoB) envisages that organized industrialization in the country will be able to improve the country's competitiveness, thereby attracting more investments from global manufacturers across different sectors. The advent of the EZ model is expected to foster organized industrialization in the country with an impetus to manufacturing, which in turn shall promote investment inflow and employment generation. This is expected to increase contribution from other sectors towards diversification of the export basket of Bangladesh.

GoB has adopted a proactive approach to promulgate investment within the country and foster organized industrialization. In tandem with this initiative, economic zone (EZ) regime ushered in, and Bangladesh Economic Zones Authority (BEZA) was conceptualized. BEZA is the nodal agency mandated for economic zone development in the country. BEZA in support with World Bank is implementing Private Sector Development Support Project (PSDSP) to upkeep pilot EZ projects under the new EZ regime.

As part of this endeavour, BEZA and the World Bank intend to undertake pre-feasibility studies of five economic zone locations spread across the country. This report captures pre-feasibility assessment of economic zone located in Feni at Sonagazi upazila.

Figure 1: Location of the proposed EZ site



Proposed EZ is spread over an area of 7,000 acres and it is located in Sonagazi upazila, Feni district of Chittagong division. Currently, major population of Feni district is engaged in agriculture, fish rearing and animal husbandry. A significant population from Feni district also travel overseas in search of employment. As per Bureau of Manpower, Employment and Training, 24,068 people went overseas from Feni district in search of employment in 2017. This figure is significantly higher than the national district wise average of 15,566. The industries in this district comprise cottage industry, bamboo and cane industry, textile industry, rice mill, jute mill etc. Key location attribute of the proposed EZ site is its location along the Dhaka-Chittagong industrial and transport corridor, Bangladesh's most important highway Dhaka-Chittagong Highway (N1) passes in proximity

to this site. According to an Asian Development Bank (ADB) study conducted in 2013, 90% of Bangladesh's goods for export and import passes through this highway.[1] Around 30,000 vehicles (highest among all road alignments in the country) pass through this road on a daily basis,[2] which includes trucks carrying cargoes of apparels, light machinery, chemicals, steel roads, agricultural produce, processed food, cement etc. **This strategic location will help industries in proposed EZ site, cater to the consumer market in Dhaka and form upstream and downstream linkages with industries along Dhaka-Chittagong Highway**. Industries in proposed EZ will also have an access to markets and industries in North East India due to its close proximity to the Indian state of Tripura.

Site visits revealed that the EZ site is currently split into 2 parts due to a shallow river channel created by Feni River, which remains mostly dry throughout the year due to creation of Muhuri dam on the upstream of this river. However, during monsoons when the volume of water stored in this dam increases beyond its capacity, water from this dam is released resulting in increased volume of water flow downstream. In order to ensure connectivity between the 2 land parcels of this EZ, provision of establishing bridge has been captured in the Master Planning section of this report.

Proposed site can be reached from Dhaka-Chittagong highway by accessing Feni-Sonagazi Zilla Road (Z1034) from Lalpol Bus stand in Feni Sadar Upazila. This zilla road is a single lane bituminous road with a width of 5.54 m. A journey of 17 km on this road leads to Sonagazi Upazila. To reach the proposed EZ site from Sonagazi Upazila, a single lane village road, Chor Chandia needs to be accessed which is a bituminous single lane road. Journey of 7 km on this single lane road will lead to a 1.5 km long stretch of single lane dirt road which connects to the western border of the proposed EZ site. Another alternate route to access the proposed EZ site from Dhaka-Chittagong highway is to access the Muhuri Project Road from School Road Bus Stop in Zoraworgonj village in Mirsarai Upazilla. Muhuri Project Road is a single lane bituminous road originating from Old Dhaka-Chittagong Highway. Journey of around 10 km on Muhuri Project Road leads to the Muhuri Project Tourist spot-cum-sluice gate over Feni River. A single lane village road branches out towards south from Muhuri Project Road just before the Feni River. Journey of 2 km on this dirt road leads to the proposed EZ site.

Belonia Land Port (under development) is the nearest land port located at around 60 km north of the proposed EZ site. As per current information available, this port is yet to be operationalized although a Development Project Proposal (DPP) has been passed and land acquisition is in progress. Once operational, industries in Proposed EZ will be able to leverage this port to boost their trade with India. This land port, by virtue of its location, can also allow import of raw materials from North-Eastern states of India for the industries in the EZ site. Currently land ports at Bibirbazar (85 km north of the EZ site) and Akhaura (155 km north of the EZ site) are the nearest operational land ports to the EZ site. Goods like cement, steel, processed food, beverages, tiles etc., are transported to Tripura through these ports. Currently there are no mechanized goods handling facility available at these ports, and goods are handled manually. **Mechanization of cargo handling facility in Bibirbazar, Akhaura, and Belonia land ports would result in faster processing of goods through these ports**.

The site has access to river based ferry ghat at Chandpur on the Meghna River which is around 130 km from the site and is accessible from road via Dhaka-Chittagong highway followed by Comilla-Chandpur Highway which is a 2-laned bituminous road. **This port is equipped to handle movement of heavy vehicles and currently has a capacity to handle 6,500 MT/ month of bulk cargo and 6,500 MT/month of general cargo**. This ferry ghat has an available draft of around 3.5 meters and is well connected to Shariatpur Ferry Ghat, Barisal Ferry Ghat and all other major river ports of Bangladesh through widespread waterway network crisscrossing the country.[3] Industries in the proposed EZ can make use of this port to transport goods like clinker, fly-ash, light engineering products, textile, RMG etc. through Inland Waterways Transportation.

Also, **proposed EZ at Feni has access to a water front in Sandwip Channel**, having a draft of around 3-4 meters, where berthing facilities can be developed for vessels carrying raw material for heavy industries and

[1] *http://www.theindependentbd.com/post/81393*
[2] http://www.thedailystar.net/editorial/highway-growth-1249747
[3] *Bangladesh Inland Waterways Authority*

clinker for cement factories. **Developing a jetty here, will enable direct riverine transportation of goods across Bangladesh and ports of call in India.**

Chittagong Sea port is the nearest seaport, which is located approximately 75 km from the proposed EZ. This port is also accessible via National Highway, N1. This seaport is the most important trade-facilitating infrastructure in Bangladesh. The fact that on an average 81.22% of Bangladesh's international trade takes place through Chittagong Port underlines the strategic importance of this seaport.[4] Chittagong Port has all major logistics infrastructure available like weighbridges, railway wagons for container transport, railway terminal, container freight stations, dredgers, tug boats and specialized berths for handling POL, grains, cement, urea, ammonia, containers, general cargo etc. Industries in the proposed EZ can leverage this infrastructure to achieve competitive economics when it comes to logistics cost.

The strategic importance of Chittagong Port for Bangladesh's industries and economy is resulting in a steady rise of cargo traffic at the port. This is resulting in congestion due to which ships calling at this port often face **delay in berthing by 6 to 7 days.** In order to ease the burden on Chittagong Port, Chittagong Port Authority (CPA) is exploring the potential to develop a new port in Mirsarai (within 60 km of proposed EZ site), which is the adjacent district to Feni. The main function of this seaport will be to act as an intermediate port/terminal, which will provide support to Chittagong Sea Port. The key purpose of this port will be to enable direct sea connectivity for industries that might come up in the region so that early and easy delivery of container and cargo can be made possible. This project is still at conceptualization stage and studies are ongoing to finalize the location, capacity and other features of this port. **Setting up of the port in Mirsarai would be beneficial for industries that would come up in the proposed EZ site. This proximity should encourage manufacturers to set up export-oriented industries in the proposed EZ.**

Nearest international airport to the EZ site is Shah Amanat International Airport located in Chittagong at a distance of 75 km from the EZ site. It is Bangladesh's 2nd largest. This airport has manual handling facilities for cargo and provides services to more than 12 lakh people annually.[5] Bangladesh's most important airport Hazrat Shah Jalal International Airport (HSIA) is located at a distance of 180 km from the EZ site. **Both the airports can be accessed via Dhaka-Chittagong Highway. These airports provide air transport services to both domestic and international passengers.**

Chittagong railway station is the nearest junction railway station from the proposed EZ, located at a distance of around 75 km, where cargo-handling facility is present currently. Access to Chittagong junction railway station takes place through Dhaka-Chittagong highway and time of travel is ~2.5 hours. Chittagong Railway station is connected to Inland Container Depot at Dhaka railway station. Boraiyarhat station is the closest rail head at a distance of around 15 km from the site. It is a small station with no cargo handling facility and caters to movement of passengers, only.

Location of Feni EZ site in between Dhaka and Chittagong allows easy access to all modes of transportation. However, last mile connectivity to this EZ site will have to be improved in order to enable smooth movement of heavy vehicles.

Site assessment indicates that proposed EZ would have access to steady source of power from Mirsarai 132/33 kV power Grid substation, which is currently under construction. A Main Receiving sub-station (MRSS) of 230/132/33/11 kV substation could be established in the site in order to meet the EZ's power requirements. Due to EZ site's location in a coastal area, ground water would have high salinity, hence, a desalination plant is recommended to be established in order to draw water from the sea. Presently, there is no existing gas pipeline in Sonagazi and the nearest gas station is in Feni at a distance of 25 km with an approx. capacity of 50 Mn cu.ft / day. State controlled Gas Transmission Company Ltd. (GTCL), which is responsible for establishing gas pipelines across Bangladesh, is in the process of laying down 181 km long, 36 inch dia. gas pipeline from Chittagong -Feni-Bakhrabad in order to supply imported gas from LNG terminal established at Moheshkhali near the southern tip

4 *http://www.cpa.gov.bd/*

5 *http://dlca.logcluster.org/display/public/DLCA/2.2.2+Bangladesh+Shah+Amanat+International+Airport;jsessionid=D3203DDC18DB84A9D4C62A8A4DB784B2*

of Bangladesh. GTCL has already established 91 km pipeline from Moheshkhali to Anowara. Construction is underway to lay down 30 km of pipeline from Anowara to Fouzdarhat in Chittagong. **Once GTCL lays down the pipeline from Moheshkhali to Feni, sourcing gas from the pipeline to proposed EZ site can be made possible.** Basic social infrastructure is available in this region for unskilled and semi-skilled labour. However, this region lacks in term of quality social infrastructure (suitable for expats, executives and skilled human resources), which is available in Chittagong. Provisions have been made in the master plan to include adequate social infrastructure facilities that could serve the needs of skilled personnel and expats working in the proposed EZ.

In line with the identified transport infrastructure, access to utility and prevailing economy in the region of the proposed EZ, a framework of industry assessment has been formulated.

This framework takes into cognizance availability of factors of production (logistics, utility and manpower), agricultural & natural resources, and possible industrial linkages in site surrounding context. Based on the regional landscape and site intrinsic features, suitability of various industrial sectors have been assessed. Desk based study in synthesis with stakeholder consultations with domestic and foreign manufacturers indicate the following sectors as the potential industrial mix for the proposed EZ –

Heavy industries	Other industries
• Heavy Machineries, iron & steel	• Textile & RMG
• Ship building and ship breaking	• Leather & Leather Products
• Petroleum and petroleum products	• Electrical & Electronics
	• Automobile & Accessories
	• Light Machinery, Equipment & Furniture
	• Non-Metallic Mineral products

Based on the industrial mix mentioned above, land demand forecasting using statistical projection techniques have been undertaken. Three scenarios have been considered viz. aggressive, base, and conservative. Assumptions related to industrial growth rates and investment inflow to the subject site have been varied as per the three scenarios elaborated below.

Base case assumes business as usual situation, where macro-economic parameters are indicating steady trend; industrial growth rates and investment inflow are denoting status quo situation. For aggressive case, it has been assumed that the macro-economic situation is showing an increasing pattern and higher investment inflow is envisaged. **Conservative case** assumes pessimistic situation, where macro-economic situations reflecting downward trend and investment inflow is reducing. Base case assumes as-is commencement of proposed infrastructure projects in this region, where as conservative case considers delay in commencement of infrastructure projects. **Aggressive case** considers infrastructure developments commencing prior to plan.

Demand forecasting projections indicate the following rate of industrial land uptake within the proposed EZ site.

Table 1: Industrial land uptake projections

Scenarios	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Conservative	4%	6%	6%	6%	6%	6%	8%	11%	11%	11%	11%
Base	6%	11%	11%	11%	11%	11%	16%	22%	22%	22%	22%
Aggressive	10%	19%	23%	25%	28%	32%	40%	50%	50%	52%	57%

Scenarios	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046 onwards
Conservative	11%	11%	26%	28%	42%	50%	50%	59%	95%	100%

Scenarios	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046 onwards
Base	23%	28%	43%	62%	70%	90%	100%	100%	100%	100%
Aggressive	65%	76%	98%	100%	100%	100%	100%	100%	100%	100%

Demand projection outlines that in conservative case, complete industrial space uptake would take place in 21 years. For base and aggressive cases, the same would be spread over 18 years and 15 years respectively.

For the purpose of demand forecasting, attempt was made to allocate around 65% of the EZ site for industrial purpose after taking into consideration development guidelines of BEZA and similar developments globally. However, due diligence on revised site area and location reveals that out of 7,000 acres, 5,033.08 acres of land is developable (mangroves are spread over an area of 1966.92 acres) and 3,600.82 acres has been earmarked in the master plan for industrial development. Thus, this demand projection exercise has been undertaken for revised industrial area of 3,600.82 acres (~51% of total site area).

In line with the industries proposed to be established within the EZ site, conceptual demand forecasting and prevalent best industry practices in the context of Bangladesh, Master Plan, Off-site Infrastructure plan and On-site infrastructure plan have been prepared for the EZ site. Off-site infrastructure takes into consideration providing the external basic infrastructure facilities (such as power supply, water supply, and access road) to the doorstep of the site. Development of off-site infrastructure is the responsibility of BEZA. On-site infrastructure considers internal infrastructure components (such as internal road network, power substation, water conveyance system, effluent treatment facilities). Development of on-site infrastructure is the responsibility of the private developer.

The Master Plan has envisaged allocating around 75% of total developable land area (5,033.08 acres) as saleable (industrial land and support amenities including logistics zone).

There are 1,075 plots earmarked in the proposed master plan for different usage out of which 5 plots for support amenities, utilities etc. and balance 1,070 plots are demarcated for industrial use.

The project is planned to be developed across 5 phases with phase-I, II of 4 years each, phase-III, IV of 3 years duration each and phase-V of 2 years duration. In phase I – 1480 acres will be developed, phase II – 1600 acres will be developed, phase III – 640 acres, phase IV – 497 acres and phase V – 816 acres will be developed.

To enable a smooth movement of vehicular traffic to and from the EZ site and to provide the shortest route to Dhaka-Chittagong highway, two entry/exit points have been proposed. Approach road-1 of 24 m width and 2.1 km length would provide road connectivity to EZ site from its north-eastern boundary and approach road-2 of 45 m width and 6.5 km length would provide road connectivity to EZ site from its north-western boundary.

The proposed Master Plan has segregated the site into 4 zones viz. Industrial Zone, Logistics Zone, multi-facility complex, amenities & utilities, green spaces & walkways.

The Sub-Zones proposed within Industrial Zone of EZ site are as follows –

1. Textile & RMG
2. Light Machinery, Equipment and Furniture
3. Electrical & Electronics
4. Leather & Leather products
5. Non-Metallic mineral products
6. Petroleum and petroleum products
7. Heavy Machinery, Iron & Steel and metals including shipbuilding
8. Automobile & automobile accessories

Further to developing the best practice Master Plan, infrastructure plan has been developed for the EZ site in Feni including the following –

Site filling – The average natural ground level for the proposed EZ is +6 m above mean sea level. To avoid inundation during monsoon season, average land filling of +5 m above the existing natural ground level has been recommended.

Road – The total length of the internal road network planned within EZ is 63,687 m. This comprises of arterial, (45 m), primary (30 m) and secondary (25 m) roads. Internal road network provides access to the industrial plots apart from providing access to areas having support amenities.

Power – Infrastructure assessment suggests that basis industrial assessment and demand forecasting for the proposed EZ, power demand for the proposed EZ would be about 589 MVA. This figure is indicative in nature and may vary based on on-ground implementation of the project. The private developer may undertake a separate industry assessment and master planning exercise in order to validate this figure. To cater to the above mentioned power requirements a main receiving substation of 132 /33/11 kV substation has to be established on the site. Power to this substation can be sourced from the under-construction 132 kV Mirsarai Grid substation located at a distance of 7 km from the EZ site.

Water – Infrastructure assessment suggests that basis industrial assessment and demand forecasting for the proposed EZ, potable water demand calculated for the proposed EZ would be about 127.6 MLD and total water demand would be 137.2 MLD. This figure is indicative in nature and may vary based on on-ground implementation of the project. The private developer may undertake a separate industry assessment and master planning exercise in order to validate this figure. In order to meet the above mentioned water requirements and mitigate the salinity in water resources available in the vicinity, a desalination plant would have to be provided at site in order to draw water from Sandwip Channel.

Sewer System – Total sewage estimation of proposed EZ site is 91.1 MLD.

Solid Waste Management – The estimated total solid waste quantity for the proposed EZ is about 144.2 TPD.

Based on estimated quantity of sewage, a Sewage Treatment Plant (STP) of 91.1 MLD capacity has been recommended for the EZ site.

Master plan and proposed infrastructure interventions in the proposed EZ necessitate the need for a social and environmental review to assess the impact arising from the development initiatives.

Social Review suggests that the site area is mostly *char* land (land which is submerged during monsoons but is dry otherwise). 10-15% of the total area is currently used for activities like cattle grazing and fish farming. BEZA proposes to obtain 7,000 acres towards developing this project. **Basis information obtained during site visit, around 4,512.56 acres of land parcel has already been transferred to BEZA and the remaining 2,487.44 acres of land area is in the process of being transferred and is under private ownership**.

As per the 'Conventional' rule set by the law i.e. Cash compensation under law (CUL), cost of land acquisition is taken as 3 times the cost obtained from Assistant Commissioner (AC) land office for private land and 1 time the cost for government land or Khas land. Based on Govt. mouza rate, total cost of land acquisition is BDT 1,063.33 million (i.e. USD 12.97 million). Current market price (CMP) method through primary survey recommends that the cost of land acquisition is BDT 1,163.02 million i.e. USD 14.18 million (excluding registration cost and stamp duty).

More than 1,500 PAPs would be directly and indirectly affected as a result of development of this project. It is suggested that a detailed social impact assessment (SIA) along with Resettlement Action Plan (RAP) should be undertaken to assess the social impact on the affected people, and devise social management plan to mitigate the impacts of the land acquisition.

The land area demarcated for EZ development is found to have presence of mangroves over an area of 2,023.69 acres. Environmental review reveals that the site is ecologically sensitive and overall impact from pre-construction, construction and operation phases for setting up the economic zone will be detrimental for the surrounding environment. Many of the impacts could be possibly irremediable in nature and can't be replenished. The proposed site is quite rich from ecological point of view. The project falls under Red category as per ECA,

1995 and requires prior environment clearance from DoE, Bangladesh. In order to mitigate adverse impact on the environment due to development of EZ, an Environment Management Plan (EMP) has been formulated. This EMP envisages precautions needed to be taken by the developer during pre-construction, construction and operation phases along with regular monitoring of environmental impacts. Fixed cost of implementing the EMP has been estimated to be **BDT 858.84 million (i.e. USD 10.47 million).**

Basis the master planning and environmental management plan, the cost estimate of developing the EZ site is expected to be around **BDT 43,380.4 million (i.e. USD 529.0 million)**. This is the total hard cost for development of infrastructure in the proposed EZ. Estimated project cost is tentative in nature and may vary during on-ground implementation.

Taking into consideration the cost of developing the EZ site and expected revenue that would be generated from the EZ site a financial model has been developed in order to assess the feasibility of developing this EZ site by a PPP developer and expected returns have been calculated for the private developer who would be undertaking the construction and operation of this economic zone.

This model calculates the return under all the three different scenarios outlined during demand forecasting exercise. The expected returns for the developer are as shown below –

Table 2: Returns to the developer from Feni EZ

Parameters	Conservative Case	Base Case	Aggressive Case
Project IRR	10.7%	12.6%	19.1%
Equity IRR	10.8%	14.6%	31.2%

The interest rate of debt has been assumed to be 10% for the purpose of financial analysis, as per the prevailing lending rates in Bangladesh. Considering the rate of interest, the returns being generated from the project is attractive for the developer under the current parameters assumed for constructing the financial model.

Project structuring exercise has been undertaken to evaluate different options that could be considered to make the project returns more attractive. It has been observed that if the private developer is able to get funding for the project from multi-lateral agencies or raise external commercial borrowings at low interest rates, the returns from this project would improve for the private developer. Considering private sector efficiency and better access to diversified resources, **project development through a private developer appears to be a better option with respect to the other project structuring options.**

In addition to the financial modelling, an economic modelling exercise has also been undertaken to evaluate the economic benefits accrued from this project. Financial analysis (or Financial IRR) estimates the return accruing to the project operating entity (EZ developer), whereas Economic Internal Rate of Return (EIRR) estimates the return on the investment to the national economy. Economic analysis is essential to develop a rationale for Government of Bangladesh to support the development of the proposed EZ and illustrates the measure of the accrued economic benefits. A good EIRR would also assist the private developer in making a good case to be able to avail concessional loans.

Three scenarios have been considered for the purpose of EIRR calculation viz. conservative, base, and aggressive. Details of these scenarios are outlined in the demand forecasting exercise. Base case Economic Internal Rate of Return (EIRR) has been calculated as 18.15%, which indicates that the project would provide fairly attractive returns. In conservative and aggressive cases, the project generates 14.50% and 25.98% economic return which ranges from fair to attractive.

Based on the area, location attributes, stage of development, macroeconomic parameters, and subscription tariffs a bench-marking exercise has been undertaken with the intention of assessing the competitiveness of the proposed economic zone vis-a-vis other similar developments in the region or emerging economies.

The benchmarking exercise has assessed various parameters such as commercial terms, infrastructure availability, labour cost, distance from trade gateways, etc. for similar developments. This analysis not only

provides the relative competitiveness of the proposed economic zone but also synthesises the key learnings from each of these zones. For the purpose of benchmarking of the proposed EZ site with other competitors at the same development stage, a total of 6 economic zones/ industrial parks have been shortlisted at local, regional, and global levels. These 6 economic zones/ industrial parks are spread across countries such as India, Russia, Oman and Philippines.

Benchmarking exercise suggests that the EZ site at Feni is competitive with respect to factors such as availability of standard factory buildings, shipping costs and labour cost. Manufacturers in the EZ site would enjoy good access to sea port and road connectivity (post development of approach road), thus enabling smooth logistics of bulk cargo through water and land routes. Relatively high power tariff could be a deterrent for investors, however EZ's proximity to industrial hubs of Dhaka and Chittagong, access to Bangladesh's most important highway (Dhaka-Chittagong highway) and further industrialization & infrastructure development planned in the region, might attract investors looking to invest in Bangladesh. One Stop Service facility has still not been fully implemented by BEZA, although GoB has approved the OSS Act. Competing EZs have an already established OSS facility which could incentivize investors to set up their manufacturing units in such EZs.

2. Introduction

The objective of this chapter is to picture a broad overview of this engagement. At the onset, a need assessment of organized industrialization in Bangladesh context has been carried out. This further deep dives into the salient features of the engagement in light of economic zone development programme towards validating the growth agenda of Government of Bangladesh (GoB).

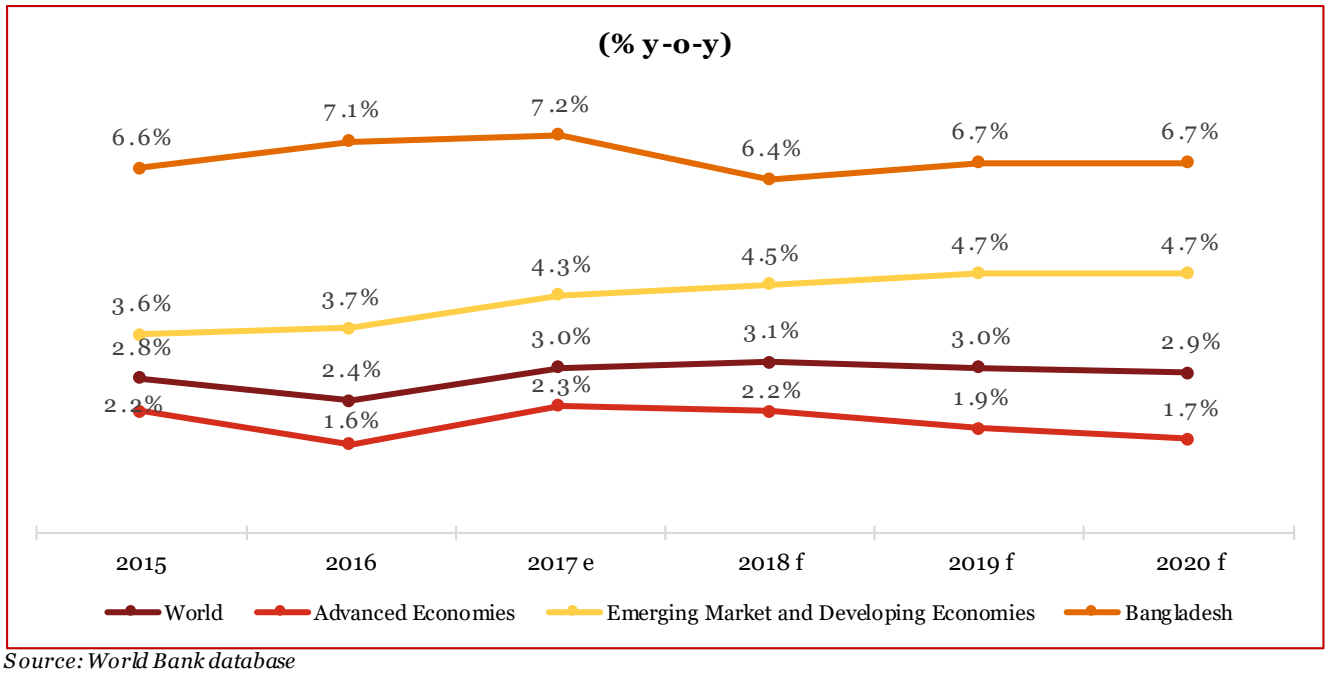
2.1. Bangladesh – Need for organized industrial growth

Recent economic and investment trends indicate a **gradual shifting of economic prowess from large economies to emerging markets**. Owing to rising cost of operation and cost of manpower in the developed economies, global production centers are moving towards Asian region.

As per World Bank reports, after dip in the past, global GDP growth is estimated to have picked up from 2.4 percent in 2016 to 3 percent in 2017.[6] This upturn is broad-based, with growth prospects improving in more than half of world's economies. As per World Bank estimates, global economy is expected to grow at a steady rate of ~3 percent on a year on year basis.

This is conducive for global trade and commerce, especially for the Emerging Market and Developing (EMD) economies which generally depend on exports for their GDP growth. **Among the EMD economies, it is expected that Bangladesh will sustain its healthy growth rate at above 6 percent on the back of its robust export sector and investment in infrastructure.**

Figure 2: Global Real GDP growth (e-estimated; f- forecasted)



Source: World Bank database

Above figure indicates how real GDP growth rate of Bangladesh has outperformed EMD and world's average. **Bangladesh, strategically located adjacent to the neighbouring large economies of India and China has embarked into an ambitious journey of industrial development and economic progress.**

On the global economic radar, Bangladesh has long been overshadowed by its larger neighbours in the region, India and China. However, with a population exceeding 160 million, Bangladesh has been steadily building its economic strength and is now emerging as an attractive frontier growth market in South Asia. This presents a

[6] *http://www.worldbank.org/en/publication/global-economic-prospects*

sizeable opportunity for organizations seeking to expand their global footprint and further establish a presence in the South Asia region.

This stable growth rate in recent times is an outcome of investment friendly policy push from GoB, and significant infrastructure augmentation across the country. Bolstered by these initiatives, Bangladesh is poised to shape up as manufacturing hub. **Various global accolades indicate the confidence expressed by the global agencies on the economic development of the country.**

- The growth potential of the economy has led to Bangladesh's inclusion in the 'Next 11' of Goldman Sachs.[7]
- The country being considered as the next Asian Tiger Economy.[8]
- Bangladesh was also included in the 'Frontier Five' economies by JP Morgan.[9] It indicates impressive economic and investment potential.
- Credit rating agency Standard & Poor has awarded Bangladesh a credit rating of BB-, [10] indicating long term stability.
- Bangladesh was also ranked 22nd in AT Kearney Global Services Location Index, [11] which analyses and ranks countries for outsourcing worldwide based on financial attractiveness, people skills and availability.
- Economy of Bangladesh was the 34th largest economy in the world in 2016 in GDP PPP (Purchasing power parity-2016) terms.[12]
- In Ease of Doing Business Index (2018), Bangladesh has improved its overall Distance to Frontier score. It has also made notable improvement along the parameter 'getting electricity'.

Bangladesh had effectively leveraged its attractive demographic dividend and low cost of operation (including low cost of manpower) to emerge as one of the largest exporters of Ready Made Garments (RMG). RMG sector has been the cornerstone of Bangladesh's growth story, so much so that RMG industry accounts for more than 81 percent of Bangladesh's export basket. [13] Such high dependency on RMG sector for exports symbolizes all that is good and not so good for Bangladesh's economy. **While, Bangladesh's dominance in RMG can be painted as a success story for the country which has effectively utilized its abundant pool of human resources, it also reveals that Bangladesh has not been able to diversify its export basket.** Bangladesh's export basket is four times more concentrated in a few individual product lines than the average of a developing country. The contribution of new products, identified by the six-digit level of Harmonized System of trade classification, to the overall export growth between 2005 and 2015, was less than 5 percent for Bangladesh in comparison to 78 percent for Malaysia, 42 percent for Vietnam, 32 percent for China, 25 percent for China and 20 percent for India. [14]

The world economy has increasingly become less predictable and is dictated by technological innovations which are disruptive in nature. In such a dynamic business environment, it has become imperative for Bangladesh to diversify its product mix and to hedge the risks associated with any particular sector. In order to reduce the high dependency of its economy on the textile and RMG sector, Bangladesh needs to address its infrastructure, energy and urbanization bottlenecks by chalking out a strategy to create a holistic environment for organized industrial growth. **Organized industrial growth will not only help in improving the country's competitiveness but will also attract more investments from manufacturers across the world.**

In order to carve out a strategic roadmap towards organized industrialization in the country, GoB has come up with the concept of economic zone (EZ) development. The advent of EZ model is expected to foster investment inflow and employment generation, which in turn will boost the overall socio-economic condition of the country.

[7] *http://www.goldmansachs.com/our-thinking/archive/archive-pdfs/brics-book/brics-chap-13.pdf*
[8] *http://www.thefinancialexpress-bd.com/2015/12/17/6199*
[9] *http://bangladesh.nlembassy.org/doing-business/bangladesh-economy.html*
[10] *https://en.wikipedia.org/wiki/List_of_countries_by_credit_rating*
[11] *http://www.prnewswire.com/news-releases/at-kearney-releases-2016-global-services-location-index-gsli-300201927.html*
[12] *World Bank Growth Indicators- GDP current in PPP basis*
[13] *http://www.dhakatribune.com/business/2018/02/01/ready-industry-4-0/*
[14] *http://www.thedailystar.net/supplements/building-modern-economy/revitalising-exports-1536607*

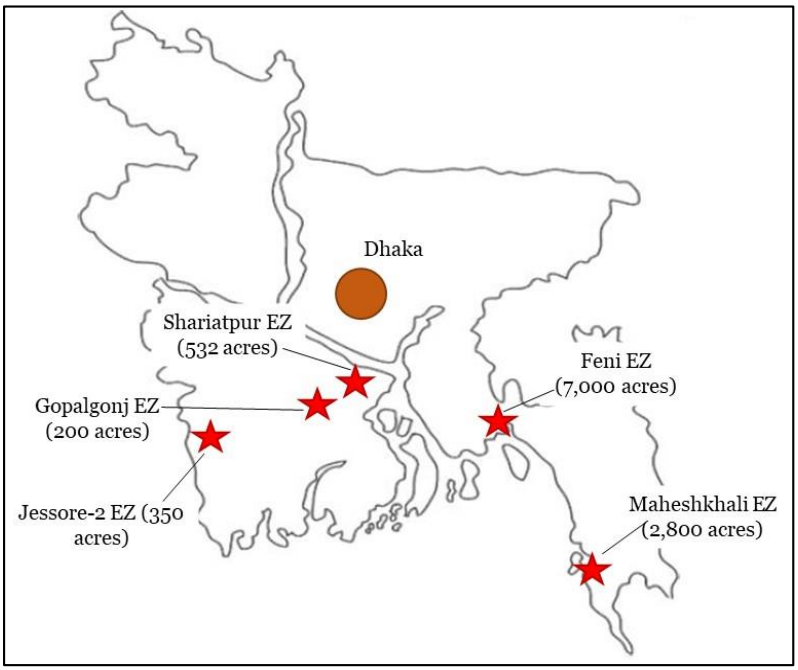
2.2. Project Overview

As a key part of its growth strategy, GoB, with the support of the World Bank is implementing the Private Sector Development Support Project (PSDSP) to support pilot EZ projects under the new EZ model. The project will support viability and will promote the removal of barriers and constraints faced by the private sector, which hinders their participation in developing EZs in Bangladesh. This project will support creation of serviced industrial land and use of good social and environmental practices. GoB intends to pay special attention to supporting international commercial practices and good governance to attract public-private partnerships in –

i) Zone Development
ii) Service and/or Management provision
iii) A strong emphasis on environmentally and socially-compliant manufacturing

A strengthened institutional framework will also be supported through policy advice and capacity building to help accomplish the above objectives.
The PSDSP consists of public sector portion of investment in land, infrastructure and services for a number of pilot EZs established under the new EZ law. The PSDSP will support transformative investments beyond already established sectors. A key outcome of this program is a contribution towards zoned industrialization, which will enable Bangladesh to maximize its growth benefits of agglomeration and ease the increasing urban congestion. More importantly, the project will enable new sources of growth, where investor interests have already been noted.
To support GoB's commitment to develop EZs in Bangladesh. BEZA intends to undertake five independent pre-feasibility studies for setting up Economic Zones in the locations as shown in the figure below –

Figure 3: Site Location of proposed EZs



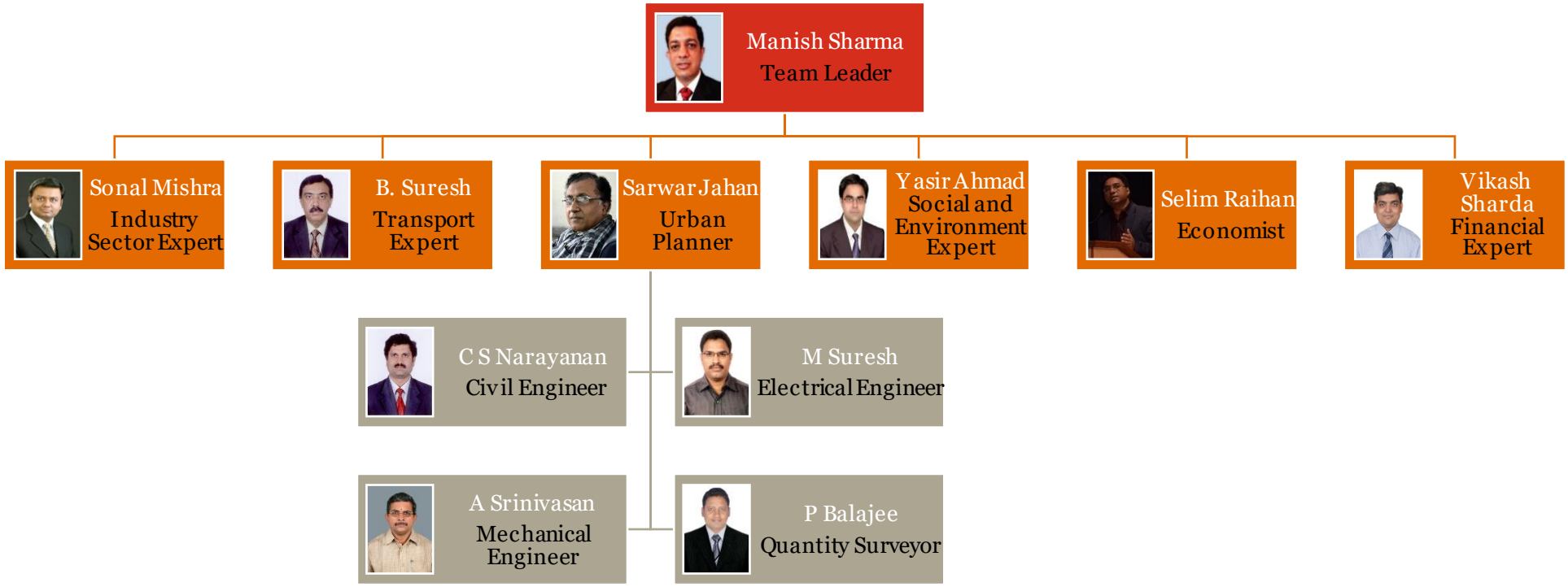
This report aims at pre-feasibility assessment of proposed economic zone at Feni spread over an area of 7,000 acres

2.3. PwC's Team of Experts

In consideration of the deliverables required during the course of this engagement, PwC has formed a team of experts with ***significant experience in the required areas of focus***. Through cross sectoral experience in handling projects of various types, our experts are well versed in the areas where expertise is required for this engagement: ***Feasibility Studies, Industry Assessment, Demand Forecasting, Competition Benchmarking, Transport Assessment, Master Planning, Financial & Economic modelling, and Environment and Social Review***.

The proposed team of experts demonstrates our qualifications and capabilities in executing the engagement. The organogram depicting the experts for various key positions is elucidated below, their detailed CVs have been duly submitted as a part of PwC's proposal on 8th June, 2017, under Form Tech-6.

Figure 4: Team of Experts



2.4. Project Timeframe

In conformance to this engagement's Terms of Reference, following deliverables will be submitted to BEZA as per the schedule laid out in the below table –

Table 3: Schedule of Deliverables

Deliverable	Description	Timeline	Status
D1	Inception Report	At 15-day milestone	Inception Report submitted
D2	Draft interim Report Presentation workshop to discuss findings of Interim Report Draft Final Report	At 3-month milestone	Final Interim Report submitted
D3	Draft Final Pre-Feasibility Study Report Presentation workshop on finding of Draft Final Pre-Feasibility Study	At 6-month milestone	Draft Final Pre-Feasibility Study Report submitted
D4	Final Pre-Feasibility Study Report	At end of the project	Final Pre-Feasibility Study Report submitted
	Deliverable submitted		
	Deliverable to be submitted in the future		

Legend:

D1: Inception Report
D2: Draft interim Report, Presentation on Key Findings & Draft Final Report
D3: Draft Final Pre-Feasibility Study, Presentation on Key Findings
D4: Final Pre-Feasibility Study

The activities covered under this assignment will be scheduled in a manner so that all tasks to be executed are in sync with each other, thus ensuring an organized and sequential flow of activities. A detailed timeframe has been previously submitted under Section 3.2 of the Inception Report dated, 8th February, 2018.

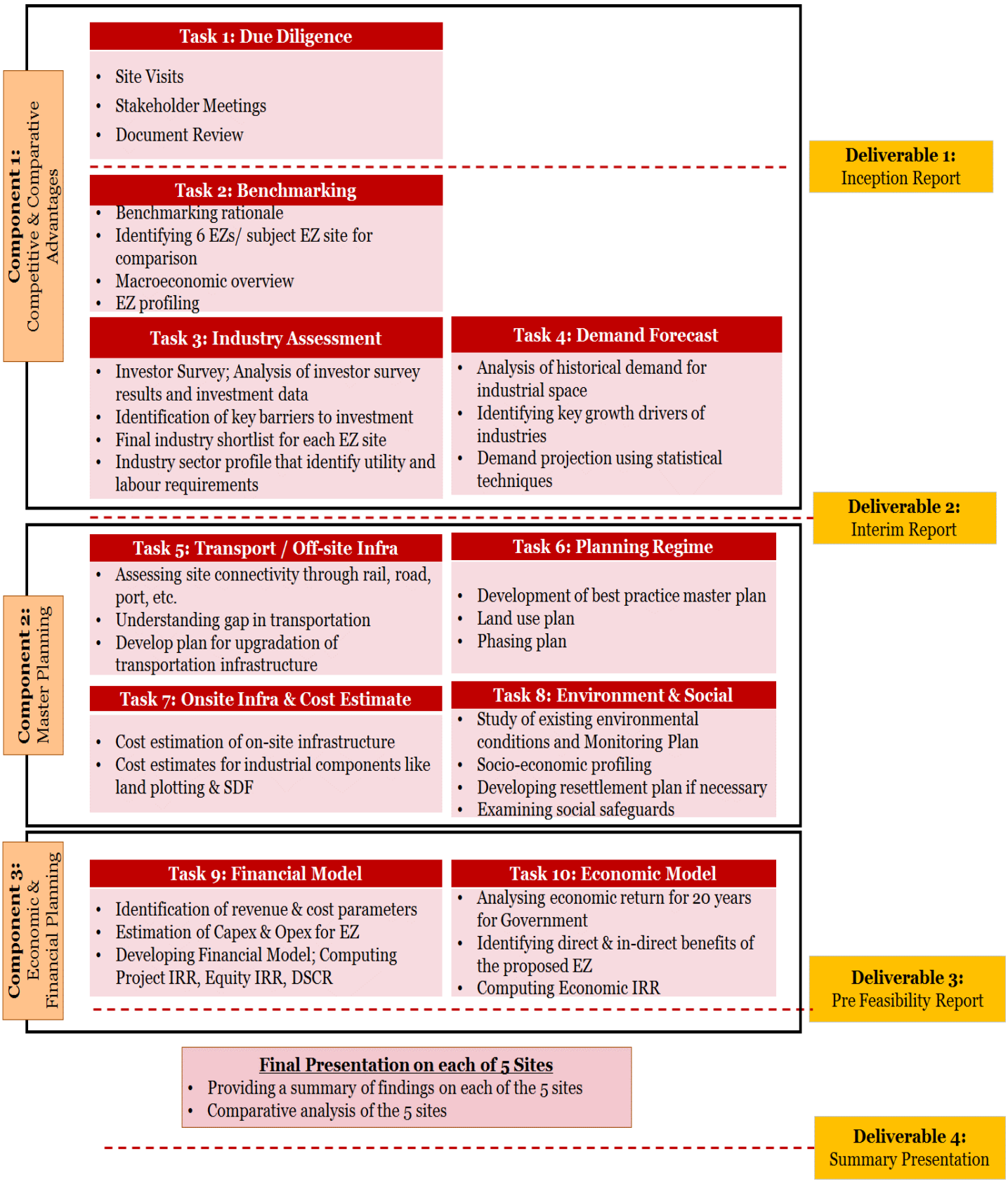
Next section elaborates detailing about the key activities/ tasks to be undertaken under each of the deliverables.

2.5. Outline of the Engagement

A detailed outline of the Terms of Reference and approach have been previously submitted as part of the Inception Report dated, 8th February, 2018.

Figure in the next page captures a concise outline of the engagement as per the Terms of Reference –

Figure 5: Tasks covered under current engagement



2.6. Description of Site Location

The proposed EZ is located in Sonagazi Upazila, Feni district of Chittagong division. Chittagong division, located in the south-eastern part of the country is geographically the largest division of Bangladesh with industrial city of Chittagong being the primary driver of the division's economy. Chittagong division contributes to ~18.9% of overall GDP of the country[15] and it houses various industrial units. Owing to the presence of Bangladesh's most important sea port, Chittagong Sea Port, this division has seen rapid industrialization with steel re-rolling mills, cement plants and other trade dependent industries getting established in this area. Chittagong division has 11 districts (zilas) and 99 sub-districts (Upazilas).

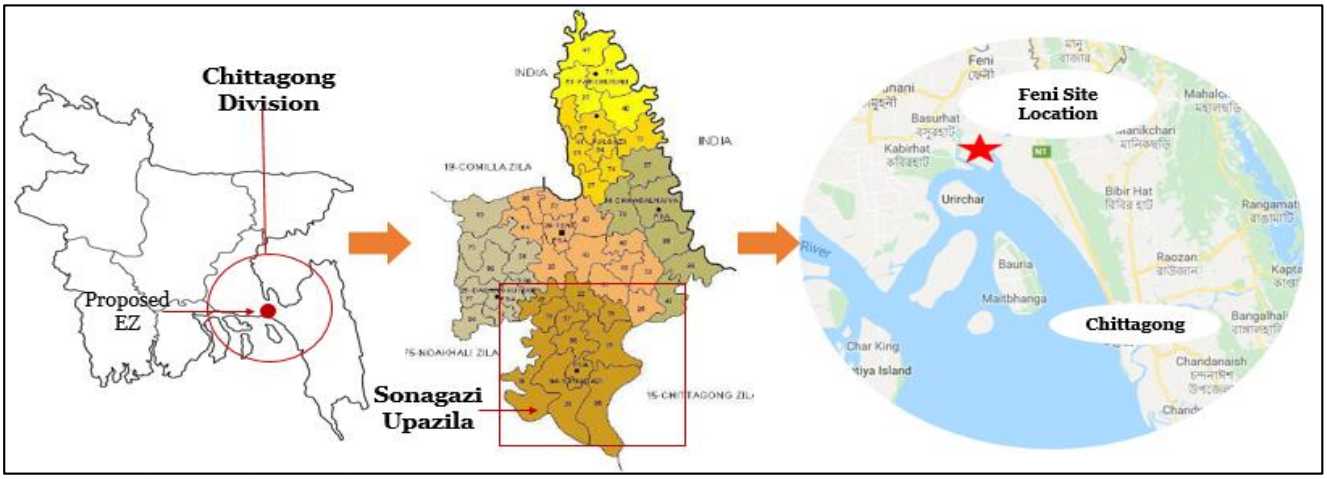
Feni district is located in the middle of Chittagong division and shares border with India to its north and Bay of Bengal to its South. It is surrounded by the following –

- Comilla district – North-West
- India – North & East
- Chittagong district – South-East
- Sandwip Channel (Bay of Bengal) – South
- Noakhali - West

Feni district comprises 6 upazilas; proposed EZ is located in Sonagazi upazila.

As per Housing and Population Census 2011, Feni district had an overall population of 1,437,371 with a gender ratio of 47% male and 53% female. Linear projection techniques indicate that in 2017, overall population of Feni district could be ~1,580,589; and population of Sonagazi upazila could be ~289,279.

Figure 6: Feni Site Location (Chittagong Division - Feni District - Sonagazi Upazila)



Source: Google Map and PwC Analysis

Feni experiences a tropical climate throughout the year with temperature ranging from 33.6°C during summer to 11.4°C during winter with average annual rainfall of 2,843 mm.[16]

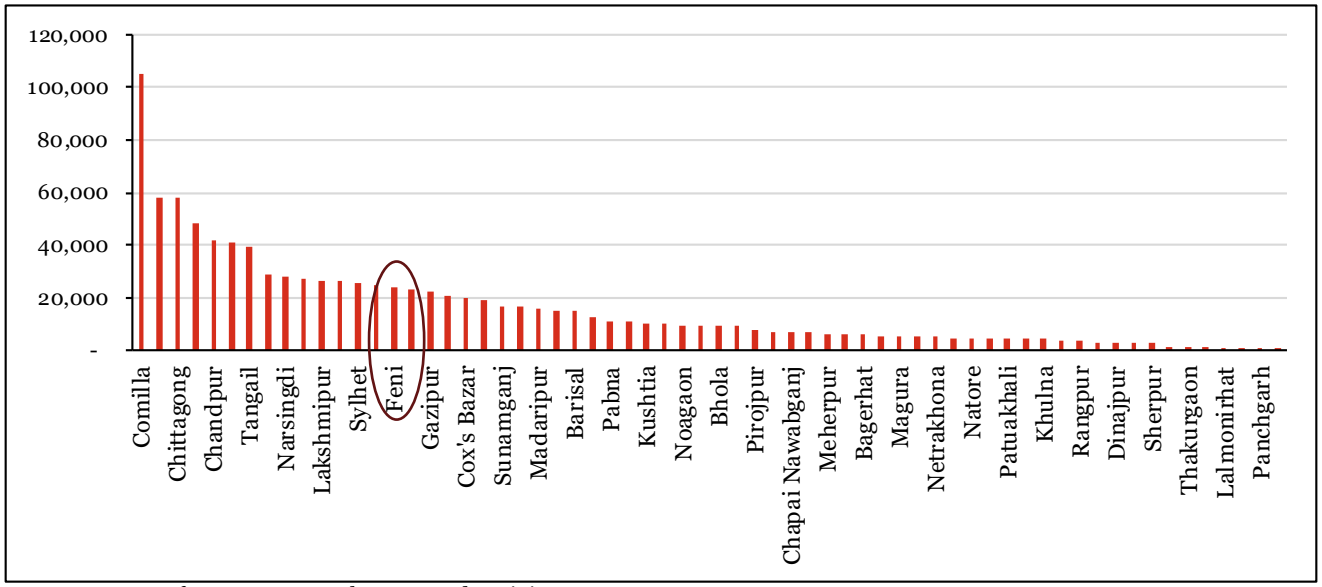
2.6.1. Economic Profile of Feni District

Currently, major population of Feni district is engaged in agriculture, fish rearing and animal husbandry. Although around 9.5% of population is also involved in non-farming activities.[17] A significant population from Feni district also travel overseas in search of employment. As per Bureau of Manpower, Employment and

[15] *Planning Commission- Lagging Regions' Survey*
[16] *Feni District Census, 2011*
[17] *Feni District Census, 2011*

Training, 24,068 people went overseas from Feni district in search of employment in 2017. This figure is significantly higher than the national average of 15,566.

Figure 7: District wise Overseas Employment, 2017



Source: Bureau of Manpower, Employment and Training

This trend of people travelling overseas for employment has resulted in relative well-being of their family members who reside in Feni district, which reflects in their per capita monthly consumption expenditure. As per lagging district development report, Feni district witnesses 4th highest per capita monthly consumption expenditure of 3,522 BDT, just behind the districts of Chittagong (3,681 BDT), Dhaka (3,585 BDT), Kushtia (3,643 BDT) and Noakhali (3,946 BDT).

Local residents who wish to stay in Bangladesh, migrate to cities like Dhaka and Chittagong after their education due to lack of industrial development in the region. Creation of an economic zone in Feni could enable a transformation in the social profile of the area as local people who leave their homes in search of jobs, might get incentivized to stay back and take up employment at skilled and semi-skilled workers.

Presently, the primary economy of Feni is agro based, with about 54.23% of total land holdings being under cultivation, as per Bangladesh District Statistics, 2011. The industries in this district comprise cottage industry, bamboo and cane industry, textile industry, rice mill, jute mill etc.

Nearest industrial belts are in:

(i) Chittagong district (comprising industries like textile & RMG, cement, shipbuilding, steel re-rolling mills) and

(ii) Comilla district (comprising industries like textile & RMG, leather products, light engineering etc.)

Industries in these industrial belts could serve as good markets and source of raw material for the proposed EZ.

Detailed economic and industrial profiling of the site surrounding region is undertaken in industry assessment chapter.

2.6.2. Site Surrounding Features

Districts in vicinity of the proposed EZ site location are Comilla in north-west, Chittagong in south-east and Noakhali in the west. Feni also shares international boundary with Tripura state of India towards its north and east. Sandwip Channel connecting Bay of Bengal forms its southern boundary. Industrial development has taken place in Comilla and Chittagong districts.

Key location attribute of the proposed EZ site is its location in between industrial cities of Dhaka and Chittagong, Bangladesh's most important highway Dhaka-Chittagong Highway (N1) passes in proximity to this site. According to an ADB study conducted in 2013, 90 percent of Bangladesh's goods for export and import passes through this highway.[18] Around 30,000 vehicles pass through this road on a daily basis,[19] which includes trucks carrying cargoes of apparels, light machinery, chemicals, steel roads, agricultural produce, processed food, cement etc. This strategic location will help industries in proposed EZ site, cater to the consumer market in Dhaka and form upstream and downstream linkages with industries along Dhaka-Chittagong Highway. Industries in proposed EZ will also have an access to markets and industries in North East India due to its close proximity to the Indian state of Tripura. Governments of both India and Bangladesh are in the process of implementing several infrastructure projects in this region in order to boost trade and commerce between the two countries.

2.6.3. Location Reconfirmation

The proposed EZ site is located towards the southern part of Feni district. Basis site visit, site location and site demarcation details have been reconfirmed. The same have been captured in the table below.

Table 4: Proposed EZ Site Information

Parameters	Details
Site co-ordinates	339049.021 Easting – 2526334.742 Northing 333719.358 Easting – 2520638.809 Northing 340462.307 Easting – 2515791.009 Northing 342181.996 Easting – 2517607.676 Northing
Site boundaries on East	Proposed Mirsarai EZ
Site boundaries on West	Proposed 100 MW Wind & 100 MW Solar power plants to be constructed by Electricity Generation Company of Bangladesh (EGCB), occupying 999.65 acres of land
Site boundaries on North	Muhuri Irrigation Project Dam
Site boundaries on South	Sandwip Channel
Total area of the site	7,000 acres
Privately owned land	Not yet identified
Government Land/ *Khas* land	4,512.56 acres already transferred to BEZA; 5,107.91 acres land has been identified out of which 2,487.44 acres land is in process of being transferred
Expansion potential	Basis discussion with local inhabitants, it was understood that there were interspersed char land along the northern boundary of the proposed EZ, where expansion could take place. However, any expansion proposal should be subjected to land surveys and site visits.

Source: Information obtained from Site visit and MACE Analysis

On analysis of the proposed EZ site location, it can be observed that the site is ideally positioned to cater to industrial belt in Comilla and Chittagong, it can also cater to the consumer market in Dhaka and boost Bangladesh's international trade with India through Belonia Land Port (post operationalization). Its demography offers a pool of labor which can be absorbed in the EZ to take up semi-skilled jobs. Also, setting up of the EZ can arrest the trend of overseas migration of young people from Feni.

During site visit, it was observed that the EZ site is currently split into 2 parts due to a shallow river channel created by Feni River, which remains mostly dry throughout the year due to creation of Muhuri dam on the upstream of this river. However, during monsoons when the volume of water stored in this dam increases beyond

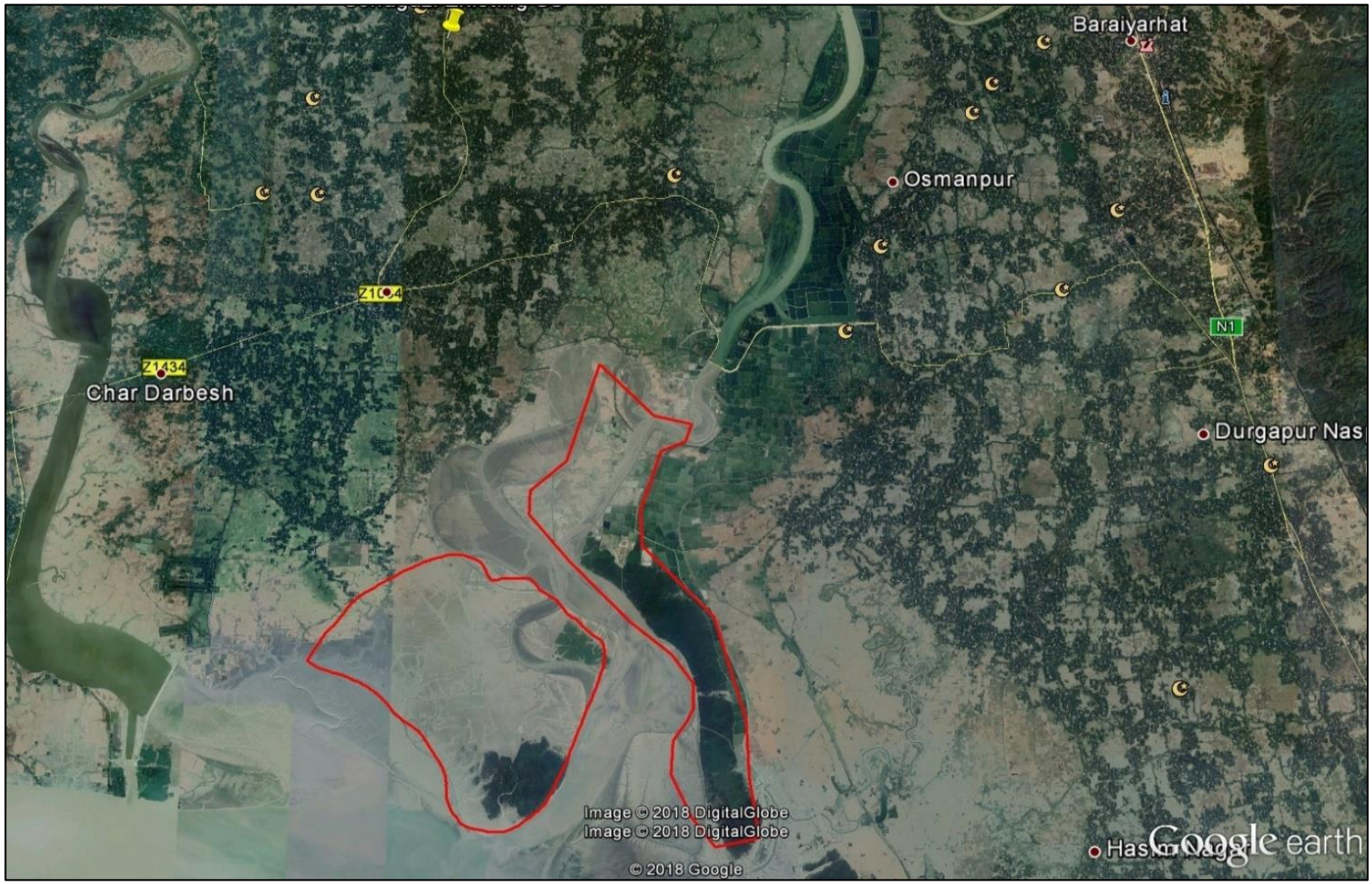
[18] *http://www.theindependentbd.com/post/81393*
[19] http://www.thedailystar.net/editorial/highway-growth-1249747

its capacity, water from this dam is released resulting in increased volume of water flow downstream. Presence of this river bifurcating the site is important aspect of site assessment, as it might result in duplication of supporting infrastructure facility like administration building, ETP/STP, substations etc. The mitigation measures required to create utility infrastructure to support the development of this EZ site has been captured in the Master Planning section of this report.

Basis discussions with UNO office and the local surveyors, it was informed that there lies an expansion possibility of the project site beyond its northern boundary; in the future, based on industrial space demand. Expanding of this EZ site can be considered as a second phase development activity, after assessing the land uptake for the current area. Any decision on the same is subjected to feasibility studies and topography survey.

Figure on the next page elucidates the site boundary of the proposed EZ.

Figure 8: Site Boundary of Proposed EZ

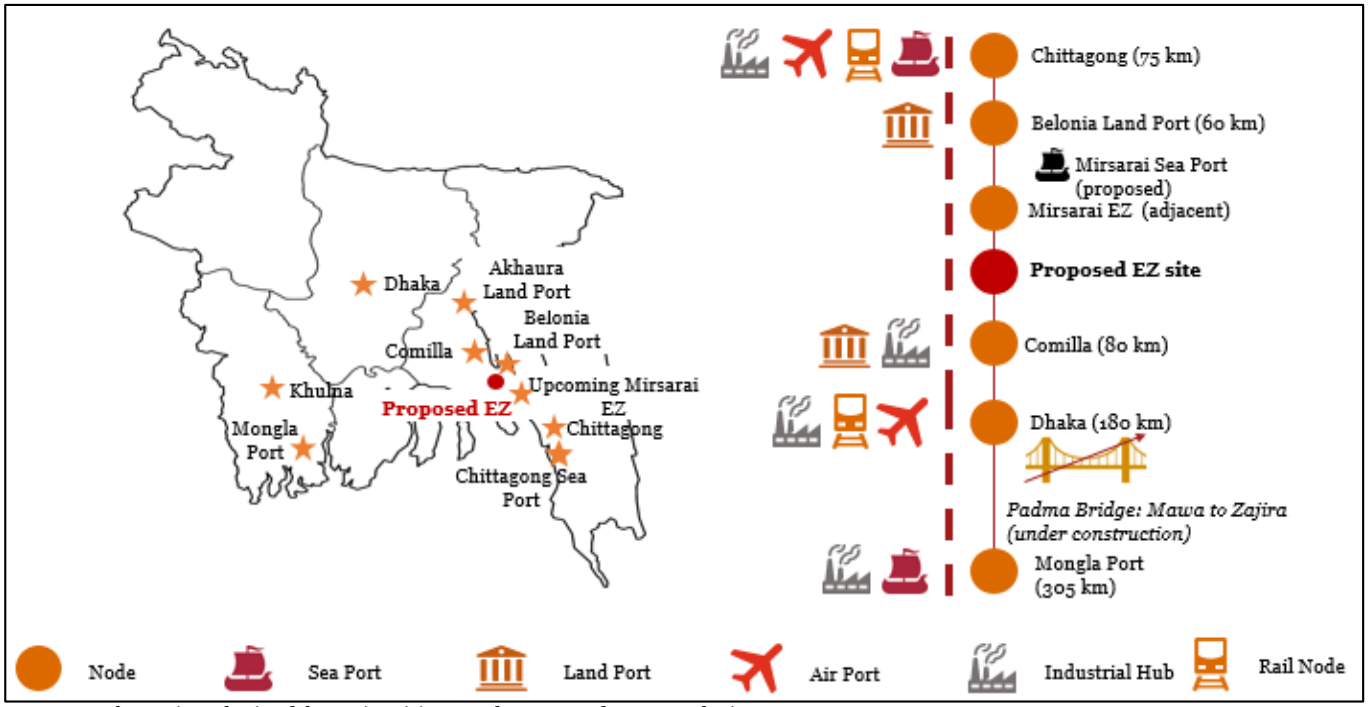


Source: MACE Analysis

2.6.4. Transport Infrastructure in Proximity of Proposed EZ Site

For any location to shape up as a potential EZ, access to multimodal connectivity is an important feature. Figure on the next page depicts the site location juxtaposed with major trade gateways, industrial nodes, and transport infrastructure near the proposed EZ site.

Figure 9: Transport infrastructure in proximity of proposed EZ site



Source: Information obtained from site visit, Google Map, and PwC Analysis

Figure above elucidates that the proposed EZ is in proximity to Belonia Land Port, Comilla and upcoming EZ at Mirsarai. It is also located near the transit route from Dhaka to Chittagong. The locational advantage of proposed EZ site is expected to give a fillip to the industries which would be established at proposed EZ site.

Last Mile Connectivity: Proposed site can be reached from Dhaka-Chittagong highway by accessing Feni-Sonagazi Zilla Road, Z1034 from Lalpol Bus stand in Feni Sadar Upazila. This zilla road is a single lane bituminous road with a width of 5.54 m. A journey of 17 km on this road leads to Sonagazi Upazila. As per discussions with UNO officials, we were informed that RHD intends to undertake a road widening exercise for this stretch of road to convert it into 2-lane road. To reach the proposed EZ site from Sonagazi Upazila, a single lane village road, Chor Chandia needs to be accessed which is a bituminous single lane road. A journey of 7 km on this single lane road will lead to a 1.5 km long stretch of single lane dirt road which connects to the western border of the proposed EZ site. Another alternate route to access the proposed EZ site from Dhaka-Chittagong highway is to access the Muhuri Project Road from School Road Bus Stop in Zoraworgonj village in Mirsarai Upazilla. Muhuri Project Road is a single lane bituminous road originating from Old Dhaka-Chittagong Highway. A journey of around 10 km on Muhuri Project Road leads to the Muhuri Project Tourist spot-cum- sluice gate over Feni River. A single lane village road branches out towards south from Muhuri Project Road just before the Feni River. A journey of 2 km on this dirt road leads to the proposed EZ site. Developing of last mile connectivity would be considered during off-site infrastructure planning stage.

Rail Connectivity: Boraiyarhat station (15 km) is the closest rail head from the site. It can be accessed via Muhuri Project Road followed by Dhaka Chittagong Highway. However, it is a small station with no cargo handling facility. Feni railway station is the nearest major railway station to the proposed EZ. It is approximately 30 km from the proposed EZ and can be reached from Sonagazi via Feni-Sonagazi road. Presently, Feni station primarily caters to passenger movement. These railways stations are on the Dhaka-Chittagong railway route, providing rail connectivity to both Dhaka and Chittagong.

Air Connectivity: Nearest international airport is Shah Amanat International Airport in Chittagong. This airport is around 75 km away from EZ site requiring around 2.5 hours of travel. Another international airport, Hazrat Shah Jalal Airport (HSIA) in Dhaka. This airport is around 180 km away from EZ site requiring 5.5 hours of travel. Both the airports provide air transport connectivity to domestic as well as international passengers.

River Connectivity: Boro Feni River bifurcates the proposed EZ. However, this river is a part of the Muhuri Irrigation project and it cannot be used for navigational purposes from the proposed EZ. Nearest river port to the Proposed EZ site is at Chandpur on the Meghna River which is around 130 km from the proposed EZ and is accessible from road via Dhaka-Chittagong highway followed by Comilla-Chandpur Highway which is a 2-laned bituminous road. This port is equipped to handle movement of heavy vehicles and currently has a capacity to handle 6,500 MT/ month of bulk cargo and 6,500 MT/month of general cargo. Also, proposed EZ has access to a water front in Sandwip Channel, having a draft of around 6.5 to 8.5 metres, where berthing facilities can be developed for vessels carrying raw material for heavy industries and clinker for cement factories. A bathymetric chart showing depth of Sandwip Channel near proposed EZ at Feni has been shown in the Annexure

Sea Port Connectivity: Chittagong Sea port is the nearest sea port which is located approximately 75 km from the proposed EZ. This port is also accessible via Dhaka-Chittagong highway. Chittagong Port Authority has also envisaged developing a new port in Mirsarai, which is the adjacent district to Feni. The main function of this sea port will be to act as an intermediate port/terminal, which will provide support to Chittagong Sea Port.

Land Port Connectivity: Belonia Land Port is the nearest land port located at around 60 km north of the proposed EZ site. This port is yet to be operationalized. Bibirbazar Land Port is also in proximity to the proposed EZ at a distance of around 85 km from proposed EZ site, requiring a travel time of 2 hours. This port has a handling capacity of 500,000 MT per annum. Akhaura Land Port is also in proximity to the proposed EZ at a distance of around 155 km from proposed EZ site, requiring a travel time of 4.5 hours. This port has a handling capacity of 500,000 MT per annum and storage capacity of 2,000 MT.[20]

2.6.5. Utility Linkages at the Proposed EZ

Availability of utilities is most critical to support daily operations of any industry. Different industries have varying requirement of utilities depending on their raw material and final products. Basic utilities that are required by any industry can be captured in four baskets i.e. power, water, gas, and telecommunication facilities. It is important for industries to have access to cheap utilities in order to manufacture their products at competitive prices, since cost of utilities impact the manufacturing cost of products.

Power Availability: The nearest power grid to proposed EZ site is at Feni having a capacity of 186 MVA, which supplies power to a substation (33/11 KV) in Dakbangla at Sonagazi having a capacity of 20 MVA. As per discussions with REB officials, we were informed that this substation is operating at full capacity. Distance of this substation from the site is around 8 km. A substation (33/11 KV) is under construction at Solakhali (6km from EZ site). This substation will have a capacity of 20 MVA and is envisaged to be ready by April, 2018. During interactions with REB officers, it was understood that power for proposed EZ will be provided from this substation. Also Power Grid Company of Bangladesh Ltd. (PGCB) are setting up 2 renewable energy plants adjacent to the proposed EZ site. These plants are expected to generate 100 MW each from wind energy and solar energy. A parcel of land measuring approximately 999.65 acres has already been allocated for this. However, based on discussions with REB officers, we understand that power from these plants would be supplied to Feni Grid.

Water Availability: Albeit the site is located adjacent to the Feni River, the water is saline which poses a challenge for industrial or domestic consumption. Hence, bore well becomes essential for water supply. Based on discussions with UNO officials we understand that average depth of bore welling required is approx. 800 to 1,000 ft. Extracting water from such depth could pose a challenge in making use of ground water commercially viable. Alternate sources of water supply would be evaluated during on-site infrastructure planning stage.

[20] *Bangladesh Land Port Authority*

Gas Availability: Presently, there is no existing gas pipeline in Sonagazi and the nearest gas station is in Feni at a distance of 25 km with an approx. capacity of 50 Mn cu.ft / day. However, basis discussions with relevant authorities at gas stations, we were informed that the existing gas station does not have sufficient capacity to supply to industries and can only cater to domestic needs. State controlled Gas Transmission Company Ltd. (GTCL), which is responsible for establishing gas pipelines across Bangladesh, is in the process of laying down 181 km long, 36 inch dia. gas pipeline from Chittagong-Feni-Bakhrabad in order to supply imported gas from LNG terminal established at Maheshkhali near the southern tip of Bangladesh. GTCL has already established 91 km pipeline from Maheshkhali to Anowara. Construction is underway to lay down 30 km of pipeline from Anowara to Fouzdarhat in Chittagong. Once GTCL lays down the pipeline from Maheshkhali to Feni, sourcing gas from the pipeline to proposed EZ site can be made possible.

Telecom Availability: Telecommunication facility is available in the region of the proposed EZ site with major private telecom service providers (like Grameen Phone, Bharti Airtel, Banglalink, Teletalk) providing voice calling and internet facility. Optical fiber cable is present till Sonagazi Upazila. However, at least another 7 km of additional optical cable needs to be laid in order to provide telecom connectivity till the site.

Wastewater Treatment Facility: Presently, there is no wastewater treatment facility in the vicinity of the proposed EZ site which can be used by the industries that would come up inside the EZ. Provision for wastewater treatment facility has been captured during the master planning stage of this report.

Solid Waste Management Facility: Presently, there is no solid waste management facility in the vicinity of the proposed EZ site which can be used by the industries that would come up inside the EZ. Provision for solid waste management facility has been captured in the master planning chapter of this report.

2.6.6. Access to Social Infrastructure

An important predecessor for establishing of industries in a region is the type of social infrastructure that is present in the region. Quality of educational institutes determine the availability of skilled local manpower, quality of residential and medical facilities determine whether skilled manpower can be brought in from outside to work at a particular place or not. With the growth in economy, quality of lifestyle has become an important determining factor which can influence investment decisions for a particular place. Hence, it is important to understand social infrastructure available in Feni district.

Academic Facilities: Feni district has 6 Polytechnic Institutes, 1 Technical School and College, 1 Nursing Institute, 12 General Secondary Schools, providing vocational training for basic skill development and 3 Union Digital Centre for imparting knowledge about computers to the young people in the district.

Some of the major colleges in Feni district are –

- Feni Polytechnic Institute
- Feni Technical School and College
- Golden Polytechnic Institute

As per the TVET Census – 2015 report, there are 97 Vocational Institutes in Feni district offering courses ranging from Computer Science, Telecommunications, Electrical and Electronics, Food Processing & Preservation to Dress Making, General Mechanics, Textile Technology, Pisciculture, Refrigerator & AC repair, General House Wiring etc.

Primary and secondary education facilities provided in Feni is of good quality. However, students travel to Dhaka and Chittagong cities for higher studies.

Medical Facilities: There are 5 upazila health complex, 18 union sub centres, 148 community clinics, and 11 private clinics in Feni district.[21] In addition, there are also a few Union Health and Family Welfare Centres being operated by Directorate of General Health Services in Feni district.

[21] *Local Health Bulletin, 2016 for Upazilas in Feni district*

Access to basic healthcare facilities is necessary for catering to the requirements of the manpower employed in the proposed EZ.

Residential Facilities: Basic level residential facilities are located in Feni upazila. Basis preliminary site visit and discussions with local residents, we were informed that residential requirements of unskilled and semi-skilled manpower to be employed in the proposed EZ are available in the surrounding region. Provisions for developing adequate social infrastructure in the proposed EZ site would be taken into cognizance during master planning stage.

The Proposed EZ site at Feni is in proximity of Dhaka-Chittagong Highway, which is an important economic corridor in Bangladesh. Basis our site assessment, we understand that the potential to develop the last mile connectivity from this highway to the site needs to evaluated. Dhaka-Chittagong highway, connects the site to other modes of transportation (railways & ports). Detailed power requirement for the EZ and a need to augment power supply has been evaluated in the off-site infrastructure chapter of this report. A desalination plant has been proposed in the off-site infrastructure chapter to establish water supply to the site for industrial purpose. Presently, gas supply does not exist in vicinity of proposed EZ site, however based on stakeholder discussion with UNO officials; we understand that the GoB has plans to supply gas in the region and has already taken up plans to lay down gas pipeline along Dhaka-Chittagong highway. Basic social infrastructure is available in the region surrounding the EZ site, which can cater to the needs of semi-skilled and unskilled employees.

3. Benchmarking

3.1. Key Objectives

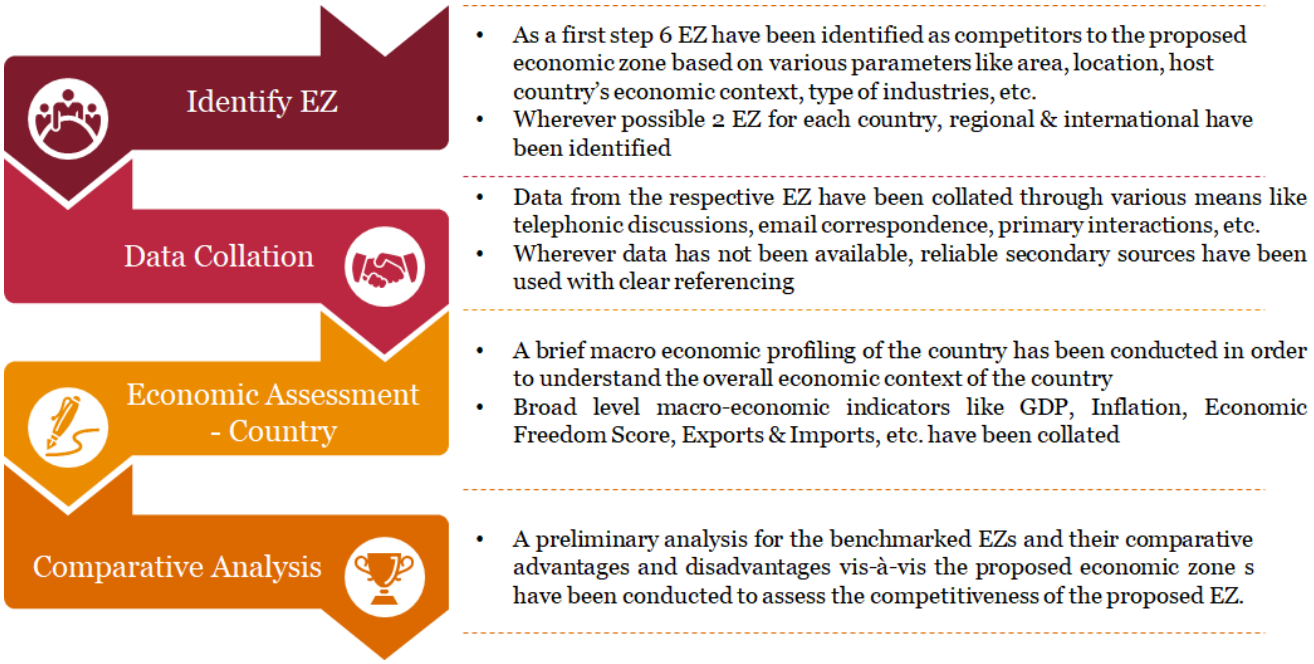
The success of an economic zone often hinges upon the competition experienced by it from similar developments either within the country or region. Additionally, at a planning stage a developer should be well abreast of various best practices and the quality of economic zones that are being developed across the world. Hence, studying of other economic zones and their development strategies are vital information for a developer to construct a state of the art industrial region which incorporates the best prevalent practices of the world.

Based on this premise, this chapter attempts to provide a profiling of various economic zones which share similar physical and economic attributes as the proposed economic zone.

3.2. Methodology of Benchmarking

The benchmarking exercise has been conducted through extensive research which entailed telephonic discussions, email correspondence, primary interactions, with developers of economic zones, etc. An illustration for the flow of the benchmarking exercise has been depicted below:

Figure 10: Benchmarking Methodology



The identification of economic zones has been carried out on the following broad parameters as described below:

Figure 11: Benchmarking Methodology

Area of Economic Zone	Wherever possible economic zones of similar sizes to the proposed EZ have been selected. However, this parameter has been kept flexible to accommodate more of comparable economic zones
Industry Type	Only those economic zones which are multi-product in nature have been considered for the benchmarking. Sector specific or service based economic zones have been ruled out
Product Offering	Economic zones offering superior quality infrastructure and professionally management have been considered. Non operational of decrepit zones have been ruled out.
Stage of Development	The benchmarking have been limited to economic zones that are in active stages of marketing. Non operational or saturated zones have not been considered

Post identification of the shortlisted EZs an information request mailer have been circulated to the respective marketing or business development teams for the EZs. The data thus obtained have been further validated through telephonic discussions with concerned persons in order to ensure data adequacy and accuracy.

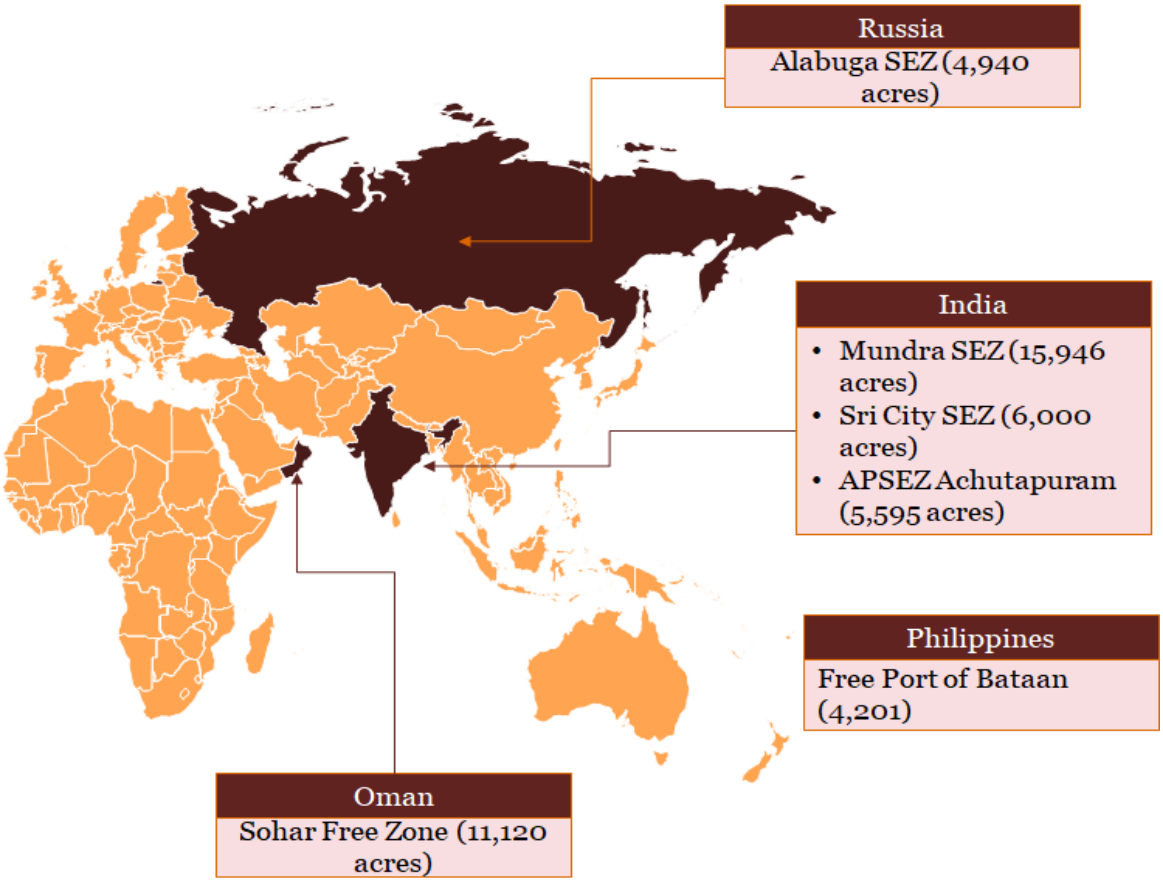
Post receipt of all data pints a brief macro-economic profiling of the respective countries have been conducted to assess their economic landscapes.

Finally a comparative assessment of all these EZs have been done with proposed EZ in Feni to assess the comparative position of the proposed EZ with each of these EZs.

3.3. Competitor Identification

The subject economic zone is located in Feni and is envisaged to cover a land area of approx. 7,000 acres in Bangladesh. Bangladesh has not witnessed the development large scale organized economic zones as yet, hence no suitable comparable to the subject economic zone could be identified within the country. Based on extensive research and the parameters as highlighted above, the following economic zones have been identified.

Figure 12: Geographic Spread of Comparable EZ



Source: PwC Research

A brief overview and rational for selection for each of these economic zones have been provided below:

Table 5: Brief Overview of Shortlisted SEZ

Name of economic zone	Country	Type of industries	Land Area	Rational
Sohar Free Zone	Oman	Petrochemicals, Plastics, Automotive, Furniture, Ceramics	11,120 acres	Sohar Free Zone is located in the Sultanate of Oman and is spread across a large land area of approx. 11,120 acres. It also houses a fairly diverse mix of industries. The Feni Economic Zone is also envisaged as a large scale economic zone with a varied product mix. Hence, keeping cognizance of the overall attributes of the zone it is believed to be a suitable comparable to the envisaged economic zone in Feni.
Mundra SEZ	India	Textiles, Chemicals, Petrochemicals, Heavy Engineering, Plastics	15,946 acres	Mundra Special Economic Zone is located in the western coast of India and is spread across a large land area of approx. 15,946 acres. It is one of the most prominent economic zones in India and well known for its superior quality industrial infrastructure. Although it is of a larger size as compared to Feni, the overall product mix and scale of development is similar and hence it has been chosen as a comparable to Feni

Name of economic zone	Country	Type of industries	Land Area	Rational
Sri City SEZ	India	IT/ITeS, Food and Beverage, Construction machinery, Electrical and Electronic etc.	6,000 acres	Sri City is a multi-product economic zone that is located in the eastern coast of India. It is widely considered to be one of the successful economic zones of the country with a healthy amount of investments. The SEZ is also home to a diverse set of industries like Food & Beverages, Automotive, Electronics, Light Engineering, etc. The area of the economic zone is also similar to the envisaged economic zone in Feni. Hence, keeping cognizance of the overall attributes of the zone it is believed to be a suitable comparable to the envisaged economic zone in Feni.
APSEZ Achutapuram	India	Chemicals, Light Engineering, Chemicals, Apparels, Construction Equipment	5,595 acres	The APSEZ Achutapuram is a special economic zone, promoted by Andhra Pradesh Industrial Infrastructure Corporation in the eastern coast of India. This is a multi-product economic zone that houses a multitude of industries like chemicals, apparel, construction equipment, etc. Hence, keeping cognizance of the overall attributes of the zone it is believed to be a suitable comparable to the envisaged economic zone in Feni.
Alabuga SEZ	Russia	Automotive, Chemicals, Non Metallic Minerals, Light Engineering	4,940 acres	Alabuga SEZ is Russia's premiere economic zone within Russia located within the Republic of Tatarstan. The success of this economic zone has hinged upon superior infrastructure, utility services and professional management. This zone has attracted investments from a plethora of diverse industries like automotive, chemicals, light engineering, etc. The development concept of Feni is similar to the Alabuga SEZ and hence the same has been chosen as a comparable.
Free Port of Bataan	Philippines	Manufacturing, Transshipment and Logistics, Ship Repair, Tourism and Resort Facilities/Services, Agriculture and Agro-Industrial	4,201 acres	The Free Port of Bataan is located in the island country of Philippines and is one of the largest economic zones of the country. The area houses a gamut of industries like electronics, light engineering, textiles, IT/ITeS, etc. Keeping cognizance of the overall attributes of the zone it is believed to be a suitable comparable to the envisaged economic zone in Feni

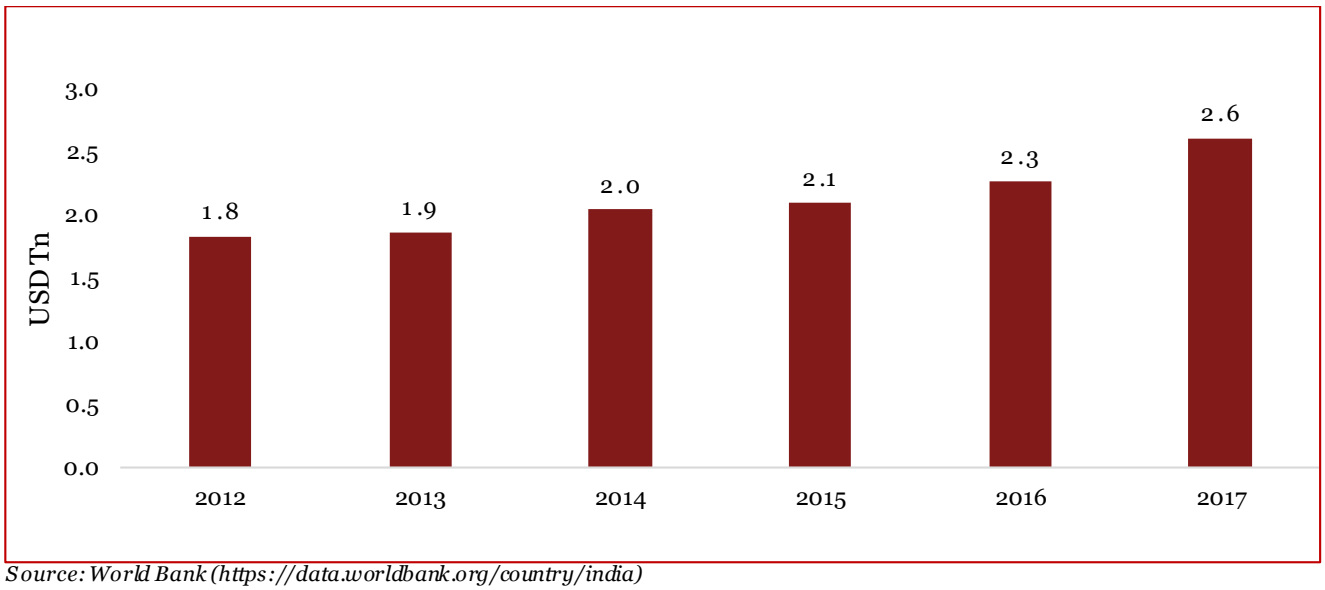
Source: PwC Research

The following sections of the report shall elucidate the macroeconomic landscape of the each of the host country and a profiling of the respective economic zones.

3.3.1. India

India is one of the largest trade partners of Bangladesh and share longstanding trade and cultural relationships. India also has one of the longest internationals borders with Bangladesh. India had started its special economic zone in 2001 and has successfully promoted a number of successful economic zone both through government initiatives as well as joint venture with private sectors. India has emerged as one of the fastest growing economies of the world and registered healthy GDP growth rates as depicted below. **Data used for the analysis is the latest data point available in the respective database.**

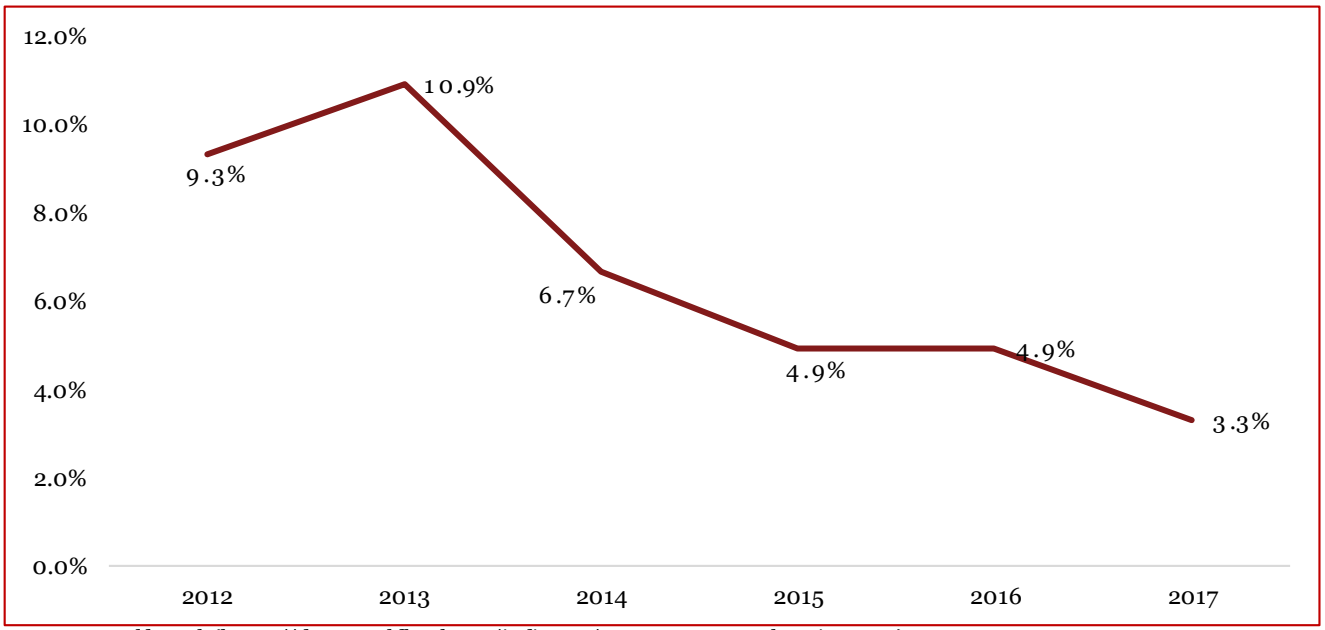
Figure 13: GDP Trend of India



Source: World Bank (https://data.worldbank.org/country/india)

Inflation rates in India have eased post a surge in the inflation rates owing to decreasing prices of food grains and the same is depicted below. **Data used for the analysis is the latest data point available in the respective database.**

Figure 14: Inflation Trend of India



Source: World Bank (https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=IN)

The other macroeconomic indicators for the country have been summarized below –

Table 6: Macro-economic Parameter of India

Macroeconomic Indicator	Description	Data Source
Unemployment	3.50%	The Heritage Foundation
FDI Inflow	$40.0 billion	The World Bank
Exports	USD 295.8 Bn	ITC Trade Map
Imports	USD 444 Bn	ITC Trade Map
Heritage Foundation's Index of Economic Freedom Rankings.	130	The Heritage Foundation
Cato Institute's Human Freedom ranking	102	Human Freedom Index | Cato Institute
World Economic Freedom's Global Competitive Index Rating	40	Global Competitiveness Index 2017–2018 rankings
WB Doing Business ranking	100	Doing Business 2018

India is an emerging economy with a predominantly restricted economy as might be deciphered from its rank of 130. The country is gradually shifting from being a largely regulated and restricted economy to a more open market economy. Economic liberalization measures, including industrial deregulation, privatization of state-owned enterprises, and reduced controls on foreign trade and investment began in the 1990s and unshackled the economy from a longstanding regime of regulations. The country also witnessed a paradigm shift in its taxation regime with introduction of Goods & Services Tax (GST). The restricted levels of economic freedom is also reflected in the human freedom ranking wherein India ranks fairly low.

Recent years have witnessed India gaining significantly on the economic competitiveness front and is leading group of South Asian economies. Some of the key factors contributing to the improved rankings are improvement in infrastructure, increased public investment and sped up approval procedures by the Government.

Post identification of the various macro-economic parameters of India, the subsequent section of the report intends to highlight the various attributes of each of the economic zones within the country.

3.3.1.1. Mundra Special Economic Zone

The Mundra Special Economic Zone is flagship economic zone developed by the Adani Group which is a pioneer in ports and economic zones. The economic zone was developed on a vast stretch of barren land adjoining the Gulf of Kutch. The region was a remote location with extreme climatic conditions. The economic zone deployed the concept of integrating the special economic zone with the largest deep-sea port of India. Today the Mundra Special Economic Zone is a multi-product zone and houses various industries like light engineering, heavy engineering, power, chemicals, etc. The success of the economic zone has hinged upon the proximity to the container port in Mundra and the thriving industrial ecosystem in the state of Gujarat. The zone is also well connected by road and rail network adding to its preference as a manufacturing destination. The zone also provides superior quality infrastructure in the form of plotted land plots, utility services like power, water, waste treatment plants, etc.

Figure 15: Mundra Port & SEZ

Source: Google Images

The detailed profiling of the special economic zone is provided below:

Table 7: Mundra Special Economic Zone

Factors	Mundra Special Economic Zone, India
Site	
Land Size (acres)	15,946 acres
Number of Plots	Plots are allocated based on requirement of investors, hence no pre-decided number of plots are demarcated
No. of Development Phases	The development has been carried out over a long period of time without any official development phases
Land Lease (+length) or Sale (Taka/USD)	One time lease premium of **INR 3,000 / sq.m (USD 46.23 / sq.m)** for a lease period of **30 years**. There is an additional lease rent of INR 80 / sq. (USD 1.23 / sq.m)
Pre-Built Factories (PBF) (Y/N)	There are **no** Pre-Built Factories provided as a part of the product offering
Lease Rate for PBF (Taka/USD)	There is no lease rate for PBF since PBF are not provided
Infrastructure/Utilities	

Factors	Mundra Special Economic Zone, India
Onsite Independent Power (Y/N and Type)	There is onsite captive power plant. There is a 4,620 MW Power Plant within SEZ commissioned by Adani Power Ltd, (4 x 330 MW and 5 x 660 MW units)
Cost of Power (Taka/USD)	Fixed cost of power is **INR 1.1 / KwH (USD 0.017 / KwH)** and Energy Charges is **INR 3.50/ KwH (USD 0.054 / KwH)**
Cost of Water (Taka/USD)	The cost of water for industrial purpose is **INR 65 / KL (USD 1 / Kl)**
Onsite Wastewater Treatment Plant (Y/N)	There is onsite wastewater treatment plant available. 2.5 MLD CETP is operational in first phase
Transport costs	
Cost of shipping 20 foot FCL container shipping to Mundra	• Hamburg – Mundra → USD 2,035[22] • Rotterdam – Mundra → USD 1,731[23] • Antwerp – Mundra → USD 1,557[24] • New York – Mundra → USD 6,443[25]
Cost of Labor (Taka/USD)	
Management	The salary of a management professional in the state of Gujarat is approx. USD 1,356 / month[26]
Technicians	The salary of a technician in the state of Gujarat is approx. USD 308 / month[27]
Skilled	The salary of a skilled in the state of Gujarat is approx. USD 109 / month[28]
Unskilled	The salary of a unskilled in the state of Gujarat is approx. USD 104 / month [29]
Sectors	
Type of Sectors within the Zone	Chemicals, Light Engineering, Heavy Engineering, Logistics, Automotive, etc.
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	Exemptions from Customs duty on imports.
Corporate Taxes / Indirect Taxes	Exemption from central and state level taxes
Income Tax on Profits	100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years.
Social Security Tax	No social security tax is available in India
No restrictions on Money Transfers	Profit and dividend earned from an Indian company are repatriable after payment of dividend distribution tax (DDT). DDT @ 16.995% (inclusive of cess) is payable by the company (that declares dividend) on the amount of dividend distributed. However, dividend is free of Indian income tax in the hands of the recipient shareholders, Indian or foreign. Profit of LLP is flow-through and repatriable without payment of any taxes and without any regulatory approval[30].
Others	• Exemption from Service Tax

[22] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[23] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[24] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[25] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[26] *Source: http://www.averagesalarysurvey.com/india*
[27] *Source: http://www.averagesalarysurvey.com/india*
[28] *Source: https://tradingeconomics.com/india/indicators*
[29] *Source: https://tradingeconomics.com/india/indicators*
[30] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*

Factors	Mundra Special Economic Zone, India
	• Exemption from payment of Royalties & Cess on construction materials
Non-Fiscal Incentives	
One Stop Shop Within the Zone	There is no One Stop Shop available within the zone
Support Amenities	
Onsite Administration office	Onsite administration office is available within the zone
Onsite Convenience Retail	Onsite convenience retail is available within the zone
Onsite Housing	Onsite housing is available within the zone
Onsite Schools	Onsite schooling is available within the zone
Onsite Community Facilities	Onsite community facilities is available within the zone
Onsite Security	Onsite security is available within the zone
Quality of Life	
International Housing (Within 15 Km)	Superior quality housing facilities like Swastik Apartment, Ramdev Nagar, Fortune Pratharna Bungalow, etc. are available in close proximity to the zone
International Hospital/Clinic (Within 20 km)	Superior quality health care facilities like Sterling Hospital is available in close proximity to the zone
International Schools (Within 20 kms)	Superior quality schools like St. Xavier's English Medium High School is available in close proximity to the zone

Mundra's success revolves around the Mundra Port which is India's largest all weather, deep sea port and the country's gateway to international trading. The state of Gujarat is also one of the most industrially advanced state of the country offering prudent governance and existing industrial eco system. The zone is developed by the Adani Group which has rich experience of developing various infrastructure and hence has been able to leverage on its key strengths to provide an industrial destination that is replete with all necessary amenities.

3.3.1.2. Sri City Special Economic Zone

Sri City is located in the eastern state of Andhra Pradesh which is well known for its industrial eco system. Sri City encompasses well-planned and dedicated zones for industry and business services, and full-fledged social support infrastructure. The industrial park includes a Multi-product Special Economic Zone (SEZ), a Free Trade & Warehousing Zone (FTWZ), a Domestic Tariff Zone (DTZ), and an Electronics Manufacturing Cluster (EMC). The larger integrated township includes zones for residences, retail, healthcare, and education. The economic zone is located strategically on the National Highway 16 and enjoys excellent connectivity through road, rail, air and sea. City was developed in functional partnership with the Government of the State of Andhra Pradesh and the Government of India. Sri City is regarded as one of the most successful economic zones of India replete with state of the art infrastructure. The success of the economic zone has revolved around superior infrastructure, excellent connectivity through various modes, well developed master plan, efficient marketing activities, etc.

Figure 16: Sri City SEZ

Source: Sri City Brochure

The detailed profiling of Sri City is provided below:

Table 8: Sri City Special Economic Zone

Factors	Sri City SEZ
Site	
Land Size (acres)	6,000 acres
Number of Plots	Over 150 companies are operational within the special economic zone
No. of Development Phases	The development have been carried out over a period of time but in a single phase
Land Lease (+length) or Sale (Taka/USD)	One time upfront land premium of **INR 2,500 / sq.m (USD 38.50 / sq.m)** is applicable
Pre-Built Factories (PBF) (Y/N)	There are **no** Pre-Built Factories provided as a part of the product offering
Lease Rate for PBF (Taka/USD)	There is no lease rate for PBF since PBF are not provided
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is no onsite captive power plant available for the special economic zone

Factors	Sri City SEZ
Cost of Power (Taka/USD)	Fixed charges of **INR 55 / Kw / month (USD 0.85 / Kw / month)** and additional energy charges of **INR 6.64 / KwH (USD 0.10 / KwH)** of energy consumed[31]
Cost of Water (Taka/USD)	The charge of industrial water is **INR 60 / KL (USD 0.92 / KL)**
Onsite Wastewater Treatment Plant (Y/N)	There is onsite waste water treatment plant available within the special economic zone
Transport costs	
Cost of shipping 20 foot FCL container shipping to Chennai	• Hamburg – Chennai → USD 1,906[32] • Rotterdam – Chennai → USD 1,886[33] • Antwerp – Chennai → USD 1,697[34] • New York – Chennai → USD 5,325[35]
Cost of Labor (Taka/USD)	
Management	The salary of an operations manager in the state of Andhra Pradesh is approx. INR 737,120 / annum (USD 944 / month)[36]
Technicians	The salary of a technician in the state of Andhra Pradesh is approx. INR 300,082 / annum (USD 384 / month)[37]
Skilled	The salary of a skilled labor in the state of Andhra Pradesh is approx. INR 12,595 / month (USD 193 / month)[38]
Unskilled	The salary of a un-skilled labor in the state of Andhra Pradesh is approx. INR 8,054 / month (USD 123 / month)[39]
Sectors	
Type of Sectors within the Zone	Automotive, Light Engineering, Food & Beverages, Fast Moving Consumer Goods (FMCG)
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	Exemptions from Customs duty on imports.
Corporate Taxes / Indirect Taxes	Exemption from central and state level taxes
Income Tax on Profits	100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years.
Social Security Tax	No social security tax is available in India
No restrictions on Money Transfers	Profit and dividend earned from an Indian company are repatriable after payment of dividend distribution tax (DDT). DDT @ 16.995% (inclusive of cess) is payable by the company (that declares dividend) on the amount of dividend distributed. However, dividend is free of Indian income tax in the hands of the recipient shareholders, Indian or foreign. Profit of LLP is flow-through and repatriable without payment of any taxes and without any regulatory approval[40].
Others	• Exemption from Service Tax • Exemption from payment of Royalties & Cess on construction materials
Non-Fiscal Incentives	
One Stop Shop Within the Zone	**Yes**, there's a special regime for incentives

[31] *Source: http://www.aperc.gov.in/aperc1/assets/uploads/files/08f97-to2016-17.pdf*
[32] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[33] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[34] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[35] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[36] *Source: https://www.payscale.com/research/IN/Job=Operations_Manager/Salary/1c2ca479/Hyderabad*
[37] *Source: https://www.payscale.com/research/IN/Job=Electrical_Engineer/Salary/66155e97/Hyderabad*
[38] *Source: http://labor.ap.gov.in/documents/Max_Min_Wage_Rates_in_Part-I_II_Scheduled_Employments/Maximum_Minimum_wage_in_Part_I_Part_II_wef_01102014.pdf*
[39] *Source: http://labor.ap.gov.in/documents/Max_Min_Wage_Rates_in_Part-I_II_Scheduled_Employments/Maximum_Minimum_wage_in_Part_I_Part_II_wef_01102014.pdf*
[40] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*

Factors	Sri City SEZ
Support Amenities	
Onsite Administration office	Onsite administration office is available within the zone
Onsite Convenience Retail	Onsite convenience retail is available within the zone
Onsite Housing	Onsite housing is available within the zone
Onsite Schools	Onsite schooling is available within the zone
Onsite Community Facilities	Onsite community facilities is available within the zone
Onsite Security	Onsite security is available within the zone
Quality of Life	
International Housing (Within 15 Km)	Investment grade accommodation of more than 600 dwelling in 3 different locations, ready for occupation is located in close proximity to the site
International Hospital/Clinic (Within 20km)	Quality health care facilities like SRM Institutes for Medical Science is available in close proximity of the site
International Schools (Within 20 kms)	Quality schools like Chinmaya Vidyalaya School is available in close proximity of the site

Sri City has witnessed resounding success owing to its superior quality infrastructure, strategic location in the industrial state of Andhra Pradesh and proximity to Chennai which is one of the major cities of India. The region also has access to ports, international airports, rail heads, etc. which allows for seamless transportation of goods and raw materials to and from the zone. Identifying Foxconn as the anchor tenant has allowed the zone to develop a superior brand image and quick land offtake.

3.3.1.3. APSEZ Atchutapuram

APSEZ is a multi-product SEZ developed in Atchutapuram and Rambilli mandals of Visakhapatnam District, in the state of Andhra Pradesh in the eastern coast of India. The economic zone is promoted by Andhra Pradesh Industrial Infrastructure Corporation (APIIC) which is one of the Government agencies responsible for providing industrial infrastructure within the state. The economic zone enjoys superior connectivity through road, rail and port. However, competition from more professionally managed economic zones in the vicinity have adversely affected the investment within the APSEZ.

Figure 17: Brandix India unit within APSEZ

Source: Google Images

The detailed profiling of the economic zone is provided below:

Table 9: APSEZ Atchutapuram Special Economic Zone

Factors	APSEZ Atchutapuram
Site	
Land Size (acres)	5,595 acres
Number of Plots	More than 10 companies are operational within the economic zones
No. of Development Phases	The development have been carried out over a period of time but in a single phase
Land Lease (+length) or Sale (Taka/USD)	One time upfront land premium of **INR 1,976 / sq.m (USD 30.45 / sq.m)** is applicable
Pre-Built Factories (PBF) (Y/N)	There are **no** Pre-Built Factories provided as a part of the product offering
Lease Rate for PBF (Taka/USD)	There is no lease rate for PBF since PBF are not provided
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is no onsite captive power plant available for the special economic zone
Cost of Power (Taka/USD)	Fixed charges of **INR 55 / Kw / month (USD 0.85 / Kw / month)** and additional energy charges of **INR 6.64 / KwH (USD 0.10 / KwH)** of energy consumed[41]
Cost of Water (Taka/USD)	The charge of industrial water is **INR 40 / KL (USD 0.62 / KL)**
Onsite Wastewater Treatment Plant (Y/N)	There is onsite waste water treatment plant available within the special economic zone
Transport costs	

[41] *Source: http://www.aperc.gov.in/aperc1/assets/uploads/files/08f97-to2016-17.pdf*

Factors	APSEZ Atchutapuram
Cost of shipping 20 foot FCL container shipping to Vishakhapatnam	• Hamburg – Vishakhapatnam → USD 1,732[42] • Rotterdam – Vishakhapatnam → USD 1,731[43] • Antwerp – Vishakhapatnam → USD 1,697[44] • New York – Vishakhapatnam → USD 5,840[45]
Cost of Labor (Taka/USD)	
Management	The salary of an operations manager in the state of Andhra Pradesh is approx. INR 737,120 / annum (USD 944 / month)[46]
Technicians	The salary of a technician in the state of Andhra Pradesh is approx. INR 300,082 / annum (USD 384 / month)[47]
Skilled	The salary of a skilled labor in the state of Andhra Pradesh is approx. INR 12,595 / month (USD 193 / month)[48]
Unskilled	The salary of a un-skilled labor in the state of Andhra Pradesh is approx. INR 8,054 / month (USD 123 / month)[49]
Sectors	
Type of Sectors within the Zone	Automotive, Light Engineering, Food & Beverages, Chemicals, Garments
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	Exemptions from Customs duty on imports.
Corporate Taxes / Indirect Taxes	Exemption from central and state level taxes
Income Tax on Profits	100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years.
Social Security Tax	No social security tax is available in India
No restrictions on Money Transfers	Profit and dividend earned from an Indian company are repatriable after payment of dividend distribution tax (DDT). DDT @ 16.995% (inclusive of cess) is payable by the company (that declares dividend) on the amount of dividend distributed. However, dividend is free of Indian income tax in the hands of the recipient shareholders, Indian or foreign. Profit of LLP is flow-through and repatriable without payment of any taxes and without any regulatory approval[50].
Others	• Exemption from Service Tax • Exemption from payment of Royalties & Cess on construction materials
Non-Fiscal Incentives	
One Stop Shop Within the Zone	**Yes**, there's a special regime for incentives
Support Amenities	
Onsite Administration office	There is onsite administration office within the zone
Onsite Convenience Retail	Onsite convenience retail is not available within the zone
Onsite Housing	Onsite housing is not available within the zone
Onsite Schools	Onsite schools are not available within the zone
Onsite Community Facilities	Onsite community facilities are not available within the zone
Onsite Security	Onsite security is available within the zone

[42] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[43] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[44] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[45] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[46] *Source: https://www.payscale.com/research/IN/Job=Operations_Manager/Salary/1c2ca479/Hyderabad*
[47] *Source: https://www.payscale.com/research/IN/Job=Electrical_Engineer/Salary/66155e97/Hyderabad*
[48] *Source: http://labor.ap.gov.in/documents/Max_Min_Wage_Rates_in_Part-I_II_Scheduled_Employments/Maximum_Minimum_wage_in_Part_I_Part_II_wef_01102014.pdf*
[49] *Source: http://labor.ap.gov.in/documents/Max_Min_Wage_Rates_in_Part-I_II_Scheduled_Employments/Maximum_Minimum_wage_in_Part_I_Part_II_wef_01102014.pdf*
[50] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*

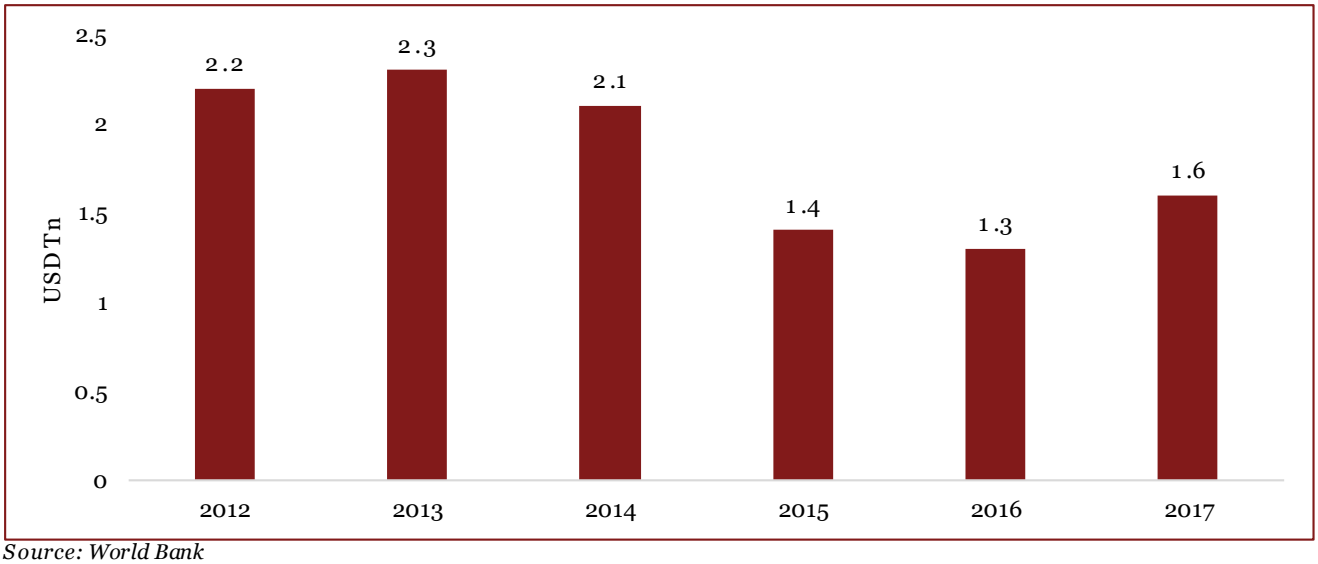
Factors	APSEZ Atchutapuram
Quality of Life	
International Housing (Within 15 Km)	There is no superior quality housing available in close proximity to the zone
International Hospital/Clinic (Within 20km)	There are no superior quality hospitals available in close proximity to the zone
International Schools (Within 20 kms)	There is no superior quality schools available in close proximity to the zone

The APSEZ Atchutapuram is located conveniently on close proximity to trade gateways like ports, airports & rail heads. However the zone has not been able to generate significant interest amongst investors owing to stiff competition from other zones in the region which are more professionally managed. The quality of infrastructure also is not comparable to the private economic zones, which has resulted in investors gravitating towards the private economic zones.

3.3.2. Russia

Russia is a vast and resource rich country with significant reserves of oil and gas. Russia was one of the fastest growing economies until recently with economic growth riding on escalating oil prices. However fluctuation of the prices of oil prices in recent times. However, Russia has some of the world's largest reserves of oil, natural gas and other raw materials, many of which are critical to industrialized countries. The economy of Russia had witnessed steady growth in the past few years but experienced a gradual slump as depicted in the graph below. **Data used for the analysis is the latest data point available in the respective database.**

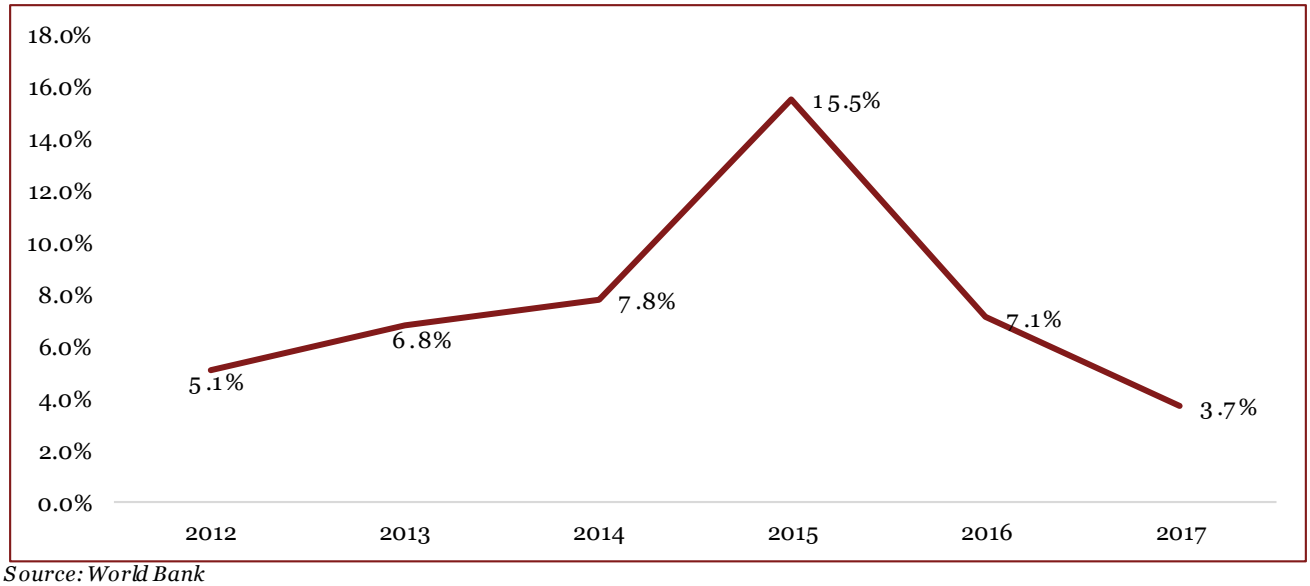
Figure 18: GDP Trend of Russia



Source: World Bank

The inflation of Russia had risen sharply in consonance with the economic turmoil in the recent past but with tightening of monetary policies by the Central Bank of Russia, inflation within the country has been contained. **Data used for the analysis is the latest data point available in the respective database.**

Figure 19: Inflation Trend of Russia



Source: World Bank

The other macroeconomic indicators for the country have been summarized on the next page.

Table 10: Macro-economic Parameter of Russia

Macroeconomic Indicator	Description	Data Source
Unemployment	5.70%	The Heritage Foundation
FDI Inflow	USD 37.7 billion	The Heritage Foundation
Exports	USD 359 billion	ITC Trade Map
Imports	USD 228 billion	ITC Trade Map
Heritage Foundation's Index of Economic Freedom Rankings.	107	The Heritage Foundation
Cato Institute's Human Freedom ranking	126	Human Freedom Index | Cato Institute
World Economic Freedom's Global Competitive Index Rating	38	Global Competitiveness Index 2017–2018 rankings
WB Doing Business ranking	35	Doing Business 2018

Russia has witnessed an overall improvement in its ranking from previous year with better scores in the areas of trade freedom and tax burden. Russia's transition from a centrally planned economy to a more market-based system has not been successful, and the country remains predominantly state driven. The private sectors of the country has been marginalized with Government sector penetrating the various markets. Russia economy has been dominated by state-owned institutions and inefficient public sector enterprises. The judiciary is susceptible to corruption, and weak protection of property rights undermines prospects for optimal long-term economic development within the country.

3.3.2.1. Alabuga Special Economic Zone

Alabuga Special Economic Zone is one of the largest economic zone in Yelabuzhsky District of the Republic of Tatarstan in Russia. The region of Tatarstan is one of the most industrially developed zones in Russia with an industrial output of USD 29.4 Bn. The economic zone of Alabuga enjoys certain inherent advantages in the form of strong governmental support, developed industrial infrastructure, attractive tax and customs preference, etc. The Alabuga Special Economic Zone contributes 61% of the total revenues emanating out of the 24 operational zones within Russia.

Figure 20: Alabuga SEZ

Source: Google Images

A detailed profiling of the economic zone is presented below:

Table 11: Alabuga Special Economic Zone

Factors	Alabuga Special Economic Zone
Site	
Land Size (acres)	9,880 acres
Number of Plots	Almost 30 companies have their industrial units operational within the economic zone
No. of Development Phases	There are 3 phases of development within the economic zone
Land Lease (+length) or Sale (Taka/USD)	• The lease rental for industrial land is **USD 0.05 / sq.m** with average lease period of **30 years** • The sale price of industrial land is **USD 0.15 / sq.m**
Pre-Built Factories (PBF) (Y/N)	There are no Pre-Built Factories that are being offered as a part of the product mix
Lease Rate for PBF (Taka/USD)	There is no lease rent available for PBF, since no Pre-Built Factories that are being offered as a part of the product mix
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is no captive power plant available within the economic zone

Factors	Alabuga Special Economic Zone
Cost of Power (Taka/USD)	Rubel 3.15 / KwH (USD 0.055 / KwH) for 1 group more than 150 KwH
Cost of Water (Taka/USD)	Rubel 29.48 / KL (USD 0.52 / KwH)
Onsite Wastewater Treatment Plant (Y/N)	There is onsite Wastewater Treatment Plant available for tenants
Transport costs	
Cost of shipping 20 foot FCL container shipping to Naberezhnye Chelny	• Dubai – Naberezhnye Chelny → USD 1,925[51] • Mumbai – Naberezhnye Chelny → USD 2,224[52] • Colombo – Naberezhnye Chelny → USD 2,730[53] • New York – Naberezhnye Chelny → USD 2,830[54]
Cost of Labor (Taka/USD)	
Management	The salary for a management professional in Alabauga is approx. USD 600 / month[55]
Technicians	The salary for a technician in Alabauga is approx. USD 400 / month[56]
Skilled	The salary for a skilled labor in Alabauga is approx. USD 200 – 300 / month[57]
Unskilled	The salary for a un-skilled labor in Alabauga is approx. USD 100 – 200 / month[58]
Sectors	
Type of Sectors within the Zone	Automotive, Chemicals, Non Metallic Minerals, Light Engineering
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	The regime of free customs zone provides placement of foreign equipment within the SEZ without paying customs duties and VAT (concerns, first of all, technological equipment)
Corporate Taxes / Indirect Taxes	Perpetual exemption from VAT and customs import duty on inputs – raw materials, machinery, office equipment, certain petroleum fuel for boilers and generators, building materials, other supplies. VAT exemption also applies on local purchases of goods and services supplied by companies in the Kenyan customs territory or domestic market. Motor vehicles which do not remain within the zone are not eligible for tax exemption.
Income Tax on Profits	10 year corporate income tax holiday and a 25% tax rate for a further 10 years thereafter (except for EPZ commercial enterprises)
Social Security Tax	No social security tax is applicable
No restrictions on Money Transfers	The foreign investment law in Russia guarantees the un restricted repatriation of after tax investment. The foreign investor can buy foreign currency on the domestic foreign exchange market.
Others	• SEZ residents are granted a remission of transportation taxation for 10 years since tax base introduction • SEZ residents are granted a remission of taxation for 10 years since tax base introduction • Accelerated amortization of fixed assets
Non-Fiscal Incentives	
One Stop Shop Within the Zone	**Yes**, there is One Stop Shop Within the Zone
Support Amenities	
Onsite Administration office	Onsite administrative office is available within the zone

[51] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[52] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[53] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[54] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[55] *Source: Marketing brochure received from Alabuga SEZ*
[56] *Source: Marketing brochure received from Alabuga SEZ*
[57] *Source: Telephonic discussion with authorized representatives of Alabuga SEZ*
[58] *Source: Telephonic discussion with authorized representatives of Alabuga SEZ*

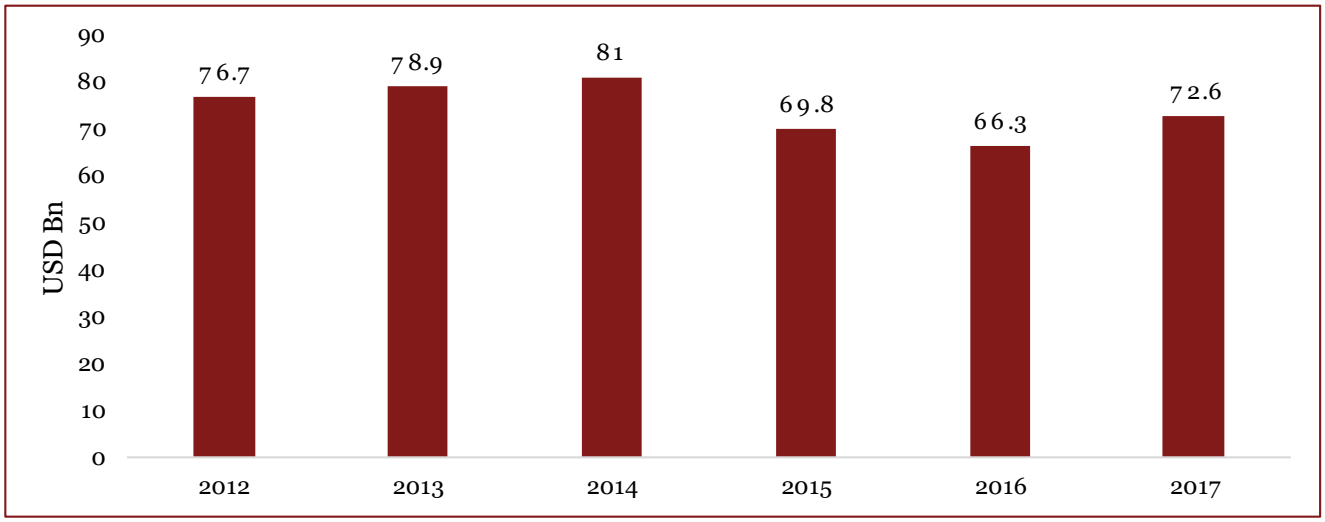
Factors	Alabuga Special Economic Zone
Onsite Convenience Retail	Onsite convenience retail is available within the zone
Onsite Housing	Onsite housing is not available within the zone
Onsite Schools	Alabuga International School is available within the zone
Onsite Community Facilities	Onsite community facilities are not available within the zone
Onsite Security	Onsite security is available within the zone
Quality of Life	
International Housing (Within 15 Km)	Quality international housing is available within in town of Yelabuga which is in close proximity to the zone
International Hospital/Clinic (Within 20km)	Quality international hospital like Medical Center "Healing, Ulitsa Tazi Gizzata is available in close proximity to the zone
International Schools (Within 20 kms)	Quality international schools are available in the Yelabuga town in close proximity to the zone

Alabuga SEZ draws its strength from its strategic location in one of Russia's most industrially advanced location of Yelabuga. Strong governmental impetus on industrialization, reduced bureaucracy, attractive tax and customs preferences, well developed infrastructure, etc. have been the major selling points for the zone.

3.3.3. Sultanate of Oman

The Sultanate of Oman is an Arabian country located in the southeastern coast of the Arabian Peninsula. Oman is a relatively free economy but is dependent on oil and gas as the key driver of economy. Tourism is another important exponent of the economy, however, agriculture's contribution to the economy remains miniscule owing to the barren nature of the country. The country signed a free-trade agreement with the United States in January 2009 to eliminate tariff barriers on all consumer and industrial production a bid to diversify the economy and encourage foreign investment. The GDP trend of Oman indicates a gradual slump commensurate with other oil dependent economies and the same has been depicted in the graph below. **Data used for the analysis is the latest data point available in the respective database.**

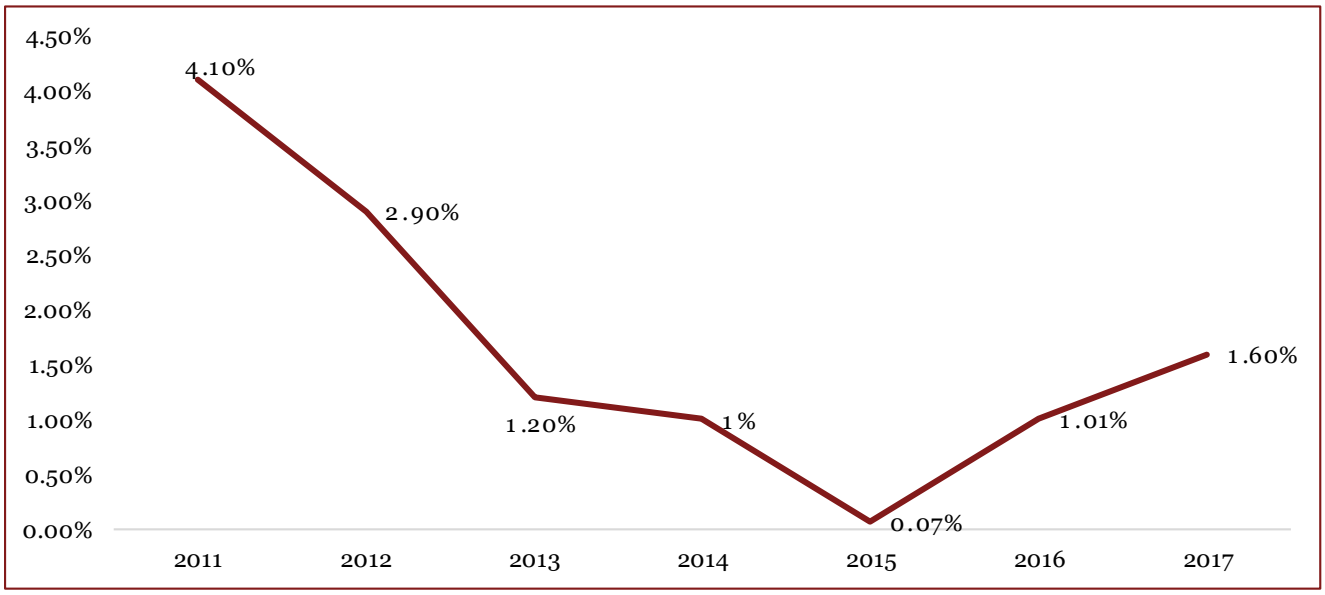
Figure 21: GDP Trend of Oman



Source: The World Bank

The inflation of Oman has been depicted below. **Data used for the analysis is the latest data point available in the respective database.**

Figure 22: Inflation Trend of Oman



Source: The World Bank

According to the Central Bank of Oman increase in inflation rate mainly resulted from the phenomenal rise of 24 percent in tobacco and transportation cost. The expected increase in the inflation rate is consistent with the removal of subsidies, higher expected interest rates within the country.

Post analysis of the broad macro-economy of Oman, an analysis of the Sohar Port Freezone has been provided below:

Table 12: Macro-economic Parameter of Oman

Macroeconomic Indicator	Description	Data Source
Unemployment	17.50%	The Heritage Foundation
FDI Inflow	USD 142.0 million	The Heritage Foundation
Exports	USD 28.9 billion	ITC Trade Map
Imports	USD 20 billion	ITC Trade Map
Heritage Foundation's Index of Economic Freedom Rankings.	93	The Heritage Foundation
Cato Institute's Human Freedom ranking	126	Human Freedom Index | Cato Institute
World Economic Freedom's Global Competitive Index Rating	62	Global Competitiveness Index 2017–2018 rankings
WB Doing Business ranking	71	Doing Business 2018

Oman's economy is oil centric and has been impacted by the global dip in oil prices. The Government in order to provide resilience to the economy has enhanced oil recovery techniques to boost production and also focusing on fiscal reform and economic diversification to reduce the country's dependency on hydrocarbons. The Government has also focused on reducing bureaucracy in order to promote the participation of private sector. However, the oil price fluctuations have led to widening gap in the fiscal and current account deficits. Oman has also resorted to external borrowings to finance its deficits leading to rise in public debt.

3.3.3.1. Sohar Port Freezone

Sohar Port and Freezone is a deep-sea Port and Freezone in the Sultanate of Oman, managed by Sohar Industrial Port Company (SIPC), a 50:50 joint venture between the Port of Rotterdam and the Sultanate of Oman. The Freezone is located in the Strait of Hormuz and spread across almost 11,120 acres. Strategic location of the Freezone along with a deep sea port has ensured steady interest levels from investors resulting in an investment amount of approx. USD 25 Bn[59]. The success of the Freezone is based upon the availability of the deep sea port and its strategic location which has resulted in the same being a transshipment hub. The Freezone houses mother industries like petrochemical, metals, automotive which feed downstream industries with critical raw materials like with iron, steel, plastics, rubber, ceramics and chemicals.

Figure 23: Sohar Port Freezone

Source: Google Images

The detailed profiling of the Freezone has been provided in the table below:

Table 13: Sohar Port Freezone

Factors	Sohar Port Freezone
Site	
Land Size (acres)	11,120 acres
Number of Plots	There are approx. 26 companies with operational manufacturing units within the Sohar Port Freezone
No. of Development Phases	Based on interactions with the relevant authority it is understood that currently the Freezone is being developed in two phases
Land Lease (+length) or Sale (Taka/USD)	The land lease rentals are **USD 7 / sq.m / year** for a typical **lease period of 25 years**.
Pre-Built Factories (PBF) (Y/N)	There are no Pre-Built Factories that are being offered as a part of the product mix
Lease Rate for PBF (Taka/USD)	There is no lease rent available for PBF, since no Pre-Built Factories that are being offered as a part of the product mix
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is no independent captive power plant within the Freezone.

[59] *Source: http://www.soharportandfreezone.com/en/about/overview*

Factors	Sohar Port Freezone
Cost of Power (Taka/USD)	The cost of industrial power is 24 Baiza / KwH (USD 0.06 / KwH[60])
Cost of Water (Taka/USD)	The cost of industrial water is USD 1.95 / KL
Onsite Wastewater Treatment Plant (Y/N)	There is Onsite Wastewater Treatment Plant available for tenants
Transport costs	
Cost of shipping 20 foot FCL container shipping to Sohar Port	• Hamburg – Sohar Port → USD 1,981[61] • Rotterdam – Sohar Port → USD 2,017[62] • Antwerp – Sohar Port → USD 2,035[63] • New York – Sohar Port → USD 4,887[64]
Cost of Labor (Taka/USD)	
Management	The average salary of a management professional in Oman is approx. USD 5,321.81 / month[65] (OMR 2,049 / month)[66]
Technicians	The average salary of a technician in Oman is approx. USD 4,036.16 / month (OMR 1,554 / month)[67]
Skilled	The average salary of a skilled labor in Oman is approx. USD 4,036.16 / month (OMR 1,554 / month)[68]
Unskilled	The average salary of an unskilled labor in Oman is approx. USD 919.43 / month[69] (OMR 354 . month)[70]
Sectors	
Type of Sectors within the Zone	Metal Fabrication, Food Processing, Light Engineering, Logistics
Special Regime	
Yes/No	**Yes**, there is One Stop Shop Within the Zone
Fiscal Incentives	
Customs Duties	No customs duties on goods brought into the Freezone. All customs processes are described in a dedicated set of Customs procedures
Corporate Taxes / Indirect Taxes	Each working company has a guaranteed 10-year exemption of corporate tax (normally 12% in Oman). This exemption can be extended up to the duration of the lease contract if certain targets in Omanization are reached, which can be for up to 25 years.
Income Tax on Profits	Each working company has a guaranteed 10-year exemption of corporate tax (normally 12% in Oman). This exemption can be extended up to the duration of the lease contract if certain targets in Omanization are reached, which can be for up to 25 years.
Social Security Tax	A 17.5% social security contribution is applicable to employees who are Omani nationals, but not to expatriate employees. The employee pays a contribution of 7% of salary, and the employer pays the balance of 10.5%. The employer is also required to contribute for insurance for work related injuries in the amount of 1% of the salary of the employee. This brings the total monthly social security and insurance contributions to be made by the employer to 11.5%.
No restrictions on Money Transfers	There are no exchange controls for both inward and outward investment and repatriation of capital or profits for both nationals and expatriates
Others	Freezone companies could benefit from existing Free Trade Agreements between Oman and the USA, and Oman and Singapore, as their goods could receive preferential treatment while in transit.

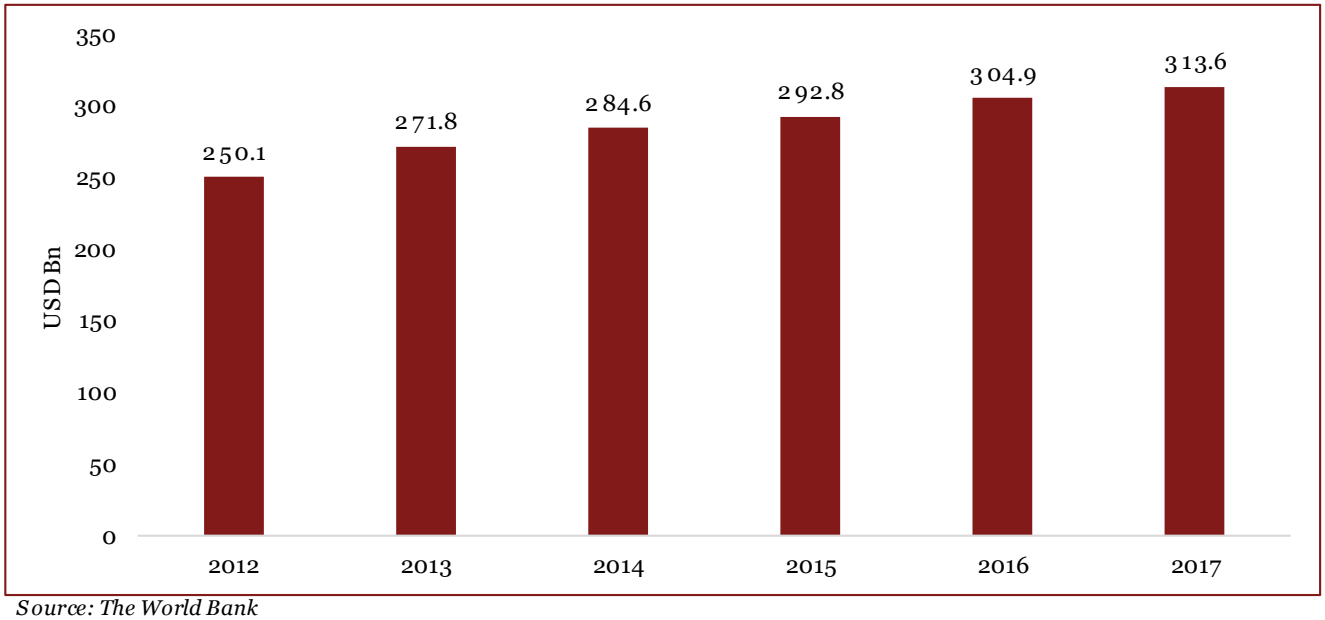
[60] *1000 Baiza = 1 Oman Rial*
[61] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[62] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[63] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[64] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[65] *Source: http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[66] *http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[67] *Source: http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[68] *Source: http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[69] *Source: http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[70] *http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*

Factors	Sohar Port Freezone
Non-Fiscal Incentives	
One Stop Shop Within the Zone	Sohar Port and Freezone offers a single window through which all licenses, permits and approvals can be obtained. In practice this means that Freezone clients require very little interaction with the various governmental institutions.
Support Amenities	
Onsite Administration office	Onsite administration office is available within the zone
Onsite Convenience Retail	Onsite convenience retail is available within the zone
Onsite Housing	Onsite housing is not available within the zone
Onsite Schools	Onsite school is not available within the zone
Onsite Community Facilities	Onsite community facilities are not available within the zone
Onsite Security	Onsite security is not available within the zone
Quality of Life	
International Housing (Within 15 Km)	Superior quality housing facilities are available in Sohar in close proximity to the Freezone
International Hospital/Clinic (Within 20km)	Superior quality health care facilities are available in Sohar in close proximity to the Freezone
International Schools (Within 20 kms)	Sohar International School is available at a distance of 25 km from the Freezone

3.3.4. Philippines

The Republic of Philippines is an archipelagic country in Southeast Asia and one of the important manufacturing hubs of Asia. The country is an exporter of semi-conductors and electronics products, transport equipment, garments, fruits, etc. Post witnessing a slump in its economy on 2011 due to economic downturn, the economy of Philippines has revived on the back of back of strong domestic demand. The manufacturing sector has been supported by increased production of basic metals, transport equipment, petroleum products and food processing. The country also has a robust framework for promoting organized industrialization through the nodal agency Philippines Economic Zones Authority (PEZA). The GDP trend of Philippines exhibit sustained growth levels as depicted below in the graph. **Data used for the analysis is the latest data point available in the respective database.**

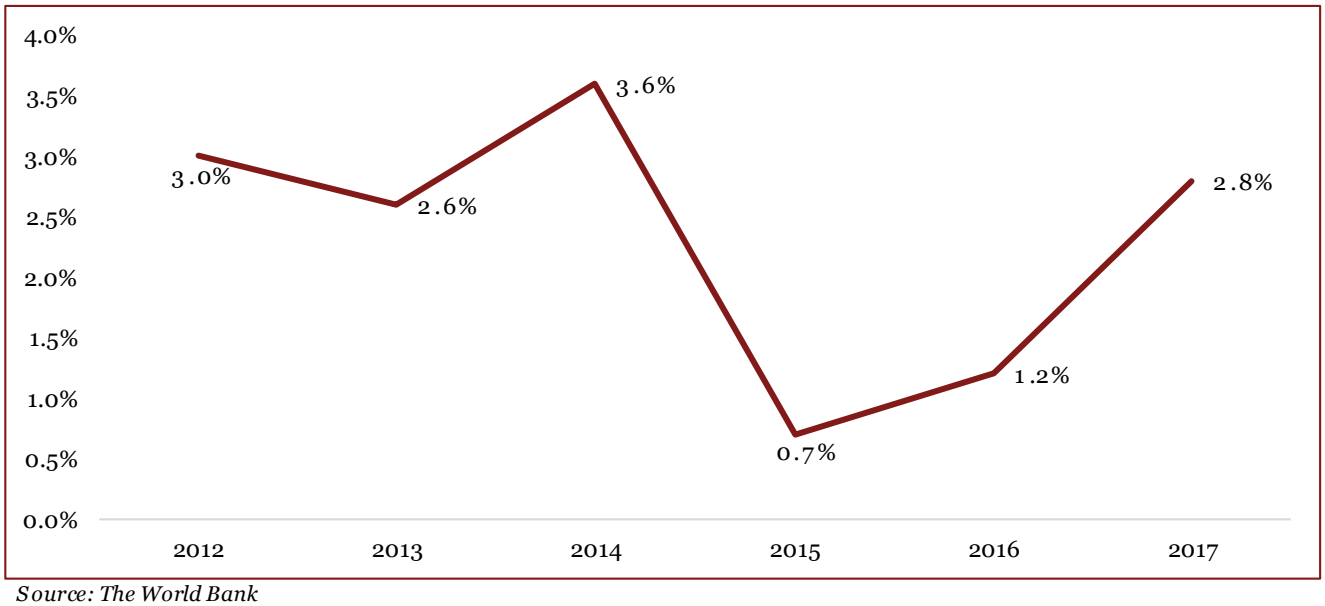
Figure 24: GDP Trend of Philippines



Source: The World Bank

The following graph elucidates the inflation trend of Philippines. **Data used for the analysis is the latest data point available in the respective database.**

Figure 25: Inflation Trend of Philippines



Source: The World Bank

Post analysis of the broad macro-economy of Philippines, an analysis of the Sohar Port Freezone has been provided on the next page:

Table 14: Macro-economic Parameter of Philippines

Macroeconomic Indicator	Description	Data Source
Unemployment	5.90%	The Heritage Foundation
FDI Inflow	$10.1 billion	The World Bank
Exports	USD 68.7 billion	ITC Trade Map
Imports	USD 101.9 billion	ITC Trade Map
Heritage Foundation's Index of Economic Freedom Rankings.	61	The Heritage Foundation
Cato Institute's Human Freedom ranking	71	Human Freedom Index | Cato Institute
World Economic Freedom's Global Competitive Index Rating	56	Global Competitiveness Index 2017–2018 rankings
WB Doing Business ranking	113	Doing Business 2018

Philippines has undergone a dip in its rankings owing to the shift of Government focus domestic law-and-order issues over economic policy concerns. However, the positive impact of the previous Government's reforms to enhance investment climate has still allowed the country to retain a healthy rank. The country's economy is still heavily reliant upon agriculture, however industrial production in such areas as electronics, apparel, and shipbuilding has been growing rapidly. Philippines has also witnessed substantial infrastructure spending with the Government adopting the Build-Build-Build strategy that has ambitious plans of augmenting the infrastructure of the country.

3.3.4.1. Freeport of Bataan

The Freeport of Bataan is located within the Municipality of Mariveles in the Province of Bataan in Philippines. The Freeport is governed by the he Authority of the Freeport Area of Bataan (AFAB), a government-owned and controlled corporation under the Office of the President. The region became the first export processing zone of Philippines however witnessed limited success in the initial years of its formation. In order to augment the Bataan Economic Zone's investment potential and allow the zone to fulfill its original mandate to become a catalyst for progress and development in the region bill for the conversion of then BEZ into a Freeport was drafted. Currently, Freeport of Bataan is a hub for quality brand of bags, garments and apparels, shoes, among other industrial products. The region is equipped with a natural deep sea port and rich pool of labor in the vicinity.

Figure 26: Freeport of Bataan

Source: Google Images

A detailed profiling of the Freeport of Bataan is provided below:

Table 15: Freeport of Bataan

Factors	Freeport of Bataan
Site	
Land Size (acres)	4,201 acres
Number of Plots	There are approximately 128 companies who have manufacturing units within the economic zone
No. of Development Phases	Based on our interactions with the concerned authority, we understand that although the economic zone is being developed a period of time, there are no official phased under which it is being developed.
Land Lease (+length) or Sale (Taka/USD)	The lease rental for industrial land is **PhP 20.58/ sqm. / month (USD 0.4 / sq.m / month)**
Pre-Built Factories (PBF) (Y/N)	Yes, there are Pre-Built Factories (PBF) available for the tenants
Lease Rate for PBF (Taka/USD)	• Entire Floor: **PhP 165.38 / sqm. / month (USD 3.18 / sq.m / month)** • Half Floor: **PhP 187.43 / sqm. / month (USD 3.6 / sq.m / month)**

Factors	Freeport of Bataan
	• Less than Half Floor: **PhP 209.48 / sqm. / month (USD 4.02 / sq.m / month)**
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	The economic zone has a dedicated power supply, providing the most affordable electricity cost in the Philippines. GN Power operates a 600MW clean coal-fired power plant
Cost of Power (Taka/USD)	The cost of industrial power is **PhP 7.2 / KwH (USD 0.14 / KwH)**
Cost of Water (Taka/USD)	The cost of industrial water is **as follows:** • The cost for first 25 KL of water is at **Php 355.58 /KL (USD 6.83 / KL)** • The cost of water between subsequent **26 – 100 KL of water is at Php 17.6 /KL (USD 0.34 / KL)** • The cost of water beyond 100 KL of water is at **Php 17.6 /KL (USD 0.34 / KL)**
Onsite Wastewater Treatment Plant (Y/N)	Yes, there is Onsite Wastewater Treatment Plant
Transport costs	
Cost of shipping 20 foot FCL container shipping to Bataan Port	• Hamburg – Bataan Port → USD 2,452[71] • Rotterdam – Bataan Port → USD 2,246[72] • Antwerp – Bataan Port → USD 2,304[73] • New York – Bataan Port → USD 4,164[74]
Cost of Labor (Taka/USD)	
Management	The average pay for a Production Manager, Manufacturing is PHP 532,379 per year (USD 852.25 / month)[75]
Technicians	An Technician earns an average salary of PHP 260.063 per year (USD 415.43/ month)[76]
Skilled	The average salary of unskilled labor in Philippines is approx. PHP 14,663 / month (USD 281 / month)[77]
Unskilled	The average salary of unskilled labor in Philippines is approx. PHP 10,162 / month (USD 194 / month)[78]
Sectors	
Type of Sectors within the Zone	Manufacturing, Transshipment and Logistics, Ship Repair, Tourism and Resort Facilities/Services, Agriculture and Agro-Industrial
Special Regime	
Yes/No	Yes, there is a special regime for incentives available
Fiscal Incentives	
Customs Duties	Duty free importation of capital equipment, raw materials, consumer goods and personal items
Corporate Taxes / Indirect Taxes	• Zero rating on local purchases of goods, properties and services • Exemption from local and national taxes
Income Tax on Profits	Income Tax Holiday for at least four (4) years for qualified industries
Social Security Tax	There is a social security tax for Philippines. The current SSS contribution rate is 11% of the monthly salary credit not exceeding PhP 16,000 and this is shared by the employer (7.37%) and the employee (3.63%)
No restrictions on Money Transfers	Capital and profits may be freely repatriated through the banking system, but prior registration of the foreign investment with the

[71] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[72] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[73] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[74] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[75] *Source: https://www.payscale.com/research/PH/Job=Production_Manager%2C_Manufacturing/Salary*
[76] *Source: https://www.payscale.com/research/PH/Job=Electrical_Engineer/Salary*
[77] *Source: https://www.psa.gov.ph/content/2016-occupational-wages-survey-ows*
[78] *Source: https://www.psa.gov.ph/content/2016-occupational-wages-survey-ows*

Factors	Freeport of Bataan
	Bangko Sentral Ng Pilipinas is required if foreign currency to service the repatriation will be sourced from the banking system.[79]
Others	• Exemption from wharfage dues, export taxes, impost and fees • Domestic sales allowance of up to 30% of total sales
Non-Fiscal Incentives	
One Stop Shop Within the Zone	Yes, there is one stop shop within the zone for facilitating investors.
Support Amenities	
Onsite Administration office	Onsite administration offices is available within the zone
Onsite Convenience Retail	Onsite convenience retail is available within the zone
Onsite Housing	Onsite housing like Camaya Hills Residencies, Opus Land Inc are available within the zone
Onsite Schools	Onsite school is not available within the zone
Onsite Community Facilities	Onsite community facility is not available within the zone
Onsite Security	Onsite security is available within the zone
Quality of Life	
International Housing (Within 15 Km)	Quality housing like BEPZ Executive village housing, Vera Paza homes are available in close proximity to the zone
International Hospital/Clinic (Within 20km)	Quality health care facilities like Marivles District Hospital is available in close proximity to the zone
International Schools (Within 20 kms)	Quality international schools like BEZP Multinational School is available in close proximity to the zone

The single biggest advantage of this zone is the access to the Bataan Port which ensures seamless shipment of goods in and out of the country. The region of Bataan has a rich pool of man power and superior quality social and institutional infrastructure. Access to uninterrupted power and water has also added to the attractiveness of the region as an industrial destination.

[79] *Source: https://www.pwc.de/de/internationale-maerkte/assets/doing-business-and-investing-in-philippines-2015.pdf*

3.4. Comparative Analysis

As described in the earlier sections of the report, an exhaustive comparative analysis can only be conducted once the master plan and financial analysis for the proposed EZ has been conducted. Hence, at this stage the comparative analysis has been restricted to only broad level geographic indicators based on primary site reconnaissance and secondary research. Tables below provide an insight into macro-economic performance indicators of the countries which are home to the industrial parks shortlisted as competitors to EZ site in Feni, Bangladesh. A comparison has been made to understand how Bangladesh stands with respect to these countries. This comparison is important as investors often take into consideration the macro-economic performance of countries to shortlist investment destinations in order to minimize risks to their investments and maximize their returns.

Table 16: Macro-Economic indicators (2017-18)

Country	GDP (USD billion)	GDP annual growth rate (%)	GDP per capita (PPP) (USD)	Inflation Rate (%)	Unemployment Rate (%)	Population (million)
India	2,597	6.62%	1,939	3.3%	3.5%	1,339.2
Russia	1,577	1.54%	10,743	3.9%	5.7%	144.50
Oman	72.6	-0.27%	15,668	1.6%	17.5%	4.64
Philippines	313.6	6.68%	2,988	2.8%	5.90%	104.92
Bangladesh	249.7	7.28%	1,516	5.8%	4.1%	164.67

Source: World Bank and the Heritage Foundation

Table 17: FDI indicators 2017

Country	FDI for 2017 (USD million)
India	39,966
Russia	28,683
Oman	2,918
Philippines	10,057
Bangladesh	2,151

Source: World Bank

Table 18: Heritage Foundation Score 2018

Country	Heritage Foundation Rating (global)	Individual country score	Score change	Freedom group ranking	Competitor's ranking
India	130	54.5	+1.9	Mostly unfree	5
Russia	107	58.2	+1.1	Mostly unfree	3
Oman	93	61.0	-1.1	Moderately free	2
Philippines	61	65	-0.6	Moderately free	1
Bangladesh	128	55.1	+0.1	Mostly unfree	4

Source: The Heritage Foundation

Table 19: Global Competitiveness Ranking 2017-18

Country	Global Competitiveness Ranking 2018	Country Score	Global Competitiveness Ranking 2017	Rank Change from 2017 to 2018
India	40	4.59	39	-1
Russia	38	4.64	43	+5
Oman	62	4.31	66	+4
Philippines	56	4.35	57	+1

Country	Global Competitiveness Ranking 2018	Country Score	Global Competitiveness Ranking 2017	Rank Change from 2017 to 2018
Bangladesh	99	3.91	106	+7

Source: World Bank

Table 20: Global Financial Market Development Ranking (World Economic Forum)

Country	Financial Market Development Ranking
India	42
Russia	107
Oman	54
Philippines	52
Bangladesh	98

Source: World Economic Forum

Table 21: World Bank Doing Business Ranking 2017-18

Country	Ease of Doing Business Ranking 2018	Ease of Doing Business Ranking 2017	Rank Change from 2017 to 2018
India	100	130	+30
Russia	35	40	+5
Oman	71	66	-5
Philippines	113	99	-14
Bangladesh	177	176	-1

Source: World Bank

Table 22: World Bank Doing Business Components 2017-18

Country	India	Russia	Oman	Philippines	Bangladesh
Starting Business	156	28	31	173	131
Dealing with Construction Permits	181	115	60	101	130
Getting Electricity	29	10	61	31	185
Registering Property	154	12	54	114	185
Getting Credit	29	29	113	142	159
Protecting Minority Investors	4	51	124	146	76

Country	India	Russia	Oman	Philippines	Bangladesh
Trading Across Borders	146	100	72	99	173
Enforcing Contracts	164	18	67	149	189

Source: World Bank

The comparative study done indicates that while Bangladesh is becoming more competitive at the global stage, it still lags behind competing economies. Due to Bangladesh's close proximity to India and Philippines, these countries can be considered a major competitor to Bangladesh in terms of attracting foreign investments. Both, India and Philippines rank higher than Bangladesh in terms of doing business rankings, global competitiveness and financial market development. Oman and Russia are relatively developed economies, having better access to sources of energy due to availability of oil and gas. Bangladesh, currently also lags behind its regional and global competitors in major macro-economic parameters like providing electricity and easy credit facility, registering of property, protecting minority investors and enforcing contracts.

Bangladesh Investment Development Authority (BIDA) has taken cognizant of the need to improve Bangladesh's ease of doing business rankings and has set a target of reaching double digit ranking by 2021 from its current rank of 177. Areas of improvement identified by BIDA are - Streamlining regularity service delivery in National Board of Revenue, Directorate of Environment, RAJUK, Courts, Export Promotion Bureau, Chief Controller of Imports and Exports, and other agencies in 11 thematic areas which are a part of Doing Business Components as listed in Table 22.

These initiatives could make Bangladesh a more competitive economy in future.

Improvement in macro-economic scenario of Bangladesh would also need to be supported by the facilities and cost advantages being offered by proposed EZ site in Feni in order to attract investments. A comparative study of competing economic zones have been done on the next page to understand stand out features of competitors that could divert potential investments from flowing into the EZ site in future.

Table 23: Comparative Analysis

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
Site							
Land Size (acres)	7,000 acres	15,946 acres	6,000 acres	5,595 acres	9,880 acres	4,201 acres	11,120 acres
Number of Plots	1,075 plots have been allocated. 1,070 of these plots are for industrial use and rest for specialized infrastructure and utilities.	Plots are allocated based on requirement of investors, hence no pre-decided number of plots are demarcated	Over 150 companies are operational within the special economic zone	More than 10 companies are operational within the economic zones	Almost 30 companies have their industrial units operational within the economic zone	There are approximately 128 companies who have manufacturing units within the economic zone	There are approx. 26 companies with operational manufacturing units within the Freezone
No. of Development Phases	The development is proposed to be carried out over a period of 16 years in 5 phases.	The development has been carried out over a long period of time without any official development phases	The development has been carried out over a period of time but in a single phase	The development has been carried out over a period of time but in a single phase	The development has been carried out over a period of time in a three phases	The development has been carried out over a long period of time without any official development phases	The development is being carried out in two phases
Land Lease (+length) or Sale (Taka/USD)	Industrial land lease rent is BDT 204.4/ sq. m./ year (USD 2.5/ sq. m./ year) for 50 years lease period, subject	One time upfront land premium of INR 3,000/ sq.m (USD 46.23 / sq.m) for a lease period of 30	One time upfront land premium of INR 2,500/ sq.m (USD 38.50 / sq.m) is applicable	One time upfront land premium of INR 1,976/ sq.m (USD 30.45 / sq.m) is applicable	• Industrial land lease rent is USD 0.05/ sq.m/ year with average lease period of 30 years	Industrial land lease rent is PhP 246.96/ sq.m./ year (USD 4.8 / sq.m / year)	Industrial land lease rent is USD 7 / sq.m / year for a typical lease period of 25 years.

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
	to escalation of 10% in a block of 3 years	years. There is an additional lease rent of INR 80 / sq. m/ year (USD 1.23 / sq. m/ year)			• Industrial land sale price is USD 0.15 / sq. m		
Pre-Built Factories (PBF) (Y/N)	Yes, 180 acres of land parcel has been earmarked for PBF	No, there are no Pre-Built Factories provided	No, there are no Pre-Built Factories provided	No, there are no Pre-Built Factories provided	No, there are no Pre-Built Factories provided	Yes, there are Pre-Built Factories (PBF) provided	No, there are no Pre-Built Factories provided
Lease Rate for PBF (Taka/USD)	Lease rent rate for PBF is BDT 2,959/ sq. m. / year (USD 36.1 / sq. m / year), subject to escalation of 10% in a block of 3 years	There is no lease rate for PBF since PBF are not provided	There is no lease rate for PBF since PBF are not provided	There is no lease rate for PBF since PBF are not provided	There is no lease rate for PBF since PBF are not provided	• Entire Floor: PhP 1984.5 / sqm. / year (USD 38.16 / sq.m / year) • Half Floor: PhP 2249 / sqm. / year (USD 43.2 / sq.m / year) • Less than Half Floor: PhP 2513.76 / sqm. / year (USD 48.24 / sq.m / year)	There is no lease rate for PBF since PBF are not provided
Infrastructure/Utilities							
Onsite Independent Power (Y/N and Type)	No onsite captive power plant available for the economic zone. Power will be sourced from an onsite	There is onsite captive power plant. There is a 4,620 MW Power Plant within SEZ commissioned	There is no onsite captive power plant available for the special economic zone	There is no onsite captive power plant available for the special economic zone	There is no captive power plant available for the economic zone	There is onsite captive power plant. GN Power operates a 600MW clean coal-fired power plant	There is no captive power plant available for the economic zone.

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
	substation connected to national electricity grid	by Adani Power Ltd, (4 x 330 MW and 5 x 660 MW units)					
Cost of Power (Taka/USD)	The cost of power within the economic zone is taken as BDT 8.69/ KwH (USD 0.106/KwH)	Fixed cost of power is INR 1.1 / KwH (USD 0.017 / KwH) and energy cost is INR 3.50/ KwH (USD 0.054 / KwH)	Fixed cost of INR 55 / Kw / month (USD 0.85 / Kw/ month) and additional energy cost of INR 6.64 / KwH (USD 0.10 / KwH)[80]	Fixed cost of INR 55 / Kw / month (USD 0.85 / Kw/ month) and additional energy charges of INR 6.64 / KwH (USD 0.10 / KwH)[81]	The cost of power within the economic zone is Rubel 3.15 / KwH (USD 0.055/ KwH) for 1 group more than 150 KwH	The cost of power within the economic zone is PhP 7.2 / KwH (USD 0.14 / KwH)	The cost of power within the economic zone is 24 Baiza / KwH (USD 0.06 / KwH)[82]
Cost of Water (Taka/USD)	The cost of industrial water supply is taken as BDT 41.32/ KL (USD 0.50/ KL)	The cost of industrial water supply is INR 65 / KL (USD 1/ KL)	The cost of industrial water supply is INR 60 / KL (USD 0.92/ KL)	The cost of industrial water supply is INR 40 / KL (USD 0.62 / KL)	The cost of industrial water supply is Rubel 29.48 / KL (USD 0.52 / KL)	The cost of industrial water supply is: • The cost for first 25 KL of water is at Php 355.58 /KL (USD 6.83 / KL) • The cost of water between subsequent 26 – 100 KL of water is at Php 17.6 / KL (USD 0.34 / KL) • The cost of water beyond 100 KL of water is at Php 17.6 / KL (USD 0.34 / KL)	The cost of industrial water supply is USD 1.95 / KL

[80] *Source: http://www.aperc.gov.in/aperc1/assets/uploads/files/08f97-to2016-17.pdf*
[81] *Source: http://www.aperc.gov.in/aperc1/assets/uploads/files/08f97-to2016-17.pdf*
[82] *1000 Baiza = 1 Oman Rial*

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
Onsite Wastewater Treatment Plant (Y/N)	Yes, an onsite waste water treatment plant has been proposed in the master plan	Yes, an onsite waste water treatment plant available within the SEZ	Yes, an onsite waste water treatment plant available within the SEZ	Yes, an onsite waste water treatment plant available within the SEZ	Yes, an onsite waste water treatment plant available within the SEZ	Yes, an onsite waste water treatment plant available within the Free Port	Yes, an onsite waste water treatment plant available within the Free Zone
Transport costs							
Cost of shipping 20 foot FCL container	The approximate shipping charges of a 20 foot FCL Container from the nearest port are as follows: • Rotterdam – Chittagong → USD 1,317[83] • Hamburg – Chittagong → USD 1,317[84]	The approximate shipping charges of a 20 foot FCL Container from the nearest port are as follows: • Hamburg – Mundra → USD 2,035[87]	The approximate shipping charges of a 20 foot FCL Container from the nearest port are as follows: • Hamburg – Chennai → USD 1,906[91] • Rotterdam – Chennai → USD 1,886[92]	The approximate shipping charges of a 20 foot FCL Container from the nearest port are as follows: • Hamburg – Vishakhapatnam → USD 1,732[95] • Rotterdam – Vishakhapatnam → USD 1,731[96]	The approximate shipping charges of a 20 foot FCL Container from the nearest port are as follows : • Dubai – Naberezhnye Chelny → USD 1,925[99] • Mumbai – Naberezhnye	The approximate shipping charges of a 20 foot FCL Container from the nearest port are as follows: • Hamburg – Bataan Port → USD 2,452[103] • Rotterdam – Bataan Port → USD 2,246[104] • Antwerp – Bataan Port → USD 2,304[105]	The approximate shipping charges of a 20 foot FCL Container from the nearest port are as follows: • Hamburg – Sohar Port → USD 1,981[107] • Rotterdam – Sohar Port → USD 2,017[108]

[83] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[84] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[87] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[91] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[92] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[95] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[96] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[99] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[103] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[104] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[105] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[107] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[108] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
	• Antwerp – Chittagong → USD 1,317[85] • New York – Chittagong → USD 1,390[86]	• Rotterdam – Mundra → USD 1,731[88] • Antwerp – Mundra → USD 1,557[89] • New York – Mundra → USD 6,443[90]	• Antwerp – Chennai → USD 1,697[93] • New York – Chennai → USD 5,325[94]	• Antwerp – Vishakhapatnam → USD 1,697[97] • New York – Vishakhapatnam → USD 5,840[98]	Chelny → USD 2,224[100] • Colombo – Naberezhnye Chelny → USD 2,730[101] • New York – Naberezhnye Chelny → USD 2,830[102]	• New York – Bataan Port → USD 4,164[106]	• Antwerp – Sohar Port → USD 2,035[109] • New York – Sohar Port → USD 4,887[110]
Cost of Labor (Taka/USD)							
Management	The average salary for a management professional is	The average salary for a management professional in the state of Gujarat is	The average salary for a management professional in the state of Andhra Pradesh	The average salary for a management professional in the state of Andhra Pradesh is approx. INR 737,120 /	The average salary for a management professional in Alabaga is	The average salary for a management professional is PHP 44,365 per month (USD 852.25 / month)[116]	The average salary for a management professional in Oman is approx. OMR 2,049 / month (USD

[85] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[86] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[88] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[89] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[90] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[93] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[94] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[97] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[98] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[100] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[101] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[102] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[106] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[109] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[110] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[116] *Source: https://www.payscale.com/research/PH/Job=Production_Manager%2C_Manufacturing/Salary*

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
	approx. USD 533 / month[111]	approx. USD 1,356 / month[112]	is approx. INR 737,120 / annum (USD 944 / month)[113]	annum (USD 944 / month)[114]	approx. USD 600 / month[115]		5,321.81 / month[117])[118]
Technicians	The average salary for a technician is approx. USD 403 / month[119]	The average salary for a technician in the state of Gujarat is approx. USD 308 / month[120]	The average salary for a technician in the state of Andhra Pradesh is approx. INR 300,082 / annum (USD 384 / month)[121]	The average salary for a technician in the state of Andhra Pradesh is approx. INR 300,082 / annum (USD 384 / month)[122]	The average salary for a technician in Alabauga is approx. USD 400 / month[123]	The average salary for a technician is PHP 260.063 per year (USD 415.43/ month)[124]	The average salary for a technician in Oman is approx. OMR 1,554 / month (USD 4,036.16 / month)[125]
Skilled	The average salary of a skilled laborer is approximately USD 107.25 / month[126]	The average salary of a skilled laborer in the state of Gujarat is	The average salary of a skilled laborer in the state of Andhra Pradesh is approx. INR 12,595 / month	The average salary of a skilled laborer in the state of Andhra Pradesh is approx. INR 12,595 / month	The average salary of a skilled laborer in Alabauga is	The average salary of a skilled laborer in Philippines is approx. PHP 14,663 / month (USD 281 / month)[131]	The average salary of a skilled laborer in Oman is approx. OMR 1,554 / month

[111] *Source: http://www.averagesalarysurvey.com/bangladesh*
[112] *Source: http://www.averagesalarysurvey.com/india*
[113] *Source: https://www.payscale.com/research/IN/Job=Operations_Manager/Salary/1c2ca479/Hyderabad*
[114] *Source: https://www.payscale.com/research/IN/Job=Operations_Manager/Salary/1c2ca479/Hyderabad*
[115] *Source: Marketing brochure received from Alabuga SEZ*
[117] *Source: http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[118] *http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[119] *Source: http://www.averagesalarysurvey.com/bangladesh*
[120] *Source: http://www.averagesalarysurvey.com/india*
[121] *Source: https://www.payscale.com/research/IN/Job=Electrical_Engineer/Salary/66155e97/Hyderabad*
[122] *Source: https://www.payscale.com/research/IN/Job=Electrical_Engineer/Salary/66155e97/Hyderabad*
[123] *Source: Marketing brochure received from Alabuga SEZ*
[124] *Source: https://www.payscale.com/research/PH/Job=Electrical_Engineer/Salary*
[125] *Source: http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[126] *Source: https://tradingeconomics.com/bangladesh/indicators*
[131] *Source: https://www.psa.gov.ph/content/2016-occupational-wages-survey-ows*

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
		approx. USD 109 / month[127]	12,595 / month (USD 193 / month)[128]	(USD 193 / month)[129]	approx. USD 200 – 300 / month[130]		(USD 4,036.16 / month)[132]
Unskilled	The average salary of an unskilled laborer is approximately USD 56 / month[133]	The average salary of an unskilled laborer in the state of Gujarat is approx. USD 104 / month [134]	The average salary of an unskilled laborer in the state of Andhra Pradesh is approx. INR 8,054 / month (USD 123 / month)[135]	The average salary of an unskilled laborer in the state of Andhra Pradesh is approx. INR 8,054 / month (USD 123 / month)[136]	The average salary of an unskilled laborer in Alabauga is approx. USD 100 – 200 / month[137]	The average salary of an unskilled laborer in Philippines is approx. PHP 10,162 / month (USD 194 / month)[138]	The average salary of an unskilled laborer in Oman is approx. OMR 354 . month (USD 919.43 / month[139])[140]
Sectors							
Type of Sectors within the Zone	Textile & RMG, Leather & Leather Products, Electrical and Electronics, Automobile and	Chemicals, Light Engineering, Heavy Engineering, Logistics, Automotive, etc.	Automotive, Light Engineering, Food & Beverages, Fast Moving	Automotive, Light Engineering, Food & Beverages, Chemicals, Garments	Automotive, Chemicals, Non Metallic Minerals, Light Engineering	Manufacturing, Transshipment and Logistics, Ship Repair, Tourism and Resort Facilities/Services, Agriculture and Agro-Industrial	Metal Fabrication, Food Processing, Light Engineering, Logistics

[127] *Source: https://tradingeconomics.com/india/indicators*
[128] *Source: http://labor.ap.gov.in/documents/Max_Min_Wage_Rates_in_Part-I_II_Scheduled_Employments/Maximum_Minimum_wage_in_Part_I_Part_II_wef_01102014.pdf*
[129] *Source: http://labor.ap.gov.in/documents/Max_Min_Wage_Rates_in_Part-I_II_Scheduled_Employments/Maximum_Minimum_wage_in_Part_I_Part_II_wef_01102014.pdf*
[130] *Source: Telephonic discussion with authorized representatives of Alabuga SEZ*
[132] *Source: http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[133] *Source: https://tradingeconomics.com/bangladesh/indicators*
[134] *Source: https://tradingeconomics.com/india/indicators*
[135] *Source: http://labor.ap.gov.in/documents/Max_Min_Wage_Rates_in_Part-I_II_Scheduled_Employments/Maximum_Minimum_wage_in_Part_I_Part_II_wef_01102014.pdf*
[136] *Source: http://labor.ap.gov.in/documents/Max_Min_Wage_Rates_in_Part-I_II_Scheduled_Employments/Maximum_Minimum_wage_in_Part_I_Part_II_wef_01102014.pdf*
[137] *Source: Telephonic discussion with authorized representatives of Alabuga SEZ*
[138] *Source: https://www.psa.gov.ph/content/2016-occupational-wages-survey-ows*
[139] *Source: http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*
[140] *http://www.salaryexplorer.com/salary-survey.php?loc=163&loctype=1*

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
	Accessories, Light Machinery, Equipment and Furniture, Non-Metallic minerals, Heavy Machineries Iron and Steel, Shipbuilding, Petroleum products		Consumer Goods (FMCG)				
Special Regime							
Yes/No	Yes, there's a special regime for incentives	Yes, there's a special regime for incentives	Yes, there's a special regime for incentives	Yes, there's a special regime for incentives	Yes, there's a special regime for incentives	Yes, there is a special regime for incentives available	Yes, there is One Stop Shop Within the Zone
Fiscal Incentives							
Customs Duties	• Declaration of EZ as Ware housing Station- Duty free import & Export of Raw material etc. • 100% duty free Import of Vehicle (One Car, One Microbus- 2000 cc)	Exemptions from Customs duty on imports.	Exemptions from Customs duty on imports.	Exemptions from Customs duty on imports.	The regime of free customs zone provides placement of foreign equipment within the SEZ without paying customs duties and VAT (concerns, first of all, technological equipment)	Duty free importation of capital equipment, raw materials, consumer goods and personal items	No customs duties on goods brought into the Freezone. All customs processes are described in a dedicated set of Customs procedures

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
	• 100% VAT free Import of Machinery, Construction Materials						
Corporate Taxes / Indirect Taxes	• Corporate income tax exemption for 10 years (First 3 years- 100%, gradually diminishing from 80% in 4th Year to 20% in 10th Year) • Exemption of VAT on utilities (80% on gas, water, and electricity; 100% on supplies)	Exemption from central and state level taxes	Exemption from central and state level taxes	Exemption from central and state level taxes	Perpetual exemption from VAT and customs import duty on inputs – raw materials, machinery, office equipment, certain petroleum fuel for boilers and generators, building materials, other supplies. VAT exemption also applies on local purchases of goods and services supplied by companies in the Kenyan customs territory or domestic market. Motor vehicles which do not remain within the zone are not	• Zero rating on local purchases of goods, properties and services • Exemption from local and national taxes	Each working company has a guaranteed 10-year exemption of corporate tax (normally 12% in Oman). This exemption can be extended up to the duration of the lease contract if certain targets in Omanization are reached, which can be for up to 25 years.

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
					eligible for tax exemption.		
Income Tax on Profits	Corporate income tax exemption for 10 years (First 3 years- 100%, gradually diminishing from 80% in 4th Year to 20% in 10th Year)	100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years.	100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years.	100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years.	10 year corporate income tax holiday and a 25% tax rate for a further 10 years thereafter (except for EPZ commercial enterprises)	Income Tax Holiday for at least four (4) years for qualified industries	Each working company has a guaranteed 10-year exemption of corporate tax (normally 12% in Oman). This exemption can be extended up to the duration of the lease contract if certain targets in Omanization are reached, which can be for up to 25 years.
Social Security Tax	No concept of social security tax in Bangladesh	No social security tax is available in India	No social security tax is available in India	No social security tax is available in India	No social security tax is applicable	There is a social security tax for Philippines. The current SSS contribution rate is 11% of the monthly salary credit not exceeding PhP16,000 and this is shared by the employer (7.37%) and the employee (3.63%)	A 17.5% social security contribution is applicable to employees who are Omani nationals, but not to expatriate employees. The employee pays a contribution of 7% of salary, and the employer pays the balance of 10.5%. The employer is also required to contribute for

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
							insurance for work related injuries in the amount of 1% of the salary of the employee. This brings the total monthly social security and insurance contributions to be made by the employer to 11.5%.
No restrictions on Money Transfers	Full repatriation of capital invested from foreign sources is allowed by Bangladesh. Similarly, profits and dividend accruing to foreign investment may be transferred in full. If foreign investors reinvest their repatriable dividends and or retained earnings, those	Profit and dividend earned from an Indian company are repatriable after payment of dividend distribution tax (DDT). DDT @ 16.995% (inclusive of cess) is payable by the company (that declares dividend) on the amount of dividend distributed. However,	Profit and dividend earned from an Indian company are repatriable after payment of dividend distribution tax (DDT). DDT @ 16.995% (inclusive of cess) is payable by the company (that declares dividend) on the amount of dividend distributed. However,	Profit and dividend earned from an Indian company are repatriable after payment of dividend distribution tax (DDT). DDT @ 16.995% (inclusive of cess) is payable by the company (that declares dividend) on the amount of dividend distributed. However, dividend is free of Indian	The foreign investment law in Russia guarantees the un restricted repatriation of after tax investment. The foreign investor can buy foreign currency on the domestic foreign exchange market.	Capital and profits may be freely repatriated through the banking system, but prior registration of the foreign investment with the Bangko Sentral Ng Pilipinas is required if foreign currency to service the repatriation will be sourced from the banking system.[144]	There are no exchange controls for both inward and outward investment and repatriation of capital or profits for both nationals and expatriates

[144] *Source: https://www.pwc.de/de/internationale-maerkte/assets/doing-business-and-investing-in-philippines-2015.pdf*

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
	will be treated as new investment. Foreigners employed in Bangladesh are entitled to remit up to 50 percent of their salary and will enjoy facilities for full repatriation of their savings and retirement benefits	dividend is free of Indian income tax in the hands of the recipient shareholders, Indian or foreign. Profit of LLP is flow-through and repatriable without payment of any taxes and without any regulatory approval[141].	dividend is free of Indian income tax in the hands of the recipient shareholders, Indian or foreign. Profit of LLP is flow-through and repatriable without payment of any taxes and without any regulatory approval[142].	income tax in the hands of the recipient shareholders, Indian or foreign. Profit of LLP is flow-through and repatriable without payment of any taxes and without any regulatory approval[143].			
Others	• Exemption from income tax on salary of expatriates , dividend tax and royalty, technical fees, local govt. tax, land development tax	• Exemption from Service Tax • Exemption from payment of Royalties & Cess on construction materials	• Exemption from Service Tax • Exemption from payment of Royalties & Cess on construction materials	• Exemption from Service Tax • Exemption from payment of Royalties & Cess on construction materials	• SEZ residents are granted a remission of transportation taxation for 10 years since tax base introduction • SEZ residents are granted a remission of taxation for 10	• Exemption from wharfage dues, export taxes, impost and fees • Domestic sales allowance of up to 30% of total sales	Freezone companies could benefit from existing Free Trade Agreements between Oman and the USA, and Oman and Singapore, as their goods could receive preferential treatment while in transit.

[141] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*
[142] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*
[143] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
					years since tax base introduction • Accelerated amortization of fixed assets		
Non-Fiscal Incentives							
One Stop Shop Within the Zone	Yes, there is one stop shop proposed within the zone	There is no One Stop Shop available within the zone	Yes, there's a special regime for incentives	Yes, there's a special regime for incentives	Yes, there is One Stop Shop Within the Zone	Yes, there is one stop shop within the zone for facilitating investors.	Sohar Port and Freezone offers a single window through which all licenses, permits and approvals can be obtained. In practice this means that Freezone clients require very little interaction with the various governmental institutions.
Support Amenities							
Onsite Administration office	Provision for onsite administration office has been captured in Master Plan	Onsite administration office is available within the zone	Onsite administration office is available within the zone	Onsite administrative office is available within the zone	Onsite administrative office is available within the zone	Onsite administration offices is available within the zone	Onsite administration office is available within the zone

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
Onsite Convenience Retail	Area earmarked for support amenities in Master Plan can accommodate Onsite Convenience Retails store	Onsite convenience retail is available within the zone	Onsite convenience retail is available within the zone	Onsite convenience retail is not available within the zone	Onsite convenience retail is available within the zone	Onsite convenience retail is available within the zone	Onsite convenience retail is available within the zone
Onsite Housing	No provision for onsite housing has been captured in Master Plan	Onsite housing is available within the zone	Onsite housing is available within the zone	Onsite housing is not available within the zone	Onsite housing is not available within the zone	Onsite housing like Camaya Hills Residencies, Opus Land Inc are available within the zone	Onsite housing is not available within the zone
Onsite Schools	Area earmarked for support amenities in Master Plan can accommodate onsite schools	Onsite schooling is available within the zone	Onsite schooling is available within the zone	Onsite schools are not available within the zone	Alabuga International School is available within the zone	Onsite school is not available within the zone	Onsite school is not available within the zone
Onsite Community Facilities	Area earmarked for support amenities in Master Plan can accommodate onsite community facilities	Onsite community facilities is available within the zone	Onsite community facilities is available within the zone	Onsite community facilities are not available within the zone	Onsite community facilities are not available within the zone	Onsite community facility is not available within the zone	Onsite community facilities are not available within the zone
Onsite Security	Provision for onsite security has been duly considered	Onsite security is available within the zone	Onsite security is available within the zone	Onsite security is available within the zone	Onsite security is available within the zone	Onsite security is available within the zone	Onsite security is not available within the zone

Parameters	Feni EZ site	Mundra SEZ	Sri City SEZ	Achutapuram SEZ	Alabuga SEZ	Free Port of Bataan	Sohar free Zone
Quality of Life							
International Housing (Within 15 Km)	There is no international housing facility available within 15 km radius of the EZ site	Superior quality housing facilities like Swastik Apartment, Ramdev Nagar, Fortune Pratharna Bungalow, etc. are available in close proximity to the zone	Investment grade accommodation of more than 600 dwelling in 3 different locations, ready for occupation is located in close proximity to the site	There is no superior quality housing available in close proximity to the zone	Quality international housing is available within in town of Yelabuga which is in close proximity to the zone	Quality housing like BEPZ Executive village housing, Vera Paza homes are available in close proximity to the zone	Superior quality housing facilities are available in Sohar in close proximity to the Freezone
International Hospital/Clinic (Within 20km)	There is no international hospital facility available within 15 km radius of the EZ site	Superior quality health care facilities like Sterling Hospital is available in close proximity to the zone	Quality health care facilities like SRM Institutes for Medical Science is available in close proximity of the site	There are no superior quality hospitals available in close proximity to the zone	Quality international hospital like Medical Center "Healing, Ulitsa Tazi Gizzata is available in close proximity to the zone	Quality health care facilities like Marivles District Hospital is available in close proximity to the zone	Superior quality health care facilities are available in Sohar in close proximity to the Freezone
International Schools (Within 20 kms)	There are no international schools available within 20 km radius.	Superior quality schools like St. Xavier's English Medium High School is available in close proximity to the zone	Quality schools like Chinmaya Vidyalaya School is available in close proximity of the site	There is no superior quality schools available in close proximity to the zone	Quality international schools are available in the Yelabuga town in close proximity to the zone	Quality international schools like BEZP Multinational School is available in close proximity to the zone	Sohar International School is available at a distance of 25 km from the Freezone

Table on the previous page provides a comparative study on different economic zones and industrial parks that could compete with this proposed EZ site. The industrial parks studied for comparative purposes are located in emerging economies and support sectors similar to those proposed for this EZ, providing potential investors a plethora of options for making investment decision. Following key findings may be concluded from this exercise:

Competitiveness of the proposed EZ site as compared to its competitors

1. The subject site in Feni has been envisaged to be built over an area of 7,000 acres, which is of a comparative size to its competitors. Provision has been kept for providing both industrial land and Standard Factory buildings to the manufacturers in this EZ; however apart from Free Port of Batan, no other competing economic zone offers standard factory buildings.
2. The proposed master plan includes a provision for establishing a water and sewage treatment plant within the EZ. This is in line with other competing economic zones which also have captive waste treatment plant.
3. Bangladesh enjoys demographic dividend thereby providing labor at a very competitive rate as compared to other competing countries / economic zones. This might act as a catalyst for promoting labor-intensive manufacturing activities within the zone.
4. Cost of shipping from Chittagong Port in Bangladesh is relatively lower as compared to competing EZs in countries like India, Russia, Oman and Philippines. This would provide a cost advantage (in terms of transportation costs) to manufacturers who would decide to setup the manufacturing units in Feni. Also, work is in progress to construct a feeder port in Mirsarai, in close proximity to the EZ site. Once operational, this port could provide faster transit of goods.
5. Fiscal incentives offered by GoB, like exemption of import duty on machinery and construction material and discounts on VAT is matched by competing EZs in competing countries. Income tax waiver is provided by all countries. Besides Bangladesh, India and Russia also do not impose any social security tax.
6. Provision has been kept in the Master Plan of EZ in Feni to develop support amenities which could include international quality residential facilities, health care facilities, vocational training institutes, retail store and community facility inside the EZ. These facilities are also present in Mundra SEZ and Sri City SEZ. Other competing SEZs also offer varying levels of social infrastructure. These facilities could attract highly skilled manpower to EZ in Feni, who could stay with their family and work in the EZ.

Areas where the proposed EZ site is lagging behind its competitors

1. Steep power tariff could act as a key bottleneck for investors investing in the EZ. This is a country level challenge as Bangladesh faces a power deficit due to its dependence on import of coal and nautral gas from other countries for generation of power. Moreover, power generation infrastructure has not developed in the country, due to which it has to buy power from neighboring countries like India. This could prove to be a major disadvantage when compared to other competing economic zones in competing EZ in countries like India, Russia and Oman.
2. Draft One Stop Service (OSS) Act for BEZA has been passed by GoB, however presently this has not been fully implemented by BEZA for its Economic Zones. Competing EZs have an already operational OSS mechanism in place to aid investors. Absence of an operational OSS could hinder smooth investment facilitation in the proposed EZ.

Basis the analysis done in this section, proposed EZ is found to be competitive with respect to other EZs on majority of the comparative parameters.

BEZA could also fast track implementation of OSS in order to incentivize investors to set up manufacturing units in proposed EZ.

4. Industry Assessment

4.1. Purpose and Objective

Bangladesh has been considered as a global hub for producing garments and exporting the same to all parts of the world. Its garment industry which formed 3.89% of its total export basket in 1983-84, occupied 81.23% of the total exports in 2016-17, providing employment to around 4 million people.[145] This underlines the importance of garment sector in Bangladesh. However, at the same time also highlights the over dependency of Bangladesh's exports on a single sector. There is a need for Bangladesh to improve its manufacturing competencies in other sectors as well, in order to make its economy resilient to possible sector specific disruptions due to automation, policy changes and increasingly competitive global scenarios. GoB has taken cognizance of this situation and has identified other sectors apart from textile and garment sector as priority sectors.

High Priority Industrial Sectors	Priority Potential Industrial Sectors
• Agri-Business • Textile & Garments • ICT • Leather Products • Electrical & Electronics	• Plastic Industry • Light Engineering • Ship Building • Tourism Industry • Frozen Food • Ceramic Sector • Power Sector • Medical Equipment Sector • Health Care Sector • Renewable Energy Sector

Source: Bangladesh Investment Development Authority

As a part of Industry Assessment, our objective is to identify site specific target industries which can be compatible with the local economy of the region. Through this chapter, recent growth trends and policy support for various industries will be highlighted to draw attention to nascent industries which are registering robust growth figures in Bangladesh. Local level infrastructural and manpower support, presently available and proposed plans, would be elaborated and site specific suitability of various industries would be covered. Reference to insights obtained through primary survey have also been elucidated in this section. Results obtained from both primary and secondary studies would be synthesized to arrive at an ideal industrial mix for the proposed EZ site. An industrial profile would be undertaken for these sectors, covering typical land, water, power and employment requirements for these sectors.

4.2. Our Approach

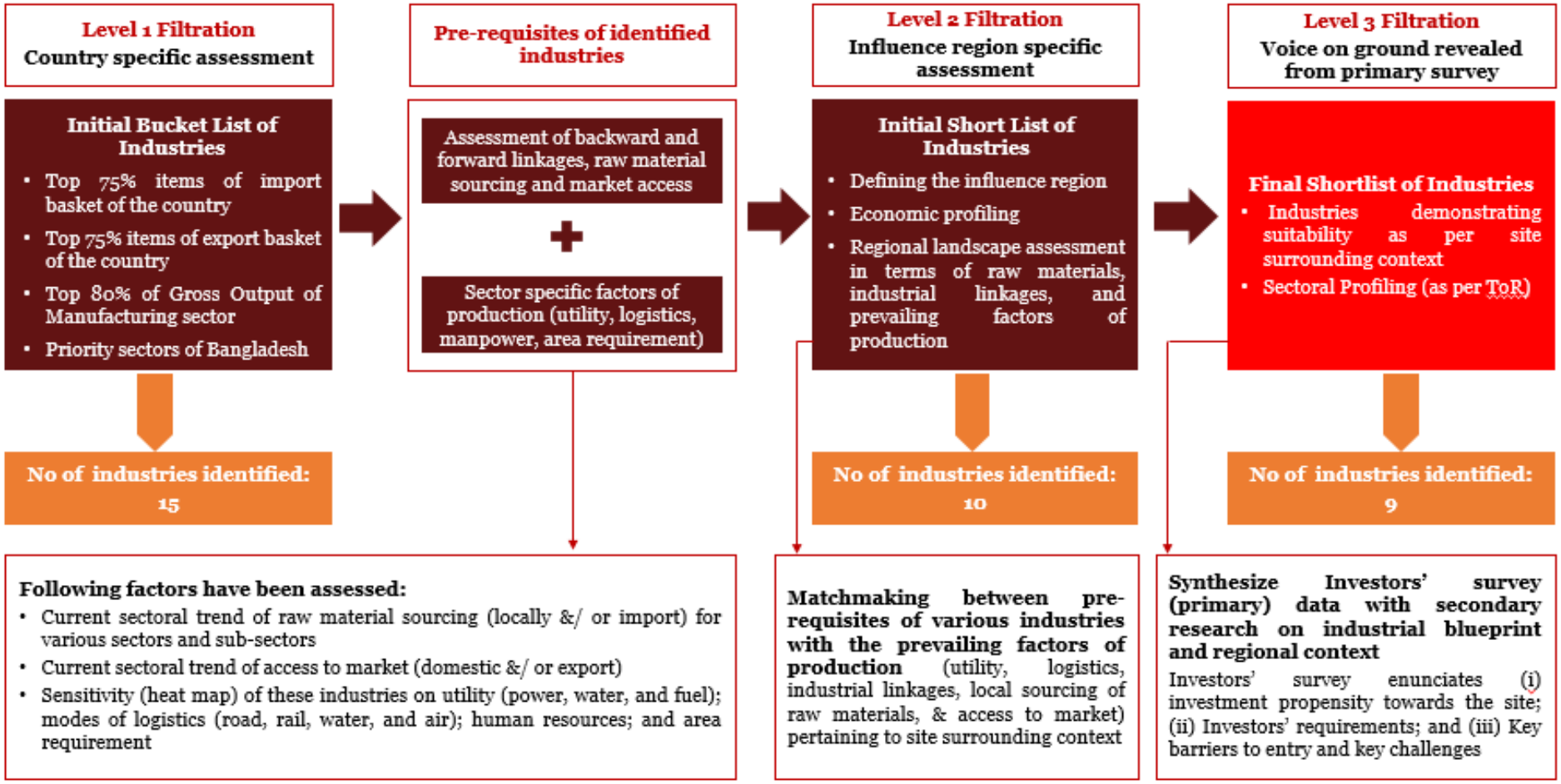
The process to shortlist the industrial sectors that can be most compatible for the proposed EZ site at Feni involves a 4-step approach covering macro level assessment of Bangladesh as a whole and then funneling down to site level assessment, with validation from current manufacturers and members of various industrial associations.

As a part of this study, recent growth trends of different industries in manufacturing sector have been analyzed to identify an initial bucket list of industries demonstrating high growth potential. Data sources available with agencies like BIDA, BEPZA, BEZA and ITC trade map have been used for this study. This has been followed by an assessment of forward & backward linkages and factors of production requirements for each industry in the bucket list. Further, a deep dive into influence region assessment has been undertaken to assess the availability of raw materials, forward & backward linkages and factors of production requirements prevailing at the project site and influence region. In cognizance of the above, initial shortlist of sectors has been arrived at. To validate the findings of the same, a primary survey exercise has been undertaken to reach out to potential investors across

[145] http://www.bgmea.com.bd/home/pages/tradeinformation

different sectors to gauge their views on sectors and suitability of the same. The findings have been synthesized to create a final shortlist of industries that should be most compatible for the proposed EZ site. Figure on the next page captures diagrammatic representation of the approach adopted.

Figure 27: Approach Methodology for Industry Assessment



Source: PwC Analysis

4.3. Country Level Assessment

In order to shortlist potential sectors that can be established at the proposed EZ site in Feni, it is important to identify a bucket list of industries under the following heads –

- Traditionally dominant in Bangladesh
- Demonstrating better growth than country's GDP in recent past
- Thrust Sectors identified by government

Above mentioned selection criteria will ensure that during the shortlisting process all those industries are taken into consideration, which have the potential to do well in the country on basis of their historic trends. The aim is to also ensure that the shortlisted sectors are in line with those sectors which GoB has identified as thrust sectors in its National Industrial Policy, 2016.

Thrust sectors are those sectors which have been able to successfully contribute to Bangladesh's industrialization, poverty alleviation and employment generation. GoB would also consider special incentives like tax exemptions, exemption from dual taxation, tax holidays, taxation at reduced rates, accelerated depreciation etc. for these sectors on basis of their performance and contribution to national economy.

These industries would provide an initial universe of list that can be taken up for further scrutiny with respect to regional and site context for the proposed EZ. Sectors can then be further shortlisted, based on various sector specific prerequisites and region/site specific support available.

In order to create a shortlist of industries, data was extracted from secondary sources like ITC trade map, Ministry of Industries, Bangladesh Investment Development Authority and Bangladesh Bureau of Statistics.

Sectors were shortlisted by selecting industries on basis of the following parameters -

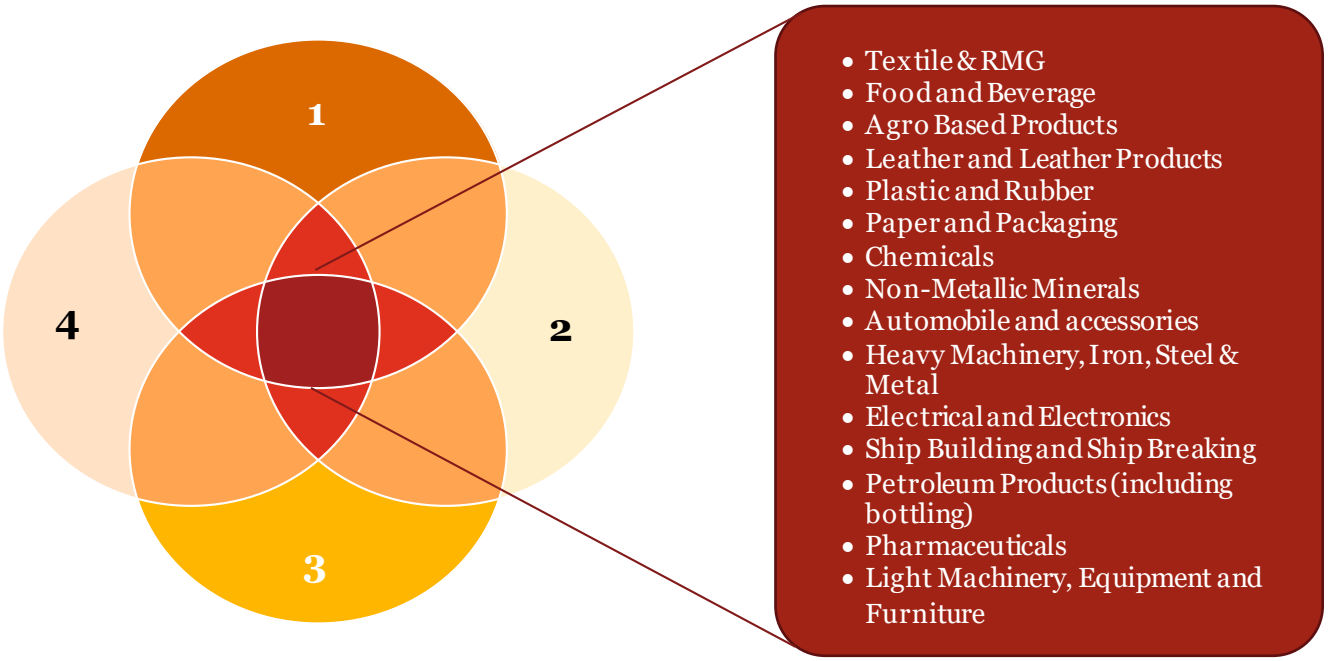
- ✓ Product wise ranking of industries to identify top 80% of items, currently being produced in Bangladesh.
- ✓ A list of top 75% of items, being exported and imported, were shortlisted on basis of average trade value over the past 5 years (in million USD).
- ✓ Sectors that have been identified by GoB as thrust sectors.

The major sectors identified after filtering through the above mentioned parameters are listed in the next page. Details of export trend, import trend and gross output of manufacturing sectors in Bangladesh are presented in the Annexure.

Figure 28: Bucket list of Sectors & Products

An initial shortlist of sectors was created by identifying those industries performing well across the parameters highlighted in the previous page. The initial shortlist of sectors are as mentioned below –

Figure 29: Initial Shortlist of Sectors



Based on secondary research, above mentioned initial list of sectors has been shortlisted. These sectors have either demonstrated healthy growth in Bangladesh or are a part of the thrust sectors identified by GoB

4.4. Sector Specific Requirements

Post shortlisting of sectors based on a country level assessment, it is imperative to understand the salient features of each sector in order to deduce suitability of the sector with respect to the proposed EZ location. This analysis, will culminate into a basic list of pre-requisites needed for the specific sector to develop in a particular region. The criteria for assessing the pre-requisites of sectors are two-fold –

- Study of Backward and Forward Linkages
- Sector specific Factors of Production

The above two criteria will provide an in-depth insight into the requirements of each of the shortlisted sector. A study of **Backward and Forward Linkages** of each sector will provide information about various stages of development of these sectors, raw material required and markets where these products are consumed.
Sector specific Factors of Production will provide qualitative information about the dependency of each sector on different supporting infrastructure like modes of transportation, utility (water, power, & gas), and manpower.
Rationale behind this assessment are (i) detailed primary survey undertaken among investors to comprehend the voice on ground; and (ii) in-depth secondary research on sectoral outlook.

Holistic assessment of backward and forward linkages of various sectors including raw material sourcing and access to market have been captured in a tabular format on the next page –

Table 24: Sector Specific Backward and Forward Linkages

Sector	Description of raw materials, industrial linkages, and market access
Textile & Ready Made Garments (RMG)	Textile & RMG is the major industrial sector in the country. Bangladesh is 2nd largest exporter of RMG in the world after China, having 6.4% of global market share. This industry is already well developed in Bangladesh generating growth rate of 13%.[146] Gross value added from this sector is BDT 2534.7 million, which is ~47% of the country's overall gross value added from manufacturing sector.[147] GoB has set a target to achieve USD 50 billion of exports from RMG sector by 2020, in order to do so, it has also placed textile & RMG sector in its high priority industrial sector list. Among the incentives offered by GoB, garment manufacturers and exporters get 4 percent cash incentive against value addition of products manufactured in the country using locally manufactured yarn.[148] The basic material required for this sector is cotton, which is converted into yarn, followed by conversion into fabric and finally into RMG after dyeing. Bangladesh specialises in manufacturing of RMG by dint of its attractive demographic dividend and low cost of manpower. It is cost advantageous to produce RMG in Bangladesh as compared to other parts of the world. Bangladesh's humid climate is not conducive for cultivation of cotton, hence cotton is primarily imported from neighbouring countries like China, India. Basis primary survey with industry sectors, local textile mills are also not able to meet demand for fabric by the RMG industry, hence fabric is also imported. Moreover due to specific quality requirements of international customers, many customers have pre-designated fabric sourcing units outside Bangladesh, from where fabrics are imported into the country. Dyeing of garment is the last stage of activity before RMG being manufactured. This is a water intensive exercise, for which mostly ground water or river water towards captive sourcing is utilized (which ascertains continuous water supply). Due to poor quality of locally available dyeing material, some firms either export their garments for dyeing or use imported dyes.[149] Textile buyers (customers) from large economies such as USA, EU, and others place orders to RMG manufacturers in Bangladesh as producing RMG in Bangladesh is cost advantageous. This is why RMG is the major export commodity from Bangladesh to major markets such as USA, Europe, and various other large economies. Yarn and fabric produced in Bangladesh primarily caters to domestic requirements as industrial linkage towards RMG.
Food and Beverages (F&B)	Bangladesh's large population base has created a huge domestic potential for this sector. With growing consumption economy, demand for nutrient rich, high quality food products is increasing. Besides, catering to local demand, Bangladesh also exports processed food products to 104 countries, with major exports being to middle-east and south-east Asian countries.[150] These countries have a lot of immigrants from Bangladesh, who drive demand for Bangladesh food products in these countries. As per data available with Bangladesh Agro-Processors Association, Bangladesh clocked a growth of 33% in exports of processed food in between 2011-12 to 2013-14. Major items of exports were fruit juice, biscuits, potato crackers, chips,

[146] https://www.textiletoday.com.bd/overview-bangladesh-rmg-2016/
[147] *Survey of Manufacturing Industries, Bangladesh Bureau of Statistics*
[148] *http://rmgbd.net/incentives-for-textile-clothing/*
[149] *Primary Survey with Industry sectors*
[150] http://www.bapabd.org/home/export/1

Sector	Description of raw materials, industrial linkages, and market access
	puffed rice, jam, confectionery items, ketchup, parathas, singharas etc. As per Bangladesh Investment Development Authority, frozen food export is a priority sector for Bangladesh with special focus towards exports of shrimps. Food and Beverage industry can be broadly segregated into two categories – (i) agro based products and (ii) animal products For agro based products, the first stage is cultivation of necessary agricultural crops like cereals, fruits and vegetables. This is followed by 2-stage processing, where products like wheat are converted into flour by agro based industries and flour is then converted into 2nd stage products. These products are then packaged and sent to consumer markets. F&B is the second stage in the value chain, while the first being agro based products. Although Bangladesh being an agrarian economy is able to supply most of the raw material required for agro based industry, it also has to rely on imports for products like Wheat, Sugar and few fruit various reasons ranging from poor protein content in wheat to poor productivity of sugarcane. For animal products, Bangladesh is primarily focussed of exports of fish products, in particular exports of shrimp. Shrimp production is a three-stage process, starting at hatcheries, where shrimp fries are cultivated, followed by farming where adult shrimps are cultivated from the shrimp fries. This is followed by processing, where activities like deshelling, de-heading and some minimal processing takes place in order to increase the shelf life of shrimp products. Lack of technological know-how prevents shrimp processing firms from adding further value to the processed shrimps. Fish and shrimp cultivation takes place in coastal parts of the country like Khulna, Barisal, Cox's Bazar and Chittagong. Basis primary survey, investors prefer setting up of F&B units at central locations of Bangladesh so that seamless supply to consumers located across the country can take place easily. Some large domestic and foreign F&B players also source a part of their raw materials (like additives, flavours, and chemicals) from outside the country from registered vendors in order to conform to their global quality policy.
Agro Based Products	Agro based products act as source of raw material and intermediaries/ backward linkage to F&B sector in Bangladesh. Agro based products can broadly be classified into three categories viz. (a) cereal, egg & fruits based; (b) tobacco; and (c) non edibles (such as jute, cotton). This sector deals with first level processing of agricultural products and it acts as the upstream industry sector for F&B sector. Being an agrarian economy, Bangladesh cultivates agricultural products in abundance. Although Bangladesh shows prominence in yield per unit area for wheat (3.1 MT per hectare vis-à-vis 3.07 MT per hectare globally), locally produced wheat are low on protein content. As a result of the same, Bangladesh has import dependency for wheat (Russia, Ukraine, and India are the major importers).[151] Rajshahi division is the top wheat producing division in the country. Egg and milk production in Bangladesh is not sufficient. Bangladesh's sugar yield (per unit area) is lower compared to neighbouring countries and as a result of the same, sugar is also imported. Rajshahi division produces major sugarcane and it is also largest producer of fruits including mango. Rice cultivation takes place in abundance in this country; ~75% of the total cropped area and ~80% of the total irrigated area is planted to rice. It caters to ~67% of total calorie supply and ~50% of total protein intake of an average person in this country.[152] Agro produces (both in raw form and intermediaries) caters to domestic demand as well as to F&B units for production of second stage of value chain products.

[151] *ITC Trade Database*
[152] *http://www.knowledgebank-brri.org/riceinban.php*

Sector	Description of raw materials, industrial linkages, and market access
	Bangladesh specialises in export of unmanufactured tobacco. Bangladesh produces 10,000 MT of tobacco in a year, out of which ~30% is exported. Khulna and Rangpur divisions are the top most tobacco producing divisions. Tobacco cultivated caters to the domestic demand and the tobacco leaves are being exported to large economies. Jute is one of the predominant cash crops in Bangladesh. Bangladesh is contributing ~39% of world's jute production. Jute is cultivated in almost all districts of Bangladesh; various jute mills are located in Khulna division. As explained earlier, humid climate in this country is not conducive for cultivation of cotton, hence cotton is primarily imported from countries like China, and India owing to quality aspects as well as less lead time requirement due to import from neighbouring countries. Agro based products manufactured in Bangladesh primarily caters to the domestic demand and as feed to F&B industry. Export of agro based products mostly takes place to India and the surrounding countries. High dependency on primary sector (agriculture) necessitates the usage of light machinery and agricultural equipment in Bangladesh.
Leather and Leather Products	Leather industry is the second largest export earning sector of Bangladesh with major markets being Italy, England, Spain, France, Germany, Poland, China, Japan, USA and Canada. The overall leather industry is classified into three broad categories such as finished leather, leather products, and footwear. GoB has also declared this industry as the priority sector. This sector caters to only 0.5% of the world's leather trade (worth USD 75 billion). About 113 tanneries in Bangladesh produce 220 million square feet of hides and skins every year.[153] There are about 30 modern shoe manufacturing plants involved in production of high-quality footwear; also, ~2,500 small and medium scale footwear manufacturers are operational.[154] Value chain assessment of this sector depicts that in tanneries raw animal skins and hides are processed (using industrial salt and chemicals) to manufacture finished leather, which in turn is used to manufacture leather based products and footwear. Design of the leather products is a critical step which precedes the leather based products manufacturing. Designing involves skilled human resources and there appears to be a clear gap in availability of specialised manpower towards this stage. Tanneries in Bangladesh form a cluster, recently this cluster has been relocated to Savar area from Hazaribagh area of Dhaka. This move was undertaken in order to regulate tanneries in Bangladesh and to ensure that proper safety and environment friendly norms were being followed. Basis primary survey, these tanneries suffer from inadequate infrastructure (such as non-metalled internal road, non-functional CETP, and high electricity cost), resulting in adverse effect on production of leather and underutilization of capacity for tanneries, located in Savar. The raw material required for leather is animal hide and skin. Due to its large cattle population, Bangladesh has a good supply of leather. Cow hides account for 56% of production, goat skins for 30% and buffaloes make up the rest.[155] Bangladesh is a net exporter of raw hides and skins. In 2016, Bangladesh's exports within the category were about ~USD 208 million and imports were ~USD 116 million.[156] Raw hides obtained from animals are mixed with chemicals for the purpose of tanning. The chemicals used for this process are currently imported due to lack of domestic production of the same.

[153] *http://www.theindependentbd.com/printversion/details/112906*
[154] *https://www.researchgate.net/publication/235609270_Bangladeshi_Leather_Industry_An_Overview_of_Recent_Sustainable_Developments*
[155] *Research Gate. 2013. Bangladeshi Leather Industry: An Overview of Recent Sustainable Developments.*
[156] *ITC Trade map*

Sector	Description of raw materials, industrial linkages, and market access
	After tanning of leather, these leather goods are supplied to manufacturers of leather goods, where leather is converted into different products like footwear, bags, belts, clothes etc. Final output from this sector caters to the domestic demand as well as it serves the export market. High quality and high end leather products are being manufactured in this country which are fit for export to large economies. Bangladesh is a net exporter of leather, however export share of leather products has potential to increase in Bangladesh. For which adoption of new technologies, investment in R&D, and gradual development of designing capacity will be required. Bangladesh currently exports its leather products across the globe.
Plastic and Rubber	Plastic and rubber industry segment acts as intermediary and backward linkages for other sectors such as leather, packaging, machineries & equipment, footwear, and accessories. Plastic and rubber industry in Bangladesh is depicting an annual growth rate of 20%.[157] There are a total of 300 manufacturers in Bangladesh generating export of plastic goods is ~USD 99 million (in 2015-16, contributing to ~0.01% of global export) primarily to India.[158] Oil and gas industries are the primary upstream industries required for plastic and synthetic rubber production. From crude oil distillation, compounding exercise is undertaken in which plastic products are polymerised. Further, mixing and moulding takes place for converting polymers to plastic products. Natural (procured from rubber plantation) and synthetic rubber are compounded through adding chemical additives to manufacture rubber based products for industrial, commercial, and household purposes. Owing to lack of oil refineries in this country, Bangladesh has limited participation in the plastic compounding stage. Since there is no polyolefin units in Bangladesh and demand of polymers is met through import (from China, Saudi Arabia, Chinese Taipei, Korea, and Thailand). Raw material requirements of plastic is met through import and from local recycled plastic waste.[159] It is to be noted that 20% of raw materials are from recycled materials.[160] Bangladesh has limited production capacity in this sector due to lack of advanced machinery and lack of skilled human resources. As a result, plastic products manufactured in this country primarily cater to domestic demand. Due to lack of upstream petrochemical industries, there is no production of synthetic rubber in Bangladesh. USD 25 million of synthetic rubber is imported annually. Natural rubber is produced from rubber plantations located in Chittagong, Sylhet, Madhupura, and in Bandarban hill tracts.[161] Major importing countries for synthetic rubber are India and non SASEC countries. Produces from plastic and rubber industries are mostly used for industrial, commercial, and domestic consumption. Due to lack of advanced technology, local small and medium players have restriction in producing quality rubber products. As a result, rubber produced in Bangladesh primarily caters to the domestic demand and export contribution is very less.

[157] http://bida.gov.bd/plastic-industry
[158] *Bangladesh Investment Development Authority*
[159] *http://emergingrating.com/wp-content/uploads/2017/09/Plastic-Industry-of-Bangladesh-Vol-I.pdf*
[160] *The Financial Express. 2015. Export-Oriented Plastic Industry of Bangladesh: Opportunities and Challenges*
[161] *http://en.banglapedia.org/index.php?title=Rubber_Industry*

Sector	Description of raw materials, industrial linkages, and market access
Paper and Packaging	As per Bangladesh Paper Mills Association, there are 100 paper mills in Bangladesh with a production capacity of 1.5 million metric tonne per year. Manufacturers in Bangladesh are investing in upgradation of technology to produce export quality papers in order to export paper to 40 countries. Paper exports from Bangladesh generated revenue of USD 920,488 in fiscal year 2016-17.[162] The process of manufacturing paper products can be divided into a 3-stage process. The first stage involves acquiring raw material which can be soft wood, bamboo or other fibre based plants. Raw material availability in Bangladesh is limited currently due to lack of ample land, conducive climate and soil conditions. Manufacturers are able to source local wood for manufacturing of basic paper. The wood obtained from plants is converted into pulp through use of digester, bleaching agents are typically sourced from local suppliers.[163] Manufacturers also use recycled paper or import pulp from other countries depending on the final product. This pulp is then converted into paper or packaging products. Usually integrated paper manufacturers in other countries have upstream access to forest towards sourcing of wood. In Bangladesh, locally sourced wood is procured from forest areas in Bandarban and Chittagong forest areas. However, the pulp available locally is not of high quality fit for commercial and industrial purposes. Per capita paper and board production in Bangladesh is ~3.5-4 kg, whereas the world average is 50 kg.[164] This shows that Bangladesh is still lagging behind the world in per capita paper production. Although, Bangladesh is producing sufficient paper for writing, printing and newsprint purposes, consumers are still dependent on imports for packaging material used in RMG, medicine and food items. This is because Bangladesh does not produce high quality pulp locally and while local raw material can meet local demand for basic paper and tissues, it does not satisfy the needs of manufacturers in RMG, F&B and pharmaceutical sectors, who are very particular about their paper quality. Paper packaging items are currently imported from Japan, South Korea, China, India and Indonesia. Bangladesh imported 1 million MT of packaging material in 2016-17.[165]
Chemicals	Chemicals sector comprises various products viz. (i) fertilizer, (ii) adhesives & paints related products, and (iii) other chemicals. This sector exhibits annual growth trend of ~9%.[166] Chemicals sector acts as the downstream sector for various sectors such as agro based, shipbuilding, and heavy machineries. Adhesives and paints based products are consumed for household, commercial, and industrial purposes. At present, chemicals sector fulfils domestic demand and it is not export oriented. This sector is largely dominated by local traders who offer competitive price across the range of products.[167] Primary survey among industrial players reveals that owing to lack of technical know-how, lack of skilled manpower, and lack of quality laboratory facilities (research and testing) in this country, Chemicals sector is yet to shape up in Bangladesh and get ready for export oriented manufacturing. Urea is the major raw material for fertilizer production. Additives are added to Urea for manufacturing fertilizers. Basis primary survey, production of urea based fertilizer is controlled by GoB; current production of urea is not sufficient to meet local demand (demand is 2.5 million MT annual

[162] *http://www.theindependentbd.com/home/printnews/139544*
[163] *Paper Sector in Bangladesh: MMA Quader (2011)*
[164] *Paper Sector in Bangladesh: MMA Quader (2011)*
[165] *http://www.theindependentbd.com/home/printnews/139544*
[166] *http://www.thedailystar.net/supplements/painting-the-future-bright-1331338 https://factsweek.com/160464/asia-textile-chemicals-market-is-projected-to-exhibit-a-cagr-of-7-6-from-2014-2020/ https://advancedtextilessource.com/2014/07/23/bangladesh-textile-chemicals-market-growth-continues/*
167 www.banglajol.info/index.php/jce/article/download/10178/7533

Sector	Description of raw materials, industrial linkages, and market access
	and local supply is only 1 million MT annual) and owing to the same, import of fertilizer is required. Private players are involved in adding micro nutrients (NKPF) to urea in order to enhance the quality. Resin is the basic raw material for adhesive manufacturing, the same is imported. Downstream produces from adhesives are used in footwear, light engineering and construction sectors in the country. Large paints companies in Bangladesh are dependent on procuring raw materials through import from reputed empanelled vendors worldwide. Basis primary survey with industrial players, local (small and medium scale) chemicals manufacturers are dependent on importing resins from countries like India and South Asia. Outputs of Chlor Alkali and Hydrogen Peroxide are basic chemicals necessary for all industrial usage. Downstream products from these basic chemicals have demand across various sectors such as dyeing, textile, F&B, Electrical & Electronics, Steel, Leather, Pharmaceuticals, and Plastic. These inputs are primarily imported from India, China, and other Asian countries. Due to lack of integrated chemical manufacturing facilities in Bangladesh, this sector is import dependent.
Non-metallic minerals	Non-metallic minerals sector comprises of (a) glass, (b) ceramics, and (c) cement. This sector records an average annual growth trend of ~24%.[168] Manufacturing output from these sectors primarily caters to the domestic demand. Domestic market for glass and glassware has been estimated at USD 2 billion (2016) and sectoral outlook is demonstrating healthy growth rate of ~20% annually. Main ingredient of glass industry is sand, although quality sand is imported from China and Egypt.[169] In addition, Bangladesh imports the other ingredients (like limestone, dolomite, feldspar, and other minerals) required for glass industry. Local sand deposits of Bangladesh are located at Balijuri, Shahjibazar, Maddhyapara, and Barapukuria.[170] Secondary research depicts that local glass sector caters to ~95% of the domestic demand; local glass companies are exporting products to South Asian countries (such as India, Nepal, Bhutan, and Sri Lanka).[171] Domestic market for ceramics industry has been estimated at USD 593 million (2016) and this segment is growing at ~20% annually; Bangladesh is a net importer of ceramics (USD 145 million).[172] Clay mining (main ingredient) is sourced locally from Mymensingh and Sylhet regions. Basis primary survey with industry sector players, for high quality products, Bangladesh is import dependent and other raw materials (minerals, adhesives, and chemicals) are being imported. This sector caters to ~85% of the domestic demand and export takes place to various countries (like India, large western economies).[173] Natural gas is used in the production process and owing to low Sulphur content in locally available natural gas, ceramics products look shiny and bright, which makes it adequate for export to large markets.[174] Limestone is the major raw material for cement production. Limestone is processed to form clinker, on which additives are mixed and crushed to manufacture cement. For cement production in this country, end-to-end manufacturing is not available as Bangladesh doesn't have enough supply of limestone. Clinker (processed limestone) is being imported from countries such as India, China, and South East Asia. Coal is also imported and

[168] http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489
[169] *Secondary research and primary survey*
[170] *Banglapedia*
[171] *http://www.thedailystar.net/news-detail-42940*
[172] *Secondary Research and information obtained from industry associations*
[173] *http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489*
[174] *http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489*

Sector	Description of raw materials, industrial linkages, and market access
	fly ash is sourced locally. All the cement based industrial units are located adjacent to river to facilitate smooth logistics. Cement production in this country is primarily used for domestic consumption and minimal export takes place.
Automobile and accessories	With rising income levels in the country, Bangladesh's demand for automobiles is rising. The domestic market demand has been mostly satisfied by imports. Bangladesh is not present across the value chain of automobile industry due to lack of technological know-how and trained manpower. The country has been primarily dependent on assembling of automobile components; these components (completely knock down units) are being imported. Currently the passenger car import comprise of refurbished cars or re-used cars that are reconditioned in Bangladesh. Import of passenger cars has clocked USD 351 million (in 2015). Basis interaction with respondents from automobile sector we were informed that import duty on brand new vehicles ranges from 100% to 300% and as a result of the same, passenger cars are costly in the country. Due to GoB's tax structure which imposes 165 percent duty on imported new cars, 60 percent duty on cars made in Bangladesh and 25 percent Supplementary Duty on reconditioned hybrid cars, Bangladesh is witnessing a rising demand of refurbished vehicles in Bangladesh. [175] [176] However, with development of technological know-how automobile manufacturers are starting to manufacture vehicles at competitive prices locally and have also started targeting export markets. In the recent past several foreign entities expressed their intent to invest in Bangladesh. For example, recently Ashok Leyland opened a new commercial vehicle assembly plant near Dhaka. Various assemblers of vehicles are joint-ventures with foreign entities to help bring in technology and parts. Examples include a partnership between Ashok Leyland and IFAD Autos Limited, and a partnership between Tata Motors and Nitol Niloy Group. Bangladesh has duty-free agreement with several countries due to which cars manufactured and exported from Bangladesh do not attract import duties. These cars can also attract local customers who are interested in buying new cars rather than refurbished cars.
Heavy Machinery, Iron, Steel and Metal	Bangladesh is one of Asia's emerging steel markets having more than 400 steel, re-rolling and auto re-rolling mills. Most of steel manufacture in Bangladesh takes place in form of long steel products and MS bars used in construction of buildings. Majority of the steel and metal based industrial units in Bangladesh are re-rolling mills and they are located in Chittagong and Narayanganj areas, where downstream produces (steel and metal scraps) from ship breaking industry are readily available. As per discussions with leading steel manufacturers, Bangladesh currently produces more than 4 million tonnes of steel and production of this sector is expected to double by 2022. The value of chain of this sector involves mining of iron ore and converting it into pig iron inside blast furnace. This pig iron is converted into steel ingots by adding metals like magnesium, nickel etc. as per requirements of the final products. These steel ingots are then sent to rolling mills where they are converted into billets. Billets are then converted into final products in re-rolling mills. Due to absence of iron ore deposits, steel industry in Bangladesh is dependent on import of scraps and billets to produce final products. Bangladesh is a net importer of iron ore; as per ITC trade data Bangladesh imported USD 2054 million worth of iron and steel products, and USD 31 million worth of iron ore and slag in 2015. This contributes to ~5% of total import of the country. [177] However, Bangladesh has now developed capacity to manufacture 90% of its billet requirement locally.

[175] *http://www.thedailystar.net/business/sales-of-reconditioned-cars-getting-popular-in-bangladesh-1530604*
[176] *http://www.business-standard.com/article/companies/bangladesh-firm-keen-to-assemble-tata-small-cars-117092600034_1.html*
[177] *ITC Trade Database*

Sector	Description of raw materials, industrial linkages, and market access
	Bangladesh currently manufactures steel for its domestic consumption only, however due to capacity expansion by steel manufacturers, Bangladesh has also developed potential to export steel products. Heavy machineries are dependent on supply of metals and steel. However the skill and technology requisite for the same are not available in the country. Water front facilities are required for setting up of steel, metal, and heavy machinery manufacturing related industries in the country.
Electrical and Electronics	Electrical and electronics sector consists of various end products such as cables, electrical appliances, switches, white goods, electronics appliances and goods. This sector caters to both household requirements as well as industrial requirements in sectors such as ship building, heavy machineries & equipment, and light machinery. Size of this sector is BDT 150 billion, out of which ~BDT 70-80 billion is met through domestic production.[178] Raw materials for this sector is diversified and dependent on industrial linkages of various sectors. Products from plastic and rubber industries are used as base for production of switches and cables. Products from metal based industries are used for electrical wiring. Electronics sector has a fragmented value chain spread across various geographic locations. Spare parts of electronics sector (such as compressor, coil, and circuit) are sourced through import from India, China, Thailand, Singapore, and Malaysia. In addition to assembling of the spare parts, manufacturing of spare parts are also available in the country.[179] The country's import in computer and telecommunication devices has been growing with negligible export. Growth in this sector is primarily attributed to the growing consumption pattern countrywide. Singapore, Malaysia, China, and India are the major supplier of spare parts and accessories. Major produces from this sector (such as electronic appliances like AC, fridge, TV, computer and peripherals; electrical fittings, cables, and lighting) are consumed locally. Electrical and Electronics products manufactured locally are comparatively cheaper as compared to the products being manufactured by large brands (such as Sony, Samsung, Hitachi). Walton is the major player in electronics segment in Bangladesh with a market share of ~70%-80%. Local manufacturers hold minuscule share of market and they fail to enjoy economies of scale. Since the output from this sector are cost beneficial as compared to the product offerings of international brands, this sector mostly caters to the domestic demand. Minimal export takes place to India, Africa, Nepal, and Sri Lanka.[180]
Ship Building and Ship Breaking	Shipbuilding industry in Bangladesh is growing; exports earning from this sector in FY 2016-17 was USD 65.61 million, whereas in FY 2012-13 it was USD 5.73 million.[181] However, Bangladesh is still a net importer of end products of shipbuilding industry, with imports of USD 155 million in 2016.[182] The most imported items in Bangladesh are cruise ships, excursion boats, ferry boats, cargo boats; and light vessels, fire-floats, and dredgers. There are currently 300 shipyards operating in Bangladesh where 0.3 million people are employed.[183] Approximately 70% of the yards are located in and around Dhaka and Narayanganj along the side of the river banks of the Buriganga, Shitalakha, and Meghna. About 20% of the shipyards are in Chittagong division located along the side of the Karnapuli River and 6% are located along the bank of Poshur River of Khulna

[178] *INSPIRED, Electronics Sector Report, EU*
[179] *Primary survey with industry players*
[180] *Primary Survey with industry players*
[181] *https://thefinancialexpress.com.bd/trade/export-earnings-from-shipbuilding-soar-1513396358*
[182] *ITC Trade Database*
[183] *https://thefinancialexpress.com.bd/trade/export-earnings-from-shipbuilding-soar-1513396358*

Sector	Description of raw materials, industrial linkages, and market access
	division, and the remaining 4% are located in Barisal division. Almost all inland, coastal, and bay crossing ships are constructed and repaired locally in these local shipyards.[184] Design stage is the first component in the value chain where the layout of the ship is finalized. Ship production is primarily dependent on using steel plates to manufacture the hull of the ship and installing engines, cables and machines inside the ship. Manufacturing of ship requires designing of ship and availability of power sources. Shipbuilding industry requires input from various other downstream industries such as light engineering, chemicals (paints and adhesives), and steel. At present, Bangladesh has limited participation at the design stage of the value chain, which requires skilled manpower. Bangladesh shipbuilders (due to lack of specialised skillset) are supplied with designs by foreign ship owners. From the input perspective, inputs such as steel plates, switch boards, steel cables, and power transformers, are procured locally, whereas engines are imported exclusively. With regard to steel, which is the primary input necessary for the industry, Bangladesh is import-dependent. This is because maximum steel rolling mills in Bangladesh are focussed towards producing long bars which have a higher demand from the construction industry and Bangladesh has a limited steel plate producing capacity. The coast line of Bangladesh is also conducive for setting up ship breaking industry which primarily requires cheap labor. Shipyards in India, Pakistan and Bangladesh comprise around 80% of global breaking and recycling market.[185] The biggest ship recycling yard out of these 3 countries is in Chittagong, which recycled 230 ships in 2017.[186] Basis primary interaction and sectoral research, it was understood that Bangladesh gets 60% of its steel supply from ship breaking industry, which is used in iron, steel, light engineering and equipment manufacturing industries.
Petroleum products (including bottling)	Petroleum sector in Bangladesh is exhibiting historical annual growth trend of 10%.[187] Gross value added in this sector is estimated at BDT 1309 billion.[188] Bangladesh is a major importer of petroleum products. Based on the petroleum and petroleum based products (such as LPG, LNG, and polymers), gas refining, storage and bottling facilities have been developed in water front locations mostly located near the sea sides of the country. Imported volume of POL (petrol, oil, lubricants) products has clocked 4.1 million MT (2016).[189] Based on extraction of crude oil, distillation and polymerization takes place to manufacture various downstream products such as lube oil, plastic, and rubber. Since there is no crude oil reserve in this country, Bangladesh is not present across the value chain of this sector. Crude oil is mostly being imported from gulf countries. Setting up of oil refineries is highly capital intensive and it involves usage of advanced technologies and heavy machineries. Further, highly skilled and specialized manpower is essential towards smooth functioning of this sector. Basis primary survey with industry players, Bangladesh lacks in terms of availability of highly skilled manpower; as a result of which, Bangladesh is present in less technologically challenging aspects in the value chain of this sector. There are various local players manufacturing lube oil and blended oil which

[184] *Japan Bangla Business Center. 2014. A Report on Shipbuilding Industry of Bangladesh.*
[185] *http://www.atimes.com/article/shipbreaking-asia-profit-price/*
[186] *http://www.atimes.com/article/shipbreaking-asia-profit-price/*
[187] *http://fpd-bd.com/wp-content/uploads/2016/10/Research-Report-on-Energy-Sector-of-Bangladesh-Initiation-Mar-15-11.pdf*
[188] *Survey of Manufacturing Industries by Bangladesh Bureau of Statistics*
[189] *Bangladesh Petroleum Corporation*

Sector	Description of raw materials, industrial linkages, and market access
	are primarily consumed in sectors such as automobile, heavy engineering, and light machinery. LPG based cylinders are bottled in cylinders for industrial, commercial, and domestic supply. This sector caters to the local demand and not export oriented.
Pharmaceuticals	Pharmaceuticals is one of the most popular industry sector in the country; gross value added from this sector is BDT 113 billion yearly.[190] Domestic market has been estimated at ~USD 2 billion (2016) with an indicative growth rate of 15% annually.[191] Pharmaceuticals is a highly research and development oriented industry where regulatory aspects (like drug laws, patent issues, and affiliation with drug agencies) play key role. From basic chemicals and other products (like herbal contents), Active Pharmaceutical Ingredients (APIs) are manufactured. APIs are the key ingredients for drug manufacturing. Active Pharmaceutical Ingredients (APIs) of Pharmaceutical sector is sourced through import owing to quality issues and lack of API manufacturing ecosystem in the country. Basis primary survey, Bangladesh has commenced API manufacturing, but the production is not sufficient to cater to the economies of scale (~10% APIs are locally sourced). Also, owing to lack of educational ecosystem and lack of research facilities, Bangladesh is limited in R&D and sourcing of skilled technicians in this sector. Chemicals and various ingredients of drug are imported (from various markets spread across USA, Europe, and Asia) and end products (drugs) are being manufactured in this country. Dhaka and the surrounding region has evolved as a hub for pharmaceutical manufacturing with majority of the pharmaceutical units are located in this region. Basis primary survey with industry players, lack of adequate educational system related to pharmaceutical sector and availability of skilled human resources are major challenges that this sector is facing. End products of this industry primarily caters to domestic demand and minuscule export takes place (mostly to Africa and LDC countries).
Light Machinery, Equipment and Furniture	This sector involves production of mechanical equipment, agricultural machinery, bicycles, and furniture. Produces from this sector is predominantly used for catering to domestic demand. This is an important industry in Bangladesh as it provides backward and forward linkages to all other industries. Light machinery sector provides support for operation and maintenance of heavy machines through production of spare parts, castings, moulds, dies, fittings etc. As per information provided by Bangladesh Investment Development Authority (BIDA) there are currently 40,000 light engineering units/workshops scattered across Bangladesh. These industries develop in vicinity of industrial clusters in order to provide support to large scale capital intensive factories requiring heavy machinery. Products manufactured by this sector can be made out of rubber, ceramics, metals or plastic. Exporters from countries like China, Japan and Korea are developing light engineering facilities in Bangladesh in order to cater to export market. Raw materials are steel scraps, components of plastic and rubber, and wood. Basis primary interaction, we were informed that steel scrap is sourced primarily from ship breaking industries (located in Chittagong and Narayanganj). Other raw materials (such as articles made of plastic and rubber) are sourced locally; Bangladesh doesn't produce good quality wood required for manufacturing of furniture. Since, wood available in Bangladesh are high in moisture and fibre content and is not fit for processing.

[190] *Survey of Manufacturing Industries 2012, Bangladesh Bureau of Statistics*
[191] https://www.jetro.go.jp/ext_images/world/asia/bd/seminar_reports/20160413/p4.pdf

Sector	Description of raw materials, industrial linkages, and market access
	Bicycle sector in Bangladesh participates in the entire value chain (assembling and manufacturing). Manufacturers focused on export are completely import dependent for raw material sourcing. According to them, quality raw material fit for export is not available locally. However, majority of manufacturers are focused on catering to domestic demand.

Above table describes sector wise dependency on raw material sourcing and major markets. It is evident that across the industry sectors, Bangladesh is a net importer for major raw materials and intermediaries; Bangladesh is primarily focusing on domestic supply and negligible export takes place in all sectors apart from RMG and F&B. As a next step, during primary survey with industry players and with industry associations, pre-requisites in terms of logistics, utility sourcing, and dependency on manpower have been assessed. Table in the next page covers the dependency of each sector on various factors of production.

Table 25: Sector Specific dependency on Factors of Production

Industries	Import Dependency	Export Dependency	Land Transport	Air Transport	Water Transport	Access to Water Front	Electricity Requirement	Water Requirement	Gas Requirement	Labor dependency	Area Sensitivity
Textiles & RMG	High	High	Moderately High	Moderately Low	Moderately High	Low	High	Moderate	Low	High	Low
Food and Beverages	Moderate	Moderately High	Moderately High	Moderate	Moderately High	Moderately Low	Moderate	Moderate	Moderate	Moderate	Moderate
Agro Based Products	Low	Moderate	Moderately High	Moderately Low	Moderate	Moderate	Moderate	Moderate	Moderately Low	Moderately High	Moderate
Leather and Leather Products	Moderately Low	High	Moderately High	Low	Moderately High	Low	Moderately Low	Moderately High	Moderately Low	Moderately High	Moderate
Plastic and Rubber	Moderately High	Moderately Low	Moderate	Low	Moderately Low	Low	Moderate	Moderate	Moderately High	Moderately High	Moderate
Paper and Packaging	Moderate	Moderately Low	Moderate	Low	Moderately Low	Low	High	High	Moderate	Low	Moderately Low
Chemicals	High	Moderately Low	Moderate	Moderate	Moderately High	Moderately High	High	High	Moderate	Low	Moderately High
Non-Metallic Minerals	High	Moderate	Moderate	Low	High	High	High	Low	High	High	High
Automobile and Accessories	High	Low	Moderate	Moderately Low	Moderately Low	Low	Moderate	Low	Moderately Low	Moderately High	High
Heavy Machinery, Iron, Steel and Metal	High	Low	Moderate	Low	High	High	High	Moderate	High	High	High
Electrical and Electronics	High	Low	Moderately High	Moderately Low	Moderately Low	Low	Low	Low	Low	Moderate	Low
Ship Building and Ship Breaking	High	Moderately High	Moderately Low	Low	High	High	High	Low	Moderately High	High	High
Petroleum Products (including Bottling)	High	Moderately Low	Moderate	Low	High	High	High	Low	Moderate	Moderate	High
Pharmaceuticals	High	High	Moderate	Moderately High	Moderately High	Moderate	High	High	Moderately High	High	Moderately High
Light Machinery, Equipment and Furniture	Moderately Low	Moderate	Moderately High	Moderately Low	Low	Low	Moderately Low	Moderate	Moderate	Moderate	Moderate

Table in the previous page captures a heat map, which highlights the dependency of each sector on various factors of production. Further, project site and influence region (surrounding the project site) specific assessment is undertaken to assess the economic profiling, natural resources, industrial development, and backward/ forward linkages prevailing in the region. Assimilating the outcome of regional assessment with the site specific attributes related to factors of production, compatibility of initial universe of industries in site surrounding context would be assessed. Outcome of this assessment would result in the initial shortlist of industries.
Next section captures the regional assessment involving economic profiling, natural resources, and industrial linkages prevailing in the influence region surrounding the proposed EZ.

4.5. Regional Assessment

This section assesses the region surrounding Feni district in terms of the following:

- Agricultural and natural resources,
- Industrial development,
- Analysis of manpower sourcing to the proposed EZ

In Chapter 3, detailed location assessment captures inherent features owing to location and proximity to upcoming infrastructure projects (such as upgradation of Dhaka Chittagong Highway, Mirsarai Integrated Industrial City by BEZA, Matarbari Power project, and other upcoming infrastructure development projects in this region). Outcome of this regional assessment shall capture if the initially shortlisted industries are suitable for establishment in the proposed EZ based on factors of production.

Border adjoining districts of Feni district have been considered as the immediate influence region for the proposed EZ. These districts are the neighbouring districts of the proposed EZ and could have major influence on the industries in the proposed EZ from the aspects of local supply of raw materials and industrial linkages. This influence region consists of the following districts:

- Feni
- Chittagong
- Comilla
- Noakhali

Feni district shares its border with Indian state of Tripura on northern and north-eastern side. Belonia land port connects Feni district with Tripura; proximity to India enables smooth trade linkage between India and the proposed EZ. Since the proposed EZ shares border with Mirsarai Integrated Industrial City by BEZA, it is also expected to gain from the industrial linkage with the upcoming Mirsarai Integrated Industrial City by BEZA.

4.5.1. Key Characteristics of Influence Region

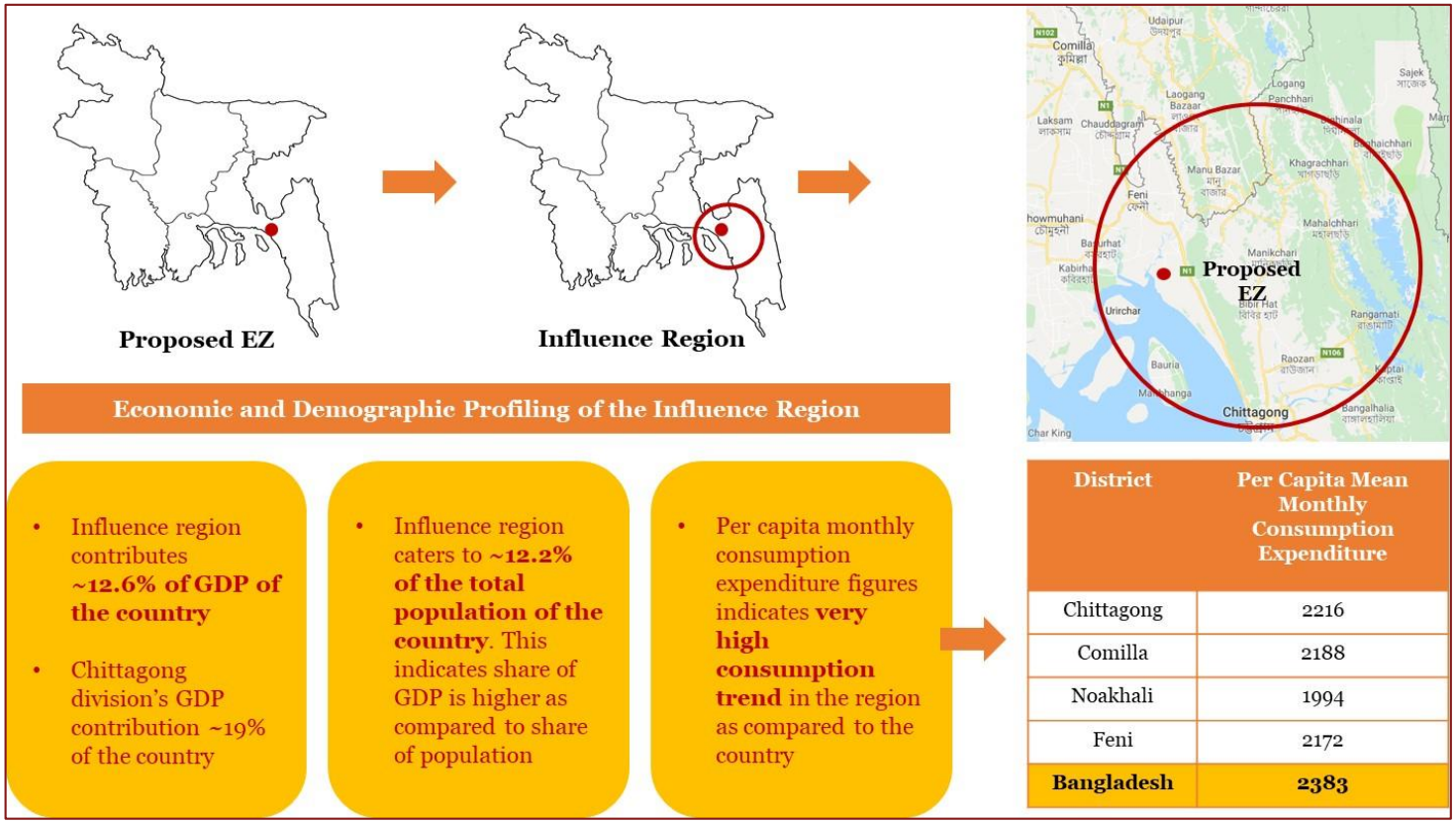
The proposed EZ site is located in Sonagazi Upazila of Feni district. This district (and the influence region) is adjacent to the industrial hub and commercial capital of Bangladesh i.e. Chittagong.

Economy of Feni district is predominantly agricultural. ~54% holdings of this district are farms. Total area under agriculture in this district is 106,689 acres, and the agricultural produces per acre is 2.99 MT per year.[192]

Figure on the next page captures profiling of the influence region based on demographic and economic indicators.

[192] *Bangladesh district statistics, 2011*

Figure 30: Economic and Demographic profiling of the influence region[193]



District	Per Capita Mean Monthly Consumption Expenditure
Chittagong	2216
Comilla	2188
Noakhali	1994
Feni	2172
Bangladesh	**2383**

Figure on the left indicates that the influence region is doing excellent economically. Share of GDP is more than the share of population in this region, which indicates that economic and industrial activities are significantly taking place in this region. This may be attributed to the proximity of Chittagong (commercial and industrial powerhouse of the country).

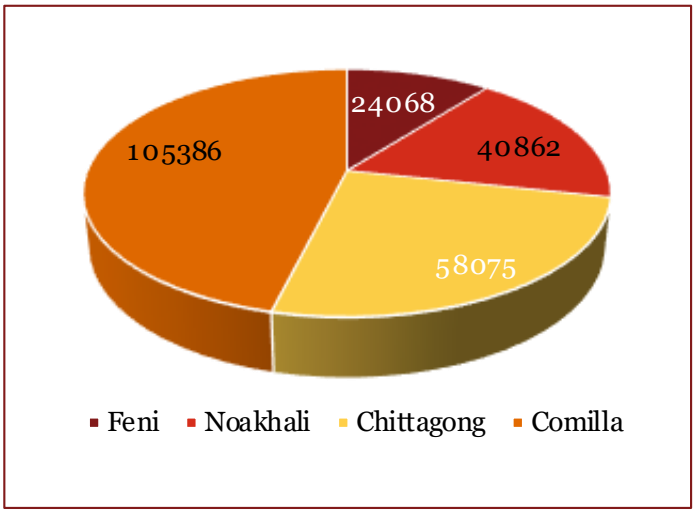
Per capita monthly consumption expenditure figures indicate that the economic condition and spending pattern of the population is significantly higher as compared to the country average. It can be expected that the immediate vicinity of the proposed EZ may shape up as a good market place to supply finished products.

Proposed EZ could act as catalyst towards transforming the overall industrial and economic outlook of this district.

[193] *Source: Secondary Research (Lagging Region's Study, District Statistics, World Bank) and PwC Analysis*

Significant trend of expenditure pattern may be attributed to the fact that overseas employment in the influence region is very high, which result in high inflow of foreign remittance. Following table elucidates the overseas employment breakdown in the influence region.

Figure 31: Overseas employment numbers (2017) in the influence region



District	Overseas Employment (as % of country level figure)
Feni	2.4%
Noakhali	4.1%
Chittagong	5.8%
Comilla	10.6%
Total	**22.9%**

Source: http://www.bmet.gov.bd/BMET/viewStatReport.action?reportnumber=37

Higher overseas employment in this influence region is duly backed up by lower poverty level. Poverty levels (in % terms of the total population) of these four districts are mentioned below. These figures are lower than the country average (24.3%).

- Comilla- 13.5%
- Noakhali- 23.3%
- Feni- 8.1%
- Chittagong- 13.7%

Economic and demographic profiling of this influence region indicates relative affluence of this region in terms of spending power, poverty level, and consumption pattern. Owing to higher spending power and disposable income, the demand for consumable items are higher in this region. Proposed EZ is located in between Dhaka (the capital city) and Chittagong (the commercial capital) on the alignment of Dhaka-Chittagong highway (the major spine of the country). Due to attractive location and access to two most important marketplaces of the country, proposed EZ is poised to gain significantly from the economic prowess of the influence region and Chittagong division.

4.5.2. Raw Materials and Natural Resources available in the Influence Region

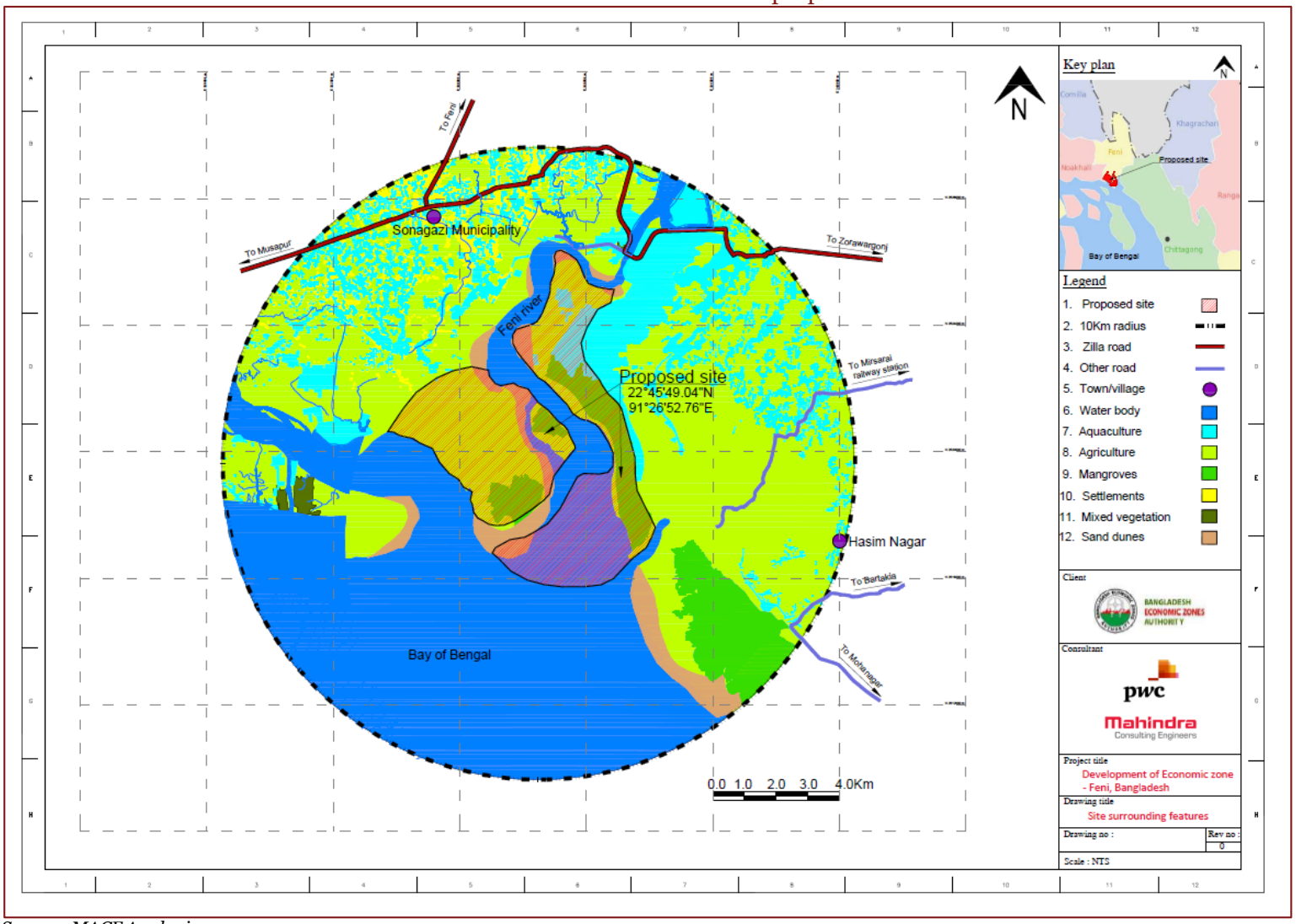
Agricultural and natural resources in Feni district

An analysis of district statistics report, 2011 of Bangladesh, reveals that Feni district witnesses production of rice (283,745 MT), potatoes (10,443 MT), fish (7,889 MT), Sugarcane (4,365 MT), Banana (3,280 MT), Jackfruit (2,935 MT), Radish (2,234 MT), Mango (1,800 MT), and other agricultural products (such as Arum, Brinjal, Pumpkin, Oil Seed, Tomato etc.). However, agricultural production in this district is lower as compared to other surrounding districts.

Agricultural produces in this district mostly cater to the internal demand of this district. In addition to the agricultural resources in this district, various species of sea and fresh water fish are available in Feni district. Feni being a coastal area, has plenty of sea fish; major supply of fish comes from ponds, canals, and low lying areas in this district.

Figure in the next page indicates settlement profile of the immediate vicinity of the project site (at a radius of 10 km). It indicates that mostly agricultural and aquaculture activities are ongoing in the immediate vicinity of the project site.

Table 26: Settlement Profile of the proposed EZ



Source: MACE Analysis

Agricultural and natural resources in the influence region

Economy of **Noakhali district** is predominantly agriculture dependent. ~65% holdings of this district are farms which produce various agricultural products such as local and hybrid rice, wheat, vegetables, spices, pulses, betel leaves, betel nuts, mango, banana, jackfruit, and coconut. Other agricultural produces in this district include timber and forest trees, fish of various varieties.[194]

Agricultural products of **Chittagong and Comilla districts** are indicated in the table below:

Table 27: Agricultural and natural resources in Chittagong and Comilla districts (figures are in MT annual production)

Crops/ Resources	Chittagong	Comilla
Rice	1,262,074	791,000
Potatoes	309,419	73,567
Fish	80,023	36,378
Radish	30,793	22,740
Tomato	26,218	11,754
Cabbage	22,763	
Cauliflower	18,762	
Mango	11,392	15,138
Jackfruit		35,781
Sugarcane		12,404

Source: Bangladesh Bureau of Statistics - District Statistics

Chittagong and Comilla districts produce rice, potatoes, fish, radish, tomato, and mango in abundance.

Rice, Fish, and other agro based resources are available in the influence region. These agricultural and fish based resources can provide steady supply of raw materials to the proposed EZ. However, possibility of agro based and food processing industries for the proposed EZ is subjected to suitability of the project site based on assessment of factors of production.

Mineral resources in the influence region

Bangladesh is not a mineral rich nation. Following figure (in the next page) captures the mineral map of the country outlining the influence region.[195]

[194] *Bangladesh Bureau of Statistics- District Statistics*
[195] *https://www.omicsonline.org/open-access/present-scenario-of-renewable-and-non-renewable-resources-in-bangladesh-2151-6219.1000134.pdf*

Figure 32: Mineral Map of Bangladesh

Source: http://en.banglapedia.org/index.php?title=Mineral_Resources

Figure on the left indicates that in the influence region of the proposed EZ, natural gas is available in various locations such as Feni, Begumganj, Semutang, and Bakhrabad. Limestone deposits are available in Sitakund and glass sand is available in Chauddagram.

In the country, natural gas is a very useful input which is primarily used as fuel to generate electricity. Limestone is a key raw material towards cement production and glass sand (silica) is used as raw material in glass industry.

Although gas pipeline is not available in proximity to the project site, in Sundalpur (of Noakhali district), natural gas exploration project was undertaken. Cost towards this exploration project is ~BDT 736.5 million. It is estimated that everyday ~10-12 million cubic feet natural gas is extracted. From 2012 onwards, everyday ~10 MVA gas supply is taking place.

It becomes evident that presence of natural gas exploration fields in this region generates the possibility of gas availability in the proposed EZ. However, as on date there is no gas supply network in the vicinity of the project site.

Availability of other raw materials (limestone and glass sand) shall foster the possibility of non-metallic mineral production in the proposed EZ.

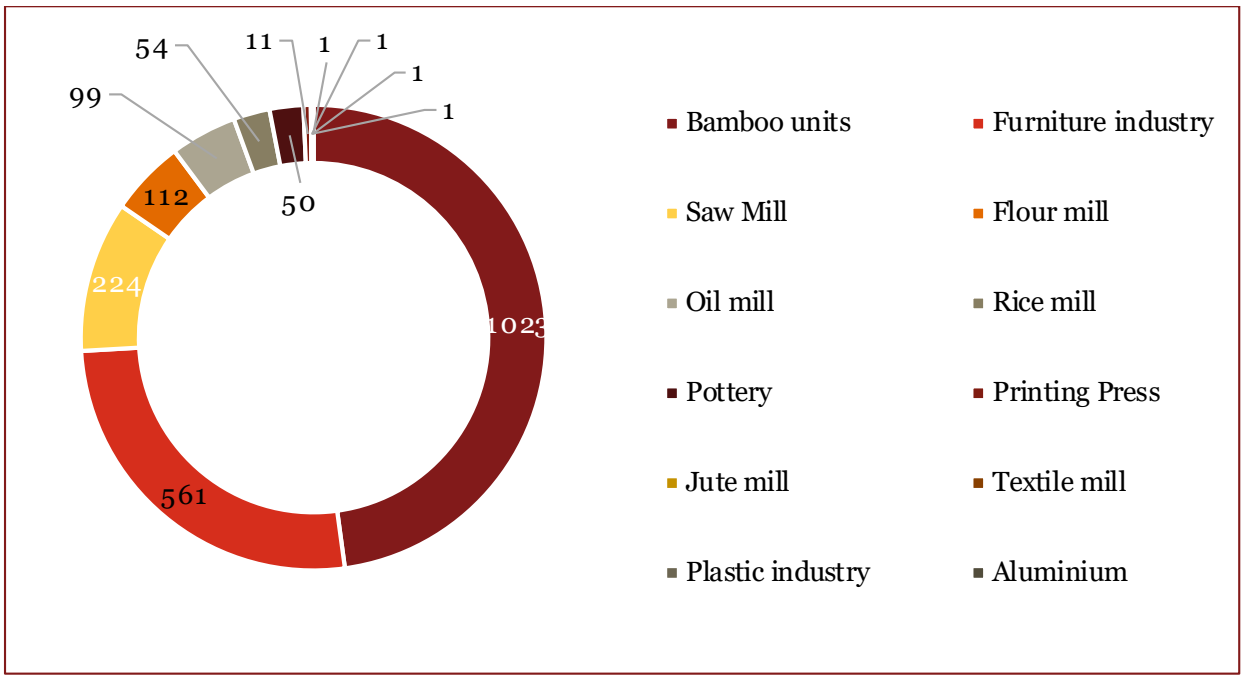
4.5.3. Industries in vicinity of proposed EZ location

Industrial ecosystem in Feni district

Significant Industrial development is yet to take place in this district. District Statistics reveal that there are a total of 3,557 manufacturing related establishments employing 22,223 (~1.5% of total population of this district).

Figure in the next page outlines the industrial snapshot in this district. It becomes evident that furniture, light engineering, and food processing related industries have developed in this district.

Figure 33: Industrial snapshot of Feni district (figures in numbers of establishments)



Source: Bangladesh Bureau of Statistics- District Statistics

Industrial ecosystem in this region

Industrial snapshot (breakdown of industrial establishments) in the surrounding **Comilla district** is indicated below:[196]

- Husking mill- 77%
- Furniture industry- 12%
- Rice mill- 4%
- Bamboo units- 3%
- Handicraft- 1%
- Saw Mill- 1%

Above table indicates that in the surrounding district, industrial establishments related to agro based, salt processing, furniture, and handicraft have proliferated.

Noakhali district has not witnessed significant industrial development. Most prominent industrial establishments in this district are:

- Delta Jute Mills
- Habib Vegetable Products
- Al Amin Bread and Biscuits
- Globe Agro Fisheries
- Al Amin Fisheries

Proposed EZ can harness the benefit of already developed industrial ecosystem and steady supply of raw materials in the influence region.

[196] *District Statistics- Bangladesh Bureau of Statistics*

Chittagong: Commercial Capital of Bangladesh

The industries in this region have flourished owing to the development of Chittagong Port. Approximately 80%-85% of international trade in Bangladesh is facilitated through Chittagong sea-port, thereby making this district industrial hub of Bangladesh.

Chittagong, the second largest city of Bangladesh is also the "Commercial Capital" of Bangladesh. It has earned a significant status of the second important City in the country owing to the location of Chittagong Port, diversified economic and industrial activities and strategic geographical location.[197]

Chittagong is the major contributor to the country's export and import trade. Following table captures the economic importance of the Chittagong district.

Table 28: Economic importance of Chittagong at a glance

Economic importance of Chittagong at a glance	
Export through Chittagong	75 % of the country's total export trade
Import through Chittagong	80 % of the country's total import trade
Revenue growth	More than 60 % of total revenue
GDP contribution	12% ($25.5 billion)
Sea port	1 Nos.
International Airport	1 Nos.
EPZ	3 Nos.

Source: Chittagong District website, <www.chittagong.gov.bd/>

Major Manufacturing Industries include Eastern Refinery, Pahartali Railway Workshops, Fouzi Flour mill, Jamuna Oil Company, Glaxo Welcome, Lever Brothers, and KDS Garments etc.

Fuel deposit of Padma Oil Company Ltd., Jamuna Oil Company Ltd., Meghna Oil Company Ltd., International Oil Tankers Ltd., Food Silo, Heidelberg cement Bangladesh Ltd., TSP Fertilizer Factory, LP Gas Ltd, Petro Bangla Chittagong Refinery, NGS Cement Ltd., Eastern Refinery Ltd. (ERL), CEPZ Area are located in Patenga Heavy Industrial Zone. On the other side of river, Karnaphuli Fertilizer Company Limited (KAFCO), Anwara 1300 MW Power plant, Shikalbaha Power Station, National cement Factory Ltd., Super Petro Chemicals, Star Cement, and Chittagong Urea Fertilizer Factory (CUFL) are situated at Anowara. Following table captures a brief snapshot of the industrial landscape of entire Chittagong district.

Table 29: Industrial landscape of Chittagong district

Type	Number
Heavy Industries	328
Small Industries	4323
Major Industrial Units	Shipping industry in Shitakunda, Eastern Refinery, KAFCO, CUFL, THP Complex, Pahartali Railway Workshop, Yamuna Oil, PHP Float Glass, Unilever, Glaxo etc.
Jute Mill	24
Government Textile mill	5
Cement Factory	10
Garments and Textile Factory	647
EPZ	3 (Govt.-1; Private-2)

[197] *Hashemi, Kazi Mobassher Ahmed. "City report of Chittagong." Asian Urban Information centre of Kobe (AUICK) First workshop, japan. 2006.*

Type	Number
Oil Refinery	1
Rubber Garden	8
Fertilizer Industries	3
Tea Gardens	23
Leather Industries	19
Shipping related industries	110
Multinational Companies	12
International Companies (Office in Chittagong)	628

Source: Chittagong District website, <www.chittagong.gov.bd/>

Govt. of Bangladesh is developing Strategic Assets in this region to uplift the industrial development

Following key infrastructure development projects are being undertaken by GoB towards overall improvement of socio-economic condition of this region.

Marine Drive Road along with the coastal area from Feni to Chittagong Port

A four lane road along with the coastal area from Feni (100 km. from Chittagong city) to the Chittagong port is undertaken to be constructed by the government. Completion of this marine drive could help attract more foreign tourists in the country and particularly in Chittagong.

Upgrading Dhaka-Chittagong highway to four lanes & doubling of railway lines

Recently, Dhaka-Chittagong Highway was upgraded to 4 lanes to ensure fast and smooth conveyance of goods and passengers between Dhaka and Chittagong. It is also planned to make the railway line double tracked between Dhaka and Chittagong.

3rd Karnaphuli Bridge

Government is also actively contemplating the construction of a 3rd Karnaphuli Bridge over the river Karnaphuli to promote investment on the other side of the river.

Karnaphuli Tunnel project

Most of country's export and import activities are being carried out through Chittagong Port situated in the mouth of the Karnaphuli River. The proposed Tunnel will connect the Chittagong Port City directly with other side of the Karnaphuli River & indirectly with other parts of the country through Dhaka-Chittagong-Cox's Bazar Highway. The width of the river at the site of the proposed Tunnel is 700 meters and the water depth is 9-11 meters. The indicative length of the proposed Tunnel is 2000 meters.[198] [199]

Access to already developed industrial ecosystem in Chittagong shall ensure forward/ backward linkages in the proposed EZ pertaining to various industries such as Textile/ RMG, Electrical & Electronics, Heavy industries (like steel, heavy machineries, shipbuilding etc.)

Once the proposed infrastructure surrounding this region is operational, proposed EZ is expected to get a boost towards industrial development duly supported by the upcoming infrastructure projects in this region facilitating smooth cargo movement.

Economic Importance of Chittagong Port

Following key infrastructure development projects are being undertaken by GoB towards overall improvement of socio-economic condition of this region.

[198] *http://www.bba.gov.bd/construction-of-multi-lane-tunnel-under-the-river-karnaphuli-at-chittagong-city/*
[199] *http://bba-beta.dayspringltd.com/wp-content/uploads/2015/01/Karnaphuli_tunnel_Feasibility-study-report.pdf*

Chittagong port is the World's only natural sea port. Its strategic location makes it a hub for global business houses. Chittagong port has been able to show a marked improvement in handling of containers and optimising the utilisation of berths and yards by making it easier for the country to become an economic gateway to South Asia.

Chittagong Port is the major seaport of Bangladesh. The GDP growth of Bangladesh economy is around 6-7% while the container traffic growth of Chittagong Port is about double of GDP rate at 14%. It provides a major gateway for the country's trade with the outside world.

In 2016-17, Chittagong Port has handled 66.46 MT of import cargo and 67.10 MT of export cargo.[200] Chittagong Port handles around 90% of total maritime trade of Bangladesh and around 80%-85% of total foreign trade of the country.[201]

To meet the challenges of globalization and liberalization of world trade and economy, Chittagong Port has undertaken several projects to enhance its capacity, improve efficiency and quality of services and also to develop adequate facilities to turn itself into a world class regional port.

Access to the major port of the country shall encourage export oriented industries to set up units in the proposed EZ.

Access to Export Processing Zones

Export Processing Zones (EPZs) in Bangladesh house various foreign and domestic industrial establishments which are completely export oriented. Proximity to these EPZs foster the possibility of downstream industrial linkages.

Proposed EZ is located at a distance of ~55 km from Comilla EPZ and at a distance of ~95 km from Chittagong EPZ and Karnaphuli EPZ. Industrial profiling of these three EPZs is placed in the following table.

Table 30: EPZ within 100 km radius from the proposed EZ

Comilla EPZ	Textile & RMG, Plastic, Chemicals, Leather & Footwear, Electronics & Electrical Products, Paper
Chittagong EPZ	Textile & RMG, Metal Products, Electronics & Electrical Products, Leather & Footwear
Karnaphuli EPZ	Textile & RMG, Metal Products, Electronics & Electrical Products, Leather & Footwear, Light Engineering & Furniture

Source: BEPZA website

Proposed EZ has good access to these EPZs through Dhaka-Chittagong Highway. Downstream linkages from the above mentioned industries could be potential for the proposed EZ.

Proximity to Mirsarai Integrated Industrial City

As mentioned earlier, BEZA has envisaged setting up of Mirsarai Integrated Industrial City spread over 30,000 acres. It is located adjacent to the proposed EZ sharing common boundary. Basis discussion with BEZA officials, ~13,000 acres of land acquisition is completed and lease agreement signing is completed for ~4,000 acres of land area. In 2018 and 2019, it is expected that full land acquisition will be completed and subsequently plot allocation for the full land parcel shall be completed.

Leading industrialists from various sectors such as Textile/ RMG, ceramics, chemicals, power have expressed interest in setting up industrial units in the upcoming Mirsarai Integrated Industrial City. In addition to the industrial powerhouses, plot allocation to Bangladesh Export Processing Zones Authority (BEPZA), Govt. of India, and multiple foreign entities have been allocated land plots.

[200] *Data from Chittagong Port Authority*
[201] *Chittagong Port Authority, < http://cpa.gov.bd/ >*

Once this Mirsarai Integrated Industrial City is operational, owing to geographical proximity, it shall enable industrial linkages to the proposed EZ. Basis mutual trade linkage and industrial relationship, this region is expected to shape up as an industrial powerhouse.

Competition generated due to the upcoming Mirsarai Integrated Industrial City has been captured while assessing the demand projection for the proposed EZ.

4.5.4. Proximity to India shall facilitate Trade Linkages

Feni district is surrounded by Indian state of Tripura on the North Eastern side. Foreign trade linkage between Tripura and Bangladesh takes place through various land ports such as Akhaura, Bibirbazar, and Belonia. Out of these three land ports, Belonia land port is the closest. Detailed assessment of these three land ports is captured in the location assessment chapter.

Significant aspect of Tripura's location is that this state shares 856 km long border with Bangladesh, which is about 84% of the perimeter of the state.[202] Distance between Agartala (capital city of Tripura) and Kolkata is ~1570 km through India; however, through Bangladesh, direct distance is only 350 km. Once the Bangladesh Bhutan India Nepal (BBIN) Motor Vehicle Agreement comes into effect, foreign trade between Tripura and Bangladesh shall be augmented to a significant extent.

Proximity to India shall enable the proposed EZ to have access to raw materials and industries in Tripura and it shall also foster the possibility of access to Indian market.

Agro climatic conditions of Tripura is conducive for agricultural production. Major crops cultivated in Tripura are: Rice, Maize, Pulses, Sugarcane, potato, fruits (such as Pineapple, Jackfruit, Orange, Cashew, and Coconut), and spices (ginger, turmeric, chili, and black pepper). Based on the agricultural produces, agro export zone and modern food park are being set up in this state. Tripura also has potential for meat processing sector.[203]

In addition to dominance of food processing sector in this area, Tripura is known for tea cultivation. There are around 55 Tea Estates and 4,350 small tea growers, producing about 8.9 million kg of tea every year.[204]

Tripura has abundance of natural gas reserve; this offers the possibility of setting up of gas based industries in this area. Other mineral resources (such as glass sands, limestone, plastic clay and hard rock) are also available in this state. Industries dependent on these raw materials (like Cement, Glass etc.) can easily be set up in Tripura.[205]

Proposed EZ can utilize the proximity to Tripura by having access to its abundance natural resources as raw materials for industrial production.

4.5.5. Assessment of Manpower Sourcing

Basis interactions with heads of educational heads during site visit, we were informed that unskilled manpower can be sourced from Sonagazi upazila and nearby villages. Primary survey with investors reveals migration of unskilled labor is not a constraint in Bangladesh context. Thus, sourcing of unskilled human resources is not a challenge. Following depicts assessment on sourcing of semi-skilled manpower to the proposed EZ.

The average literacy rate in Feni district is 59.6% which is above the national average of 51.77%.[206] A study of Technical and Vocational Education and Training (TVET) Institution Census 2015 reveals that Feni district has 109 TVET institutes having the following breakup –

Table 31: TVET institutes in Feni

Type of Institute	Number of establishments
Polytechnic Institutes	6

[202] *http://industries.tripura.gov.in/about_tripura*
[203] *http://industries.tripura.gov.in/food*
[204] *http://industries.tripura.gov.in/tea*
[205] *http://industries.tripura.gov.in/gas*
[206] *Statistical Yearbook of Bangladesh, 2016*

Type of Institute	Number of establishments
HSC (Business Management)	3
Training Institute (Basic skill development)	66
Vocational Secondary Education	1
General Secondary School (Attached vocational education)	12
Agriculture Training Institute	1
Nursing Institute	1
Union Digital Centre (UDC)	3
Technical School and College	1
Office (Training)	15
Total	**109**

Source: PwC Research

These institutes offer diploma courses in Computers, Graphic Designing, Architecture, Power Systems, Civil, Telecommunications, Electronics and Electrical, Dress Making etc. Certain vocational courses like Food Processing and Preservation and Dress Making and tailoring, Refrigeration and AC repair are gaining traction among students. Computer education is the most sought after course for students.

Prominent TVET Institutes in the district

Below is a brief overview of Feni's popular institutes –

Feni Polytechnic Institute – It is a polytechnic institute offering diploma courses in Civil, Electronics and Electrical, Architecture and Power generation. Each course has a tenure of 4 years, with around 240 students in each batch of each course. Students taking up courses related to electrical and electronics and power generation vie to get jobs in government departments like Rural Electricity Board. GoB is the most sought after employer in Bangladesh. Students prefer not to stay in Feni and either go overseas in search of employment or travel to regions like Dhaka and Chittagong.

Feni Technical School and College – It is a Technical School offering diploma courses in Electronics and Electrical, Computers, Refrigeration and AC repair, clothing and garments. Each course has a tenure of 4 years and there are around 120 students in each batch of each course. All the courses offered in this college are in great demand and every year the college witnesses 100% registrations. As per the principal of this college, after completing their education, students migrate from Feni for higher education and travel overseas in search of employment.

In Bangladesh, each Upazila has an Upazila Youth Development Officer, who is responsible for providing short term courses (ranging from 7-90 days) to young people of the Upazila wishing to learn new skills. As per our discussion with Youth Development Officer of Sonagazi Upazila, it was understood that most popular courses in Sonagazi Upazila are fish culture, stitching, computer training, poultry farming, livestock husbandry, dress making and repair of electronic items like mobiles, refrigerator and AC. It is expected that young people in proximity of proposed EZ location will be skilled in above mentioned trades.

Sufficient educational institutes are available in the region to produce skilled and semi-skilled workers for the proposed EZ. However, there could be a dearth of skilled manpower in the region since majority of the educated class migrate to other regions and overseas in search of employment. Development of proposed EZ site shall go a long way in arresting migration of skilled employees from this region as industries that will come up in the proposed EZ site will generate employment opportunities for local residents within the vicinity of their hometown.

4.5.6. How Proposed EZ can act as Catalyst of Industrial Transformation in Feni District

Once this proposed EZ comes up, it shall act as a catalyst towards industrial transformation in Feni district and the surrounding region.

Investment (local and foreign) trend at the country level is analyzed to forecast the future potential investment figures. Further, potential investment figure at the Feni district level has been estimated based on GDP share (Source: Bangladesh Investment Development Authority and Lagging Districts' Survey). In three scenarios, various cases have been developed considering the proposed EZ can tap 1%, 5%, and 10% of cumulative investment inflow (from 2023 to 2027) in Feni district. Following table elucidates the outcome of this quantitative analysis.

Table 32: Estimated investment inflow in the proposed EZ

Scenarios	Elaboration	Anticipated cumulative investment inflow in Feni district from 2023 to 2027 (USD million)	Projected Cumulative Investment inflow to the proposed EZ (USD million)		
			1%	5%	10%
Conservative	Macro-economic conditions are diminishing and as a result of the same, investment inflow prospects are not sanguine	3577	**36**	**179**	**358**
Base (as-is)	Business as usual scenario	4769	**48**	**238**	**477**
Aggressive	Macro-economic conditions are expected to improve and as a result of the same, investment inflow prospects are good	5962	**60**	**298**	**596**

Source: Secondary Data and PwC Analysis

Above assessment reveals that in worst possible case, USD 36 million of cumulative potential investment can flow into the proposed EZ (from 2023 to 2027) even if the proposed EZ taps 1% of the potential investment inflow to Feni district. In best possible case, proposed EZ could tap USD 596 million investment. Bolstered by these potential investment figures, proposed EZ is poised to shape up as catalyst towards industrial transformation in Perception about the Economic Zone.

4.5.7. Summary of Influence Region Assessment

Above discussions related to an overall holistic assessment of the influence region can be summarized in the following-

1. Consumption expenditure trend in this region is higher than the country average, which indicates that the region surrounding the proposed EZ is developed as a marketplace. This may be attributed to the proximity to Chittagong.
2. Foreign remittance and literacy rate of this region (Feni, Comilla, Chittagong, and Noakhali) show higher than the average trend, which validates the economic superiority of this region.
3. Feni and Comilla are agriculture based economies having various agricultural production.
4. Chittagong is the commercial and industrial powerhouse of Bangladesh. Various industries (such as textile/ RMG, electrical and electronics, cement, steel, heavy machineries, shipbuilding, and furniture) have experienced growth in this area, which might act as downstream linkage for the proposed EZ.
5. Industrial prowess of Chittagong region can be attributed to Chittagong Port (catering to ~80%-85% foreign trade of the country) and various upcoming infrastructure projects planned in this region.

6. Natural gas is available in this region. Also, glass sand and limestone are available. However, suitability for industrial usage needs to be assessed.
7. Upcoming Mirsarai Integrated Industrial City (adjacent to the proposed EZ) can act as a source for industrial linkage; competition generating from this upcoming EZ has been considered in the demand projection exercise.
8. Proximity to Indian state of Tripura shall foster the possibility of sourcing of raw materials and industrial linkages. Tripura has rich agricultural and natural gas sources. Industries developed in Tripura are based on food processing, agro based and gas extraction related.
9. Locally available semi-skilled labor can be employed in the proposed EZ after providing industry specific training.

4.6. Initial Shortlist of Industries

Information from the previous sections provide insights about the pre-requisites of the bucket list of industries, profiling of the region surrounding the proposed EZ in light of economic indicators, natural resources, industrial development, and sourcing of semi-skilled and skilled manpower. This information can be distilled to create a matrix for compatibility mapping.

A compatibility mapping will create an understanding about which industries from among the bucket list of sectors are suitable for the proposed EZ. On basis of this compatibility assessment, a shortlist of industries can be drawn which are most suitable to be developed in the proposed EZ location. This shortlist will contain those specific sectors which are in conformance with the utility, connectivity and other support infrastructure available at the proposed EZ location. This shortlist will further assist in streamlining the primary assessment for which interaction with industry players in the sectors will be required to understand the on ground perception about the proposed EZ location and whether the shortlisted industries are suitable to be developed in the proposed EZ.

A matrix has been created in the next page, to map requirements of each sector with the supporting Backward & Forward linkages, Factors of Production and other prerequisites available at proposed EZ location.

Table 33: Compatibility Mapping

Sector	Access to Backward and Forward Linkage		Access to Factors of Production							
	Access to Raw Material	Access to Markets	Land Connectivity	Air Connectivity	Water Connectivity	Availability of Power	Availability of Water	Availability of Gas	Availability of manpower	Access to Water Front
Features prevailing at proposed EZ site			Last mile connectivity needs to be developed	Moderately Easy to access	Moderately Easy to access	Captive substation needs to be developed	Source for potable water needs to be developed	Not Available; Needs to be developed	Semi-skilled/ Unskilled available; Skilled unavailable	Available
Assessment of pre-requisites of industrial sectors										
Textiles & RMG	Moderately High	Low	Moderately High	Moderately Low	Moderately High	High	Moderate	Low	High	Low
Rationale for selection	• This is an export oriented industry, with already a high global market share. • Sector pre-requisites are met by the proposed EZ for all parameters • This sector requires good access to sea ports in order to cater to global markets • Proposed EZ site is in close proximity to Bangladesh's most important sea port • Skilled, semi-skilled and unskilled labor can be accessed from local area as well as Comilla district • Proposed EZ can provide a conducive ecosystem for growth of industries in this sector, if supporting infrastructure like last mile connectivity is developed									
Food and Beverages	High	High	Moderately High	Moderate	Moderately High	Moderate	Moderate	Moderate	Moderate	Moderately Low
Rationale for rejection	• This industry primarily caters to domestic demand as well as it exports to neighboring countries and countries having significant Bangladeshi immigrants like middle east Asia • Water, the basic ingredient for beverage industry is currently not available at proposed EZ site • Though agriculture is practiced in Feni district, but this region is witnessing gradual shift to industrialization • Mirsarai EZ coming up adjacent to proposed EZ will result in higher demand for industrial goods • Proposed EZ can support industries related to Food & Beverage, however supporting infrastructure in terms of last mile connectivity, water and power sources will have to be developed									
Agro Based Products	High	High	Moderately High	Moderately Low	Moderate	Moderate	Moderate	Moderately Low	Moderately High	Moderate

Sector	Access to Backward and Forward Linkage		Access to Factors of Production							
	Access to Raw Material	Access to Markets	Land Connectivity	Air Connectivity	Water Connectivity	Availability of Power	Availability of Water	Availability of Gas	Availability of manpower	Access to Water Front
Rationale for rejection	• This industry mainly caters to domestic demand • Cash crops like jute, cotton are not grown in the vicinity of proposed EZ area • Proposed EZ will be a huge land parcel of 7,200 acres situated adjacent to another industrial zone in Mirsarai • This will transform the economy of the land from an agro based to an industrial zone • Due to perishable nature of edible crops like wheat, rice, fruits etc. industries in this sector are located close to source of raw material • Establishing an agro based industry in close proximity to the raw material results in lesser wastage and better quality of products due to low lead time • Presently, there is a dearth of potable water at proposed EZ site. This is another challenge for industries in this sector • Proposed EZ site is not suitable for establishing industries related to agro based products									
Leather and Leather Products	Moderately Low	Moderate	Moderately High	Low	Moderately High	Moderately Low	Moderately High	Moderately Low	Moderately High	Low
Rationale for selection	• This industry is mostly export oriented and generates 2nd highest exports after textile & RMG • Apart from raw hides, Bangladesh has also started exporting finished products • Majority of the tanneries in Bangladesh are located in Savar area near Dhaka • Proposed EZ site is located favorably on Dhaka-Chittagong highway which could allow processed leather from tannery to be brought to site for preparing finished goods and then exporting from Chittagong sea port • Proposed EZ site location satisfies the pre-requisites for the industries which prepare finished goods from processed leather as it requires application of adhesive and stitching • To produce high quality finished goods, this sector requires skilled employees • Presently leather industry is established near adjacent district of Comilla from where labors can be sourced • In order to establish industries that can manufacture finished leather products in the proposed EZ, pre-requisites will be developing last mile connectivity to the proposed EZ									
Plastic and Rubber	Low	Moderately High	Moderate	Low	Moderately Low	Moderate	Moderate	Moderately High	Moderately High	Low
Rationale for rejection	• This sector is highly dependent on import of raw material plastic beads, resin etc. for their production • Gas is the primary fuel used in this industry; Proposed EZ, presently does not have any gas source in its vicinity • Plastic and Rubber products are mostly consumed in local markets, industries located in vicinity of Dhaka will be better positioned to cater to domestic demand • Setting up of this industry can be considered in proposed EZ, when gas and power connection is established to the proposed EZ site									
Paper and Packaging	Low	High	Moderate	Low	Moderately Low	High	High	Moderate	Low	Low

Sector	Access to Backward and Forward Linkage		Access to Factors of Production							
	Access to Raw Material	Access to Markets	Land Connectivity	Air Connectivity	Water Connectivity	Availability of Power	Availability of Water	Availability of Gas	Availability of manpower	Access to Water Front
Rationale for selection	• This sector is dependent on import of raw material like pulp, fiber and chemicals • Proposed EZ site is strategically located near Chittagong port and Dhaka-Chittagong highway, from where industries related to this sector can have easy access to imported raw material • Development of Feni-Mirsarai industrial area will witness a rise in demand for packaging products and industries from proposed EZ site can also cater to demand in markets like Dhaka and NE India • Industries in this sector not having high dependency on utilities like power and water can be established at proposed EZ site • Such utilities will have to be developed at Proposed EZ site before industries related to this sector can be established									
Chemicals	Moderate	High	Moderate	Moderate	Moderately High	High	High	Moderate	Low	Moderately High
Rationale for rejection	• There are different types of chemicals having varied utility requirements like fertilizers, adhesives, washing powder, paints, varnishes etc. • Chemical industry have high power and water requirement • Proposed EZ site needs to develop water and power sources in order for it to be possible for such industries to be established									
Non-Metallic Minerals	Low	Moderately High	Moderate	Low	High	High	Low	High	High	High
Rationale for selection	• Non-metallic minerals involve manufacturing of cement, ceramics, glass etc. • For manufacturing of cement, the basic prerequisite is to have a water front access, since all clinker in Bangladesh is currently imported through sea • Manufacturing of ceramics and glass require application of high temperatures for which gas is an indispensable source of fuel • This is a labor intensive industry and labor available locally can be accessed to work in this industry • Proposed EZ site has access to Sandwip Channel, from where vessels carrying clinkers can reach proposed EZ site • Proposed EZ site can support industries related to non-metallic minerals provided sources of power and gas are established at the site.									
Automobile and Accessories	Low	Moderately High	Moderate	Moderately Low	Moderately Low	Moderate	Low	Moderately Low	Moderately High	Low
Rationale for selection	• Automobile manufacturing in Bangladesh is highly import dependent • CKD units are brought through Benapole or Chittagong port and assembled in the country • Manufacturing in this sector is automated and there is high dependency on skilled manpower like engineers • Given the large size of the proposed EZ site, social infrastructure to accommodate skilled manpower can be developed with the proposed EZ site • Automobile manufacturing industries operate in clusters with other ancillary units • Given the large land parcel of proposed EZ, it can be ideal for development of automobile cluster									

Sector	Access to Backward and Forward Linkage		Access to Factors of Production							
	Access to Raw Material	Access to Markets	Land Connectivity	Air Connectivity	Water Connectivity	Availability of Power	Availability of Water	Availability of Gas	Availability of manpower	Access to Water Front
	• Proposed EZ is ideally located to support development of automobile industries for which CKD units are being brought from Chittagong, given its close proximity to NE India, industries from this site can also cater to markets in NE India.									
Heavy Machinery, Iron, Steel and Metal	Low	Moderately High	Moderate	Low	High	High	Moderate	High	High	High
Rationale for selection	• Bangladesh is highly import dependent for this sector, with majority of raw material coming through Chittagong Port • This sector requires large quantities of power and fuel • Proposed EZ has close proximity to Chittagong Port from where majority of the imports take place • It also has access to water front allowing ships to bring in raw material from Chittagong Port • The large land parcel of proposed EZ site is ideal for supporting capital intensive industries, however certain prerequisites like developing last mile road connectivity, and setting up supply water, power and gas to the proposed EZ site needs to be established									
Electrical and Electronics	Low	Moderately High	Moderately High	Moderately Low	Moderately Low	Low	Low	Low	Moderate	Low
Rationale for selection	• Bangladesh currently performs assembly of all electronic items • These items are imported from different countries in individual units and assembled in workshops • Proposed EZ offers all utilities required for manufacturing of electronics and electrical items • Due to strategic location of proposed EZ site, industries can have easy access to Chittagong port for supply of raw material, as well as access to markets like Dhaka, Comilla, Feni and NE India • Skilled labor can be available locally for this industry due to establishing of Feni-Mirsarai industrial zone • Consumption of electrical and electronic items is rapidly rising in rural Bangladesh leading to high demand • Presently the region does not have any major electronics industry in vicinity • Proposed EZ is ideally suitable for setting up industries pertaining to this sector									
Ship Building and Ship Breaking	Low	Moderate	Moderately Low	Low	High	High	Low	Moderately High	High	High
Rationale for selection	• Access to water front is mandatory for setting up of this sector • Not only does the proposed EZ site have access to water front, it also is in proximity to Bay of Bengal • The large land parcel of the proposed EZ site can accommodate ship building industry • Proximity to Chittagong Port will also allow ship breaking industry to be established in the proposed EZ site, since Chittagong region already has a developed ship breaking industry and this industry is growing rapidly in Bangladesh									

Sector	Access to Backward and Forward Linkage		Access to Factors of Production							
	Access to Raw Material	Access to Markets	Land Connectivity	Air Connectivity	Water Connectivity	Availability of Power	Availability of Water	Availability of Gas	Availability of manpower	Access to Water Front
	• Proposed EZ site can support setting of industries in this sector, however power and gas supply will have to be developed in the proposed EZ site for the same									
Petroleum Products (including Bottling)	Low	Moderately High	Moderate	Low	High	High	Low	Moderate	Moderate	High
Rationale for selection	• Bangladesh is currently dependent on import of petroleum products via large sea faring tankers • Access to water front is mandatory for setting up of this sector • Proposed EZ site has access to water front and is ideally located in the industrial zone of Dhaka-Chittagong thus allowing easy access to consumers • Feni-Mirsarai region is also expected to be developed as a large industrial zone thus creating a good demand for petroleum products in the region • Proposed EZ site is presently suitable for setting of industries in this sector, however source of power supply will have to be developed as a pre-requisite									
Pharmaceuticals	Moderately Low	High	Moderate	Moderately High	Moderately High	High	High	Moderately High	High	Moderate
Rationale for rejection	• Development of API park in Munshiganj will create a hub for raw material needed in pharmaceutical industry • Pharmaceutical industries coming up near Munshiganj will have advantage in terms of access to raw material, as well as central location in Bangladesh will enable better supply to different parts of the country • Pharmaceutical industries would perform better if established in proximity to Munshiganj • Moreover presence of industries like heavy machinery and non-metallic metals in vicinity might not provide conducive environment for setting up of pharmaceutical industries • Also the proposed EZ site currently does not have access to reliable sources of power and water which is an important pre-requisite for this industry • Proposed EZ site is not suitable for establishing of this industry									
Light Machinery, Equipment and Furniture	Moderately High	High	Moderately High	Moderately Low	Low	Moderately Low	Moderate	Moderate	Moderate	Low

Sector	Access to Backward and Forward Linkage		Access to Factors of Production							
	Access to Raw Material	Access to Markets	Land Connectivity	Air Connectivity	Water Connectivity	Availability of Power	Availability of Water	Availability of Gas	Availability of manpower	Access to Water Front
Rationale for selection	• Demand for light machinery, equipment and furniture products are rising in Bangladesh • Bangladesh is gradually shifting away from importing light engineering goods to manufacturing them inside the country • Raw material like steel, aluminum plates can be imported via Benapole Port from India • Light Engineering industry also includes spare machinery parts or ancillary parts for automobiles • Proposed EZ is located close to industrial region of Dhaka-Chittagong, as well as the Feni-Mirsarai industrial zone will also serve as an important market for this sector • All utilities required for setting up of this sector can be made available at proposed EZ • Proposed EZ is conducive for setting up light machinery, equipment and furniture products									

Source: PwC Analysis

Based on the analysis done, an initial shortlist of ten sectors were created from the bucket list of 15 sectors. These shortlisted sectors were found to be most suitable for the proposed EZ site due to the compatibility of their forward and backward linkages, access to factors of production and growth prospects in Bangladesh. The shortlisted sectors are –

Other Industries

1) Textile & RMG, 2) Leather and Leather Products, 3) Paper and Packaging, 4) Electrical and Electronics, 5) Light Machinery, Equipment and Furniture, 6) Automobile and Accessories, and 7) Non-Metallic Minerals

Heavy Industries

8) Heavy Machinery, Iron & Steel, 9) Ship Building and Shipbreaking, and 10) Petroleum Products (including Bottling)

Step-wise approach brings out the initial shortlist of ten industrial sectors. Next section captures voice on ground to arrive at the final shortlist of industrial sectors suitable for the proposed EZ

4.7. Analysis of Survey Results

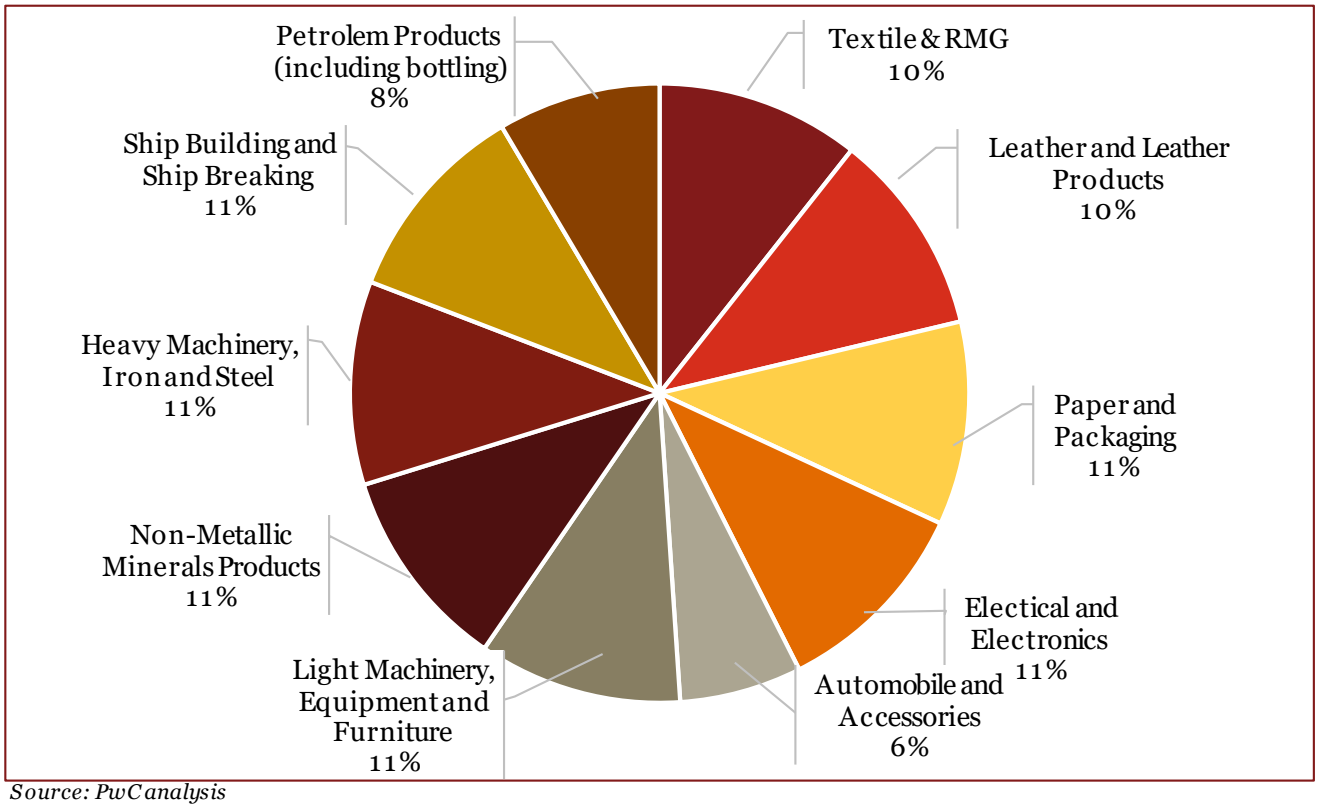
The initial shortlist of industries was created using insights obtained through site visits, interaction with various government departments and information available in public domain. In order to validate the findings of the secondary research, primary survey was undertaken by interacting with various industry players in Bangladesh and overseas. A total of 124 respondents were approached – 94 respondents were Bangladesh based firms, while the rest were foreign companies, who did not have a presence in Bangladesh. For the purpose of this survey, questionnaire format provided in the ToR was used as the base to obtain insights from the industry players. Information about the perception of respondents towards Economic Zone Policy in Bangladesh, their opinion about performance of their industry in the proposed EZ region, challenges faced by respondents in doing business in Bangladesh and prerequisites of the respondents for setting up a new manufacturing unit in the proposed EZ were analyzed.

4.7.1. Profile of Respondents

The respondents of the survey were equally divided from the ten shortlisted sectors for the proposed EZ site. 10 local respondents from each of the 10 sectors for in-person interaction (however for automobiles and accessories and petroleum and petroleum products, it was possible to meet 6 and 8 respondents respectively) and 3 foreign respondents from each of the 10 sectors were selected for telephonic interviews. Attempt was made to ensure that local respondents for the survey were spread across different locations of the country (like Dhaka, Comilla, Chittagong etc.). Companies operating out of various countries were approached for interaction under the foreign respondents category.

The final shortlist of industries was prepared after taking into consideration the responses received through primary survey. A graphical representation of the same has been provided on the next page.

Figure 34: Sectoral Profile of Respondents



Source: PwC analysis

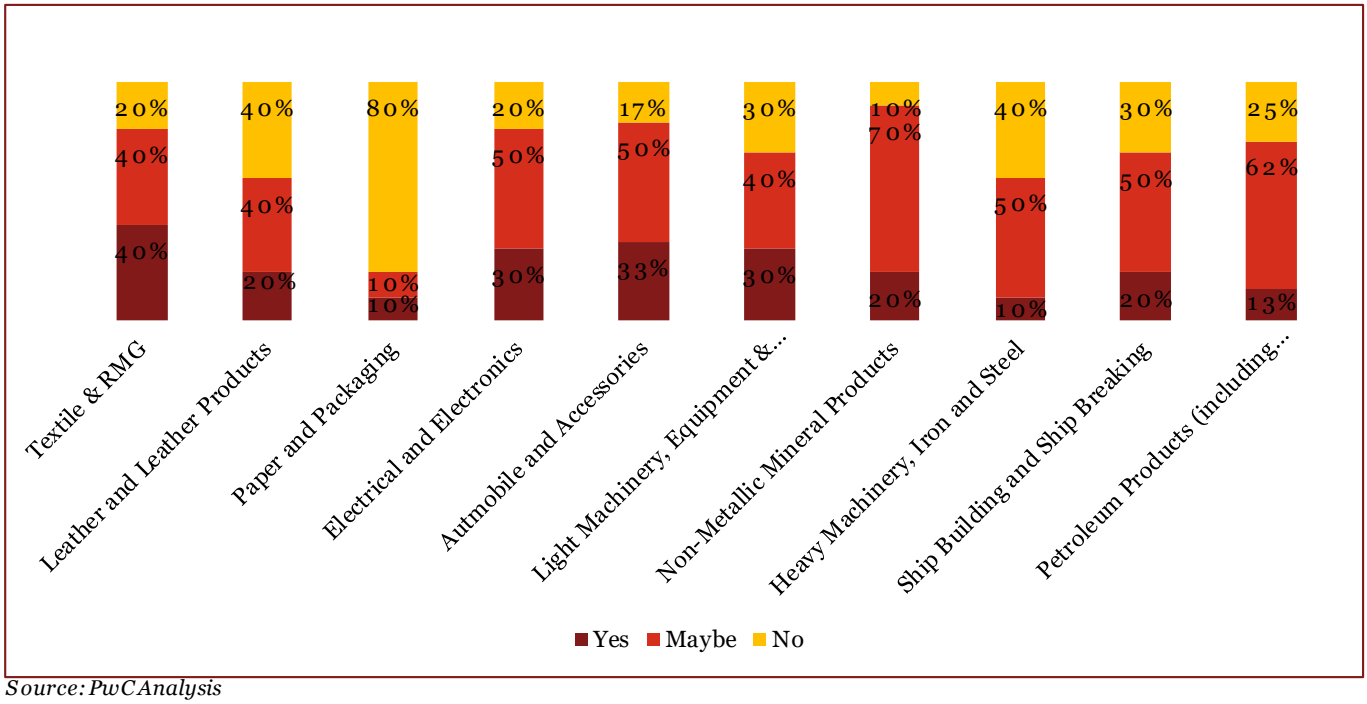
4.7.2. Perception about the Economic Zone

One of the key objective of the exercise was to assess the awareness about the GoB's Economic Zone policy among the industrial players and also the investment appetite for the proposed EZ. Among the domestic manufacturers surveyed ~46% respondents were not aware about the existing policy, 32% respondents confused the Economic Zone policy with Export Processing Zone policy, 12% respondents had heard about the policy and 10% respondents were aware about the policy beforehand.

Among the foreign investors surveyed, 5 manufacturers were aware about Bangladesh's Economic Zone policy while others had to be briefed about the same.

Below chart captures the opinion of domestic respondents from different sectors about whether their specific sector could be successful in the proposed EZ location –

Figure 35: Investment opinion expressed by domestic investors



Source: PwC Analysis

The above chart reveals that maximum number of respondents belonging to Textile & RMG sector showed positive intent regarding the proposed EZ and maximum number of respondents belonging to Paper & Packaging sector showed negative intent. There were quite a few respondents who had ambivalent opinion regarding the proposed EZ site, their responses have been captured under "Maybe" option. These respondents were either unsure about whether industries from their sectors would perform well in proposed EZ site or they wanted certain pre-requisites to be fulfilled for industries to be successful.

As an outcome of this survey, 64 domestic respondents have expressed positive interest ("Yes" and "Maybe" categories together) about their industries, in the proposed EZ. Sectors from which more than 50% respondents have expressed positive interest are –

- Textile & RMG
- Leather and Leather Products
- Electrical & Electronics
- Automobile and Accessories
- Light Machinery, Equipment & Furniture
- Non-Metallic Mineral Products
- Heavy Machinery, Iron and Steel
- Ship Building and Ship Breaking
- Petroleum and Petroleum Products (including bottling)

Among the foreign respondents surveyed, 26 respondents showed negative interest towards investing in Bangladesh in near future. 4 investors (1 from Textile & RMG, 2 from Heavy Machinery, Iron and Steel, 1 from Light Machinery, Equipment and Furniture) showed positive interest, however they wanted further details like date of operationalizing of Economic Zone, price of land, details of lease holding agreement etc.

4.7.3. Analysis of responses obtained through survey

Considering the responses of both domestic and foreign industry players taken together, it is observed that respondents have indicated positive or ambivalent interest towards the proposed EZ in Feni. A brief synopsis of the response and discussion held with the respondents is captured in the table below–

Table 34: Synopsis of Primary Survey

Description	Yes	Maybe	No
% of respondents	18%	35%	47%
Key reasons for response	• Location is advantageous in terms of future connectivity • Close proximity to Chittagong Port provides advantage in getting raw material to manufacturing unit • Proximity to Bellonia Port will facilitate trade with India in future • Incentives offered by BEZA are attractive • Interest in expanding existing facility in Bangladesh • Proposed EZ site can develop utility supply in future • Access to water front is a major advantage offered by proposed EZ site	• Considering business expansion in a new economic zone • Will wait to see quality of utility provided on site • Decision depends on development of utility supply at proposed EZ site • Further evaluation needs to be done regarding the site • Proposal will have to be discussed with management • More details regarding the proposed EZ is needed (Ex- rent, utility charges) • Contemplating in between Mirsarai and Feni EZ	• Have already committed significant investments for current expansion facilities • Time required for development of proposed EZ site • Poor Last mile connectivity to proposed EZ site • Political instability in Bangladesh is hindering investment decision • Unavailability of adequate power/gas supply • Difficulty in procuring license or permits from GoB • Given current underutilization of existing facilities, not interested in expansion plans • Interested in investing somewhere closer to Dhaka
Prominent Companies	Tarasankar Plastics Industries, KISC, Carmelton Co. Ltd.	BSRM Group, Highspeed Shipbuilding & Engineering Co. Ltd.	Farr Ceramics, Supreme Plastics,
Insights	Basis our discussion, manufacturers who are involved in textile & RMG sector are very interested since the proposed EZ site is located near Chittagong Port and also has access to Dhaka-Chittagong highway	Manufacturers involved in manufacturing of cement, steel and other capital intensive products are interested in proposed EZ site. However, they want to undertake further studies to understand draft available near the site, last mile	Foreign manufacturers were wary about investing in a new country since they were unaware of local policies, language, culture etc.

		connectivity and operational expenses at the proposed EZ site	

Source: PwC Analysis

4.7.4. Barriers to Investment

The respondents were also asked about the current challenges faced by them in running business in Bangladesh and barriers to investment, specific to the EZ site area. The responses received can be broken up into 3 parts – Bangladesh specific, sector specific and site specific.

Bangladesh Specific

Most of the respondents, surveyed were optimistic about the Bangladesh's economy and expressed their satisfaction about the country's growth. However, country specific hindrances to growth and investment mentioned by the respondents had resonance across the sectors. The common problems faced by manufacturers in running a business in Bangladesh, across sectors are listed on the next page.

Power Shortage – All the investors surveyed expressed discontent with power availability across Bangladesh. Many complained about the 2-3 hour power outages suffered on a daily basis, which had affected the capacity utilization of existing machineries. Among the respondents surveyed, 65% had to make arrangements for their own source of power, which was either diesel or gas operated.

Gas Unavailability – Frequent drop in pressure of gas supply was another grouse among the respondents. Bangladesh has a network of pipes through which gas is supplied to manufacturing units. Most manufacturing units apply for piped gas to be used as fuel in their industries or a source for generating electricity (Gas is cheaper than diesel). Due to Bangladesh's depleting gas reserves, GoB has also stopped issuing new gas connections to manufacturers in the country. This is a major hindrance to investment in Bangladesh. 40% of the respondents, have put their expansion plans on hold due to unavailability of new gas connection.

Congestion at Chittagong Sea Port – Manufacturing sector in Bangladesh is dependent on imported raw material for their production to take place. Chittagong port is the most important port in Bangladesh, it caters to around 92% of the country's sea borne trade. However, this has resulted in heavy congestion in Chittagong Port, resulting in manufacturer's having to wait 10-15 days to get their raw material. Due to low draft at Mongla Port, Chittagong Port is still the most efficient way to get raw materials for the manufacturers. 56% of the respondents complained about delays in getting custom clearance and access to their imported products. Although few respondents who had outsourced the handling of their imports to 3rd party agencies were satisfied with the turn-around time taken for their goods.

Sudden changes in applicable HS code – Few of the respondents expressed their dissatisfaction at the sudden changes in the applicable HS code for the imported items. Import duty on goods are levied on basis of their HS codes. Respondents claimed that custom officials suddenly charge higher import duty on items of regular import, by changing the applicable HS code under which the item is covered. This results in extra hassle for the importers as they need to visit customs law office to get the goods cleared and get clarity on applicable HS code. Sudden changes in the rate of applicable import duty creates uncertainty among the manufacturers as it causes delay in access to raw material and also makes it difficult to accurately predict costing of the manufactured goods.

Access to Credit – During the survey exercise, most of the respondents expressed disappointment in getting easy access to credit. Getting credit in Bangladesh, is a tedious task spread over 2-3 months involving lot of paperwork, documentation etc. Credit rate in Bangladesh ranges from 9-14% depending on the relationship that respondents develop with the banks. Large industry houses are able to get credit at low rates while medium and small scale manufacturers pay high interest rates. 27% of the respondents mentioned that high interest rates and amount of paperwork involved in getting credit, prevented them from availing loans.

Excessive Bureaucracy – Respondents in their feedback, complained about the difficulty in interacting with government officials for any purpose. It was claimed that obtaining permission or license for any utility or activity

is cumbersome, requiring many days and several levels of permissions. This is a major reason hindering manufacturers in Bangladesh from starting a new business.

Corruption – 30% of the respondents conveyed their dissatisfaction with the unprofessional approach of government officials from clerk to officer level. In their opinion, it had become a mandatory affair to bribe Government Officials in order to get any approval or permit.

The above responses were received from manufacturers who are based out of Bangladesh and have been operating their enterprise in Bangladesh over the years. These problems were highlighted at a country specific level.

Sector Specific

The respondents were asked questions about their particular sectors to understand the challenges that they are facing in their sector, which is hindering their current business operations and affecting the growth/expansion plans. The problems specific to each sector are listed below –

Textile & RMG – Respondents were positive about the growth prospects in this sector, with consistently increasing demand from foreign customers. They recognized GoB's initiatives to provide impetus to exports of textile & RMG through export subsidies, VAT exemption and lower duty on import of cotton. However, small and medium scale manufacturers were concerned about rising competition affecting the profit margins in the industry. Previously large manufacturers used to outsource, embroidery work, sewing of sequins and placing of decorative beads and stones on clothes to small scale manufacturers. However, cost and quality control awareness among the large manufacturers have led to creation of in-house facility for the same. Respondents also aired their view about high import duties on fabrics like sequins, better quality thread, beads etc. These items are used to produce high value garments.

Electrical and Electronics – Respondents in this sector were divided in their opinion about the sector's performance. The big players, like Walton group, were looking to expand aggressively and establish new manufacturing units. However, the SMEs were witnessing falling sales and shrinking margins due to their inability to compete with large scale manufacturers, who have cornered a lion's share of market sales due to economies of scale. This sector is highly import dependent, with major traffic coming through Chittagong Port. Thus congestion at Chittagong Port is a major hindrance for growth of this sector.

Leather and Leather products – Tannery operators expressed their displeasure at having been forced by the court of Bangladesh to shift their existing manufacturing units from Hazaribagh to Savar. This forceful eviction took place in 2017. Hazaribagh was a traditional tannery hub in Bangladesh, however due to rapid expansion of Dhaka city, this area came in close proximity to the residents of Dhaka. Tannery industry due to its polluting nature poses health hazard for nearby communities. Taking cognizance of this matter, tannery producers were shifted to a place called Savar, 25 km away. Savar was to be developed by GoB as a tannery hub, however, leather manufacturers are yet to get basic facilities like ETP, gas connection etc. in Savar. Tannery operators are upset with GoB over their forceful eviction from traditional hubs to new location. Manufacturers involved in finished goods have expressed their inability to provide high quality leather products required by western customers due lack of technical skills and technical know-how among the laborers.

Light Machinery, Equipment and Furniture – Respondents in this sector did not have any major sector specific issues. Their only concern was that rising competition in the sector was affecting their profitability and high dependence on import of steel and iron products prevented them from manufacturing goods at competitive rates. Respondents were dependent on GoB's import duty policy for growth of their industry.

Paper and Packaging – The major challenge highlighted by respondents in this sector was regarding unavailability of utilities in terms of power and gas connection. Most of the paper and packing industries have been established in proximity to Dhaka city and manufacturers do not feel comfortable in shifting their plants to other locations.

Automobiles and Accessories – There are very few car manufacturers in Bangladesh. All the existing domestic players have tie-ups with foreign car manufacturers and are involved in assembly of Completely Knocked Down units imported from the home country of their partners. Manufacturers mentioned that currently

due to lack of advanced technology and technical know-how, cars were not being manufactured in the country. The tax structure imposed by GoB was such that it favored import of reconditioned cars. Currently supplementary duty on import of reconditioned hybrid cars ranges from 25% to 45%, whereas cars which are assembled in Bangladesh attract 60% tax. Manufacturers were also upset with the poor transport network of the country and were interested in setting up plants near trade gateways.

Non-Metallic Minerals – This sector involves manufacturers engaged in cement and ceramic production. Manufacturers in this sector raised their concerns about lack of natural resources in Bangladesh for manufacturing of both cement and ceramics. While cement manufacturers are dependent on import of clinkers, ceramics manufacturers depend on import of good quality clay. Due to high reliability on imports, this sector is dependent on global price markets as any fluctuations due to geo-political or economic issues impact prices in this sector. Moreover, cement manufacturers were concerned with over capacity of cement production in Bangladesh, resulting in shrinking profit margins and price wars.

Heavy Machinery, Iron and Steel – This sector is witnessing high growth in Bangladesh. However, challenges highlighted by manufacturers were related to raw material, tax structure and port congestion. Due to lack of iron ore deposits in Bangladesh, currently steel and iron manufacturers import scrap iron or billets for manufacturing of steel products. Almost all steel manufacturers currently produces MS steel bars or long products in the country with only 1 factory producing steel plates or flat products. Unavailability of raw material forces Bangladesh to produce either steel billets or scrap steel. However, smaller industries are facing problem due to differential tax structure as small players are dependent on import of billets for steel production but larger players are engaged in manufacturing of billets from scrap. GoB has imposed a higher tax on import of billet in order to promote domestic manufacturing resulting in adverse effect on smaller players. Most of the import of heavy machinery, aluminum, iron and steel products take place through Chittagong Port, congestion at Chittagong Port was a major concern of all manufacturers. Some steel and aluminum manufacturers were not able to utilize their capacity due to lack of proper gas supply.

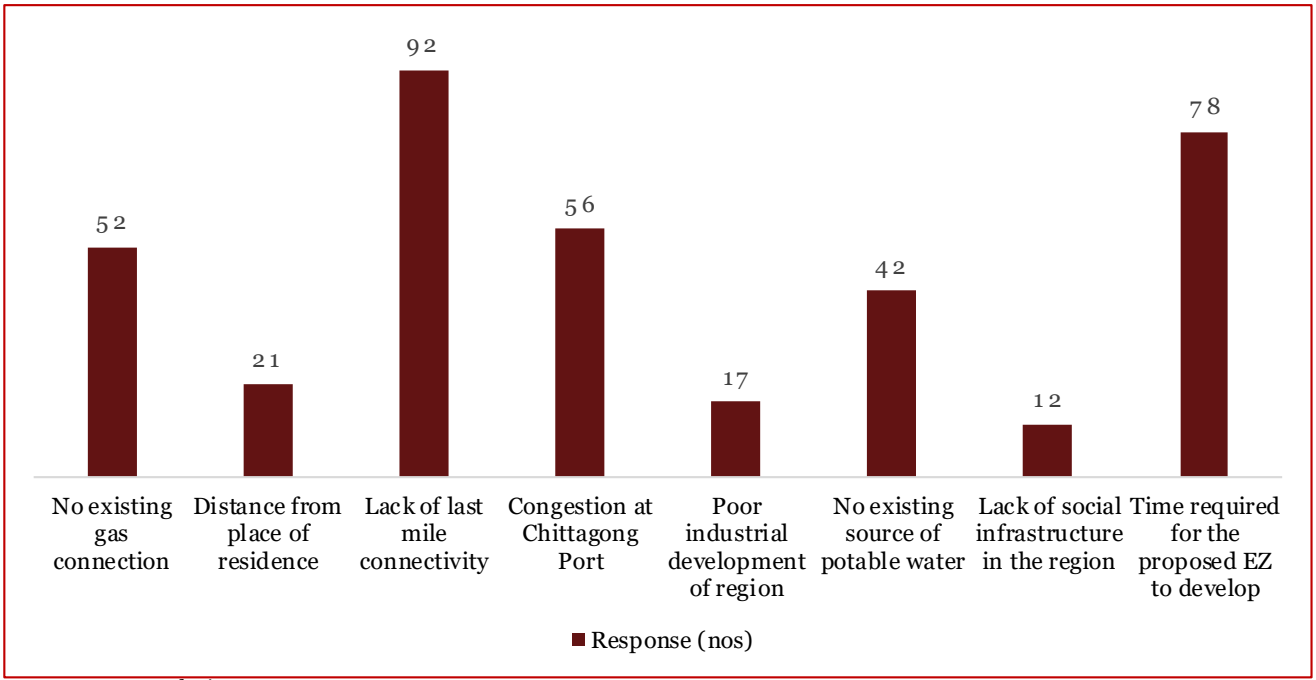
Ship Building and Ship Breaking – Respondents in this sector highlighted challenges in accessing easy and cheap credit as a major hindrance for capacity expansion. Manufacturers mentioned that ship building industry in Bangladesh is growing at a rapid pace, however in order to meet global demands they needed to undertake capacity expansion and/or purchase new machinery for which adequate funding support was not provided by banks. Moreover, shipbuilders also faced a dearth of skilled manpower and technological know-how. Except a couple of large manufacturers, other shipbuilders claimed that most of their employees had acquired skills by learning on job and had not taken any formal training. Ship breaking industry also faced challenge of using outdated labor intensive technology.

Petroleum and Petroleum Products (including bottling) – Respondents in this sector did not highlight any major challenges which were specific to their sectors.

EZ Site Specific

Responses received from manufacturers regarding key hindrances to site specific investments were captured in specific baskets. The figure below captures the responses of the manufacturers, some of the respondents also listed out more than one reason, hindering their investment plan in the proposed EZ region.

Figure 36: Site specific barrier to investment



Source: PwC Analysis

The above chart reveals that the major reason hindering investment in the proposed EZ region was the lack of proper last mile connectivity to the proposed EZ site. Last mile connectivity to the proposed EZ site is vital since it is a vital logistics link that will enable movement of man and material to and from the proposed EZ site. Another major reason, hindering investment in the proposed EZ site is the time required for development of proposed EZ. This reveals that most respondents were unwilling to base the investment decisions on forecasted timelines for construction of the Economic Zone as it is common for infrastructure construction in Bangladesh to suffer from time overruns. Thus, given the very preliminary stage of planning for the proposed EZ site location, manufacturers did not want to take any investment decisions. Congestion at Chittagong Port also hindered investment decisions of some manufacturers, who were of the opinion that if Chittagong Port is struggling to meet the current traffic demand, it would be difficult for CPA to cater to additional traffic from new EZs in Bangladesh. Developing a 2nd port near Chittagong Port has become important to meet the increasing sea traffic in Bangladesh. Most of the SME manufacturers choose to set up their businesses close to their area of residence. The need to shift to a new location for establishing a new manufacturing unit also hindered investment decision for the proposed EZ site. Other site specific factors that served as barrier to investment were – absence of any gas, power or water supply at the proposed EZ site, lack of social infrastructure and poor industrial development in the region.

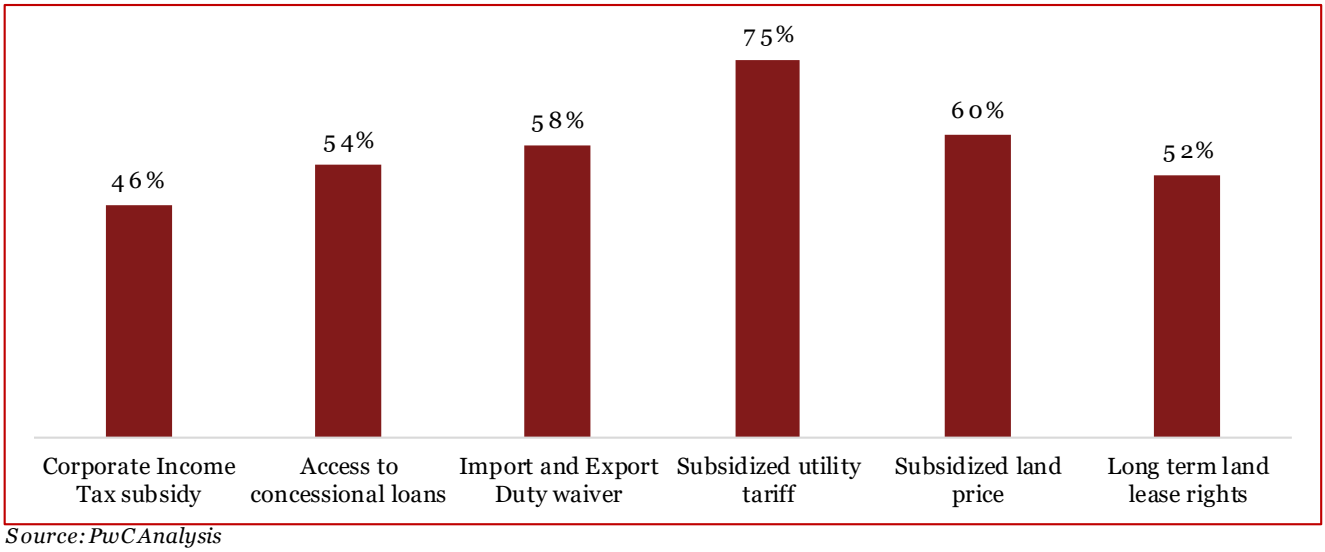
4.7.5. Pre-requisites to Investment

In order to understand the pre-requisites of investment, all the respondents were asked about their requirement with respect to (i) fiscal and non-fiscal incentives and (ii) infrastructure & logistics.

Fiscal/ Non-Fiscal Incentives

For assessing this aspect, the respondents were asked about the various fiscal and non-fiscal benefits that they require for considering an investment decisions in the proposed EZ site. Respondents raised concern about various incentives such as corporate income tax subsidy, waiver on import and export duty, subsidized utility tariff, ease in concessional loan facility and ease in obtaining clearances and approvals. Responses received from the survey is depicted in the figure below –

Figure 37: Pre-requisites in form of incentives



Source: PwC Analysis

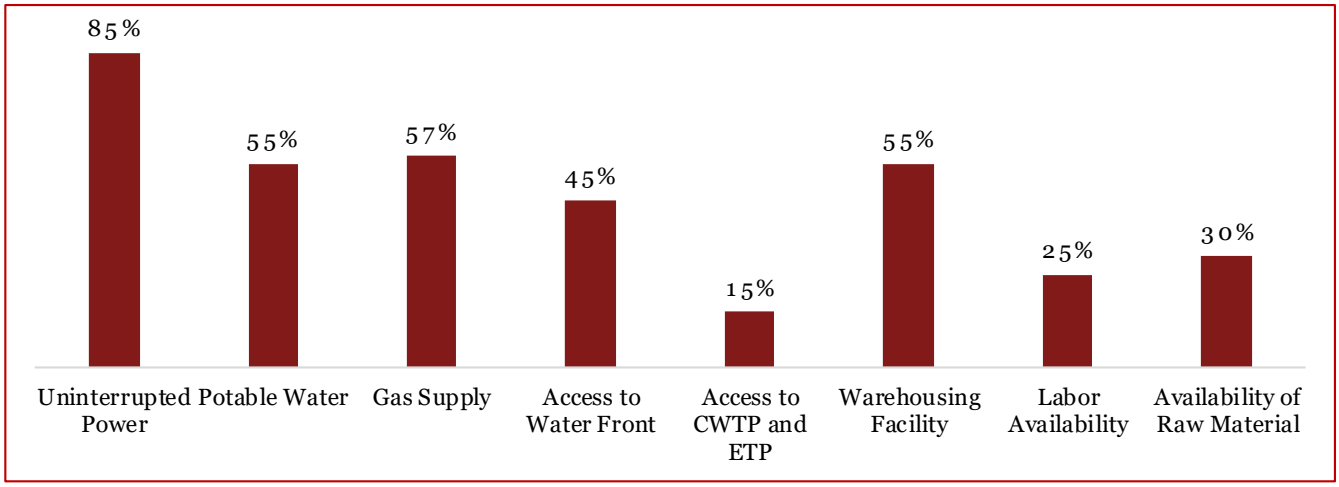
The above chart reveals that majority of the respondents have asked for access to subsidized utility tariff. Subsidized land price was also among the top requirements for respondents. A healthy demand has also been obtained for getting import/export duty waiver, access to concessional loans and provision for long term land lease for the proposed EZ.

BEZA has already formulated a set of fiscal incentives and the same has been approved by their governing board. These fiscal incentive package would take into consideration the concerns expressed by the investors. Medium and (a few) large scale manufacturers have expressed concern about availability of concessional loan facility, the same is not captured under the incentive package offered by BEZA.

Pre-requisites for Infrastructure

A good infrastructure availability is a key enabler for success of any Economic Zone project. To understand the priority of the same, respondents were asked to specify the pre-requisites expected by them for investing in the proposed EZ. Their response is captured in the figure on the next page –

Figure 38: Pre-requisites in form of supporting infrastructure



Source: PwC Analysis

Manufacturers have expressed that the major factors which influence investment decisions include access to uninterrupted power supply (without voltage fluctuation), gas supply, potable water, warehousing facility and availability of raw material. Access to water front and labor in the vicinity of the proposed EZ were another important factors highlighted during our interaction with manufacturers.

During interactions, manufacturers, particularly those involved in Heavy machinery, iron and steel, cement manufacturing, ship building and ship breaking and petroleum products stressed on the importance of having a water front adjacent to their manufacturing area. Some manufacturers also inquired about availability of social infrastructure in the vicinity like school, colleges, hospitals etc. Manufacturers involved in textile & RMG, Paper and Packing stressed on the need for having access to CWTP and ETP.

In the event of addressing the list of pre-requisites requested by the manufacturers, BEZA can expect several manufacturers to evince interest in the proposed EZ site

4.7.6. Final Shortlist of Site Specific Industry Sectors

On basis of incorporating the feedback received during the survey, it can be safely deduced that among the respondents surveyed from the initial shortlisted sectors. Manufacturers from Paper and Packaging sector have majorly expressed negative opinion about growth prospects of their sector in the proposed EZ site. However, manufacturers from Textile & RMG, Leather and Leather Products, Electrical and Electronics, Automobile and Accessories, Light Machinery, Equipment and Furniture, Non-Metallic Mineral Products, Heavy Machinery, Iron and Steel, Ship Building and Ship Breaking and Petroleum Products (including bottling) sectors have majorly evinced positive interest about the growth prospects of their sectors in the proposed EZ location.

As per the responses recorded from domestic and foreign manufacturers it can be deduced that following industries are most suitable for the proposed EZ site

Other Industries like - Textile & RMG, Leather and Leather Products, Electrical and Electronics, Automobile and Accessories, Light Machinery, Equipment and Furniture, Non-Metallic Mineral Products sectors

&

Heavy Industries like - Heavy Machinery, Iron and Steel, Ship Building and Ship Breaking and Petroleum Products (including bottling) sectors

A demand forecast model has been prepared in the next chapter, for the above mentioned industries to understand the land, utility and employment requirements for these industries over the years. The master planning and infrastructure plans chapters contain the master plan for the proposed EZ site, which incorporates the best practice layout and requirements of industry specific supporting infrastructure for the shortlisted industries.

4.7.7. Sector Profiles

This section contains the profiles of all the nine shortlisted sectors obtained through industry assessment exercise. This sector profile provides a brief overview about the various sub-categories of the sectors, sector overview, sector trends, barriers to investment in the sector and various utility requirements.

Table 35: Sector Profile 1

Sector	**Textile & RMG Sector**
Sub-Categories Proposed	RMG, embroidery, dyeing, washing
Sector Overview	Textile and Clothing sector plays a vital role in the economy of Bangladesh. It generates more than 65% of country's industrial employment and 81% of export earnings. This industry also provides employment to about 5 million workers with around 80% women employees. As per discussions UNO officers during site visit, we were informed that proposed EZ in Feni region has some small scale textile industries which are mostly unorganized in nature. Adjacent district in Comilla has an Export Processing Zone where industries related to textile and RMG have been established. These industries cater to the export market.
Sector Trends	GoB has set a target to achieve USD 50 billion of exports from RMG sector by 2020, in order to do so, it has also placed textile & RMG sector in its high priority

	industrial sector list. It is world's 2nd largest exporter of RMG after China, having a market share of 6.4%. Although RMG exports in Bangladesh is still growing, Bangladesh is still falling short of its annual growth targets. This sector has a lot of potential for growth since, China – the largest exporter of RMG and having a market share of around 35% is shifting focus to manufacturing of other high value products in technology sector.[207] This is creating a gap in the textile & RMG market, which can be tapped into by Bangladesh. Proposed EZ in Feni is ideally located to become the manufacturing hub of textile & RMG as it is situated close to Dhaka-Chittagong highway and Chittagong Port through which bulk of Bangladesh's textile & RMG products are transported. Nearest industrial belt where textile & RMG manufacturing is taking place is in Comilla. It is expected the industrial zone coming up near Mirsarai will also support textile & RMG industries. This will be an advantage for the industries in proposed EZ site since, this sector being export oriented will not cannibalize each other's market but will rather gain efficiency through creating textile & RMG cluster where various supporting industries can come up across different value chain of the entire RMG sector.
Current Barriers to Investment	Major impediment to the growth of textile & RMG industry in the proposed EZ region is lack of last mile road connectivity to the proposed EZ site. Presently, there is no arrangement of providing utilities like water, power and gas connection for the industries at proposed EZ site. These utility connections will have to be developed. Also,
Land Requirements	Land requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector However, basis our secondary research and primary survey, it can be mentioned that land requirement for this sector would be between 2362 to 3760 acres. For purpose of demand projections, land requirement of 2531 acre has been taken for this sector.
Power Requirements	Power requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and interaction with local respondents, it can be mentioned that power requirement for this sector would range from 160 to 200 KVA per acre of factory land. For the purpose of demand projections, power requirement of 182.11 KVA/ acre has been taken for this sector.
Water Requirements	Water requirements for this sector is highly variable depending on the capacity of the factory and type of sub-sector. However, basis our prior experience of working on similar projects and secondary research, it can be mentioned that water requirement for this sector normally ranges in between 10 to 14 cum. per day per acre of factory land. For the purpose of demand projections, water requirement of 12.14 cum. per day per acre has been taken for this sector.
Employment per Factory	Manpower requirement for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, primary survey and taking inputs from Survey of Manufacturing Industries Database published by Bangladesh Bureau of Statistics, a typical factory generates direct employment for 130-150 people per acre of factory land. For the purpose of demand projections, manpower requirement of 142 people per acre has been taken for this sector.

Source: PwC Analysis and MACE analysis

[207] http://www.dhakatribune.com/business/2017/11/05/can-bangladesh-increase-share-pie/

Table 36: Sector Profile 2

Sector	**Leather and Leather Products**
Sub-Categories Proposed	Finished leather products
Sector Overview	Leather industry is the second largest export earning sector of Bangladesh with biggest markets being Italy, England, Spain, France, Germany, Poland, China, Japan, USA and Canada. The overall leather industry is classified into three broad categories such as finished leather, leather products, and footwear. GoB has also declared this industry as the priority sector. This sector caters to only 0.5% of the world's leather trade (worth USD 75 billion). About 113 tanneries in Bangladesh produce 220 million square feet of hides and skins every year.[208] There are about 30 modern shoe manufacturing plants involved in production of high-quality footwear; also, ~2,500 small and medium scale footwear manufacturers are operational. Tanneries in Bangladesh form a cluster, recently this cluster has been relocated to Savar area from Hazaribagh near Dhaka. This move was undertaken in order to regulate tanneries in Bangladesh and to ensure that proper safety and environment friendly norms were being followed. Currently, Proposed EZ area does not have any organized or unorganized leather product manufacturing clusters. Nearest place where leather products are manufacturers in an organized manner is Comilla EPZ, which has few leather goods manufacturing industries.
Sector Trends	Bangladesh exported leather goods worth USD 1.23 billion in FY 2016-17.[209] It has a target a reaching export figures of USD 5 billion by 2021. GoB declared leather products as the "Product of the Year" in 2017 in order to promote export of leather goods. It is offering cash incentives of 15% against export of leather products. With greater adherence to environment safety and labor protection norms in this sector, exports of Bangladeshi leather products is gradually growing. Proposed EZ site is strategically located near Dhaka-Chittagong highway, which caters to a bulk of Bangladesh's international exports. Proposed site is also close to Indian border, giving it access to NE Indian markets. Leather industries getting established in this region have good growth prospect as leather coming from tanneries of Savar will not have to take a detour to reach factories making finished goods as proposed EZ site is in between Savar and Chittagong Port. Thus, leather which is transported from Savar can be processed on the way to Chittagong Port or NE India without incurring extra transportation costs.
Current Barriers to Investment	Major impediment to the growth of finished leather products industry in the proposed EZ region is lack of last mile road connectivity to the proposed EZ site. Presently, there is no arrangement of providing utilities like water, power and gas connection for the industries at proposed EZ site. These utility connections will have to be developed. Also, due to lack of any major leather industry in vicinity of the proposed EZ site, manpower will have to be sourced from adjacent district of Comilla. A major challenge that leather manufacturers face is lack of skilled employees with know-how of manufacturing high value leather goods. Several institutes are being established across Bangladesh in order to train young people in leather goods manufacturing
Land Requirements	Land requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. However, basis our secondary research and primary survey, it can be mentioned that land

[208] http://www.theindependentbd.com/printversion/details/112906
[209] https://www.thefinancialexpress.com.bd/editorial/leather-sector-needs-more-support-1507215808

	requirement for this sector would be between 24 to 31 acres. For purpose of demand projections, land requirement of 27 acre has been taken for this sector.
Power Requirements	Power requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and interaction with local respondents, it can be mentioned that power requirement for this sector would range from 160 to 200 KVA per acre of factory land. For the purpose of demand projections, power requirement of 121.41 KVA/ acre has been taken for this sector.
Water Requirements	Water requirements for this sector is highly variable depending on the capacity of the factory and type of sub-sector. However, basis our prior experience of working on similar projects and secondary research, it can be mentioned that water requirement for this sector normally ranges in between 10 to 14 cum. per day per acre of factory land. For the purpose of demand projections, water requirement of 13.36 cum. per day per acre has been taken for this sector.
Employment per Factory	Manpower requirement for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, primary survey and taking inputs from Survey of Manufacturing Industries Database published by Bangladesh Bureau of Statistics, a typical factory generates direct employment for 50-60 people per acre of factory land. For the purpose of demand projections, manpower requirement of 54 people per acre has been taken for this sector.

Source: PwC Analysis and MACE analysis

Table 37: Sector Profile 3

Sector	**Electrical and Electronic Sector**
Sub-Categories Proposed	Manufacture of TV, Fridge, AC and other household appliances
Sector Overview	Size of this sector is BDT 150 billion, out of which ~BDT 70-80 billion is met through domestic production. GoB's digital Bangladesh 2021 policy has resulted in exponential increase in country's import in computer and telecommunication devices. Singapore, Malaysia, China, and India are the major supplier of spare parts and accessories. Major products from this sector (such as electronic appliances like AC, fridge, TV, computer and peripherals; electrical fittings, cables, and lighting) are consumed locally. Basis primary survey, local players are dependent on import of raw materials and manufacturing of spare parts locally. Bangladesh presently does not have any integrated manufacturing facilities in the country, electronics industry in Bangladesh is dependent on assembly of spare parts, imported from outside the country.
Sector Trends	This is one of the fastest growing sectors in Bangladesh and is also recognized by GoB as one of the high priority sectors. More than 3000 units are currently operational in Bangladesh generating direct and indirect employment for around 1 million people. Rural Bangladesh is currently witnessing an exponential growth in terms of demand for electronic products like smartphones, TVs, refrigerators and fridges. Proposed EZ region is economically one of the better off districts in Bangladesh, since the region witnesses high migration rate in terms of people going overseas for employment. Foreign remittance has resulted in increased level of disposable income for people in the region of proposed EZ, who are able to spend more on purchasing electronic goods. Thus, proposed EZ has good potential of catering to the needs of local markets. Also, proximity to NE Indian states can provide access to those markets. Proposed EZ site is favorably located near Dhaka-Chittagong highway from where it can have access to the imported spare parts needed to manufacture electronic items.

Current Barriers to Investment	Major impediment to the growth of electrical and electronics industry in the proposed EZ region is lack of last mile road connectivity to the proposed EZ site. Presently, there is no arrangement of providing utilities like water, power and gas connection for the industries at proposed EZ site. These utility connections will have to be developed.
Land Requirements	Land requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. However, basis our secondary research and primary survey, it can be mentioned that land requirement for this sector would be between 184 to 286 acres. For purpose of demand projections, land requirement of 241 acre has been taken for this sector.
Power Requirements	Power requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and interaction with local respondents, it can be mentioned that power requirement for this sector would range from 100 to 140 KVA per acre of factory land. For the purpose of demand projections, power requirement of 121.41 KVA/ acre has been taken for this sector.
Water Requirements	Water requirements for this sector is highly variable depending on the capacity of the factory and type of sub-sector. However, basis our prior experience of working on similar projects and secondary research, it can be mentioned that water requirement for this sector normally ranges in between 10 to 15 cum. per day per acre of factory land. For the purpose of demand projections, water requirement of 13.35 cum. per day per acre has been taken for this sector.
Employment per Factory	Manpower requirement for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, primary survey and taking inputs from Survey of Manufacturing Industries Database published by Bangladesh Bureau of Statistics, a typical factory generates direct employment for 240-260 people per acre of factory land. For the purpose of demand projections, manpower requirement of 253 people per acre has been taken for this sector.

Source: PwC Analysis and MACE analysis

Table 38: Sector Profile 4

Sector	**Light Machinery, Equipment and Furniture Sector**
Sub-Categories Proposed	Manufacture of spare parts of machines
Sector Overview	This is an important industry in Bangladesh as it provides backward and forward linkages to all other industries. Light machinery sector provides support for operation and maintenance of heavy machines through production of spare parts, castings, molds, dies, fittings etc. As per information provided by Bangladesh Investment Development Authority (BIDA) there are currently 40,000 light engineering units/workshops scattered across Bangladesh. These industries develop in vicinity of industrial zones in order to provide support to large scale capital intensive factories requiring heavy machinery. Products manufactured by this sector can be made out of rubber, ceramics, metals or plastic. Exporters from countries like China, Japan and Korea are developing light engineering facilities in Bangladesh in order to cater to export market. Although, this sector is very flexible and versatile, proposed EZ region has not seen much development in its vicinity due to lack of industrial development. There are small spare part manufacturing workshops in Feni which cater to requirements of local population. However, this industry is highly fragmented in this region, due to lack of any major industries. Local residents often have to travel to Dhaka in order to get spare parts for their household products and agricultural machinery. Nearest industrial belts are in Comilla and Chittagong

	region, proposed EZ can address the spare parts requirements of industries in these region.
Sector Trends	Given the large land parcel of the proposed EZ and also the upcoming industrial zone spread over 30,000 acres in the adjacent Mirsarai region. Industries in this sector have growth opportunities by catering the requirements of other major sectors by providing forward and backward linkages. Industrialization of this region will involve setting up several machines, which will require periodic servicing and replacement of spare parts. Industries from Light Machinery sector can manufacture such spare parts and cater to the local markets. Also, given the proximity of EZ site to NE India, markets in India can also be tapped from the proposed EZ site.
Current Barriers to Investment	Major impediment to the growth of light machinery, equipment and furniture industry in the proposed EZ region is lack of last mile road connectivity to the proposed EZ site. Presently, there is no arrangement of providing utilities like water, power and gas connection for the industries at proposed EZ site. These utility connections will have to be developed.
Land Requirements	Land requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. However, basis our secondary research and primary survey, it can be mentioned that land requirement for this sector would be between 146 to 258 acres. For purpose of demand projections, land requirement of 207 acre has been taken for this sector.
Power Requirements	Power requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and interaction with local respondents, it can be mentioned that power requirement for this sector normally ranges in between 110 to 130 KVA per acre of factory land. For the purpose of demand projections, power requirement of 121.41 KVA/acre has been taken for this sector.
Water Requirements	Water requirements for this sector is highly variable depending on the capacity of the factory and type of sub-sector. However, basis our prior experience of working on similar projects and secondary research, it can be mentioned that water requirement for this sector normally ranges in between 8 to 11 cum. per day per acre of factory land. For the purpose of demand projections, water requirement of 9.71 cum. per day per acre has been taken for this sector.
Employment per Factory	Manpower requirement for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and taking inputs from Survey of Manufacturing Industries Database published by Bangladesh Bureau of Statistics, a typical factory generates direct employment for 170 to 200 people per acre of factory land. For the purpose of demand projections, manpower requirement of 186 people per acre has been taken for this sector.

Source: PwC Analysis and MACE analysis

Table 39: Sector Profile 5

Sector	**Automobile and Accessories**
Sub-Categories Proposed	Manufacture of automobiles
Sector Overview	Bangladesh is not present across the value chain of automobile industry. The country has been primarily dependent on assembling of automobile components; these components (completely knock down units) are being imported. Currently the passenger car import comprise of refurbished cars or re-used cars that are reconditioned in Bangladesh. Import of passenger cars has clocked USD 351 million (in 2015). Basis primary survey, it was understood that

	import duty on brand new vehicles is quite high as a result of the same, passenger cars are costly in the country. Recently various local players (such as Runner group) have commenced full-fledged manufacturing of automobiles in the country. Currently there are no automobile manufacturing units near the proposed EZ site, however, due to advantageous location of proposed EZ site, the site can have good access to CKDs imported from Chittagong Sea Port as well as access to markets in Dhaka, Chittagong, Feni-Mirsarai industrial belt and NE Indian markets.
Sector Trends	Due to GoB's tax structure which imposes 165 percent duty on imported new cars, 60 percent duty on cars made in Bangladesh and 25 percent supplementary duty on reconditioned hybrid cars, Bangladesh is witnessing a rising demand of refurbished vehicles in Bangladesh.[210][211] However, with development of technological know-how automobile manufacturers are starting to manufacture vehicles at competitive prices locally and have also started planning to export their products. Bangladesh has duty-free agreement with several countries due to which cars manufactured and exported from Bangladesh do not attract import duties. These cars can also attract local customers who are interested in buying new cars rather than refurbished cars. It is expected that industrialization in vicinity of proposed EZ will take place due to creation of Feni-Mirsarai industrial zone. This will result in rise in demand for automobiles for industrial use as well as for private use by employees working in the proposed EZ area. Feni-Mirsarai area will be spread over more than 35,000 acres of land creating a huge potential market for car manufacturers. Also proximity of NE India also will give automobile makers in proposed EZ, an opportunity to access Indian markets.
Current Barriers to Investment	Major impediment to the growth of automobile and accessories industry in the proposed EZ region is lack of last mile road connectivity to the proposed EZ site. Presently, there is no arrangement of providing utilities like water, power and gas connection for the industries at proposed EZ site. These utility connections will have to be developed. High automation in the sector requires employing well-qualified engineers, lack of well-developed social infrastructure in vicinity of proposed EZ could also serve as a hindrance in getting engineers to work in the proposed EZ.
Land Requirements	Land requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. However, basis our secondary research and primary survey, it can be mentioned that land requirement for this sector would be between 103 to 150 acres. For purpose of demand projections, land requirement of 130 acre has been taken for this sector.
Power Requirements	Power requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and interaction with local respondents, it can be mentioned that power requirement for this sector normally ranges in between 130 to 150 KVA per acre of factory land. For the purpose of demand projections, power requirement of 141.64 KVA/ acre has been taken for this sector.
Water Requirements	Water requirements for this sector is highly variable depending on the capacity of the factory and type of sub-sector. However, basis our prior experience of working on similar projects and secondary research, it can be mentioned that water requirement for this sector normally ranges in between 8 to 14 cum. per

[210] http://www.thedailystar.net/business/sales-of-reconditioned-cars-getting-popular-in-bangladesh-1530604
[211] http://www.business-standard.com/article/companies/bangladesh-firm-keen-to-assemble-tata-small-cars-117092600034_1.html

	day per acre of factory land. For the purpose of demand projections, water requirement of 12.15 cum. per day per acre has been taken for this sector.
Employment per Factory	Manpower requirement for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and taking inputs from Survey of Manufacturing Industries Database published by Bangladesh Bureau of Statistics, a typical factory generates direct employment for 90 to 100 people per acre of factory land. For the purpose of demand projections, manpower requirement of 98 people per acre has been taken for this sector.

Source: PwC Analysis and MACE analysis

Table 40: Sector Profile 6

Sector	**Heavy Machinery, Iron, Steel and Metal**
Sub-Categories Proposed	Manufacture of iron and steel products
Sector Overview	Bangladesh is one of Asia's emerging steel markets having more than 400 steel, re-rolling and auto re-rolling mills. Most of steel construction in Bangladesh takes place in form of long steel products and MS bars used in construction of buildings. As per discussions with leading steel manufacturers, Bangladesh currently produces more than 4 million tonnes of steel and production of this sector is expected to double by 2022. Due to absence of iron ore deposits, steel industry in Bangladesh is dependent on import of scraps and billets to produce final products. However, Bangladesh has now developed capacity to manufacture 90% of its billet requirement locally. Bangladesh currently manufacturers steel for its domestic consumption only, however due to capacity expansion by steel manufacturers, Bangladesh has also developed potential to export steel products. Proposed EZ region currently does not have any major steel producing plant in its vicinity. All major steel producing plants are located near Chittagong and Narayanganj areas, where downstream produces from ship breaking industry are readily available.
Sector Trends	It is expected that industrialization in vicinity of proposed EZ will take place due to creation of Feni-Mirsarai industrial zone. This will result in exponential rise in steel demand. Steel manufacturing industries coming up in proposed EZ site can cater to this demand and also export steel products outside Bangladesh. Proposed site can provide advantage to steel manufacturers due to presence of water front, where raw materials required for manufacturing of steel items can be directly shipped in and finished products meant for markets can be directly shipped out.
Current Barriers to Investment	Major impediment to the growth of heavy machinery, iron and steel industry in the proposed EZ region is lack of last mile road connectivity to the proposed EZ site. Presently, there is no arrangement of providing utilities like water, power and gas connection for the industries at proposed EZ site. These utility connections will have to be developed.
Land Requirements	Land requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. However, basis our secondary research and primary survey, it can be mentioned that land requirement for this sector would be between 197 to 201 acres. For purpose of demand projections, land requirement of 203 acre has been taken for this sector.
Power Requirements	Power requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and interaction

	with local respondents, it can be mentioned that power requirement for this sector normally ranges in between 170 to 190 KVA per acre of factory land. For the purpose of demand projections, power requirement of 182.11 KVA/ acre has been taken for this sector.
Water Requirements	Water requirements for this sector is highly variable depending on the capacity of the factory and type of sub-sector. However, basis our prior experience of working on similar projects and secondary research, it can be mentioned that water requirement for this sector normally ranges in between 11 to 15 cum. per day per acre of factory land. For the purpose of demand projections, water requirement of 12.15 cum. per day per acre has been taken for this sector.
Employment per Factory	Manpower requirement for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and taking inputs from Survey of Manufacturing Industries Database published by Bangladesh Bureau of Statistics, a typical factory generates direct employment for 70 to 90 people per acre of factory land. For the purpose of demand projections, manpower requirement of 82 people per acre has been taken for this sector.

Source: PwC Analysis and MACE analysis

Table 41: Sector Profile 7

Sector	**Petroleum and Petroleum Products (including bottling)**
Sub-Categories Proposed	Bottling plant
Sector Overview	Bangladesh is a major importer of petroleum products. Based on the petroleum and petroleum based products (such as LPG, LNG, and polymers), gas refining, storage and bottling facilities have been developed in water front locations mostly located near the sea sides of the country. Imported volume of POL(petrol, oil, lubricants) products has clocked 4.1 million MT (2016). LPG based cylinders are bottled in cylinders for industrial, commercial, and domestic supply. This sector caters to the local demand and not export oriented. Currently the proposed EZ site, does not have any bottling plant in its vicinity. GoB has plans to lay down LNG pipes along Dhaka-Chittagong highway in near future. Once this pipeline is established LNG could be made available in the proposed EZ site.
Sector Trends	It is expected that industrialization in vicinity of proposed EZ will take place due to creation of Feni-Mirsarai industrial zone. This will result in exponential rise in demand for cheap source of fuel. Bottling plants coming up in proposed EZ site can cater to this demand. Proposed site can provide advantage to bottling plants due to presence of water front, where sea faring tankers can bring LPG directly to the bottling plant from where the gas can be bottled in cylinders and be used for distribution.
Current Barriers to Investment	Major impediment to the growth of Petroleum and Petroleum products industry in the proposed EZ region is lack of last mile road connectivity to the proposed EZ site. Presently, there is no arrangement of providing utilities like water, power and gas connection for the industries at proposed EZ site. These utility connections will have to be developed. Moreover, draft available for movement of ships from sea till the proposed EZ water front in Sandwip Channel will have to be evaluated and if required dredging exercise needs to be undertaken.
Land Requirements	Land requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. However, basis our secondary research and primary survey, it can be mentioned that land requirement for this sector would be between 11 to 14 acres. For purpose of demand projections, land requirement of 13 acre has been taken for this sector.

Power Requirements	Power requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and interaction with local respondents, it can be mentioned that power requirement for this sector normally ranges in between 170 to 190 KVA per acre of factory land. For the purpose of demand projections, power requirement of 182.11 KVA/ acre has been taken for this sector.
Water Requirements	Water requirements for this sector is highly variable depending on the capacity of the factory and type of sub-sector. However, basis our prior experience of working on similar projects and secondary research, it can be mentioned that water requirement for this sector normally ranges in between 8 to 14 cum. per day per acre of factory land. For the purpose of demand projections, water requirement of 12.15 cum. per day per acre has been taken for this sector.
Employment per Factory	Manpower requirement for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and taking inputs from Survey of Manufacturing Industries Database published by Bangladesh Bureau of Statistics, a typical factory generates direct employment for 30 to 40 people per acre of factory land. For the purpose of demand projections, manpower requirement of 36 people per acre has been taken for this sector.

Source: PwC Analysis and MACE analysis

Table 42: Sector Profile 8

Sector	**Shipbuilding and Shipbreaking**
Sub-Categories Proposed	Ship Building and Ship Breaking
Sector Overview	Ship building and ship breaking units are located in Chittagong, Barisal, Meghnaghat, and in Keraniganj areas on waterfront facilities. Bangladesh is currently focusing on catering to the domestic demand along with export. Engines of the ships are imported from various parts of globe and as per the order requirements. Other major raw materials such as steel, electronics, furnishing, cabling, piping, paint, and accessories are primarily imported. Depending on the production cycle and quality aspects, steel is also procured locally. Liquid oxygen is a major pre-requisite for this sector, which is procured both locally and through import. Basis primary survey and sectoral research, produces from ship breaking industry feed the light engineering and equipment manufacturing industry developed in Bangladesh. Proposed EZ site provide good scope to set up Ship Breaking and Ship Building industries as the site has access to water front allowing ships meant for breaking to be brought directly to shipyards for dismantling and also providing jetty for new ships to be floated in the water. Given the huge land parcel of proposed EZ site, iron and steel industries coming up can purchase the scrap steel thus creating markets in vicinity of ship breaking industry.
Sector Trends	It is expected that industrialization in vicinity of proposed EZ will take place due to creation of Feni-Mirsarai industrial zone. This will result in exponential rise in steel demand. Steel manufacturing industries coming up in proposed EZ site will require scrap iron which can be provided by Ship breaking industries. Shipbuilding industry in Bangladesh is witnessing a growth due its cheap workforce. Due to the proposed EZ having a large land parcel, shipbuilding yards which normally require large plots of land can be established in the proposed EZ site and also the water front can be used to launch newly made ships in the water.

Current Barriers to Investment	Major impediment to the growth of Shipbuilding and Ship breaking industry in the proposed EZ region is lack of last mile road connectivity to the proposed EZ site. Presently, there is no arrangement of providing utilities like water, power and gas connection for the industries at proposed EZ site. These utility connections will have to be developed. Moreover, draft available for movement of ships from sea till the proposed EZ water front in Sandwip Channel will have to be evaluated and if required dredging exercise needs to be undertaken.
Land Requirements	Land requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. However, basis our secondary research and primary survey, it can be mentioned that land requirement for this sector would be around 1-2 acres. For purpose of demand projections, land requirement of 1 acre has been taken for this sector.
Power Requirements	Power requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and interaction with local respondents, it can be mentioned that power requirement for this sector normally ranges in between 130 to 150 KVA per acre of factory land. For the purpose of demand projections, power requirement of 141.64 KVA/ acre has been taken for this sector.
Water Requirements	Water requirements for this sector is highly variable depending on the capacity of the factory and type of sub-sector. However, basis our prior experience of working on similar projects and secondary research, it can be mentioned that water requirement for this sector normally ranges in between 10 to 14 cum. per day per acre of factory land. For the purpose of demand projections, water requirement of 12.15 cum. per day per acre has been taken for this sector.
Employment per Factory	Manpower requirement for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and taking inputs from Survey of Manufacturing Industries Database published by Bangladesh Bureau of Statistics, a typical factory generates direct employment for 30 to 50 people per acre of factory land. For the purpose of demand projections, manpower requirement of 40 people per acre has been taken for this sector.

Source: PwC Analysis and MACE analysis

Table 43: Sector Profile 9

Sector	**Non-Metallic Minerals Sector**
Sub-Categories Proposed	Manufacture of cement
Sector Overview	Bangladesh's annual cement demand is around 25 million MT, however production capacity of cement manufacturers is 43 million MT with an installed capacity of 50 million MT.[212] Bangladesh still has a long way to go in order to boost its cement consumption as it lags behind the world average in terms per capita cement consumption. The global average of per capita cement consumption is 500kg while Bangladesh currently has a per capita cement consumption of 120kg. Clinker is the most important raw material for manufacturing of cement in Bangladesh. Due to lack of limestone deposits, all clinker is currently imported in Bangladesh. Major challenge faced by manufacturers in Bangladesh, is the overcapacity of cement production and uncertain clinker prices. As per discussions with various cement manufacturers, it was understood that due to high competition between various cement manufacturers this sector is currently witnessing price wars

[212] http://www.thedailystar.net/business/no-cheer-cement-industry-2017-1511329

	which has resulted in profit margins of cement manufacturers shrinking to as low as 2-3%. The proposed EZ site does not have any cement manufacturing plant, majority of the plants are located near Chittagong, Narayangonj, Munshiganj etc. where there is access to water front. It is important for cement plants in Bangladesh to have access to water front, as clinkers that are imported are transported in ships.
Sector Trends	It is expected that Bangladesh's cement consumption will keep rising year on year by 9% till 2021.[213] Construction of various marquee projects in Bangladesh has resulted in a rapid uptick in cement consumption with public sector responsible for country's 35% cement consumption. Also the high growth rate of Bangladesh, has resulted in rising number of homebuyers which has also pushed up demand of cement. Presently there are 32 factories in operation in Bangladesh with 81 percent of market share held by top ten manufacturers. Despite Bangladesh having already high cement producing capacity, cement manufacturers are on an expansion drive in Bangladesh in order to introduce new cement manufacturing technology and bring down their manufacturing costs. This is resulting in consolidation in cement sector with large players remaining and the smaller players being forced to cede market share. It is expected that Proposed EZ site will be suitable for production of cement as the site has access to water front and the site will be a part of the Feni-Mirsarai industrial zone where a lot of construction activity is expected to take place. Thus creating local market for the proposed EZ site. Moreover, proximity to NE Indian border will also create opportunity for cement industries to cater Indian markets as well.
Current Barriers to Investment	Major impediment to the growth of non-metallic mineral industry in the proposed EZ region is lack of last mile road connectivity to the proposed EZ site. Presently, there is no arrangement of providing utilities like water, power and gas connection for the industries at proposed EZ site. These utility connections will have to be developed. Moreover, draft available for movement of ships from sea till the proposed EZ water front in Sandwip Channel will have to be evaluated and if required dredging exercise needs to be undertaken. Overcapacity of cement production in Bangladesh is also a challenge with companies looking to further expand their manufacturing capacity. This might result in price of cements falling further, resulting in industry witnessing consolidation by larger players.
Land Requirements	Land requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. However, basis our secondary research and primary survey, it can be mentioned that land requirement for this sector would be between 753 to 901 acres. For purpose of demand projections, land requirement of 843 acre has been taken for this sector.
Power Requirements	Power requirements for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and interaction with local respondents, it can be mentioned that power requirement for this sector normally ranges in between 150 to 170 KVA per acre of factory land. For the purpose of demand projections, power requirement of 161.87 KVA/ acre has been taken for this sector.
Water Requirements	Water requirements for this sector is highly variable depending on the capacity of the factory and type of sub-sector. However, basis our prior experience of

[213] https://www.worldcement.com/indian-subcontinent/02062017/bangladesh-to-be-a-bright-spot-for-cement-demand/

	working on similar projects and secondary research, it can be mentioned that water requirement for this sector normally ranges in between 7 to 13 cum. per day per acre of factory land. For the purpose of demand projections, water requirement of 9.72 cum. per day per acre has been taken for this sector.
Employment per Factory	Manpower requirement for this sector is highly variable depending on the capacity of the factory, use of technology and type of sub-sector. Basis our prior experience of working on similar projects, secondary research and taking inputs from Survey of Manufacturing Industries Database published by Bangladesh Bureau of Statistics, a typical factory generates direct employment for 550 to 650 people per acre of factory land. For the purpose of demand projections, manpower requirement of 603 people per acre has been taken for this sector.

Source: PwC Analysis and MACE analysis

4.8. Analysis of Survey Results

In order to arrive at the most suitable industries in site surrounding context, an industry assessment framework comprising of top-down (secondary research) and bottom-up (primary survey) was adopted.

The **top-down approach** identifies 15 best-performing industrial sectors (initial bucket list of industries) in the country context based on historical trend analysis of industrial production and foreign trade. At the next level, sectoral outlook of these industries were studied in details to understand about (i) raw material sourcing, (ii) major markets being served, and (iii) factors of production (such as utility, logistics, and manpower) necessary.

In-depth regional landscape assessment of the influence region (comprising of adjoining districts) surrounding the proposed EZ was undertaken in light of (i) economic profiling, (ii) natural resources (agricultural, marine, and mineral), (iii) industrial ecosystem in the influence region, and (iv) availability of semi-skilled and skilled manpower. It emerged out that the influence region is yet to witness significant industrial development and the economy is primarily agriculture dependent, although a lot of industrial activities are planned in the influence area like developing of Mirsarai Economic Zone spread over 30,000 acres. Proximity to Chittagong ensures industrial linkages to the proposed EZ. Project site has proximity to Indian state of Tripura, which shall provide access to agricultural and natural resources of Tripura including the growing market of North-East India.

Regional assessment depicts the suitability of the initial bucket list of industries in site surrounding and influence region context. **Ten industries were initially shortlisted** ex post facto this regional landscape assessment. These industries are: (a) Textile & RMG, (b) Leather and Leather Products, (c) Electrical & Electronics, (d) Automobile and Accessories, (e) Paper and Packaging, (f) Light Machinery, Equipment and Furniture, (g) Non-Metallic Mineral Products, (h) Heavy Machinery, Iron and Steel, (i) Ship Building and Ship Breaking, and (j) Petroleum and Petroleum Products (including bottling).

On-ground primary survey was undertaken to validate the aptness of these initially shortlisted industries and to capture the feedback from investors. A total of 124 respondents (comprising of 94 Bangladeshi and rest foreign) were surveyed. Primary survey revealed that ~22% of the respondents have some understanding about economic zone policy and regime. Voice on ground also captured that the investors are facing challenges regarding power shortage, unavailability of fuel (natural gas), access to credit, excessive bureaucracy, and with overall logistics scenario in the country. These challenges (country specific, site specific, and sector specific) are causing hindrances to investment. Among the various site specific challenges faced by manufacturers, hindering investment towards proposed EZ, it was observed that lack of a good last mile connectivity was listed as the common reason by the manufacturers.

Respondents opined that they have certain pre-requisites of investment. **Key pre-requisites** as divulged by the primary survey are:

- Subsidized industrial space and utility tariffs
- Access to concessional loan

- Corporate income tax subsidy
- Availability of Raw Material
- Uninterrupted access to quality utility services (power, water, and gas)
- Warehousing facility and access to water front

Many fiscal and infrastructure related pre-requisites are already under implementation by BEZA as part of its EZ incentive package and operational guidelines.

Following sectors have emerged as most suitable for this proposed EZ –

Heavy industries

- Heavy Machineries, Iron and Steel
- Shipbuilding and Ship breaking
- Petroleum and Petroleum Products (including bottling)

Other industries

- Textile & RMG
- Leather and Leather Products
- Electrical & Electronics
- Automobile and Accessories
- Light Machinery, Equipment & Furniture
- Non-Metallic Mineral Products

5. Demand Forecast

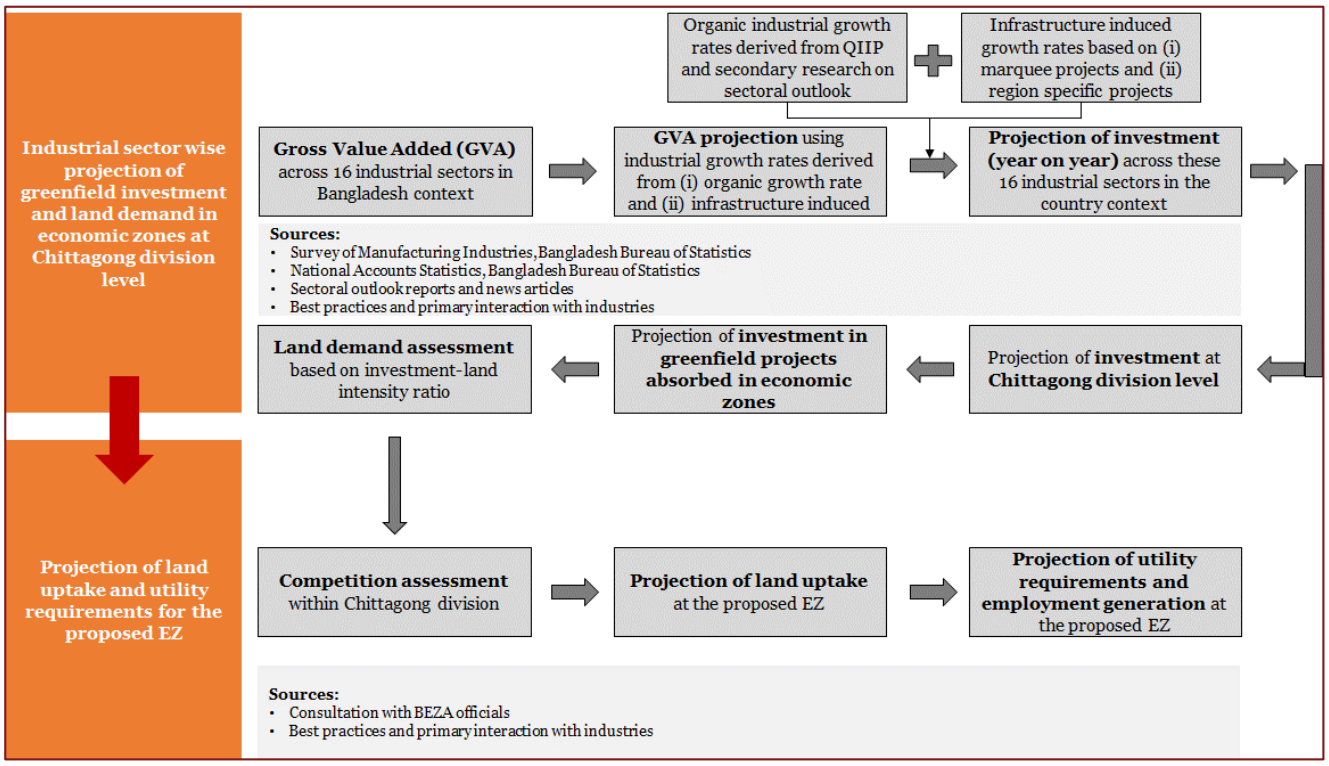
5.1. Purpose and Objective

Former chapter delves into an overall assessment of industrial sectors in regard to the country and the regional landscape (for the region surrounding the proposed EZ). This assessment culminates into identification of key industry sectors which are suitable for the proposed EZ. Based on the shortlisted industrial sectors, statistical projection techniques are applied to develop a mathematical model towards estimation of demand for the proposed EZ spread over a time span of 20 years. This chapter captures estimation of the potential demand (in terms of land uptake and utility requirements) in the context of the proposed EZ. An assessment of employment generation have also been undertaken in this chapter. Basis the key findings of this demand model, land demand uptake and potential industrial mix for the proposed EZ is arrived at; this forms the basis of the best practice master planning and infrastructure planning. It is to be noted that the estimation of utility requirements is tentative in nature and it may vary depending on the best practice master planning.

5.2. Methodology of Demand Forecast

Associative method projection technique is used for this demand forecasting study. Various parameters have been analyzed in the country and region context to understand the impact on the variables used for projection. Following figure captures overall methodology for the demand forecasting exercise.

Figure 39: Overall approach for demand forecast



Source: PwC Analysis

Step-wise approach has been elucidated in the following-

Step-1: Gross Value Added (GVA) is the measure of the value of goods and services produced by a particular industry sector. In this exercise, GVA for the best performing 16 industrial sectors (identified in last chapter) in the country context has been considered as the base for forecasting. Survey of Manufacturing Industries 2012 (SMI) data published by Bangladesh Bureau of Statistics (BBS) has been referred for the same.

Step-2: GVA for these 16 industrial sectors have been forecasted based on industrial growth rates. It has been considered that these growth rates are generating owing to (i) organic growth rate(s) of the respective industrial sector(s) and (ii) infrastructure induced growth rates.

Quantum Index of Industrial Production (QIIP) published in National Account Statistics 2017 (NAS) by BBS has been analyzed to find out CAGR for each of these industry sectors. The results obtained from the same have been further validated by detailed secondary research on sectoral outlook and industry trends in Bangladesh. Data points in support to these parameters are furnished in the annexure.

It has been assumed that the organic growth rates of industrial sectors are augmented due to upcoming infrastructure projects planned in the country and in the region surrounding the proposed EZ. Details of the related assumptions are mentioned in the next section.

Step-3: Earlier step estimates projection of investment in the overall country context. Based on certain sets of assumptions, Greenfield investment in economic zones at Chittagong division level have been assessed. These assumptions are outlined in the next section.

Step-4: Basis secondary research on industry sector outlook and primary interaction with industries, investment-land intensity ratio (investment per unit area) has been assessed. This ratio is applied on the projected investment to estimate the land uptake forecasting in the economic zones of Chittagong division.

Step-5: In addition to the proposed EZ, various other economic zones are planned within Chittagong division. In consultation with BEZA officials, land uptake in these proposed economic zones have been prepared. After considering competition from the other economic zones within Chittagong division, land uptake projection at the proposed EZ is arrived at.

Step-6: Based on the shortlisted industry sectors suitable for the proposed EZ (identified in last chapter), land uptake projection has been calculated. Proceeds from the same would be used to formulate the best practice master planning and accordingly infrastructure requirement to be assessed.

Step-7: Referring to secondary research and prevailing best practices, utility requirements and employment generation (per unit area) have been considered. These index figures have been validated through the primary interaction held on ground. Based on the same, projection of utility requirements and employment generation for the proposed EZ has been estimated.

It is to be noted that forecasting of land uptake, utility requirements and employment generation are based on the hypothesis elaborated above. Actual scenario during on-ground development of the proposed EZ may vary from this estimation.

5.3. Demand Scenarios and Associated Assumptions

5.3.1. Demand Scenarios

Three scenarios have been considered while developing the demand forecasting model.

- Aggressive case: Economic conditions of Bangladesh and the region are improving and behaving better than expected; as a result of the same, macro-economic indicators showing good prospect and potential infrastructure projects are commencing as scheduled.
- Base case: Economic conditions of Bangladesh and the region are showing steady trend and behaving as expected; macro-economic indicators also indicating good prospect.
- Conservative case: Economic conditions of Bangladesh and the region are showing lagging trend and behaving worse than expected; macro-economic indicators indicating hindrances to growth.

5.3.2. Key Assumptions

1. Timing and related assumptions

It has been assumed that regulatory activities and study on the proposed EZ would take place throughout the current financial year i.e. 2018-19 (termed as 2019). Further, project preparatory activities (such as off-site infrastructure development, decision on development model, environmental & other clearances, and appointment of private developer) would consume a timeframe of 4 years (i.e. from 2020 to 2023). Taking cues from similar developments across the globe, construction timeline of 16 years (from 2024 to 2039) has been considered.

Basis above timelines, it has been assumed that land uptake in the proposed EZ to commence from 2026 and accordingly a demand model has been prepared for 21 years (i.e. from 2026 to 2046).

2. Industries considered for this assessment

As elaborated in earlier chapter, broadly two categories of industries have been identified for the demand projection framework.

Other Industries

- Textiles and Ready Made Garments (RMG)
- Leather and Leather Products
- Nonmetallic Minerals
- Auto and Automobile accessories
- Electrical & Electronics
- Light Machinery and Equipment & Furniture

Heavy Industries

- Heavy machinery, Iron & Steel and metals
- Ship building and Ship breaking
- Petroleum products including bottling

3. Assumptions related to industrial growth rate (organic)

Basis primary survey of industrial units, growth trend and changing investment landscape in the country context were assessed. Based on the responses recorded during primary survey, organic industrial growth has been taken into cognizance.

As outlined in the methodology of the demand forecast, following organic industrial growth rates have been assumed. The values considered are on the conservative side. Detailed rationale behind these assumptions are placed as annexure.

Table 44: Organic industrial growth rate related assumptions

Industrial Sectors	Description of the Assumptions
Other Industries	
Textiles and RMG	• 13.0% annual growth rate (from 2012 to 2016) • 12.0% annual growth rate (from 2017 to 2021) • 10.0% annual growth rate (from 2022 to 2026) • 8.0% annual growth rate (from 2027 to 2031) • 7.5% annual growth rate (from 2033 to 2045)

Industrial Sectors	Description of the Assumptions
Leather and Leather Products	• 3.0% annual growth rate (from 2012 to 2016) • 5.0% annual growth rate (from 2017 to 2021) • 7.0% annual growth rate (from 2022 to 2026) • 6.0% annual growth rate (from 2027 to 2045)
Nonmetallic Minerals	• 15.0% annual growth rate (from 2012 to 2016) • 14.0% annual growth rate (from 2017 to 2021) • 15.0% annual growth rate (from 2022 to 2026) • 12.0% annual growth rate (from 2027 to 2045)
Auto and Automobile accessories	• 15.0% annual growth rate (from 2012 to 2016) • 17.0% annual growth rate (from 2017 to 2021) • 15.0% annual growth rate (from 2022 to 2045)
Electrical & Electronics	• 15.0% annual growth rate (from 2012 to 2016) • 17.5% annual growth rate (from 2017 to 2021) • 20.0% annual growth rate (from 2022 to 2026) • 16.0% annual growth rate (from 2027 to 2045)
Light Machinery and Equipment & Furniture	• 20.0% annual growth rate (from 2012 to 2016) • 21.0% annual growth rate (from 2017 to 2021) • 18.0% annual growth rate (from 2022 to 2045)
Heavy Industries	
Heavy machinery, Iron & Steel and metals	• 8.0% annual growth rate (from 2012 to 2016) • 9.0% annual growth rate (from 2017 to 2021) • 10.0% annual growth rate (from 2022 to 2026) • 9.0% annual growth rate (from 2027 to 2045)
Ship building and Ship breaking	• 10.0% annual growth rate (from 2012 to 2016) • 12.0% annual growth rate (from 2017 to 2021) • 10.0% annual growth rate (from 2022 to 2045)
Petroleum products including bottling	• 15.0% annual growth rate (from 2012 to 2016) • 14.0% annual growth rate (from 2017 to 2021) • 13.0% annual growth rate (from 2022 to 2045)

Source: National Accounts Statistics (May' 2017) by Bangladesh Bureau of Statistics; Secondary Research and PwC Analysis

4. Assumptions related to industrial growth rate (infrastructure induced)

Respondents from primary survey also opined that the infrastructure induced growth trend in the country is going to impact industrial development landscape.

Various marquee projects are planned across the country. These projects, once operational are expected to bolster the overall socio-economic growth of Bangladesh and in turn will also facilitate industrial growth. Three path-breaking infrastructure projects have been identified in the country context such as (i) Padma Bridge (~205 km from the proposed EZ), (ii) Upgradation of Dhaka-Chittagong Highway (~25 km from the proposed EZ).

In addition to these projects, following infrastructure development projects in the region surrounding the proposed EZ have been considered.

(i) Matarbari Power Plant (~185 km from the proposed EZ),

(ii) Proposed Mirsarai Port (~50 km from the proposed EZ),

(iii) Upcoming Mirsarai Integrated Industrial City by BEZA (adjacent to the proposed EZ),

(iv) Other proposed infrastructure developments in this region

It has been assumed that owing to development of these projects, industrial growth rate would be augmented to a certain extent. Table in the next page elucidates the infrastructure induced augmentation in industrial growth rate across the three scenarios.

Table 45: Assumptions towards infrastructure induced augmentation in industrial growth rate

Details	Conservative	Base	Aggressive
Industrial growth rate augmentation per year (%) as a result of Padma Bridge (from 2021 to 2027)	0.00%	1.00%	2.00%
Industrial growth rate augmentation per year (%) as a result of upgradation of Dhaka Chittagong highway (from 2020 to 2024)	0.15%	0.20%	0.25%
Industrial growth rate augmentation (%) as a result of (i) Matarbari Power Plant, (ii) Proposed Mirsarai Port, (iii) Upcoming Mirsarai integrated industrial city by BEZA, and (iv) various infrastructure development projects planned in Southern Bangladesh (from 2021 to 2030)	0.35%	0.40%	0.45%

Source: Secondary research and PwC Analysis

Research articles and secondary sources hint that Padma Bridge is expected to boost the GDP growth of the country by 1.66%. Since the upcoming Padma Bridge is located at a distance from the proposed EZ, it has been assumed in the base case that once the bridge is operational, industrial growth in this region shall be augmented by 1.00% annually. Impact of other potential infrastructure projects at country level and region level has been assumed subsequently.

Detailed rationale behind these assumptions are placed as annexure.

5. Assumptions related to investment inflow in economic zones of Chittagong division

Out of the total investment forecasted at the country level, certain portion is expected to inflow at Chittagong division level. A part of this investment inflow is Greenfield in nature (involves setting up of new facilities). Out of the total Greenfield investment estimated at Chittagong division level, it has been assumed that a certain quantum would take place in the economic zones proposed within Chittagong division. Following table captures the assumptions related to investment inflow in economic zones of Chittagong division.

Table 46: Assumptions related to investment inflow in economic zones of Chittagong division

Details	Conservative	Base	Aggressive
Investment in Chittagong Division as % of the total investment estimated for the country	18%	19%	20%
% of greenfield investment	35%	37.5%	42%
Investment in economic zones (%) out of total greenfield investment	52%	54%	56%

Source: Secondary research and PwC Analysis

Based on information availed from secondary research and PwC analysis, Chittagong division contributes to ~19% of GDP of the country. Thus, commensurate investment in Chittagong division has been assumed as 19% (in base case) of the total investment inflow in the country. Taking cues from research articles on Greenfield investment in developing countries, in base case, 37.5% of Greenfield investment has been assumed.[214]

BEZA has embarked into an ambitious journey of setting up of 100 economic zones in the coming 15 years. Basis information obtained from BEZA officials, around 18 economic zones (including govt. driven, G2G and private) are planned in Chittagong division. Basis discussion with BEZA officials, it was understood that economic zones planned in Chittagong division are spread over huge area (such example is Mirsarai integrated industrial city

[214] *http://documents.worldbank.org/curated/en/628261468781753575/110510322_20041117173021/additional/325780wps3192.pdf*

which is planned to be spread over 30,000 acres) especially the economic zones in Mirsarai, Feni, and Maheshkhali. Keeping in cognizance planned industrialization in Chittagong division and upcoming economic zones, it has been assumed that in base case, 54% investment in economic zones (out of total Greenfield investment) would flow in.

Detailed rationale behind these assumptions are placed as annexure.

6. Assumptions related to investment-land intensity and number of establishments

Based on prevailing practices and primary interaction with industries and taking in cognizance similar developments in the geographical context, investment-land intensity ratio (investment per unit land area) for the shortlisted industries have been arrived at. These figures are indicative in nature and may vary depending on the exact stage of value chain and the type of finished goods.

It is very difficult to estimate number of industrial establishments in any economic zone during project conceptualization stage. Synthesizing number of industrial establishment data obtained from Survey of Manufacturing Industries 2012 with the feedback obtained from primary survey, number of industrial establishment per unit acre figures have been arrived at. It has also been taken into consideration that as per prevailing BEZA development guidelines, minimum land plot size is 1 acre.

While calculating the above, it has been assumed that the proposed EZ houses only small, medium, and large scale industries.[215]

Table 47: Assumptions related to investment-land intensity ratio

Industrial Sectors	Investment (BDT million) per acre	Area (acre) Requirement for each industrial establishment (small, medium and large)
Other Industries		
Textiles and RMG	34.80	2.00
Leather and Leather Products	48.06	2.00
Nonmetallic Minerals	58.82	5.00
Auto and Automobile accessories	115.18	1.00
Electrical & Electronics	172.35	1.00
Light Machinery and Equipment & Furniture	198.86	1.00
Heavy Industries		
Heavy machinery, Iron & Steel and metals	84.52	10.00
Ship building and Ship breaking	107.42	20.00
Petroleum products including bottling	107.42	10.00

Source: Secondary research, primary interaction with industries and PwC Analysis

[215] *Definitions of Small, Medium, and Large industries are as per Survey of Manufacturing Industries (2012) published by Bangladesh Bureau of Statistics*

7. Assumptions related to competition from other proposed EZs within Chittagong division

Basis discussion with BEZA officials and data provided in BEZA website, information on the competing manufacturing EZs within Chittagong division have been gathered. Following table captures information about the same.

Table 48: Competing economic zones within Chittagong division

Sl. No.	Name of EZ	Location	District	Acres	Remarks
1	Ashugonj EZ	Ashugonj	Brahmanbaria	328.61	Govt. driven
2	Anawra -2 (CEIZ)	Anawra	Chittagong	774.48	Govt. driven
3	Anwara EZ	Gahira, Anwara	Chittagong	503.70	Govt. driven
4	Mirsarai EZ	Mirsarai	Chittagong	30000.00	Govt. driven
5	Patiya EZ	Patiya	Chittagong	774.48	Govt. driven
6	Comilla EZ	Meghna	Comilla	272.00	Private EZ
7	Cox's Bazar Special EZ	Moheshkhali	Cox's Bazar	87 84.77	Govt. driven
8	Moheshkhali -1 EZ	Moheshkhali	Cox's Bazar	1438.52	Govt. driven
9	Moheshkhali -2 EZ	Moheshkhali	Cox's Bazar	827.31	Govt. driven
10	Moheshkhali -3 EZ	Dholghata	Cox's Bazar	1497.00	Govt. driven
11	Moheshkhali Special Economic Zone	Ghotibangha	Cox's Bazar	1000.00	Govt. driven
12	Moheshkhali Special Economic Zone Kalamarchora	Moheshkhali	Cox's Bazar	2890.00	Govt. driven
13	Maheshkhali EZ	Cox's Bazar	Cox's Bazar	13659.00	Govt. driven
14	alliance EZ	Comilla	Comilla	100.00	Private EZ

Source: BEZA website and discussion with BEZA officials

In addition to the above mentioned economic zones, there are a few economic zones planned in this region which are slated to become tourism based economic zones. These economic zones are not being considered as competition to the subject site as the proposed EZ is multiproduct in nature.

In line with the above information, industrial space uptake in the competing EZs from 2017 to 2052 have been assumed. Details of the same are placed in the annexure. Basis suggestions obtained from various BEZA officials and realistic development scenarios of these competing EZs, this assumption has been formulated. However, on ground scenario may vary than this assumption.

8. Industrial space requirement as % of total land area

In any EZ, a certain proportion is allotted for industrial space. Remaining portion is kept reserved for allied on-site infrastructure (such as internal road connection, water and sewer system, effluent treatment facilities and utility connection) and non-processing zone (such as entrance plaza, social infrastructure, skill development facilities, green space and other amenities). It has been assumed that 65% of total land area is to be earmarked in the competing EZs for industrial purposes. However, this is tentative and based on development guidelines of BEZA & similar developments worldwide. During best practice master planning, this ratio may vary depending on the shape of the land parcel and terrain condition.

Demand projection undertaken in the interim stage has been revised in this report. Basis our discussion with BEZA officers on 16th August, site area was revised to 7,000 acres. Due diligence on the revised site area and

location reveals that out of 7,000 acres, 4,976.31 acres of land is developable (mangroves are spread over an area of 2,023.69 acres) and approximately 4,192 acres has been earmarked in the master plan for industrial development. Thus, this demand projection exercise has been undertaken for revised industrial area of 4,192 acres.

9. Utility requirements and employment generation

Standard industry benchmarks and excerpts from the primary survey have been referred to arrive at the benchmark figures (per unit area) towards estimation of utility requirements and direct employment generation. It is to be noted that these figures are indicative in nature. These figures may vary during on-ground implementation of the proposed EZ and as per the stage in the value chain for the industry. These figures are also dependent on the production capacity and exact type of finished goods being produced.

Table in the next page captures these benchmark figures.

Table 49: Utility requirements and employment generation - benchmark figures

Industry sectors	Power requirements (kVA per acre)	Water requirements (Cum per day per acre)	Direct Employment generation (Number per acre)
Other Industries			
Textiles and RMG	182.11	12.15	142
Leather and Leather Products	121.41	13.36	54
Nonmetallic Minerals	161.87	9.72	603
Auto and Automobile accessories	141.64	12.15	98
Electrical & Electronics	121.41	13.36	253
Light Machinery and Equipment & Furniture	121.41	9.72	186
Heavy Industries			
Heavy machinery, Iron & Steel and metals	182.11	12.15	82
Ship building and Ship breaking	141.64	12.15	40
Petroleum products including bottling	182.11	12.15	36

Source: Industry best practices & standard benchmarks, primary survey

Basis primary survey, most of the industries use gas as fuel source to generate power and for boiler usage. Depending on the value chain requirements and requirements of factors of production, the same would vary. It is very difficult to estimate gas requirements without comprehending the exact requirements and exact product type from these industries. Thus, estimation of gas requirement has not been carried out in this module.

5.4. Demand Forecasting

5.4.1. Industrial Space Uptake

Based on the above stated assumptions, industrial space occupancy for the three scenarios are captured in the following table.

Table 50: Industrial space occupancy (in %) for the three scenarios (cumulative)

Scenarios	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Conservative	4%	6%	6%	6%	6%	6%	8%	11%	11%	11%	11%	11%	11%	26%	28%	42%	50%	50%	59%	95%	100%
Base	6%	11%	11%	11%	11%	11%	16%	22%	22%	22%	22%	23%	28%	43%	62%	70%	90%	100%	100%	100%	100%
Aggressive	10%	19%	23%	25%	28%	32%	40%	50%	50%	52%	57%	65%	76%	98%	100%	100%	100%	100%	100%	100%	100%

Source: Demand Forecasting

Detailed calculations are furnished in the annexure. Following tables elucidates the industrial sector wise industrial space uptake for the three scenarios.

Table 51: Industrial space uptake- Conservative Scenario (figures in acres) - cumulative

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Other Industries	154	235	235	235	235	235	235	313	313	313	313	313	313	824	1166	1628	1946	1946	2566	3884	3980
Heavy Industries	7	11	11	11	11	11	11	16	16	16	16	16	16	44	62	86	103	103	137	207	212
Total	**161**	**246**	**246**	**246**	**246**	**246**	**246**	**329**	**329**	**329**	**329**	**329**	**329**	**868**	**1228**	**1714**	**2049**	**2049**	**2703**	**4091**	**4192**

Source: Demand Forecasting (kindly ignore the rounding off)

Table 52: Industrial space uptake- Base Scenario (figures in acres) - cumulative

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Other Industries	258	440	440	440	519	519	617	803	803	822	822	938	1065	1389	2100	2663	3367	3956	3977	3977	3977
Heavy Industries	12	22	22	22	26	26	31	42	42	43	43	49	57	74	113	143	182	214	215	215	215
Total	**270**	**462**	**462**	**462**	**545**	**545**	**648**	**845**	**845**	**865**	**865**	**987**	**1122**	**1463**	**2213**	**2806**	**3549**	**4170**	**4192**	**4192**	**4192**

Source: Demand Forecasting (kindly ignore the rounding off)

Table 53: Industrial space uptake- Aggressive Scenario (figures in acres) - cumulative

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Other Industries	413	752	929	954	1168	1185	1433	1782	1844	2060	2211	2561	2942	3548	3977	3977	3977	3977	3977	3977	3977
Heavy Industries	20	37	47	49	60	60	74	94	97	109	117	136	157	191	215	215	215	215	215	215	215
Total	**433**	**789**	**976**	**1003**	**1228**	**1245**	**1507**	**1876**	**1941**	**2169**	**2328**	**2697**	**3099**	**3739**	**4192**	**4192**	**4192**	**4192**	**4192**	**4192**	**4192**

Source: Demand Forecasting (kindly ignore the rounding off)

Conservative scenario of demand projection takes into consideration laggard trend of investment influx at the subject site and in the surrounding region. Conservative scenario takes into consideration the worst possible case where economic indicators are slowing down, investment trend is declining, and infrastructure projects are completing later than stipulated. Aggressive scenario considers sanguine and upward trend of the indicators mentioned, whereas base scenario considers as-is situation of economic indicators, investment, and infrastructure growth. Thus, in conservative scenario, land uptake and other related ind icators are showing laggard trend, whereas in the aggressive scenario, land uptake and related indicators are showing increasing trend.

Competition from the Mirsarai integrated industrial city (located adjacent to the proposed EZ) has been considered and conservative scenario reflects intense competition from Mirsarai integrated industrial city. Thus, the conservative scenario indicates staggered pattern of land uptake, whereas the aggressive scenario indicates sanguine nature of land uptake (since in aggressive case, competition from the adjacent Mirsarai integrated industrial city is moderate).

In accordance to the above estimated land demand, number of industrial establishments (small, medium, and large) has also been estimated. Following table (in the next page) captures the same. Please note that the industrial mix obtained as elaborated in the tables abov may vary while formulating the master planning. This is owing to accommodate the industries in the shape of the land parcel demarcated for the proposed economic zone.

Table 54: Estimation of Industrial Establishments- cumulative

Scenarios	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Conservative	75	114	114	114	114	114	114	154	154	154	154	154	154	416	593	834	999	999	1330	2036	2088
Base	126	215	215	215	254	254	303	396	396	405	405	464	529	696	1062	1356	1725	2035	2046	2046	2046
Aggressive	201	368	455	467	573	582	705	879	911	1019	1096	1274	1468	1779	2001	2001	2001	2001	2001	2001	2001

Source: Demand Forecasting (kindly ignore the rounding off)

5.4.2. Utility Requirements

In line with the industrial space uptake projections, following tables elaborates the forecasting of utility (power and water) requirements at the proposed EZ.

Table 55: Power Requirements- Three Scenarios (figures in MVA) - cumulative

Scenarios	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Conservative	28	43	43	43	43	43	43	58	58	58	58	58	58	149	210	292	348	348	457	688	705
Base	48	81	81	81	96	96	113	148	148	151	151	172	195	253	380	480	605	709	712	712	712
Aggressive	76	139	171	176	215	218	264	327	339	378	405	468	537	645	722	722	722	722	722	722	722

Source: Demand Forecasting (kindly ignore the rounding off)

Table 56: Water Requirements- Three Scenarios (figures in thousand cum per day or MLD) - cumulative

Scenarios	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Conservative	2	3	3	3	3	3	3	4	4	4	4	4	4	10	14	20	24	24	31	47	48
Base	3	5	5	5	6	6	8	10	10	10	10	12	13	17	26	33	41	48	49	49	49
Aggressive	5	9	12	12	14	15	18	22	23	26	27	32	36	44	49	49	49	49	49	49	49

Source: Demand Forecasting (kindly ignore the rounding off)

Detailed calculations are furnished in the annexure. Demand figures estimated are tentative in nature and may change during on-ground implementation. During master planning, these numbers would be reviewed based on the zoning pattern adopted in master planning.

5.4.3. Employment Generation

In line with the industrial space uptake projections, figure in the next page elaborates the forecasting of direct employment generation from the proposed EZ.

Figure 40: Direct employment generation for the three scenarios (figures in '000)

Scenarios	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Conservative	33	51	51	51	51	51	51	70	70	70	70	70	70	199	287	406	488	488	653	1005	1032
Base	56	95	95	95	113	113	136	180	180	185	185	214	246	327	509	654	837	992	998	998	998
Aggressive	88	162	201	206	254	258	317	400	415	467	504	590	686	839	949	949	949	949	949	949	949

Source: Demand Forecasting (kindly ignore the rounding off)

Detailed calculations are furnished in the annexure.

5.5. Key Takeaways

- Three scenarios (conservative, base, and aggressive) have been developed to forecast land demand for the proposed EZ. Base scenario assumes Business-as-Usual situation for the overall economic condition of the country and the influence region; whereas the conservative (aggressive) scenarios assume good (bad) performance of economic and infrastructure indicators in regard to the country and the influence region.
- Assumptions related to industrial growth rates and investment inflow to the subject site have been varied as per the three scenarios elaborated above. It has been assumed that in aggressive (conservative) case, higher (lower) infrastructure induced growth rate and higher (lower) investment inflow taking place to the subject site. Base case considers the current scenario backed up by evidences and present trends.
- It appears that in conservative case, complete land uptake would take place in 21 years. For base and aggressive cases, the same would be spread over 18 years and 15 years respectively.
- Total number of industrial establishments (small, medium, and large) for conservative case is 2,088. For base and aggressive cases, it is 2,046 and 2,001 respectively.
- For conservative case, ultimate power and water demand have been estimated as 705 MVA and 48 thousand cum per day; For base case, ultimate power and water demand have been estimated as 712 MVA and 49 thousand cum per day; For aggressive case, ultimate power and water demand have been estimated as 722 MVA and 49 thousand cum per day. These figures are indicative and may vary during formulation of best practice master planning. Details of electricity and water sourcing would be captured in the infrastructure planning stage.

- Proposed EZ is expected to generate direct employment of ~1,032,000 in conservative case. In base and aggressive cases, employment generation figures could be ~998,000 and ~949,000. These figures are indicative and may vary during implementation.

6. Transport Assessment

6.1. Purpose and Objective

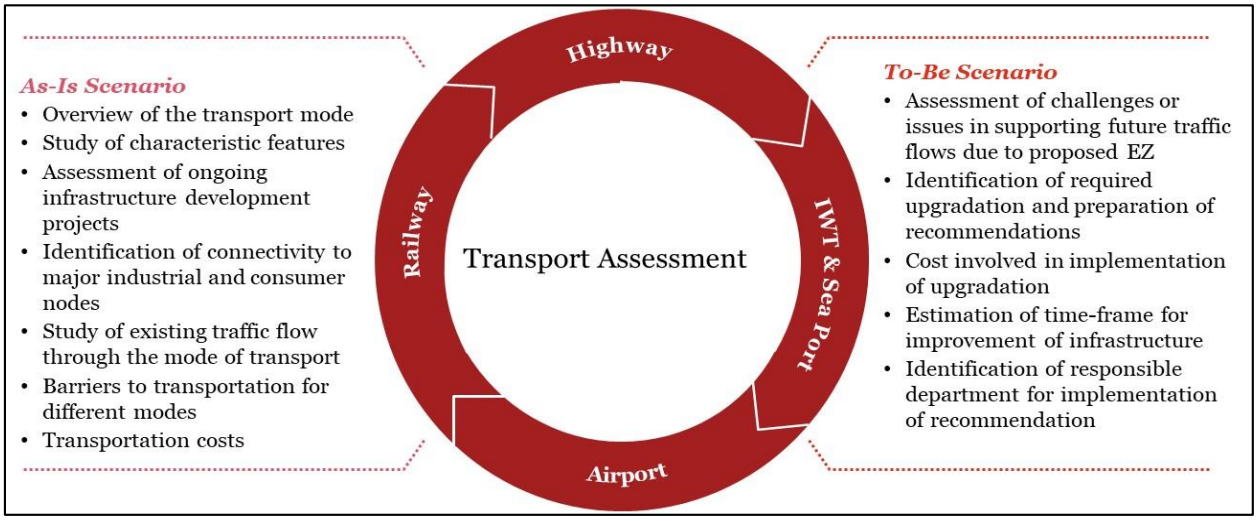
A robust transport infrastructure is the most vital enabler for movement of men and material from origin to destination. In an increasingly globalized economy, industrial development of any region needs to be supported by a seamless movement of traffic to ensure resources can be brought in or sent out to major international transit gateways.

This chapter will delineate the transport infrastructure available in the vicinity of proposed EZ site and existing connectivity with major international transit points. A comprehensive study of each mode of transport i.e. road, railway, port and airport will be performed to understand as-is scenario of these modes of transport. The impact of the development of proposed EZ site on all transport modes will be considered and proposals to upgrade the existing transport network in order to support the proposed EZ site will be elucidated.

6.2. Methodology of Transport Assessment

The approach adopted to assess transport infrastructure supporting movement of goods and passengers in the vicinity of the proposed EZ site is segregated into 2 modules. 1st module deals with evaluation of the existing status of different modes of transport with respect to its features, connectivity, traffic flow, ongoing projects and transportation costs involved. 2nd module contains recommended upgradations of different modes of transport infrastructure to support the future traffic flows due to proposed EZ, cost implication of such upgradations, timeframe over which the upgradation should take place and department responsible for concerned upgradation.

Figure 41: Assessment Methodology

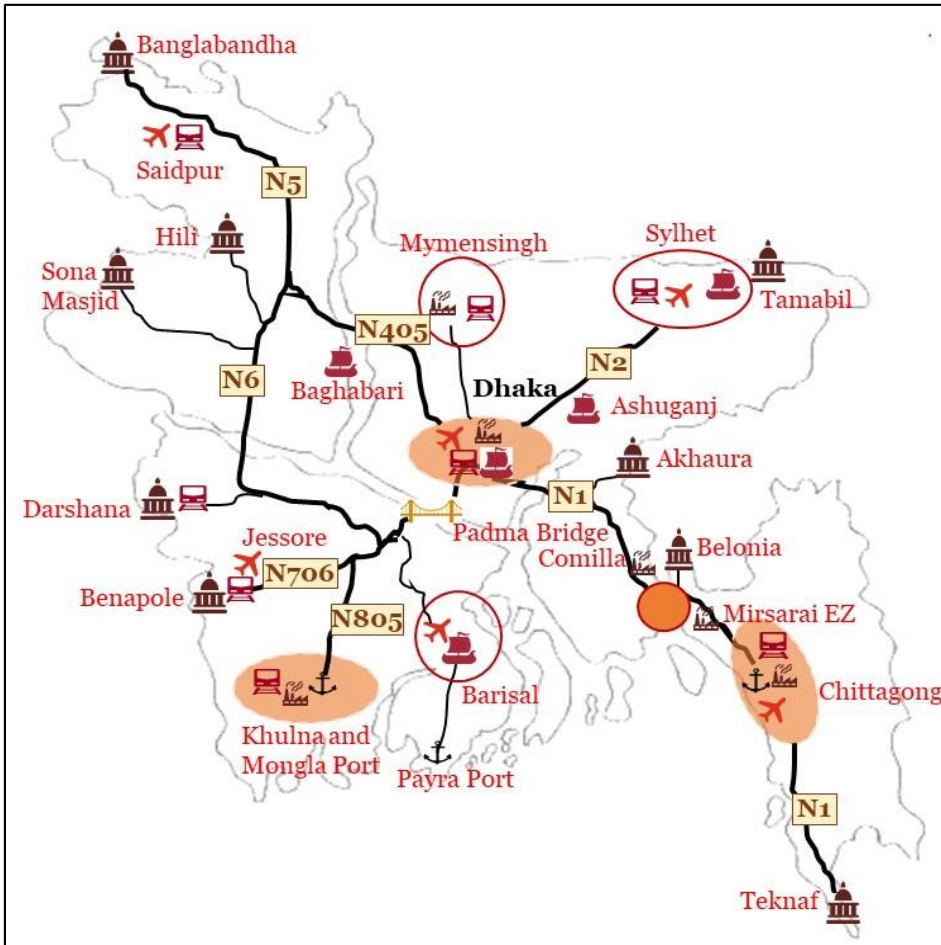


Source: PwC Analysis

6.3. Review of National Infrastructure with respect to site

A macro level view of major transport nodes across Bangladesh has been outlined in the figure below –

Figure 42: Bangladesh's major transport nodes with respect to Proposed EZ site



Legends:

- Land Port
- Airport
- Major IWT Node
- Major National Highway
- Major Rail Node
- Proposed EZ
- Sea Port
- Major Industrial Hub

Distances from Major National Infrastructure Nodes:

Node	Distance (km)	Node	Distance (km)
Benapole	370	Mirsarai	10
Darshana	400	Payra Port	260
Jessore	370	**Chittagong**	**75**
Comilla	**80**	Sylhet	295
Belonia	60	Mymensingh	295
Mongla Port	305	Akhaura	155
Dhaka	**180**	Teknaf	285

Major Highways:

- **N1 –** Dhaka-Chittagong Highway
- **N2 –** Dhaka-Sylhet Highway
- **N5 –** Dhaka-Rangpur Highway
- **N405 –** Nalka-Hatikamrul Highway
- **N6 –** Dhaka-Rajshahi Highway
- **N805 –** Dhaka-Khulna Highway
- **N706 –** Jessore-Benapole Highway

Source: PwC Analysis

6.3.1. Highways

Road connectivity is essential to foster last mile connectivity of cargo from source to destination. Good access to roadways shall enable seamless movement of cargo to/ from the proposed EZ to industrial nodes and trade gateways.

Following figure captures the road infrastructure near the project site.

Figure 43: Road infrastructure in the vicinity of the proposed EZ

Source: Google Map and PwC Analysis

Figure above elucidates that the proposed EZ is in proximity to Belonia Land Port, Comilla and upcoming EZ at Mirsarai. It is also located along the industrial corridor (and the major spine of the country i.e. Dhaka Chittagong highway) from Dhaka to Chittagong. The locational advantage of proposed EZ site could give a fillip to the industries that would be established at proposed EZ site since Dhaka-Chittagong route is the most vital industrial and transport corridor of Bangladesh providing access to trade gateway in Chittagong and domestic market in Dhaka. The location of proposed EZ site could provide market access and raw material access to both domestic and export oriented industries.

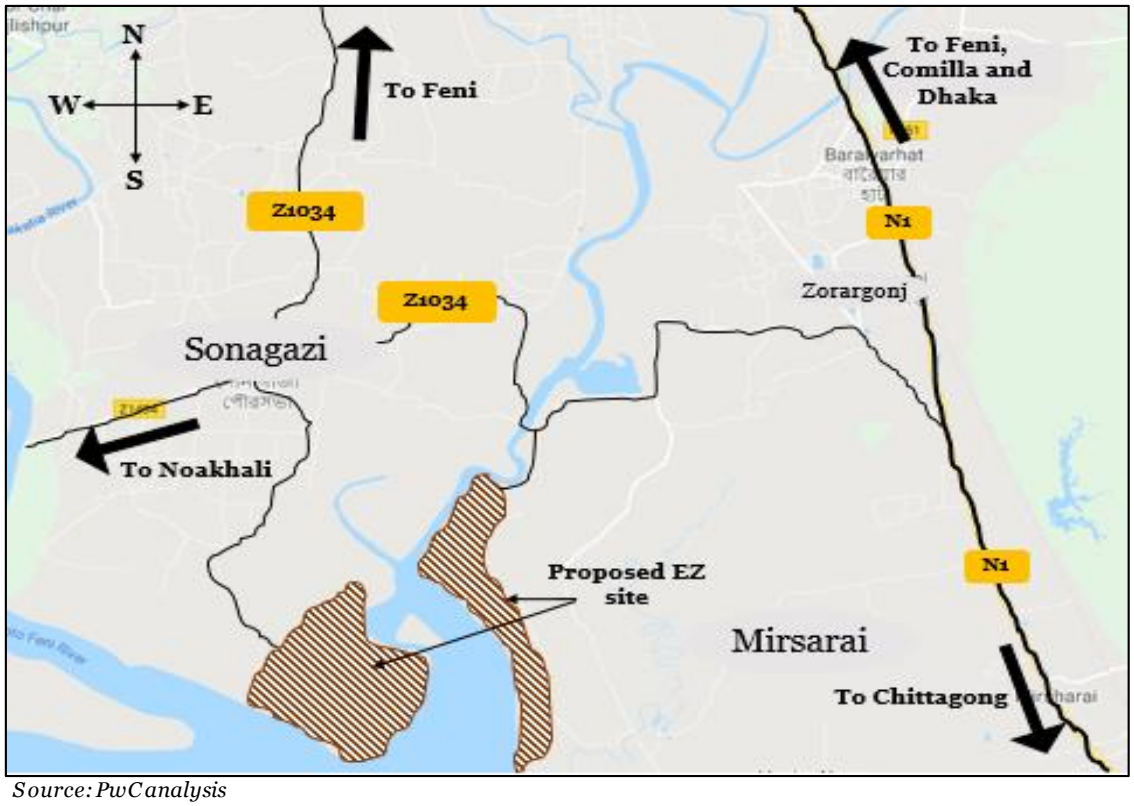
6.3.1.1. Highways near the proposed EZ

Dhaka-Chittagong Highway is the most important arterial route in Bangladesh connecting the industrial hubs along Dhaka-Chittagong corridor. This highway is a mix of 4-lane and 2-lane roads having an average width of 8.35 meters and bulk of the commercial traffic passing between Dhaka-Chittagong make use of this road. Inclusion of this highway to be a part of the Asian Highway network (AH41) highlights the importance of this stretch of road in providing connectivity to neighboring countries like India and Myanmar. This road passes through Feni Sadar Upazila, proposed EZ site can be reached from Dhaka-

Chittagong highway by accessing Feni-Sonagazi Zilla Road (Z1034) from Lalpol Bus stand in Feni Sadar Upazila. This zilla road is a single lane bituminous road of width 5.52 meters. Journey of 17 km on this road leads to Sonagazi Upazila. Although, this road can support movement of heavy vehicles, it has limited capacity in terms of allowing movement of 2-way traffic of heavy cargo laden vehicles. Under present condition, development of large-scale industries in the region could lead to traffic congestion, as setting up of industries would result in an increase of vehicles transporting men and material along this stretch of road. This would also increase wear and tear of the road leading to increased probability of accidents. As per discussions with Upazila Nirbhahi Officer (UNO) officials, we were informed that RHD intends to undertake a road widening exercise for this stretch of road to convert it into 2-lane road. To reach the proposed EZ site from Sonagazi Upazila, a single lane village road, Chor Chandia needs to be accessed which is a bituminous single lane road. Journey of 7 km on this single lane road will lead to a 1.5 km long stretch of single lane dirt road which connects to the western border of the proposed EZ site.

Another alternate route to access the proposed EZ site from Dhaka-Chittagong highway is to access the Muhuri Project Road from School Road Bus Stop in Zorargonj village in Mirsarai Upazilla. Muhuri Project Road is a single lane bituminous road originating from Old Dhaka-Chittagong Highway. Journey of around 10 km on Muhuri Project Road leads to the Muhuri Project Tourist spot-cum-sluice gate over Feni River. A single lane village road branches out towards south from Muhuri Project Road just before the Feni River. A journey of 2 km on this dirt road leads to the proposed EZ site. As per discussions with RHD officers, we were informed that RHD is in the process of widening and strengthening of road from Sonagazi to Zorargonj. This road is a part of Z1034 and once completed, this road could provide support for movement of heavy vehicles from proposed EZ site till Dhaka-Chittagong highway.

Figure 44: Road connectivity in vicinity of proposed EZ site



Source: PwC analysis

The location of proposed EZ site is favorably in proximity to Dhaka-Chittagong Road. However, the last mile connectivity to this site is currently not conducive for movement of heavy vehicles due to presence of dirt roads. Dirt roads are not able to support movement of heavy vehicles due to lower load bearing capacity of such roads. Road strengthening and widening activities will have to be undertaken in order to improve transportation facilities for the last mile connectivity. Road widening on both the access roads could pose a challenge, due to presence of human settlements along the sides of the road. This would require creating resettlement plan and providing compensation to the displaced residents.

Vehicular Traffic

As per data available in Roads and Highways Department (RHD) database, Average Annual Daily Traffic (AADT) for N1 is 23,272 vehicles, out of which 21,961 is motorized, rest is non-motorized. Comparison with busiest road links of Bangladesh indicates that the AADT for N1 is approximately 85% of the AADT of the busiest road links in the country. Thus, making N1 a vital road network in Bangladesh.

Data from RHD reveals that AADT for Z1034 is 8,588 vehicles, out of which 8,043 is motorized and rest is non-motorized. Traffic volume in Z1034 is significantly lower than the traffic volume of busiest road links in the country. This may be attributed to the fact that Feni district is yet to witness large scale industrial development.

Basis our discussion with UNO officials, we were informed that Roads and Highways Department has plans to widen Z1034. Widening of this road would provide an impetus to road network in the vicinity of proposed EZ site. This would allow a faster 2-way movement of heavy vehicles, which is essential for transporting construction material, as well as raw material and manufactured goods.

Present Hindrance and Redressal by GoB

By virtue of providing connectivity between the two most important hubs in Bangladesh. Dhaka-Chittagong highway transports the bulk of Bangladesh's cargo meant for international trade. Taking cognizance of the economic importance of this highway, GoB had undertaken a road widening exercise along the entire alignment of this highway. However, there were some stretches where road widening could not be performed due to geographical challenges or presence of human settlement. These stretches often result in bottlenecks, as a result which Dhaka-Chittagong highway witness's heavy traffic congestion often resulting in tailbacks stretching several kilometres.[216]

In order to ensure smooth flow of traffic, GoB has decided to construct a Greenfield Dhaka-Chittagong Expressway, which would double the transportation capacity of vehicles in between Dhaka and Chittagong, at the same time would also reduce travel time along this corridor. Currently feasibility studies for construction of this Greenfield Expressway is in progress. It could take another 5-6 years for this Expressway to become operational.

6.3.1.2. Trunk Connectivity to Dhaka, Comilla and Chittagong

There are three major urban/industrial nodes in vicinity of the proposed EZ site. These are –

- Dhaka
- Comilla
- Chittagong

[216] *http://www.dhakatribune.com/bangladesh/nation/2018/03/31/42km-long-tailback-dhaka-chittagong-highway/*

Dhaka city is the capital and largest city of Bangladesh. It is the commercial hub of Bangladesh, attracting people from all over Bangladesh, who migrate to Dhaka in search of job and business prospects. Large corporate houses (both domestic and foreign) in Bangladesh have their head-office in Dhaka. Several major industries like textile/ RMG, pharmaceutical, leather, food processing, cement, electrical & electronics, FMCG etc. are located in and around Dhaka.

The proposed EZ is around 180 km from Dhaka city and 80 km from Comilla, and can be accessed by travelling along Dhaka-Chittagong Highway from Dhaka and Comilla respectively, till Lalpol village in Feni Sadar Upazilla. Feni-Sonagazi road can be accessed from Lalpol bus stop to reach the proposed EZ site. Having smooth access to Dhaka and Comilla is very important for the industries that might come up in the proposed EZ site as both Dhaka and Comilla are home to major industries related to chemicals, fertilizer, RMG, electrical equipment, iron, steel and metal products, and leather products etc., which have potential for providing upstream and downstream linkages.

The proposed EZ is around 75 km from Chittagong city and can be accessed by travelling along Dhaka-Chittagong Highway from Chittagong till Zorargonj village in Mirsarai Upazilla. Muhuri Project road can be accessed from School Road bus stop to reach the proposed EZ site. Accessibility to Chittagong is vital due to the presence of several large scale industries related to steel re-rolling, cement, RMG etc. Chittagong also has Bangladesh's most important seaport, Chittagong Sea Port through which 81.22% of Bangladesh's international trade takes place.[217]

Having good connectivity to Dhaka, Comilla and Chittagong is vital for industries in Bangladesh as besides being a major industrial corridor, these regions are most densely populated regions in Bangladesh.

Dhaka, Comilla, Feni and Chittagong districts figure in top 10 most densely populated districts in Bangladesh, with Dhaka being the most densely populated district in Bangladesh having a population density of 8,707 people per square km.[218] Such high density create potential for consumer focused markets for industries to cater to the needs of local residents.

6.3.2. Land ports

Bangladesh and India share a borderline of 4,096 km, which is the fifth longest border in the world.[219] Such a long land border creates opportunity for mutually beneficial foreign trade. Land ports facilitates trade and commerce between two countries, as they provide secure gateways through which cargo can be transported. Facilities that can be developed at land ports include weighbridges, cargo-handling stations, warehouses, Inland Container Depots etc. Currently, India and Bangladesh have 23 land ports to facilitate trade between the two countries.[220]

As shown in the figure on the next page, Belonia Land Port (under development) is the nearest land port located at around 60 km north of the proposed EZ site. This port is connected to Dhaka-Chittagong Highway at Mohipal village in Feni Sadar Upazila through 25 km long double lane bituminous Feni-Parsuram road. As per current information available, this port is yet to be operationalized although a Development Project Proposal (DPP) has been passed and land acquisition is in progress. Once operational, industries in Proposed EZ will be able to leverage this port to boost their trade with India. Products like cement, steel, processed food, beverages, tiles etc., which are currently transported to Tripura through ports in Akhaura,

[217] *http://www.cpa.gov.bd/*
[218] *Lagging District Survey*
[219] *http://www.thehindu.com/news/national/half-of-indiabangladesh-border-fenced/article17396794.ece*
[220] *Bangladesh Land Port Authority*

and Bibirbazar will have an alternative route through this port. This land port, by virtue of its location, can also allow import of raw materials from North-Eastern states of India. Governments of India and Bangladesh are working together to improve transport infrastructure in this region in order to boost trade between the two countries through this port. Work on construction of Feni Bridge over river Feni in Belonia sub-division has also started. This bridge, upon completion, would connect Dhaka-Chittagong highway with Sabroom-Agartala National Highway, creating a seamless road network across India and Bangladesh.

Bibirbazar Land Port (currently operational) is also in proximity to the proposed EZ at a distance of around 85 km from proposed EZ site, requiring a travel time of 2 hours. This port is connected to Dhaka-Chittagong Highway at West Boto village, via 11 km long double lane bituminous Comilla-Chittagong bypass road. As per Bangladesh Land Port Authority, this port has a handling capacity of 500,000 MT per annum. The major items of import and export through this port has been listed in the table below.

Akhaura Land Port (currently operational) is another port on the Eastern border of Bangladesh, which can be leveraged to boost trade relations with North East India. It is located at a distance of around 155 km from proposed EZ site, requiring a travel time of 4.5 hours. This port is connected to Dhaka-Chittagong Highway at Comilla, via 20 km long single lane bituminous Akhaura–Senarbadi road followed by 36 km long single lane bituminous Comilla–Brahmabaria road. As per Bangladesh Land Port Authority, this port has a handling capacity of 500,000 MT per annum, and storage capacity of 2,000 MT. Currently there are no mechanized goods handling facility available at this port, and goods are handled manually. The major items of import and export through this port has been listed in table below.

Figure 45: Land Ports in vicinity of proposed EZ

Source: Information obtained from site visit, Google Map, and PwC Analysis

Table 57: Types of goods being traded through Bibirbazar Land Port

Major imports	Spices, Sanitary ware, Leather, Machinery, Fabric, Fruits etc.
Major exports	Crushed stone, Cement, Drinks, PVC, Furniture, Knit Fabrics, Plastic door, Ceramic tiles etc.

Source: Data from Bangladesh Land Port Authority Website

Table 58: Types of goods being traded through Akhaura land port

Major imports	Bamboo, Turmeric, Watch, Ginger, Marble slabs, Fruits etc.
Major exports	Processed stone, Bricks, Tiles, Fish, Cement, Battery etc.

Source: Data from Bangladesh Land Port Authority Website

The items of trade enlisted in the tables above, indicate that presently heavy machineries or industrial goods are not traded between Bangladesh and India through the two ports. This reveals that regional economy in vicinity of the land ports for both Bangladesh and India is non-industrialized and majorly dependent on agriculture and light engineering. However, with growing urbanization, this region could witness a rise in demand for industrial goods and heavy machinery. Industries that would operate in the proposed EZ could

cater to various consumer demand in the region and source raw materials by leveraging the land ports mentioned in the previous page.

Present Hindrance and Redressal by GoB

Currently, cargo is being handled manually at the land ports. This results in slower clearance of goods that are transported out of and into the ports, resulting in delays and congestion at the ports. As per our discussions with Bangladesh Land Port Authority, mechanized cargo handling facilities are only available at Benapole Land Port, located 370 km away from the EZ site.

Governments of Bangladesh and India are also developing supporting infrastructure in the proposed EZ region. These infrastructural projects like Belonia Land Port, Feni River Bridge, rail connectivity between Tripura and Bangladesh will create good connectivity with land ports and will boost trade and commerce in the region.

Good access to land port will ensure good trade relationship with India, in particular North East India. Industries can tap into Indian markets for their products and also have access to raw material from the Indian side.

6.3.3. Sea Ports and Inland Water Terminals

Waterway transport is one of the most fuel efficient, environment friendly and cheapest mode of transportation. Cost of transporting one MT freight over a distance of one km by waterway is around 50% and 80% of the same transport done via road and rail respectively.[221] Bangladesh is blessed with a riverine geography, especially towards its south, where distributaries of large rivers like Padma and Meghna drain the region. This creates a fairly widespread inland waterways network, creating an opportunity for Inland waterways transportation. Bangladesh also has a coastline of 580 km which creates good potential for sea trade with other countries. Currently, more than 90% of international trade in Bangladesh is done via shipping. This makes it vital to understand the potential of waterways connectivity to support transportation in the proposed EZ region.

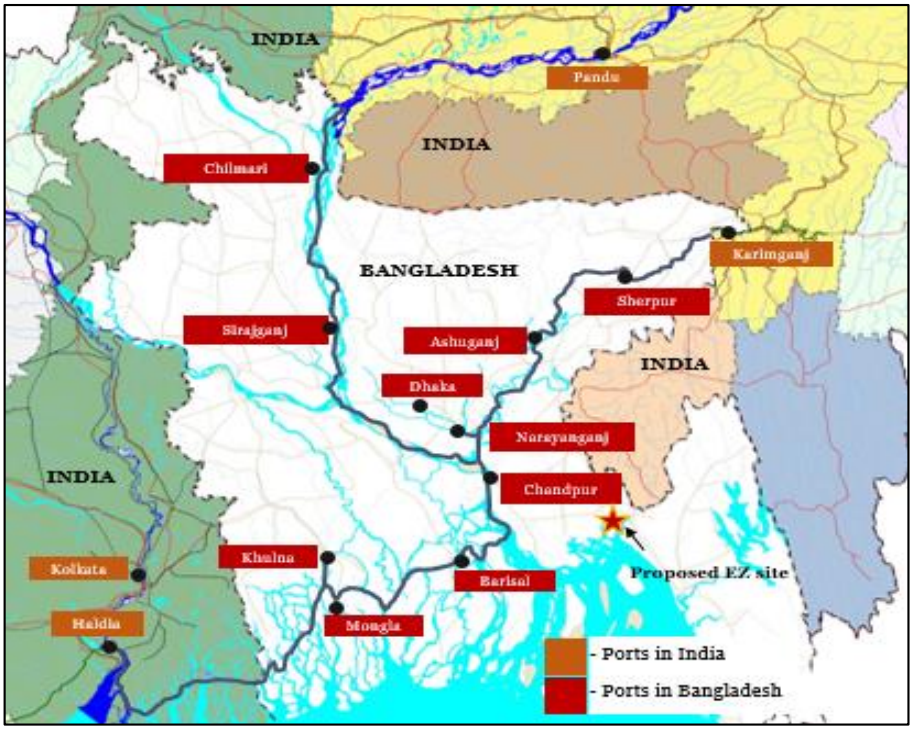
Boro Feni River bifurcates the proposed EZ. However, this river is a part of the Muhuri Irrigation project and it cannot be used for navigational purposes from the proposed EZ.

Nearest river port to the Proposed EZ site is at Chandpur on the Meghna River which is around 130 km from the proposed EZ and is accessible from road via Dhaka-Chittagong highway followed by Comilla-Chandpur Highway which is a 2-laned bituminous road. This port is equipped to handle movement of heavy vehicles and currently has a capacity to handle 6,500 MT/ month of bulk cargo and 6,500 MT/month of general cargo. This ferry ghat has an available draft of around 3.5 meters and is well connected to Shariatpur Ferry Ghat, Barisal Ferry Ghat and all other major river ports of Bangladesh through widespread waterway network crisscrossing the country.[222] Industries in the proposed EZ can make use of this port to transport goods like clinker, fly-ash, light engineering products, textile, RMG etc.

[221] *https://www.thehindubusinessline.com/opinion/flowing-down-the-waterways/article23384237.ece*
[222] *Bangladesh Inland Waterways Authority*

Protocol on Inland Water Transit and Trade

Figure 46: Inland Waterway network in Bangladesh



Source: Bangladesh Inland Waterways Authority

India and Bangladesh have an existing Indo-Bangladesh Protocol on Inland Waterways and Transit which allows for using inland waterways network between the two countries for the purpose of trade and commerce. As per Standard Operating Procedure of the existing protocol, both countries have six ports each, designated as the Port of Call. In Bangladesh, the Ports of Call are Mongla, Khulna, Sirajganj, Narayanganj, Pangaon (in Dhaka) and Ashuganj, whereas in India the Ports of call are Kolkata, Haldia, Pandu, Karimganj, Silghat and Farakka.

The river port at Chandpur can be used to access the designated routes in India-Bangladesh Protocol on Inland Waterways and Transit, which will enable industries to have access to an alternate route to transport goods to ports of call in India like Haldia, Kolkata, Karimganj and Pandu.

Also, proposed EZ at Feni has access to a water front in Sandwip Channel, having a draft of around 3-4 meters, where berthing facilities can be developed for vessels carrying raw material for heavy industries and clinker for cement factories. Developing a jetty here, will enable direct riverine transportation of goods across Bangladesh and ports of call in India. A detailed study is required to be undertaken in order to understand the dredging requirement at this site in order to make the channel navigable for vessels carrying bulk cargo. Access to water front can also be utilized for developing shipbuilding and ship breaking industries.

Access to Sea Port

Chittagong Sea port is the nearest seaport which is located approximately 75 km from the proposed EZ. This port is also accessible via Dhaka-Chittagong highway. This seaport is the most important trade-

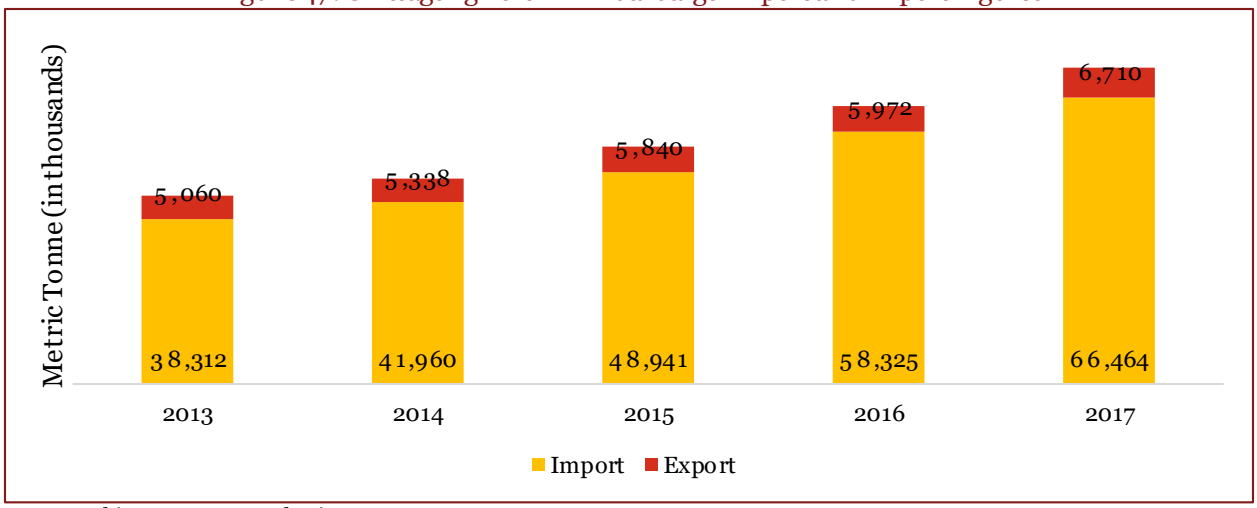
facilitating infrastructure in Bangladesh. The fact that on an average 81.22% of Bangladesh's international trade takes place through Chittagong Port underlines the strategic importance of this seaport.[223]

Chittagong has all major logistics infrastructure available like weighbridges, railway wagons for container transport, railway terminal, container freight stations, dredgers, tug boats and specialized berths for handling POL, grains, cement, urea, ammonia, containers, general cargo etc.

Given the commercial importance of this port, infrastructure at Chittagong port is well developed. Industries in the proposed EZ can leverage this infrastructure to achieve competitive economics when it comes to logistics cost.

Figure below captures the quantum of cargo handled at Chittagong Port over the past 5 years.

Figure 47: Chittagong Port – Annual cargo Import and Export Figures



Source: Chittagong Port Authority

Figure above elucidates that volume of cargo being imported through Chittagong Port is far higher that export figures and imports has almost doubled over the past 5 years. This highlights the need to boost local manufacturing in Bangladesh. However, the rising trend of import and exports indicates that the economy of Bangladesh is growing and with development of industrial infrastructure in Bangladesh, export figures could get an impetus.

Present Hindrance and Redressal by GoB

Draft constraints at Chittagong Port prevents sea faring mother ships from reaching the port directly. **Available draft of 6-7 meters** necessitates the use of feeder vessels to transport goods till the jetty, resulting in multiple cargo handling.[224] Rising traffic at the port has resulted in congestion, which can **delay berthing of ships by 6 to 7 days**.[225] **Existing infrastructure at the port is inadequate** in terms of handling rising cargo movement with gantry cranes experiencing frequent breakdowns.

In order to address these bottlenecks, Chittagong Port Authority (CPA) has undertaken a dredging exercise to increase the draft at Chittagong Port. It is also in the process of installing new gantry cranes to enable faster movement of goods and has also announced plans to develop new container terminal.

[223] *http://www.cpa.gov.bd/*
[224] *https://www.joc.com/port-news/asian-ports/congestion-paralyzes-chittagong-port_20170719.html*
[225] *https://www.joc.com/port-news/asian-ports/asia-port-congestion-tests-supply-chains_20180514.html*

To ease the ever increasing pressure on Chittagong Port, CPA is exploring the potential to develop a new port in Mirsarai (within 60km of proposed EZ site), which is the adjacent district to Feni. The main function of this seaport will be to act as an intermediate port/terminal, which will provide support to Chittagong Sea Port. The key purpose of this port will be to enable direct sea connectivity for industries that might come up in the region so that early and easy delivery of container and cargo can be made possible. This project is still at conceptualization stage and studies are ongoing to finalize the location, capacity and other features of this port. Development of this port will give a fillip to industrial development in the proposed EZ site.

Proposed EZ is located close to Chittagong Port. This proximity should encourage manufacturers to set up export oriented industries in the proposed EZ. However, last mile road connectivity from the EZ needs to be improved in order to facilitate smooth movement of goods into and out of the proposed EZ site.[226]

6.3.4. Airport

Air travel is the fastest mode of travel, which enables movement of passengers as well as time sensitive and perishable cargo. Having such a mode of transport in vicinity of an industrial location enables faster movement of decision makers of an organization who may have a need of making brief visits to production centers. Perishable items like drugs, chemicals or food ingredients like dairy products, fish, fruits requiring short travel time from centers of production to that of consumption also need access to air travel. This necessitates the need to understand air travel facilities around the proposed EZ region.

Nearest major airport is Shah Amanat International Airport in Chittagong. It is Bangladesh's 2nd largest airport and provides air transport services to both domestic and international passengers. This airport is around 75 km away from EZ site requiring around 2.5 hours of travel. Basis secondary research, it is understood that this airport has manual handling facilities for cargo and provides services to more than 12 lakh people annually.[227] Civil Aviation Authority of Bangladesh has planned a few upgradation projects at this airport like construction of a parallel taxiway, extension of the existing runway and construction of a cargo warehouse. These projects, upon completion, will enable faster movement of cargo and enhance cargo handling capacity of this airport. This upgradation would aid the industries that would be dependent on air cargo for movement of raw material and finished products.[228]

Hazrat Shah Jalal Airport (HSIA) is in Dhaka and is Bangladesh's largest and busiest airport. This airport caters to travel requirements of both domestic and international passengers. This airport is around 180 km away from EZ site requiring 5.5 hours of travel. Currently, this airport has the capacity to handle 8 million passengers and 2 hundred thousand metric tonnes of cargo. Over 4 million international and 1 million domestic passengers (as well as 150,000 MT of freight and mail exchange) use HSIA. This airport is forecasted to witness a passenger traffic of 12 million by 2022 and 22 million by 2035.[229] This airport also has a freight village (warehouse), terminal buildings, hangers and other modern equipment for aircraft handling.[230] Goods like RMG, vegetables, fruits, fish, dry fish and crabs are transported through HSIA.

Both the airports can be accessed via Dhaka-Chittagong Highway.

---

[226] *https://www.joc.com/regulation-policy/infrastructure-news/asia-infrastructure-news/bangladesh-opts-make-payra-deep-sea-port_20171121.html*

[227] *http://dlca.logcluster.org/display/public/DLCA/2.2.2+Bangladesh+Shah+Amanat+International+Airport;jsessionid=D3203DDC18DB84A9D4C62A8A4DB784B2*

[228] *http://caab.portal.gov.bd/site/page/199a0caf-101f-418f-bc8b-07626928a449*

[229] *https://www.airport-technology.com/projects/hazrat-shahjalal-international-airport-expansion-dhaka/*

[230] *http://www.shahjalalairport.com/*

Present Hindrance and Redressal by GoB

Air freight transportation services are used for EXIM cargo movement only with **Dhaka international airport** providing facilities for cargo handling. Most of the **major international airline operators** such as Emirates, Etihad Airways, HK airlines, Cathay Pacific, Qatar Airways are servicing the air cargo freight movement through a mix of **passenger aircrafts and dedicated freighters**. Biman Bangladesh is the Bangladesh Government owned airline facilitating cargo movement to Middle East region. The **cargo handling operations** at the Dhaka airport are also managed by **Biman Bangladesh exclusively**. The international airlines have reported significant gaps in the cargo operation as Biman Bangladesh **lacks expertise, assets and manpower** to run the operations efficiently. In fact, the operator is yet to develop expertise to track and trace the goods unloaded from aircrafts. Further, there is **no separate procedure for handling of perishable and temperature sensitive cargo**. The industry players station their representatives to constantly follow-up with Biman Bangladesh once the cargo is unloaded in Dhaka. Biman Bangladesh cites shortage of infrastructure at airport as the main reason for mismanagement of cargo. Owing to lack of necessary infrastructure for screening of cargo, **Dhaka international airport does not have the statutory clearance for shipment directly to Europe**. The Europe bound cargo is first unloaded in Dubai/other hubs for re-scanning and clearance, then forwarded to Europe. This adds to extra cost and time for industries exporting to Europe.

Given the current capacity of the airport, GoB has already appointed developers to construct a new terminal at HSIA. This project is being funded by Japan International Cooperation Agency (JICA) and it is anticipated that post operationalization of this terminal in 2021, annual passenger handling capacity of this airport will be 20 million and cargo handling capacity will rise to 5 hundred thousand metric tonnes.[231]

In order to decongest HSIA, GoB has also planned construction of a new international airport Bangabandhu Sheikh Mujib International Airport near Dhaka. The airport area is envisaged to cover 8,000 acre of land and will take about 10 years to complete the project. Currently, 3 sites have been shortlisted for construction of the airport, viz. Char Janajat of Shibchar in Madaripur district, Keyain in Munshiganj and Char Bilashpur in Dohar district.[232]

Good access to airport will allow industries manufacturing time sensitive goods, like RMG or designer clothes and requiring perishable products like fruits or chemicals, to develop in the proposed EZ.

[231] *http://www.dhakatribune.com/bangladesh/dhaka/2017/06/12/construction-third-airport-terminal-begins-next-year/*
[232] *http://www.dhakatribune.com/business/2016/08/05/bangabandhu-sheikh-mujib-international-airport-construction-begin-2018/*

6.3.5. Railways

Railways can haul larger volumes of cargo over longer distances as compared to trucks and trailers, and is also faster than vehicles plying on road, since it is easier to monitor and regulate traffic on railway lines. Moreover, transporting goods through railways also help in easing traffic congestions on road by reducing the requirement of trucks which would otherwise have to ply. An overview of railway connectivity in the proposed EZ region is mentioned below.

Figure 48: Railway stations in proximity of proposed EZ

Source: Information obtained from site visit, Google Map, and PwC Analysis

Boraiyarhat station is the closest rail head at a distance of around 15 km from the site. It can be accessed via Muhuri Project Road followed by Dhaka Chittagong Highway. However, it is a small station with no cargo handling facility. Feni railway station is the nearest major railway station to the proposed EZ. It is approximately 30 km from the proposed EZ and can be reached from Sonagazi via Feni-Sonagazi road. Presently, Feni station caters to passenger movements and does not have cargo handling facilities.

Chittagong railway station is the nearest junction railway station from the proposed EZ, located at a distance of around 75 km, where cargo-handling facility is present currently. Access to Chittagong junction railway station takes place through Dhaka-Chittagong highway and time of travel is ~2.5 hours. Chittagong Railway station is connected to Inland Container Depot at Dhaka railway station. Currently containers are transported only on Dhaka and Chittagong rail route, requiring a travel time of around 10 hours. In FY 2016-17, 75 thousand TEUs of containerized goods were transported between Dhaka and Chittagong.[233] As per Bangladesh Railway Information Book, major items transported on this route are Cement, Jute, Fertilizer, Rice, Wheat, Iron & Steel, Sugar cane etc.

Present Hindrance and Redressal by GoB

Rail freight services majorly constitutes of container movement on **Dhaka – Chittagong corridor**, with a **40% share** of entire rail freight market. ICD Kamlapur in Dhaka facilitates the container movement on rail mode. However, the ICD reached its peak annual capacity of ~90,000 TEUs six years ago, post which its traffic is declining due to **long and unpredictable service levels**.[234] The overcapacity of the rail network limits the capacity addition of ICD. In case of domestic movement, the use of rail service is negligible due to inadequate broad gauge network and poor terminal handling facilities. The rail freight services market is **not open for private participation**, further restricting the development of adequate infrastructure. There are **no cargo aggregators** presently, to aid industries in using the rail services for domestic transportation.

Bangladesh Railway (BR) has also started a preliminary assessment of establishing a railway line till Mirsarai, providing connectivity to Dhaka-Chittagong route.[235] Officials at Bangladesh Railways have informed that feasibility study for this project is in progress and is expect to end by October, 2018. BR is

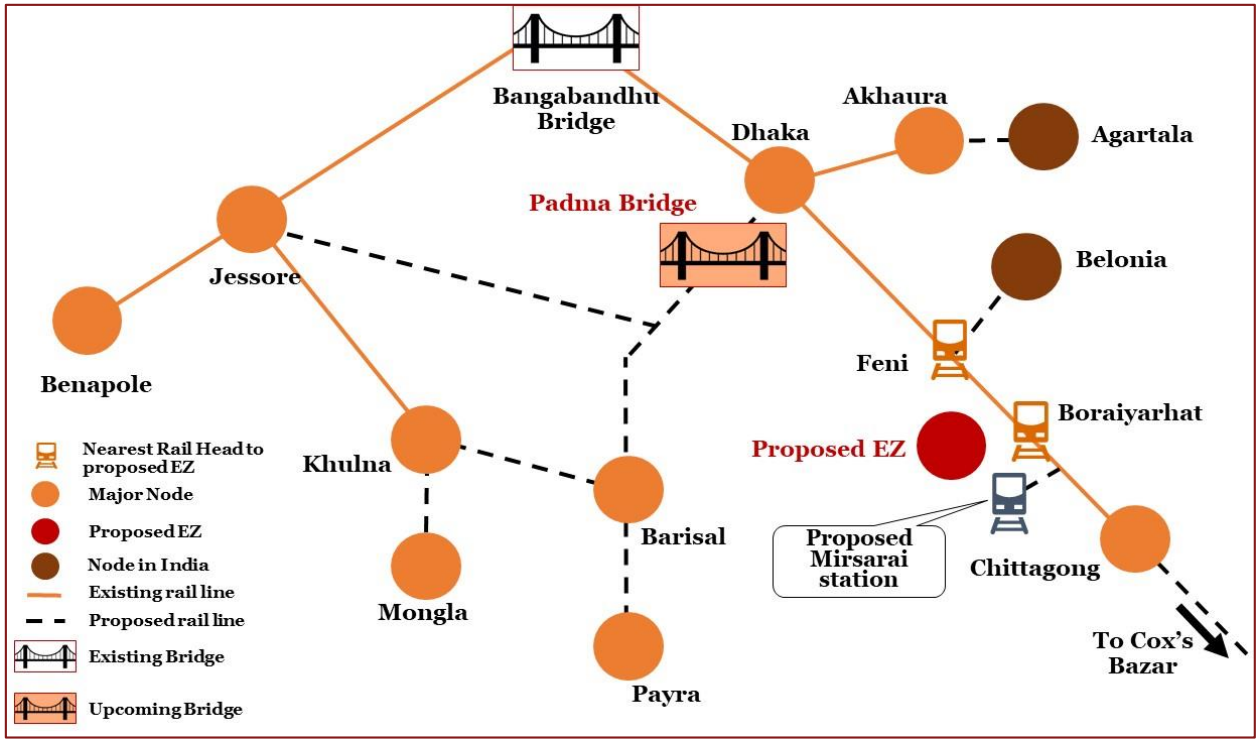
[233] *https://www.joc.com/rail-intermodal/rail-equipment/adb-oks-360m-loan-bangladesh-rail-cars-locomotives_20180221.html*
[234] *PwC Research*
[235] *http://www.beza.gov.bd/news/investment-promotion-seminar-titled-attracting-investment-in-economic-zones-of-bangladesh-held-at-radisson-blu-dhaka/*

planning this railway line with the objective of ensuring smooth movement of men and material from/to upcoming economic zone in Mirsarai (spread over 30,000 acres) which is adjacent to the proposed EZ in Feni. Depending on finalization of the alignment, industries in proposed EZ in Feni can also leverage this railway line for transportation of goods.

In February 2013 Bangladesh became a part of the Trans-Asian Railway network which is a proposed 81,000 km network stretching from Europe to South-East Asia.[10] It is expected that by becoming a part of this network, Bangladesh will be able to further boost its trade with other countries. A part of this proposed Trans-Asian Railway network will be along the Dhaka-Chittagong railway enhancing the connectivity and linkages of the proposed EZ.

Presently railway connectivity in Bangladesh is very limited. However, GoB has already initiated the process of overhauling Bangladesh's railway infrastructure. Work has started to extend direct railway route from Mongla till Chittagong and onwards to Cox's Bazar.[236] On completion, these projects will support easy railway transportation of goods and people from proposed EZ site to different parts of Bangladesh, as well as to neighboring countries like India and Myanmar.

Figure 49: Present and proposed railway route connecting proposed EZ to major nodes



Source: PwC Analysis and Bangladesh Railway

Completion of railway network shown in the above figure, will enable faster movement of both goods and people between EZ site and other parts of the country. **It can be envisaged that goods being transported to/from Chittagong Port, Mongla Sea Port, as well as Benapole Land Port would be able to reach stations in vicinity of proposed EZ site in future.** GoB is also working with Indian Government to establish better rail links between the 2 countries. Work has already started on construction

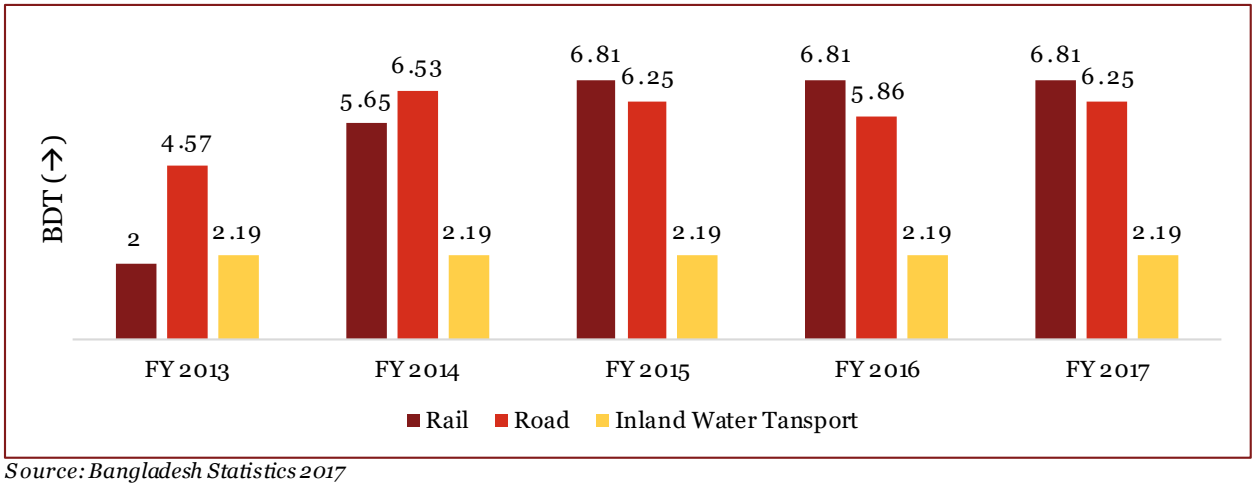
236 *http://mor.portal.gov.bd/sites/default/files/files/mor.portal.gov.bd/page/9a1ba160_209b_4d94_9077_3befdc9e2ef3/8.%20Formulation%20of%20BR%20Masterplan.pdf*

of Agartala-Akhaura railway line and it is expected to get operational by December, 2019. Also, existing railway transport between Feni in Bangladesh and Belonia on the Indian side, which was discontinued in 1997, due to India upgrading its tracks to broad gauge, is under consideration of being re-established.[237] These railway lines will give a boost to industries that would come up in the proposed EZ site by providing faster access to markets and raw material in NE India.

In order to perform a holistic transport assessment, it is imperative to understand the freight charges applicable for different modes of transportation. This would help in assessing the most economical mode of cargo transport for the proposed EZ site and also assist in determining the interventions that could be taken up by GoB to further improve the transport logistics infrastructure in the vicinity of the Economic Zone sites.

6.1. Rate of freight for different modes of transport

Figure 50: Freight per tonne per km for different modes of transport



Source: Bangladesh Statistics 2017

The figure above indicates that freight transport through inland waterways has been the most economical mode of transporting goods, in Bangladesh. However, cost of transporting goods through rail and road have shown an increasing trend over the past 5 years due to rising demand from manufacturers and traders.

Data presented in the figure elucidates that it is cheaper to transport goods through airways or IWT for longer distances and can then be transported via roadways to provide last mile delivery.

6.2. Potential Infrastructure Interventions to support proposed EZ

The proposed EZ site at Feni has advantage of being located along the Dhaka-Chittagong industrial corridor. The site is about 12 km away from Dhaka-Chittagong Highway. It has access to water front at Sandwip channel and Belonia Land Port is around 60 km away from the proposed EZ site. An industrial economic zone spread over 30,000 acres is also being developed in Mirsarai near the eastern boundary of EZ site.

[237] *https://www.thebetterindia.com/120233/india-bangladesh-railway-tracks/*

Table on the next page captures present and potential hindrances to smooth movement of manufactured goods in the region, alongside the infrastructure interventions that could be undertaken in order to make the proposed EZ site attractive to industries looking to set up manufacturing units in the region. Interventions suggested in the table on the next page have been done after taking into considerations the infrastructure upgradation currently being planned by different departments of GoB. These interventions are indicative development activities that could be further studied, apart from development activities already being implemented.

Table 59: Proposed Infrastructure Interventions

Key Asset	Existing Condition	Issues	Recommendation	Cost Implications	Timeframe for Improvement	Jurisdictional Responsibility
Rail Siding	Nearest railhead is at Boraiyarhat around 15 km away from the site. Bangladesh Railway is planning to establish a railway siding till Mirsarai in order to enable movement of men and material.	Transporting cargo till nearest railhead would result in multiple cargo-handling and subsequently loss of time.	• Possibility of extending the railway siding in Mirsarai till Feni should be explored. • Also, development of railhead at Boraiyarhat could be explored to allow cargo handling at the station.	Detailed feasibility assessment needs to be undertaken for assessing viability of the proposed rail line.		Bangladesh Railways
Water Transport	Chittagong Port Authority is exploring the potential to set up a port in Mirsarai (within 60 km from EZ site).	Delay in cargo unloading due to potential traffic.	• Provide prioritized access to ships transporting cargo for proposed EZ site at Mirsarai Port. • Develop a private jetty at the proposed EZ site.	Detailed feasibility assessment needs to be undertaken for assessing viability of the proposed port/ jetty in Mirsarai or at a suitable location.		Chittagong Port Authority
Land Port	Land Ports at Bibirbazar, Akhaura and Belonia (upcoming, currently under development) are utilized at under capacity level since there are no significant cargo. Once Mirsarai and Feni economic zones are operational, these land ports are expected to be important trade gateways for foreign trade between India and Bangladesh.	At present, manual cargo handling takes place at the mentioned land ports. Once traffic flow increases in these land ports, the need for mechanized cargo handling system would evoke.	• Mechanization of cargo handling facility in Bibirbazar, Akhaura, and Belonia land ports • Considering the development of Mirsarai integrated industrial city (spread over ~30,000 acres) and Feni EZ (spread over ~7,000 acres) in the future, significant cargo would generate from these two EZs. To cater to this requirement, separate storage space in the land ports can be earmarked for these two economic zones.	Detailed feasibility assessment is solicited.		Bangladesh Land Port Authority

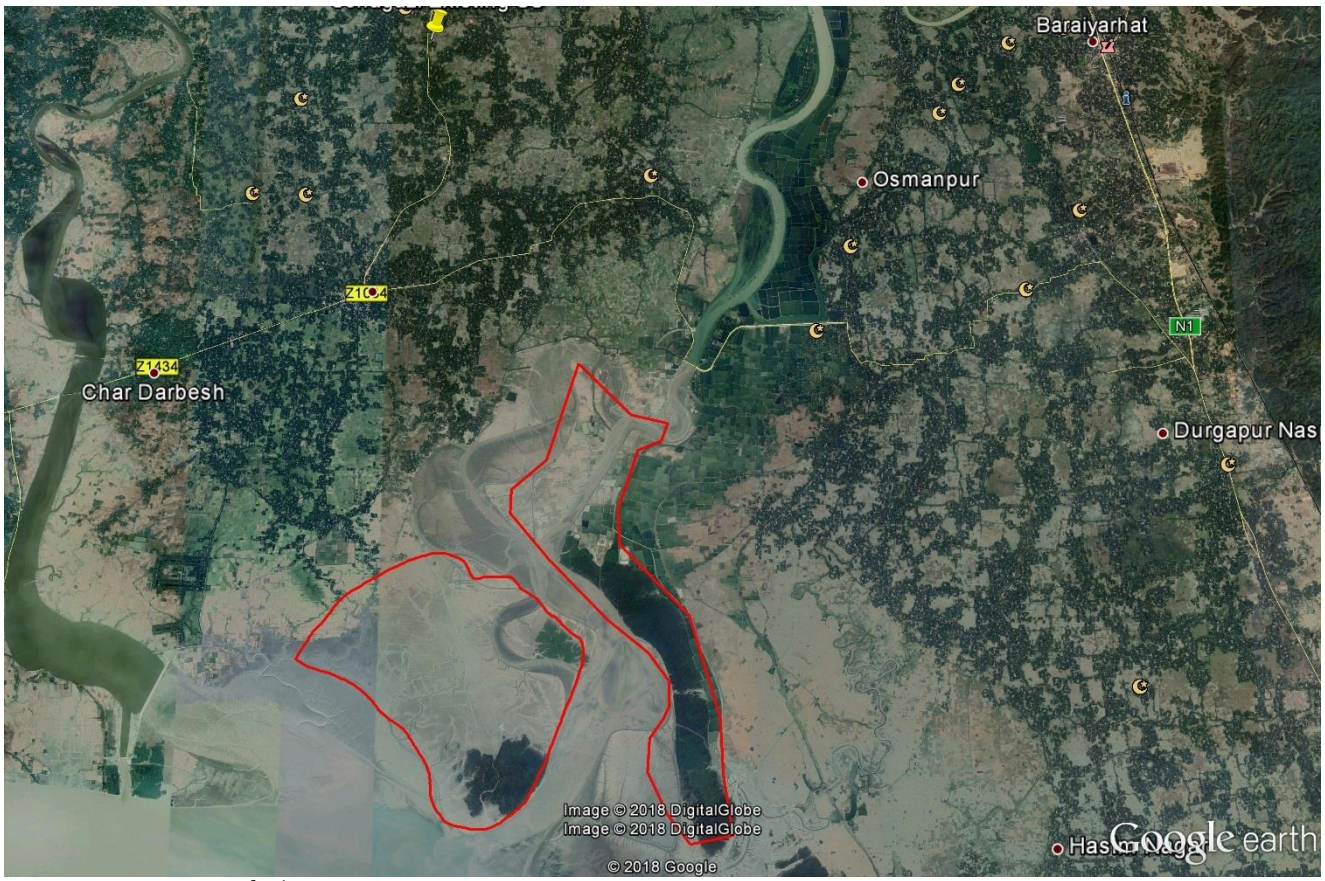
7. Off-site Infrastructure Assessment

7.1. Purpose and Objective

For sustained business operation of EZ, it is pertinent that off-site infrastructure and EZ connectivity to the proposed sectors are adequately addressed. To facilitate integration of basic infrastructure and utilities like water, power, approach road, Drain and Boundary wall for EZ, the existing infrastructure facilities surrounding the site need to be identified and gaps that could hinder development of the EZ site, need to be addressed. The major offsite infrastructure components considered for EZ are as follows –

The above listed off-site infrastructure components would be developed by BEZA in order to provide support to the developer who would undertake construction of the EZ. The location of the proposed site is shown below.

Figure 51: Location map of Feni EZ



Source: MACE analysis

7.2. Methodology of Off-site Infrastructure Assessment

A stepwise approach has been adopted to assess the off-site infrastructure at proposed EZ site in Feni.

Step 1: Identification of possible sources

The available infrastructure facilities at the project site and in the surrounding area have been identified carrying out following activities –

- Study of satellite image
- Site visit
- Field investigation
- Discussion with the officials (Roads and Highways Department, Rural Electricity Board, Department of Public Health and Engineering)

Step 2: Feasibility study

The feasibility of utilizing the identified infrastructure component depends upon several factors for different component and are provided below.

All the infrastructure components and its developments should be in compliance with the standards prescribed in the Bangladesh Economic Zones (Construction of Building) Rules, 2017.

Site filling – The average natural ground level for the proposed EZ and the depth of site filling required.

Access road – The existing carrying capacity of the road and the probability of expansion if required.

Power supply – The available surplus capacity of existing sub-station to cater the power demand of the proposed EZ. Distance of sub-station from the proposed site and the possibility of bringing the feeder line to EZ.

Water supply – Surface water: Availability of water to meet the demand, Distance, Quality and possibility of bringing the main supply line from the source.

Ground water: Aquifer depth, yield to meet the demand and quality of Groundwater.

Drain- Capacity of existing drain to carry the additional runoff water from the proposed EZ area.

The terrain of the site to support the flow from the drain of EZ to reach the identified external drain through gravity.

7.3. Review of last mile offsite infrastructure

Site filling

The average natural ground level for the proposed EZ is +6 m level. To avoid inundation during monsoon season, the land filling of 5 m above the existing natural ground level is considered.

The finished ground level for the proposed EZ will be around +11 m from above Mean Sea Level. An average depth of 16 feet to 17 feet of land filling has been envisaged for the proposed EZ area.

Figure 52: Site Contour

Source: Mace Analysis

Approach Road

1) **Approach Road 1:** As mentioned above, Sonagazi – Muhuri Project road (Z1034) runs to the northern side of the proposed EZ at a distance of 2.1km establishing trunk connectivity adjacent to the proposed EZ. Hence, Major approach roads from the Sonagazi – Muhuri Project road road of 24 m wide for a length of 2100 m have been proposed connecting the industrial area of EZ.

2) **Approach Road 2:** Sonagazi –Olmabazar- Chardarbeshpur- Companiganj road (Z1434) runs to the northern side of the proposed EZ at a distance of 6.5 km establishing trunk connectivity adjacent to the proposed EZ. Hence, Major approach roads from the Sonagazi –Olmabazar- Chardarbeshpur- Companiganj of 45 m wide for a length of 6500 m have been proposed connecting the industrial area of EZ.

3) **Bridge 1:** There is river crossing for a distance of 1300 m along the proposed road alignment connecting the two land parcels of EZ. Hence, a bridge for a length of 1300 m has been proposed to cross Feni river.

4) **Bridge 2:** There is river crossing for a distance of 800m along the proposed road alignment connecting the Bangladesh Water Development embankment (Super Dyke). Hence, a bridge for a length of 800 m has been proposed.

The connectivity and linkages for the proposed EZ is shown below.

Figure 53: Map of last mile connectivity to proposed EZ

Source: MACE analysis

Power Supply to Economic Zone

Our assessment suggests that basis industrial assessment and demand forecasting for the proposed EZ, power demand for the proposed EZ would be about 590 MVA. This figure is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake a separate industry assessment and master planning exercise in order to validate this figure.

To cater to this power demand a Main Receiving sub-station of 230/132 /33/11 kV substation has to be established in the site.

The power from Mirsarai 132/33 kV power Grid substation which is under construction.

During the initial phase of development, the 132/33/11 kV MRSS can be established within EZ site with a capacity of 175 MVA for phase – I development. Incoming 132 kV supply to this substation may be availed from the 132 kV Mirsarai Grid substation located at a distance of 7 km from the EZ site.

Based on the load growth, the proposed 132/33/11 kV MRSS within EZ site can be upgraded to a capacity of 590 MVA by augmenting the proposed substation to 230/132/33 kV.

Water Supply to Economic Zone

Our assessment suggests that basis industrial assessment and demand forecasting for the proposed EZ, potable water demand for the proposed EZ would be about 128 MLD and total water demand would be 137 MLD. This figure is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake a separate industry assessment and master planning exercise in order to validate this figure.

Site is situated adjacent to Bay of Bengal on its Southern side. It is proposed to provide desalination plant adjacent to site to meet the water demand of EZ on a long-term basis. Detailed hydrogeological investigations need to be carried out based on which, intake of water for desalination plant shall be provided.

For the initial demand it is planned to build three to four new bore wells within the proposed site to draw the ground water. Exact location of water intake (i.e., the locations of the tube wells) within the site needs to be finalized during the construction stage.

Drainage/ Embankment

River Feni bifurcates the site into two land parcels indicated as land parcel A and B in the following Figure. Majority of the site is bounded by River Feni and some stretch/branch of River passes through land parcel A and B. In general, the flow of surrounding area will be towards river. Hence there are chances of site for flooding due to surrounding storm water runoff and overflow of river and its branches.

To determine the vulnerability of site for flooding due to surface storm water runoff/, detailed contour study of the surrounding area was carried out based on GIS data for the radius of about 2 km surrounding the site and the flow pattern of the surface storm water runoff based on the same is provided in the following Figure. This study will help to determine the requirement of embankment/water diversion structure to prevent the site from flooding.

In the following Figure, various details such as Ridge lines, Stream lines, Contours with levels and existing water body have been shown. Ridge lines are the lines connecting highest elevation points and the stream lines are the line connecting lowest elevation points. In general, the flow will be from the ridge line towards stream lines.

Land Parcel A

From the Figure, it is observed that, a ridge line passing through the centre of the site and the flow from the ridge is towards the surrounding River. A major stream line falls on the Northwest side of the site which is collecting the collecting the flow from the surrounding three ridge lines, passes through the site in the northwest and finally drains into Bay of Bengal.

It is inferred that the site is vulnerable to flooding from all directions. Hence, in order to prevent the land parcel from flooding, it is recommended to fill the site above High flood level with the provision of Embankment on all sides.

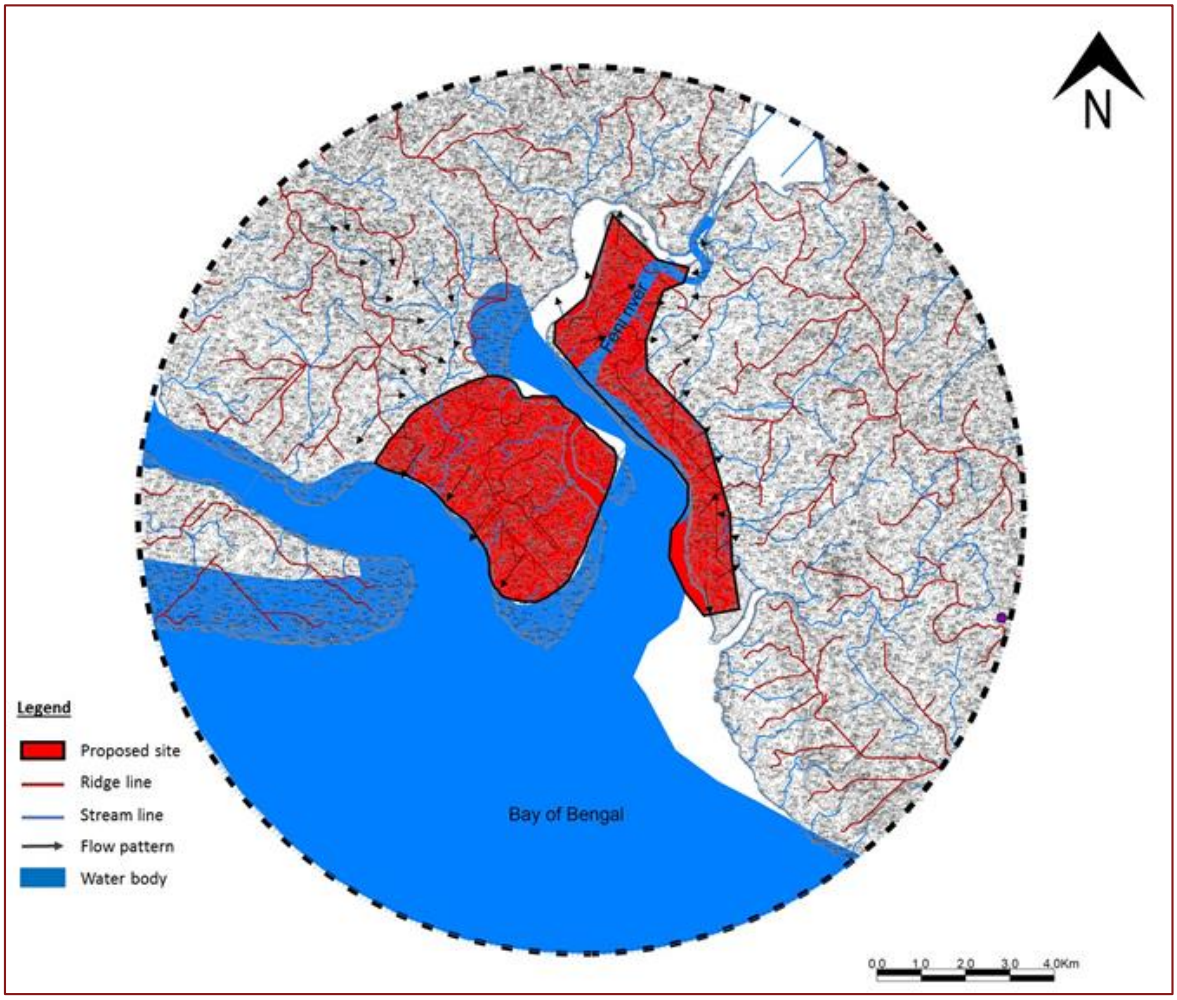
Land Parcel B

From the Figure, it is observed that there is a ridge line passing through the centre of the land parcel B and the flow from the ridge is towards the surrounding River. Also, a major segment of river passes through the land parcel in the Northeast and there is a minor stream line in the southeast side of the land parcel. Hence, from the site surrounding area, the surface runoff flow will be towards the site in the Northeast and some stretch of southeast side.

It is recommended to retain the path of the river entering in the Northeast and to prevent the land parcel from flooding, it is recommended to fill the site above High flood level with the provision of Embankment on all sides.

Hence, from this study, it is concluded that there is a requirement of embankment on all sides of the proposed site (both land parcels).

Figure 54: Study of site surrounding flow pattern



Source: MACE analysis

Boundary Wall

Construction of a boundary wall is required in order to earmark the EZ site and prevent unauthorized access to the EZ site. Presently, there is no boundary wall at the EZ site, earmarking the EZ boundary. Boundary wall would be developed by BEZA as a part of offsite infrastructure. Boundary wall having brickwork with suitable height of barbed wire and width of 150 mm is recommended at the EZ site.

7.4. Required improvements or upgrades

Based on the above study, recommendations have been provided below on developing various components of infrastructure in order to support development and operation of the EZ site.

Site filling

To avoid inundation during monsoon season, land filling depth of average 2 m from the existing ground level above the existing natural ground level needs to be carryout.

Approach road

1) It has been proposed to construct an approach road of 24m wide and 2100m to connect the industrial area. These approach roads are emerging from the existing Sonagazi – Muhuri Project road (Z1034) road.

2) It has been proposed to construct an approach road of 45 m wide and 6500m to connect the industrial area. These approach roads are emerging from the existing Sonagazi –Olmabazar- Chardarbeshpur-Companiganj road (Z1434) road. While connecting the approach road necessary turning radius should be provided and the junction of the highway should be provided with necessary traffic management measures in safety aspect.
3) Establish a Bridge of 45m wide and 800m length from CDSP embankment.
4) Establish a Bridge of 45 m wide and 1300m length connecting the two blocks of proposed site.

Power supply

132 kV power shall be avail from Mirsarai 132/33 kV power Grid substation which is under construction.

Water supply

No improvements or upgradation have been suggested in the existing off-site water supply infrastructure since it has not been considered as a source of water supply for the proposed EZ with the aim of not increasing the pressure on existing water supply infrastructure due to EZ since. Instead, a nearby available source of ocean has been considered as a water source for the proposed site. Hence, it is proposed to establish desalination plant.

7.5. Last Mile Off-site infrastructure action plan

The infrastructure action plan for the proposed EZ is provided in the following table.

Table 60: Offsite infrastructure action plan

Key Assets	Existing Condition	Issues	Recommendations	Cost Implication	Timeframe for Improvement	Jurisdictional responsibility
Site filling	average natural ground level +6 m AMSL	inundation during monsoon season	land filling depth of average 5 m from the existing ground level	13,402.14 million BDT	12 months	BEZA
Access road	1)Zilla road(Z1034) at 2100 m distance. 2)Zilla road(Z1434) at 6500 m distance. 3)Bangladesh Water Development embankment at a distance a 800m.	No connectivity to site.	1)Establish approach roads of 24m wide and 2100m length connecting from Sonagazi – Muhuri Project road (Z1034). 2)Establish approach roads of 45m wide and 6500m length connecting from Sonagazi – Olmabazar- Chardarbeshpur- Companiganj road (Z1434). 3)Establish a Bridge of 45 m wide and 350m length from CDSP embankment. 4) Establish a Bridge of 45 m wide and 1300m length connecting the two blocks of proposed site.	17,616 million BDT	36 months	BEZA
Power supply	1. 132/33 kV Grid substation at Mirsarai at a distance of 7 km is under construction.		To build a new 132 kV dedicated power transmission line from Mirasarai 132/33 kV power Grid substation during initial phase of development for a capacity of 175 MVA. Ultimate Power requirement for the proposed EZ shall catered by augmenting the substation.	833 million BDT	24 months	BPDB
Water supply	Not available at present		Establish Desalination plant, water draw from Bay of Bengal.	11,316.43 million BDT	36 months	BEZA
Boundary wall	Does not exist.		Boundary wall having brickwork with suitable height of barbed wire and width of 150 mm is recommended at the EZ site.	750.00 million BDT	6 months	BEZA

Key Assets	Existing Condition	Issues	Recommendations	Cost Implication	Timeframe for Improvement	Jurisdictional responsibility
Super Dyke	Does not Exist		A dyke will have to be constructed spread over a length of 30km.	49,464 million BDT	48 months	BEZA

Source: MACE analysis

In addition to the table displayed above, a breakdown of developing off-site infrastructure components has been outlined in the table below.

Table 61: Off-Site Infrastructure cost estimates

Description of Item	Quantity	Unit	Price without tax (In million Taka)	Price without tax (In million USD)
Site Development				
Land filling	71,287,978.9	CUM	13,402.14	163.44
Total			**13,402.1**	**163.44**
Road Network				
Road (24 m)	3.8	KM	266	3.24
Road (45 m)	6.5	KM	455	5.55
Bridge (45 m)	350	RM	3,840	46.83
Bridge (45 m)	1,300	RM	12,600	153.66
Total			**17,161**	**209.28**
Power Network				
132 kV line	7	KM	63	0.77
230 kV line	7	KM	770	9.39
Total			**833**	**10.16**
Water Network				
Water Supply Network	5	KM	116.71	1.42
Desalination Plant	128	MLD	11,199.72	136.58
Total			**11,316.4**	**138.01**
Fencing	16	KM	**750**	9.15
Super Dyke	30 km	RM	**49,464.67**	603.23
Project Subtotal			**92,927.24**	**1,133.26**

Source: MACE analysis

The off-site infrastructure cost estimates have been arrived at after taking into considerations benchmark costs as prevalent in the construction sector of Bangladesh.

Development of off-site infrastructure is the responsibility of BEZA.

7.6. Key Takeaway

Off-site infrastructure captures the external basic infrastructure facilities, which need to be developed. Development of off-site infrastructure is the responsibility of BEZA. The major off-site infrastructure considered for the proposed EZ are Boundary wall, water supply, power supply, access road and drainage. These external infrastructure facilities and sources have been identified and well-integrated with the proposed EZ based on site visit, data collection, stakeholder consultations with various government agencies (such as RHD, REB, and DPHE).

Key recommendations formulated from this exercise are outlined below-

- It is proposed to carryout the land filling depth of average 5 m from the existing ground level.
- Subject site has good access to trunk connectivity. Proposed EZ is located at a distance of 2100m from Sonagazi – Muhuri Project road (Z1034). Approach roads of 2100 m length and 24 m wide have been proposed to connect the industrial area.
- Proposed EZ is located at a distance of 6500m from Sonagazi –Olmabazar- Chardarbeshpur-Companiganj road (Z1434). Approach roads of 6500 m length and 45 m wide have been proposed to connect the industrial area.
- Establish a Bridge of 45m wide and 350 m length from CDSP embankment.
- Establish a Bridge of 45m wide and 1300m length connecting the two blocks of proposed site.

- Groundwater sources may be tapped to meet the water demand during construction stage. In order to meet the water requirements during operation stage, surface water source needs to be explored, which is sustainable and perennial in nature.
- Bay of Bengal act as source of water for the proposed EZ.
- Mirsarai 132/33 kV power Grid substation (located at a distance of 7 km from the proposed EZ) can act as source of power for development.

8. Master Planning

8.1. Purpose and objective

The aim of setting up an EZ in Feni is to develop Textile and RMG, Light Machinery, Equipment and Furniture, Electrical and Electronics, Leather and Leather products, Non-metallic minerals, Heavy machinery, Iron & Steel and Metals and Petroleum products including bottling-based industries in the region along with excellent state-of-the art infrastructure facilities and professional management to attract and support investments in industrial sectors.

While short-listing the above industries, for master planning purpose, entire processing area has been considered as a single industrial zone having varied plot sizes. However, this zoning plan is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake a separate industry assessment and master planning exercise in order to validate the same.

Hence, Feni EZ, in the form of prepared land, is proposed to be developed with general and specialized infrastructure facilities. This EZ focuses on development of large, medium and small-scale industries. All facilities required for target industries have been planned and identified in this chapter. This will enable the proposed EZ to function as an integrated package having the required facilities and service activities with sufficient provision for future growth and expansion.

Given the industrial base and the concept of EZ which has evolved to leverage the cluster advantage, the proposed project will further strengthen the Feni region in the industrial sector map of Bangladesh and will contribute to the economy. A careful planning exercise has been done to position the project taking into account the geographic, demographic, raw material resources, industrial, economic and social characteristics of region and it is in this context that master planning of the project assumes significance.

The purpose of creating a master plan is to create a thriving place where investors in the targeted sectors, managers of plants, support staff and their family can work, live and lead a wholesome life . It is important to develop the master plan to accommodate both the user industries area requirements and requirements of the various identified non-industrial components of the proposed EZ.

In order to implement this uniquely conceived EZ into a fully integrated, functionally best facility and to promote a new industrial cluster image in Bangladesh, as well as to develop confidence for foreign and local investors to undertake the development of the project and subsequent operation of their businesses, certain planning objectives/principles are envisioned as depicted in the figure on the next page.

Figure 55: Principles adopted for Master Planning

8.2. Methodology of Master Planning

Based on industry assessment and demand forecast

The industries which would be envisaged for this EZ site were shortlisted based on an extensive study on the macro-economic parameters of Bangladesh, combined with regional and site level assessment in order to identify and leverage the raw materials and market demand which would assist the industries in the EZ site. This was further validated through primary interactions and stakeholder consultations. Demand forecast for land space from each industry identified during industry assessment, was calculated based on the country level growth trend of the identified industry after taking into consideration the regional level investments, development of mega infrastructure and other greenfield EZs planned in the region.

Methodology adopted in preparing the Master Plan

The methodology adopted in preparing the master plan is provided below –

Step 1: Study of existing features and constraints

As a preliminary step of preparing the master plan, the existing features in and around the proposed site were studied in detail to understand the beneficial features and constraints. It is also necessary to understand the site on basic factors such as existing connectivity, the predominant wind direction and general slope of the terrain.

Step 2: Zoning

As a preliminary step of Zoning entry/exit to the proposed site has been planned. During the stage of Zoning, the entire site area has been divided into different Zones.

Step 3: Preparation of master plan

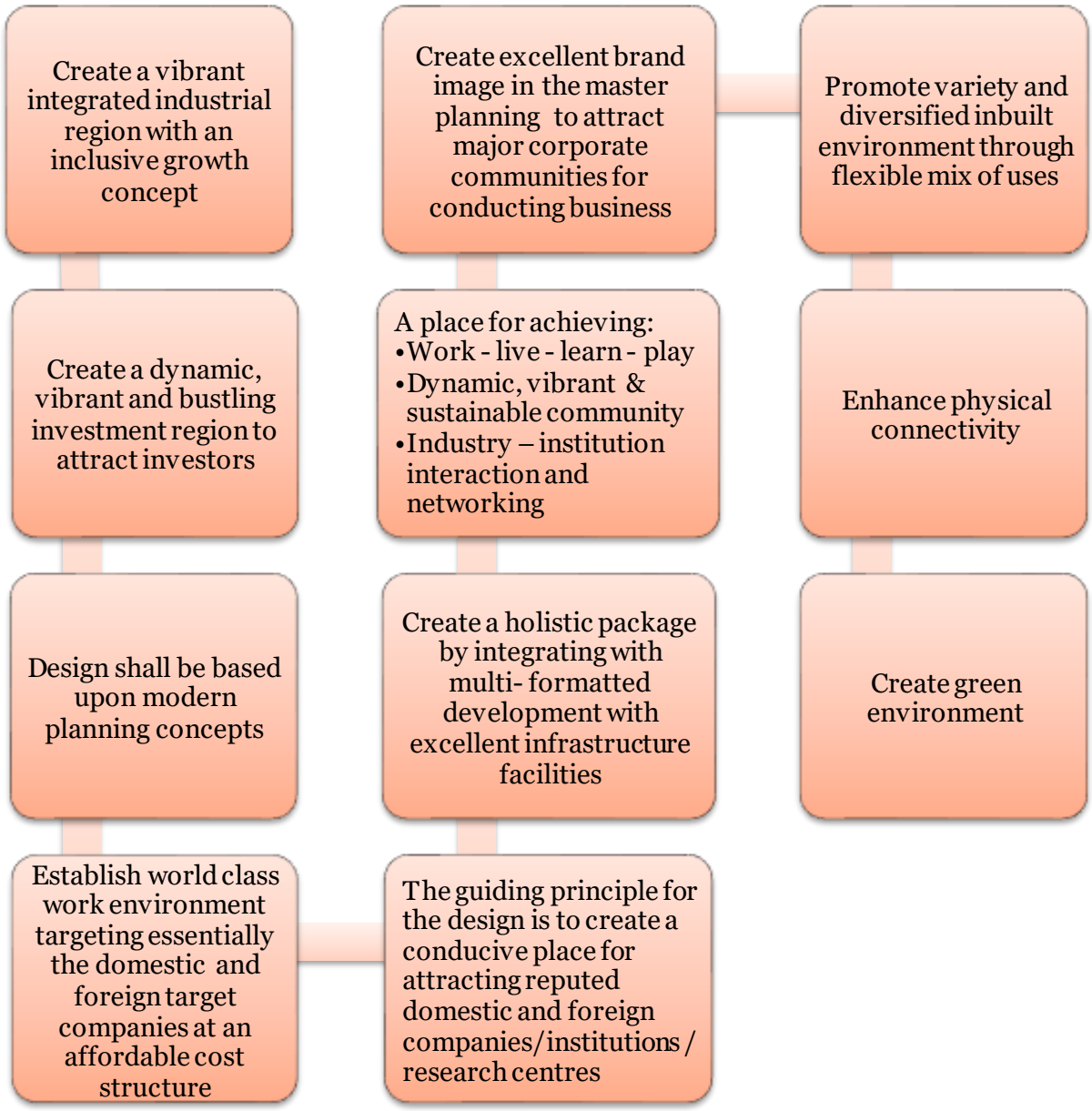
After zoning, as a preliminary step of preparing the master plan based on Zoning, the major road network has been planned based on planned entry/exit. This has been followed by sub-zoning, land parcellation, planning of internal access road based on land parcellation, planning of utilities & amenities and Phasing.

The outputs obtained through this master planning exercise might be slightly different from the outputs obtained during demand forecasting due to minor adjustments in area allocation for different industries in order to create an aesthetic Master Plan. The planning concepts and considerations are as follows –

Planning Concept

The planning concepts for the proposed EZ are as depicted below. The EZ shall be a self-contained region with a salubrious surrounding and is envisaged to be developed as "Sustainable-holistic-smart intelligent-eco-Economic zone.

Figure 56: EZ planning concept



8.3. Master Planning consideration

The planning for the proposed EZ is based on the broad objective of establishing a world class business environment targeted essentially at high growth manufacturing and processing industrial & related infrastructure sectors.

Each zone within the EZ shall be planned to be dedicated to the specific sub-sector and would be a self-sufficient unit in terms of facilities, ability to attract investors and revenue generation.

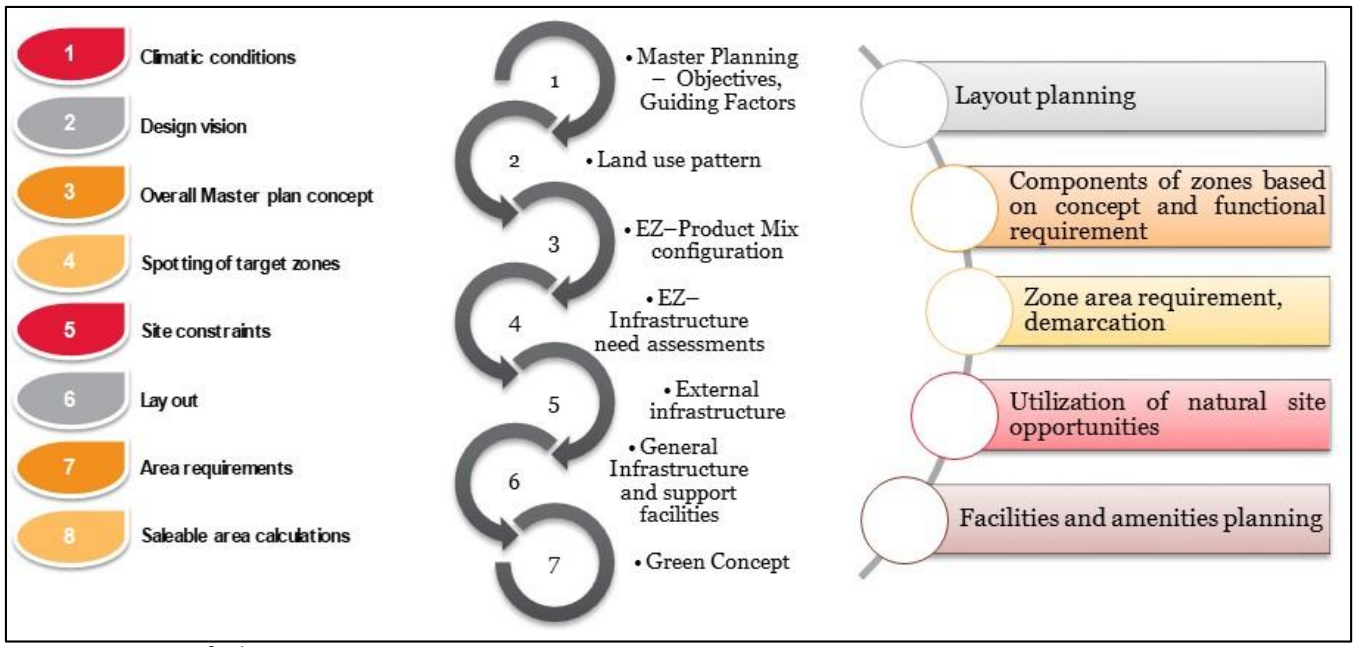
Social and commercial amenities are also planned to provide convenience to visitors as well as to the working population within the EZ. The project is planned to be housed in a lush green environment and accordingly, landscaping and greenery are planned.

While planning the EZ, the following vital issues were addressed along with strategies for successful implementation and sustained operation of EZ:

- **Land use and layout:** The whole area is suitably divided into a number of identified activity centres of different sizes. The layout is developed with complete understanding of the phasing program. Integration of the financial aspects with physical planning aspects is the most important factor for success in implementation.
- **Constraints and core offering of the site**: All the site-specific constraints are fully respected and mitigation measures are fully taken into consideration while developing the master plan. Similarly, the planning fully leverages the core and supplementary offering of the site.
- **Services and amenities**: The master plan takes into account planning for services and amenities.
- **Addressing shortage of housing for the workforce**: Provision is made for sustainable integrated township with multi-format development enabling a strong work live play concept.
- **Lack of enforcement / control on land use and growth of unapproved housing / layouts**: Well-conceived EZ implementation framework shall be suggested to address these issues.
- **Non- uniform distribution / concentration of industrial growth pockets**: A structured industrial zoning in terms of raw material, effluent generations, pollution level category, end product distribution etc. is done and accordingly sub-zones in EZ are suggested.
- **Conservation of ground water & surface water resources**: Sustainable infrastructure planning, incorporation of eco-friendly concepts and environment sustainability, water conservation schemes, environmental infrastructure, recycling and reuse options etc., are suggested to be incorporated in the EZ development program.
- **Transportation**: The master plan looks at the transport linkages. As the EZ will have regional, national as well as international linkages for freight movement, it generates lot of traffic. A well-developed logistic hub for both raw material and finished product is planned to cater to the transport systems.
- **Poor quality of roads & unplanned road junctions leading to traffic congestions**: EZ development plan identifies the constraints and appropriate road network including the approach roads, road congestion removal by the provision of grade separators and hinterland connectivity, augmentation / widening of existing roads are being suggested.
- **Environmental management**: Various aspects such as adherence to pollution control norms & standards control over goods, storage and handling of industrial waste, common treatment, etc., are given paramount importance while planning.

Above listed master planning considerations are summarized on the next page.

Figure 57: Master Planning Considerations



Source: MACE analysis

8.4. Zoning Plan

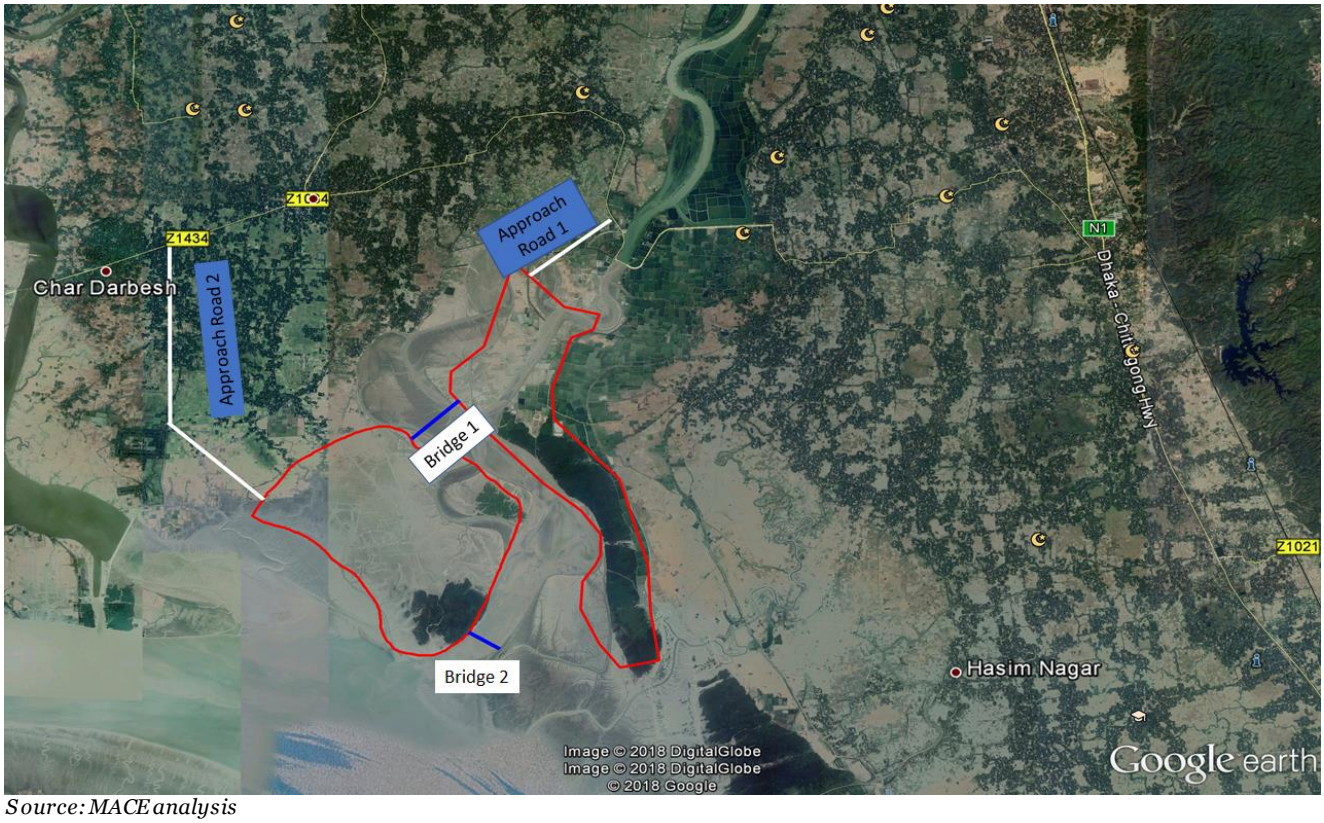
The preliminary step of Zoning is planning of entry/exit to the proposed site. During the stage of Zoning, the whole area was divided into various zones. The major factors considered while locating the zones are Wind direction, connectivity and demand forecast.

There are 2 approach roads which connects the two land parcels of the proposed EZ. Based on the same, entry/exits have been proposed for the EZ.

During preliminary stage, the entry/exit planned for the proposed EZ can be from the proposed approach road connecting the Sonagazi – Muhuri Project road (Z1034) and is depicted on the next page.

Another entry/exit from the approach road connecting Z1434 will be developed on long-term basis upon development of another land parcel.

Figure 58: Entry/Exits of the proposed EZ



Source: MACE analysis

The zoning design was done in order to have a smooth pedestrian circulation by simplifying the movement patterns and allow the inter-zone movement.

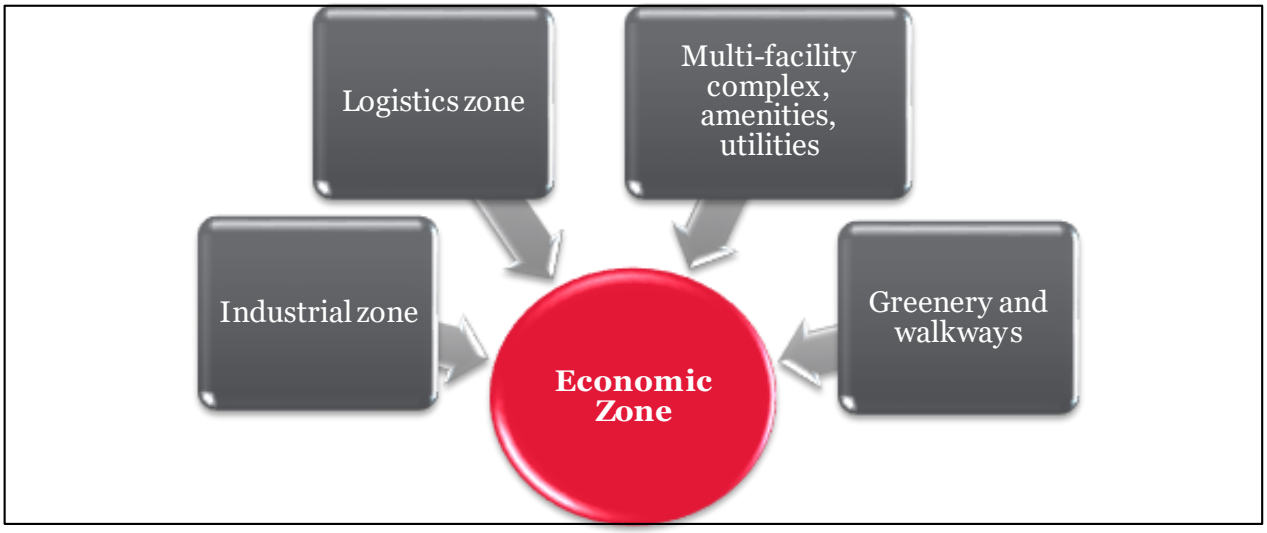
Following site parameters have been considered while positioning the zones.

- Boundary shape
- Physical site features
- Area availability
- Environmental considerations
- Micro climatic conditions
- Compatibility issues
- Surrounding areas
- Accessibility
- Transportation issues
- Visibility

Zoning, product mix and facility configuration

A well-balanced land use is perceived with a judicial mix of Industrial, Institutional and social zones as illustrated in the figure on the next page.

Figure 59: Zoning, product mix and facility configuration



Source: MACE analysis

8.5. Zoning Principles

The development bound to occur within the EZ premises shall comply with competent local Bye-Laws. This shall ensure a uniform development of the structures and buildings planned within the EZ. BEZA has prepared a stand-alone development control regulation guideline which derives its essence from the local planning guidelines (As per BNBC). It shall be ensured that any tenant/occupant unit in the EZ while planning shall comply with all the norms as stipulated below

Floor Area Ratio (FAR)

Floor area ratio is defined as ratio between the total build-up area and total plot coverage.

In construction of building, FAR shall be 6:

Provided that internal roads, open to sky drive way and parking area, tanks, STP, ETP shall be excluded from FAR calculation.

Site coverage

In the construction site the covered area shall be as follows

(a) maximum 50% of the total area shall be covered by factory building, power house, storage, covered parking, ETP, overhead STP etc;

(b) 30% of the site shall be covered by the drive way, open parking, 50 sq.m guard room, fire common center, cycle stand, internal roads, underground water tank and septic tank

(c) 20% of the site shall be open to sky soak area:

Provided that soaking soft pave may be used instead of green grass or naked earth in the open space.

Setback

(1) A minimum front setback of 12 (twelve) meters shall apply to the primary street and a minimum setback of 4.5 (four point five) meters shall apply to the secondary street, or streets, unless otherwise determined by the Authority.

(2) Side and rear setbacks shall be 3.5 (three point five) meters.

(3) Notwithstanding anything contained in sub-rule (1) and (2), the Authority may, considering the following circumstances, make variation up to a reasonable limit in determining the setbacks, namely:

(a) general streetscape;

(b) properties and buildings near and surrounding the site;

(c) fire separation distance;

(d) solar aspect and prevailing breezes; and

(e) bulk of the development.

Community open space for industrial plots:

(1) For every industrial plot having an area of 1.0 hectare or more, a minimum of 10% of the total area, but not exceeding 0.25 hectare, shall be reserved as community open space and such area shall be contiguous to and shall have a means of access from every unit of the industry for recreational activities of the persons working in the industry and also linked to the external roads for safe exit during emergency.

(2) The adjacent road network and the internal open space together shall be used for the assembly area during emergency.

8.6. Master Plan

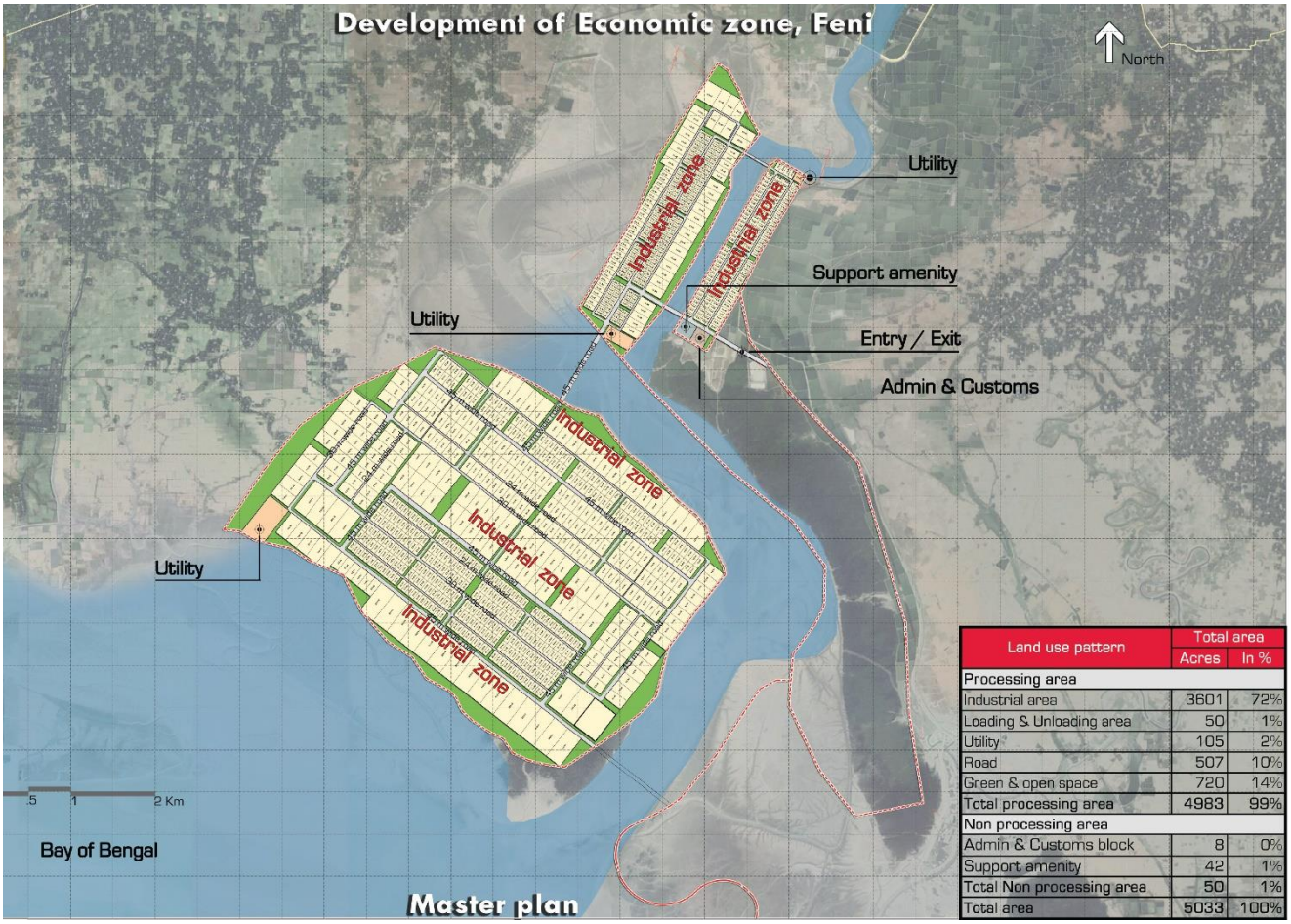
A best practice master plan based on zoning exercise has been created. This master plan comprises major road network which has been planned based on planned entry/exit. This was followed by sub-zoning, land parcellation, planning of internal access road based on land parcellation, planning of utilities & amenities and Phasing.

Detailed master planning is done cluster wise covering the following components:

- Micro level zoning
- Land use plan
    - Detailing the locations and sizes of various land uses
- Land parcel plan
    - Showing the sub-division of industrial land
- Phasing
- Utilities mapping
- Greenery and open space plan
- Road category

The master plan of EZ is given in the figure on the next page.

Figure 60: Master plan of EZ



Land use pattern	Total area	
	Acres	In %
Processing area		
Industrial area	3601	72%
Loading & Unloading area	50	1%
Utility	105	2%
Road	507	10%
Green & open space	720	14%
Total processing area	4983	99%
Non processing area		
Admin & Customs block	8	0%
Support amenity	42	1%
Total Non processing area	50	1%
Total area	5033	100%

Source: MACE analysis

Various type of industries to be accommodated within Industrial Zone arrived from market demand analysis are as follows-

1) Textile and RMG

2) Light Machinery, Equipment and Furniture

3) Electrical & Electronics

4) Leather & Leather products

5) Non-Metallic Minerals

6) Petroleum products including bottling

7) Heavy Machinery, Iron & Steel and Metals.

8) Auto and automobile accessories

Within industrial Zone, there should be a chance for establishing various type of industries according to the trend, wish and requirements of developer. In order to provide that flexibility during implementation stage, area for the Industrial Zone has been earmarked as whole and further earmarking of area for different type of industries listed above has been avoided. This will attract the developers towards EZ due to its high flexibility.

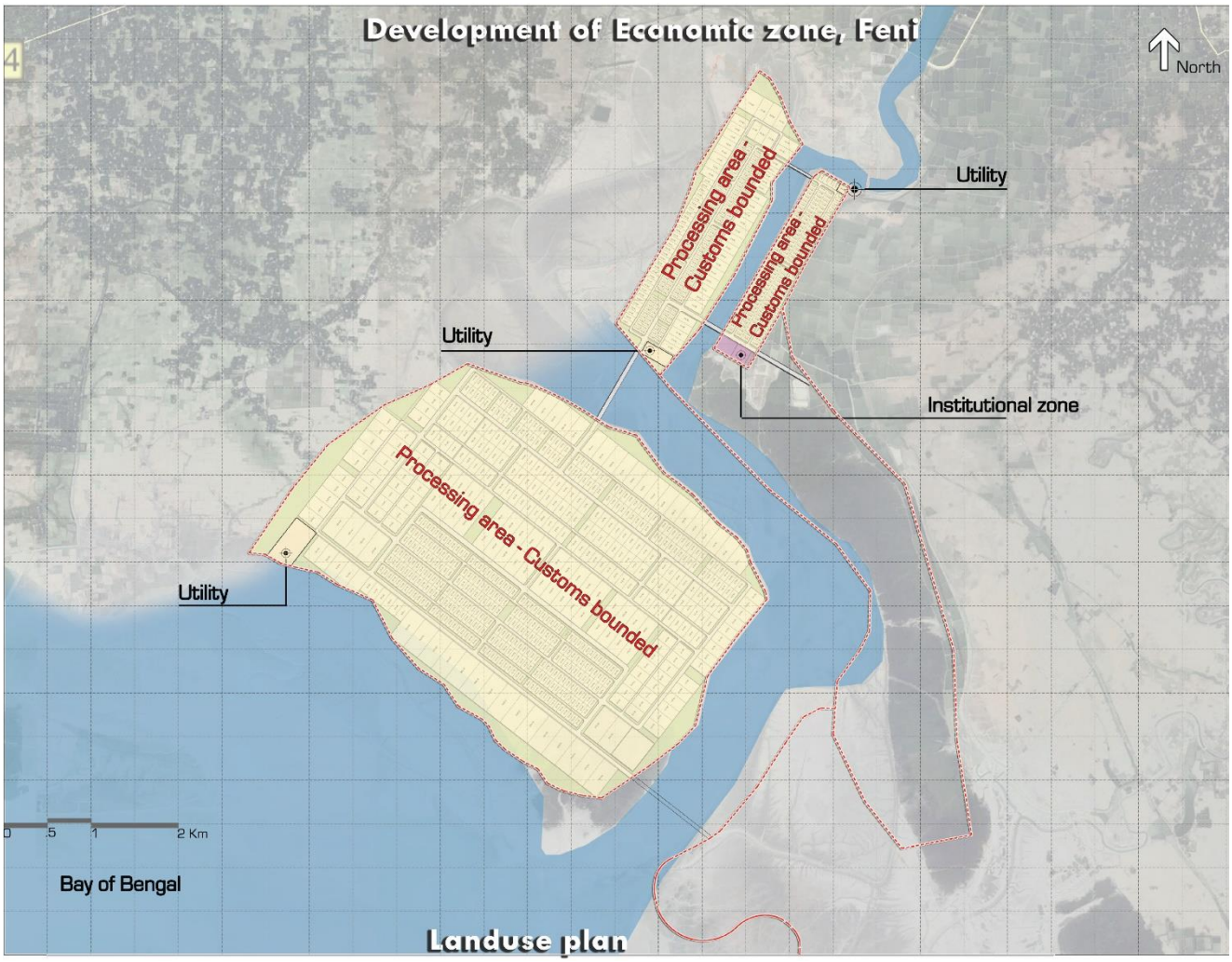
Apart, area for Utilities and supporting amenities have also been earmarked in the proposed master plan.

8.7. Land use Plan

The land use pattern of the EZ is determined after considering the land requirement for various processing units, logistics requirements, utilities and public amenities etc.

The different land use proposed in the master plan is depicted below.

Figure 61: Land use plan of EZ



Source: MACE analysis

Following table and figures provide the land use pattern for the proposed EZ.

Table 62: Land use pattern for the proposed EZ

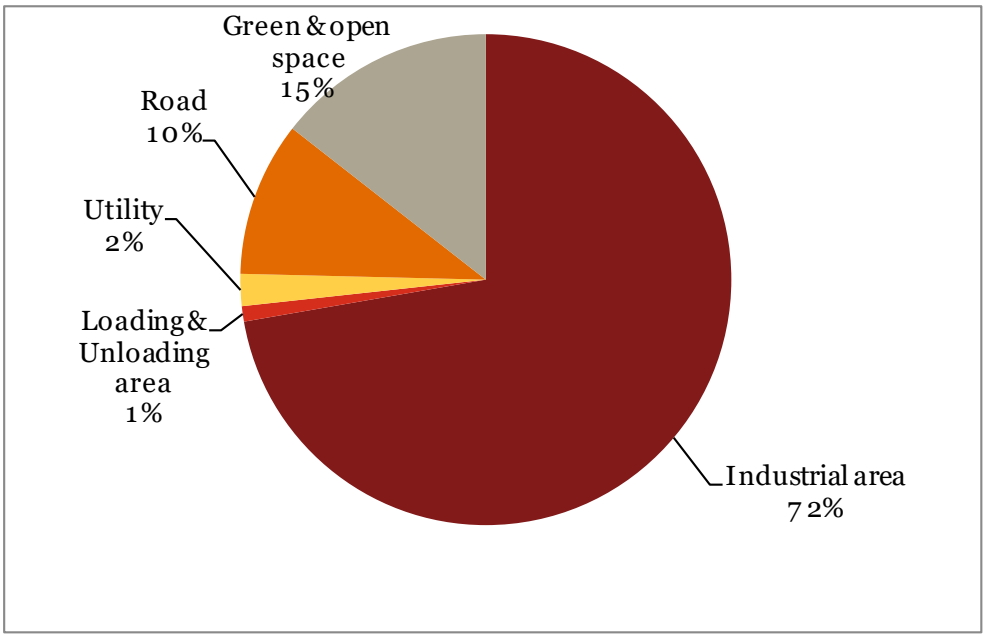
Land use pattern	Total area		Saleable area		Non-saleable area	
	Acres	In %	Acres	In %	Acres	In %
Processing area						
Industries	3600.82	72%	3600.82	72%		
Loading & Unloading area	50.43	1%	50.43	1%		
Utility	104.94	2%	104.94	2%		
Road	507.16	10%			507.16	10%
Green & open space	719.61	14%			719.61	14%

Land use pattern	Total area		Saleable area		Non-saleable area	
	Acres	In %	Acres	In %	Acres	In %
Total processing area	**4982.96**	**99%**	**3756.20**	**75%**	**1226.76**	**24%**
Non-processing area						
Admin & Customs block	8.40	0%	8.40	0%		
Supporting amenities	41.72	1%			41.72	1%
Total Non-processing area	**50.12**	**1%**	**8.40**	**0%**	**41.72**	**1%**
Total area	**5033.08**	**100%**	**3764.60**	**75%**	**1268.48**	**25%**

Source: MACE analysis

The land use pattern as elucidated in the table above covers the infrastructural components being planned to be developed inside the EZ site. Land for different industrial sectors has been allocated without keeping provision of Standard Factory Buildings (SFBs) that would be established for industries. Provision for SFBs has been kept in the Financial Model chapter. Due care has been taken to include provisions for adequate green and open space. Non-Processing area has been segregated into different blocks to include facilities like admin and customs blocks and supporting amenities.

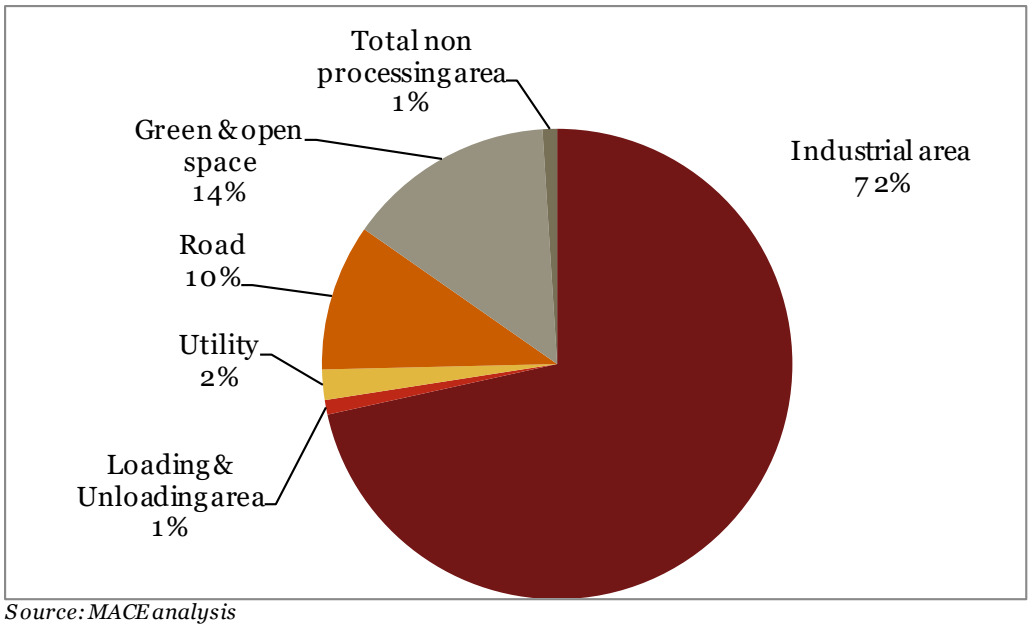
Figure 62: Land Use Pattern - Processing Area



Source: MACE analysis

The above figure indicates a percentage wise breakup of land use pattern of the processing area of the EZ site. An overview of this figure reveals that Industrial area has been allocated maximum area in the EZ site. A further break up of land use pattern envisaged for entire area of the EZ site has been shown in the following figure.

Figure 63: Land Use Pattern – EZ site



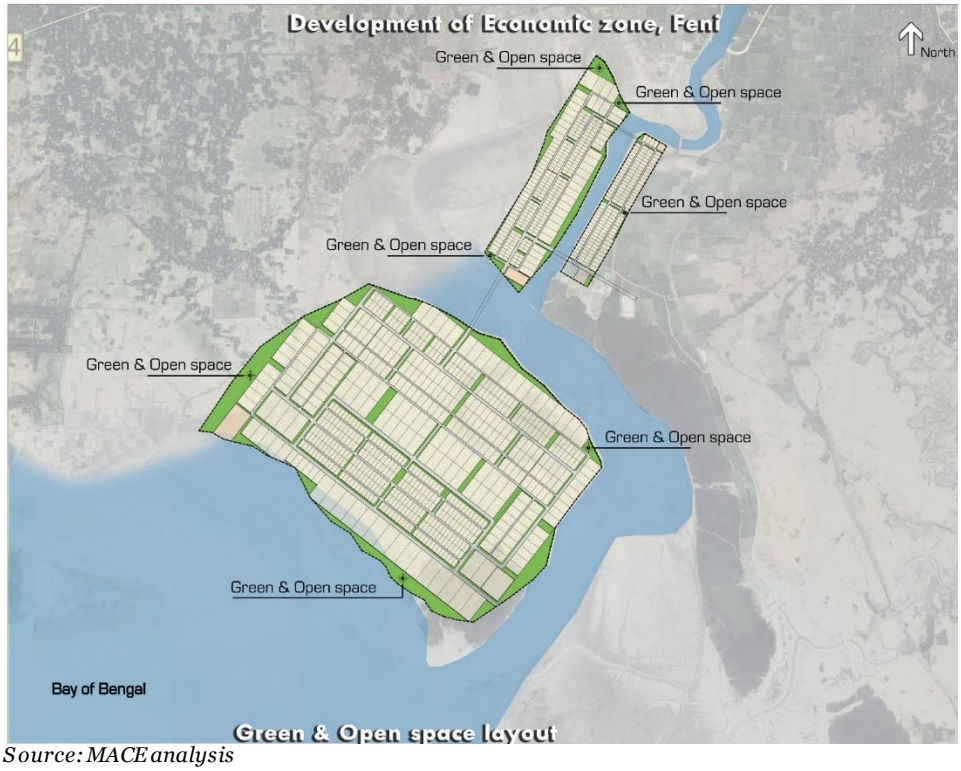
Source: MACE analysis

Based on the above land use pattern, 75% of land area accounts for saleable area and remaining 25% of land area accounts for non-saleable area. Out of 75% total saleable area, 74.63% is accounts for industrial use and remaining 0.17% of total saleable land area is earmarked for Admin & customs and supporting amenities.

Green space required as per international planning norms in practice is being earmarked at strategic locations in the master plan. Private Green within the industrial plots is not included in the computation of overall green area of EZ. The greenery will be concentrated at the boundary of zones and at pocket parks.

The layout showing earmarked area for Green/Open space within the proposed EZ is as follows:

Figure 64: Green and open space



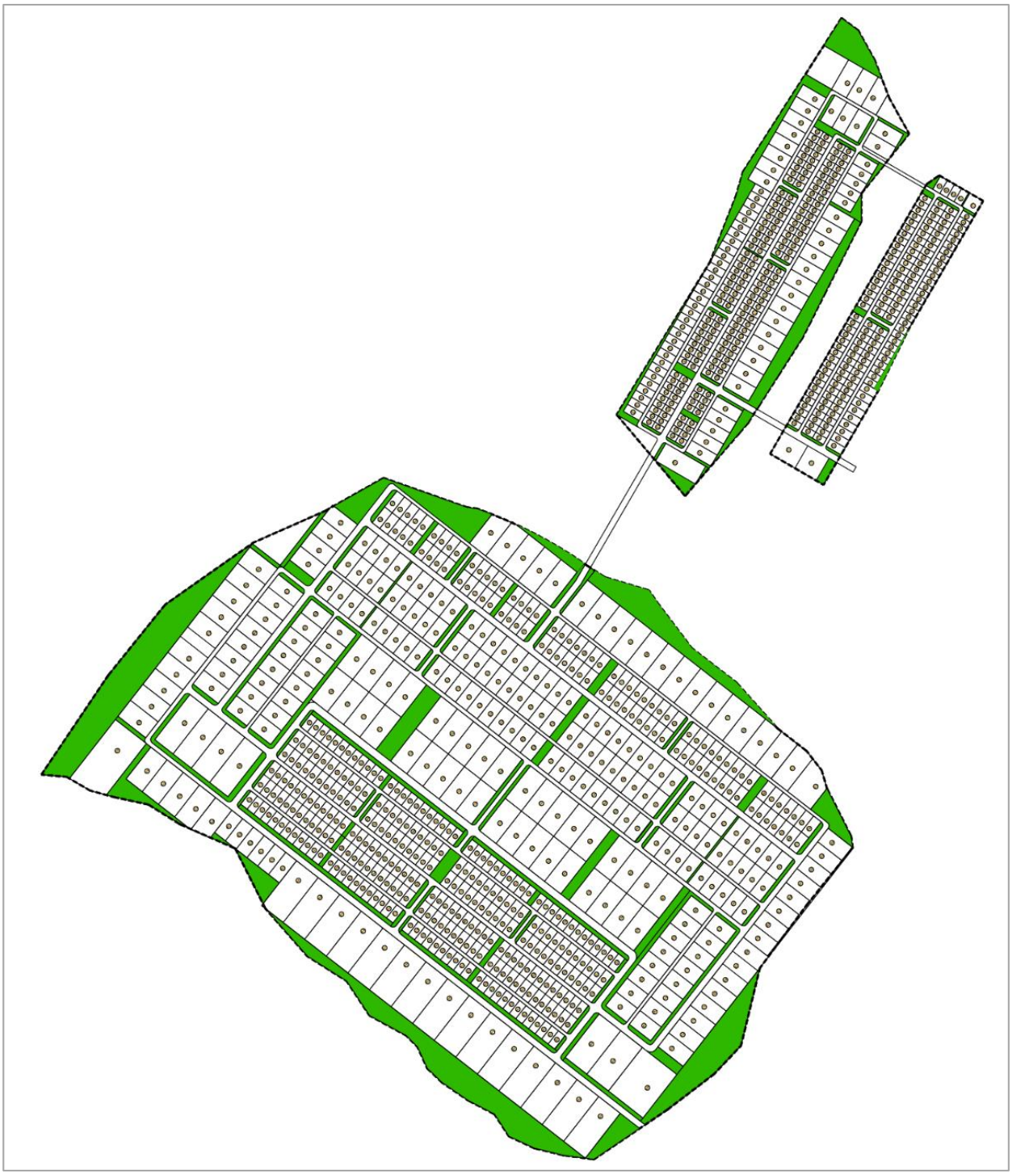
Source: MACE analysis

8.8. Plot details

There are totally 1,075 plots earmarked in the proposed master plan for different usage out of which 3 plots for Utilities, 2 for Admin and customs and balance plots are demarcated for industrial usage.

The number of plots and different configuration of plots provided in the master plan are shown in the figure below.

Figure 65: Plot configuration of EZ



Source: MACE analysis

From the proposed land use distribution, it can be seen that industrial usage is the predominant land use.

Besides offering pleasant environment for people to work, the development will offer a variety of prepared land plots complete with infrastructure for clients to build their own factories. Industrial land will be marketed as prepared land sites complete with infrastructure.

The parcellation of plots is done depending upon the types of industries to be accommodated. Occupant units can merge or sub-divide the prepared land into appropriate sizes to meet their own requirements. Conversely, the larger plots can be subdivided by introducing some minor roads if the demand is for small plots. Prominent sites which normally command a slightly higher land premium are reserved for industrial brand names and multinational companies (MNCs) who desire these prime locations for enhancement of their corporate image and are ready to pay a premium price for the same. Apart from general infrastructure, specialized infrastructure required for a particular zone is also envisaged.

A variety of small and large plots are provided to meet the varied needs of the industrialists. A size wise breakup of the plot details envisaged for the EZ site is shown below.

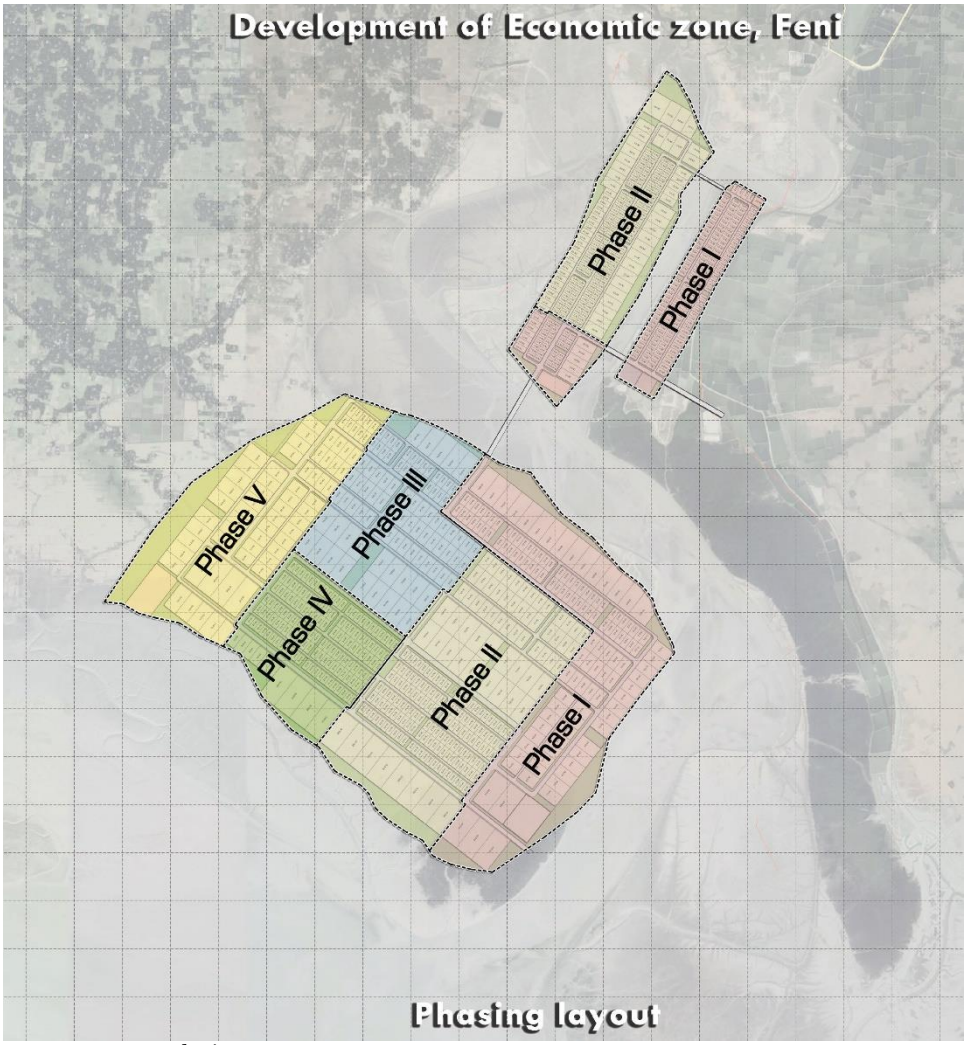
Table 63: Area wise break up of land plots

Site	Project Total	Phase I	Phase II	Phase III	Phase IV	Phase V
Land (Acres)	5033.08	1480	1600	640	497	816
No of Plots	1075	334	413	100	154	74
Size of Plots						
1 acres	330	178	152	-	-	-
2 acres	431	85	163	29	141	13
5 acres	214	50	69	46	8	41
10 acres	75	15	20	25	-	15
20 acres	25	6	9	-	5	5
No and size of buildings to be constructed						
Building Type	**Total No in Project and Size**	**Phase I Total No and Size**	**Phase II Total No and Size**	**Phase III Total No and Size**	**Phase IV Total No and Size**	**Phase V Total No and Size**
EZ Entry/ Exit Gates	(1000 Sqm)	1 (1000 Sqm)	-	-	-	1 (1000 Sqm)
Admin Building	1 (4500 Sqm)	1 (2500 Sqm)	-	-	-	-

8.9. Phasing Plan

The project is planned to be developed over 5 phases. In phase I – 1480 acres (334 Plots) will be developed, phase II 1600 acres (413 Plots) in will be developed, phase III 640 acres (100 Plots), phase IV 497 acres (154 Plots) and phase V 816 acres (74 Plots) will be developed. The details of the phasing plan are as shown in figure on the next page.

Figure 66: Phasing plan of EZ



Source: MACE analysis

The details of the phase wise breakup are as shown in following table –

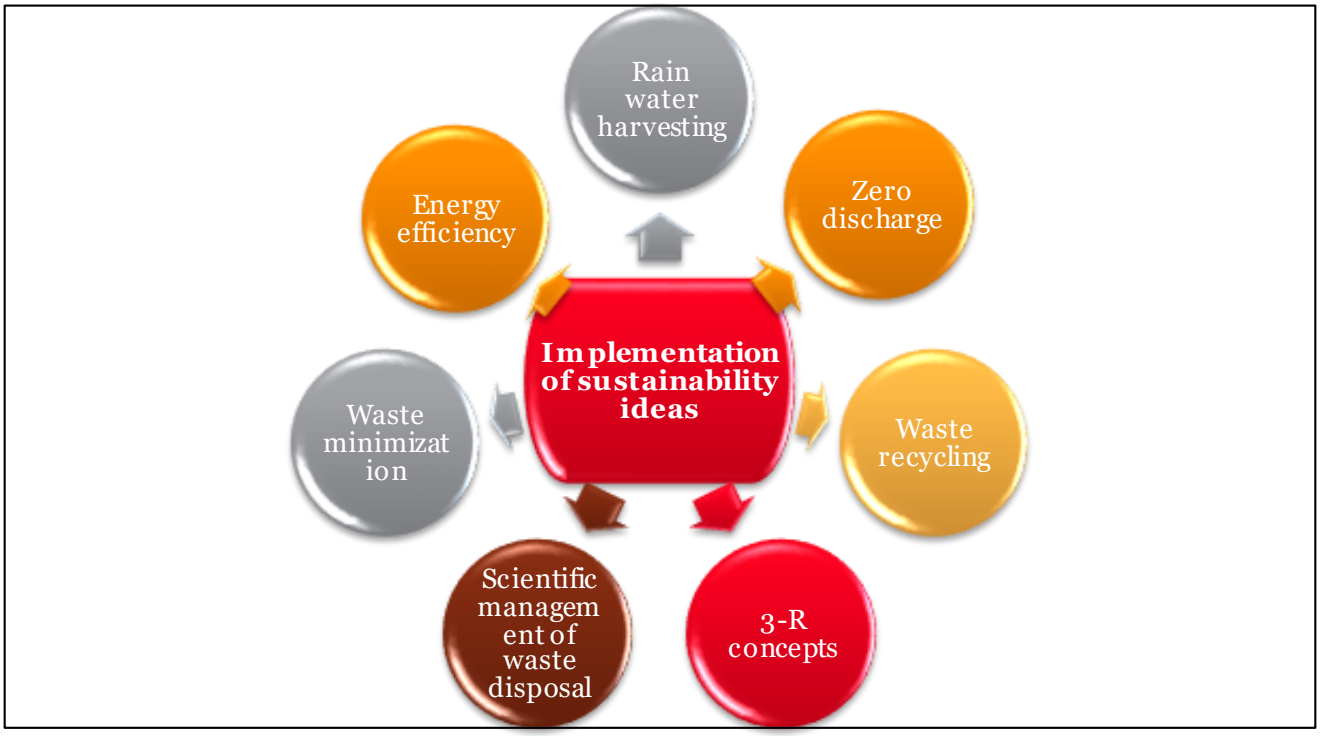
Table 64: Phase wise Industry breakup

Land use pattern	Total area (in Acres)	Phase 1 (in Acres)	Phase 2 (in Acres)	Phase 3 (in Acres)	Phase 4 (in Acres)	Phase 5 (in Acres)
Industries	3600.82	998.29	1170.11	535.21	366.92	530.21
Loading & Unloading area	50.43	14.62	16.13	6.5	5	8.18
Utility	104.94	8.94	37.47	-	-	58.53
Road	507.16	178.03	149.72	44.09	72.93	62.39
Green and Open Spaces	719.61	230	226.57	54.20	52.15	156.69
Non-Processing area	50.12	50.12	-	-	-	-
Total	**5033.08**	**1480**	**1600**	**640**	**497**	**816**

8.10. Sustainability Initiatives

The development of the EZ is driven on strong foundation of sustainability concepts and these needs were built right in the conceptualization stage itself. The sustainable elements conceived in the concept plan include use of eco-friendly materials, recyclable material, avoidance of toxic chemicals, usage of environmental friendly products, waste minimization technologies, scientific treatment of waste and energy recovery possibilities to reduce power consumption etc. as shown in the figure below.

Figure 67: Sustainability initiatives



Source: MACE analysis

Implementation of the above-mentioned sustainability ideas inside the Economic Zone would enable an eco-friendly and holistic growth of the regional economy providing adequate benefits to local stakeholders and at the same time preserving the local fauna and flora in vicinity of EZ site.

8.11. Key Takeaway

Taking inputs from industry assessment and demand forecasting, best practice master planning has been carried out to enable state-of-the art infrastructure facilities in the proposed EZ to attract and support investments in industrial sectors.

Master planning takes into cognizance layout planning, zoning based on concept & functional requirements, facilities & amenities planning. Master plan comprising Zoning plan, Road network plan, detailed land use & land parcellation plan and phasing plan has been prepared.

Key recommendations formulated from this exercise are outlined below-

- During Zoning, main entry/exits for the industrial area have been planned in order to allow smooth circulation movement and to avoid traffic congestion. The whole site area has been divided into various zones such as Industrial Zone, Logistics Zone and Amenity/Utility Zone
- After Zoning, internal road network has been planned based on planned entry/exit followed by sub-zoning, land parcellation; planning of internal access road based on land parcellation, planning of utilities & amenities and phasing.

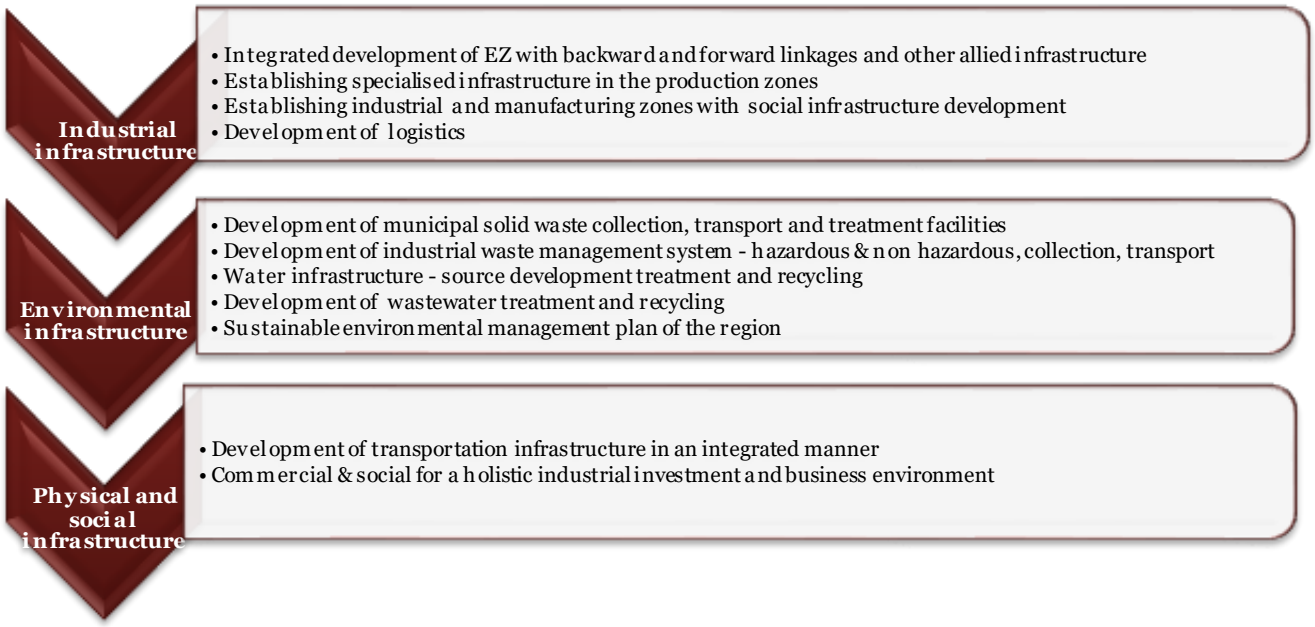
- This project has been planned to be developed over 5 phases with each phase having a construction period of 10 years. In phase I – 1480 acres (334 Plots) will be developed, phase II 1600 acres (413 Plots) in will be developed, phase III 640 acres (100 Plots), phase IV 497 acres (154 Plots) and phase V 816 acres (74 Plots) will be developed.
- Best practice master planning indicates that 75% of land area accounts for saleable area and remaining 25% of land area accounts for non-saleable area. Out of 75% total saleable area, 74.63% is accounts for industrial use for targeted sector. 0.17% of total saleable land area is earmarked for Admin & customs and Supporting amenities.
- 1,075 plots earmarked in the proposed master plan for different usage out of which 3 plots for Utilities, 2 for Admin and customs and balance plots are demarcated for industrial usage.

9. Infrastructure Plans

9.1. Purpose and Objective

The industrial, environmental, physical & social infrastructure objectives of EZ are described in figure below.

Figure 68: EZ infrastructure objectives



Source: MACE analysis

The infrastructure is the key requirement for sustainable operation of the EZ. Infrastructure requirements are categorized as follows:

1) Infrastructure within EZ
2) Specialized infrastructure
3) External connectivity and offsite infrastructure for EZ.

All the necessary infrastructure facilities for the development are designed to create an ideal ambience and best environment.

As a part of Infrastructure planning and designing, the Infrastructure demand will be calculated. For the same, it is planned to consider the High demand industrial requirement as a base value for arriving the overall demand of water, power etc., for the proposed EZ. Hence, it provides the flexibility in establishing different industries based on the investors requirements which makes the EZ ready to occupy with sufficient infrastructure facilities to meet their demand.

9.2. Methodology of Infrastructure Plans

The basic considerations and the methodology adopted for planning various infrastructure components within the EZ are provided in the following table.

Table 65: Details of components covered under infrastructure plan

Components	Detailing of utilities, infrastructure within proposed EZ
➢ **Roads – General considerations**	○ Arterial, Primary and Secondary roads are planned to give access to the industries within EZ.

Components	Detailing of utilities, infrastructure within proposed EZ
	○ In order to maximize lead values and minimize land taken by major and minor roads, a proper hierarchy of roads is proposed to ensure smooth traffic movement inside EZ.
➢ **Roads – categories**	○ Different categories of roads are proposed for the internal road transportation network. ○ The details are given in **Table-Hierarchy of roads.**
➢ **Roads – pedestrian walkways**	○ Routes and paths are provided for easy movement of visitors with sufficient care so that no transport system comes in the way of pedestrians. ○ Aesthetically designed walkways are provided along with lush green environment on either side of road. ○ Pedestrian walkways are provided for all categories of roads. ○ All services for drains, sewers, water, power and telecom are contained within the road right of way. ○ Necessary signage, street name boards, zone guiding maps and visitor's guidance map etc. are planned to be positioned at necessary locations, such as intersections and at various strategic locations in each zone. ○ No access is planned to be allowed near the road junctions and it is recommended that ingress/egress points will be with a set back at least 30 m from the road junction.
➢ **Roads - pavement structure**	○ In the proposed EZ, flexible pavement structure is recommended for the following reasons: • Ease of rehabilitation in consideration for anticipated long-term settlement. • Lower reinstatement cost to accommodate future laying of utility services. ○ The typical composition of flexible pavement structure is detailed in **Table- Composition of Flexible Pavement Structure** considering California Bearing Ratio (CBR) value of 9% and 5 Million Standard Axles (MSA). ○ Wherever necessary, the unsuitable soil at sub-grade/below sub-grade level shall be replaced with suitable materials as per standard specifications. The sub-grade soil shall have CBR value of 9%. ○ The base course and surface wearing course should be delayed in the initial construction and could instead be laid 12 months later or in the subsequent road development program. This would minimize reinstatement costs during subsequent underground services lying, road crossings, connections and settlement in the filled areas.
➢ **Surface drainage – general considerations**	○ Based on the topography of the EZ, the drainage pattern has been decided. ○ In order to prevent the storm water entering from adjacent areas to the development area, a cut-off drain all along the periphery of the site is considered and connected to existing river/discharge points.
➢ **Surface drainage – Peak runoff**	○ The peak runoff and discharge capacities are computed based on the following design parameters. • The peak runoff is planned to be computed based on rational formula: -

Components	Detailing of utilities, infrastructure within proposed EZ
	Q = C * I * A / 360 Where, Q = Quantity of runoff, m^3/s C = Coefficient of runoff I = Intensity of rainfall, mm/hr A = Catchment area, hectare • Considering the nature of soil/ surface, the coefficient of runoff adopted in the drainage computation are given below: 0.9 - for built-up area 0.5 - for road and other paved area 0.2 - for greenery and open area
➢ **Surface drainage – sizing**	• The sizing of the drains is designed based on the discharge capacity of Qc to cater adequately the estimated peak runoff using Manning's formula: - $Qc = (1/n) * A * R^{2/3} * S^{1/2}$ (m^3/sec) Where A = Area of cross-section of drain (m^2) R = Hydraulic mean radius (m) S = Hydraulic gradient n = roughness coefficient
➢ **Surface drainage – design & scheme**	• The drainage system is planned to cater for the entire EZ through gravity flow. • Drains are proposed to be provided on both sides of the roads. • Open trapezoidal drain is considered for the surface run off collection due to easy maintenance for the primary road. Stone pitching is considered for the side walls and PCC for the base. • Covered rectangular brick masonry drain is considered for the remaining areas for optimization of area under drainage. • RCC box / pipe culverts of suitable sizes are considered for road crossings. • Rainwater harvesting structures are envisaged all along the drain at every 30 m interval.
➢ **Water demand**	○ The water demand estimation norms considered for arriving the water demand is depicted in **Table-Water Demand Estimation Norms.**
➢ **Water losses**	○ Water losses occur in the distribution and transmission network. The percentage of loss depends on the pipe material, jointing system, etc. As this is a complete loss, it is attempted to keep these losses below 10% of the total demand. ○ Potable water has been considered to be used for processing, bathing and washing clothes, cooking, drinking and washing vessels. ○ Non-potable water has been considered to be used for gardening, cleaning, cooling and toilet flushing. ○ The water consumption pattern assumed is given in **Table-Water Consumption Pattern.**

Components	Detailing of utilities, infrastructure within proposed EZ
➢ **Fire protection demand - non-potable**	○ Fire demand in litres per minute has been calculated based on the following formula: $Q_{FD} = 4000 x (P)^{0.5} x (1-0.01 x (P)^{0.5})$ *Where P = Population in thousands per hectare* Q_{FD} = *1879.69 lpm* = *112.78 cum/hr* ○ Considering two hours fire demand requirement, the total quantity of water required for fire protection is 225.56 cum. ○ Demand for firefighting has not been considered under daily demand as one-time storage i.e. 2 hours of fire demand will be created and maintained.
➢ **Average water demand**	○ Based on the computation and analysis, the total average water demand is estimated and presented in **Table-Water Demand.** ○ The water demand estimation for different components in the processing and non-processing area is depicted in **Table- Estimation of Average Daily Water Demand.**
➢ **Water storage**	○ Based on the above estimates, the following infrastructure for the EZ is proposed. ○ ***Underground storage tank*** • The total storage capacity of the underground storage tank based on 24 hrs. Storage requirement is proposed is shown in **Table-Underground Sump Storage Capacity.** • Totally there will be 2 underground storage tanks for storing portable and non-portable water including fire demand for processing and non-processing area respectively. ○ ***Elevated level service reservoir (ELSR)*** • The total storage capacity of the overhead storage tank based on 2 hrs. Storage requirement is shown in **Table Overhead Tank Storage Capacity** • Totally there will be ELSR for storing portable and non-portable water including fire demand for processing and non-processing area respectively. • As per standard norms, the tail end should have a minimum residual pressure of 7.0 m. To meet the norms, the staging height of ELSR shall be fixed accordingly by the project implementation company.
➢ **Water pumping station**	○ Water pumping station for potable and non-potable water is required for pumping from the underground storage sump to respective ELSR. ○ The water supply scheme including distribution is planned based on the peak flow, minimum residual pressure and pipe material.
➢ **Water distribution network**	○ It is proposed to provide separate water distribution network for potable and non-potable supply. ○ The design criteria for the design of water supply network are given below. • Demand computed based on the analysis. • Working hours per day - 24 • **Pipe material** ▪ For pumping main - DI (K9)

Components	Detailing of utilities, infrastructure within proposed EZ
	▪ For distribution up to 200 mm dia. - HDPE (PE 100) ▪ For distribution above 200 mm dia. - DI (K7) ▪ Pipe roughness coefficient - 140 for DI and - 150 for HDPE ▪ Formula used for friction loss - Hazen Williams ▪ Minimum residual pressure at all tapping points - 7.0 m ▪ ELSR staging height - as per design requirement o The proposed pipe size and pumping capacity are given in **Table Pipe Sizing for Processing Area and Table Pump Capacity.** o Proposed pump capacity for pumping the water from underground sump to ELSR is given in **Table-Waste Water Generation Pattern**
➢ **Sewage quantity estimation**	o The sewerage system is planned to cater for the anticipated peak discharge requirements and to treat the waste to the required discharge standards. o The estimation of the sewage shall vary depending upon the land use distribution. o The domestic sewage to be generated has been assumed to be 80% of the domestic water consumption in addition to an infiltration of 10%. o Based on the general wastewater generation pattern, the quantity of wastewater generated in domestic premises is presented in **Table-Sewage and Sullage Generation Pattern** o Wastewater generated from toilets is considered as sewage and wastewater generated from bath / shower, laundry, hand basin and kitchen is considered as sullage (grey water). o The wastewater generation pattern is depicted in **Table-Sewage and Sullage Generation Estimation.** o The estimation of average daily sewage and sullage generation is detailed in **Table Pipe size- sewerage network** o Treated sewage water available @ 90% = 81978.06 cum/day o Non-Potable water demand is 9529.71 Cum/day o Balance treated sewage water to be discharged as non-potable water of 72448.35 cum/day o Following design criteria is proposed for sewerage, treated effluent collection system • Demand computed based on the analysis. • Working hours per day - 24 • Pipe material - NP2 RCC for all areas except road crossing and NP3 RCC for road crossing • Pipe roughness coefficient - 0.011 • Peak flow factor - 3 • Formula used to calculate friction loss - Manning's • Infiltration - 10% • Self-cleansing velocity - 0.6 m/s • Minimum cover - 1 m • Manhole spacing – 30 m up to pipe size 900 mm o It is presumed that each industry will treat their effluent into sewage standards prior to discharge into the sewerage network.

Components	Detailing of utilities, infrastructure within proposed EZ
	○ It is proposed to collect treated effluent, sewage & sullage through a single collection network which is planned based on the above design criteria. Sewerage network shall be established by the project implementation company considering the topography of the site. ○ The network is divided into trunk main and sub mains according to the natural topography and other site constraints. Minimum pipe size of 150 mm is considered for sewerage network. ○ Proposed pipe size of sewerage network is provided in **Table Sewage Quality.**
➢ **Quality of sewage**	○ In general, the quality of domestic sewage generation shall be as per **Table STP- process and Components** ○ However, this is based on the condition that occupant units treat industrial trade effluent to required level of pre-treatment before discharging to common system ○ The design and treatment scheme has been worked out based on this assumption of input quality. It is proposed to treat both sewage & sullage in a single treatment system.
➢ **Sewage treatment plant (STP) considerations**	○ Sewage treatment is the process of removing contaminants from wastewater, comprising of storm run-off, domestic sewage and primary treated effluent. It includes physical, chemical and biological processes to remove various contaminants. ○ Various sewerage treatment systems considered for selection of treatment system for EZ and are given in **Table Estimation of MSW Generation.**
➢ **Sewage treatment plant technology selection**	○ Factors considered for selection of appropriate treatment system: • Reliability • Vector nuisance • Area availability • Power requirement • Capital cost • Operation & maintenance cost ○ The above process technologies are analyzed in terms of the performance and both capital and operating cost. Based on the above analysis Sequencing Batch Reactor (SBR) system is proposed ○ This system has been widely used for municipal and industrial wastewater treatment applications to meet specific discharge requirements. ○ SBR technology advantages/benefits • Consistent high-quality, low nutrient level effluent • Tolerates wide swings in flow and organic loading • No clarifier required • Better control over filamentous growth and settling problems • Nutrient removal without chemicals - nitrification and de-nitrification, phosphate removal • The system can also work with sewage in flow of 20 to 30 percentage of designed capacity due to presence of variable frequency drive (VFD)

Components	Detailing of utilities, infrastructure within proposed EZ
	○ SBR system is a fill and draw activated sludge system. SBR process uses high-efficiency oxygen transfer aeration equipment to satisfy the high-rate oxygen consumption requirement at the beginning of the "fill" and "aeration" cycles. SBR is efficient in carbonaceous pollutant removal, and is easily modified to satisfy nutrient removal of nitrogen (N) and phosphorous (P). Because the fill, aeration, settlement and draw take place in the same reaction tank, SBR tank itself would serve as the clarifier. Refer **Figure-Waste Reduction by Integrated SWM** for process flow diagram. ○ The total capacity of Sewage treatment plant is 91.09 MLD.
➢ **Solid waste management (SWM)**	○ SWM is one of the most essential services for maintaining the quality of life in EZ and for ensuring better standards of health and sanitation. ○ If properly collected at source, SWM would reduce a number of downstream problems related to transportation and disposal of the same. Solid waste (SW) generated in EZ can be broadly categorized as under following categories: • Industrial non-hazardous waste • Industrial hazardous waste • Domestic wastes: kitchen and wood waste, plastic, paper, floor sweepings, etc. • Road sweeping & sanitary waste: human waste, etc. • Garden & agriculture waste, leaves, branches, plants etc. • Roads/building construction waste: earth, asphalt, concrete, brick, plaster, wood, glass, stones etc. • E-Waste: Computer systems, peripheral equipment, mobile phone sets, TVs and audio sets. • Hospital and biomedical waste. ○ The role of integrated SWM is to reduce the quantity of SW disposed of to land by recovering materials and energy from SW as depicted in **Figure Waste Reduction by Integrated SWM.** ○ The generation rates of industries, logistics and other areas vary to such an extent that exact quantification of SW generation is not feasible. ○ However, an attempt has been made to quantify the municipal solid waste (MSW) that may be generated from various zones of EZ. • Industries – 200 gm / person / day • Utilities – 100 gm / per person / day • Road – 10 kg / hectare / day is considered as street sweeping. • Greenery – 30 kg / hectare / day is considered. • Admin and customs block – 100 gm / person / day • Amenities- 400 gm / person / day ○ Based on the above, MSW quantification has been carried out and depicted in **Table Estimation of MSW Generation.** ○ Total estimated MSW quantity – 144.18 TPD ○ Source segregation should be made mandatory and due care has to be taken while planning the collection, transportation of waste within the site

Components	Detailing of utilities, infrastructure within proposed EZ
	area. Users will be required to segregate their waste in the following categories and put in color coded bins. • Industrial non-hazardous waste • Industrial hazardous waste • Bio-degradable waste • Non-biodegradable waste • E-waste like parts of computer, monitor, cartridges, ribbons etc. • Construction debris, street sweepings etc. • Hospital and biomedical waste o From the above only bio-degradable waste can be treated in the SW treatment facility o The rate of MSW generation in the initial stages will be less than the estimated quantity and hence during the initial stage, the MSW generation rate can be considered as 50% of the estimated quantity. o The entire MSW is planned to be collected and treated in the composting plant within EZ and the rejects shall be disposed to suitable landfill outside the EZ.
➢ **Power supply & distribution**	o The system parameters are as follows: • Transmission line - 33 kV • Number of phases - 3 • System frequency - 50 Hz • Consumer supply voltage 33 kV /11kV/415/240 volt o As peak demand may vary for each facility in EZ, a diversity factor, which relates peak demand to rated load demand or calculated demand, is utilized in computation of maximum demand. o A simultaneous factor of 10 - 80 % is normally considered. o Power losses generally occur in the distribution network depending upon the type of conductors and equipment installed. As this is a complete loss to the system, it is generally kept below 10% of the total load. o Estimated power demand is depicted in **Table-Estimation of Power Demand.** o Total estimated power demand is 589.56 MVA. o Distribution substation is proposed in a strategic location. Individual facilitation and all power reticulation are to be carried out at 11 kV. o The advantage with reticulation at 11 kV is that it is the standard voltage and therefore electrical reticulation equipment for 11 kV systems would be readily available including spares. o Distribution network is the main backbone of the reticulation system. It is most essential that the network must deliver uninterrupted power, in right quantity & quality to individual facilities continuously. o Power can be distributed by a network of overhead lines or underground cables. o An overhead distribution system is adopted for much more flexible for extension and for connection of new consumers and less expensive than an underground cable system.

Components	Detailing of utilities, infrastructure within proposed EZ
➢ **Street lighting**	○ Street lighting has been conceived in 2 different forms. • Street lights for the road network • Solar street lighting ○ All the road and streets are provided with street lighting not only to assist pedestrians and traffic, but also to increase safety and security in the area. It is recommended that all lighting should be by high-pressure sodium lanterns mounted on power poles or on streetlight columns. For major roads the average illumination should be about 20 lux.
➢ **Landscaping**	○ This includes works associated with the landscaping within the EZ covering tree strips along the boundary, roads, public greenery etc.

Source: MACE analysis

Industry best practices have been adopted in order to create an outline of the supporting infrastructure for the EZ site as mentioned in the table above. Presence of infrastructure components highlighted above would ensure smooth functioning of industrial activities and ease of logistics movement within the EZ site.

9.3. Infrastructure requirements and concept drawings

9.3.1. Vehicular Traffic Assessment

The objective is to assess the future traffic impact on the existing Road due to the development of EZ based on the present traffic characteristics and suggest appropriate remedial measures to address the project impacts. The following factors were taken into consideration for assessing the traffic impact.

1. Traffic generated due to the passenger movement from the proposed industries of EZ.
2. Traffic generated due to the goods movement from the proposed industries of EZ.

Mode of share between all the goods movement vehicle like Truck, Medium Axle Vehicle (MAV), Light Commercial Vehicle (LCV) and Tractor is considered as 35%, 30%, 10% and 10% respectively as per the general practice for the industrial zone. Balance 15 % is considered traffic generated within the industrial area.

It is usual practice to express capacity in terms of "Passenger Car Units". The basic consideration behind this practice is that different types of vehicles different degrees of interference to other traffic and it is necessary to bring all types to a common unit. The common unit adopted is the Passenger Car Unit (PCU).

Table 69: PCU conversion values according to Vehicles Categories

Type of Vehicle	PCU Value	No. of travelling persons
Standard Bus	3	50
Other Bus	3	35
Mini Bus	1.5	20
Van	1	14
Cars	1	4
Two Wheeler	0.5	2
Auto Rickshaw	1	3
Truck	3	1
MAV	4.5	1
LCV	1.5	1
Tractor	4.5	1

Source: MACE analysis

Table 66: PCU Estimation based on traffic

Description	Total Area		Type	Buses							Goods Vehicles				Total PCUs / day
	in Acres	in %		Standard bus	Other Bus	Mini Bus	Van	cars	Two-wheeler	Auto rickshaw	Truck	MAV	LCV	Tractor	
PCU Value			PCU Value	3	3	1.5	1	1	0.5	1	3	4.5	1.5	4.5	
No, of Passenger			No, of Passenger	50	35	20	14	4	2	3	1	1	1	1	
				45.0%	10.0%	15.0%	10.0%	10.0%	5.00%	5.00%	10.0%	30.0%	10.0%		
Industrial area	3600.82	99%		2117	1120	2940	2800	9800	9800	6533	180.04	270	90	0	40044
				40.0%		30.0%		20.0%	10.00%			100%			
Customs, Security, Admin, public amenities	50.1	1%		131	0	246	0	818	818	0	0.00	25.06	0.00	0.00	2102
GRAND TOTAL	3650.94	100 %		2248	1120	3186	2800	10618	10618	6533	180	295	90	0	42146

Source: MACE analysis

9.3.2. Roads

Hierarchy of roads

Arterial, primary and secondary roads are planned to give access to the industries within EZ. These are looped and planned with the aim of providing smooth and dispersed traffic flow to reduce traffic congestion within EZ.

The hierarchy of roads planned within EZ are provided below.

Table 67: Hierarchy of roads

Category	Road width (m)	Carriage Carriage way width (m)	Number of lanes	Length (m)		Total
				Processing area	Non-processing area	
Arterial Road	45	10.8 +10.8	Six lane two way	21288	-	21288
Primary road	30	7.5 + 7.5	Four lane two way	12807	-	12807
Secondary road	25	7.5 + 7.5	Four lane two way	29592	-	29592
Total				**63687**	**-**	**63687**

Source: MACE analysis

The composition of pavement structure is provided in the following table.

Table 68: Composition of flexible pavement structure

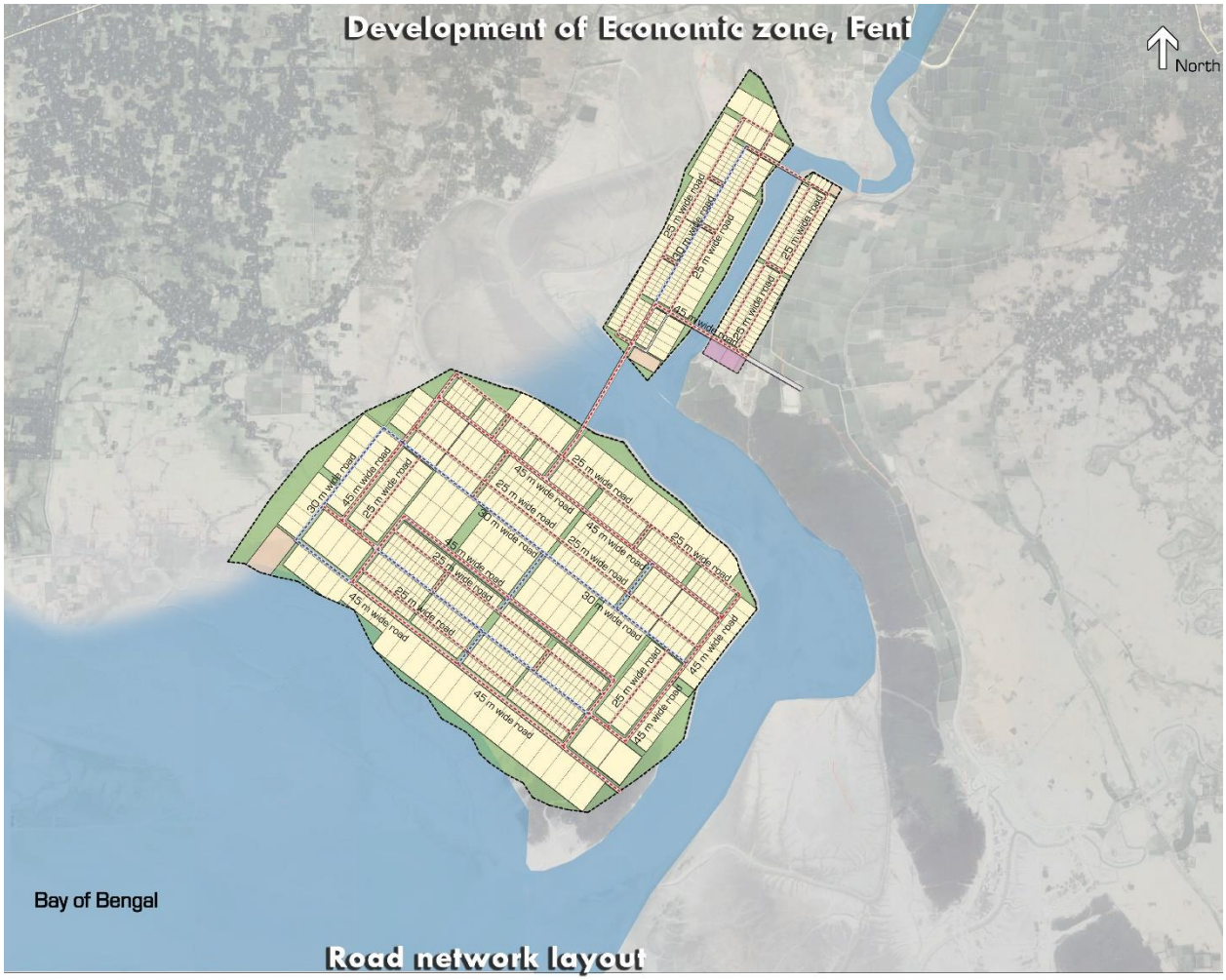
Layer	Composition details
Wearing course	Dense Bituminous surfacing wearing course of 25 mm thick laid with mechanical spreaders
Binding coat	A tack coat of 0.30 kg / sq. m. of 60/70 grade bitumen
Binder course	Dense bituminous surfacing base course of 50 mm thick, laid with mechanical spreaders
Binding coat	A prime and tack coat of 1.2 kg / sq. m & 0.25 kg/sq.m of 60/70 grade bitumen
Base course	Aggregate base (Type I & II) of 250 mm thickness
Sub-base	150 mm thick granular sub base to a soaked CBR of min. 30%
Sub-grade	Min. soaked CBR value of 9%

Source: MACE analysis

Road network drawing

The road network layout for the proposed EZ is shown in the figure on the next page.

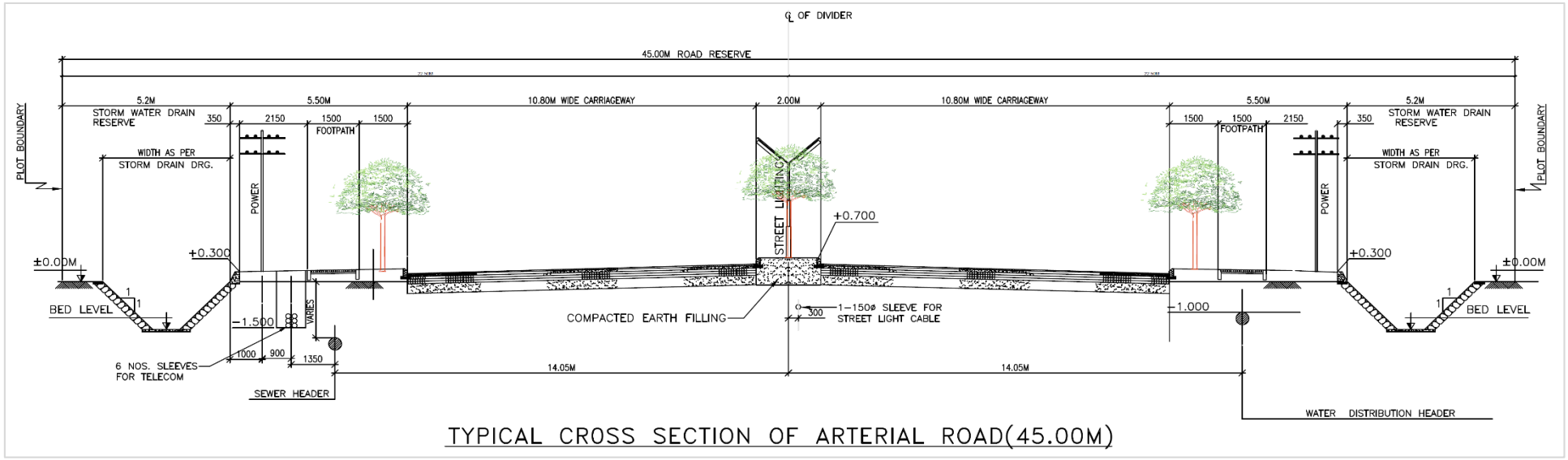
Figure 69: Road Network Diagram

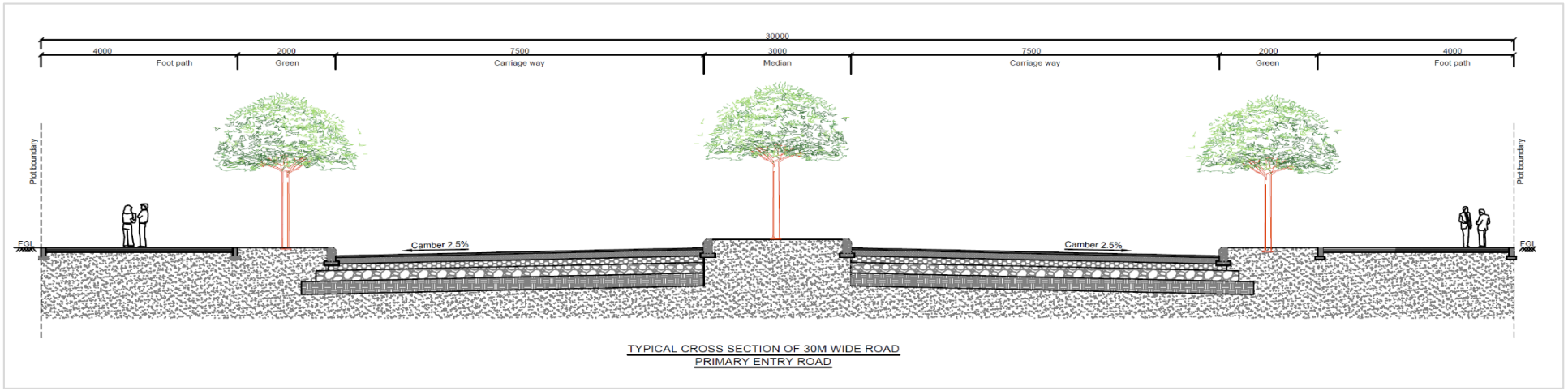


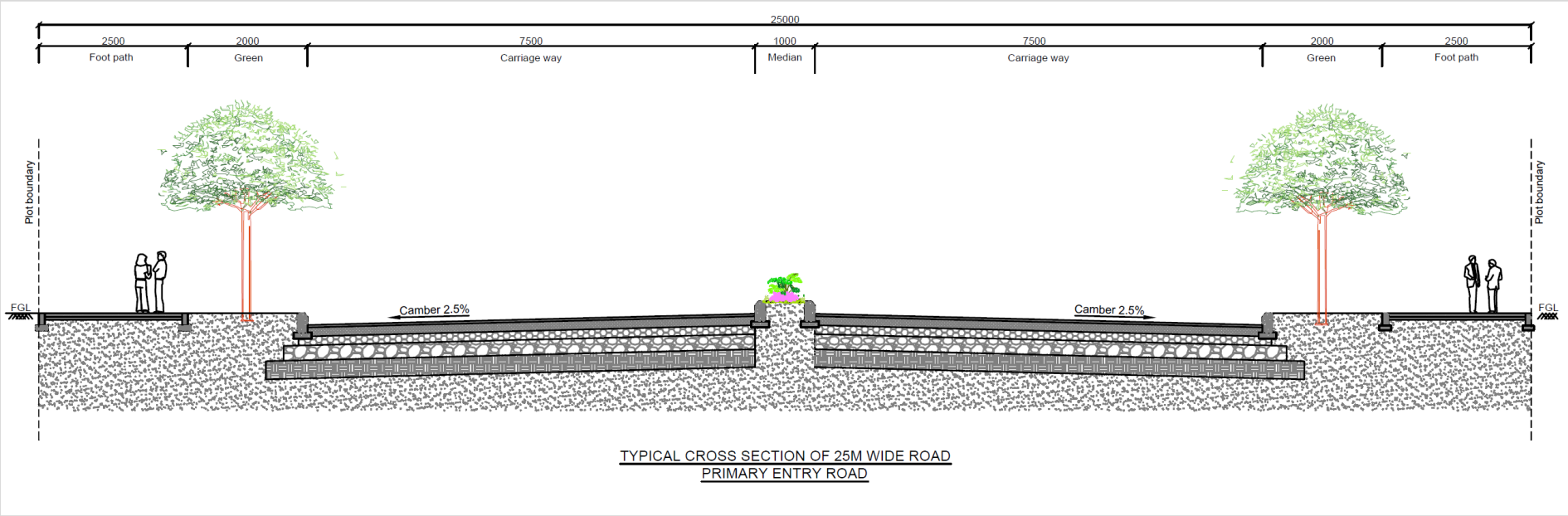
Source: MACE analysis

Figure above outlines the top view of the road network diagram. As evident from the diagram above, road plan has been created to ensure last mile connectivity to all units inside the EZ site. Figure on the next page outlines the cross-sectional view of the road structure.

Figure 70: Cross sectional view of the road structure







Source: MACE analysis

The typical cross-sectional view of the road structure is shown in the above figures. As elaborated in the figure, provision has been kept for riding surface, drainage and street lighting facilities.

9.3.3. Power

Design basis

- **Electrical system - EHV / HV supply**

  Nominal voltage : 132/33 kV ± 5%
  Frequency : 50 Hz ± 2.5 %
  No. of phases : 3 phases, 3 W
  Fault level : 26 kA

- **Distribution supply**

  Nominal voltage : 11 kV / 415 V/230V ± 6%
  Frequency : 50 Hz ± 3%
  No. of phases : 3 phases, 3/4 W

Power demand basis

The power demand estimation carried out on the next page is at ultimate level and based on prevailing development guidelines in Bangladesh context. This is different from the demand estimated during industrial space demand projection and the basis is presented in **the table below.**

Table 69: Power demand estimation – basis

Land use pattern	Load in KVA/ha & KVA/Sqm	Simultaneously Factor
Processing area		
Industries	450.00	80%
Loading & Unloading area	250.00	10%
Utility	250.00	40%
Road	35.00	40%
Green & open space	4.00	40%
Non - processing area		
Admin & Customs block	250.00	60%
Supporting amenities	250.00	60%

Reference – published standards, guidelines and best industry standards

Power demand estimation

- The system parameters are as follows:
  - Consumer supply voltage 33/11 kV/415/240 Volt
  - Number of phases - 3
  - System frequency - 50 Hz
- As peak demand may vary for each facility in EZ, a simultaneous factor, which relates peak demand to rated load demand or calculated demand, is utilized in computation of maximum demand.
- A simultaneous factor ranging from 10-80% is generally considered based on the type of industry.
- Power losses generally occur in the distribution network depending upon the type of conductors and equipment installed. As this is a complete loss to the system, it is generally kept below 10% of the total load.

With the above consideration, estimated power demand is worked out and the summary of load estimation is presented in the table below.

Table 70: Summary of electrical load estimate

Sl. No	Type of development	Load in KVA
1	Processing area	**586,208.00**
2	Non-processing area	**3,348.00**
	Total estimated load in KVA	**589,556.00**
	Total estimated load in MVA	**589.56**

The above table provides a summarized view of total electricity requirement of the EZ site. The individual plot wise estimated electrical demand for this facility is given in the table below.

Table 71: Power demand calculation

Overall Land use pattern								
Land use pattern	Total Area		FSI	Load in KVA/ha & KVA/Sqm	Plot Area	Simultaneous factor	Loss Factor	Load in kVA
	Acres	% age						
Processing area								
Industrial area	3600.82	71.54%		450.00	50%	80%	1.10	577297
Loading & Unloading area	50.43	1.00%		250.00	50%	10%	1.10	562
Utility	104.94	2.09%		250.00	30%	40%	1.10	4674
Road	507.16	10.08%		35.00	10%	40%	1.10	3162
Green & open space	719.61	14.30%		4.00	10%	40%	1.10	513
Total processing area	**4982.96**	**99.00%**						**586,208**
Non-processing area								
Admin & Customs block	8.40	0.17%	2.00	250.00	60%	60%	1.10	561
Supporting amenities	41.72	0.83%	1.50	250.00	60%	60%	1.10	2,787
Total Non-processing area	**50.12**	**1.00%**						**3348**
Total	**5033.08**	**100.00%**				**Load in KVA**		589,556
						Load in MVA		**589.56**

Source: MACE analysis (sum total figures might have minor aberrations due to rounding off of the decimals)

Power Supply to Economic Zone

Our assessment suggests that basis industrial assessment and demand forecasting for the proposed EZ, power demand for the proposed EZ would be about 589.56 MVA. This figure is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake a separate industry assessment and master planning exercise in order to validate this figure.

To cater this power demand a Main Receiving sub-station of 230/132 /33/11 kV substation has to be established in the site.

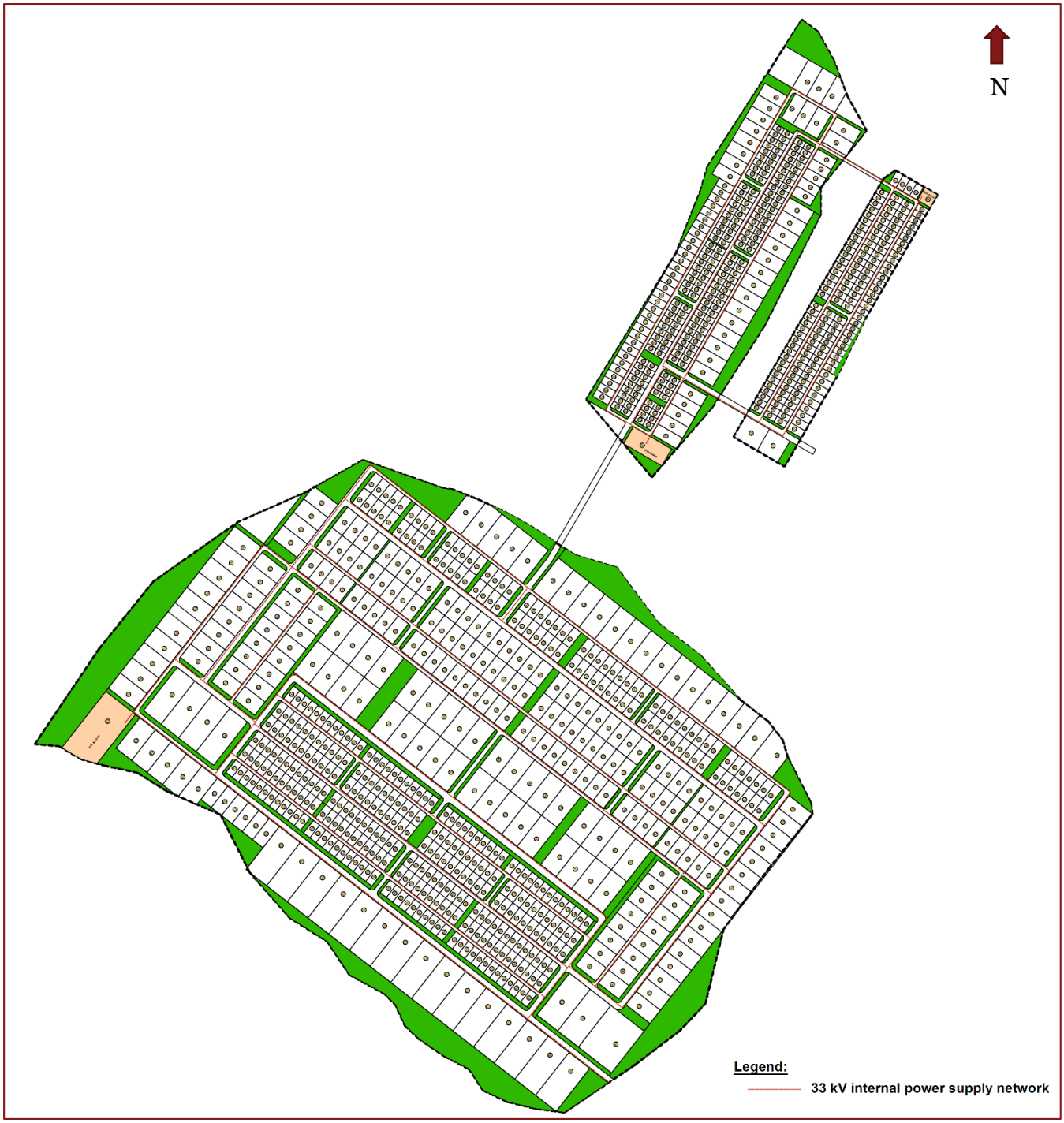
During the initial phase of development, the 132/33/11 kV MRSS can be established within EZ site with a capacity of 175 MVA for phase – I development. Incoming 132 kV supply to this substation may be availed from the 132 kV Mirsarai Grid substation located at a distance of 7 km from the EZ site.

Based on the load growth, the proposed 132/33/11 kV MRSS within EZ site can be upgraded to a capacity of 589.56 MVA by augmenting the proposed substation to 230/132/33 kV.

Power Supply network planned within EZ

The feeder line from 132 kV Mirsarai Grid substation is proposed and enters the site in the NE side. It is planned to establish the proposed Main Receiving substation at the entry of feeder line in the NE corner of the site. From the substation the transmission line network is planned along the proposed road network to feed the individual plots as shown on the next page.

Figure 71: Power supply network inside the EZ



Source: MACE analysis

9.3.4. Water

Demand estimation basis

Table 72: Water demand estimation norms

Description	Reference – published standards, guidelines and best industry norms
Processing area	
Industries	70 cum / ha / day - process water demand
Loading & Unloading area	36 cum / ha / day- process water demand
Utilities	45 litres per capita per day
Road	1.8 cum / ha / day
Green & open space	1.8 cum / ha / day
Non-processing area	
Admins and customs block	45 litres per capita per day
Supporting amenities	45 litres per capita per day

Source: MACE analysis, published standards, guidelines and best industry norms

Table 73: Water consumption pattern

For areas with bathing facilities	
Potable water	70%
Non-potable water	30%
For areas without bathing facilities	
Potable water	45%
Non-potable water	55%

Source: MACE analysis

Water demand calculation

The summary of water demand for EZ is given below.

Table 74: Water demand

S. No.	Description	Processing area	Non-processing area	Total	Unit
1	Total average demand	125604	11557	137161	cum/day
2	Total potable water demand	119541	8090	127631	cum/day
3	Total non-potable water demand	6063	3467	9530	cum/day
4	Fire demand	223	2	225	cum

Source: MACE analysis

Table 75: Estimation of average daily water demand

Land use pattern	Total area Acres	Proposed FSI	Population Density/Sq. / person	Population	Basis	Water demand					
						Process water	Domestic Water	Loss @ 10 %	Total	Potable	Non-Potable
Processing area						In Cum/day					
Industries	3600.82	1.00	800	195992	70.00	102047.53	8819.64	11086.72	121953.89	117588.17	4365.72
Loading & Unloading area	50.43	1.00	200	10980	36.00	735.05	494.10	122.92	1352.07	1107.49	244.58
Utility	104.94	1.00	200	22848			1028.16	102.82	1130.98	622.04	508.94
Road	507.16				1.80		369.59	36.96	406.55	223.60	182.95
Green & open space	719.61				1.80		524.41	235.98	760.39		760.39
Total processing area	4982.96			229820.00		102782.59	11235.90	11585.39	125603.88	119541.30	6062.58
Non-processing area											
Admin & Customs block	8.40	1.50	100.00	9038	45.00		406.71	40.67	447.38	313.17	134.21
Supporting amenities	41.72	1.50	20	224439	45.00		10099.76	1009.98	11109.73	7776.81	3332.92
Total Non-processing area	50.12			233477.00			10506.47	1050.65	11557.11	8089.98	3467.13
Total	5033.08			463297.00		102782.59	21742.36	12636.04	137160.99	127631.28	9529.71

Source: MACE analysis (sum total figures might have minor aberrations due to rounding off of the decimals)

Water Supply to Economic Zone

Our assessment suggests that basis industrial assessment and demand forecasting for the proposed EZ, potable water demand for the proposed EZ would be about 127.6 MLD and total water demand would be 137.2 MLD. This figure is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake a separate industry assessment and master planning exercise in order to validate this figure.

Site is situated adjacent to Bay of Bengal on its Southern side. It is proposed to provide desalination plant adjacent to site to meet the water demand of EZ on a long-term basis. Detailed hydrogeological investigations need to be carried out based on which, intake of water for desalination plant shall be provided.

For the initial demand it is planned to build three to four new bore wells within the proposed site to draw the ground water. Exact location of water intake (i.e., the locations of the tube wells) within the site needs to be finalized during the construction stage. Basis interaction with DPHE officials, the ground water is available at a depth of 170 m. approximately from natural ground level. The lithologic profile for the proposed area is provided on annexure.

Potable water supply network

It is proposed to provide desalination plant near Bay of Bengal and the feeder line from the source to EZ. The proposed potable and non-potable water supply network are depicted below.

Figure 72: Potable and non-potable water supply network

Source: MACE analysis

Estimated water storage capacity

The estimated storage capacity calculated based on the arrived water demand is provided in the following table.

Table 76: Underground sump storage capacity

S. no.	Description	Processing area	Non-processing area	Unit
1	Potable water	119541	8090	cum
2	Non- potable water including fire demand	6288	3470	cum
	Total	**125829**	**11560**	**cum**

Source: MACE analysis

Table 77: Overhead tank storage capacity

S. no.	Description	Processing area	Non-processing area	Unit
1	Potable water	9962	674	cum
2	Non-potable water	505	289	cum
	Total	**10467**	**963**	**cum**

Source: MACE analysis

Tables above lists out the water storage capacity required to be established at the EZ site on basis of calculation of the water requirements. As per the tables, total underground sump storage capacity that would be required is 137389 cum and total overhead storage capacity requirement would be 11430 cum.

Required Pipe size and pump capacity

The required pipe size and pump capacity is provided in the following tables.

Table 78: Pipe sizing and Length details

Pipe size diameter (in mm)	Total Length of pipe (in m)	Type of pipe material	
		HDPE pipe length (in m)	DI pipe length (in m)
50	42488	42488	-
63	25493	25493	-
90	12060	12060	-
110	15240	15240	-
140	14390	14390	-
160	8085	8085	-
200	6386	6386	-
250	6030	-	6030
300	6030	-	6030
350	5674	-	5674
400	3399	-	3399
450	3399	-	3399
500	2549	-	2549
Total	**151223**	**124142**	**27081**

Source: MACE analysis

Table 79: Pump capacity

Description		Processing area	Non-processing area	Unit
Potable water	Capacity	2.77	0.19	cum/sec
	Number of pumps	2 W+1S	2 W+1S	
	Power requirement of each pump	679.00	46.00	Kw
Non- potable water	Capacity	0.14	0.08	cum/sec
	Number of pumps	2 W+1S	2 W+1S	
	Power requirement of each pump	34.00	20.00	Kw

Source: MACE analysis

The requirement of pipe size and pump capacity has been calculated in the above tables on basis of the water demand, water storage capacity and the size of the EZ site.

9.3.5. Waste water

The basis for calculating the wastewater quantity is provided in the following tables

Table 80: Waste water generation pattern

Description	Percentage
Bath / shower & laundry	55.97%
Hand basin, kitchen	12.29%
Toilet	31.74%

Source: MACE analysis, published standards, guidelines and best industry norms

Table 81: Sewage and sullage generation pattern

Sewage	Percentage
Grey water	27.91%
Gardening	19.53%
Cleaning	8.37%
Sewage	31.74%
Grey water	68.26%
Gardening	47.78%
Cleaning	20.48%

Source: MACE analysis, published standards, guidelines and best industry norms

As mentioned in the tables above, best industry practices and published standards have been adopted in order to calculate the percentage of waste water that would be generated from use of water for above mentioned non-industrial uses.

The calculated wastewater quantity is provided in the following table.

Table 82: Sewage and sullage generation estimation

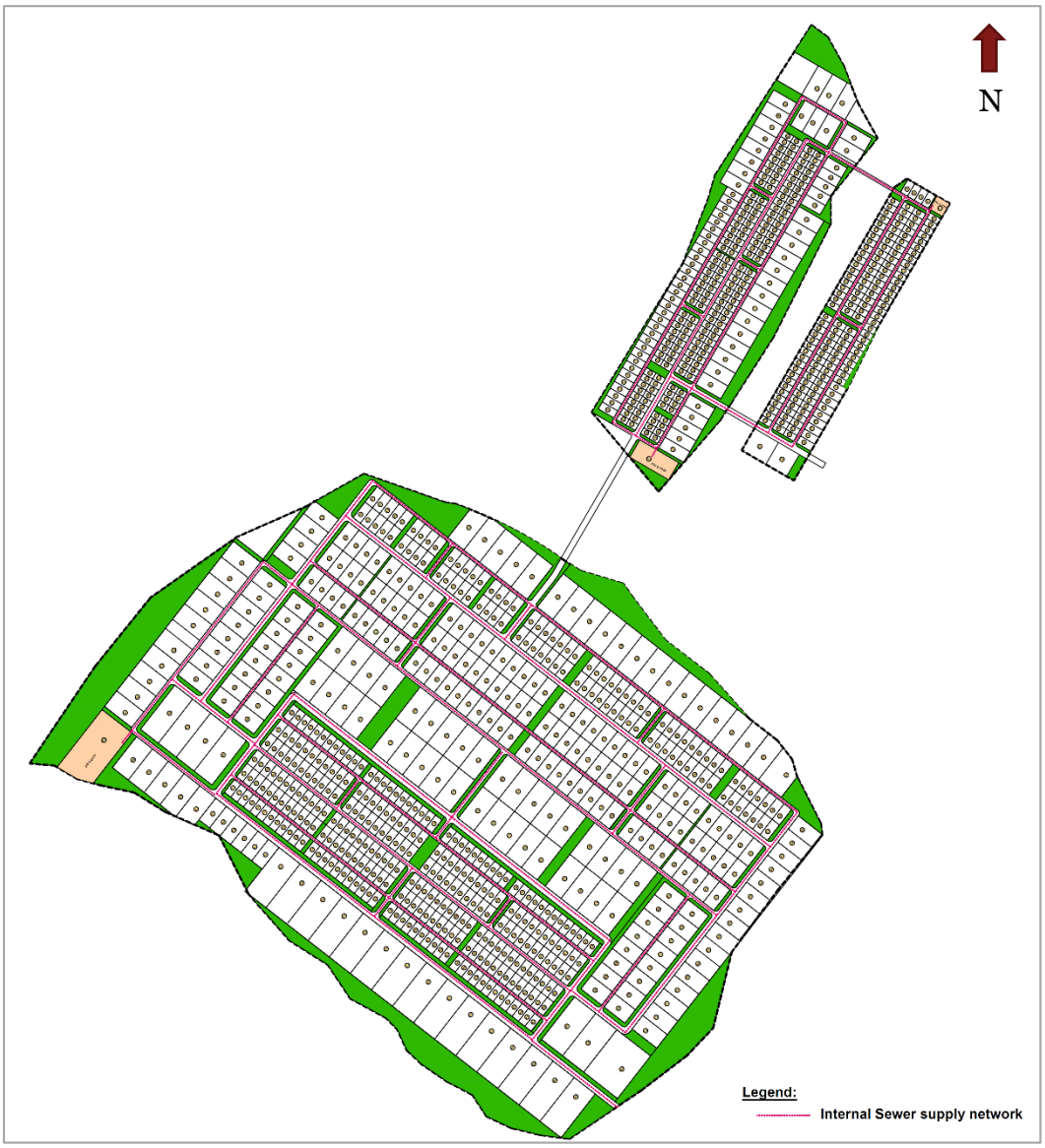
Land use pattern	Total area	Water demand			Effluent generation		Sewage generation		Sullage generation		Total effluent, sewage & sullage generation	Infiltration @10%	Total sewage quantity
	Acres	Process water	Domestic Water	Potable	Non-Potable	In %	In cum/day	In %	In cum/day	In %	In cum/day			
Processing area														
Industries	3600.82	102047.53	8819.64	117588.17	4365.72	50%	51,023.77	72.09%	3147.25	20.48%	13135.46	67,306.47	12195.39	79,501.86
Loading & Unloading area	50.43	735.05	494.10	1107.49	244.58	50%	367.53	72.09%	176.32	20.48%	343.46	887.30	135.21	1,022.51
Utility	104.94		1028.16	622.04	508.94	50%	-	72.09%		20.48%	594.21	594.21	113.10	707.31
Road	507.16		369.59	223.60	182.95	50%	-	72.09%	131.89	20.48%	213.60	345.48	40.65	386.14
Green & open space	719.61		524.41		760.39								76.04	76.04
Total processing area	4982.96	102782.59	11235.90	119541.30	6062.58		51391.29		3455.45		14286.72	69133.47	12560.39	81693.86
Non-processing area														
Admin & Customs block	8.40		406.71	313.17	134.21		-	72.09%	96.76	20.48%	274.17	370.92	44.74	415.66
Supporting Amenities	41.72		10099.76	7776.81	3332.92		-	31.74%	1057.87	20.48%	6808.38	7,866.24	1110.97	8,977.22
Total Non-processing area	50.12		10506.47	8089.98	3467.13				1154.62		7082.54	8237.17	1155.71	9392.88
Total	**5033.08**	**102782.59**	**21742.36**	**127631.28**	**9529.71**		**51391.29**		**4610.08**		**21369.27**	**77370.64**	**13716.10**	**91086.74**

Source: MACE analysis (sum total figures might have minor aberrations due to rounding off of the decimals)

Sewer network

STP is located at lowest level in the SW side of the site. The entire sewer network is planned along the proposed 45 m, 30 m and 25 m wide roads of EZ. The sewer network and location of STP is shown below.

Figure 73: Sewerage Network



Source: MACE analysis

Required Pipe size

Table 83: Pipe size- sewerage network

Pipe size in mm	Processing area length in m
900	20379.84
1000	15921.75
1100	12737.4
1200	7642.44
1300	3184.35
1400	1910.61

Pipe size in mm	Processing area length in m
1500	1273.74
1600	636.87
Total	**63687**

Source: MACE analysis

The above table mentions the length of pipe that would be required for removal of sewage from the EZ site. This has been calculated after taking into consideration the perimeter of the EZ site.

Sewage quality

Table below captures the quality of sewage that would be generated due to various industrial and non-industrial activities expected to take place inside the EZ site.

Table 84: Sewage quality

S. no.	Parameters	Unit	Concentration
1	PH	-	5.5 – 9.0
2	Suspended solids	Mg/l	300–600
3	Biochemical oxygen demand	Mg/l	250 – 350
4	Chemical oxygen demand	mg /l	400 – 600
5	Oil & grease	mg /l	<20

Source: MACE analysis

STP components and process flow diagram

Table 85: STP- process and components

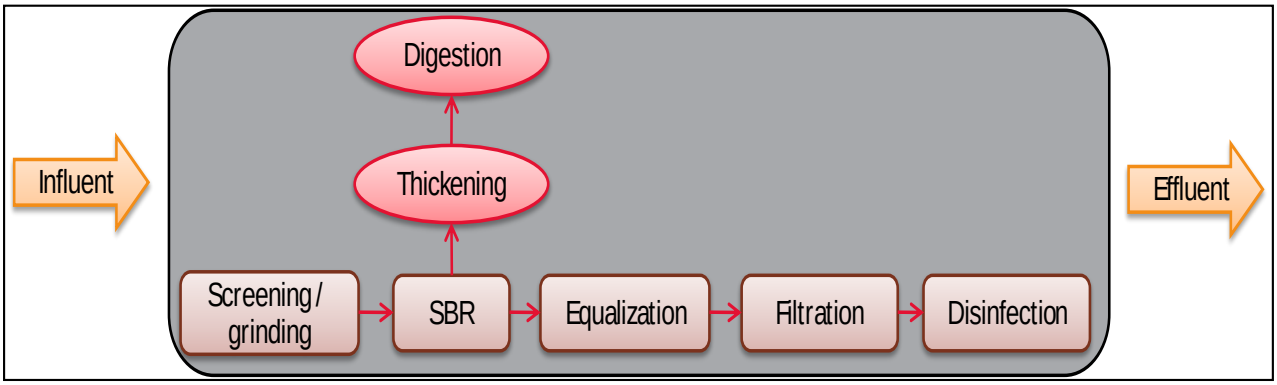
S. no.	Process	Units required	Accessories
1	Activated sludge – extended aeration	Aeration tank & secondary clarifier	Surface aerators or membrane diffuser system for oxygen supply
2	Aerated lagoon	Earthen bund basins	Fixed or floating aerators for oxygen supply
3	Up-flow Anaerobic Sludge Blanket (UASB)	Reactor with liquid, solid & gas separation facilities	Gas collector, burner and influent distribution system
4	Trickling filters	Circular tanks with media, under drain & secondary clarifier	Rotary distributor for influent and re-circulation pumps
5	Rotating Biological Contactors (RBC)	Trough with PVC/plastic discs, secondary clarifier	Drive mechanism for rotating the discs
6	Fluidized aerobic bio reactor	Reactor tank with poly propylene media and diffusers followed by secondary clarifier	Blowers for supply of oxygen through membrane diffusers
7	Sequencing Batch Reactor (SBR)	It uses deep RCC basins, and very efficient oxygen transfer equipment's (diffused aeration mechanism)	Diffusers, blowers and aeration grid, which provides highest aeration and oxygen transfer efficiency. Decanter assembly in Stainless steel equipped with variable frequency drive to automatically control rate of decanting based on input feed condition

S. no.	Process	Units required	Accessories
8	Membrane Bio Reactor (MBR)	Aeration tanks followed by balancing tank and membrane bio reactor	Diffusers, blowers to supply oxygen, air compressors for backwashing, chemical dosing for pre-treatment.

Source: MACE analysis

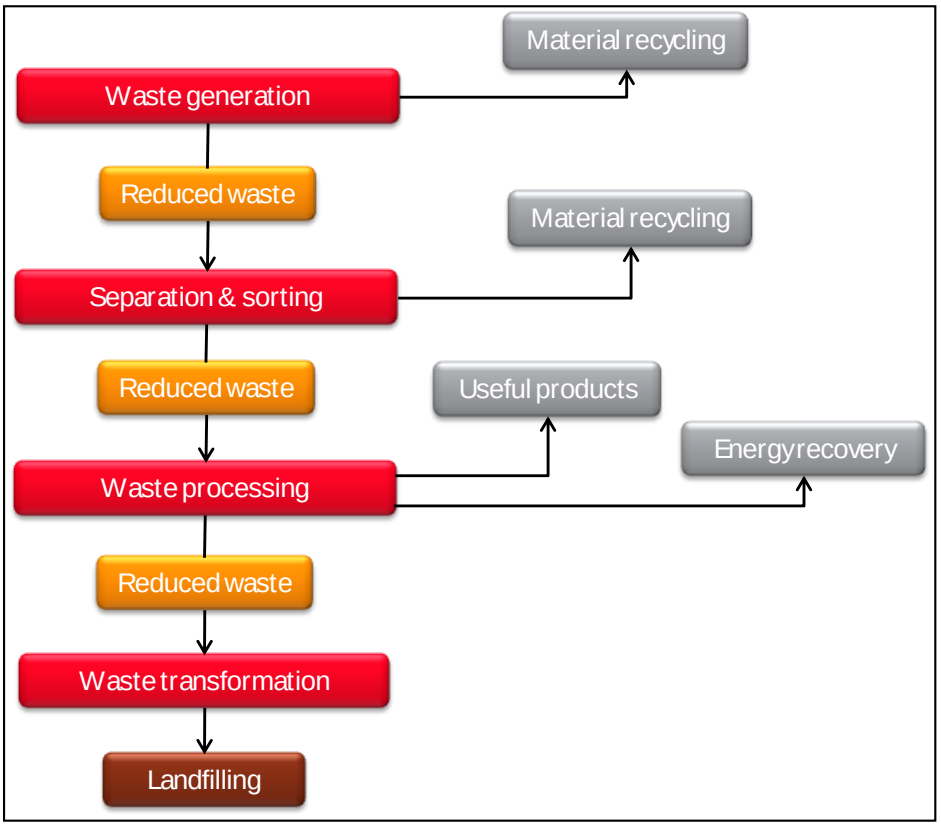
The table above captures the various components of the sewage treatment plant that would be required to set up in order to treat the sewage that would be generated from the EZ site. A process flow diagram elucidating the process of sewage treatment has been highlighted on the next page.

Figure 74: STP process flow diagram (SBR technology)



Source: MACE analysis

Figure 75: Waste reduction by integrated SWM



Source: MACE analysis

9.3.6. Drainage

Based on the site gradient, the drainage pattern has been decided. It has been planned to discharge the flow of the internal drain into nearby highway drain to be developed.

- The drainage system is planned to cater for the entire EZ through gravity flow.
- Drains are proposed to be provided on both sides of the roads.
- Open trapezoidal drain is considered for the surface run off collection due to easy maintenance for the primary road. Stone pitching is considered for the side walls and PCC for the base.
- Covered rectangular brick masonry drain is considered for the remaining areas for optimization of area under drainage.
- RCC box / pipe culverts of suitable sizes are considered for road crossings.

Rainwater harvesting structures are envisaged all along the drain at every 30 m interval.

Figure 76: Internal storm water drain network

Source: MACE analysis

9.3.7. Solid waste

The estimated solid waste quantity is provided in the following table.

Table 86: Estimation of Solid waste generation

Land use pattern	Total area Acres	Solid waste generation Population	Solid waste generation rate	Unit	Kg/day
Processing area					
Industries	3600.82	195992	200	gm/capita/day	39198.40
Loading & Unloading area	50.43	10980	100	gm/capita/day	1098.00
Utility	104.94	22848	100	gm/capita/day	2284.80
Road	507.16	0	10.12	kg/ha/day	2077.91
Green & open space	719.61		30.36	kg/ha/day	8845.03
Total processing area	4982.96	229820			53504.14
Non-processing area					
Admin & Customs block	8.40	9038	100	gm/capita/day	903.80
Supporting amenities	41.72	224439	400	kg/ha/day	89775.60
Total Non-processing area	50.12	233477			90679.40
Total	5033.08	463297			144183.54

Source: MACE analysis

9.3.8. Telecom/ Internet connectivity to the proposed EZ

Optical fiber cables are available near the site and the bandwidth available is around 2 mbps. At present, the internet and telecom services are provided by private telecom subscribers such as Grameen Phone, Bharti Airtel, Banglalink, Teletalk and Robi in this region. Service by private operators has significantly improved the telecom connectivity in the region.

9.3.9. River Morphology

The proposed Feni EZ is located adjacent to River Feni on its eastern side. The project area is located around the confluence of the Muhuri and Feni rivers. The Feni River forms a portion of the boundary between Bangladesh and India. About half of the project area's drainage basin is in India. The principal rivers and khals within the project boundaries not only fluctuate with the tides in the Sandwip Channel, but also allow the intrusion of seawater.

During monsoon period, the mean and maximum ranges of tide in the Feni estuary have been found as 3.50 m and 5.50 m respectively. The tides have also been studied based on annual maximum High-Water Level data collected over the periods 1985 to 2004 at the gauge downstream of 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 are about 6.0 m and 5.276 m (SOB) respectively over the 20 years period.

Table 87: Mean High Water Level of Feni river

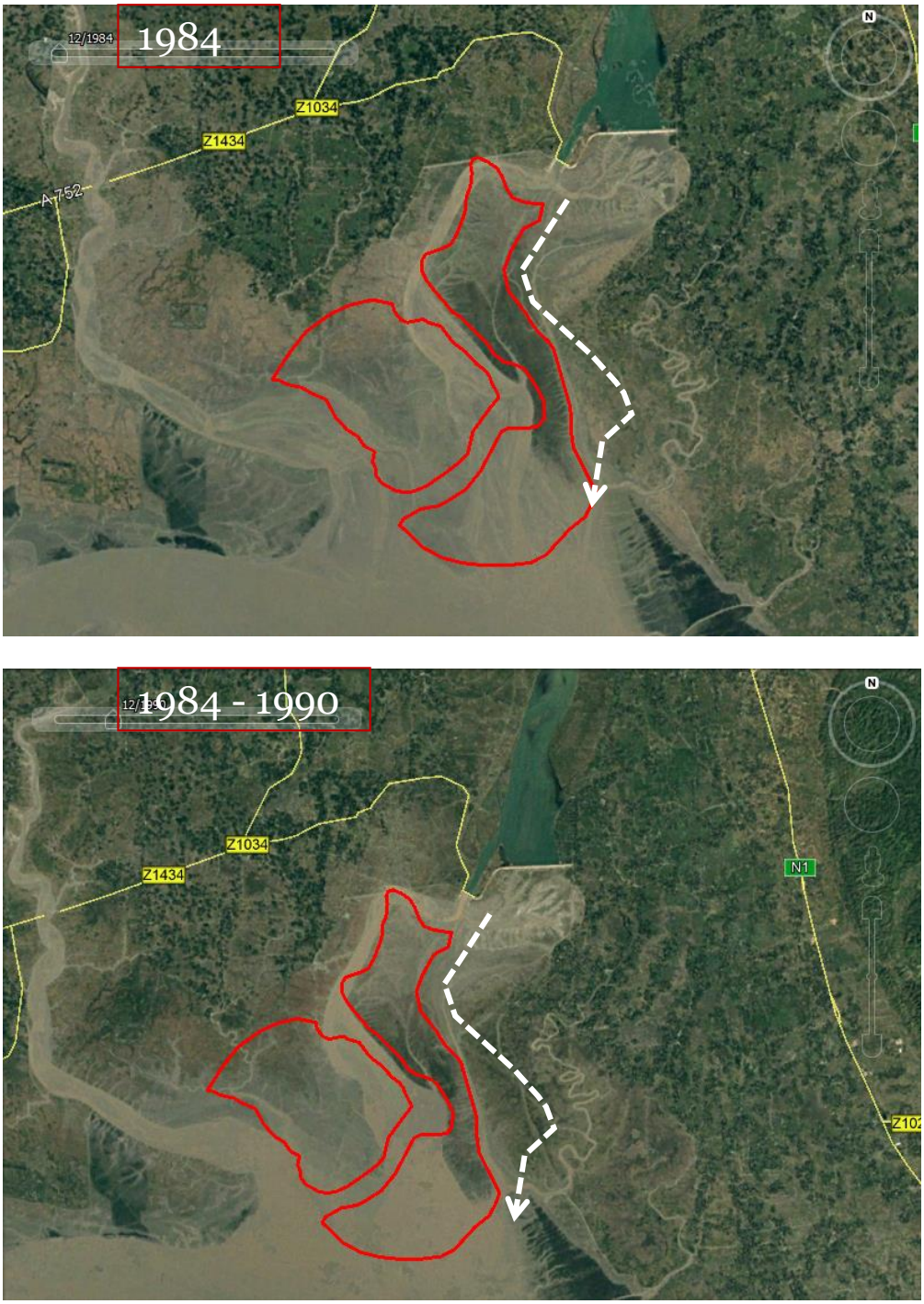
Mean Water Level in Meter (PWD)				
Year	Pre – Monsoon (Mar – May)	Monsoon (Jun – Sep)	Post – Monsoon (Oct – Nov)	Dry Period (Dec – Feb)
2000	3.46	4.30	3.62	2.79
2001	3.36	4.05	3.49	2.67
2002	3.38	4.04	3.55	2.56
2003	3.42	4.11	3.76	2.73
Mean	3.47	4.14	3.61	2.69

Source: BWDB

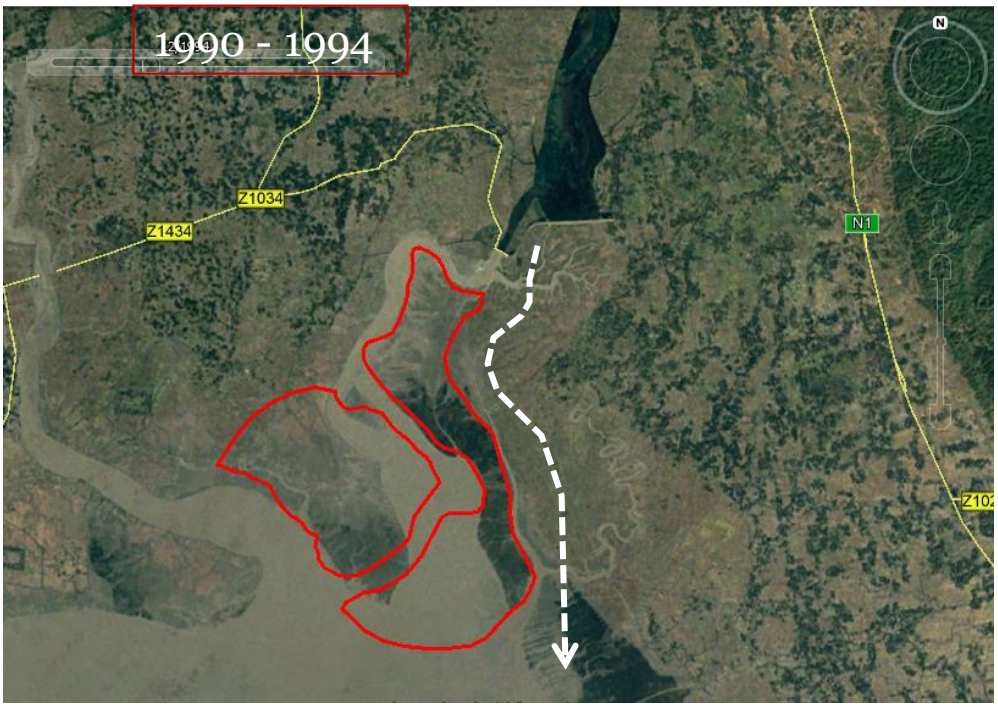
River Course Shifting

The following Historical satellite images shows changes and evolutions of riverbanks, main stream and sand bar (char) during recent years since 1984.

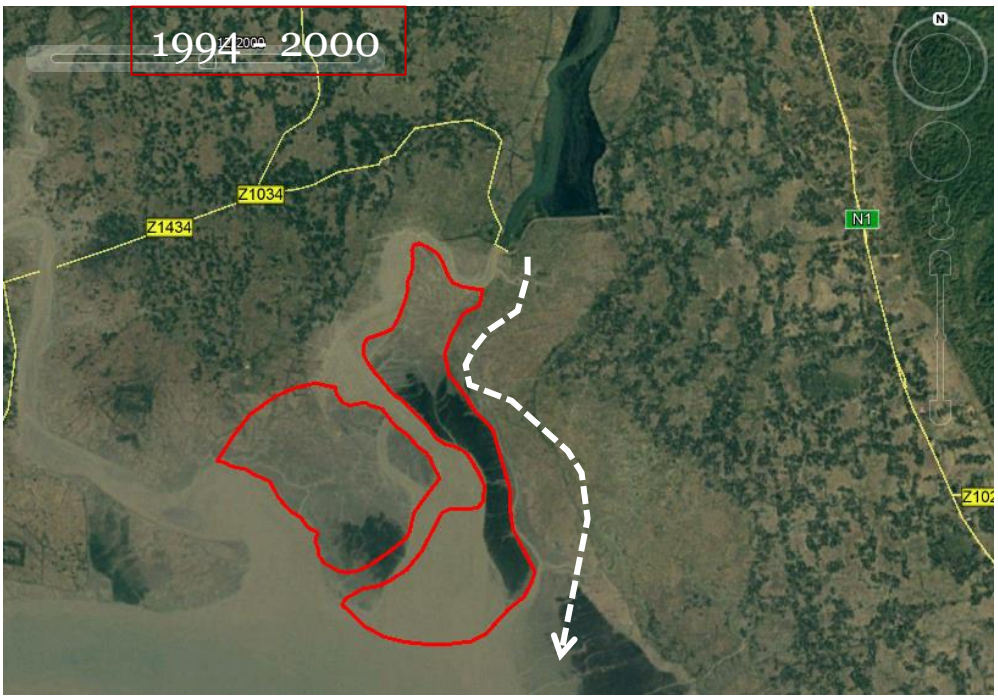
Figure 77: Changes in river bank lines



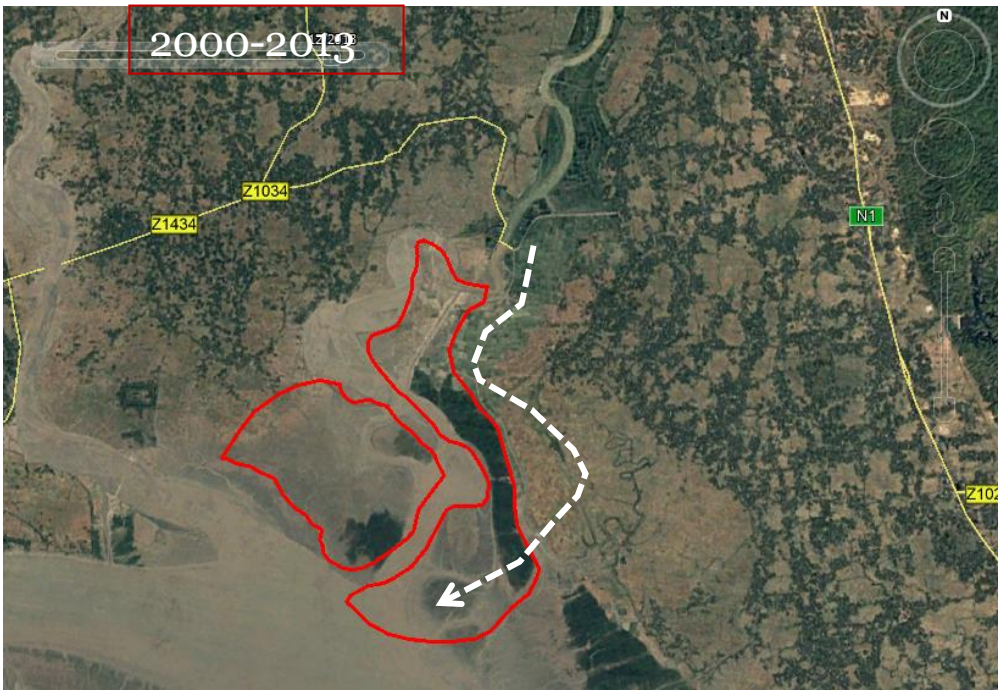
Since 1984 -1990, the Feni River near to the proposed site has maintained a single channel section with no char land. It is noted that the river width is within the range from 0.5 km to 2.0 km.



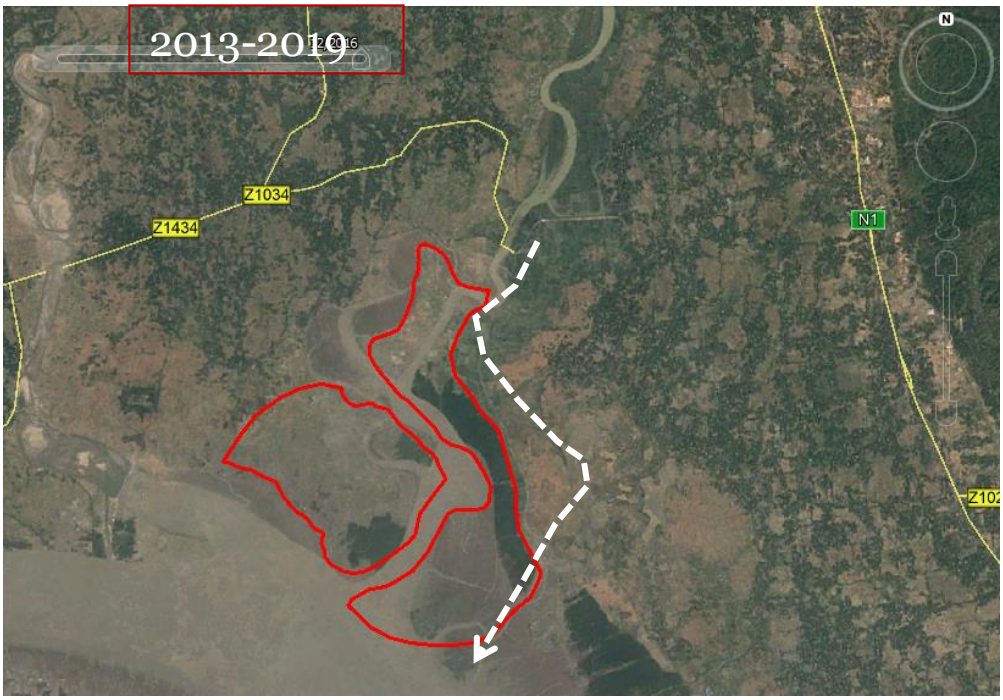
Since 1990 -1994, the River has maintained the same channel section with Char land developing in the mid of the river.



Since 1994 -2000, it is observed that there is extension in the developed Char land in all the directions.



Since 2000 -2013, the Char land is further getting extended in all the directions. Also, the channel flow became uniform due to creation of manmade channels near the check dam.



Since 2013 -2019, the channel flow is streamlined and uniform. Three parcels of Char lands were formed. Hence, in order to stabilize and protect the site, necessary embankment needs to be created for utilization of the char land.

The height of the embankment to be provided is +10.00 m and the length of the embankment to be provided is 30 km.

9.3.10. Infrastructure cost estimates

A component wise breakdown of the cost of developing on-site infrastructure as mentioned in this report has been elaborated in the table on the next page.

Table 88: On-Site Infrastructure cost estimates

Description of Item	Quantity	Unit	Phase I Cost Breakdown	Phase II Cost Breakdown	Phase III Cost Breakdown	Phase IV Cost Breakdown	Phase V Cost Breakdown	Price without tax (In mn Taka)	Price without tax (In mn USD)
Road Network									
Road (45 m)	21288	RM	364.6	364.6	364.6	364.6	364.6	1823	22.23
Road (30 m)	12807	RM	144	144	144	144	144	720	8.78
Road (25 m)	29592	RM	267.4	267.4	267.4	267.4	267.4	1337	16.30
Total			**776**	**776**	**776**	**776**	**776**	**3880**	**47.32**
Footpath and plot entry culvert			226.6	226.6	226.6	226.6	226.6	1133	13.82
			1002.6	**1002.6**	**1002.6**	**1002.6**	**1002.6**	**5013**	**61.13**
Storm Water Network	63687	RM	159.8	159.8	159.8	159.8	159.8	**799**	**9.74**
Power Network									
Internal Power Distribution (OHT)	63687	RM	23.72	23.72	23.72	23.72	23.72	118.61	1.45
Distribution Transformer			151.9	151.9	151.9	151.9	151.9	759.52	9.26
Street Light	63687	RM	27.33	27.33	27.33	27.33	27.33	136.64	1.67
Internal Substation	589.56	MVA	1536.78	1536.78	1536.78	1536.78	1536.78	7,683.91	93.71
Fire Hydrant			1.91	1.91	1.91	1.91	1.91	9.56	0.12
Total			**1,741.64**	**1,741.64**	**1,741.64**	**1,741.64**	**1,741.64**	**8,708.24**	**106.20**
Water supply Network									
Water Supply Network	63687	RM	104.6	104.6	104.6	104.6	104.6	523	6.38
Sump, Overhead Tank, Pumps			464.37	464.37	464.37	464.37	464.37	2321.86	28.32
Water Treatment Plant	127.63	MLD	664.69	664.69	664.69	664.69	664.69	3323.44	40.53

Description of Item	Quantity	Unit	Phase I Cost Breakdown	Phase II Cost Breakdown	Phase III Cost Breakdown	Phase IV Cost Breakdown	Phase V Cost Breakdown	Price without tax (In mn Taka)	Price without tax (In mn USD)
Total			**1233.66**	**1233.66**	**1233.66**	**1233.66**	**1233.66**	**6168.3**	**75.22**
Sewer Network									
Sewer Network	63687	RM	109.4	109.4	109.4	109.4	109.4	546.99	6.67
Waste Water Treatment Plant	91.09	MLD	662.45	662.45	662.45	662.45	662.45	3312.25	40.39
Effluent Treatment Plant	77.37	MLD	464.22	464.22	464.22	464.22	464.22	2321.12	28.31
Solid waste Management	144.18	TPD	449.57	449.57	449.57	449.57	449.57	2247.87	27.41
Total			**1685.64**	**1685.64**	**1685.64**	**1685.64**	**1685.64**	**8428.23**	**102.78**
Telecom	63687	RM	77.2	77.2	77.2	77.2	77.2	385.98	4.71
Sustainable Infrastructure elements									
Open Space/ Landscaping	2158818	Sqm	19.89	19.89	19.89	19.89	19.89	99.44	1.21
Greenery along road	63687	RM	0.38	0.38	0.38	0.38	0.38	1.91	0.02
Percolation Pits	4246	Nos	1.24	1.24	1.24	1.24	1.24	6.18	0.08
Total			**21.51**	**21.51**	**21.51**	**21.51**	**21.51**	**107.53**	**1.31**
Support Amenities									
Admin Building	4500	Sqm	275					275	3.35
Maintenance Buildings	3500	Sqm	18.2	18.2	18.2	18.2	18.2	91	1.11
Total			**293.2**	**18.2**	**18.2**	**18.2**	**18.2**	**366**	**4.46**
Project Subtotal			**6,215.25**	**5,940.25**	**5,940.25**	**5,940.25**	**5,940.25**	**29,976.28**	**365.56**

Source: MACE analysis (sum total figures might have minor aberrations due to rounding off of the decimals)

Apart from the costs considered in the previous page, calculation of total project cost also takes into consideration the construction costs of standard factory buildings and implementing environmental management plan. The costs for these components are listed below –

- Per sq. feet cost of constructing SFB has been taken to be 1,600 BDT/sq. ft. over an area of 300 acres having 60% coverage. The cost of constructing SFBs is 12,545.3 million BDT (i.e. 153 USD million).
- The cost of implementing environmental management plan during construction phase is taken to be 858.8 million BDT (USD 10.5 million). This cost covers expenses of environmental and social experts that developer would have to hire and social and environmental audit and studies that would have to be taken in order to prevent damages to local fauna, flora and residents during the construction period.

In view of considering these additional expenses, total cost of developing the EZ site would be **BDT 43,380.4 million (i.e. USD 529 million).**

9.4. Key Takeaway

On-site infrastructure captures the internal infrastructure facilities which need to be developed within the project site. Development of on-site infrastructure is responsibility of the developer. The major on-site infrastructure considered for the proposed EZ are internal road network, power substation, effluent treatment plant and other internal infrastructure facilities.

Key recommendations formulated from this exercise are outlined below-

- In accordance to the prevailing development guidelines of BEZA, a well-defined hierarchy of roads planned within the proposed EZ (such as arterial road of 45 m width, primary road of 30 m width and secondary road of 25 m width.
- The proposed feeder line from 132 kV Mirsarai grid substation enters the site from the North Eastern side, the main Receiving substation can be located at entry point of feeder line as per infrastructure plan. From the sub-station the transmission line network is aligned along the proposed road network to feed the individual plots.
- Water conveyance system including desalination plant near the Bay of Bengal, and the feeder line from the identified water source (Bay of Bengal) to be provided.
- Infrastructure planning takes into consideration an underground sump for storage purpose and for distribution, it is recommended to provide overhead tank (OHT) with distribution lines connecting each plot.
- Aligning the distribution pipeline individually for potable and non-potable along the roadside with plot connection has been considered.
- The entire sewer network is planned along the proposed 45 m, 30 m and 25 m of EZ. It is proposed to use the treated water for non-potable purpose such as washing, watering to green areas etc.
- Infrastructure planning suggests adoption of Sequencing Batch Reactor (SBR) technology.

Block cost estimated based on the above outlined infrastructure components have been considered in the financial model.

10. Social Review

10.1. Purpose and Objective

As per the Resettlement and Social Management Framework (RSMF), which has been adopted in order to comply with the social safeguards requirements of the World Bank's operational policy on Involuntary Resettlement (OP 4.12), the proposed project is required to conduct a Social Impact Assessment Study of the impact area. The policy requires that all unavoidable adverse impacts be 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.

In the process of social review, an overall understanding of the social conditions of the project area were assessed which included: examination of the number of PAPs, type of vegetation, presence of agricultural fields, type of crops and cropping patters, extent of compensation for land acquisition, livelihood restoration, identification of Common Property Resources (CPR) falling within the proposed site and impact on structures due to the land acquisition.

10.2. Methodology of Social Review

Social review has been undertaken to ensure that potential social impacts/concerns are recognized at an early stage of project preparation, so that these concerns can be effectively addressed during subsequent stages.

The study for this project incorporates both secondary and primary information gathered through individual consultations, stakeholder interaction, and interactions with people within the project influence area. The broad methodology followed by the team and the objective for undertaking the social impact assessment, are detailed below:

- To gather necessary information on existing socio-economic and cultural conditions in the project area for establishing the baseline;
- Determine magnitude of (a) potential social impacts, positive as well as negative and (b) identify sensitive socio-economic cultural issues and vulnerable social groups.
- Identify key stakeholders and establish an appropriate framework for their participation in the project selection, design and implementation;
- Ensure that project objectives and incentives for change are acceptable to the range of people intended to benefit;
- Identification of areas which might require further social analysis.

The choice of methodology, sub-tasks/activities and their sequencing has been determined by these specified objectives and is guided by the World Bank safeguard policy guidelines.

10.3. Socio-Economic Environment

The key parameters that are required to establish a baseline socio-economic profile of population within the project's area of influence include gender, ethnicity, social structure, employment patterns, sources of income, local tenure and property rights arrangements, common property resources (CRP) use of community and natural resources. Primary information gathered by undertaking the screening survey, individual consultations and other stakeholder interaction and secondary information sourced from published references have been analyzed to establish the socio-economic baseline. As, the proposed economic zone is located under 7 No. Sonagazi Union and 6 No.Char Chandina Union at Sonagazi Upazila in Feni district, the socio-economic profile of Sonagazi Upazila is detailed below.

10.3.1. Geography

Sonagazi upazila is located at 22.8500°N 91.3917°E. It has 49,810 households and spread over a total area of 284.9 km². It is situated in the southern part of the district, the only Upazila in Feni district to have a coastline with the Bay of Bengal. Sonagazi is noted for its natural environment and a sluice gate, known as "Muhuri Project", built in the late 1970's to control water flow of the Feni River.

10.3.2. Demography

Sonagazi is an upazila of Feni District in the Division of Chittagong, Bangladesh. There are 97 villages, 1 Pourasova, 9 Unions Parishads, and 94 Mouza's in Sonagazi upazila.

According to Census 2011, total population of Feni district is 1,437,371, of which male is 694,128 and female is 743,243. It is estimated that in the year of 2018 the total population of the district is approximately 1,593,594 (Male – 769,571; Female – 824,024).

As per the 2011 census, Sonagazi Upazila has a total population of 262,547 and the total male and female population at the Upazila is 123,653 and 138,894 respectively. The population density per sq. km is 920. The literacy rate of the Upazila is 61% (higher than the country average). It is estimated that in the year of 2018 the total population of the Upazila is approximately 283,536 (Male- 133,538; Female- 149,998).

10.3.3. Social Infra Structure

Sonagazi Upazila has the following social infrastructure and public utility structures in its vicinity.

Table 89: Social Infrastructure in Sonagazi Upzila

Social Infrastructure	Numbers
GoB Primary Schools	108
Secondary High Schools	24
Secondary Girls High Schools	3
Jr. High Schools	02
Dakhil Madrasa	13
Alim Madrasa	03
Non-government secondary school	20
Government Degree college	01
Non-government Degree college	1
Non-government college	1
Kawmi madrasah	30
Non-government Women college	1

Source: Bangladesh Bureau of Statistics

10.3.4. Livelihood and Economy

According to Bangladesh District Statistics, The economy of Feni is predominantly agricultural. *Main sources of income* Include: Agriculture 36.40%, non-agricultural laborer 3.35%, industry 1.58%, commerce 12.67%, transport and communication 4.40%, service 15.62%, construction 2.11%, religious service 0.56%, rent and remittance 14.04% and others 9.27%.

10.4. Calculation of land cost

For the development of EZ, the authority of BEZA proposes to acquire 7,000 acres land.

The proposed land for acquisition is mostly char land. The stakeholders' discussion with the local farmers and Upazilla Agricultural Officer indicated that, 10-15% of total proposed area is currently being used for grazing cattle and fish farming.

Impact on Land Acquisition:

Basis information obtained from Assistant Commissioner (AC) land office, the detail of the land which has been transferred to BEZA for the proposed EZ is provided in the following table.

Table 90: Details of land transferred to BEZA

SL	Name of Mouza	Proposed Land (Acre)	Transferred land (Acre)	Remarks
1.	Dakhin Char Khondaker	1,494.72	54.95	Diara survey
2.	Char Khowajer Lamchi	184.36	4.52	Diara survey
3.	Char Nasrin	0	2,762.00	Charcha Map only
4.	Bahir Char	17.94	611.05	Diara survey
5.	Thak khowajer Lamchi	1,239.90	86.22	Diara survey
6.	Char Khondaker	1,789.00	71.16	Diara survey
7.	Char Ram Narayan	381.99	922.66	SA survey
	Total land	**5,107.91**	**4,512.56**	

Source: Information collected during field visit

4,512.56 acres land has been acquired by the authority from 7 mouza's as follows; (1) Thak Khoaj Lamchi 86.22 acres (2) Char Ramnarayan 922.66 (3) Char Khadaker 71.16 acres (4) Bahir Char 611.05 acres (5) Dakhin Char Khandaker 54.95 (6) Char Khoaj Lamchi 4.52 and (7) Char Nasrin 2,762.00 acres.

The development of the EZ is proposed on area of 7,000 acres of which 4,512.56 acres land has been transferred to BEZA and the remaining 2,487.44 acres of land area is in the process of being transferred. Based on our discussion with local officers, the proposed (2487.44 acres) land ownership pattern is private and is spread across 6 mouzas. According to local consultation meeting, more than 1,500 PAPs would be affected as a result of development of this project. The effect of the development of EZ on the PAP's is primarily due to the loss of livelihood from the fish farming and cattle grazing that is currently being practiced.

Generally, two steps are followed to determine replacement value for the land acquired. The first one is the 'Conventional' rule set by the law often called DC payments or Cash compensation under law (CUL). Second, the project has provision for 'top up' payments to match replacement value for land acquired in the case of difference between DC valuation and current market price (CMP).

The CMP survey conducted for the proposed EZ was interview based. The interview was conducted with landowners, most recent buyers and sellers and Deed writers of the proposed mouza where land is proposed to be acquired. Based on three group's interview, we found that the current market price is on an average 10% higher than Govt rates (excluding registration cost and stamp duty).

For the development of this EZ, BEZA proposes to acquire 7,000.00 acres land, out of which 4,512.56 acres land has been transferred to BEZA and the remaining 2,487.44 acres of land area is under private ownership. In accordance to the current legislations governing land acquisition of Bangladesh is the Acquisition and Requisition of Immovable Property Act 2017 (hereinafter, "the Act") which replaces the old 1982 Ordinance on Acquisition and Requisition of Immovable Property and BEZA's RSMF, cost of land for private land was taken as 3 times the cost obtained from AC land office for private land and 1 time the cost for government land or *Khas land*. Based on Govt. mouza rate total land cost was found to be BDT 1,063.33 million (including 200% premium). On the

other hand, CMP survey result indicates difference between CMP and CUL, and the CMP survey findings recommended land cost to be BDT 1,163.02 million (excluding registration cost and stamp duty)

Table 91: Average CMP and Mouza Rate of Land- Summary

Land Ownership Pattern	Quantity (acre)	Status	Average CMP of different land (Tk)	Average Mouza Rate including 200% premium/CUL(Tk)	Remarks
Khas/ Transferred land	4,512.56	Transferred to BEZA	66,447,245	66,447,245	Khas land calculated only 1 time
Private/ Proposed Land	2,487.44	Under process	1,096,580,462	996,891,329	10 % is Nul categories and others fellow land
	7,000		**1,163,027,707**	**1,063,338,574**	

Note : Govt/khas land premium is 1 time and private land premium is 3 times

A detailed Social Impact Assessment (SIA) study should be carried out and Resettlement Action Plan (RAP) needs to be prepared for the PAPs in accordance to World Bank safeguard standards and Government of Bangladesh's social and resettlement rules.

10.5. Requirements for SIA and RAP

10.5.1. Social Impact Assessment Requirement

The ideal situation for any project would be that it does not have any adverse impact on the population around. In practical, that is not always possible. The proposed EZ at Sonagazi Upazila under Feni district in will cause acquisition of about 7,000 acres mostly of khas land and char land categories and about 10-15% of total proposed area is being currently used for cattle grazing land and fish farming round the year. Based on local level consultation meeting and details shared by UNO office, the fishing is the substantial source of livelihood for the majority households. A detailed social impact assessment (SIA) should be carried out to assess the standard of living of this population, and hence arrive at an estimate of the losses that they will have to face in terms of loss of livelihood opportunities. The SIA report may be used further for putting together a resettlement action plan to diminish the adverse impacts to the affected population, as well as provide compensation as required. The SIA report can also be used to understand the existing social fabric amongst the affected population, and this can deepen the understanding of what an R&R plan will require.

Land Acquisition & Impact Mitigation Objectives

The principles and guidelines proposed in the 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 business and livelihood activities during implementation of the civil works.

RSMF & Impact Mitigation Plans

The principles, policies and guidelines as proposed in this RSMF will apply, irrespective of PSDSP components, to all EZs and similar sub-projects, and their off-site support infrastructures that will involve private land acquisition and use of khas/public lands.

10.5.2. Requirement of RAP

The development of the EZ is envisaged on land parcel of 7,000 acres which is spread across the seven mouzas (viz. Dakhin Char Khondaker, Char Khowajer Lamchi, Char Nasrin, Bahir Char, Thak Khowajer Lamchi, Char Khondaker and Char Ram Narayan) located under Sonagazi Union and Char Chandina Union at Sonagazi Upazila in Feni district. The proposed area is mostly under khas land ownership and char land categories, and about 10-15% of total proposed area is being currently used for grazing cattle and fish farming round the year. Thus the proposed project will result in the loss of livelihood. Based on stakeholders consultation meeting, the total number of project affected persons (PAPs) are higher than 1,500, thus a Resettlement Action Plan needs to be prepared for the PAPs.

Based on the principles proposed for impact mitigation, the following tables define the specific entitlements for different types of losses, entitled person, and the institutional responsibility to implement them.

Table 92: Loss of agriculture, cultural, employment and rental homes

Ownership type	Entitled Person	Entitlement	Responsibility
Agricultural Income: On private Lands	Legal owners as determined by DCs, or by courts in cases of legal disputes	• Current market value of trees, based on species, size and maturity. • Current harvest prices of fruits on trees, if they are uprooted before harvest. • Owners are allowed to sell the trees and keep them.	By BEZA (included in the CUL) and/or By Project (included in the top-up)
Business Income: • 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 or complete the civil works	By Project
	Business Owners (premise/land owners & tenants)	Compensation, calculated as above, for smaller of the number of days needed to repair and reopen the individual business premises, or complete the civil works.	By Project
	Business Owners (premise/land owners & tenants)	Relocation in khas/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, 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

Ownership type	Entitled Person	Entitlement	Responsibility
• Loss of income from rented-out premises on private Lands & VNR Lands	Legal Owners and Current Owners/Users of VNR lands	• Six months' rent at the current rates to the owners of the premises on private lands. • Three months' rent at the current rates to the owners/users of premises on VNR lands	By Project

Table 93: Loss of trees on acquired, private and public land

Impact Type	Entitlement Person	Entitlement	Responsibility
If acquisition amounts to 10-15% or more of the total productive area	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

Table 94: Unforeseen losses

Impact Type	Entitlement Person	Entitlement	Responsibility
As may be identified during subproject preparation & implementation	As Identified	As determined in consultation with World Bank and the stakeholders.	By Project

According to Sonagazi Zila sub-Registry office land price list, Dakhin Char Khondaker, Char Khowajer Lamchi, Char Nasrin, Bahir Char, Thak Khowajer Lamchi, Char Khondaker and Char Ram Narayan mouza per decimal Nul, , household, vita, pond, Doba/khal , Pond, Market, Char land categories GoB land price as shown in the table below.

Table 95: Average per decimal land price (BDT) for 2017-18, Sonagazi, Feni

SL No	Name of Mouza	Land Categories & Per Decimal Land Price(BDT)								
		Nul	*Home land*	*Vita*	*Pond*	*Garden*	*Doba*	*Fellow land*	*Layek fellow land*	*Chara Viti*
1	Dakhin Char Khondaker	1,716	1,200	1,200	1,200	1,200	800	800	499	1,100
2	Char Khowajer Lamchi	9,969	2,200	2,200	5,390	1,910	1,571	1,500	1,359	1,871
3	Char Nasrin#									
4	Bahir Char	1,724	800	800	800	800	500	500	300	700
5	Thak khowajer Lamchi	3,186	1,910	2,000	5,390	1910	1,071	1,000	1442	1,400
6	Char Khondaker	5,626	5,846	2,182	1,875	1,500	1,100	1,100	653	1,400
7	Char Ram Narayan	615	800	800	800	800	500	500	300	700

#Note : Mouza of Char Nasrin not included sub-registry office price list of Sonagazi. A deed writer noted that Char Nasrin mouza is a new char and Diara survey or any survey has not been undertaken.

10.5.3. Land Requirements and Resettlement Issues

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 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 and 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 EZ 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.

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 due to lack of other alternatives, 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. 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.

10.6. Overview of Social Legal and Policy Requirements

The current legislations governing land acquisition for Bangladesh is the Acquisition and Requisition of Immovable Property Act 2017 (hereinafter, "the Act") which replaces the old 1982 Ordinance on Acquisition and Requisition of Immovable Property. The Act provides safeguards for landowners and has provisions for payment of 'fair value' for the property acquired. The act also made provisions for payment of crop compensation to tenant cultivators. However, it does not cover project-affected persons without titles or ownership record and does not ensure their replacement value of the property acquired. It does not permit the affected persons to take the salvageable materials for which compensation has been paid by the DC. It has no provision of resettlement assistance and transitional allowances for restoration of livelihoods of the non-titled affected persons.

In all cases, the Deputy Commissioner (DC) determines (i) market value of acquired assets on the date of notice of acquisition (based on the registered value of similar property bought and/or sold in the area over the preceding 12 months); and (ii) 200% premium on the assessed value (other than crops) due to compulsory acquisition. The DC payments "awarded" to owners is called cash compensation under law (CCL). The market value determined by DC is invariably less than the real market price as owners customarily report undervalued land transaction prices in order to pay lower stamp duty and registration fees. The premium paid by DC has been increased from 50% to 200% of market value for government land acquisition and to 300% in case of private land acquisition in the new act. However, even so in most cases the compensation remains less than the real market price or replacement value (RV).

World Bank's policy on involuntary settlement OP 4.12 covers direct economic and social impact caused by (a) the involuntary taking of land resulting in (i) relocation or loss of shelter; (ii) loss of assets or access to assets; or (iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or

(b) the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons

Table below shows the comparison of GOB's Ordinance and WB policy gaps between WB OP 4.12 and GOB 2017 Act.

Table 96: Gap analysis: WB OP 4.12 and GoB 2017 Act

Gaps between WB OP 4.12 and GOB 2017 Act.	Recommendation to bridge the gaps
Gaps with regard to avoidance and minimised project impacts	The project designs including that of the associated facilities should aim to minimise impacts.
Existing GOB laws recognise title owners only; informal settlers are not covered.	All affected persons irrespective of titles will need to be identified for compensation and assistance
Existing laws and methods of assessments do not ensure full replacement costs. However, the 2017 Act has increased the provisions for compensation.	Provisions should be adopted for additional top-up payments to ensure replacement costs at current market price
Consultation with affected community is not legally required under the Act.	Extensive consultations will need to be carried out during the preparatory phase; similar consultation will continue during project implementation
The affected land owners can object to the acquisition in the beginning but once the hearing is done and settled, there is no scope of further complaint during the acquisition process.	There will be a provision of two-tier grievance redress mechanism in the project. One local level GRC (LGRC) and another project level GRC (PGRC).
No support or programme for income and livelihood restoration	The project benefits will include income and livelihood restoration
No provision for reconstruction or replacement of non-religious common property resources	The project will reconstruct all physical and cultural resources (PCRs) and common property resources if affected by the project.

Source: PwC Analysis

10.7. Stakeholder Consultation

10.7.1. Introduction and Objective

This section provides the stakeholder identification and analysis as well as a brief understanding of the engagement process for the project. "Stakeholder" refers to those who have plausible stake in the environmental/social impacts of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. It is highly desirable for all key stakeholders to arrive at a consensus on sensitive features, impacts and remedial actions. Stakeholder identification was done by examining the potential impacts of the project in terms of:

- Who may be affected directly (project affected people);
- Which agencies might have responsibility for the impact management;
- Which other organizations might have an interest in monitoring proponent activities or have local knowledge to contribute; and
- Which private/non-government sector entities might face financial and social hardships if the predicted impacts occur

The stakeholders identified in the project comprise of project impacted people, project beneficiaries, various government officials.

The main objective of the consultation process is to minimize negative impacts of the project and to maximize the benefits from the project to the local populace. The objectives of public consultation as part of this project are:

- Promote public awareness and improve understanding of the potential impacts of proposed projects
- Identify alternative sites or designs, and mitigation measures
- Solicit the views of affected communities / individuals on environmental and social problems
- Improve environmental and social soundness
- Clarify values and trade-offs associated with the different alternatives
- Identify contentious local issues which might jeopardize the implementation of the project
- Establish transparent procedures for carrying out proposed works
- Inform the affected populace about the entitlement framework and to settle problems with mutual consent
- Create accountability and sense of local ownership during project implementation; and
- To obtain information on baseline environment

10.7.2. Methodology for Stakeholder's Consultation

Different techniques of consultation with stakeholders were used during project preparation, viz., in-depth interviews, public meetings, group discussions etc. to understand the socio-economic profile of the community and the affected families, baseline environment, environmental/social concerns etc. A two -fold Stakeholder Consultation Meeting (SCM) was carried out simultaneously during the social review. In this regard, the SCMs were conducted firstly with both the primary and secondary stakeholders and later, affected persons within the occupation and gender based groups were consulted through Focused Group Discussions (FGD). The Focused Group Discussions (FGD) were carried out with different group at the proposed EZ area. PWC personnel discussed about the future developments and benefits to the community due to the development of the EZ. The FGD was carried out in presence of local businessman, fish cultivator, fishermen and local elites. Locals from 2 villages i.e. Char Khondaker, Char chandia, under Soangazi and Char Chandia Union participated in the discussion. The details of the Focused Group Discussions are furnished below. The record of attendees have been attached in Annexure.

10.7.3. Level of Consultation

Public consultations in the form of institutional and focused group discussions were carried out during the period from 06 January 2018 till 11-09-2018. Types of consultations done with various participants using various tools including, interviews with government officials, focused group discussion etc. are presented in the table below.

Table 97: Types of consultations

Level	Type	Key Participants
Institutional	Stakeholder Meeting	Various Govt. Officials
Community	Focused Group Discussion	PAP, marginalized people

10.7.4. Institutional Stakeholders Consultation

Date of Meeting: 04 January 2018

Location of Meeting: Upazila Nirbahi Officer's Office, Sonagazi

Officials Met:

Table 98: Institutional Stakeholders Consultation details for meeting on 04 January 2018

Local Government			
Name of Person	**Designation**	**Contact Details**	**Date of Consultation**
Nizamuddin Ahmed	AC Land, Sonagazi Upazila	1713187329	04-Jan-17
Zakir Ahmed	Local Government Engineering Department	1715041245	04-Jan-17
Md. Mizam	Surveyor	1768947458	04-Jan-17
Md. Elias	ULAO, Sonagazi	1711123459	04-Jan-17
Md. Mohiuddin Moshahed	Deputy General Manager, Rural Electricity Board	1769401165	04-Jan-17
Md. Mohiuddin	Work Assistant	1814320988	04-Jan-17
Bhabesh Sarkar	Junior Engineer	1714885789	04-Jan-17
Md. Eskandir Hanif	Assistant Engineer	1818645247	04-Jan-17

Source: Site visit

Salient Points of Discussion

- At the onset, the officials from Upazila Nirbahi Office welcomed the idea of developing economic zone in the region and country by BEZA and expressed their consent on the same. Discussions were held on various developmental aspects of the proposed EZ like land acquisition status, utility availability, rehabilitations and resettlement issues, etc. The discussion was concluded by a visit to the project site to gain an on-ground understanding of the various issues. Some of the key features discussed were as follows:
- It was intimated to us that the site allocated to BEZA is non-contiguous in nature and there are private lands in between the pockets of land that have been allotted to BEZA. PwC had raised concern regarding the sporadic nature of the land since developing a master plan would be challenging for a non-contiguous land parcel
- A distributary of the Feni River passes through the subject site and forms a part of the Muhuri Irrigation Project. However, it was highlighted by the water department officials that this stream is not navigable and not conducive for supplying water for a large industrial development
- Although there is a 33/11 KV sub-station nearby in Dakbangla of 20 MVA, which is supplying power to the region, there is no surplus power availability in the same. A new sub-station of 20 MVA is being developed, however it is envisaged that limited surplus would be available within this sub-station to cater to industrial

demand. Hence, it is imperative to have a separate sub-station and captive power plant within the industrial park to cater to the demand for power.

- Gas supply is not available in Sonagazi district and the nearest gas sub-station is located in Feni town which only caters to residential facilities.
- PwC officials further requested the Mouza maps with site boundaries demarcated on them and the same shall has been requested from the respective officials.

10.7.5. Focused Group Discussions

The Focused Group Discussions (FGD) were carried out with different group at the proposed EZ area on 11-09-2018. PWC personnel discussed about the future developments and benefits to the community due to the development of the EZ. The FGD was carried out in presence of local businessman, fish cultivator, fishermen and local elites. Locals from 2 villages i.e. Char Khondaker, Char chandia, under Soangazi and Char Chandia Union participated in the discussion. The details of the Focused Group Discussions are furnished below. The record of attendees have been attached in Annexure.

Table 99: Details of Focused Group Discussion

Relevant Stakeholders	Issues	Suggestion/Demand from participants	Remarks
Affected fishermen, PAPs, adjacent residential community	• Risk of Navigation for fishing boat • Loss of fishingplace • Loss of Grazing field • Employment opportunity • Improved communication and social infrastructure • Skills training to enhance the competency • Priority for local manpower	• Prima-facie the stakeholders were enthusiastic of the proposed project as it will bring various economical opportunity to them. The proposed Site is crisscrossed by various nallahs and channels. The local fisherman use these channels as routes to sea/estuary. The stakeholders raised concern on the acquisition of the land for EZ may hinder the movement of these fishermen. Some small-scale local fishermen are dependent on these branches of Boro Feni River (within the proposed EZ boundary) for fishing purpose. Their livelihood will also get affected. • Local people using the char land as grazing land for cattle. Acquisition of char land shall have impact on grazing activity. • Due to acquisition of char land, small scale fishermen currently dependent on the submerged site area for fishing activity, are also likely to be affected. At the same time they feel that the development of EZ will bring new opportunities to the community widely. The fore-mentioned community will also be benefited in various ways and new livelihood opportunities will be created for them as well. • They are expecting that, as a foremost need for EZ	Employment should be given to the PAPs from the earliest stage of site development so that they don't get economically deprived/jobless

		development, the connectivity and mode of transport will be improved. The social infrastructure like schools, colleges, medical facilities will gradually be developed in the area. • They fear that the people in this region will not get job in EZ as they are neither technically skilled nor literate. The project authority should undertake skill development program in neighboring areas. This will ascertain that the priority will be given to the locals for various employment opportunities during development and operation stage of EZ.	

Source: FGD at site

Figure 78: Focused Group Discussion

Source: FGD at project site

Summary of Social Impacts

- Impact on livelihood of fish farmers
- There may be an accessibility issue after development of EZ. Fishermen currently fishing at proposed EZ area, will be no more available for fishing
- Impact on grazing land used by domesticated cattle

10.7.5.1. Training for skill development in Project Area

Based on consultation with community including potential PAPs of the project area, requirement of following pertinent training is suggested.

Table 100: Training for skill development in Project Area

SL No	Type of Trade	Course Duration	Institution
1	Electrician	6 months	Department of Youth Development
2	Welding	3 months	Vocational Training Centre
3	Carpentry	6 months	Vocational Training Centre/NGO

SL No	Type of Trade	Course Duration	Institution
4	Automobile	6 months	Vocational Training Centre
5	Plumbing	6 months	Vocational Training Centre

Source: PwC Research

10.8. Conclusion

For the development of the proposed EZ, BEZA proposed to obtain 7,000 acres of land, comprising of mostly char land. Of the 7,000 acres demarcated for the development of the proposed EZ, 4,512.56 acres has been transferred and the remaining 2,487.44 acres of land area is under process of transfer to BEZA. According to local consultation meeting, more than 1,500 PAPs would be directly and indirectly affected as a result of development of this project.

As per CUL study, based on Govt. mouza rate, total land cost was found to be BDT 1,063.33 million. However, CMP survey result indicates difference between CMP and CUL, and the CMP survey findings recommended land cost to be BDT 1,163.02 million (excluding registration cost and stamp duty).

A detailed Social Impact Assessment (SIA) study should be carried out and Resettlement Action Plan (RAP) needs to be prepared for the PAPs in accordance to World Bank safeguard standards and Government of Bangladesh's social and resettlement rules.

11. Environmental Review

11.1. Purpose and Objective

The Environmental and Social Review has been undertaken with the following objectives –

- To facilitate an understanding of the elements of the existing baseline conditions of project's area of influence;
- To identify the aspects of the project likely to result in significant impacts to environmental and social resources/receptors;
- To analyse and map relevant stakeholders involved in the project;
- To predict the significance of the impacts of the Project;
- To develop an understanding for the management and monitoring of impacts; and
- Preparation of Environmental Management Plan (EMP)

11.2. Methodology of Environmental Review

The methodology for the environmental review of the proposed site are:

- Identification and review of applicable local, state, national and international environmental and social regulatory and institutional frameworks;
- Establishment of baseline conditions of the site and surrounding area through the following:
  - Detailed surveys to observe environmental and social characteristics of the project area;
  - Discussions with the stakeholders and identification key issues during planning, construction and operation phase of the project;
  - Baseline data collection of the site and project area with respect to water, ambient air and noise quality etc.
  - Ecological assessment on flora and fauna of the site and project area through secondary data collection.
  - Assessment of the socio-economic environment through collation of secondary information of the site, supplemented by consultations with the local communities to understand community perception with regard to the project and its activities;
- Impact Assessment and Mitigation Measures for environmental and social components for pre-construction/construction and operation phases. To minimize the adverse impacts mitigations measures will also be suggested; and
- Development of Environmental Management Action Plan which includes the following:
  - Mitigations for adverse environmental impacts and associated risks;
  - Institutional arrangement - management tools and techniques for the implementation of environmental impacts and risk mitigations;
  - Monitoring and reporting of requirements and mechanisms for the effective implementation of the suggested mitigations;
  - Monitoring arrangements for effective implementation of suggested mitigations for the proposed project.

11.3. Overview of Environmental Legal, Regulatory and Policy requirements for the project (GoB, WB etc.)

This section highlights the regulatory requirements set out by Government of Bangladesh (GoB) and World Bank (WB) in relation to protection of environment and its resources as well as protection of the social environment from adverse impacts associated with the project development. These requirements are summarized in the table below.

Table 101: Applicability of Key Environmental Legislation at a Glance

Name	Key Requirement	Applicability	Remarks
Acts/Rules			
The Environment Conservation Act, 1995 and subsequent amendments in 2000 and 2002 and 2010 Environment Conservation Rules, 1997 (Subsequent Amendments in 2002 and 2003)	• 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. • To ascertain responsibility for compensation in case of damage to ecosystem • Restriction on polluting automobiles, sale and production of environmental harmful items. • Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes. • Declaration of ecologically critical areas • Promulgation of standard limit for discharging and emitting waste. • Formulation and declaration of environmental guidelines. • Categorization of industries, development projects and other activities on the basis of pollution activities of the existing or proposed industries/ development projects/ activities.	Applicable. The project is classified under red category EIA study required to be undertaken	Site approval certificate is to be obtained from DoE
Environment Court Act, 2000 and subsequent amendments in 2002	To give high priority to environment pollution prevention	Applicable as the project shall have environmental impacts	All the developments to be carried out as per ECA, 1995 & ECR, 1997 and amendments.

Name	Key Requirement	Applicability	Remarks
The Private Forests Ordinance Act, 1959	Conservation of private forests and for the afforestation on wastelands.	Applicable as the tree cutting is involved in development of off-site facilities	Tree cutting to be carried out after taking permission from Regional Forest Officer, Forest Department
The Protection and Conservation of Fish Act, 1950 and subsequent amendments in 1982	Prohibit or regulate the construction, temporary or permanent of weirs, dams, bunds, embankment and other structures	Applicable. The project involves construction of super dyke and other structures.	Necessary permission would need to be taken for construction of super dyke and other structures
Water Pollution Control Ordinance 1970	Prevention of water pollution	Applicable from the prospective of prevention of pollution	Applicable during both construction stage (e.g. sewage and equipment washing and maintenance liquid waste discharges at construction camps) and operation phase
The ground Water Management Ordinance 1985	• Management of Ground Water Resources. • Tube well shall not be dug in any place without permission from Upzilla parishad.	Applicable. 3-4 nos. bore wells will be dug to develop water supply system during initial phase	Permission should be taken before digging tube wells
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. The project proposes construction of embankment i.e. super dyke.	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	Applicable. The proposed site is partly located in the submerged area.	Permission to be taken from the Ministry of Water Resources and DOE

Name	Key Requirement	Applicability	Remarks
	water-bodies such as lakes, ponds, beels, khals, tanks, etc. affected by man-made interventions or other causes. • Completely stop the filling of publicly-owned water bodies and depressions in urban areas for preservation of the natural aquifers and environment. • Stop unplanned construction on riverbanks and indiscriminate clearance of vegetation on newly accreted land.		
The Building Construction Act 1952 (with latest amendment 2006)	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
Bangladesh Economic Zones (Construction of Building) Rules, 2017	The rule states overall economic zone design requirements including zoning, open space requirement, green area, building orientation, accessibility and infrastructural requirements, access to fire appliances etc. The rule also elaborates the design requirements for individual building in the EZ , requirement of necessary permits, duties and responsibilities of developer, required qualification and responsibilities of the technical personnel involved, requirement of timely inspection etc.	Applicable as the project involves construction of buildings in the economic zones	In exercise of the powers conferred under section 38 of the Bangladesh Economic Zones Act, 2010, GoB made this rule
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

Name	Key Requirement	Applicability	Remarks
The Factories Act, 1965 Bangladesh Labor Law 2006, amendment 2013 Bangladesh Labor Rules 2015	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	Regulatory authority is Ministry of labor
Policies			
National Environment Policy, 1992	For sustainable development	Applicable for all development projects	Usage of energy efficient building material, fuel 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 Energy Policy, 1995	Protecting the environment by requiring an EIA for any new energy development project, introduction of economically viable and environment friendly technology.	Applicable. EIA study is to be carried out	Energy efficient materials and techniques should be explored
The National Water Policy, 2000	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 and surface water is required to be withdrawn for fulfilling water requirement	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 the proposed development will involve generation of sewage	Installation of sewage 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.	Triggered	Project classified as Category A considering impacts of project

Name	Key Requirement	Applicability	Remarks
OP 4.12 Involuntary Resettlement	Ensures safeguards to address and mitigate risks due to involuntary resettlement such as economic, social and environmental risks.	Triggered	The proposed project requires acquisition of private land
Private Sector Development Support Project			
Environment & Social Management Framework (ESMF)	Describes all the mandatory environmental and social clearances and purpose of the same required to be taken before development of the project	Triggered	The framework sets out mitigation, monitoring and institutional measures to be taken during design, implementation and operation of the project activities to eliminate adverse environmental impacts, offset them, or reduce them to acceptable levels.

Source: PwC analysis

11.4. Project Description

GoB has adopted proactive approach to promulgate investment within the country and to foster organized industrialization. BEZA in support with World Bank is implementing Private Sector Development Support Project (PSDSP) to upkeep pilot EZ projects under the new EZ regime. As part of this endeavor, BEZA and the World Bank intend to undertake pre-feasibility studies of five economic zone locations spread across the country. Proposed EZ located in Sonagazi Upazila, Feni district of Chittagong division is one them.

Proposed EZ is spread over an area of 7,000 acres. It has access to major trade and industrial nodes located in eastern parts of the country. Feni's strategic location in between industrial cities of Dhaka and Chittagong, will help future industries in the proposed EZ to cater to the consumer market in Dhaka and create synergy with existing industries along Dhaka-Chittagong Highway. Industries in Feni will also have an access to markets and industries in North East India due to its close proximity with Tripura. Preliminary assessment indicates that proposed EZ has access to source of power, though further assessment needs to be done regarding identification of a reliable source of water; gas network is not available at present, but is expected to be constructed in the future. Basic social infrastructure is available in this region for unskilled and semi-skilled labor. However, this region lacks in term of quality social infrastructure (medical, residential, and academic facilities suitable for expats, executives and skilled human resources), which is available in Dhaka and Chittagong. Provisions will be made in the master plan to include adequate social infrastructure facilities that could serve the needs of skilled personnel and expats working in the proposed EZ.

In line with the identified features of the proposed EZ and its competitiveness, a framework of industry assessment has been formulated which takes into cognizance availability of factors of production (logistics, utility, manpower), agricultural & natural resources, and possible industrial linkages in site surrounding context. Based on the regional landscape and site intrinsic features, suitability of various industrial sectors have been assessed. Findings from this desk based study were further validated through primary surveys amongst domestic and foreign investors. Basis this hypothesis, the following industrial sectors emerged out as the potential industrial mix for the proposed EZ:

Heavy industries

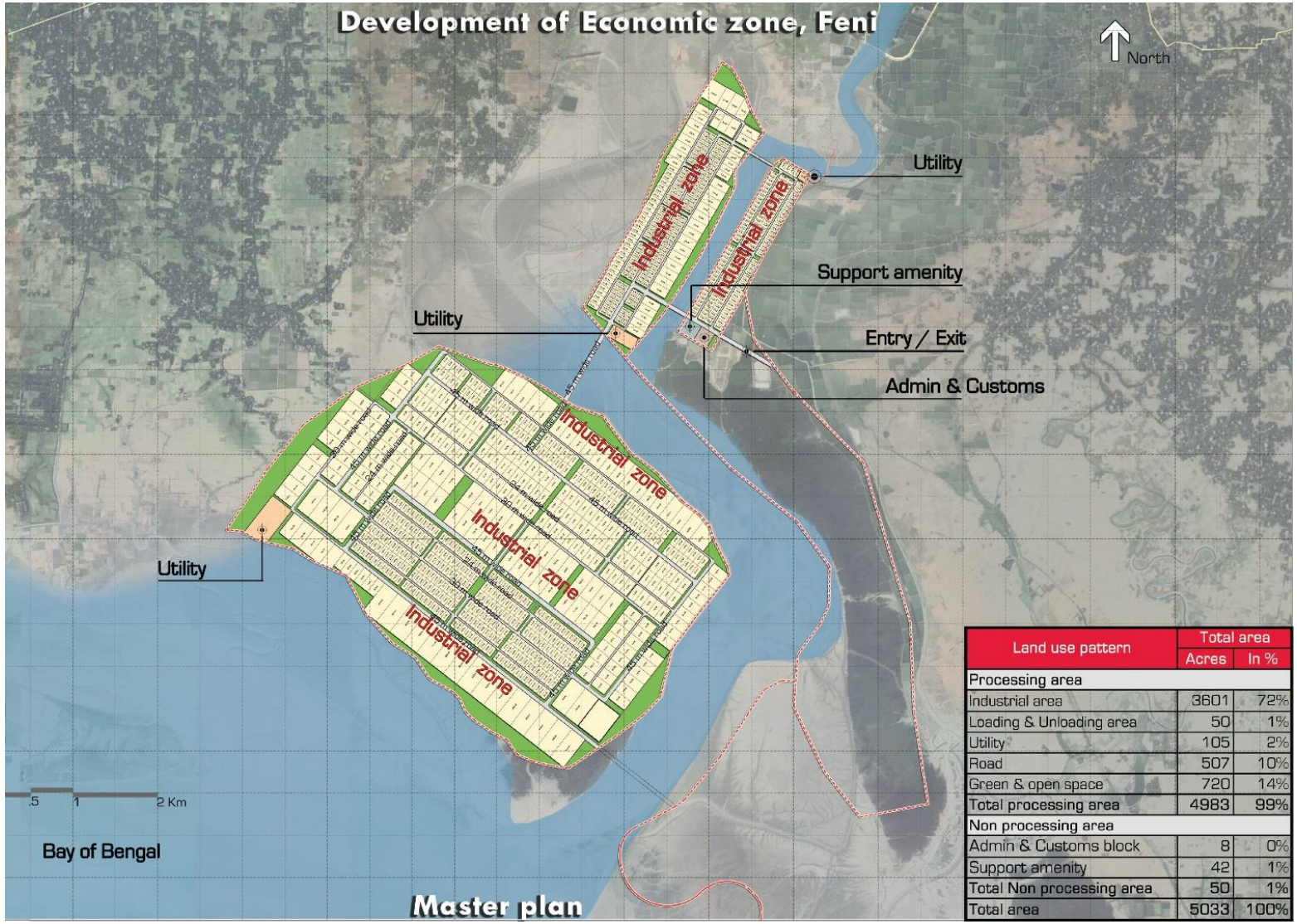
- Heavy Machineries, Iron and Steel
- Shipbuilding and Ship breaking
- Petroleum and Petroleum Products (including bottling)

Other industries

- Textile & RMG
- Leather and Leather Products
- Electrical & Electronics
- Automobile and Accessories
- Light Machinery, Equipment & Furniture
- Non-Metallic Mineral Products

Master Plan of Feni EZ is furnished in the figure on the next page.

Figure 79: Master Plan of the proposed Feni EZ site



Land use pattern	Total area	
	Acres	In %
Processing area		
Industrial area	3601	72%
Loading & Unloading area	50	1%
Utility	105	2%
Road	507	10%
Green & open space	720	14%
Total processing area	4983	99%
Non processing area		
Admin & Customs block	8	0%
Support amenity	42	1%
Total Non processing area	50	1%
Total area	5033	100%

Source: MACE analysis

11.5. Baseline Scenario

11.5.1. Location and Study Area

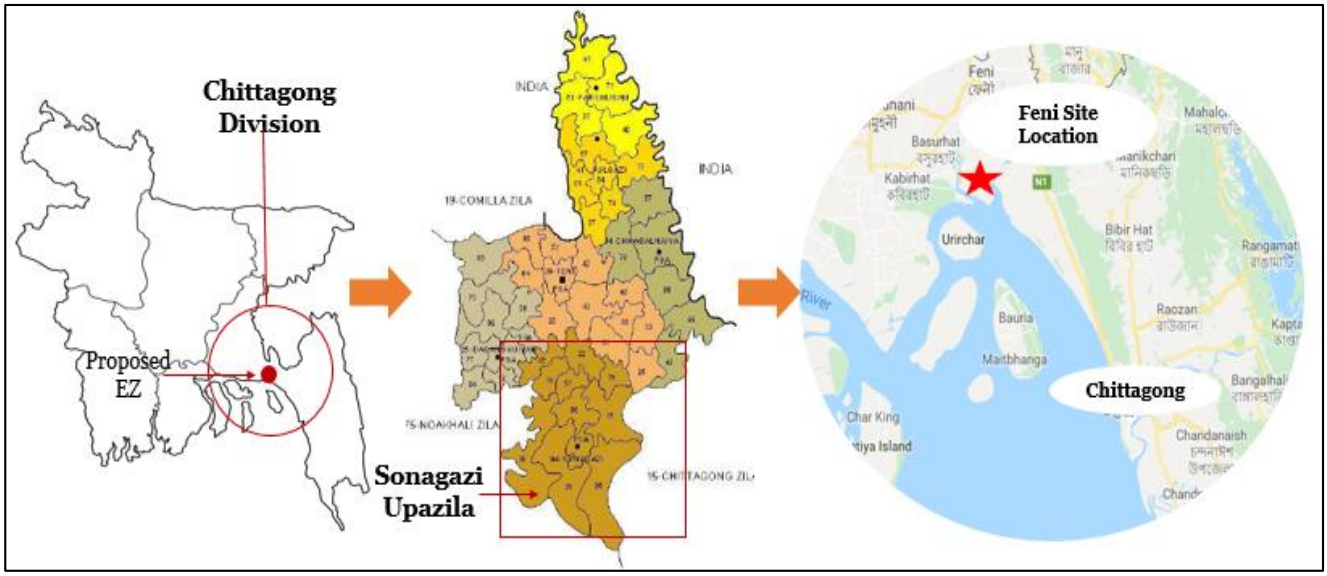
The proposed EZ is located in Sonagazi Upazila, Feni district of Chittagong division. Chittagong division, located in the south-eastern part of the country is geographically the largest division of Bangladesh with industrial city of Chittagong being the primary driver of the division's economy. Chittagong division contributes to ~18.9% of overall GDP of the country and it houses various industrial units. Owing to the presence of Bangladesh's most important sea port, Chittagong Sea Port, this division has seen rapid industrialization with steel re-rolling mills, cement plants and other trade dependent industries getting established in this area. Chittagong division has 11 districts (zilas) and 99 sub-districts (Upazilas).

Feni district is located in the middle of Chittagong division and shares border with India to its north and Bay of Bengal to its South. It is surrounded by the following:

- Comilla district – North-West
- India – North & East
- Chittagong district – South-East
- Sandwip Channel (Bay of Bengal) – South
- Noakhali - West

The proposed site falls under 7 No. Sonagazi Union and 6 No .Char Chandina Union of Sonagazi Upazila in Feni district.

Figure 80: Location of the proposed Feni EZ site



Source: Google Map and PwC Analysis

Figure 81: Location of the proposed EZ on Google Earth

Source: Google Earth

The proposed site is located adjacent to the confluence point of Bay of Bengal and Boro Feni River. The two blocks of proposed EZ is located at either bank of the river. Muhuri Dam is located on Boro Feni River at just about 1.2 Km upstream from the proposed site. From Muhuri Dam location, the river splits into number of streams before finally meeting Bay of Bengal. 2 streams of the river flows through prosed EZ blocks as well. The Bay of Bengal forms entire southern boundary of the site. The mixing of saline water from sea and fresh water of River in the confluence area generates a brackish water ecosystem. The region is quite rich in biological diversity. The Bay of Bengal and Boro Feni River are identified as key environmental features of the site surrounding and has a significant role on the topography, livelihood and ecology of the area. Another river, named Choto Feni located about 5 km west of proposed site also converges to sea at the south-west side of proposed site. Considering the ecological importance of the site, 10 km radius from proposed site boundary has been considered as zone of influence due to the proposed development. Hence, 10 Km radius is considered as study area for carrying out Environmental review. Zila/Upazila level secondary information was also collected for various environmental and social components irrespective of any demarcated boundary.

Figure 82: View of Boro Feni River from Muhuri Dam: Towards Project Site

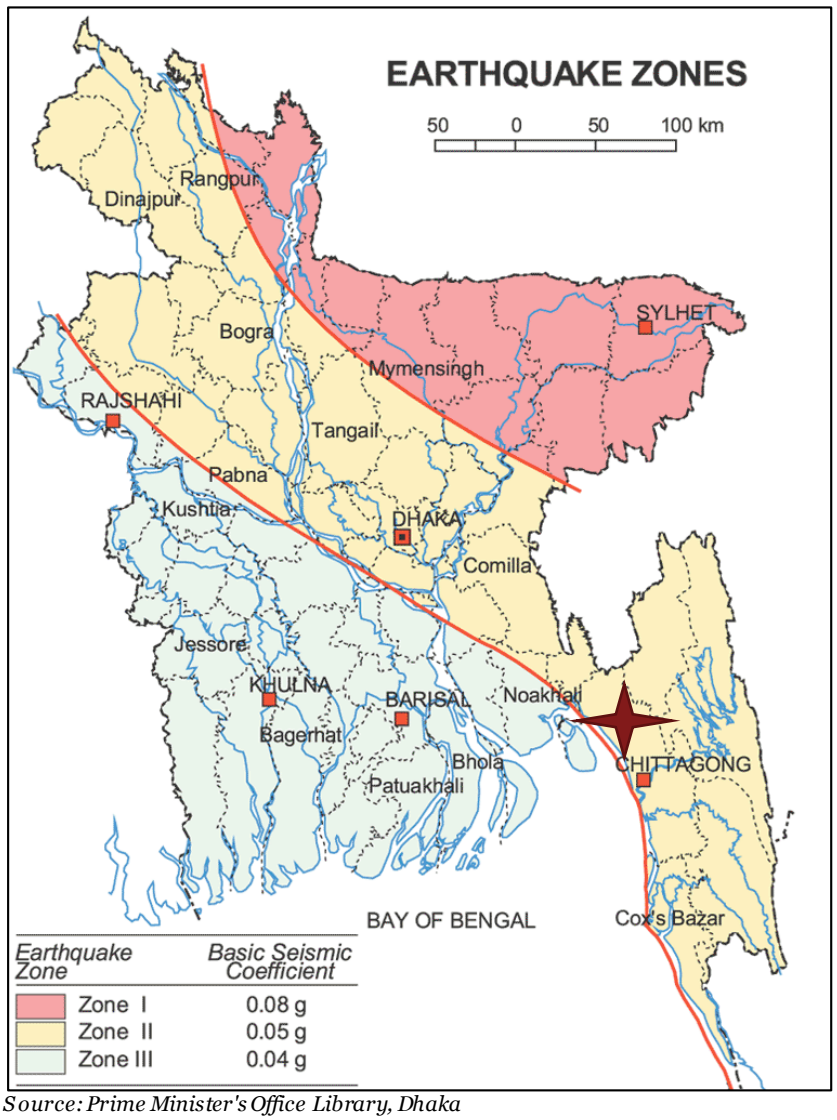
Source: Site Visit

11.5.2. Topography and Seismology

EZ site is a located on relatively newly formed delta and low lying in nature. The proposed area is crisscrossed by many channels/distributaries/streams of Boro Feni River. Significant part of the site remains submerged during high tide due to the proximity of Bay of Bengal.

Bangladesh has been divided into three generalized seismic zones. The northeastern regions of Bangladesh are the most active zones and belong to the zone-I. The zone II consists of the regions of recent uplifted Pleistocene blocks and considered as moderately active. The southwest Bangladesh is seismically quiet zone and represented by zone III. Proposed site is located in Zone II.

Figure 83: Seismic Zoning Map of Bangladesh



Source: Prime Minister's Office Library, Dhaka

11.5.3. Climatological Condition

According to District Statistics, in Feni District, the annual average temperature varies from maximum 34.3°C to minimum 14.4°C and the average annual rainfall of the zila is 3302 mm. The district having been a coastal region often fall victim to sea storm, tidal bore, hurricane and cyclone.

The area has a tropical monsoon climate. It has three main seasons i.e.

- Summer/Pre-monsoon - March to May
- Rainy Season/monsoon - June to October
- Winter season - November to February

11.5.4. Land use Pattern

According to the land use map of Sonagaji Upazila[238], Feni District the proposed site falls under the following zones-

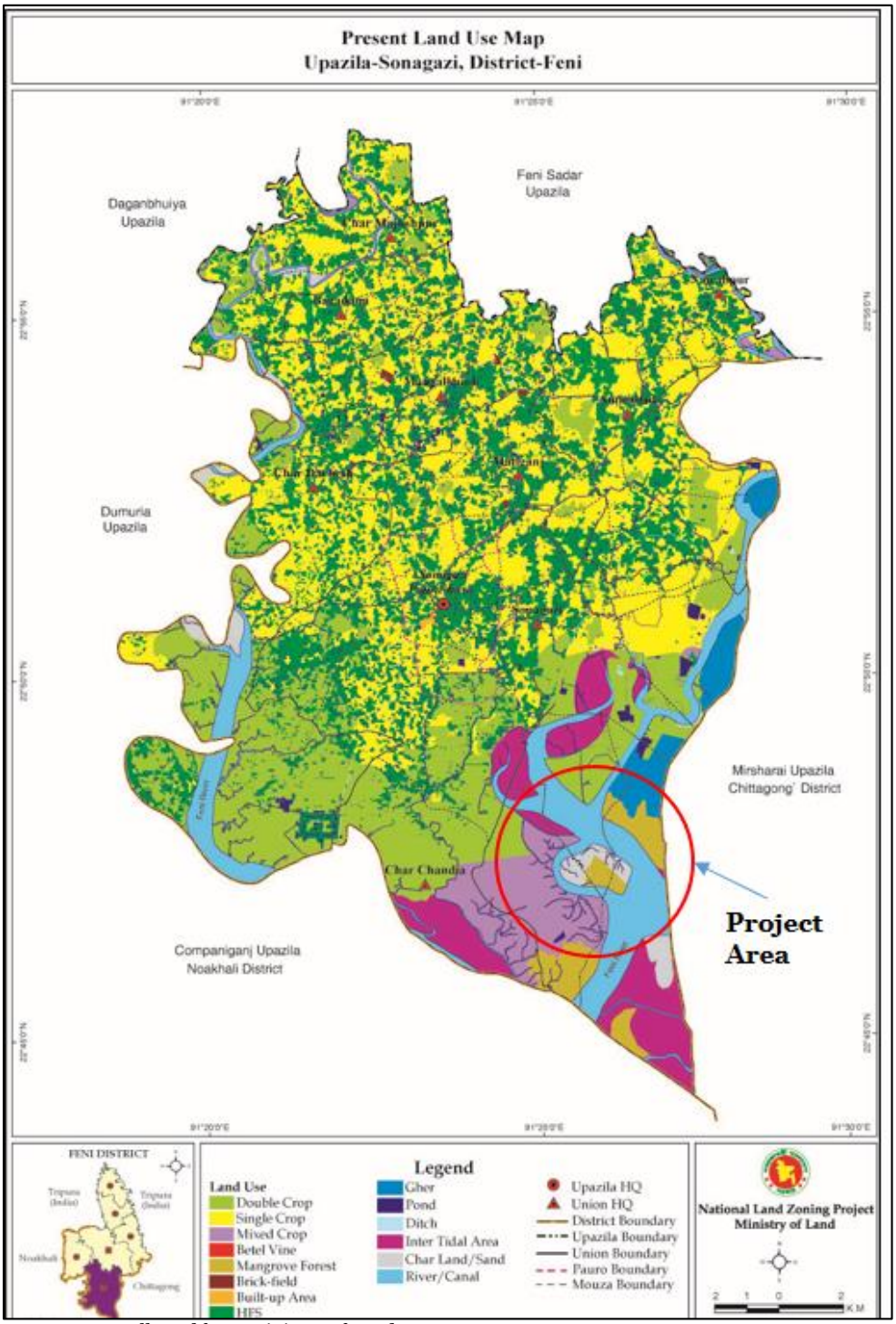
- Char Land
- Intertidal Zone

[238] *http://www.landzoning.gov.bd/land_use_map.php*

- Mangrove Forest
- Mixed Crop zone

The land use map of Sonagaji Upazila is presented in the figure below.

Figure 84: Land Use of Sonagaji Upazila



Source Data collected from Ministry of Land

Figure 85: Land Use of Proposed Project Area

Charland and Boro Feni River

Mangrove Cover

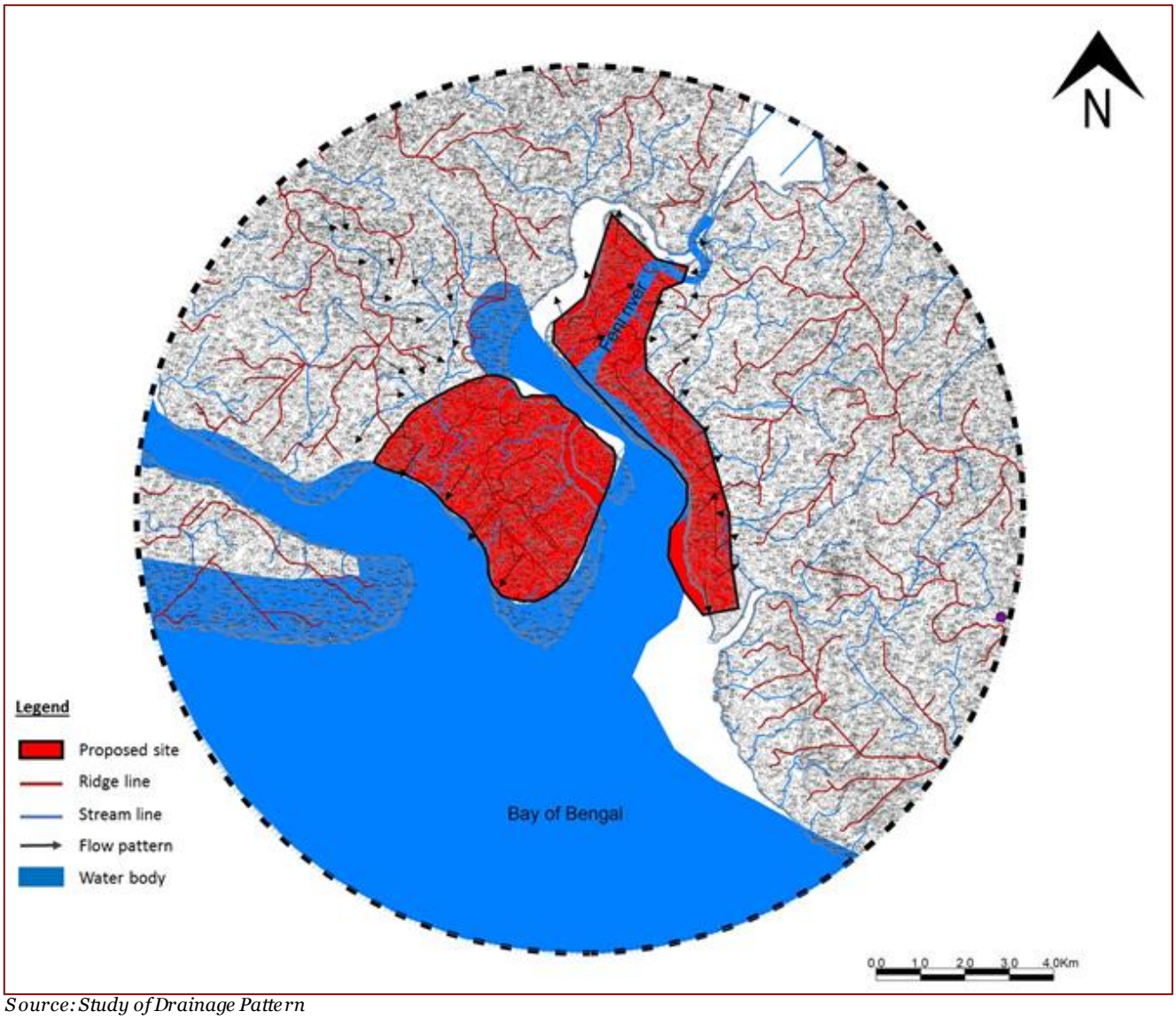
11.5.5. Drainage Pattern

River Feni bifurcates the site into two land parcels indicated as land parcel A and B in the figure on the next page. Majority of the site is bounded by River Feni and some stretch/branch of river passes through land parcel A and B. In general, the flow of surrounding area will be towards river. Hence there are chances of site for flooding due to surrounding storm water runoff and overflow of river and its branches.

To determine the vulnerability of site for flooding due to surface storm water runoff/, detailed contour study of the surrounding area was carried out based on GIS data for the radius of about 2 km surrounding the site and the flow pattern of the surface storm water runoff based on the same is provided in the following Figure. This study will help to determine the requirement of embankment/water diversion structure to prevent the site from flooding.

In the following figure, various details such as Ridge lines, Stream lines, Contours with levels and existing water body have been shown. Ridge lines are the lines connecting highest elevation points and the stream lines are the line connecting lowest elevation points. In general, the flow will be from the ridge line towards stream lines.

Figure 86: Flow Pattern of Project Area



Source: Study of Drainage Pattern

Land Parcel A

From the figure above, it is observed that, a ridge line passing through the centre of the site and the flow from the ridge is towards the surrounding river. A major stream line falls on the Northwest side of the site which is collecting the collecting the flow from the surrounding three ridge lines, passes through the site in the northwest and finally drains into Bay of Bengal. Also, the branch of River passes through the site in the Southeast side of the land parcel.

It is inferred that the site is vulnerable to flooding from all directions. Hence, in order to prevent the land parcel from flooding, it is recommended to fill the site above High flood level with the provision of Embankment on all sides.

Land Parcel B

From the figure above, it is observed that there is a ridge line passing through the centre of the land parcel B and the flow from the ridge is towards the surrounding River. Also, a major segment of river passes through the land parcel in the Northeast and there is a minor stream line in the southeast side of the land parcel. Hence, from the site surrounding area, the surface runoff flow will be towards the site in the Northeast and some stretch of southeast side.

It is recommended to retain the path of the river entering in the Northeast and to prevent the land parcel from flooding, it is recommended to fill the site above High flood level with the provision of Embankment on all sides.

Hence, from this study, it is concluded that there is a requirement of embankment on all sides of the proposed site (both land parcels).

11.5.6. Soil Environment

The soil of this area is the admixture of sand and clay in varying proportion. The entire soil condition of the Southern part is mostly sandy.

11.5.7. Air Environment

Based on the secondary information and the site reconnaissance survey it was observed that baseline air quality was satisfactory and air pollution poses little or no threat presently. This may be due to the fact that the project area is located in a rural area with no significant industries in the surrounding area and the traffic was relatively less. However, it is envisaged that, once the EZ is operational, the cumulative impact of upcoming Mirsarai EZs may create significant air pollution.

To establish the baseline of the study area, ambient air quality monitoring was conducted by Qtex Solutions Limited, Bangladesh on 31st August'2018. Ambient air (outdoor) quality of the project area was monitored for the parameters of NOx, SOx and Suspended Particulate Matter. Monitoring of NOx and SOx was conducted by following Continuous Emission Monitoring System (CEMS) by using air analyzer. The analyzer is designed to meet British Standard (BS) 8494 and European Norm (EN) 50270:2006 standard. NOx and SOx are monitored using electrochemical method. NOx is considered as the summation of NO and NO2. Suspended Particulate Matter (SPM) of the project area was monitored by handheld particle counter. The particle counter follows the principle of laser technology for single particle detection. The scattered light emitted from the particles in the sampling air stream is converted into electrical pulses, which is further measured and calculated as a particle size. The concentration of particulate matter is measured in microgram per cubic meter. Qtex Assessor conducted the ambient air quality monitoring following Qtex In-house Method "SOP-06 Procedure of Ambient Air Monitoring". As per SOP-06, the assessor divided the selected project area into 4 imaginary parts and took the air quality reading from each of the four parts. Finally, the average value from sampled area has been taken into account for interpreting the result. The inspection work has been conducted for one hour using digital Air Analyzer. The monitored results for ambient air quality is furnished in the following table.

Table 102: Ambient Air Quality of Project Area

Location	Concentration of Pollutants			Remarks
	SPM (microgram/m3)	NOx (ppm)	SO2 (ppm)	
Dakshin Char Khandakar, Near Boro Feni River	40	0.3	0.0	Temperature : 31.3°C Relative Humidity : 77.4 % Weather Condition : Sunny Time : 10:45 AM to 11:45 AM
DoE Standard (ECR 97, Schedule 2, Amendment 200s)	200 (8hours)	0.53 (Yearly)	Not specified	-

Source: Primary monitoring conducted by Qtex Solutions Limited, Bangladesh

It was observed from the result that SPM concentration is well below than the stipulated standard of Bangladesh Environment Conservation Act, 1995 (amended in 2005). NOx concentration is marginally higher. No standard has been set yet for SO2 under DoE Standard (ECR 97, Schedule 2, Amendment 200s). The detailed report on Ambient Air Quality Monitoring is furnished in the Annexure.

11.5.8. Noise Environment

To establish the baseline condition of noise environment monitoring of noise level was carried out by Qtex Solutions Limited, Bangladesh on 31st August'2018 from the project area. . Qtex assessor conducted the ambient noise level inspection by following Qtex In-house Method "SoP-08 Procedure of Noise Level Monitoring". As per SoP-08, the assessor divided the study project area into 4 imaginary parts and took representative reading for noise quality from each of these four parts. Finally, the average value of reading from 4 parts were taken into account for interpreting the result. The inspection work was conducted for one hour using digital sound level meter. Sound pressure is measured in decibel (dB) based on electric condenser microphone. The instrument complies the standard of International Electrotechnical Commission (IEC) 653, type 2 (economical type). The level of noise found within the limit of standard of ECR 97, Schedule-4. Table below represents the results of ambient noise quality of the project area. The detailed report on Ambient Noise Quality Monitoring is furnished in the Annexure.

Table 103: Ambient Noise Quality of Project Area

Location	Time	Sound Level in dB	Comparative Standards (dB)
Dakshin Char Khandakar, Near Boro Feni River	10:45 AM to 11:45 AM	60	**ECR 97, Schedule-4:** Maximum permissible limit of ambient noise level at day time is 60 dB for mixed area **According to IFC standard**[239]**:** Maximum permissible limit for ambient noise levsl is 55 dB at day time

Source: Primary monitoring conducted by Qtex Solutions Limited, Bangladesh

11.5.9. Water Environment

11.5.9.1. Ground Water

For the preliminary interpretation of the tentative ground water depth in the proposed site, data for 1 of the nearest boreholes have been observed. It was observed on basis of the lithology profile that the recommended depth of tapping the water is from 155 m Below Ground Level to 215 m Below Ground Level. Appropriate hydrological observations and tests need to be carried out within the proposed EZ site to determine the exact depth of groundwater. Bore well data collected from Department of Public Health and Engineering (DPHE) department in support of groundwater level is furnished in the Annexure.

To understand the ground water quality of the study area ground water sample was drawn by Qtex Solutions Limited, Bangladesh on 31.08.2018 for further analysis. Sampling of Ground water has been conducted by following grab sampling method. As per Qtex Technical Procedure 'TP-10_Sampling Plan and Procedure,' ground water sample was collected from deep tube well located in the project area. Sample was collected in sterilized PVC Bottle. The assessor used hand gloves during collection of samples to avoid any possibility of contamination. Qtex Technical Procedure 'TP 11-Procedure for Sample Approval & Rejection, Reception, Handling/Transportation, Storage & Disposal' has been followed to ensure proper sealing, packaging of sample to avoid any further contamination or leakage/loss of sample during storage / transportation. For transportation of sample from project area to laboratory, ice box was used and the sample was stored in refrigerator (in laboratory) before testing to preserve its physicochemical and biological characteristic. Analysis of physical and chemical parameters were done by following APHA standard methods, whereas Membrane Filtration technique was followed for analysis of Microbiological parameters.

[239] *https://www.ifc.org/wps/wcm/connect/06e3b50048865838b4c6f66a6515bb18/1-7%2BNoise.pdf?MOD=AJPERES*

It was observed that, among the analysed parameters, values for Total Dissolved Solid (TDS), Chloride, and Turbidity are only within the permissible limit of ECR 97 standards and WHO Guideline. All other parameters like BOD, COD, Total Coliform, Fecal Coliform fail to comply with permissible limit of ECR 97 & WHO standard. It seems that ground water is contaminated here due to improper sewage management. The analysed result of ground water quality of the project area is furnished in below table.

Table 104: Ground Water Quality of Project Area

S. No.	Parameters	Units	Results	Standard Limit	
				Bangladesh Standard for Drinking Water quality (ECR 97)	WHO Guideline for Drinking Water Quality
1	Total Dissolved Solid (TDS)	mg/L	224	≤1000	≤1000
2	Chloride	mg/L	15	150-160	≤250
3	Bio Chemical Oxygen Demand (BOD)	mg/L	4.1	≤0.2	-
4	Chemical Oxygen Demand (COD)	mg/L	5.6	≤4	-
5	Turbidity	NTU	Not Detected	≤10	≤5
6	Total Coliform	CFU/100ml	340	0	0
7	Fecal Coliform	CFU/100ml	306	0	0

Source: Primary monitoring conducted by Qtex Solutions Limited, Bangladesh

11.5.9.2. Surface Water

The proposed site is located adjacent to the confluence point of Bay of Bengal and Boro Feni River. The two blocks of proposed EZ is located at either bank of the river. Muhuri Dam is located on Boro Feni River at just about 1.2 Km upstream from the proposed site. From Muhuri Dam location, the river splits into number of streams before finally meeting Bay of Bengal. 2 wider streams of the river flows through prosed EZ blocks as well. The Bay of Bengal forms entire southern boundary of the site. Another river, named Choto Feni located about 5 km west of proposed site also converges to sea at the south-west side of proposed site.

Surface water sample from Boro Feni River was drawn by Qtex Solutions Private Limited, Bangladesh on 31.08.2018 for testing to have an understanding about the surface water quality of the project area. Sampling of surface water has been conducted by following grab sampling method. As per Qtex Technical Procedure 'TP-10_Sampling Plan and Procedure,' surface water sample was collected in sterilized PVC Bottle. The assecor used hand gloves during collection of samples to avoid any pobbibility of contamination. Qtex Technical Procedure 'TP 11-Procedure for Sample Approval & Rejection, Reception, Handling/Transportation, Storage & Disposal' has been followed to ensure proper sealing, packaging of sample to avoid any further contamination or leakage/loss of sample during storage/transportation. For transportation of sample from project area to laboratory, ice box was used and the sample was stored in refrigerator (in laboratory) to preserve its physicochemical and biological characteristic. pH, BOD, COD, TDS, EC and chloride parameters were tested. It was observed that the value for pH & EC is well within the limit as stipulated in Environmental Conservation Rules, 1997. However, the value for BOD exceeds the permissible limit. Standards for other parameters has not been set yet. Analysis of physical and chemical parameters were done by following APHA standard methods.

Table in the next page captures the analyzed results for the surface water quality.

Table 105: Surface Water Quality of Project Area

S. No.	Parameters	Units	Test Results	Bangladesh Standard Limit according to ECR 1997, Schedule-3
1	Bio Chemical Oxygen Demand (BOD)	mg/L	61.92	≤10
2	Chemical Oxygen Demand (COD)	mg/L	164	-
3	pH	-	8.03 at 23.5°C	6.5-8.5
4	Total Dissolved Solid (TDS)	mg/L	472	-
5	Electrical Conductivity (EC)	µS/cm	630	≤2250
6	Chloride	mg/L	300	-

Source: Primary monitoring conducted by Qtex Solutions Limited, Bangladesh

The ground and surface water quality monitoring reports conducted by Qtex Solutions Limited has been attached as Annexure to this report.

11.5.9.3. River morphology

The proposed Feni EZ is located adjacent to River Feni on its eastern side. The project area is located around the confluence of the Muhuri and Feni rivers. The Feni River forms a portion of the boundary between Bangladesh and India. About half of the project area's drainage basin is in India. The principal rivers and khals within the project boundaries not only fluctuate with the tides in the Sandwip Channel, but also allow the intrusion of seawater.

During monsoon period, the mean and maximum ranges of tide in the Feni estuary have been found as 3.50 m and 5.50 m respectively. The tides have also been studied based on annual maximum High-Water Level data collected over the periods 1985 to 2004 at the gauge downstream of 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 are about 6.0 m and 5.276 m (SOB) respectively over the 20 years period.

Table 106: Mean High Water Level of Feni river

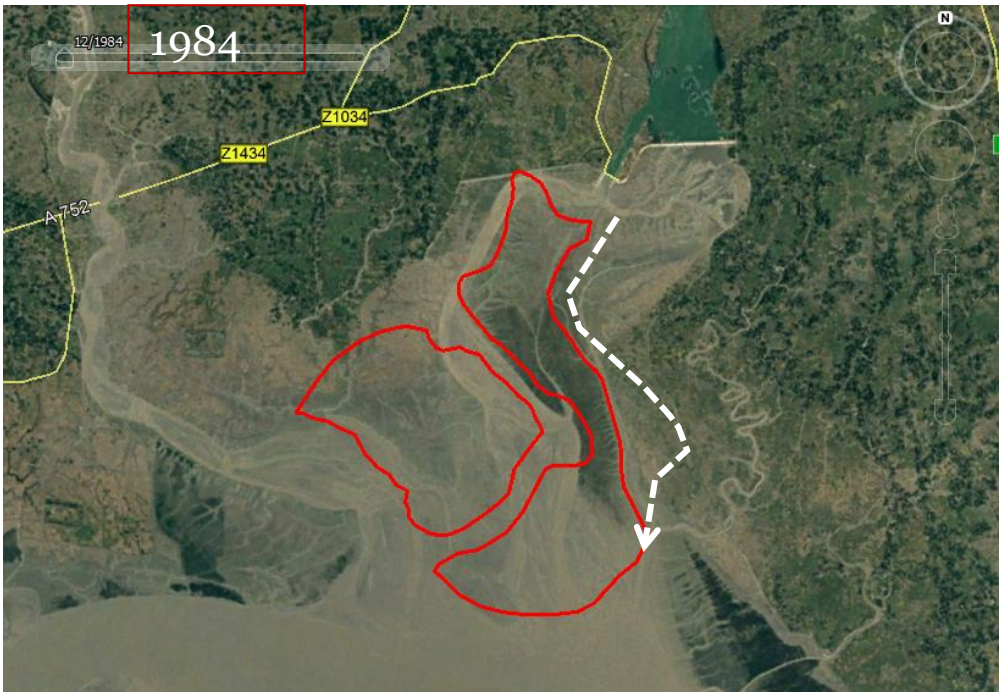
Mean Water Level in Meter (PWD)				
Year	Pre – Monsoon (Mar – May)	Monsoon (Jun – Sep)	Post – Monsoon (Oct – Nov)	Dry Period (Dec – Feb)
2000	3.46	4.30	3.62	2.79
2001	3.36	4.05	3.49	2.67
2002	3.38	4.04	3.55	2.56
2003	3.42	4.11	3.76	2.73
Mean	3.47	4.14	3.61	2.69

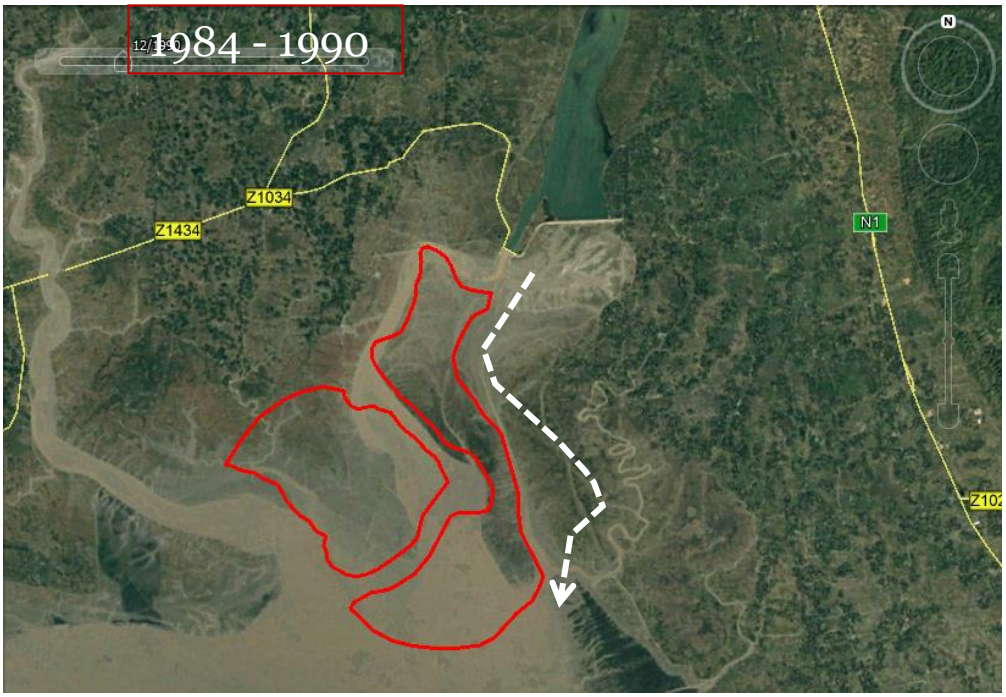
Source: BWDB

River Course Shifting

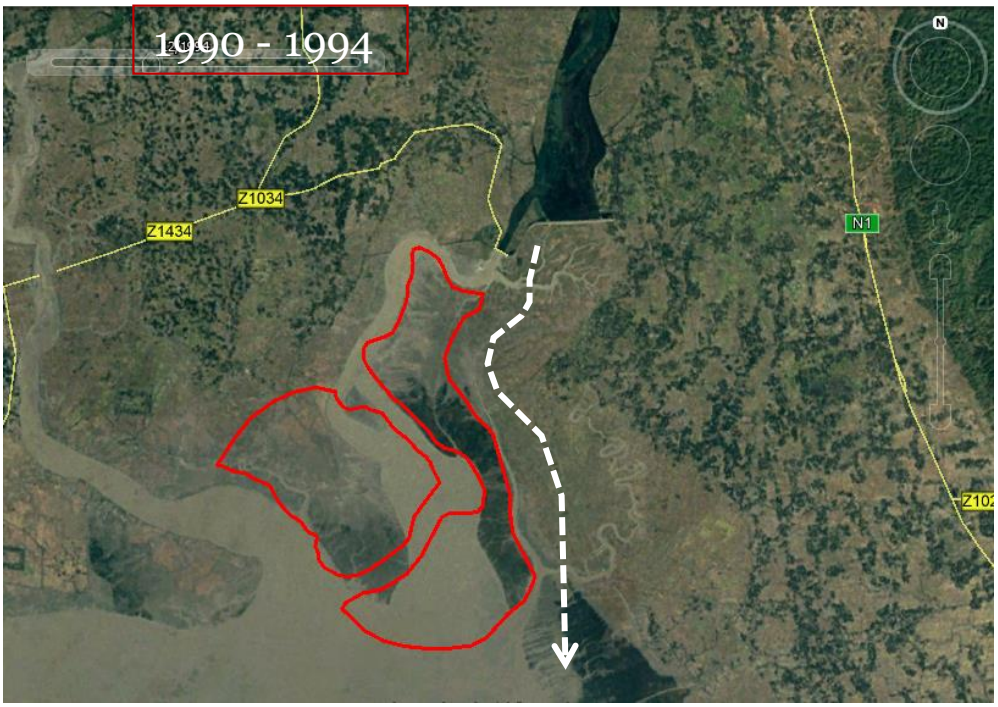
The following Historical satellite images shows changes and evolutions of riverbanks, main stream and sand bar (char) during recent years since 1984.

Figure 87: Changes in river bank lines

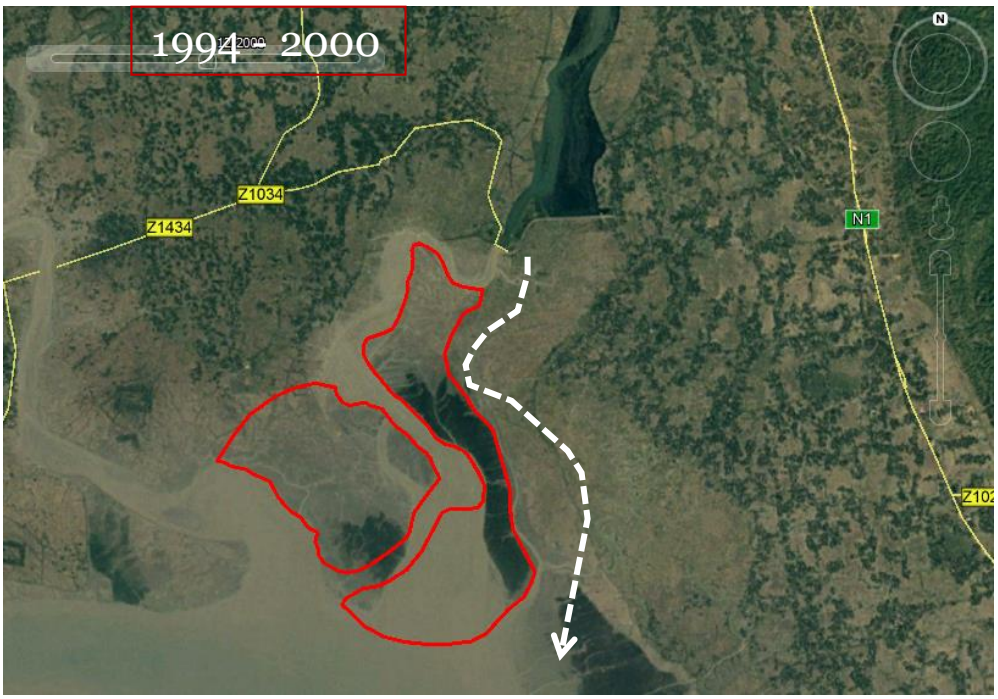




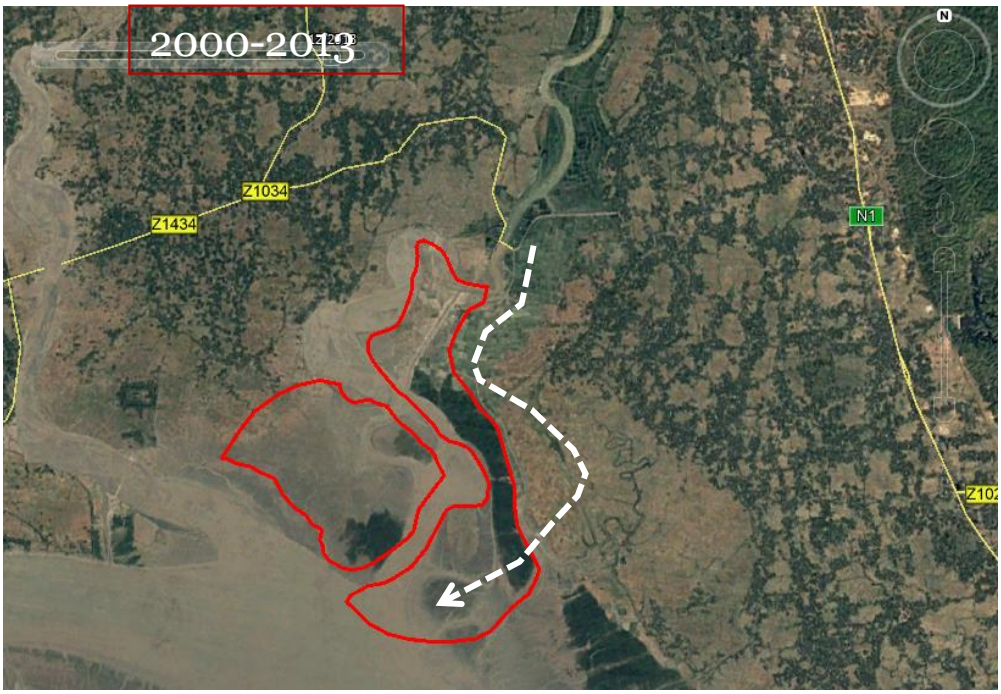
Since 1984 -1990, the Feni River near to the proposed site has maintained a single channel section with no char land. It is noted that the river width is within the range from 0.5 km to 2.0 km.



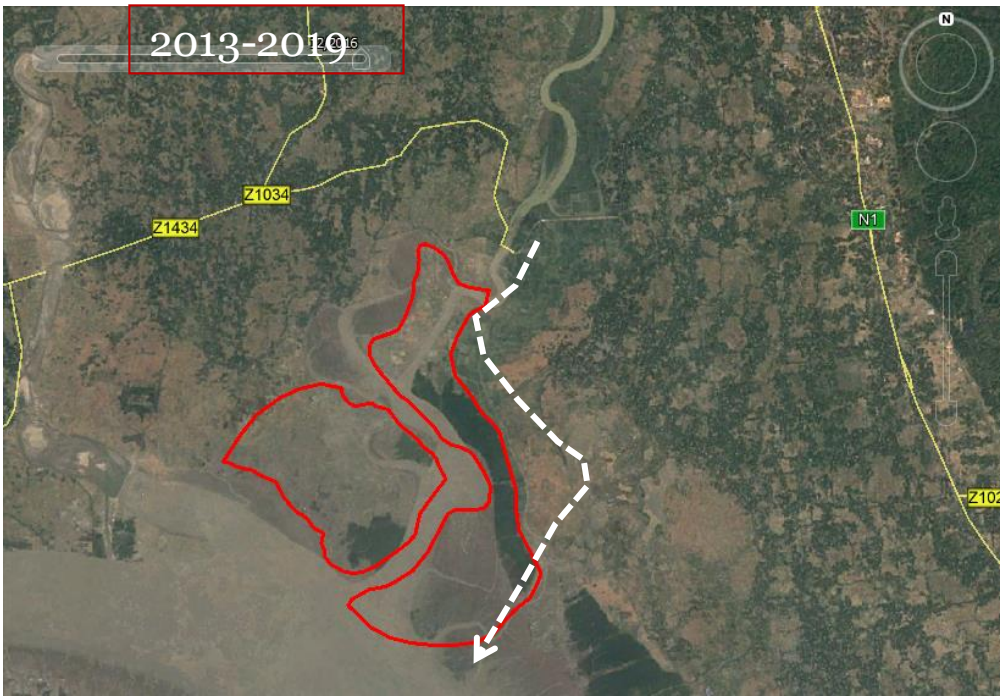
Since 1990 -1994, the River has maintained the same channel section with Char land developing in the mid of the river.



Since 1994 -2000, it is observed that there is extension in the developed Char land in all the directions.



Since 2000 -2013, the Char land is further getting extended in all the directions. Also, the channel flow became uniform due to creation of manmade channels near the check dam.



Since 2013 -2019, the channel flow is streamlined and uniform. Three parcels of Char lands were formed. Hence, in order to stabilize and protect the site, necessary embankment needs to be created for utilization of the char land.

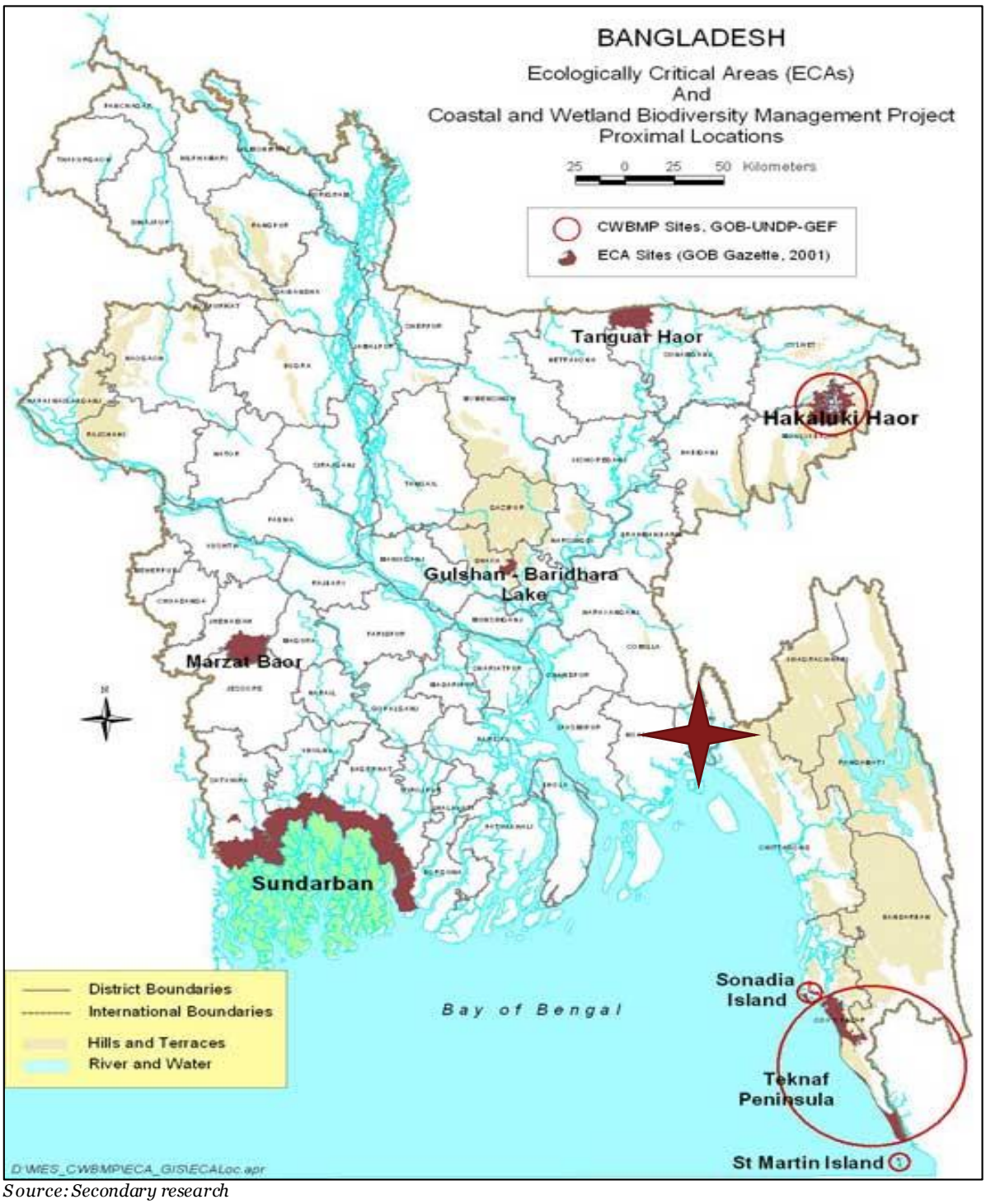
The height of the embankment to be provided is +10.00 m and the length of the embankment to be provided is 30 km.

11.5.10. Biological Environment

11.5.10.1. Protected Area/Ecologically Critical Area (ECA)

Under the Environmental Conservation Act, ecologically sensitive and precious areas are designated as Ecologically Critical Area (ECA) by Department of Environment in Bangladesh in cases where an ecosystem or biodiversity area is considered to be threatened to reach to a critical state. On the other hand, protected areas such as national parks and protected forests are designated by Department of Forest under the Wildlife Order and Forest Act. There is no protected area or ECA located within the study area of 10Km radius from proposed site boundary. Figures on the next page shows the maps of Bangladesh showing location of ECAs and protected areas distributed across the country.

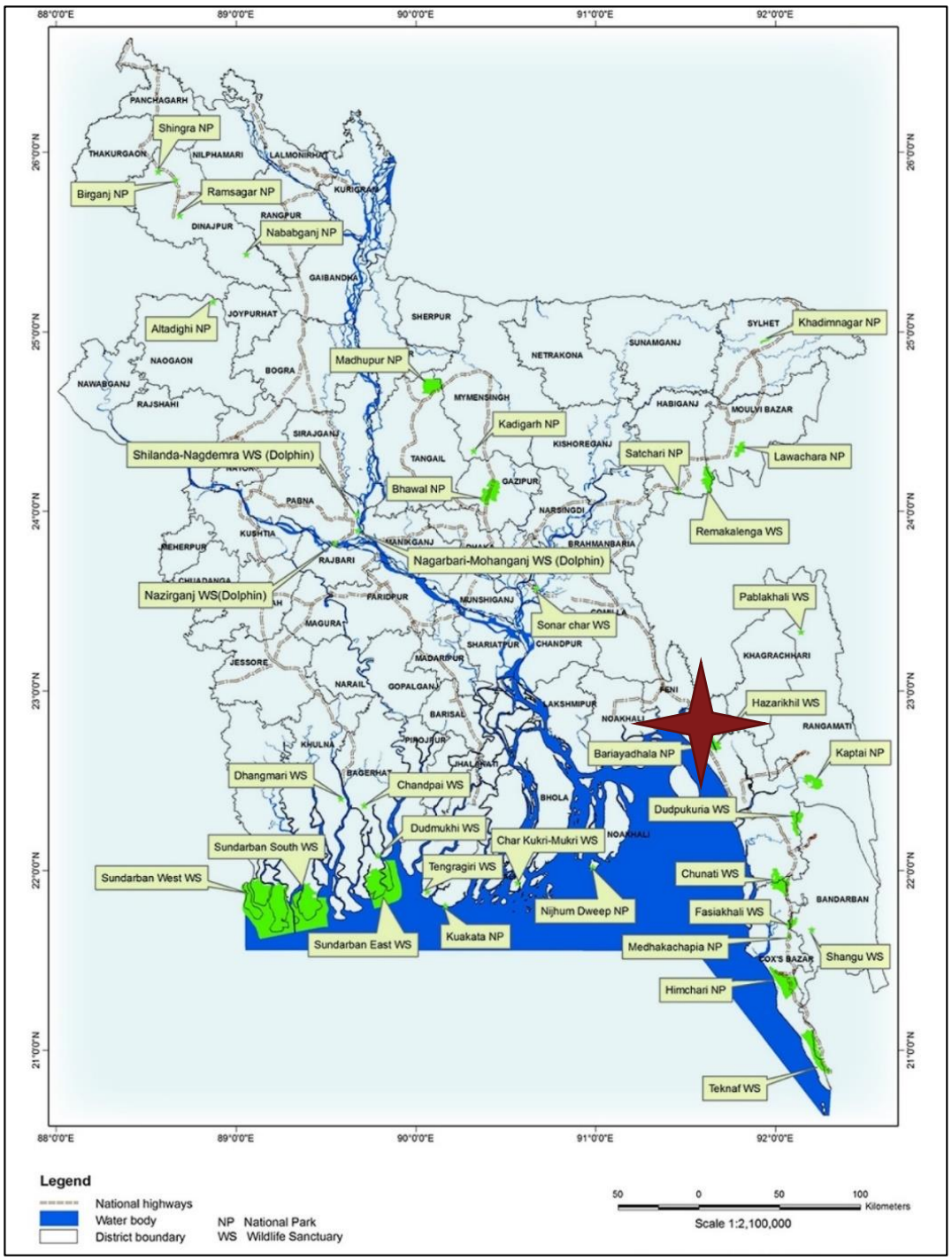
Figure 88: Ecologically Critical Areas of Bangladesh[240]



Source: Secondary research

[240] *http://www.doe-bd.org/cwbmp/*

Figure 89: Protected Areas of Bangladesh

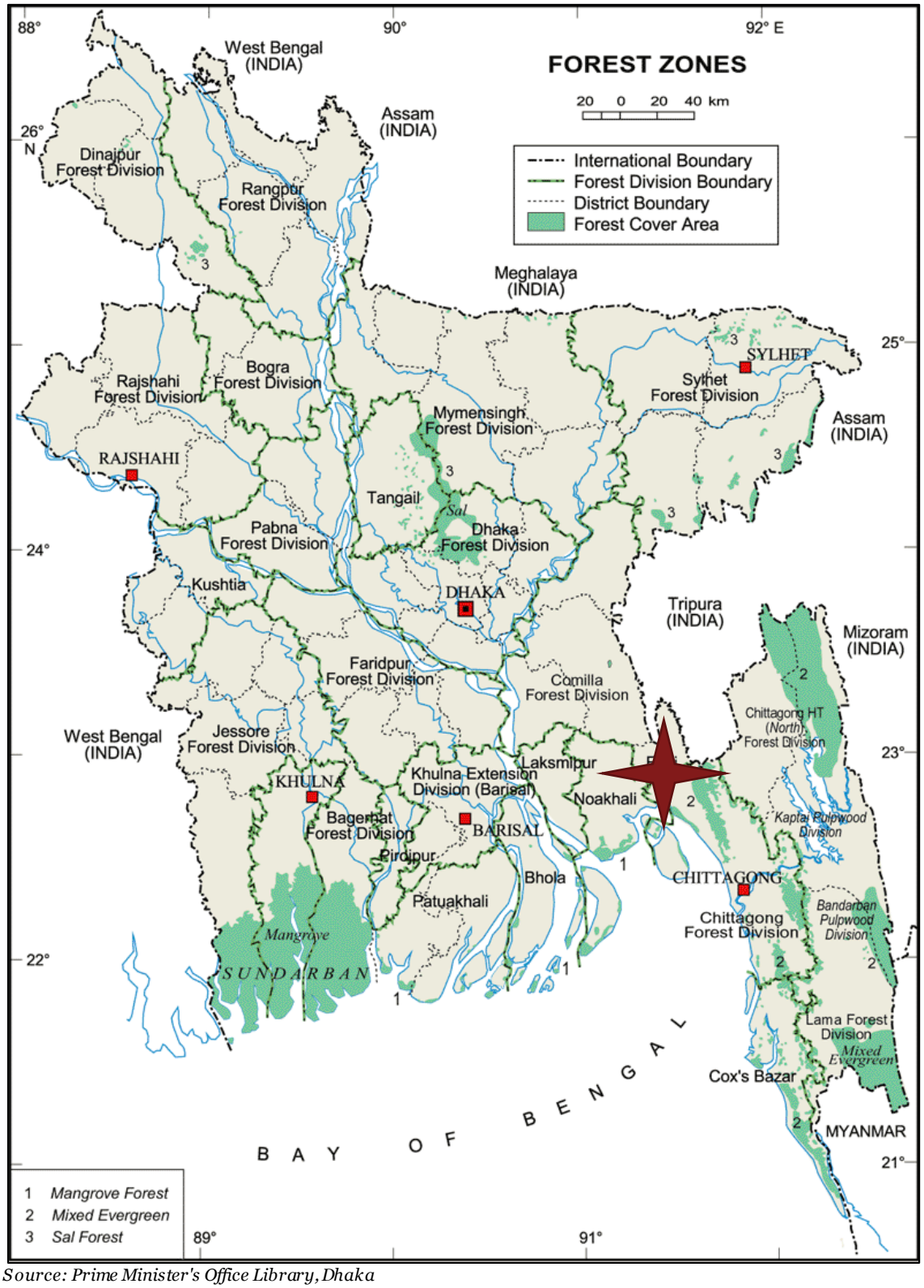


Source: Forest Department of Bangladesh

11.5.10.2. Forest Area/Vegetation Cover

There is no presence of forest land in and around the vicinity proposed site. However, the proposed project area supports well grown mangrove vegetation. A larger mangrove patch is falling in the eastern block of site. Significant mangroves are also present on southern and eastern side of western block of proposed EZ. The newly formed Char land of the area is declared as Government Land. In case of the project area, such Char land was handed over to forest department for taking up afforestation activities. Figure on the next page furnishes the forest map of Bangladesh.

Figure 90: Forest Areas of Bangladesh



Source: Prime Minister's Office Library, Dhaka

Figure 91: Mangroves' cover at proposed site

Source: Site visit

11.5.10.3. Flora & Fauna

The proposed site is located in such a location where tidal influence is prominent. The proposed site is located adjacent to the confluence point of Bay of Bengal and Boro Feni River. The two blocks of proposed EZ is located at either bank of the river. Muhuri Dam is located on Boro Feni River at just about 1.2 Km upstream from the proposed site. From Muhuri Dam location, the river splits into number of streams before finally meeting Bay of Bengal. 2 wider streams of the river flows through prosed EZ blocks as well. Based on drainage pattern study it was seen that number of channels/distributaries/streams of Boro Feni river crisscrosses both the blocks of proposed EZ. In the confluence area, the natural mixing of saline water (from Bay of Bengal) and fresh water (from Boro Feni River, its branches and other small creeks) create a brackish estuarine ecosystem. Such type of ecosystem is one of the most significant ecosystems from the point of view of species richness and biodiversity. The study area also supports substantial biodiversity. Information pertaining to ecological resources were collected from Chittagong Forest Division, local community, local fishermen and rapid site reconnaissance. The Mirsarai EZ EIA report[241] also considered to get an idea about the ecology of project area. The flora and fauna recorded from study area are presented in subsequent sections.

Flora

The proposed area is part of newly formed char land. Primary successor species like Uri /Dhansi grass is seen. Mangrove species like *Kalo Bain* (*Avicennia officinalis*), *Sada Bain* (*Avicennia marina)*, Keora (*Sonneratia apetala*) planted by forest department are the predominant species of the project area. As stated by forest department, *Gneoa* (*Excoecaria agallocha*) grows here naturally. *Nona Jhau* (*Tamarix dioica)* is also seen here in abundance. A larger mangrove patch is falling in the eastern block of site. Significant mangroves are also present on southern and eastern side of western block of proposed EZ. The eastern block is having more vegetation coverage than the western one

Among other floral components, *Eucalyptus sp*, *Casuarina sp*, Coconut (*Cocos nucifera*), Palm (*Borassus flabellifer*), Azadirachta indica (Neem), *Akashmani* (*Acacia auriculiformis*), *Khalsi* (*Aegiceras corniculatum*), *Bel* (*Aegle marmlos*), *Sirish* (*Albizia lebbek*), Mehagani (*Swietenia mehagoni*), *Jam* (*Syzygium cumini*), Jamrul (*Syzygium samarengense*), Devil's Tree (*Alstonia macrophylla*), Beetle Nut (*Arecha catechu*), Jackfruit (*Artocarpus heterophyllus*), Hijol (*Barringtonia acutangula*), *Akanda* (*Calotropis gigantean*), Papaya (*Carica papaya*), *Jambura* (*Citrus maxima*), Lime (*Citrus aurantifolia*), *Madar* (*Erythrina variegta*), Banyan (*Ficus benghalensis*). *Dumur* (*Ficus hispida*), Chinese rose (*Hibiscus rosa sinensis*), Mango (*Mangifera indica*),

[241] https://www.beza.gov.bd/wp-content/uploads/2017/01/EIA-Report-Mirershorai-2-EZ.pdf

Moringa (*Moringa olifera*), Banana (*Musa itinerans*), Date Palm (*Phoenix sylvestris*), False *Ashoka* (*Polyalthia longifolia*) etc. are commonly found in the study area.

Fauna

Beside domesticated mammals like cow, buffalo, goat, dog, cat etc., the recorded mammalian species from the project and its surrounding are Spotted Deer (*Axis axis*), Jackal (*Canis aureus*), Wild cat (*Felis chaus*), Common Otter (*Lutra lutra*), House shrew (*Suncus murinus*), Mole Rat (*Bandicota indica*), House Rat (*Rattus rattus*), Squirrel (*Callosciurus pygerythrus*), Indian Flying Fox (*Pteropus giganteus*), Indian Pipistrelle (*Pipistrellus coromandra*). Forest department stated about presence of an estimated population of 5,000 spotted deer in the jurisdiction of entire Mirsarai Range.

Commonly found bird's species in the project area are House Sparrow (*Passer domesticus*), Black Drongo (*Dicrurus macrocercus*), Pied Myna (*Sturnus contra*), Chestnut-tailed Starling (*Sturnus malabaricus*), Pale-bellied Myna (*Acridotheres cinereus*), Common Myna (*Acridotheres tristis*), Oriental Magpie-Robin (*Copsychus saularis*), Common Tailor Bird (*Orthotomus sutorius*), Common Pigeon (*Columba livia*), Eurasian Collared Dove (*Streptopelia decaocto*), Spotted Dove (*Streptopelia chinensis*), Red vented Bulbul (*Pycnonotus cafer*), Baya Weaver (*Ploceus philippinus*), White-breasted kingfisher (*Halcyon smyrnensis*), Common Kingfisher (*Alcedo atthis*), Chestnut-headed bee-eater (*Merops leschenaulti*), Asian palm swift (*Cypsiurus balasiensis*), Brown Fish Owl (*Ketupa zeylonensis*), Little Cormorant (*Phalacrocorax niger*), Indian Cormorant (*Phalacrocorax fuscicollis*), Little Egret (*Egretta garzetta*), *Yellow-billed Egret* (Egretta intermedia), Great Egret (*Casmerudias albus*), Cattle Egret (*Bubulcus ibis*), Pond heron (*Ardeola grayii*), Indian River Tern (*Sterna aurantia*), Night Heron (*Nycticorax nycticorax*) etc. During discussion with locals, it was revealed that sometime congregation of birds likely migratory species are seen in the area. However, forest department couldn't confirm about sighting migratory avifaunal species since such kind of study/information was not in their record. Since ample of evidences talk about the presence of migratory species in the Cox's Bazar Coastal belt, need for a detailed avifaunal study during detailed EIA stage is envisaged.

Commonly seen herpetofauna are Southeast Asian toad (*Bufo melanostictus*), Green from (*Euphlyctis cyanophlyctis*), Cricket frog (*Fejervarya sp*), garden lizard (*Calotes versicolor*), Skink (*Mabuya mabuya*), Gekko (*Gekko gecko*), House Lizard (*Hemidactylus brooki*), Indian Black Turtle (*Melanochelys trijuga*), Median Roofed turtle (*Pangshura tentoria*), Common Vine snake (*Ahaetulla prasina*), Checkered keel back (*Xenocrophis piscator*), Cobra (*Naja naja*) etc.

Fishes recorded from area are *Lote* (*Harpadon nehereus*), *Churi* Fish (*Trichiurus lepturus*), *Ilish* (*Hilsa ilsa*), *Bhola/Poa* (*Pama pama*), *Air* (*Sperata aor*), *Bele* (*Awaous grammepomus*), *Bhetki* (*Lates calcarifer*), *Kharu (Pisodonophis boro),* Spined anchovy *(Stolephorus tri*), Speigler's mullet *(Valamugil speigleri),* Spottail needlefish *(Strongylura strongylura), Ambassis* sp, *Tailla* (*Eleutheronema tetradactylum), Bele (Glossogobius giuris, Awaous grammepomus), Lal Chewa (Odontamblyopus rubicundus), Sada Chewa (Trypauchen vagina), Borguni (Terapon jarbua), Koi* (*Anabas testudineus*), Bengal Tongue Sole (*Cynoglossus cynoglossus)*. Other species like *Golda Chingri* (*Macrobrachium rosenbergii*), *Badga Chingri* (*Penaeus monodon*), *Harina Chingri* (*Metapenaeus Monoceros*), various crabs, snails, etc. are also found in abundance.

Figure 92: Biodiversity of Study Area

Common Myna/ *Salikh (Acridotheres tristis)*

Pied Myna/ *Gang-Salikh* (*Sturnus contra)*

Collared Dove (*Streptopelia decaocto*)

Intermediate egret (*Ardea intermedia*)

Black Drongo (*Dicrurus macrocercus)*

Mud Crab (*Scylla serrata*)

Cormorant (*Phalacrocorax niger)*

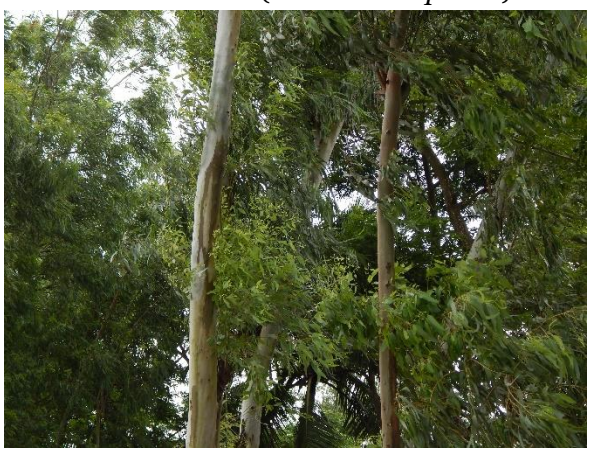
Nest of Weaver Bird hanging in Palm Tree

Naturally grown Gneoa (Excoecaria agallocha) in front row (of lesser height);
Planted Keora (Sonneratia apetala) of taller size in back row

Naturally grown Gneoa (*Excoecaria agallocha)*

Planted *Keora* (*Sonneratia apetala*)

Nona Jhau (*Tamarix dioica*)



Eucalyptus

Casuarina

11.5.11. Social Environment

For the development of EZ, the authority of BEZA proposes to acquire 7000 acres land. The proposed land for acquisition is mostly char land. The stakeholders' discussion with the local farmers and Upazilla Agricultural Officer indicated that, 10-15% of total proposed area is of grazing land and fish farming is being practiced.

Basis on AC land office information, Sonagazi Upazila admiration taken a mega project for Economic Zone. For EZ development, Upazila AC land office prepared some documents for land transfer and acquires as per BEZA's requirement.

4,512.56 acres land has been acquired by the authority from 7 mouza's as follows; (1) Thak Khoaj Lamchi 86.22 acres (2) Char Ramnarayan 922.66 (3) Char Khadaker 71.16 acres (4) Bahir Char 611.05 acres (5) Dakhin Char Khandaker 54.95 (6) Char Khoaj Lamchi 4.52 and (7) Char Nasrin 2762.00 acres.

The development of the EZ is proposed on area is a total 7000 acres of land. In accordance of the Bangladesh Economic Zone Act, 2010 (Act No. 42 of 2010), BEZA transferred 4512.56 acres land to Feni Economic Zone for long term basis. Remining 2487.44 acres of land area is transferred to BEZA/ under process of transfer to BEZA. According to local consultation meeting, more than 1500 PAPs would be directly and indirectly affected as a result of development of this project.

The proposed site boundary superimposed on Mouza Map and affected details of Plots are furnished in Annexures to this report.

11.5.12. Demography

Sonagazi is one of the upazila of Feni District in the Division of Chittagong, Bangladesh. There are 97 villages, 1 Pourasova, 9 Unions Parishads, 94 Mouza's in Sonagazi Upazila.

As per the 2011 census, Sonagazi Upazila has a total population of 254974 and the total male and female population of the Upazila is 125390 and 129584 respectively. The population density per sq km is 920. The literacy rate of the Upazila is 61%.

11.5.13. Social Infrastructure

Table below depicts the social infrastructure and public utility infrastructures available in Sonagazi upazila.

Table 107: Social Infra Structure

Social Infrastructure	Numbers
GoB Primary Schools	108
Secondary High Schools	24
Secondary Girls High Schools	3
Jr. High Schools	02
Dakhil Madrasa	13
Alim Madrasa	03
Non-government secondary school	20
Government Degree college	01
Non-government Degree college	1
Non-government college	1
Kawmi madrasah	30
Non-government Women college	1

Source: Bangladesh Bureau of Statistics

11.5.14. Livelihood and Economy

According to Bangladesh District Statistics, The economy of Feni district is predominantly agricultural. Out of total 237,575 holdings of the district, 128,830 (54.23%) holdings are farms and remaining 108,745 holdings (45.77%) are non-farms. Non-farm holdings largely depend on non-agricultural activities. Despite the growth of agriculture activities, the non-farm holdings play an important role for the district. Farm-holdings produce varieties of crops, namely, local and HYV rice, wheat, vegetables, spices, cash crops, pulses, oilseeds, maize and others. Various fruits like banana, jackfruits, guava, coconut, etc. are grown. Fishes of various species especially marine-species are abound in the district. Varieties of fish are caught from local rivers, tributary channels and creeks and from paddy fields during rainy season. Popular fresh water fish species are *rui, katla, mrigale, kalabous, aier, ghania, shaol, boal, gulsha, koi, shing, magur,* etc.

Non-farm activities are also very much significant in Feni district. Out of 41,622 establishments in the district where 118,603 persons are engaged in different types of non-farm activities. Female participation in non-farm activities is very poor. They constitute about 7.85% females as against 92.15% males. Wholesale & retail trade emerges as the single largest activity with 24,509 establishments (43.98%). Males and females engaged in the sector are 51,731 (43.62%) and only 427 (4.58%) persons respectively. In consideration of personnel strength, manufacturing is also an important among establishments where 22,223 persons are engaged. Among them the number of male and female is 15,554 and 6,669 respectively.

11.6. Impact assessment and proposed mitigation

The environmental impacts assessment was carried out considering present environmental setting of the project area, and nature and extent of the proposed activities. The proposed project involves development of EZ and off-site facilities for upcoming EZ in Feni. Potential environmental impacts associated with EZ and proposed off-site facility are classified as:

- Impacts during design/preconstruction phase
- Impacts during construction phase and

- Impacts during operation phase.

At pre-feasibility stage, based on the nature of upcoming industries, the likely impact on surrounding environment have been covered in the report. However, the detailed analysis of specific impacts on basis of scale and magnitude of the individual industry should be carried out at later phase of design along with more specific mitigation measures. During the study Sensitive environmental components were identified during the site visits and qualitative and quantitative techniques have been applied for direct and indirect assessment of impacts on these components. Table below provides the classification of environmental components.

Table 108: Classification of Social and Environmental Components

Components	Sub-component	Parameters
PHYSICAL		
Water	Surface Water and Ground Water	Hydrology, Water Qaulity
Air	Air	Air Quality
Noise	Noise	Noise Level
Land	Soil	Erosion, Soil Quality
ECOLOGICAL		
Aquatic/Marine	Fisheries/Aquatic Species and Aquatic/Marine Biology	Species, diversity, economic value, density and species
Terrestrial	Vegetation, Wildlife	Species and Population
INFRASTRUCTURE		
Water Supply	Surface/ground water	Frequency, quality
Electricity	—	Generation, Transmission, requirement
Transport	Highways/Roads	Access, availability, type, utility of each mode
Land Use	Rail	—
Drainage	Air, Water	Flooding, drainage

11.6.1. Impact Identification

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

Table 109: Impact Matrix for Proposed Off-site Infrastructure

S. No.	Activities	Impacts	Negative Impact		Positive Impact		Not Applicable
			Short Term	Long Term	Short Term	Long Term	
A	**Pre-Construction Phase**						
i	Land Acquisition for site, access road and utility supply system	Change in land use pattern		√			
		Impact on livelihood		√			
		Shifting of Utilities	√				
ii	Site Preparation	Removal of Vegetation.		√			
		Impact on aesthetic aspects		√			
		Impact on estuary		√			
B	**Construction Phase**						
i	Development of EZ and Construction of Boundary wall, embankment, Access Road, super dyke, electrical & water supply	Loss of Top soil		√			
		Soil contamination due to spillage of material	√				
		Surface water contamination	√				

S. No.	Activities	Impacts	Negative Impact		Positive Impact		Not Applicable
			Short Term	Long Term	Short Term	Long Term	
	system and administration building	Air pollution	√				
		Noise pollution	√				
		Increase in traffic	√				
		Un pleasant view	√				
		Impact on Health & safety	√				
		Social impact	√			√	
		Removal of Trees	√				
		Disturbance to estuarine brackish ecosystem		√			
		Loss of Mangrove vegetation		√			
C	**Operational Phase**						
i	Development of Off-site Infrastructure, i.e. Boundary wall, embankment, access road, water supply system, electrical supply line and administration building and operation of industries	Impact on the ambient Air Quality		√			
		Noise Pollution		√			
		Potential surface/marine water pollution due to industrial waste discharge		√			
		Impact on river hydrology due to construction of long embankment along the river/super dyke structure along shoreline		√			
		Disturbance to estuarine brackish ecosystem		√			
		Economic Development				√	
		Accessibility				√	
		Groundwater depletion		√			
		Potential for land contamination due to industrial activities		√			
		Increased Run-off		√			
		Generation of Employment				√	
		Natural drainage pattern		√			

11.6.2. Impact on Climate and Meteorology

11.6.2.1. Pre-Construction, Construction and Operation Phase

Proposed project site is located in tropical region where summers are much rainier than winter. Though no change in the macro-climatic setting (precipitation, temperature and wind) is envisaged due to the project, the microclimate is likely to be temporarily modified by vegetation removal, the addition of increased pavement surface and industrial operation which in turn might lead to rise of temperature especially during the daytime.

Mitigation Measures

- 28.91% Greenery/Open Space inside the EZ has been recommended
- Plantation shall be carried out at suitable location to minimize impact on micrometeorology

11.6.3. Impact on Land and Natural Drainage

11.6.3.1. Pre-Construction and Construction Phase

Some part site remains submerged in high tide. The preconstruction and construction phase will involve backfilling of the land to a level higher than the High Flood Line (HFL) of the nearby area with respect to the site to keep the eventual site ground level more than the high flood level ever recorded. Moreover, to prevent tidal blow, an embankment (super dyke structure) has been proposed all along the periphery of the EZ site for both the blocks. It will hider mixing of fresh and marine water that naturally occurs in the estuarine zones.

The impacts on land due to the project are as follows:

- Dredging and landfilling activity
- Removal of mangrove vegetation
- Construction of super dyke and hindered mixing of fresh and marine water
- Soil erosion due to vegetation clearance and excavation activities
- Topsoil degradation
- Generation of waste (hazardous and non-hazardous) from site clearance, excavations, civil works and activities of construction workers (general waste and sewage)
- Possible contamination of soil due to potential spills of lubricating oil, fuel oil, concrete etc.
- There could be alteration with the natural water flow pattern of the subject site due alteration of the natural contours. It may create problem pertaining to water logging, soil erosion, contamination of soil

11.6.3.1.1. Soil Erosion

During the pre-construction and construction phase, the site clearance activities including clearing of vegetation, construction of the structures, labor camps, storage area, toilets will involve removal of top soil which will result in slope destabilization and the land will be more susceptible to soil erosion.

The soil erosion will result in the run-off of the silt to surface water affecting estuarine and marine ecosystem with increased suspended sediment load and associated nutrients.

Most importantly after landfilling, if the land is be kept for long without further development, it leads to soil erosion due to loose top soil.

11.6.3.1.2. Soil Compaction

During construction activities, there will be compaction of soil in the project area due to construction of the internal access roads, movement of vehicles/ construction machinery and work force movement. The soil compaction would impact the soil physical properties such as reduction in pore spaces, water infiltration rate and soil strength etc. The extent of soil compaction is primarily limited to the Project foot print area and surroundings within 100 m distance. The impact is restricted to the construction phase of the project.

11.6.3.1.3. Landfilling with dredged material

The project site is located in low lying area and landfilling up to +11 m above mean sea level will be done during site development activity. About 71,287,978.9 cum filling material is required for landfilling. It is proposed that sand for the backfilling operations will be obtained by dredging from the Bay of Bengal. Dredging activity may be carried out near the site location or away from site. Dredging activity will have two fold impacts - firstly as a result of the dredging process itself and secondly as a result of the landfilling of the dredged material. Impacts during dredging are given in the later section.

In case the soil quality at dumping site is different from the sediment from the dredging sites, the ultimate soil quality of the disposal site can be affected. The soil used for landfilling should be free of any type of contamination and have similar characteristics as that of native soil to avoid impacts on the soil quality.

11.6.3.1.4. Waste Generation

The construction waste generated onsite comprises of materials such as excavated soil, rocks, concrete, wooden pallets, steel cuttings/filings, packaging paper or plastic, wood, metals etc. Municipal domestic wastes consisting of food waste, plastic, glass, aluminum cans and waste paper will also be generated by the construction workforce and labor camp site.

The waste generated during the construction phase will also include hazardous waste such as used oil, hydraulic fluids, waste fuel, grease and waste oil containing rags. If improperly managed, solid waste could create impacts not only to land but also to local air quality, water quality, and human health. Since the site will be raised about more than 11 m above Mean Sea Level, it is likely that the surface run off from site surrounding area will be drawn to the nearby surface water system and marine water. From the drainage pattern it is observed that, in general the flow of the surrounding area will be towards the river/estuary, eventually to the sea. If the wastes and raw materials are poorly managed, it will also be carried away by surface run off which will ultimately contaminate the aquatic system.

11.6.3.1.5. Soil Contamination

Soil contamination during the construction phase may result from filling activity, leaks and spills of oil, lubricants, or fuel from heavy equipment and wastewater. Such spills could have a long-term impact on soil quality, but are expected to be localized. Storm water run-off from the contaminated area can pollute the downstream soil and water quality of adjacent river, other waterbodies and sea.

Spill control measures such as the storage and handling of chemicals and fuel in concrete areas with secondary containment will be implemented to minimize impacts in the event of a spill.

The soil characteristics of the native soil may also be changed due to import of soil for filling and levelling purpose. It is envisaged that the filling activity may impact the native soil due to spillages during transportation of soil and run-off during filling and compaction.

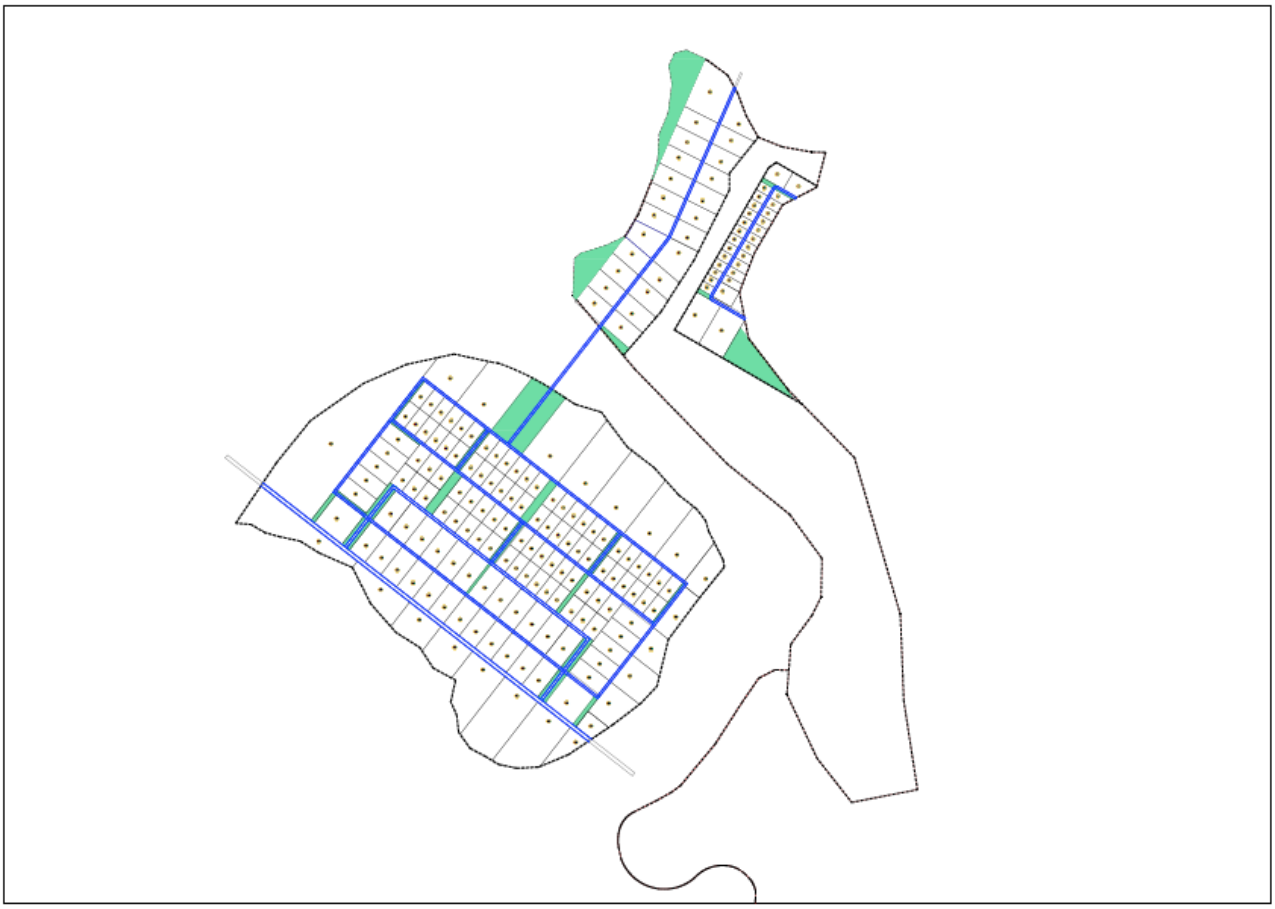
Apart from the embedded controls to be included in project design, the following mitigation measures will reduce the negative impacts on soil environment:

Mitigation Measures

- Top soil should be preserved and should be reused in borrow area or green area development
- Stripping of topsoil should be scheduled as the last mile activity (maintain vegetation cover for as long as possible) in order to prevent the erosion (wind and water) of soil;
- Care should be taken to minimize percolation of soil used for filling to adjacent rivers and sea during filling operations. Proper embankment should be provided in the downstream areas to minimize soil percolation to river/sea. Proposed super dyke structure will also help to resist soil erosion due to tidal influence.
- Provision for channels at suitable locations should be kept to maintain flow of marine water towards the riverine system
- Vegetation should be planned and maintained for slope stabilization and to prevent soil erosion after construction period;
- The disturbed areas and soil stockpiles should be maintained moist to avoid wind erosion of soil;
- The routes for movement of heavy machinery should be designated to avoid the soil compaction in other areas;

- Transport vehicles and equipment should undergo regular maintenance to avoid any oil leakages; designate routes for bringing construction material and outside soil;
- Construction contractor should designate the sites to be used for storage of hazardous wastes including waste oils, solvents, paint and batteries;
- The Contractor should ensure that no unauthorized dumping of hazardous waste are undertaken and contractor should dispose of hazardous waste through licensed traders ;
- Fuel and other hazardous substances should be stored in areas provided with roof, impervious flooring and bund/containment wall;
- The soil used for landfilling should have similar characteristics to the native soil and free of any type of contamination.
- Prior to dredging activity, analyze the soil sample to prevent impacts on the receiving environment as a result of mismatch in soil characteristics;
- During dredging activity, physical barriers such as silt screen/ curtains should be employed to prevent the spread of suspended sediments;
- The storm water drainage system shall be designed in synchronization with the existing natural drainage pattern. The direction of the flow shall be engineered to be same as that of the natural flow direction of rain water;
- The construction debris and high silt content of the virgin soil, post excavation, should be kept in a designated location so as to prevent leaching during monsoons. Storm water drains shall be designed and shall be connected with rainwater harvesting pits. All the construction wastes and excavated soil shall be temporarily stacked on tarpaulin sheet (in order to prevent leaching to groundwater) and a temporary tin sheet shall be placed on the top to prevent rainwater to maximum extent to carry the soil and construction wastes to the adjacent aquatic system
- To demonstrate the commitment towards better environment, 28.91% % of total area has been designated for green and open spaces. These green area shall be declared as the green zone of the EZ
- Based on drainage pattern study it was seen that number of channels/distributaries/streams of Boro Feni river crisscrosses both the blocks of proposed EZ. The flow of Boro Feni River through these channels/distributaries/streams must be ensured so that it doesn't erode the adjacent area. Drainage study also envisaged need of peripheral embankment on all sides of the proposed site (both blocks) to safeguard the EZ area from flooding. At the same time, the flow of river should also to be ensured.
- Based on the site gradient, the drainage pattern has been decided. It has been planned to discharge the flow of the internal drain into nearby highway drain to be developed.
    - The drainage system is planned to cater for the entire EZ through gravity flow
    - Drains are proposed to be provided on both sides of the roads
    - Open trapezoidal drain is considered for the surface run off collection due to easy maintenance for the primary road. Stone pitching is considered for the side walls and PCC for the base
    - Covered rectangular brick masonry drain is considered for the remaining areas for optimization of area under drainage
    - RCC box / pipe culverts of suitable sizes are considered for road crossings
    - Rainwater harvesting structures are envisaged all along the drain at every 30 m interval

Figure 93: Internal storm water drain network



Source: MACE analysis

11.6.3.2. Operation Phase

11.6.3.2.1. Impact on Soil Quality

After development of economic zone, disposal of industrial domestic and process waste may contaminate land and soil quality of the area. The impact can be significant and long term in case of uncontrolled discharges. Improper disposal of waste (hazardous and non-hazardous waste) may degrade soil, water, air quality and ecology of the area. As per the preliminary planning, heavy machineries, Iron, and Steel, Ship Building & Ship Breaking, Petroleum Bottling plant, Textile & RMG, finished leather products, electrical/electronic, light machinery, automobile, cement industries are envisaged for this EZ. These industries are anticipated to be polluting to some severe extent and hence discharge of the generated sludge, effluent and solid waste shall be done in a structured manner. The nature of waste likely to be generated in the EZ are described in the subsequent section.

11.6.3.2.2. Waste Generation

Type of waste likely to be generated from the proposed EZ has been furnished in below table. In the industrial cluster, quite a few severely polluting industries like heavy machineries, Ship Building & Ship Breaking, cement etc. have been proposed. Table on the next page presents industry wise nature of waste likely to be generated.

Table 110: Waste Generation from various industries

Industry Type	Nature of Waste
Heavy Industries	
Heavy machineries, Iron, and Steel: Manufacture of iron and steel products	Wastewater from iron and steel works contains a considerable amount of oil, dust, acid, iron and other metals. Blast furnace gas is treated by water spraying to remove dust. This wastewater contains cyanides, sulfur compounds, phenol, dust, metal ions, ashes, slags, and ore particles.
Ship Building & Ship Breaking	Different types of disposable materials and rubbish such as asbestos, spilled oil, heavy metals, Polycyclic Aromatic Hydrocarbons (PAHs), Polyvinyl Chloride (PVC), Polychlorinated Biphenyl Compounds (PCBs) etc. are disposed and spilled from scrapped ships. Waste generated from such project often get mixed with the beach soil and sea water around and has a severe detrimental impact on our coastal environment and marine biodiversity.
Petroleum and Petroleum Products (including bottling): Bottling plant	The bottling activity does not envisage generation/ disposal of any hazardous or toxic materials. However, effluent may contain paint residue to some extent
Other Industries	
Textile & RMG Sector: RMG, embroidery, dyeing, washing	Dyeing units which are an integral part of textile units are the main source of process waste water. The waste water generally has high TDS, high BOD, COD and the color quotient of the water is also high.
Leather and Leather Products: Finished leather products	Finished leather products industries, though less polluting, also use chemical adhesives and tanning chemicals. Examples of some of these chemicals include Chlorinated phenols, tribromophenol, chlorinated paraffins, dimethylfumarate etc. which are used to preserve the materials. These chemicals are easily leaked into the environment through the discharge from the factories
Electrical and Electronic Sector: Manufacture of TV, Fridge, AC and other household appliances	Effluent from electronic/electrical industry, light machinery, auto mobile and accessories may contain heavy metals, paint residue etc.
Light Machinery, Equipment and Furniture Sector: Manufacture of spare parts of machines	
Automobile and Accessories: Manufacture of automobiles	Effluent contains suspended and total solids such as oil, grease, dyestuff, chromium, phosphate in washing products, coloring; significant amount of dissolved organics, resulting in high BOD or COD loads
Non Metallic Minerals: Manufacture of cement	Dust generated from the manufacturing process and eventually collected in bag house are the significant source of waste

Beside the abovementioned, common type of waste like Process dry sludge, ETP sludge, e-wastes, scrap batteries, domestic dry sludge, used oil, etc. are likely to be generated from the industries proposed. All these wastes shall be segregated depending upon the source of its generation. Sludge generated from STP shall be dried using a filter-press and the dried sludge could be used as manure. There are authorized vendor for recycling e-waste in Bangladesh. These vendors are responsible for collecting the e-waste. General practice followed in Bangladesh regarding the process waste is storage in a dedicated room. As the country doesn't have a concrete rules and regulations guiding the process waste disposal, practice to design and execute a localized landfill unit could be helpful. A case study on e-waste has been furnished in Annexure to this report. Like construction phase, the waste generated during operation will also include hazardous waste such as organic/inorganic residue, used oil, scrap

batteries, waste fuel, grease, waste oil containing rags etc. If improperly managed, waste could pollute not only to land but also to local air quality, water quality, human health and the rich estuarine ecosystem.

The estimation of solid and sewage waste likely to be generated have been presented in subsequent sections.

Table 111: Estimation of Solid waste generation

Land use pattern	Total area Acres	Solid waste generation Population	Solid waste generation rate	Unit	Kg/day
Processing area					
Industries	3600.82	195992	200	gm/capita/day	39198.40
Loading & Unloading area	50.43	10980	100	gm/capita/day	1098.00
Utility	104.94	22848	100	gm/capita/day	2284.80
Road	507.16	0	10.12	kg/ha/day	2077.91
Green & open space	719.61		30.36	kg/ha/day	8845.03
Total processing area	4982.96	229820			53504.14
Non-processing area					
Admin & Customs block	8.40	9038	100	gm/capita/day	903.80
Supporting amenities	41.72	224439	400	kg/ha/day	89775.60
Total Non-processing area	50.12	233477			90679.40
Total	5033.08	463297			144183.54

Source: MACE Analysis

Table 112: Sewage and sullage generation estimation

Land use pattern	Total area	Water demand				Effluent generation		Sewage generation		Sullage generation		Total effluent, sewage & sullage generation	Infiltration @10%	Total sewage quantity
	Acres	Process water	Domestic Water	Potable	Non-Potable	In %	In cum/day	In %	In cum/day	In %	In cum/day			
Processing area														
Industries	3600.82	102047.53	8819.64	117588.17	4365.72	50%	51,023.77	72.09%	3147.25	20.48%	13135.46	67,306.47	12195.39	79,501.86
Loading & Unloading area	50.43	735.05	494.10	1107.49	244.58	50%	367.53	72.09%	176.32	20.48%	343.46	887.30	135.21	1,022.51
Utility	104.94		1028.16	622.04	508.94	50%	-	72.09%		20.48%	594.21	594.21	113.10	707.31
Road	507.16		369.59	223.60	182.95	50%	-	72.09%	131.89	20.48%	213.60	345.48	40.65	386.14
Green & open space	719.61		524.41		760.39								76.04	76.04
Total processing area	4982.96	102782.59	11235.90	119541.30	6062.58		51391.29		3455.45		14286.72	69133.47	12560.39	81693.86
Non-processing area														
Admin & Customs block	8.40		406.71	313.17	134.21		-	72.09%	96.76	20.48%	274.17	370.92	44.74	415.66
Supporting Amenities	41.72		10099.76	7776.81	3332.92		-	31.74%	1057.87	20.48%	6808.38	7,866.24	1110.97	8,977.22
Total Non-processing area	50.12		10506.47	8089.98	3467.13				1154.62		7082.54	8237.17	1155.71	9392.88
Total	**5033.08**	**102782.59**	**21742.36**	**127631.28**	**9529.71**		**51391.29**		**4610.08**		**21369.27**	**77370.64**	**13716.10**	**91086.74**

Source: MACE analysis

Mitigation Measures

- Provision shall be made for proper storage and disposal of industrial waste by respective industries.
- Special care must be taken by all the industries to avoid any kind of accidental contamination which could be a threat to the surrounding estuarine and marine ecosystem
- Provisions shall be made to segregate e-waste with rest of the wastes generated.
- Alliance shall be done with e-waste recycling vendor and the segregated e-waste shall be send to the vendor for recycling purposes
- ETP shall be mandatory for all the industries. Every unit shall have its own ETP unit.
- Based on estimated quantity of sewage and effluent, Sewage Treatment Plant (STP) of total 91 MLD capacity has been proposed respectively. As an alternative, sewage and effluent may be pumped out from the proposed EZ and sent to central CETP/STP of BEZA.
- A 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 licensed traders for recycling and rejected waste should be disposed as per the best industrial practice for particular waste
- Industrial waste generated should be stored on sealed surfaces and should be disposed as per the best industrial practice
- Local environmental bodies shall be consulted for the initiation for the designing and constructing localized landfill for the disposal of process waste.
- 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) should be used where applicable.
- Organic waste should be resold to value addition industries or can be fed to live stock.
- Sludge generated in effluent treatment plant should be sold to authorized recyclers or could be dried into cakes and used as manure for green belt

11.6.4. Impact due to Super Dyke

The proposed site is located in such a location where tidal influence is prominent. The part of the site remains submerged during high tide due to the proximity of Bay of Bengal. Moreover, the proposed area is crisscrossed by many channels/distributaries/streams of Boro Feni River. Muhuri Dam is located on Boro Feni River at just about 1.2 Km upstream from the proposed site. From Muhuri Dam location, the river splits into number of streams before finally meeting Bay of Bengal. 2 streams of the river flows through prosed EZ blocks as well. The Bay of Bengal forms entire southern boundary of the site. In the project area, the natural mixing of saline water (from Bay of Bengal) and fresh water (from River and other small creeks) create a brackish estuarine ecosystem. The area supports significant growth of various mangrove species as well. A super dyke structure has been proposed all along the periphery of EZ site (for both of the EZ Blocks) to protect low-lying site from inundation of the sea. This structure will have significant impact on the tidal flow and generation of brackish water. It may eventually cause decline in mangrove species population, which will be irreversible in nature.

Mitigation Measures

Though the impact due to the structure is likely to be irreversible in nature, following measures (mentioned in the next page) must be taken as a compensatory act and an effort to negate the impact to some extent-

- Provision for channels at suitable location on embankment to allow the tidal flow (in and out) to some acceptable volume
- Plantation and it's maintenance on the buffer zones as shown in the master plan
- Effort to plant mangrove species on the *Char* Land which is likely to be formed on the outer periphery of proposed super dyke

11.6.5. Impacts due to Dredging

11.6.5.1. Pre-Construction and Construction Phase

The preconstruction and construction phase will involve backfilling of the land to a level of +11 m above mean sea level. It is proposed that sand for the backfilling operations will be obtained by dredging from the Bay of Bengal. The possible physical impacts due to dredging are as follows:

- Resuspension of bottom sediments, thereby increasing turbidity
- Riverbank erosion
- Dispersion from and accumulation into bottom sediment of toxic substances
- Reduced primary productivity due to decrease in the depth of the euphotic zone
- Impact on habitat and breeding/spawning ground of fishes and other aquatic fauna due to bottom disturbances
- Temperature alteration
- Increase in nutrient levels
- If the dredged material is polluted, it may affect the ecosystem, and fisheries activities at both dredging and dumping locations

The extent of impacts due to dredging activity is highly varied and site specific, depending upon a number of factors shown below:

- Method of dredging and disposal
- Channel size and depth
- The size, density and quality of the material
- Background levels of water and sediment quality, suspended sediment and turbidity
- Current direction and speed
- Rate of mixing
- Presence and sensitivity of animal and plant communities (including birds, sensitive benthic communities, fish and shellfish)

Mitigation Measures

- Prior to dredging activity, analyze the soil sample to prevent impacts on the receiving environment as a result of mismatch in soil characteristics;
- During dredging activity, physical barriers such as silt screen/ curtains should be employed to prevent the spread of suspended sediments;
- Maintain the extent of the turbidity plumes close to the dredging and disposal areas to minimize impacts on aquatic fauna habitat;

- Visually inspect for aquatic life and terrestrial organisms and stop dredging activity in case of any organism in the vicinity;

11.6.6. Impact on Air Environment

11.6.6.1. Pre-construction phase

The pre-construction phase will involve site preparation activity for development of EZ, construction of access road and water supply system which will lead to dust generations and other fugitive emissions. But these emissions will be localized and have impact for short duration only during site preparation activity.

Mitigation Measures

To minimize the dust generation, water should be sprinkled regularly at the site and low Sulphur diesel should be used in land levelling equipment to control the SO_2 emissions.

11.6.6.2. Construction Phase

Air quality will be impacted from the following sources during the construction phase:

- Fugitive dust emissions from site clearing, excavation work, cutting and levelling work at sites and access/ internal roads, stacking of soils, handling of construction material, transportation of material, emission due to movements of vehicles, plying of heavy construction machinery etc.;
- Vehicular emissions due to traffic movement on site and on the connecting roads;
- Exhaust emissions (containing PM10, PM2.5, SPM, CO, HC, NOx, SO2 etc.) from construction machineries, other heavy equipment as bull dozers, excavators, compactors; and
- Emissions from diesel generator required for emergency power during construction period.

Mitigation Measures

To mitigate the construction impacts, project proponent should have contract agreements with contractors as well as sub-contractors to ensure implementation of mitigation measures.

- Sprinkling of water at construction site and haul roads
- Transportation of Raw materials in covered trucks
- Construction of barricades between the settlements and the site to minimize travel of fugitive emissions towards settlements
- Shrub Plantation (native species) on either side of the approach road to mitigate the fugitive dust emissions
- Construction vehicles and machinery should be regularly serviced and check for pollution control
- Prohibit usage of adulterated fuel in vehicles for running construction equipment and vehicles
- Covering the scaffolding (in case of administration building) to reduce the dust emission in outside environment
- Speed of vehicles on site is recommended to be 10-15 km/hour which will help in minimizing fugitive dust emissions due to vehicular movement

11.6.6.3. Operation Phase

Post development of the EZ & setting up of industries, the impacts on the air quality of the area will be from (a) air emissions from the proposed industries and (b) emissions from increased vehicular movements. Many of the industries proposed for this EZ like Heavy machineries, ship building & ship breaking, cement etc. cause significant air pollution. The cumulative effect of the industries along with upcoming other EZs in the area may

have severe negative impact on the air quality of the site and the nearby areas. Nature of Air emissions due to various industrial operations are furnished in the table below.

Table 113: Emissions from various industries

Industry Type	Nature of Emission
Heavy Industries	
Heavy machineries, Iron, and Steel: Manufacture of iron and steel products	Significantly air polluting in nature. Particulate Matter, SO2, NOx, CO emission occurs from Plant, Melting Shop, Captive Power Plant, Ore Crushing, Screening and Beneficiation Plant, Slag Crushing Plant and Material Handling areas
Ship Building & Ship Breaking	The sources of air emissions during industrial operations include blasting, painting, metal plating and surface finishing, machining, metal working, solvent cleaning and degreasing. The probable sources of emissions to air are in the form of VOCs from the shipbuilding process operations; Particulate Matter, SO2 and NO2 from utilities like boilers; and SO2, NOx, HC and CO from vehicular traffic
Petroleum and Petroleum Products (including bottling): Bottling plant	No significant emission from bottling plant is envisaged. In general vehicular emission may cause pollution to some marginal extent
Other Industries	
Textile & RMG Sector: RMG, embroidery, dyeing, washing	The major air pollutants generated from textile mills include Suspended Particulate Matter (SPM), sulphur dioxide gas, oxide of nitrogen gas, etc. The hydrocarbons are emitted from drying ovens and from mineral oils in high-temperature drying/curing. The residues from fibre preparation also emit pollutants during heat setting processes. Carriers and solvents may be emitted during dyeing operations depending on the types of dyeing processes used and from wastewater treatment plant operations. Carriers used in batch dyeing of disperse dyes may lead to volatilisation of aqueous chemical emulsions during heat setting, drying, or curing stages. Inhalation of the dust generated where cotton fibre is converted into yarn and fabric significantly contributes to byssinosis (an occupational lung disease).
Leather and Leather Products: Finished leather products	No significant emission from finished leather products manufacturing industries are envisaged. Minor fumes due to use of adhesives / gums may generate from such industries
Electrical and Electronic Sector: Manufacture of TV, Fridge, AC and other household appliances	Chlorofluorocarbons (CFCs) used manufacturing of refrigerators, freezers, chillers, and air conditioners in electrical and electronic industries are having potential to damage ozone layer of atmosphere. Release of VoCs due to painting may also occur.
Light Machinery, Equipment and Furniture Sector: Manufacture of spare parts of machines	No significant air emissions is generated from light machinery industries. However, volatile organic compounds may be released due to painting, finishing activities. Thermal cutting processes of base metals such as stainless steel, low alloy steels, hard facing materials and other alloys may release pollutants that contain manganese, chromium, cadmium, lead, nickel or other known hazardous substances.
Automobile and Accessories: Manufacture of automobiles	Air emissions are envisaged due to burning of various fuels and emission in the process of fabrication, welding, cutting, blasting, metal plating, surface finishing and painting process
Non Metallic Minerals: Manufacture of cement	Air pollutants generated during the cement manufacturing process consist primarily of particulates from the raw and finished materials. The cement dusts are alkaline with size varying from 5 µm to 250 µm. Beside these, fugitive dust can be generated due to process related &

Industry Type	Nature of Emission
	Non-process related activity. Oxides of carbon, nitrogen, and sulfur are mainly produced as a byproduct of fuel combustion for power generation. SO2 is also produced from oxidation of volatile sulfur present in the kind of limestone used as raw material

Source: In house intelligence and PwC analysis

Mitigation Measures

- Provision should be made for peripheral green belt all along the EZ boundary and in the buffer zones as shown in the master plan. For peripheral green belt, the tree species should 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 cascading canopy.
- Development of thick green belt and organized greens within each industrial plots. Broad-leaved species, which can absorb pollutants, should be planted as they help to settle particulates with their higher surface areas along with thick foliage
- Power Generators should be provided with stacks of adequate height (higher than nearest building) to allow enough dispersion of emission.
- Process emission should be controlled with the installation of adequate air pollution control systems like Venturi scrubbers, wet scrubbers, Electrostatic precipitator, cyclone separator & bag filter etc. as applicable to the individual industry
- 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 to check the air pollution level.
- Preference of usage of clean fuel like LPG, low Sulphur diesel should be explored
- Odor should be managed at the site using odor suppressant and planting fragrant flowering trees.
- Periodic checkups should be conducted for the workers to reduce exposure levels, rotate the shifts of the workers.

11.6.7. Impact on Noise Environment

11.6.7.1. Preconstruction and Construction Phase

Pre-construction phase will involve site clearance activity for development of access road and utilities. The site clearance will involve removal of vegetation and land levelling activities. Operation of different machineries and equipment for construction activities, running of heavy load traffic for construction materials transportation, and regular traffic movement may generate noise during construction period. The heavy equipment, machineries, transportation and earthworks used for the construction activities are the major sources of noise. It is envisaged that there will be an increase in traffic and thereby in traffic noise impacts on the receptors near the approach road from the transportation of equipment, construction materials. Few settlements located in the northern side of proposed site are likely to be exposed to higher level of noise due to construction activity if proper mitigation measures are not taken.

Mitigation Measures

The following mitigation measures should be implemented to minimize potential noise impacts during preconstruction and construction phases:

- Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn out components should be conducted;

- Machinery and construction equipment that may be in intermittent use should be shut down or throttled down during idle time;
- Acoustic enclosure should be provided for the DG set;
- Equipment known to generate noise strongly in one direction should be orientated so that the noise is directed away from nearby sensitive receptors as far as practicable;
- Honking should be avoided;
- Construction work should be carried out only during day time (from 8.00am to 6 pm);
- Machinery to be used should comply with the noise standards prescribed by DoE.
- To deal with noise exposure by construction workers in construction site, pocket guide by OSHA is helpful.
- At individual worker level, the construction contractor should be insisted to provide earmuffs to the workers exposed to high noise levels.

11.6.7.2. Operation Phase

After development of offsite infrastructure and economic zone, the noise levels may rise due to vehicular movement, DG set, pump sets, Boilers, mechanical and industrial operations, Auxiliary activities like operation of water pumps, booster pumps etc. Operations of ventilation units and fans can also add up to the noise generation. In heavy machinery industries, noise is generated mostly from Turbine, Crushing units, Screening unit and vehicular movement. High noise levels are generally found in the textile process from fiber to fabric (spinning and weaving mill) and automated machines. In cement plants noise levels near the raw material mill, ball mill and compressor may be higher. Main sources of noise within the ship breaking/building industries are noise due to dismantling, compressor, pump rooms and operation of D.G. Set in case of power failure. From other type of industries proposed in the EZ the major source of noise generation are vehicular movement, machinery operation and use of DG in case of power failure. The following mitigation measures are suggested to mitigate the noise pollution during operation phase.

Mitigation Measures

- Pumps should be fitted in close room, preferably acoustic enclosure to reduce the noise generation
- Green buffer should be developed all along the project boundary and buffer zone. This will help in reducing the noise level significantly.
- Noise regulators must put a strong mandate and fine on vehicle operators which are not properly maintained, produce noise (silencers not proper).
- All industries should obtain clearance from DoE 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 DoE.
- Job rotations should be practiced for workers in working at noise intensive locations to prevent prolonged exposure to high noise level as it may lead to deafness, fatigue, head ache, nausea and drowsiness. Propose PPEs must be made compulsory for workers working at locations where the intensity of noise is high.
- Acoustic design with sound proof glass paneling will be provided for critical operator cabins / control rooms of individual modules as well as central control facilities.
- Proper greasing, periodic checkups for frictionless movements.
- Honking should be regulated within the economic zone

11.6.8. Impact on Water Environment

11.6.8.1. Pre-Construction and Construction Phase

11.6.8.1.1. Impact on Surface Water and Groundwater Resource

The assessment suggests that basis industrial assessment and demand forecasting for the proposed EZ, potable water demand for the proposed EZ would be about 63.58 MLD and total water demand would be 72.47 MLD. This figure is indicative in nature and may vary based on on-ground implementation of the project. The private developer may undertake a separate industry assessment and master planning exercise in order to validate this figure.

Site is situated adjacent to Bay of Bengal on its Southern side. It is proposed to provide desalination plant adjacent to site to meet the water demand of EZ on a long-term basis. Detailed hydrogeological investigations need to be carried out based on which, intake of water for desalination plant shall be provided.

For the initial demand it is planned to build three to four new bore wells within the proposed site to draw the ground water. Exact location of water intake (i.e., the locations of the tube wells) within the site needs to be finalized during the construction stage.

11.6.8.1.2. Impact on Surface Water and Groundwater Quality

A super dyke structure has been proposed all along the periphery of EZ to protect low-lying coastal areas from inundation of the sea. This structure will have significant impact on the tidal flow and generation of brackish water. It may eventually cause decline in mangrove species population, which will be irreversible in nature

The major source of wastewater generation during construction phase is from the labor camp, which will be established for project construction activity. There is a potential for contamination of surface and groundwater resources resulting from improper management of sewage. The storage of used engine oil and lubricants as waste materials has a potential to create impacts if spillage occurs.

The quality of surrounding water bodies including the estuary, bay, River and creeks could also be affected due to surface runoff from contaminated soil (soil contamination due to oil/ fuel spillage and leakages), particularly during monsoon season. The surface runoff carrying the loose top soil will lead to increased sedimentation in the receiving water bodies. Contamination to water bodies may also result due to oil spilling during construction activities and/or surface runoff from the construction site to the adjacent estuarine and marine system. Thus measures are required to be taken to minimize the surface water pollution.

Mitigation Measures

- Provision for channels at suitable location of embankment to allow the tidal flow (in and out) to some acceptable volume
- Provision should be kept by the contractor for effective spill management plan
- 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
- Construction of storm water drains along with sedimentation tanks with sand bags as partition as barrier for direct flow of run off to aquatic system
- Check dams should be provided to prevent construction runoff from the site to the surrounding water bodies.
- Minimize run-off by using sprays for curing
- Construction of adequate nos. of toilets and proper sanitation system for workers to prevent open defecation along the river banks/water supply lines

- Construction of soak pits/septic tanks to dispose-off the domestic wastewater generated from labor camps to prevent disposal of sewage in surface water bodies. Alternatively collect labor camp sewage and connect to nearby municipal sewers.
- 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
- Use of licensed contractors for management and disposal of waste and sludge;
- Laborers should be given training towards proactive use of designated areas/bins for waste disposal and encouraged for use of toilets. Open defecation and random disposal of sewage will be strictly restricted;
- To prevent surface and ground water contamination by oil/grease, leak proof containers shall be used for storage (preferably in paved area) and transportation of oil/grease
- Spill/ leakage clearance plan to be adopted for immediate cleaning of spills and leakages.

11.6.8.2. Operation Phase

To cater the industrial water requirement water from Bay of Bengal after desalination will be used. The development of economic zone shall lead to the generation of process and domestic effluent. Liquid waste from the proposed industries will be having potentiality to affect the water quality. The direct discharge of the untreated process and domestic effluent waste will lead to impacts in the surface water quality. Also, it is anticipated that surface run-off may significantly increase post development of economic zone which may impact surface water quality. The nature of waste and effluent likely to be generated from various industries are discussed under 'waste generation' section.

Following measures should be adopted during operation phase to minimize impacts of development of Economic zone on water quality.

Mitigation Measures

- Each industry should obtain consent of DoE Bangladesh before construction and operation and should comply to the conditions laid by them
- The Industry should also obtain the consent of the water abstraction limit from DoE, Bangladesh.
- No leachate, waste water and waste material should be stored in pervious unlined area/pond.
- Efficient Rain water Management Plan will be adopted to reduce the impact due to surface runoff
- ETP shall be mandatory for all the industries. Every unit shall have its own ETP unit.
- 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
- Sludge generated in effluent treatment plant should be sold to authorized recyclers or could be dried into cakes and used as manure for green belt
- A water balance between the abstracted water and the water diverted for process purposes and domestic purpose shall be developed. Based on the volume of the process and domestic waste, ETP and STP shall be designed.
- Monitoring of surface and ground water quality should be done. Analysis of the process waste water should also be done on regular basis to check efficiency of ETP and STP.
- The effluent treated process waste water shall be analyzed and the analyzed parameter should be well below the Bangladesh Standard (ECR, 1997).
- Rainwater harvesting structures are envisaged all along the internal drain at every 30 m interval

- Each industry should practice rain water harvesting to minimize the water consumption and reduce run-off from the site

11.6.9. Impact on Biodiversity

As a part of site preparation activity, backfilling will be done to reach ground level of +11 m above Mean Sea Level and vegetation cover including precious mangrove species will be cleared. Material for backfilling will be dredged from Bay of Bengal. A super dyke structure has also been proposed all along the periphery of EZ zone to protect low-lying coastal areas from inundation of the sea. As a result of these, following impacts on biodiversity is envisaged

- Dredging- Impact on habitat and breeding/spawning ground of fishes and other aquatic fauna due to bottom disturbances. Affect bottom dwellers; the Benthos are likely to be majorly affected. Possibility for loss of wildlife
- Site preparation- Vegetation cover including significant Mangrove cover will be lost from the area. The loss will be irreversible in nature. Various Avifauna, Herpetofauna, Pisces, Arthropods dependent with on the intertidal Char Land, Mangroves and other vegetation for various reason like shelter, basking, Hunting resting will be affected.
- Construction of Dyke- Almost in the entire project area, the natural mixing of saline water (from Bay of Bengal) and fresh water (from Boro Feni River, its' branches and other small creeks) creates a brackish estuarine ecosystem. The proposed dyke may act as a physical barrier and will have significant impact on the natural tidal flow. This will affect creation of brackish water which may eventually cause decline in mangrove population in the area. It will also hinder the movement of aquatic species specifically fishes which flows in and out in the fresh water stream during high tide and low tide respectively.
- Contamination- Accidental spillage, poor management of waste may contaminate the water, eventually aquatic life

Once the site is developed on proposed land, which is currently being used as habitat by various species, will be lost. It is envisaged that, during operational period very limited diversity will be found in the EZ area. Poor waste-effluent-sewage management, mishandling of raw material, accidental spillage may contaminate the river as well as marine ecosystem. This kind of occurrence can threat wildlife of a vast area of the EZ surrounding. Therefore, proper mitigation measure is essential.

Mitigation Measures

Following measures must be taken as a compensatory act and an effort to negate the impact on biodiversity-

- Provision for channels at suitable location of Super Dyke Structure to allow the tidal flow (in and out) to some satisfactory volume
- Plantation on the buffer zones as shown in the master plan and monitoring of its survival
- Effort to plant mangrove species on the Char Land which is likely to be formed on the outer periphery of proposed super dyke
- Wildlife awareness program among the workers (during preconstruction, construction and operation phase) should be conducted. Workers should report sighting of any uncommon species to the environmental expert, who immediately should inform the incidence to local forest/wildlife authority/ conservationists
- Strict instruction to the workers must be passed on, so that they do not harm-catch-kill any wildlife or cut down trees for any reason
- Awareness program on wildlife conservation among local community should be conducted so that they can also feel the necessity for conservation of wildlife of the area

- Emission, effluent and waste must comply to GoB standard norms
- No waste shall be discharged in water bodies
- Accidental spill management plan should be developed
- No infrastructure development activities shall be encouraged close to the river/sea shore line
- A half-yearly ecological assessment (preferably in winter and monsoon) during preconstruction, construction, operation phase should be conducted through specialists to record chronological trend of biodiversity in the project area surrounding

11.6.10. Impacts on Occupation Health and Safety

The lack of adequate mitigation measures on the health and safety of the workers will result in accidents and injuries leading to loss of life or property. It is proposed to implement the following mitigation measures to ensure safe work place for the construction labor.

Mitigation Measures:

- The project proponent should ensure that the contractor (make part of contractors contract) to have and occupational health and safety plan. The contractor should provide accidental insurance and medical insurance to all the workers.
- The contractor should conduct daily tool box meeting for all workers to discuss potential work related hazards and other safety aspects.
- The contractor should conduct training for all workers on safety and environmental hygiene at no cost to the employees.
- The contractor should maintain first aid facilities for the workers and will instruct and induct all workers in health and safety matters (induction course) including construction camp rules and site agents/foremen will follow up with toolbox talks on a weekly basis. Workforce training for all workers starting on site will include safety and environmental hygiene.
- Fencing on all areas of excavation greater than 1m deep and sides of temporary works should be observed.
- Workers should be provided with appropriate personnel safety equipment such as safety boots, helmets, gloves, protective clothes, dust mask, goggles, and ear protection at no cost to the workers.
- Reversing signals (visual and audible) should be installed on all construction vehicles and plant.
- Contractor should be responsible for evacuation injured person to the nearest medical center
- Pertinent H&S trainings should be provided to all the workers with respect to hazards linked to the activities. Additionally, the workers will be informed of precautions to be taken to avoid impacts to the local community;
- Monitoring of the PPE usage can be strengthened, in that, a mechanism can be adopted whereby defaulters receive a warning on non-usage and stringent actions can be taken on subsequent offences;
- Maintain H&S records of occupational H&S incidents, accidents, diseases and dangerous occurrences
- The contractors should ensure H&S standards of labor camps. The labor camps will be established in the proposed site area. Additionally, the representative of project proponent should conduct random spot checks to determine any issues related to improper waste disposal or the living conditions in these camps (i.e. presence of secure shelter and flooring, number of persons per room, number of toilets for the manpower, water availability etc.);

- Strong protocols should be built as part of contractual obligations around zero tolerance of child labor or harassment of women workers and even health and safety aspects. These should also be monitored by supervision and monitoring team.
- Individual industries should also adopt best practice as per the industry standards for proper implementation of occupational health and safety.

11.6.11. Flood and Cyclone Risk

The project site is located adjacent to Bay of Bengal. Proposed site area falls under Cyclone and Flood Risk zone. It is recommended to prepare a proper emergency preparedness plan for the project to combat sudden strike of cyclone.

11.6.12. Sanitation and Disease Vectors

Potential sanitation and impacts from disease need to be controlled by maintaining hygienic conditions in the EZ area throughout the operational phase as well during construction by implementing appropriate social and health programs for the Project. BEZA should ensure that improvements are made to site sanitation and should implement the mitigation measure below for all operational activities and also that the contractor (during construction phase)/ industries (during operation phase) ensures that:

- Measures to prevent malaria should be implemented by installation of proper drainage to avoid water stagnation, etc.
- Standing water should not be allowed to accumulate in the drainage facilities or along the warehouse sides to prevent proliferation of mosquitoes.
- Temporary and permanent drainage facilities should be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface water ponds.
- Malaria controls should be implemented in line with social plans for the Project.
- HIV/AIDS awareness and HIV-AIDS education and prevention program should be implemented in line with social plans under the social development work stream.

11.7. Stakeholders' Consultations

This section provides the stakeholder identification and analysis as well as a brief understanding of the engagement process for the project. "Stakeholder" refers to those who have plausible stake in the environmental/social impacts of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. It is highly desirable for all key stakeholders to arrive at a consensus on sensitive features, impacts and remedial actions. Stakeholder identification was done by examining the potential impacts of the project in terms of:

- Who may be affected directly (project affected people);
- Which agencies might have responsibility for the impact management;
- Which other organizations might have an interest in monitoring proponent activities or have local knowledge to contribute; and
- Which private/non-government sector entities might face financial and social hardships if the predicted impacts occur

The stakeholders identified in the project comprise of project impacted people, project beneficiaries, various government officials.

The main objective of the consultation process is to minimize negative impacts of the project and to maximize the benefits from the project to the local populace. The objectives of public consultation as part of this project are:

- Promote public awareness and improve understanding of the potential impacts of proposed projects
- Identify alternative sites or designs, and mitigation measures
- Solicit the views of affected communities / individuals on environmental and social problems
- Improve environmental and social soundness
- Clarify values and trade-offs associated with the different alternatives
- Identify contentious local issues which might jeopardize the implementation of the project
- Establish transparent procedures for carrying out proposed works
- Inform the affected populace about the entitlement framework and to settle problems with mutual consent
- Create accountability and sense of local ownership during project implementation; and
- To obtain information on baseline environment

11.7.1. Methodology of Stakeholders Consultation

Different techniques of consultation with stakeholders were used during project preparation, viz., in-depth interviews, public meetings, group discussions etc. to understand the socio-economic profile of the community and the affected families, baseline environment, environmental/social concerns etc. The Focused Group Discussions (FGD) were carried out with different group at the proposed EZ area. PwC personnel discussed about the future developments and benefits to the community due to the development of the EZ. The FGD was carried out in presence of local businessman, fish cultivator, fishermen and local elites. Locals from 2 villages i.e. Char Khondaker, Char chandia, under Sonagazi and Char Chandia Union participated in the discussion. Consultation with various institutional stakeholders like Forest Department, Revenue Department, and Electricity Board etc. had also been conducted during the study period.

11.7.2. Level of Consultations

Public consultations in the form of institutional and focused group discussions were carried out during the period from 4th January 2018 till 11th September 2018. Types of consultations done with various participants using various tools including, interviews with government officials, focused group discussion etc. are presented in the table below.

Table 114: Types of Consultations

Level	Type	Key Participants
Institutional	Stakeholder Meeting	Various Govt. Officials
Community	Focused Group Discussion	PAP, Women, marginalized people

Source: Stakeholder Consultations

11.7.3. Institutional Stakeholders Consultation

Date of Meeting: 04 January 2018

Location of Meeting: Upazila Nirbahi Officer's Office, Sonagazi

Officials Consulted:

Table 115: Institutional Stakeholders Consultation Details for meeting on 4th January 2018

Local Government			
Name of Person	**Designation**	**Contact Details**	**Date of Consultation**
Nizamuddin Ahmed	AC Land, Sonagazi Upazila	1713187329	04-Jan-17
Zakir Ahmed	Local Government Engineering Department	1715041245	04-Jan-17
Md. Mizam	Surveyor	1768947458	04-Jan-17
Md. Elias	ULAO, Sonagazi	1711123459	04-Jan-17
Md. Mohiuddin Moshahed	Deputy General Manager, Rural Electricity Board	1769401165	04-Jan-17
Md. Mohiuddin	Work Assistant	1814320988	04-Jan-17
Bhabesh Sarkar	Junior Engineer	1714885789	04-Jan-17
Md. Eskandir Hanif	Assistant Engineer	1818645247	04-Jan-17

Source: Stakeholder Consultations

Salient Points of Discussion

At the onset, the officials from Upazila Nirbahi Office welcomed the idea of developing economic zone in the region and country by BEZA and expressed their consent on the same. Discussions were held on various developmental aspects of the proposed EZ like land acquisition status, utility availability, rehabilitations and resettlement issues, etc. The discussion was concluded by a visit to the project site to gain an on-ground understanding of the various issues. Some of the key features discussed were as follows:

- It was intimated to us that the site allocated to BEZA is non-contiguous in nature and there are private lands in between the pockets of land that have been allotted to BEZA. PwC had raised concern regarding the sporadic nature of the land since developing a master plan would be challenging for a non-contiguous land parcel
- A distributary of the Feni River passes through the subject site and forms a part of the Muhuri Irrigation Project. However, it was highlighted by the water department officials that this stream is not navigable and not conducive for supplying water for a large industrial development
- Although there is a 33/11 KV sub-station nearby in Dakbangla of 20 MVA, which is supplying power to the region, there is no surplus power availability in the same. A new sub-station of 20 MVA is being developed, however it is envisaged that limited surplus would be available within this sub-station to cater to industrial demand. Hence, it is imperative to have a separate sub-station and captive power plant within the industrial park to cater to the demand for power.
- Gas supply is not available in Sonagazi district and the nearest gas sub-station is located in Feni town which only caters to residential facilities.
- PwC officials further requested the Mouza maps with site boundaries demarcated on them and the same shall has been requested from the respective officials.

Date of Meeting: 06 Sep' 2018

Location of Meeting: DFO Office, Chittagong & RFO Office, Mirsarai

Forest Officials Consulted:

Table 116: Institutional Stakeholders Consultation Details for meeting on 6th Sept, 2018

Forest Department			
Name of Person	**Designation**	**Contact Details**	**Date of Consultation**
Md. Hussain	ACF, Coastal Chittagong	01999002839	06-September-2018
Md. Irfan	Range Forest Officer, Coastal, Mirsarai Range	01721727998	06-September-2018

Source: Stakeholder Consultations

Salient Points of Discussion

To understand the ecological significance and biodiversity of the project area the forest officials were consulted. The following issues were discussed during the meeting

- The proposed site is located in a location where tidal influence is prominent. The part of the site remains submerged during high tide due to the proximity of Bay of Bengal. The two blocks of proposed EZ is located at either bank of the Broro Feni River. The Bay of Bengal forms entire southern boundary of the site. The mixing of saline water from sea and fresh water of River in the confluence area generates a brackish water ecosystem.
- The area supports significant growth of various mangrove species as well. The proposed site is located in Mangrove-Intertidal Zone. The char land, covering significant part of proposed site, has been chosen by the Forest Department for taking up plantation activity. However, the legal status of land is of Khas (Govt.) type. The *Kalo Bain* (*Avicennia officinalis*), *Sada Bain* (*Avicennia marina*) and *Keora* (*Sonneratia apetala*) are the predominantly planted mangroves species found in the area. *Gneoa* (*Excoecaria agallocha*), a mangrove species grows here naturally. When the natural growth of Uri grass is observed on the Char, it implies the suitability of the land for taking up mangrove plantation.
- The project area is quite rich in terms of number of species (i.e. species richness) for being a part of estuarine ecosystem.
- Livelihood of many local fishermen is dependent on the ecosystem of the project area.
- There is no presence of forest in and around the proposed site

11.7.4. Focused Group Discussions (FGD)

The Focused Group Discussions (FGD) was carried out with different group at the proposed EZ area on 11-09-2018. PwC personnel discussed about the future developments and benefits to the community due to the development of the EZ. The FGD was carried out in presence of local businessman, fish cultivator, fishermen and local elites. Locals from 2 villages i.e. Char Khondaker, Char chandia, under Soangazi and Char Chandia Union participated in the discussion. The details of the Focused Group Discussions are furnished below. The record of attendees has been attached as Annexure.

Table 117: Details of Focused Group Discussion

Relevant Stakeholders	Issues	Suggestion/Demand from participants	Remarks
Affected fishermen, PAPs, adjacent residential community	• Risk of Navigation for fishing boat • Loss of fishingplace • Loss of Grazing field • Employment opportunity	• Prima-facie the stakehodlers were enthusiastic of the proposed project as it will bring various economical opportunity to them. The proposed Site is crisscrossed by various nalas and channels. The	Employment should be given to the PAPs from the earliest stage of site development so

	• Improved communication and social infrastructure • Skills training to enhance the competency • Priority for local manpower	local fisherman use these channels as routes to sea/estuary. The stakeholders raised concern on the acquisition of the land for EZ may hinder the movement of these fishermen. Some small-scale local fishermen are dependent on these braches of Boro Feni River (within the proposed EZ boundary) for fishing purpose. Their livelihood will also get affected. • Local people using the char land as grazing land for cattle. Acquisition of char land shall have impact on grazing activity. • Due to acquisition of char land, small scale fishermen currently dependent on the submerged site area for fishing activity, are also likely to be affected. At the same time they feel that the development of EZ will bring new opportunities to the community widely. The fore-mentioned community will also be benefited in various ways and new livelihood opportunities will be created for them as well. • They are expecting that, as a foremost need for EZ development, the connectivity and mode of transport will be improved. The social infrastructure like schools, colleges, medical facilities will gradually be developed in the area. • They fear that the people in this region will not get job in EZ as they are neither technically skilled nor literate. The project authority should undertake skill development program in neighbouring areas. This will ascertain that the priority will be given to the locals for various employment opportunities during development and operation stage of EZ.	that they don't get economically deprived/jobless

Figure 94: Stakeholders Consultation

Source: Stakeholder Consultations

Summary of Environmental Impacts

- Cumulative Impact: Possibility of significant cumulative impact during operation stage due to the occurrence of new EZ sites in the vicinity and upcoming industries of the EZ
- Flow from Boro Feni River: Flow from number of channels/distributaries/streams of Boro Feni River (crisscrossing the proposed EZ) should be ensured by provision of proper drainage system to avoid flooding and soil erosion in the area
- Irreversible Impact on Mangroves: The proposed project requires clearance of mangrove cover
- Impact on Estuarine Brackish Ecosystem: Due to construction of super dyke, the natural mixing of fresh (Boro Feni River) and saline (Bay of Bengal) water likely to be hindered
- Impact on Biodiversity: Loss of mangrove, loss of associated species, impact on habitat
- Loss of Grazing Land: Local people using the *char* land as grazing land for cattle, will be acquired for EZ
- Impact on fishermen dependent on estuarine ecosystem: There may be an accessibility issue after development of EZ. Fishermen currently fishing at proposed EZ area, will be no more available for fishing
- Surface Runoff: The runoff from EZ can draw waste & contaminants from site area (during construction & operation stage) to the river / estuary and eventually to the sea

11.7.4.1. Training for skill development in Project Area

Based on consultation with community including potential PAPs of the project area, requirement of following pertinent training is suggested.

Table 118: Training for skill development in Project Area

SL No	Type of Trade	Course Duration	Institution
1	Electrician	6 months	Department of Youth Development
2	Welding	3 months	Vocational Training Centre
3	Carpentry	6 months	Vocational Training Centre/NGO
4	Automobile	6 months	Vocational Training Centre
5	Plumbing	6 months	Vocational Training Centre

11.8. Environmental Management Plan and Monitoring Indicator

The environmental impacts associated with any development project are eliminated or minimized to an acceptable level through development of appropriate mitigation measures based on most suitable techno-economic options. The Environmental Management Plan (EMP) is a well-established tool to ensure effective implementation of the recommended mitigations measures throughout the subsequent project development stages. The EMP also ensures that the positive impacts are conserved and enhanced. An EMP provides location and time specific actions to be taken with defined responsibility.

11.8.1. Institutional Arrangement

BEZA has developed Environmental Social Management Framework (ESMF[242]) with the help of World Bank. The institutional arrangement of EZ shall be aligned as per this framework. Proposed EZ will have an Environmental and social cell which will coordinate with site engineers and PMC.

Overall Project Implementation Arrangements

The overall management of the project will be carried out by EZ which is the project implementing unit (PIU).

Institutional Set Up For Environment Management

The institutional arrangements for the implementation of various aspects of ESMF and environment management of the proposed project envisaged to be implemented as part of the Private Sector Development and Support Project (PSDSP) comprise the following.

- Project Environment Cell (PEC) at PIU to ensure adequate integration of environment management measures in the design phase and supervise implementation of ESMF and specific requirements of EMP
- Environment Management Unit (EMU) at EZ to implement EMP and other regulatory requirements during construction & operation phase of EZ.

Project Environment Management Cell (PEC) at PIU

The Project Implementation Unit (PIU) will establish a Project Environmental Cell (PEC) headed by a 'Manager – Environment' and supported by environmental engineers. The PEC will function to:

- Supervise implementation of ESMF throughout project implementation period;
- Ensure integration of the EA and the EMP measures into the sub-project design and implementation plans such as contract documents, maintenance contracts, tenant lease agreements, etc;

[242] http://www.beza.gov.bd/wp-content/uploads/2015/10/ESMF-of-BEZA.pdf

- Supervise the implementation of the mitigation measures by the Master developers / Contractors;
- Assist the engineering staff and other PIU staff in addressing environmental issues during planning, design and implementation of the sub-projects;
- Prepare periodic progress reports on the implementation of the EMP throughout the project period.

Environment Management Unit (EMU)

In order to implement various environmental management measures at EZ, the master developer / contractor / operator will set up an Environment Management Unit (EMU). The EMU will consist of environmental engineers with relevant experience on environmental issues associated with EZ. The EMU will function all through construction and operation phase of the EZ and perform the following functions.

- Identify regulatory requirements of the sub-project and initiate necessary actions / studies to ensure compliance to the same;
- Co-ordinate with DoE and PIU and ensure securing SCC and ECC as applicable for the project(s);
- Co-ordinate with the contractors / sub-contractors and all other agencies involved in the development and operation of EZ / EPZ and ensure that all the requirements of EMP are fully complied;
- Ensure that all the common environmental infrastructure in EZ / EPZ is operated and maintained in compliance with the regulatory requirements of GoB;
- Liaise with individual enterprise/tenants and ensure that all environmental management conditions of the tenant lease agreement are fully complied;
- Prepare regular reports on environment management and submit to PIU/GoB.

11.8.2. Monitoring Indicators

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

- Air quality
- Water quality
- Noise levels
- Soil quality
- Solid & Hazardous Waste Management
- Plantation success / survival rate
- Biodiversity and species richness
- Soil Erosion
- Siltation
- Contamination of area surrounding to the project site
- Record of accidents
- Recorded public grievance

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

11.8.3. Monitoring Plan

The objective of environmental monitoring during the preconstruction, 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 surrounding environment based on national standards. A monitoring schedule has been sketched based on the environmental components that may be affected during the various phases of the project and is given in the table below.

Table 119: Environmental Monitoring Plan

S. No.	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
1.0	**Preconstruction and Construction Phase**					
1.1	Local Manpower Absorption	Construction Works	Contractor's report No. of people working in the project	Monthly	Contractor	BEZA & PMC
1.2	Soil Erosion	Excavation, disposal, cut & fill and site preparation activities for site levelling and internal roads, disposal	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	Monthly	Contractor	BEZA & PMC
1.3	Greenbelt Development	-	Survival rate of species planted; Density of vegetation	Half Yearly	Contractor	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, NOx, CO	Quarterly for two weeks at suitable locations	Contractor	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 (Leq) at day and Night time	Quarterly at suitable locations	Contractors	BEZA & PMC
1.7	Drinking Water	Contamination due to seepage	All physio-chemical & biological parameters	Monthly	Contractor	BEZA & PMC
1.8	Inland surface and marine Water	Transportation of construction materials, various construction works, runoff from camp	All physio-chemical & biological parameters	Quarterly at suitable locations	Contractor	BEZA & PMC
1.9	Ecological Assessment of surrounding area covering terrestrial and marine ecosystem	Various construction activity	Status of floral & Faunal community, Species richness, species diversity,	6 monthly (winter and monsoon)	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 (Leq) at day and Night time	Quarterly at suitable locations	BEZA	BEZA
			Plant periphery and near noise generation sources	Monthly	Individual Industrial Units	BEZA
2.2	Biological Environment	Horticulture/ Greenbelt Development	Survival rate of plants and shrubs	Quarterly	BEZA	BEZA
			Survival rate of plants and shrubs at individual unit	Quarterly	Individual unit	BEZA
2.3	Ambient air quality	Ambient air quality levels compliance with	Ambient air quality monitoring at individual industries	Monthly	Individual Industrial Units	BEZA

S. No.	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
		respect to industrial standards	– Monitor levels of PM_{10}, $PM_{2.5}$, SO_2, NOx, CO			
		Ambient air quality levels		Quarterly	BEZA	BEZA
2.4	Ground /Drinking water quality	water quality levels compliance with respect to industrial standards	Bore-wells installed/ Drinking water source at site (All physio-chemical & biological parameters)	Monthly	Individual Industrial Units/BEZA	BEZA
				Quarterly	BEZA	BEZA
2.5	Inland Surface and marine water quality	To cross check accidental contamination	Nearby surface water resource (All physio-chemical & biological parameters)	Quarterly	BEZA	BEZA
2.6	Soil Erosion	Feni River/Coast	Survey & observation;	Monthly	BEZA	BEZA
2.7	Ecological Assessment of surrounding area covering 5 Km radius	Various industrial operation and traffic	Status of floral & Faunal community, Species richness, species diversity,	6 monthly (winter and monsoon)	BEZA	BEZA

Source: PwC Analysis

11.8.4. Community development plan

It is recommended the EZ owners to involve the local community during the project development. The EZ owner/its contractors may recruit local workforce to the extent possible during construction phase. The EZ owner would identify technically qualified unemployed youth around the project location and other nearby areas, and employ as far as practical. The EZ owner should form a forum/ association/ trust along with its industrial units to look after community development activities of EZ. All the industrial units should periodically contribute to this Trust. The Trust would represent EZ and its industries for all matters related to community and its development. This would act as interface between EZ and community. The Trust should encourage its industrial units to recruit local unemployed youth in the jobs during operational phase. For this if required arrange training for the local people to develop skilled manpower required if sufficient skilled manpower is not available to carry out technical work in the industrial units during operational phase.

The Trust will organize a community advisory group involving local representatives, representatives from EZ industries and neighboring industries; that would help them in finding ways to participate with its neighbors in addressing socio-economic concerns. With the advice of its community advisory panel, local officials, and other key individuals and groups, the trust along with its constituent industries may sponsor appropriate programs and projects to benefit its community as a whole.

Some specific community development programs that could be considered by the Trust in coordination with other industries in the locality are suggested here:

- Importance of wildlife and necessity for its Protection
- Conducting awareness programs in surrounding villages on health impacts due to environmental pollution (air, noise, water, solid waste, etc.), and precautions to be taken to minimize health impacts.
- Conducting periodic health check-ups to the EZ (including industries) staff and in the surrounding villages to identify pollution related diseases.
- Encouragement to residents in the nearby localities for self-employment ventures, such as by assisting them in arranging micro finances to develop them as artisans/ skilled personnel.

- Periodic training programs on health and sanitary education, women and child development, and income generation schemes.
- Participation in improving the existing medical and educational facilities of the area - for this purpose, it is suggested that the Trust provide funds for facilities improvement (providing toilets, furniture, additional space creation, any other needed) to the local hospitals and schools
- Development of greenbelt/greenery or tree plantation in the nearby vacant government lands to build a green and clean environment in the surrounding areas and to reduce pollution impacts to some extent.
- Sponsoring fellowships to students in surrounding villages to encourage them to go for higher education
- Construction of a hospital in collaboration with other industries to improve health status
- Conduct or sponsor camps to clean up river ghats, jetties and terminals in the surrounding areas.

11.8.5. Compensation Plan

For the development of EZ, the authority of BEZA proposes to acquire private land as well. The development of the EZ is proposed on area is a total 7,000 acres of land. In accordance of the Bangladesh Economic Zone Act, 2010 (Act No. 42 of 2010), BEZA transferred 4,512.56 acres land to Feni Economic Zone for long term basis. Remaining 2487.44 acres of land area is transferred to BEZA/ under process of transfer to BEZA. According to local consultation meeting, more than 1,500 PAPs would be directly and indirectly affected as a result of development of this project. Hence proper compensation based on present market rates to be provided to the PAPs. Based on stakeholder consultation meeting, the total number of project affected persons (PAPs) are more than 1500 (directly and indirectly); thus a Resettlement Action Plan needs to be prepared.

11.8.6. Emergency Preparedness Plan (Contingency Plan)

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

The Emergency Preparedness Plan will have the following minimal components:

- Accidents preventions procedures/ measures
- Fire prevention planning and measures
- Fire water storage and foam system
- Accident/emergency response planning procedure
- Grievance redressal mechanism
- Emergency control centre
- Emergency information system with role & responsibility and command structure
- Recovery procedure
- Assessment of damages and rectification
- Evaluation of functioning of disaster management plan
- Accident investigation
- Clean-up and restoration

11.9. Cost of EMP

The cost of EMP given here includes only that for the CETP, Environmental Monitoring, Audit and greenbelt development. The costs are approximate and need calibration at the time of detailed design and estimation stage.

Table 120: Cost for EMP Implementation

Feni EZ			
S. No	**Components**	**Unit Cost (Thousand BDT)**	**Cost (Thousand BDT)**
A	**Fixed Cost**		
A.1.	**Construction Phase (16 Years)**		
A.1.1.	PPEs for staffs of Project Proponent	50/year	800
A.1.2.	CETP/STP construction	To be covered under engineering cost	-
A.1.3.	Environmental Monitoring (Quarterly) from site and surrounding area Ambient Air Ambient Noise Surface Water Ground/Drinking Water Soil Quality	1,000/Quarter	64,000
A.1.4.	Greenbelt Development at suitable locations and protection of Mangroves	Lumpsum	650,000
A.1.5.	Marine and Terrestrial Ecological study (Half Yearly)	1,500/study	48,000
A.1.6.	Environmental Audit (Half Yearly)	120/study	3,840
A.1.7.	Environmental Specialist - Full Time : 2 Nos	900/year/person	28,800
A.1.8.	Social Analyst- Full Time	800/year	12,800
A.1.9.	occupational health specialist and a safety specialist- Full Time : 2 Nos	800/year/person	25,600
A.2.	Fund for proposed community development activities	Lumpsum	25,000
A.3.	Development and maintenance of Embankment along Feni River, maintenance of flow & Flood Protection	To be covered under engineering cost	-
	Total Fixed Cost (Thousand BDT)		**858,840**
B	**Recurring Cost (Yearly)**		
B.1.	**Operation Phase (per year)**		
B.1.1.	PPEs for staffs of Project Proponent	80/year	80
B.1.2.	Solid waste bins for common areas	70/year	70
B.1.3.	CETP/STP operation	To be covered under project cost	0
B.1.4.	Environmental Monitoring (Quarterly) from site and surrounding area Ambient Air Ambient Noise Surface Water Ground/Drinking Water Soil Quality	1,200/Quarter	4,800
B.1.5.	Maintenance of Green Belt	Lumpsum	25,000
B.1.6.	Environmental Audit (Half Yearly)	200/half	400
B.1.7.	Environmental Specialist - Full Time : 2 Nos	900/year/person	1,800
B.1.8.	Social Analyst- Full Time	800/year	800

Feni EZ			
S. No	Components	Unit Cost (Thousand BDT)	Cost (Thousand BDT)
B.1.9.	occupational health specialist and a safety specialist- Full Time : 2 Nos	800/year	1,600
B.1.10.	CETP/STP Incharge : 5 Nos	700/year	3,500
B.1.11.	Development and maintenance of Embankment along Feni River, maintenance of flow & Flood Protection	To be covered under engineering cost	-
	Total Yearly Recurring Cost (Thousand BDT) upto 16 Years		**38,050**
C	**Additional Recurring Cost after completion of 16 Years of Construction period (Yearly)**		
C.1.	Marine and Terrestrial Ecological study (Half Yearly): To be added after completion of 16 Years of Construction period	5,500/study	11,000
	Additional Recurring Cost (Thousand BDT) after completion of 16 Years of Construction period		**11,000**
Note: The costs are approximate and need calibration at the time of detailed design and estimation stage * Monitoring/Mitigation cost at individual industry level has not been covered ** If there is need of any specific mitigation according to Ecological study during Construction/Operation phase, the cost for the same will be additional			

Source: PwC analysis

11.10. Conclusion and Recommendation

Considering the sensitivity of the proposed site, it can be said that overall the impacts from preconstruction, construction and operation phase will have quite detrimental impacts to the surrounding environment. Many of the impacts are possibly irremediable in nature and can't be replenished. The proposed site is quite rich from ecological point of view. A thorough EIA/EMP study needs to be conducted. It must also to be ensured that EMP plan is followed religiously as a compensatory act and an effort to negate the impact to some acceptable extent. 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. The off-site facilities proposed to be developed by BEZA includes development of administration building, boundary wall, electrical supply, access roads etc. The project falls under Red category as per ECA, 1995 and requires prior environment clearance from DoE, Bangladesh.

The recommendations made for the project development on the basis of Environmental and Social Review study are given below:

- A detailed Environmental and Social impact assessment should be carried out by BEZA prior to any site preparation/construction activity and prior environment clearance certificate from DoE, Bangladesh should be taken.
- Construction activities for the development of project should be started after obtaining environment clearance certificate from DoE, Bangladesh
- A half-yearly ecological assessment (preferably in winter and monsoon) during preconstruction, construction, operation phase should be conducted through specialists to record chronological trend of biodiversity in the project area surrounding
- Wildlife awareness program among the workers (during preconstruction, construction and operation phase) should be conducted. Workers should report sighting of any uncommon species to the environmental expert, who immediately should inform the incidence to local forest/wildlife authority/ conservationists

- Proposed environment management plan should be implemented strictly during preconstruction, construction and operation phase of the project.
- Green area development should be carried out
- Proper training of maintaining environment, health and safety should be given to Project management unit in preconstruction, construction and operation phase
- Provision of garland drain, thick green belt, ETP, STP, segregated storm water shall be adhered to
- Environmental monitoring should be conducted as suggested in environment management plan
- Separate environment impact assessment study must be carried out by developer for whole zone before developing the EZ

12. Financial Modeling

12.1. Purpose and Objective

Establishing of economic zone regime in Bangladesh is an effort by the GoB to boost manufacturing activity and employment in the country. BEZA intends to attract manufacturers who are interested in setting up manufacturing plants in Bangladesh through development of plug and play infrastructure, industrial land, supply of utilities (water, power and gas), transport connectivity and business friendly policies.

However, in order to develop the infrastructure it is paramount to understand the financial costs involved in developing such infrastructure and the expected returns that could be expected from operating economic zones. This chapter assesses the financial feasibility of developing the proposed economic zone which has been determined based on net financial benefits under different scenarios (conservative, base and aggressive) of land uptake in the proposed EZ and level of cash flows accruing to the developer. The rate of land uptake has been captured in the demand forecasting chapter of this report.

The major sources of revenue accruing to the developer of this proposed EZ has been considered from (1) lease rental for land uptake and (2) charges on utility (power, water, gas, effluent) provided to manufacturers. In addition, the developer could earn revenue from support amenities such as leasing out the land plot for logistics zone and commercial projects, and from economic zone service fees charged from the industrial tenants. In addition to the capital expenditure for developing this project, the developer also needs to incur operational expenditure towards operation and maintenance (O&M) of this project. Assumptions with respect to inputs for the model taken with due consultations with BEZA officers have been listed out in the later part of this chapter.

This model is developed to analyze revenues generating sources and consequently Internal Rate of Return (IRR) & Debt Service Coverage Ratio (DSCR) to the PPP developer of this economic zone. In this case, BEZA shall transfer the land to the PPP developer (preferred bidder selected through competitive bidding) on leasehold basis and develop off-site infrastructure as condition precedent.

While analyzing the returns accrued from the above stated scenario, impact assessment of the following project structuring options will also be undertaken:

- BEZA acquiring equity stake (in lieu of providing EZ land to the PPP developer) in the Special Purpose Company (SPC) formed by the developer.
- BEZA acting as a developer of the Economic Zone i.e. BEZA undertaking construction and operation of the EZ.

12.2. Methodology of Financial Modelling

The financial model created as a part this engagement takes into consideration financial return to the private developer when the developer is selected by BEZA to finance, develop and operate the EZ

This scenario captures the rate of return earned by the developer after considering the costs incurred and revenue generated over a period of 50 years.[243] Following table captures the key responsibilities of the private developer in this project.

Table 121: Responsibilities of private developer

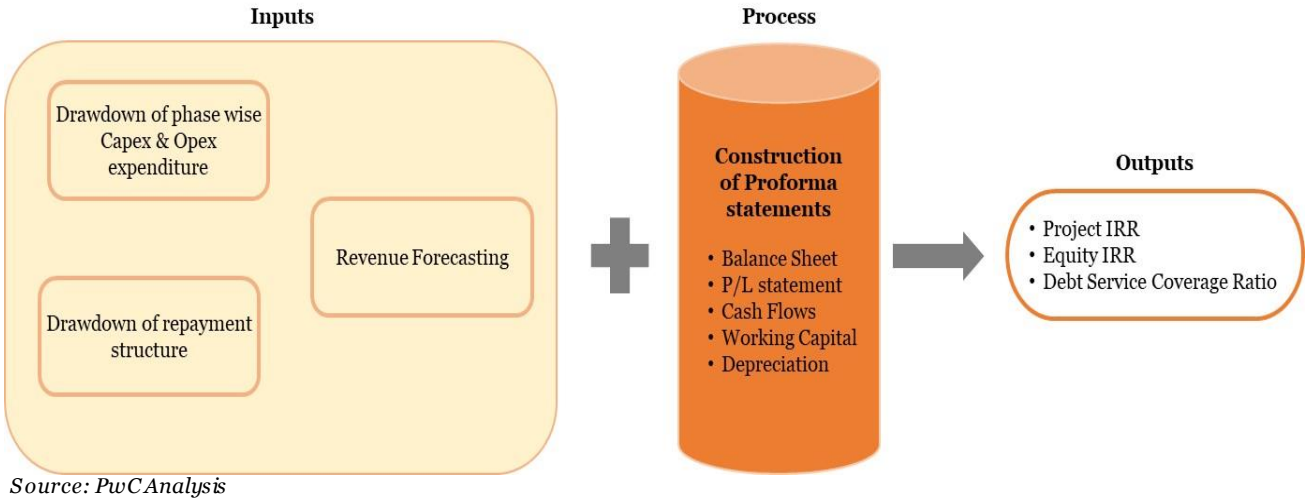
Aspects	Private Developer through PPP route
Land acquisition and ownership	BEZA would acquire the land parcel and transfer the land parcel to the private developer on leasehold basis

[243] *As per the Governing Board of BEZA approved guidelines*

Aspects	Private Developer through PPP route
Off-site infrastructure development	Responsibility of BEZA as condition precedent
On-site infrastructure development	Responsibility of the private developer
Financing	Responsibility of the private developer
O&M	Responsibility of the private developer

To have a robust model in place, an exhaustive list of assumptions has been developed which duly indicates all the inputs considered for determining the expected return on the investment. Consent has been obtained from BEZA officers about these assumptions. A graphical diagram depicting the functionalities of financial model is shown below.

Figure 95: Process flow of the Financial Model



Source: PwC Analysis

Inputs

A quarterly model has been developed to depict the capex and opex expenses along with debt (both commercial borrowing and concessional loan) drawdown structure, in order to have a granular insight into the capital cash outflows. Revenue Forecasting has been done on an annual basis to understand the cash inflows accruing to the developer through lease of industrial land, Standard Factory Buildings (SFBs), support amenities like Vocational Training Centre, Child care and healthcare units, commercial space, logistics zone etc., surcharge on supply of utility services (like water, power, gas, and effluent treatment), and EZ service fees.

Process

Considering the expenses and revenue sources above, pro-forma statements have been calculated which captures the assets, liabilities, profits/loss and cash flows accruing to the developer. This process forms the backbone of the financial model, which is used to determine the returns to the developer.

Outputs

As a measure of calculating returns to the developer on its investment in this project, parameters that have been considered are Rate of Return to providers of capital (debt + equity) i.e. project IRR, Rate of Return to providers of Equity i.e. equity IRR, and Debt Service Coverage Ratio (DSCR) of the cash flows.

Three scenarios (viz. conservative, base and aggressive) have been considered in this model based on the anticipated occupancy (land demand uptake) of the proposed economic zone in order to make provision for a dynamic investment climate. These scenarios would assist the developer in assessing the range of expected return that it could anticipate through its investment in the proposed EZ.

Aggressive case assumes macro-economic conditions of Bangladesh and the region are improving; Potential infrastructure projects are commencing prior to Commercial Date of Operations (CoD). Base case assumes macro-economic conditions of Bangladesh and the region are showing steady trend and behaving as expected; potential infrastructure projects are commencing as scheduled. Conservative case considers macro-economic conditions of Bangladesh and the region are showing declining trend; potential infrastructure projects are delayed.

The broad level commercial aspects considered while developing this model are –

- Economic zone developer is responsible for financing, constructing and developing the project site and consequently the O&M.
- Complete ownership of the land demarcated for this project belongs to BEZA. The private developer who would be contracted to develop the EZ would be required to pay BEZA an upfront fees, annual fees and a share of the gross revenue during the concession period for developing and operating the EZ.
- Cost of land acquisition has been considered to be the prerogative of BEZA and not the private developer.
- Construction of the EZ site would take place in 3 phases, phase 1 is of 3 years phase 2 and 3 are of 5 years each.
- The project would be financed by developer's own equity and loans from commercial lenders & financial institutions (i.e. concessional loan).
- The developer will market the plot to industrial units.
- The developer will enter into lease agreement with the industrial units. These industrial units will be the end users/tenants at the plots in economic zone.
- Major sources of revenue earned from economic zone operations are: (i) land lease rental from land plots, (ii) land lease rental from standard factory buildings (SFB), (iii) revenue from support amenities (such as logistics zone, healthcare, vocational training institute, and commercial space), and (iv) mark-up on utility connections.
- Sources of revenue for providing utility connections to the developer from economic zone include:
    - Power and Water tariffs from tenants
    - Revenue from Public Transport in economic zone
    - Water Treatment and Effluent Treatment charges from industries
- In addition to rentals, EZ Service fee will be charged by developer as per industry practice.

In the light of methodology elaborated above, a detailed guide on how to operate the financial model is captured in the next section.

Guide for operating this model is placed as annexure to this report.

Assumptions in the financial model (as outlined in this guide) is captured in the next section.

12.3. Assumptions, Inputs and Variables

In this section, the key assumptions used in developing the financial model (to assess the financial viability of the proposed project) have been elucidated.

12.3.1. Revenue Assumptions

Developer will earn revenues through land leasing, provision of utilities and overall maintenance and operation of the economic zone related activities. This includes- (i) revenue from industrial space (i.e. industrial land and SFB), (ii) revenue from support amenities (like commercial space, healthcare space, vocational training institute, and logistics zone), (iii) EZ Service Fees, (iv) utility charges (Power tariff, Water tariff, sewerage and effluent treatment charges).

Assumptions for revenue generating from industrial space

In order to arrive at annual land lease rent that the developer may charge from tenants, prevailing rentals of all the export processing zones (EPZs) under BEPZA were analysed.

Table 122: BEPZA operated EPZ land plot tariffs

Sl. No	EPZ	Tariff[244] (USD /sq.mt./year)	Tariff[245] (BDT /sq. ft./year)
1	Chittagong, Dhaka, Comilla, Karnaphuli & Adamjee	2.20	~17
2	Ishwardi, Uttara and Mongla	1.25	~10

Source: Data obtained from BEPZA

Based on the above data the prevailing land lease rental at Chittagong EPZ has been considered as the base since it is envisaged that the developer would provide facilities within the EZ which is at par with Chittagong EPZ. Land Lease Rental of Chittagong EPZ is USD 2.20/ sq. m. / year i.e. ~17 BDT/ sq. ft. / year (1 USD=82 BDT).

Considering the private sector service quality, land lease rental charged by the developer for the proposed EZ have been considered as 21 BDT/ sq. ft. / year (i.e. 0.26 USD/ sq. ft. / year) in the financial model. This lease rental is in line with the prevailing market rate as offered by private EZ developers elsewhere in the country.

In addition to the land lease rental, rental can also be charged from operations of the SFBs. Table below shows the rental of SFB facilities at the EPZs under BEPZA.

Table 123: BEPZA operated EPZ SFB plot tariffs

Sl. No	EPZ	Tariff[246]	Tariff[247]
1	Chittagong, Dhaka, Comilla, Karnaphuli & Adamjee	2.75 USD/ sq. mt. / month	~251 BDT/ sq. ft./ year
2	Ishwardi, Uttara and Mongla	1.60 USD/ sq. mt. / month	~147 BDT/ sq. ft./ year

Based on the data in the preceding table, prevailing SFB lease rental at Chittagong EPZ has been considered as the base since it is envisaged that the developer would provide facilities within the EZ which is at par with Chittagong EPZ. SFB plot lease rental of Chittagong EPZ is USD 2.75/ sq. m. / month i.e. ~251 BDT/ sq. ft. / year (1 USD=82 BDT).

Considering the private sector service quality, SFB plot rental charged by the developer for the proposed EZ have been considered as 300 BDT/ sq. ft. / year (i.e. 3.66 USD/ sq. ft. / year) in the financial model. This lease rental is in line with the prevailing market rate as offered by private EZ developers elsewhere in the country.

[244] *for average 2,000 sq. m. plot size*
[245] *USD to BDT conversion= 82*
[246] *for Standard Factory Building Facilities*
[247] *USD to BDT conversion= 82*

The annual escalation of lease rent (for both industrial land and SFB) has been considered as 12% in a block of 3 years (i.e. after every 3 years, the land lease rental value would be inflated by 12%). This assumption has been drawn based on prevailing charges in economic zones worldwide and taking consent from BEZA officers. It may however be noted that the land rent for EPZs under BEPZA increased several times; 2001, 2007 and 2011 respectively in Bangladesh. The escalation rate was in the range of 10%-25%. Accordingly, this assumption has been on the conservative side.

After running the financial model and sensitivity analysis on the same, these revenue drivers can be adjusted in order to arrive at a sound financial return accruing from the project.

Assumptions for revenue generating from support amenities

In addition to the land lease rental and SFB rental, base assumptions of revenue generating from support amenities have been considered as below:

- Rent from logistics zone- BDT 20/ sq. ft. per annum i.e. USD 0.24 / sq. ft. / annum (subjected to inflation of 10% in a block of three years). It has been assumed that the developer would sublet the land parcel to a logistics players for developing the logistics zone.
- Rent other support amenities – BDT 22/sq. ft. per annum i.e. USD 0.27 / sq. ft. / annum (subjected to inflation of 10% in a block of three years). Land parcel measuring an area of 41.72 acres has been earmarked for development of support amenities like Child care and healthcare units, vocational training centre, commercial space etc.

The above stated assumptions have been finalised based on market information obtained through secondary sources and taking into consideration future development taking place within Feni region. Due consent have been obtained from BEZA officers on the same.

Assumptions for utility tariffs

Other revenue streams to the developer include utility tariffs on water, power, gas and effluent treatment. The model is built on the assumption that Power and Water will be supplied to the Developer by the local nodal agency such as Rural Electrification Board (REB), City Corporation, Water Supply and Sewerage Authority (WASA).

Energy Regulatory Commission Bangladesh has fixed the electricity tariff for industrial connection. **This fixed tariff is BDT 7.90 per kWh (i.e. USD 0.10 per kWh)**.

Since no pertinent data is available for water supply in the region surrounding Feni, prevailing water tariff of Chittagong EPZ has been considered. **This tariff is BDT 37,560 per MLD (i.e. USD 458 per MLD)**.[248] This tariff may be higher during actual supply period, if a desalination plant is established to supply water to the EZ site.

Effluent treatment will also be charged by developer as per prevailing rates. Effluent volume for treatment as % of water intake is considered at 60%. Based on prevailing effluent treatment charges in Chittagong EPZ, base tariff of **BDT 33,240 per MLD (i.e. USD 405 per MLD)** of sewage treated has been considered.

Owing to lack of information of industrial gas supply tariff in this region, **prevailing gas supply tariff for Chittagong EPZ has been considered i.e. BDT 8.54 per cum**.

Developer will be responsible for operation and maintenance of these utilities and in turn sell to the industrial tenants with 10% surcharge as service fees.

The above utility tariffs are subjected to inflation rate of 15% applicable in a block of every three years (i.e. the utility tariffs would be increased by 15% after every three years).

[248] *Data obtained from BEPZA*

Assumptions for economic zone service fees

Economic Zone service fees has been considered as BDT 2/ sq. ft. / year (i.e. USD 0.02 / sq. ft. / year) considering the private sector efficiency factor. This is based on the standard benchmarking and it is subjected to the discretion of the developer. On ground scenario could be different than this assumption.

12.3.2. Cost Assumptions

Capital Expenditure

Capital costs are based on the market value of developing the land demarcated for development of the proposed EZ, which includes the costs of infrastructure development for the proposed EZ, including earthworks, roads, institutional buildings, utilities, water supply system and waste water treatment plant in line with the master plan. As per the master plan for this EZ site, the capital cost has been divided into 5 phases of 4-4-3-3-2 years. Breakup of the cumulative capital cost is mentioned in the table below.

Table 124: Break-up of Project Cost

Description of Item	Quantity	Unit	Phase I Cost Breakdown	Phase II Cost Breakdown	Phase III Cost Breakdown	Phase IV Cost Breakdown	Phase V Cost Breakdown	Price without tax (In mn Taka)	Price without tax (In mn USD)
Road Network									
Road (45 m)	21288	RM	364.6	364.6	364.6	364.6	364.6	1823	22.23
Road (30 m)	12807	RM	144	144	144	144	144	720	8.78
Road (25 m)	29592	RM	267.4	267.4	267.4	267.4	267.4	1337	16.30
Total			**776**	**776**	**776**	**776**	**776**	**3880**	**47.32**
Footpath and plot entry culvert			226.6	226.6	226.6	226.6	226.6	1133	13.82
			1002.6	**1002.6**	**1002.6**	**1002.6**	**1002.6**	**5013**	**61.13**
Storm Water Network	63687	RM	159.8	159.8	159.8	159.8	159.8	**799**	**9.74**
Power Network									
Internal Power Distribution (OHT)	63687	RM	23.72	23.72	23.72	23.72	23.72	118.61	1.45
Distribution Transformer			151.9	151.9	151.9	151.9	151.9	759.52	9.26

Description of Item	Quantity	Unit	Phase I Cost Breakdown	Phase II Cost Breakdown	Phase III Cost Breakdown	Phase IV Cost Breakdown	Phase V Cost Breakdown	Price without tax (In mn Taka)	Price without tax (In mn USD)
Street Light	63687	RM	27.33	27.33	27.33	27.33	27.33	136.64	1.67
Internal Substation	589.56	MVA	1536.78	1536.78	1536.78	1536.78	1536.78	7,683.91	93.71
Fire Hydrant			1.91	1.91	1.91	1.91	1.91	9.56	0.12
Total			**1,741.64**	**1,741.64**	**1,741.64**	**1,741.64**	**1,741.64**	**8,708.24**	**106.20**
Water supply Network									
Water Supply Network	63687	RM	104.6	104.6	104.6	104.6	104.6	523	6.38
Sump, Overhead Tank, Pumps			464.37	464.37	464.37	464.37	464.37	2321.86	28.32
Water Treatment Plant	127.63	MLD	664.69	664.69	664.69	664.69	664.69	3323.44	40.53
Total			**1233.66**	**1233.66**	**1233.66**	**1233.66**	**1233.66**	**6168.3**	**75.22**
Sewer Network									
Sewer Network	63687	RM	109.4	109.4	109.4	109.4	109.4	546.99	6.67
Waste Water Treatment Plant	91.09	MLD	662.45	662.45	662.45	662.45	662.45	3312.25	40.39
Effluent Treatment Plant	77.37	MLD	464.22	464.22	464.22	464.22	464.22	2321.12	28.31
Solid waste Management	144.18	TPD	449.57	449.57	449.57	449.57	449.57	2247.87	27.41
Total			**1685.64**	**1685.64**	**1685.64**	**1685.64**	**1685.64**	**8428.23**	**102.78**
Telecom	63687	RM	77.2	77.2	77.2	77.2	77.2	385.98	4.71
Sustainable Infrastructure elements									
Open Space/ Landscaping	2158818	Sqm	19.89	19.89	19.89	19.89	19.89	99.44	1.21
Greenery along road	63687	RM	0.38	0.38	0.38	0.38	0.38	1.91	0.02
Percolation Pits	4246	Nos	1.24	1.24	1.24	1.24	1.24	6.18	0.08
Total			**21.51**	**21.51**	**21.51**	**21.51**	**21.51**	**107.53**	**1.31**

Description of Item	Quantity	Unit	Phase I Cost Breakdown	Phase II Cost Breakdown	Phase III Cost Breakdown	Phase IV Cost Breakdown	Phase V Cost Breakdown	Price without tax (In mn Taka)	Price without tax (In mn USD)
Support Amenities									
Admin Building	4500	Sqm	275					275	3.35
Maintenance Buildings	3500	Sqm	18.2	18.2	18.2	18.2	18.2	91	1.11
Total			**293.2**	**18.2**	**18.2**	**18.2**	**18.2**	**366**	**4.46**
Standard Factory Building									
Total	300	Acres	2509.06	2509.06	2509.06	2509.06	2509.06	**12,545.28**	**152.99**
EMP									
Total			198.19	330.32	330.32			**858.84**	**10.47**
Project Subtotal			**8,922.50**	**8,779.63**	**8,779.63**	**8,449.31**	**8,449.31**	**43,380.37**	**529.03**

Source: MACE Analysis

Above elucidated project costing has been estimated considering 300 acres of SFB construction. This project cost may vary depending on the area of SFB.

Cost of SFB development has been considered as BDT 1,600/ sq. ft. as per the prevailing market rates. Ground coverage for SFB has been considered as 60% as per the prevailing practices.

Interest during construction for this project has been estimated as BDT 7,745 million (i.e. USD 94.45 million).

Above stated estimated capital expenses have been adjusted for inflation. Historical trend of Consumer Price Index (CPI) available in Bangladesh Bank has been synthesized with long term inflation rate data available in World Bank database. Basis this, yearly inflation rate of 5% has been applied in a block of 3 years on the estimated capital expenses.

Off-site infrastructure development is the responsibility of BEZA and not part of project cost (which is to be incurred by the PPP developer). Following table elucidates the off-site infrastructure cost estimation.

Table 125: Break-up of off-site infrastructure Cost

Description of Item	Quantity	Unit	Price without tax (In million Taka)	Price without tax (In million USD)
Site Development				
Landfilling	71,287,978.9	CUM	13,402.14	163.44
Total			**13,402.1**	**163.44**
Road Network				
Road (24 m)	3.8	KM	266	3.24
Road (45 m)	6.5	KM	455	5.55
Bridge (45 m)	350	RM	3,840	46.83
Bridge (45 m)	1,300	RM	12,600	153.66
Total			**17,161**	**209.28**
Power Network				
132 kV line	7	KM	63	0.77
230 kV line	7	KM	770	9.39
Total			**833**	**10.16**
Water Network				
Water Supply Network	5	KM	116.71	1.42
Desalination Plant	128	MLD	11,199.72	136.58
Total			**11,316.4**	**138.01**
Fencing	16	KM	**750**	9.15
Super Dyke	30 km	RM	**49,464.67**	603.23
Project Subtotal			**92,927.24**	**1,133.26**

Source: MACE analysis (kindly ignore rounding off)

Operations and Maintenance Expenditure

In addition to this capital cost, Operation and Maintenance (O&M) costs during the operational stage of the project is presented in the table below. These expenses are assumed as certain percentage of the capital expenditure and the same to be incurred on yearly basis. These are based on standard industry benchmarks.

Table 126: Break-up of Operational Expenditure

Total Operation Cost	% of Capex
Roads and associated infrastructure	2%
Decentralized water supply, treatment and distribution	2.5%
Electrical, street lighting & fire fighting	2%
Telecom & communication systems	0%
Sustainable infrastructure elements, RW harvesting, summer storage tank & greenery	2%
Decentralized wastewater, network and solid waste management	4%
Buildings - industrial / business, commercial, residential, MEP	0%
SFB	0%
EMP (cost during construction period)	2.2%
EMP (cost after construction period)	2.85%
Total Maintenance Cost	**% of Capex**

Roads and associated infrastructure	5%
Decentralized water supply, treatment and distribution	2%
Electrical, street lighting & fire fighting	5%
Telecom & communication systems	2%
Sustainable infrastructure elements, RW harvesting, summer storage tank & greenery	2%
Decentralized wastewater, network and solid waste management	2%
Buildings - industrial / business	5%
Buildings – commercial	5%
Buildings – residential	5%
Buildings – MEP	5%
Total Maintenance Cost	**% of Capex**
SFB	5%
EMP (cost during construction period)	2.2%
EMP (cost after construction period)	2.85%

Source: MACE Analysis

Apart from the operating cost listed in the previous page, 2% of the opex expenditure has been considered as miscellaneous cost and 2 million BDT has been considered as pre-operating expenses.

Table below indicates the proposed organogram of the EZ and manpower remuneration related expenses.

Table 127: Details of Manpower Cost

Designation	Number of Manpower	Salary (BDT million per year)	Per annum cost (million BDT)
CEO	5	1	5
GM-Finance	3	1	3
GM-Marketing	3	1	3
GM-Engineering & Procurement	3	1	3
GM-HR and IT	3	1	3
GM-Operations	3	1	3
Manager-Finance	1.5	2	3
Manager-Marketing	1.5	2	3
Manager-Engineering & Procurement	1.5	2	3
Manager-HR and IT	1.5	2	3
Manager-Operations	1.5	2	3
Assistant Manager-Finance	0.72	3	2.16
Assistant Manager-Marketing	0.72	3	2.16
Assistant Manager-Engineering & Procurement	0.72	7	5.04
Assistant Manager-HR and IT	0.72	3	2.16
Assistant Manager-Operations	0.72	6	4.32
Security Supervisors	0.36	15	5.4
Security Staffs	0.24	100	24
Peons and Clerks	0.18	20	3.6
Office Boys	0.12	30	3.6
Total			**87.44**
Total (USD million)			**1.07**

Source: PwC Analysis

The cost elements constitute both; infrastructure development and Operation & Maintenance cost in processing area as well as non-processing area. The processing area consists of industrial buildings, specialized

infrastructure, public amenities and utilities. The non-processing area has residential buildings, retail & commercial space, and open spaces. The detailed land use planning has already been covered in Master Planning section of the report.

Above stated estimated operations and maintenance expenses have been adjusted for inflation. Historical trend of Consumer Price Index (CPI) available in Bangladesh Bank has been synthesized with long term inflation rate data available in World Bank database. Based on this, yearly inflation rate of 5% has been applied on the estimated operations and maintenance expenses.

Revenue for BEZA

The 3 parameters considered as revenue to be paid to BEZA by the developer are i) Upfront Payment in lieu of license to develop EZ, ii) Annual land lease and iii) Percentage share of the gross revenue accrued to developer.

Base values for these cost parameters are as listed –

- Upfront payment to BEZA – 600 million BDT i.e. 7.32 million USD
- Annual land lease – 464 million BDT/ year (16.38 BDT/ sq. mt./ year) i.e. 5.66 million USD/ year
- Percentage gross revenue share – 5%

12.3.3. Financing Assumptions

Various financing assumptions in-built in this financial model have been outlined below:

- Interest on Working Capital- 14%
- Debt: Equity= 70:30; Debt could be sourced from either commercial borrowing or through concessional loan/ grant
- For commercial borrowing: moratorium period- 1 Year (after loan disbursement for the respective phase); rate of interest- 10% per year; repayment period- 10 years
- For concessional loan: moratorium period- 1 Year (after loan disbursement for the respective phase); rate of interest- 2% per year; repayment period- 20 years

An equal spread repayment of principal has also been assumed towards repayment of the loan (i.e. 10% principal repayment every year over 10 years of repayment period or 5% principal repayment every year over 20 years of repayment period).

Private Developer will have to pay income taxes on 'Income from Business or Profession' as per the Income Tax Ordinance, 1984. The ordinance allows deductions from total income or revenue for cash and non-cash expenses (i.e. depreciation and amortization), to arrive at Net Income before Tax (NIBT). The applicable corporate tax rate is then applied to NIBT to derive income tax to be paid. As per prevailing tax regulations, Income Tax rate of 35% has been considered in the financial model for calculating the income tax payable to National Board of Revenue, Bangladesh. According to the incentive package approved by the BEZA's Governing Board, economic zone developer shall have tax exemption for 10 years from COD, 70% tax exemption for 11th year and 30% tax exemption for 12th year. The same is incorporated in the model as fiscal benefit due to tax holiday.

Straight Line Method (SLM) of depreciation has been considered and annual depreciation rate of 2% has been taken in the model for a project tenure of 50 years. Depreciation assumptions for tax treatment are in line with prevailing corporate income tax ordinance 1984 guidelines in Bangladesh.

12.3.4. Other Assumptions

Timing related assumptions

It has been assumed that two year timeframe i.e. from present to 30th June 2021 (year 2021) would be required towards regulatory activities essential for kick starting the project. Developing of off-site infrastructure would require another 3 years. Construction for EZ would take place from 1st July, 2023 (2024) to 30th June 2039 (2039) spread over five phases, phase 1 & 2 of 4 years each, phase 3 & 4 of 3 years each and 5th phase of 2 years. Industrial space uptake will commence from year 2026.

Usage Norms for utilities

In furtherance to the utility consumption data obtained from the primary survey, ultimate water and power requirement for each of the industries are based on the applicable industry norms in Bangladesh.

A summary of usages norms included as part of our financial analysis is indicated in the following table. Detailed rationale behind the same is duly captured in the Infrastructure Plans chapter.

Table 128: Utility Usage Norms

Power requirements (kVA per acre)	Water requirements (Cum per day per acre)
182.11	13.36

Source: MACE Analysis

Based on standard industry benchmarks, 60% of water demand is considered as effluent generated.

Basis our primary interactions with manufacturers in Bangladesh and analysing the gas consumption information of unit investors in Chittagong and Dhaka EPZs of Bangladesh, gas requirement of 1,836 cum/ hectare/ day (i.e. 76.5 cum/ acre/ day) has been considered as gas requirement for industries in the proposed EZ.

Industrial space uptake rates

In line with the best practices prevailing in economic zone development, it has been assumed that developer will construct the basic shell infrastructure- public amenities, utilities and roads. This developed land in the proposed EZ will be provided on long-term lease to the industrial tenants. It has also been considered that during the construction period, developer will simultaneously undertake marketing activities for unit plots, to attract investors. Once all infrastructure development is complete, services installed and the proposed EZ is completely ready for operation, the industrial tenants will start moving onto their respective plots. Three scenarios have been created for the industrial space fill rate. Detailed calculation for each of these scenarios are duly captured in the Demand Forecasting chapter.

Aggressive case assumes macro-economic conditions of Bangladesh and the region are improving; Potential infrastructure projects are commencing prior to Commercial Date of Operations (CoD). Base case assumes macro-economic conditions of Bangladesh and the region are showing steady trend and behaving as expected; potential infrastructure projects are commencing as scheduled. Conservative case considers macro-economic conditions of Bangladesh and the region are showing declining trend; potential infrastructure projects are delayed.

As per demand forecasting exercise, complete industrial space (land and SFB) uptake would take place in 21 years, 18 years and 15 years respectively for conservative, base, and aggressive cases.

Uptake rates for support amenities

For support amenities, full land uptake has been considered in the year 2028.

12.4. Sensitivity Testing on Key Inputs

Following figure summarises the revenue and cost drivers, and the decision making parameters of this financial model.

Figure 96: Revenue and Cost Drivers

Revenue Drivers
Parameters
Industrial Land annual lease rental
SFB annual lease rental
Rent from support amenities
Logistic Zone Rent
Surcharge on utility
Revenue from EZ service fees
Escalation rate on revenue

Cost Drivers
Parameters
Capital Expenditure (capex)
Interest Expenses
O&M Expenditure (opex)
Pre-Operating Expenses
Miscellaneous Cost
Cost of Manpower
Inflation rate on capex and opex
Upfront payment, annual fees and revenue share to be paid by PPP developer to BEZA

Source: PwC Analysis

Following parameters have been varied in the sensitivity analysis to assess the most sensitive variable in the financial model.

- Land lease rental for industrial land plots
- Land lease rental for SFB
- Area allocation for SFB
- Escalation rate for industrial land and SFB
- Upfront payment, land lease fees and % of gross revenue share paid by PPP developer to BEZA

Based on the same, a sensitivity check has been carried out to understand the most sensitive parameter, where each of the above mentioned parameters have been varied by +/- 25% (keeping the other parameters constant) to understand the impact on the project IRR.

On carrying out the above mentioned exercise, we observed that on varying factors like revenue share paid by developer, annual land lease fees, escalation rates for rent, lease rentals for industrial land and SFB (keeping other parameters constant), returns generated from the project displayed significant variations. The tornado chart constructed to evaluate sensitivity of varying each parameter on a stand-alone basis is shown on the next page.

Table 129: Sensitivity variation of Project IRR across the three scenarios

Parameters	Conservative Scenario			Base Scenario			Aggressive Scenario		
	-25%	0%	+25%	-25%	0%	+25%	-25%	0%	+25%
% revenue share by developer	*10.8%*	*10.7%*	*10.5%*	*12.8%*	*12.6%*	*12.4%*	*19.4%*	*19.1%*	*18.7%*
Land lease rental to BEZA	10.9%	*10.7%*	10.5%	12.9%	*12.6%*	12.3%	19.7%	*19.1%*	18.5%
Upfront payment to BEZA	10.7%	*10.7%*	10.6%	12.6%	*12.6%*	12.6%	19.2%	*19.1%*	18.9%
Logistics zone rental	10.7%	*10.7%*	10.7%	12.6%	*12.6%*	12.6%	19.0%	*19.1%*	19.1%
Support amenity rental	10.7%	*10.7%*	10.7%	12.6%	*12.6%*	12.6%	19.0%	*19.1%*	19.1%
Area allocation for SFB	10.0%	*10.7%*	11.4%	11.7%	*12.6%*	13.5%	17.5%	*19.1%*	20.7%
Escalation rate of rentals	10.0%	*10.7%*	11.5%	11.8%	*12.6%*	13.4%	18.1%	*19.1%*	20.0%
Lease rental for SFB	9.4%	*10.7%*	12.1%	10.9%	*12.6%*	14.4%	16%	*19.1%*	22.6%
Lease rental for industrial	10.2%	*10.7%*	11.1%	12.0%	*12.6%*	13.2%	17.9%	*19.1%*	20.2%

Source: PwC analysis

Lease Rental for SFB and % of gross revenue / annual land lease fees share paid by developer have emerged out to be the most sensitive revenue and cost driver determining the rate of return from the project

In order to maximise the return from this project, levying high lease rental for the Standard Factory Buildings and minimizing gross revenue share / annual land lease fees would result in maximum return (keeping all other parameters constant).

12.4.1. Project Return Calculations and Project Structuring

Based on the above stated methodology and assumptions, project return has been calculated from the financial model as per the three scenarios viz. (i) base, (ii) aggressive and (iii) conservative. These calculations have been done on basis of the base parameters, which were considered in line with the assumptions highlighted in the previous sub-section of this chapter.

Tables below captures the returns accruing from this project for the three scenarios and the base values considered for different revenue and cost drivers.

Table 130: Returns accruing to developer of EZ from cost and revenue drivers

Parameters	Conservative Scenario	Base Scenario	Aggressive Scenario
Project IRR	10.7%	12.6%	19.1%
Equity IRR	10.8%	14.6%	31.2%
Average DSCR	8.45	8.83	9.43
Min. DSCR	1.00	1.00	1.42
Year of Min. DSCR	2029	2036	2038

Source: PwC analysis

Revenue Drivers	Values	Cost Driver	Values
Industrial land lease rental	21 BDT/ sq. ft. /year i.e. USD 0.26/ sq. ft. / year	% Revenue Share paid by developer	5%
SFB lease rental	300 BDT/ sq. ft. /year i.e. USD 3.66/ sq. ft. / year	Annual land lease fees paid by developer	464 million BDT i.e. 5.66 million USD
Escalation rate of rentals	10%	Upfront payment made by developer	600 million BDT i.e. 7.32 million USD
Area allocation for SFB	300 acres		
Support Amenity rent	22 BDT/ sq. ft. /year i.e. 0.27 USD/ sq. ft. / year		
Logistics zone rent	20 BDT/sq. ft. /year i.e. 0.24 USD/ sq. ft./ year		

Source: PwC analysis

In order to assess the impact of revenue driver and cost driver on the returns of the project, most sensitive revenue and cost drivers have been varied and the results on Project IRR have been tabulated for all 3 cases i.e. i) Conservative ii) Base and iii) Aggressive.

Table 131: Impact on return due to revenue and cost drivers

Lease Rental for SFB	Revenue Share with BEZA	Conservative Scenario		Base Scenario		Aggressive Scenario	
		Project IRR	Equity IRR	Project IRR	Equity IRR	Project IRR	Equity IRR
200	10%	8.9%	7.8%	10.4%	10.5%	15.1%	21.2%
230	7%	9.5%	8.6%	11.0%	11.6%	16.2%	24.1%
250	**5%**	**9.8%**	**9.3%**	**11.5%**	**12.4%**	**17.0%**	**26.1%**
270	2%	10.1%	9.9%	11.9%	13.2%	17.8%	28.1%
300	0%	10.7%	10.8%	12.6%	14.6%	19.1%	31.2%

Source: PwC analysis

The above table indicates the increasing returns generated as lease rental for SFB (revenue driver) is gradually increased and revenue share with BEZA (cost driver) is gradually decreased. All other parameters have been kept constant during the calculation of the above based scenarios.

Analysis of different project structuring options

Above calculations demonstrate the project returns accrued under different scenarios for the as-is case where the PPP developer would be developing the proposed EZ.

There could be three project structuring options for this project. These options are outlined in the following-

a) As-Is case where PPP developer would develop the EZ site
b) BEZA gets equity stake in developer's SPC
c) BEZA takes the responsibility of financing, constructing and operating the EZ through its own resources

Keeping other parameters as constant, following cost and revenue assumptions have been made to evaluate the project structuring outcomes under the options listed above.

Table 132: Cost and Revenue drivers for project structuring options

Scenarios	Cost	Revenue
a) As-is case where PPP developer would develop the EZ site	Hard cost of developing the EZ site - BDT 43,380.4 million i.e. USD 529 million	Sources of revenue remain unchanged across the three scenarios in line with "Revenue Assumption" section of this chapter.
b) BEZA gets equity stake in developer's SPC	Hard cost of developing the EZ site – BDT 43,380.4 million i.e. USD 529 million + Cost of acquiring land for EZ site – 1,063.33 million* i.e. USD 12.97 million	
c) BEZA takes the responsibility of financing, constructing and operating the EZ through its own resources	Hard cost of developing the EZ site – BDT 43,380.4 million i.e. USD 529 million + Cost of acquiring land for EZ site – 1,063.33 million* i.e. USD 12.97 million + Hard cost of developing offsite infrastructure – BDT 92,927.2 million i.e. USD 1,133.26 million	

**Using cash compensation under law method*

The returns calculated in this chapter under **option a)**, indicates the returns are not attractive for the developer to undertake development of the EZ site. However, a comparison of the first option with other two options listed above, indicates that the returns could further deteriorate under **option b) and c)** since although the revenue drivers have remained unchanged under these options, other cost drivers i.e. cost of acquiring land for EZ site (~BDT 1,063 million) and cost of developing offsite infrastructure (~BDT 92,927.2 million) is getting added to the cost of developing the EZ.

Thus, the as-is case (where PPP developer would be developing the EZ site) is financially a better option (generating comparatively higher returns) as compared to the other project structuring options.

12.5. Conclusions and Recommendations

Financial modelling exercise highlights the entire gamut of cost and revenue assumptions taken in order to evaluate the financial feasibility for the PPP developer who would envisage construction and operation of the proposed EZ. Given the interest rate of borrowing fund for undertaking construction of Economic Zone, which is

10%, the return generated from the project (project IRR of 12.6% and equity IRR of 14.6% in the base scenario) is attractive in nature.

Given the positive impact on Bangladesh's economy (as discussed in Economic Modelling chapter) expected out of establishing an EZ site in Feni, private developer could also consider approaching donor agencies like World Bank, Asian Development Bank or applying for external commercial borrowing (ECB) to bring down the cost of debt. This would subsequently improve returns generating from the project.

Development of economic zones in Bangladesh is in line with BEZA's end objective of promoting industrial development and employment generation in Bangladesh. Getting a PPP private developer to construct and operate the EZ site would result in better quality and improved operational efficiency in the service provided to the manufacturers who would invest in the EZ site. PPP private developer has better access to following key resources as compared to BEZA:

- **Human Resources**: The Developer has a better access to human resources, and does not have to go through government bureaucracy for deployment of human resources, which gives it better access to human resources, and more efficient operations;
- **Finance:** The developer has full access to diversified project finance instruments with limited or no constraints. This provides flexibility on capital structures and capital costs;
- **Expertise:** The developer will have better access to resources such as the required expertise in project preparation, design, management and implementation;
- **Experience**: The developer's team may have better experience in developing and managing SEZs, especially on facility management and operation;
- **Technologies:** The Developer has better access to cutting edge technologies.

By dint of having better access to the above outlined resources, PPP private developer can provide BEZA the following advantages:

- **Better financial discipline**, since a developer has to operate efficiently to stay in business, while government agencies are protected against bankruptcy
- **Rapid project implementation** through better access to additional human resources and expertise
- **Removal of financial constraints** through better access to private finance
- **Ability to change plans and resources** during implementation/ operations of the project to adapt to changes in market conditions and other variables affecting the project.

As a private developer is better placed to finance, construct, and operate the proposed EZ, BEZA may explore the possibility of getting on-board a private developer through PPP route. This option is better placed with respect to other structuring options discussed earlier.

In order to increase the returns from the project, private developer could consider possibility of obtaining concessional loans or BEZA could support the developer by adopting the following approaches –

- **Exploring possibility of obtaining concessional loan through external commercial borrowing and funding from multilaterals –** Lower the rate of borrowing, higher is the project returns. In order to increase the equity IRR, private developer may approach multilateral/ funding agencies and may also explore the possibility of obtaining commercial borrowing through External Commercial Borrowing (ECB) route.
- **BEZA deciding to modify bid parameters -** The financial model has provision for considering 3 parameters which could be used by BEZA for selection of developer, which are –
    - Upfront payment by developer to BEZA
    - Annual land lease to be paid by developer to BEZA during concession period

- % of gross revenue accruing from the EZ to be shared by developer with BEZA

Key objective of this economic zone project is to generate employment and improve the overall socio-economic conditions of the region surrounding the project site. BEZA, keeping cognizance of the ultimate objective of this project, may decide to forego one of the bid parameters. Such modification in bid parameters would result in higher project return, thus making the project financially more profitable for the private developer.

Implementation of the recommendations outlined above would improve the returns accruing from this project for the private developer.

13. Economic Modeling

13.1. Purpose and Objective

The objective of this analysis is to quantify the impact of the development of the proposed EZ on the economy of Bangladesh. Financial analysis (or Financial IRR) estimates the return accruing to the project operating entity (EZ developer), whereas Economic Internal Rate of Return (EIRR) estimates the return on the investment to the national economy. Economic analysis is essential to develop a rationale for Government of Bangladesh to support the development of the proposed EZ and illustrate the measure of the accrued economic benefits.

13.2. Methodology of Economic Modelling

13.2.1. EIRR Framework

EIRR is a holistic approach which takes into consideration the following stakeholders (directly/ indirectly) associated with the project:

- The project financers (whose return was calculated as the financial internal rate of return),
- The employment (both direct and indirect employment) generated because of the project,
- The suppliers and customers of the project,
- Competitors of the project,
- Residents who are being affected by the implementation of the project and
- Others

Determination of EIRR is directly aligned with the objectives of the multilateral agencies i.e. alleviation of poverty, employment generation and overall development of the country.

A two-stage process has been adopted for the calculation of EIRR.[249]

EIRR = Private Returns + Cost Gains

Where, *Private Returns = Actual Revenues - Actual Costs*

Cost Gains = Actual Cost - Opportunity Cost

All taxes and subsidies have been excluded for computation of EIRR. The impact of inflation has been excluded while calculating the EIRR.

Economic analysis requires quantification of various costs and benefits converted to 'economic equivalent' terms. EIRR also requires identification of 'externalities' and valuation of inputs and outputs at their true economic prices, or the 'opportunity costs'.

Financial analysis only looks at the project from the perspective of the implementing agency (the private developer). Financial analysis is only concerned with line items that entail monetary outlays. Economic analysis on the other hand looks at cost and associated benefits to the economy. In economic analysis, a resource must be priced at its opportunity cost (its value in the best possible use), even if it is obtained free since use of the resource is a cost to the economy. Economic analysis measures both the positive and negative impact of the project.

The economic cost reflects the degree to which the consumption elsewhere in the ecosystem is sacrificed due to the diversion of the resources required for the project. Whereas, the economic benefit portrays the extent to which the project contributes to the increasing value of consumption available to the society.

Some important aspects to be considered while undertaking economic analysis are:

[249] *Benjamin Esty, Frank Lysy, & Carrie Ferman, "An Economic Framework for Assessing Development Impact", Harvard Business School Case 9-202-052, February 7, 2003.*

- Economic analysis is considered at constant prices in local currency terms. Thus, in case of accounting for economic costs and benefits, all costs and benefits must be measured in 'real' terms. In such analysis, all the costs and benefits are considered at the commencement year i.e. 2018.
- For undertaking the economic analysis, financial costs are to be converted to their economic cost equivalents. By and large the financial components are capex (capital investment in land, construction cost etc.) and Opex (operational expenditure).
- Items like taxes, duties and subsidies included in the financial cost are excluded as these are market distortions.
- Debt service costs (interest during construction) are not included as economic cost in the analysis as the same doesn't require usage of resources.
- Cost owing to Environmental Management Plan has been included in the economic cost calculation.

13.2.2. Methodology Adopted

The economic analysis for proposed EZ was undertaken in three major steps:

a) *Step 1:* In this step, the total economic cost for the project was calculated. All the direct costs (both capital expenditure and operational expenditure) associated with the project development were enlisted and broken down into the three factors of production viz. capital (material and equipment), land and labor. The pertinent financial costs were converted to the economic costs using conversion factors as elucidated above.

b) *Step 2:* The financial benefits from the proposed EZ project was calculated and converted to economic terms to capture the economic benefits which (directly/indirectly) impact the economy of Bangladesh. In this step, the cumulative economic benefit accrued from this project was computed.

Economic benefits considered are:

1) Value added in export owing to the industrial activities within the economic zone.
2) Economic benefit (through gains for the exchequer) as a result of the industrial operations within the proposed EZ
3) Employment generation owing to the development of the proposed economic zone. Minimum wage rate of BEPZA, SWRF, and SERF have been considered to arrive at the economic value of the total employment generated.
4) Tax incentive availed by the developer is a loss (economic cost) for the exchequer and tax paid by the developer is a gain (economic benefit) for the exchequer.

c) *Step 3:* Economic return for the project tenure was calculated by deducting the economic cost from the total economic benefit. IRR was calculated considering the base case.

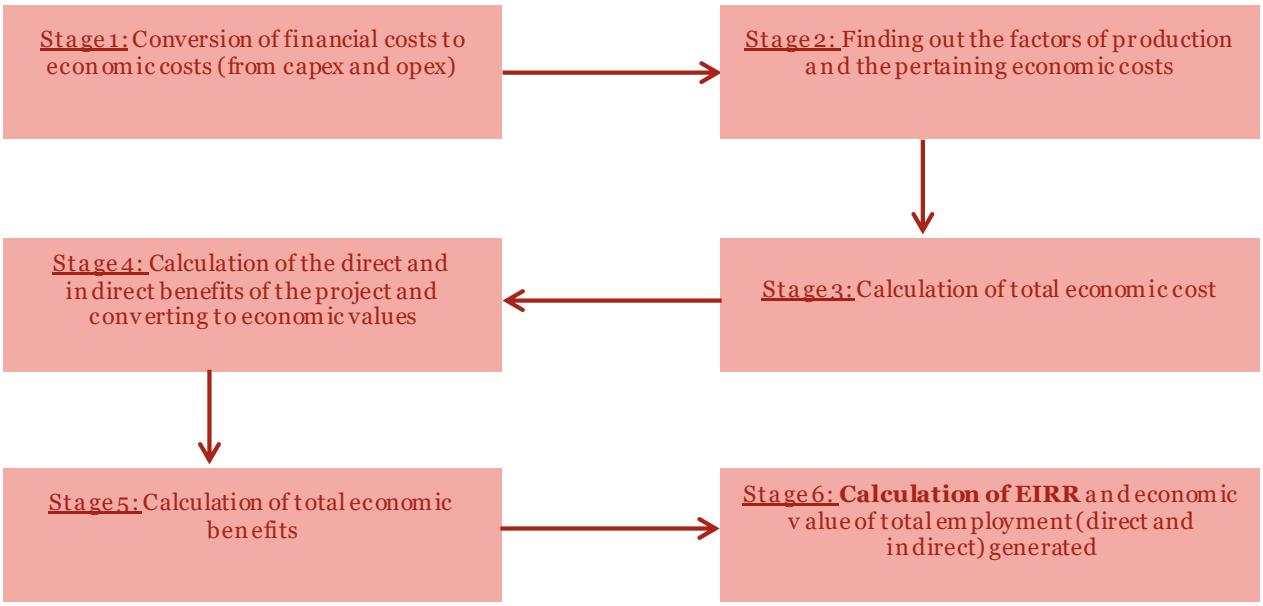
Economic modelling exercise has been undertaken for three scenarios as elucidated in the following-

- Aggressive scenario: Macro-economic conditions of Bangladesh and the region are improving; Potential infrastructure projects are commencing prior to CoD
- Base scenario: Macro-economic conditions of Bangladesh and the region are showing steady trend and behaving as expected; potential infrastructure projects are commencing as scheduled
- Conservative scenario: Macro-economic conditions of Bangladesh and the region are showing declining trend; potential infrastructure projects are delayed

Proceeds from the demand forecasting exercise have been taken into cognizance to undertake the economic modelling exercise for the above stated three scenarios. Industrial space uptake rates and number of industrial establishments have been considered to undertake this economic modelling.

The approach & methodology adopted for each of the three scenarios has been illustrated in the diagram on the next page.

Figure 97: Framework for Economic IRR calculation



13.3. Assumptions, Inputs and Variables

The Economic IRR for the project has been calculated considering economic costs and benefits generating out of the project over the project tenure. The assumptions adopted for computation of economic IRR are based on the assumptions as depicted in our financial analysis. Base case was used for calculating the EIRR for the project. In addition to the above, the following assumptions were considered for arriving at the EIRR:

- *Cost of land:* Since this project envisages land being transferred from BEZA to the private developer, cost of land has not been considered in this economic model.
- *Environmental costs:* Costs related to Environment have been also included in the model. Costs associated with technical support, development of green belt, solid and hazardous waste management, waste and waste water, construction safety etc. have been included as part of capital expenditure. In the operational expenditure section, maintenance costs for heads like operation of CETP/ STP/ waste facilities, establishment & training and monitoring of performance indicators have been considered.
- *Capital Expenditure (Capex):* The capex incurred for various components of the project is obtained from the financial model. This has further been segregated into three components:

  a) Material – 50% of total capex
  b) Equipment – 30% of total capex
  c) Labor – 20% of total capex

- *Specialized infrastructure Cost:* Additional costs incurred on developing the site due to the site's proximity to sea front in the form of constructing a superdyke and a desalination plant have also been factored in during the calculation of capital expenditure
- *Operating Expenditure (Opex):* We have assumed that 90% Opex will generate on account of the materials and the consumables; 10% of opex will generate on account of the equipment. The operating cost for personnel is calculated separately in the economic model.
- *Land lease expenses:* Land lease expense is not included in the economic analysis

- *Import of Equipment:* We have assumed that 75% of the equipment and machinery used for the project would be imported. This is based on the standard practice and market benchmark of similar industries in Bangladesh.
- Capex and Opex have been converted to economic equivalents/ market costs using the following assumptions:
  - *Shadow Exchange Rate Factor (SERF)* of 1.05 was considered. The basis is that BDT is overvalued by about 5%.[250]
    SERF is the ratio of economic price of foreign currency to its market price. Alternatively, it is the ratio of the shadow to the official exchange rate. For economic analysis using the domestic price numeraire, the SERF is applied to all outputs and inputs, including labor and land that have been valued at border price equivalent values, with project effects measured at domestic market price values left unadjusted.
  - *Shadow Wage Rate Factor (SWRF)* of 1.00 for skilled labor and 0.75 for unskilled labor was assumed.[251] Further it was considered that the project will have a mix of 60% skilled labor and 40% unskilled labor. Hence, SWRF of 0.90 has been arrived.
    SWRF is the ratio of the shadow wage rate of a unit of a certain type of labor, measured in the appropriate numeraire, and the project wage for the same category of labor. Alternatively, the ratio of the economic and the SWRF can be used to convert the financial cost of labor into its economic cost.

These figures are in conformity with the information provided by Bangladesh Planning Commission and ADB economic analysis reports for Bangladesh. These were applied to tradable inputs and labor component to get domestic equivalents. It may be noted that since SERF is applied on the costs, factors such as the import duty is considered to be adjusted in the SERF and hence import duty has not been considered separately.

- VAT rate (for both capex and opex) has been considered as 15% according to the prevailing rate for Bangladesh.
- Estimation of indirect and induced employment generation (due to generation of downstream industries) is based on Employment Multiplier Coefficient of 0.7. The coefficient was extracted from Background Paper for World Development Report 2013 "Structural Transformation and Employment Creation"[252]. The indirect employment generation coefficient for several developing countries (size and geography similar to Bangladesh) was considered to arrive at this figure.
- *Tax Treatment:* Since tax, subsidies and incentives are distortionary in nature; their impact needs to be nullified by making necessary adjustments.
- It has been assumed that each of the industrial units will operate at 80% capacity utilization level and the plant efficiency level is 80%; export contribution of each of the industrial units is 25% of its Gross Value Added.

A guide for operating the economic model is placed as annexure.

13.4. Results and Conclusions

Base case Economic Internal Rate of Return (EIRR) has been calculated as **18.15%**, which indicates that the project is providing fairly attractive returns throughout the tenure of the project. Following table in the next page depicts the scenario analysis of the proposed EZ.

250 Additional Financing to the Third Primary Education Development Project RRP BAN 42122 by ADB (2015)
251 Similar assumption was taken for ADB-Khulna water supply project
252 Background Paper for World Development Report 2013 "Structural Transformation and Employment Creation" by Christian Kingombe and Dirk Willem te Velde, Overseas Development Institute

Table 133: Scenario Analysis of the Proposed EZ

Scenario	EIRR
Base Scenario	18.15%
Aggressive Scenario	25.98%
Conservative Scenario	14.50%

Table above indicates that in conservative case, the project generates **14.50%** economic return which is fair in nature. Aggressive scenario indicates that the economic return of the project is **25.98**%, which is attractive.

It appears from the above analysis that the proposed EZ generates fair to attractive economic return in the context of Bangladesh's economy and growth targets.

14. Way Forward

Through this section, we take this opportunity of highlighting our next steps to be undertaken in this project. The same are elucidated below:

- We have tried our best to address all the concerns raised by BEZA and World Bank in this Final report, however we request you to kindly provide any further comments that you might be having, so that we can incorporate the same in the Final Report for your kind perusal within 10 days from receipt of the same.
- A detailed Environmental and Social impact assessment should be carried out by BEZA prior to any site preparation/construction activity and to obtain environment clearance certificate from Department of Environment, Bangladesh.

15. Annexure

15.1. Annexure 1 – Site Photographs

The photographs taken during the site visits have been shown below.

View of the site from West boundary

Dirt road leading to western boundary of site

Dirt road leading to west side of the site

Single lane metal road leading to the dirt road

Currently operational substation at Dakbangla

Substation under construction at Solakhali

15.2. Annexure 2 – Import Trend of Bangladesh

Figures in USD million

Highlighted cells belong to top 75% products

Product label	Imported value in 2012	Imported value in 2013	Imported value in 2015	Imported value in 2016
Cotton	5,921	6,095	7,150	5,383
Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	3,405	3,321	4,792	5,314
Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	1,941	1,799	2,451	3,059
Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	3,216	2,858	5,220	2,079
Iron and steel	1,886	1,714	2,408	2,054
Plastics and articles thereof	1,293	1,380	1,795	1,958
Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	885	759	1,144	1,675
Man-made staple fibres	1,090	1,206	1,624	1,509
Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal ...	2,971	2,705	2,770	1,459
Knitted or crocheted fabrics	297	300	590	1,003
Man-made filaments; strip and the like of man-made textile materials	660	728	1,103	912
Cereals	618	781	1,521	858
Fertilizers	1,107	956	1,256	736
Sugars and sugar confectionery	1,013	678	838	697
Paper and paperboard; articles of paper pulp, of paper or of paperboard	460	455	581	656
Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring ...	402	423	588	626
Edible vegetables and certain roots and tubers	371	517	705	606
Organic chemicals	499	458	657	599
Commodities not elsewhere specified	1	0	1	595
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	287	287	400	576
Articles of iron or steel	327	685	445	569
Miscellaneous chemical products	358	366	505	533
Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	6	6	8	496
Salt; sulphur; earths and stone; plastering materials, lime and cement	759	778	992	483
Miscellaneous manufactured articles	192	182	258	430
Residues and waste from the food industries; prepared animal fodder	185	283	491	410
Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery	98	95	163	386

Product label	Imported value in 2012	Imported value in 2013	Imported value in 2015	Imported value in 2016
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal ...	339	394	592	375
Edible fruit and nuts; peel of citrus fruit or melons	132	103	274	313
Aluminium and articles thereof	192	223	262	307
Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable ...	85	86	138	305
Rubber and articles thereof	228	216	299	278
Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, ...	274	261	375	259
Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or ...	143	143	166	257
Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere ...	267	228	290	239
Articles of apparel and clothing accessories, not knitted or crocheted	683	707	887	236
Pharmaceutical products	198	169	187	230
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	77	85	74	218
Miscellaneous articles of base metal	43	41	59	196
Footwear, gaiters and the like; parts of such articles	95	96	153	187
Copper and articles thereof	150	128	210	177
Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial ...	129	131	161	174
Zinc and articles thereof	103	104	159	164
Ships, boats and floating structures	1,353	1,005	994	155
Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	14	15	42	151
Coffee, tea, maté and spices	92	114	230	150
Ceramic products	53	55	68	138
Raw hides and skins (other than furskins) and leather	69	80	169	137
Essential oils and resinoids; perfumery, cosmetic or toilet preparations	77	71	74	137
Railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures ...	21	112	7	118
Glass and glassware	61	57	73	118
Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof	28	28	46	110
Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles ...	19	12	29	100
Albuminoidal substances; modified starches; glues; enzymes	47	52	76	94
Articles of apparel and clothing accessories, knitted or crocheted	17	12	23	90

Product label	Imported value in 2012	Imported value in 2013	Imported value in 2015	Imported value in 2016
Miscellaneous edible preparations	49	42	74	89
Preparations of cereals, flour, starch or milk; pastrycooks' products	60	60	71	85
Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	29	28	55	76
Wool, fine or coarse animal hair; horsehair yarn and woven fabric	52	46	43	62
Toys, games and sports requisites; parts and accessories thereof	19	17	24	62
Articles of stone, plaster, cement, asbestos, mica or similar materials	29	33	36	60
Aircraft, spacecraft, and parts thereof	237	138	201	59
Wood and articles of wood; wood charcoal	109	92	114	58
Other made-up textile articles; sets; worn clothing and worn textile articles; rags	40	28	34	56
Printed books, newspapers, pictures and other products of the printing industry; manuscripts, ...	59	35	297	54
Lead and articles thereof	39	39	55	42
Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles ...	41	42	4	41
Photographic or cinematographic goods	22	24	29	41
Fish and crustaceans, molluscs and other aquatic invertebrates	17	30	55	41
Umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof	8	4	5	40
Products of animal origin, not elsewhere specified or included	12	12	60	32
Ores, slag and ash	58	64	72	31
Lac; gums, resins and other vegetable saps and extracts	6	5	8	28
Clocks and watches and parts thereof	4	4	6	27
Products of the milling industry; malt; starches; inulin; wheat gluten	26	27	32	26
Live animals	12	12	10	18
Headgear and parts thereof	2	2	3	18
Tobacco and manufactured tobacco substitutes	15	10	12	16
Cocoa and cocoa preparations	4	4	7	15
Beverages, spirits and vinegar	10	9	13	13
Preparations of vegetables, fruit, nuts or other parts of plants	10	7	8	13
Vegetable plaiting materials; vegetable products not elsewhere specified or included	1	2	5	13
Carpets and other textile floor coverings	3	4	5	12
Arms and ammunition; parts and accessories thereof	120	112	130	10
Silk	6	6	5	5
Tin and articles thereof	2	3	3	5
Nickel and articles thereof	3	2	1	4
Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	2	1	2	4
Other base metals; cermets; articles thereof	6	5	5	4

Product label	Imported value in 2012	Imported value in 2013	Imported value in 2015	Imported value in 2016
Musical instruments; parts and accessories of such articles	2	1	0	2
Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	2	2	1	1
Meat and edible meat offal	1	1	1	1
Furskins and artificial fur; manufactures thereof	0	0	1	1
Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage	0	0	0	0
Works of art, collectors' pieces and antiques	1	1	0	0
Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork	0	0	1	0
Cork and articles of cork	0	0	0	0

Source: ITC Trade Database

15.3. Annexure 3 – Export Trend of Bangladesh

Figures in USD million

Highlighted cells belong to top 75% products

Product label	Exported value in 2012	Exported value in 2013	Exported value in 2015	Exported value in 2016
Articles of apparel and clothing accessories, not knitted or crocheted	9,850	10,000	13,765	16,292
Articles of apparel and clothing accessories, knitted or crocheted	9,421	9,568	12,767	16,271
Other made-up textile articles; sets; worn clothing and worn textile articles; rags	1,067	876	819	987
Footwear, gaiters and the like; parts of such articles	349	429	697	912
Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	759	669	681	768
Fish and crustaceans, molluscs and other aquatic invertebrates	496	530	445	602
Headgear and parts thereof	51	43	76	279
Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles ...	139	164	293	257
Raw hides and skins (other than furskins) and leather	325	422	299	209
Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	117	113	131	90
Tobacco and manufactured tobacco substitutes	55	49	49	88
Plastics and articles thereof	89	72	80	82
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	40	50	53	70
Pharmaceutical products	50	61	70	69
Toys, games and sports requisites; parts and accessories thereof	15	22	27	58
Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles ...	8	9	15	58
Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	76	45	60	57
Edible vegetables and certain roots and tubers	84	114	70	52
Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	447	279	178	52
Ceramic products	36	40	37	47

Product label	Exported value in 2012	Exported value in 2013	Exported value in 2015	Exported value in 2016
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	27	28	40	46
Commodities not elsewhere specified	0	2	1	42
Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof	22	21	30	37
Preparations of cereals, flour, starch or milk; pastrycooks' products	36	45	85	35
Carpets and other textile floor coverings	7	9	19	35
Lead and articles thereof	7	2	12	28
Edible fruit and nuts; peel of citrus fruit or melons	48	50	27	27
Copper and articles thereof	63	51	26	24
Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	120	80	171	24
Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, ...	41	13	22	23
Preparations of vegetables, fruit, nuts or other parts of plants	36	52	70	23
Cotton	107	105	92	22
Coffee, tea, maté and spices	27	20	26	19
Ships, boats and floating structures	3	5	20	19
Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	2	7	2	18
Man-made staple fibres	44	37	26	15
Beverages, spirits and vinegar	7	7	25	15
Iron and steel	41	32	19	14
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal ...	10	24	18	13
Salt; sulphur; earths and stone; plastering materials, lime and cement	4	4	2	13
Sugars and sugar confectionery	15	37	9	11
Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal ...	10	13	18	11
Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork	6	6	8	11
Ores, slag and ash	20	18	8	10
Rubber and articles thereof	18	12	22	10
Articles of iron or steel	19	19	27	9
Man-made filaments; strip and the like of man-made textile materials	27	31	37	8
Knitted or crocheted fabrics	17	16	34	8

Product label	Exported value in 2012	Exported value in 2013	Exported value in 2015	Exported value in 2016
Miscellaneous edible preparations	1	0	0	7
Residues and waste from the food industries; prepared animal fodder	16	8	3	7
Miscellaneous manufactured articles	9	10	15	7
Miscellaneous chemical products	2	4	4	7
Cereals	4	4	6	7
Fertilisers	0	0	0	7
Wood and articles of wood; wood charcoal	1	2	4	6
Paper and paperboard; articles of paper pulp, of paper or of paperboard	29	33	36	6
Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	0	2	5	5
Zinc and articles thereof	4	2	3	4
Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery	84	81	49	4
Organic chemicals	0	0	1	3
Umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof	0	0	0	3
Glass and glassware	0	0	2	3
Products of animal origin, not elsewhere specified or included	7	11	15	3
Railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures ...	1	1	1	2
Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	4	5	6	2
Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring ...	0	0	0	2
Albuminoidal substances; modified starches; glues; enzymes	1	1	1	2
Articles of stone, plaster, cement, asbestos, mica or similar materials	0	2	0	2
Printed books, newspapers, pictures and other products of the printing industry; manuscripts, ...	1	1	1	2
Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable ...	9	9	13	2
Aluminium and articles thereof	0	0	2	2
Arms and ammunition; parts and accessories thereof	0	3	2	2

Product label	Exported value in 2012	Exported value in 2013	Exported value in 2015	Exported value in 2016
Aircraft, spacecraft, and parts thereof	26	8	15	2
Miscellaneous articles of base metal	0	0	0	1
Essential oils and resinoids; perfumery, cosmetic or toilet preparations	1	0	1	1
Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere ...	1	0	2	1
Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial ...	2	2	3	1
Products of the milling industry; malt; starches; inulin; wheat gluten	1	1	2	1
Lac; gums, resins and other vegetable saps and extracts	0	0	0	1
Works of art, collectors' pieces and antiques	0	1	0	1
Vegetable plaiting materials; vegetable products not elsewhere specified or included	0	0	24	1
Meat and edible meat offal	1	7	1	1
Nickel and articles thereof	0	0	0	0
Cocoa and cocoa preparations	0	0	0	0
Other base metals; cermets; articles thereof	1	0	0	0
Clocks and watches and parts thereof	0	1	1	0
Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage	46	33	10	0
Silk	0	0	0	0
Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	0	0	0	0
Furskins and artificial fur; manufactures thereof	0	0	0	0
Wool, fine or coarse animal hair; horsehair yarn and woven fabric	1	0	0	0
Musical instruments; parts and accessories of such articles	0	0	0	0
Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or ...	0	0	0	0
Photographic or cinematographic goods	0	0	0	0
Tin and articles thereof	0	0	0	0
Live animals	0	0	0	0
Cork and articles of cork	0	0	0	0

Source: ITC Trade Database

15.4. Annexure 4 – Gross Output of Manufacturing Sector in Bangladesh

Highlighted cells belong to top 80% products

BSIC code and description Total	Gross Output (in BDT Million) 5,394,902	Rank
10 Manufacture of food products	608777	4
11 Manufacture of beverages	52826	13
12 Manufacture of tobacco products	87197	9
13 Manufacture of textiles	715247	3
14 Manufacture of wearing apparel (Ready-made garments)	1819482	1
15 Manufacture of leather and related products	76147	10
16 Manufacture of wood and products of wood and cork,except furniture; manufacture of articles of straw and plaiting materials.	6912	22
17 Manufacture of paper and paper products	57187	12
18 Printing and reproduction of recorded media	10821	21
19 Manufacture of coke and refined petroleum products	3684	23
20 Manufacture of chemicals and chemical products	140184	7
21 Manufacture of pharmaceuticals, medicinal chemical and botanical products	113070	8
22 Manufacture of rubber and plastics products	51143	14
23 Manufacture of other non-metallic mineral products	351779	5
24 Manufacture of basic metals	905850	2
25 Manufacture of fabricated metal products, except machinery and equipment	71357	11
26 Manufacture of computer, electronic and optical products	39623	16
27 Manufacture of electrical equipment	145166	6
28 Manufacture of machinery and equipment n.e.c.	13141	19
29 Manufacture of motor vehicles, trailers and semitrailers	36780	17
30 Manufacture of other transport equipment	36291	18
31 Manufacture of furniture	39685	15
32 Other manufacturing	11263	20
33 Repair and installation of machinery and equipment	1134	24
34 Recycling	129	25

Source: Bangladesh Bureau of Statistics, Survey of Manufacturing Industries 2012

15.5. Annexure 5 – Respondents' Profile: Primary Survey

Sl. No.	Name of Company	Sector	Origin
1	Al Salam Fabrics Pvt Ltd	Textile & RMG	Domestic
2	Hunhsin Textile Co (BD) Limited	Textile & RMG	Domestic
3	United Washing Plant Ltd	Textile & RMG	Domestic
4	Dragoni BD Limited	Textile & RMG	Domestic
5	Speed Plus BD Limited	Textile & RMG	Domestic
6	Bandrix Casual Ware BD Limited	Textile & RMG	Domestic
7	Coats Bangladesh	Textile & RMG	Domestic
8	Onus Group	Textile & RMG	Domestic
9	Bengal Textile Mills Ltd	Textile & RMG	Domestic
10	Yokohama	Textile & RMG	Domestic
11	Shahjalal Leather Complex Ltd	Leather and Leather Products	Domestic
12	Sarwar Leather Corporation Ltd.	Leather and Leather Products	Domestic
13	Huizhou Baijia Gloves Company Ltd	Leather and Leather Products	Domestic
14	M/S Sanwa Corporation	Leather and Leather Products	Domestic
15	Rider Leather Bags and Luggage Factory Ltd	Leather and Leather Products	Domestic
16	M/S Picard Bangladesh Ltd	Leather and Leather Products	Domestic
17	Divine Crafts and Fashion	Leather and Leather Products	Domestic
18	ECM Footware Limited	Leather and Leather Products	Domestic
19	Bangladesh Tannery Association	Leather and Leather Products	Domestic
20	Apex Tannery	Leather and Leather Products	Domestic
21	Isamoti Enterprise	Electrical and Electronics	Domestic
22	Anamika Electric and Engineering Works	Electrical and Electronics	Domestic
23	M.A.P Electric Company	Electrical and Electronics	Domestic
24	One Touch Electric Products	Electrical and Electronics	Domestic
25	Prince Electric Products	Electrical and Electronics	Domestic
26	M.N. Electric Company Ltd	Electrical and Electronics	Domestic
27	Hi-Tech Electro Products Ltd	Electrical and Electronics	Domestic
28	Energy Pac Industry Ltd	Electrical and Electronics	Domestic
29	Nito Cable Industry Ltd	Electrical and Electronics	Domestic

Sl. No.	Name of Company	Sector	Origin
30	General Battery Company Ltd.	Electrical and Electronics	Domestic
31	Salim Machinery	Light Machinery, Equipment and Furniture	Domestic
32	Corvo Cycles Ltd	Light Machinery, Equipment and Furniture	Domestic
33	Bestec BD Limited	Light Machinery, Equipment and Furniture	Domestic
34	OP-Seed Co (BD) Ltd	Light Machinery, Equipment and Furniture	Domestic
35	Medina Polymers	Light Machinery, Equipment and Furniture	Domestic
36	Jwel Engineering Works	Light Machinery, Equipment and Furniture	Domestic
37	Hossain Engineering Works	Light Machinery, Equipment and Furniture	Domestic
38	Ray Engneering Works	Light Machinery, Equipment and Furniture	Domestic
39	Jaker Engineering Association Ltd	Light Machinery, Equipment and Furniture	Domestic
40	Ujala Engineering Ind	Light Machinery, Equipment and Furniture	Domestic
41	Hashem Paper Mills Ltd.	Paper and Packaging	Domestic
42	Unison Paper Products & Converting Ltd.	Paper and Packaging	Domestic
43	Salauddin Paper Cone & Tube Manufacturers	Paper and Packaging	Domestic
44	Touch Paper Products	Paper and Packaging	Domestic
45	Nitol Curtis Paper Mills Ltd	Paper and Packaging	Domestic
46	S R Paper Products	Paper and Packaging	Domestic
47	NTS Paper Cone	Paper and Packaging	Domestic
48	Touch Paper Products	Paper and Packaging	Domestic
49	JB Paper Tube	Paper and Packaging	Domestic
50	N.S. Paper Tube Ltd	Paper and Packaging	Domestic
51	Runner Group	Automobile and Accessories	Domestic
52	Nitol Automobiles (JV with Tata Motors)	Automobile and Accessories	Domestic
53	IFAD Automobile	Automobile and Accessories	Domestic
54	Nita Automobiles (JV with Hero Motors)	Automobile and Accessories	Domestic
55	Toyota (JV with Navanna Group)	Automobile and Accessories	Domestic
56	Rahimafrooz	Automobile and Accessories	Domestic
57	BSRM Group	Heavy Machineries, Iron, Steel and Metal	Domestic
58	Shahriar Steel Mills	Heavy Machineries, Iron, Steel and Metal	Domestic
59	Baizid Group	Heavy Machineries, Iron, Steel and Metal	Domestic

Sl. No.	Name of Company	Sector	Origin
60	Elswedi	Heavy Machineries, Iron, Steel and Metal	Domestic
61	Al-Aksha Steel Mills Limited	Heavy Machineries, Iron, Steel and Metal	Domestic
62	KSRM Steel Plant	Heavy Machineries, Iron, Steel and Metal	Domestic
63	Kai Aluminium Limited	Heavy Machineries, Iron, Steel and Metal	Domestic
64	Al Tech Aluminium Industry Lmited	Heavy Machineries, Iron, Steel and Metal	Domestic
65	H.R. Re-Rolling Mills Ltd	Heavy Machineries, Iron, Steel and Metal	Domestic
66	Bikrampur Auto Re-Rolling Mills Limited	Heavy Machineries, Iron, Steel and Metal	Domestic
67	Amirath Lube	Petroleum and Petroleum Products (including bottling)	Domestic
68	NAVANA LPG	Petroleum and Petroleum Products (including bottling)	Domestic
69	BMS Co. Ltd	Petroleum and Petroleum Products (including bottling)	Domestic
70	Global Oil Company Ltd	Petroleum and Petroleum Products (including bottling)	Domestic
71	Lhotse BD Limited	Petroleum and Petroleum Products (including bottling)	Domestic
72	Escape Bangladesh Ltd	Petroleum and Petroleum Products (including bottling)	Domestic
73	Index LP Gas	Petroleum and Petroleum Products (including bottling)	Domestic
74	B M LP GAS	Petroleum and Petroleum Products (including bottling)	Domestic
75	HighSpeed Shipbuilding & Engineering Co. Ltd.	Shipbuilding and Shipbreaking	Domestic
76	Ismail Steel Enterprise	Shipbuilding and Shipbreaking	Domestic
77	Narayanganj Engineering and Ship Building	Shipbuilding and Shipbreaking	Domestic
78	Marine Trust Limited	Shipbuilding and Shipbreaking	Domestic
79	Alam Marine Ship Builder Ltd	Shipbuilding and Shipbreaking	Domestic
80	Karnaphuli Shipbuilders Ltd	Shipbuilding and Shipbreaking	Domestic
81	Alam Marine Shipbuilders	Shipbuilding and Shipbreaking	Domestic
82	Radiant Marine Design Ltd	Shipbuilding and Shipbreaking	Domestic
83	Shipbuilders Association	Shipbuilding and Shipbreaking	Domestic
84	Western Marine	Shipbuilding and Shipbreaking	Domestic
85	Confidence Cement	Non-Metallic Minerals	Domestic
86	Shah Cement Industries	Non-Metallic Minerals	Domestic
87	Borak Ready Mix Concrete	Non-Metallic Minerals	Domestic
88	Crown Cement	Non-Metallic Minerals	Domestic
89	Lafarge Holcim	Non-Metallic Minerals	Domestic

Sl. No.	Name of Company	Sector	Origin
90	Premier Cement Mills Limited	Non-Metallic Minerals	Domestic
91	People Ceramic Ltd	Non-Metallic Minerals	Domestic
92	Mirpur Ceramics Ltd	Non-Metallic Minerals	Domestic
93	Star Ceramic Ltd	Non-Metallic Minerals	Domestic
94	Farr Ceramics	Non-Metallic Minerals	Domestic
95	Carmelton Co. Ltd.	Textile & RMG	China
96	Wing Tai Asia	Textile & RMG	Hong Kong
97	Promising Exports Ltd.	Textile & RMG	India
98	Heritage Leather Goods	Leather and Leather Products	UK
99	Bay Emporium Ltd.	Leather and Leather Products	China
100	Rancourt & co.	Leather and Leather Products	USA
101	Huawei Technologies Co. Ltd	Electrical and Electronics	China
102	The Peking Craft Company Ltd.	Electrical and Electronics	Hong Kong
103	Sunpower Systems Pvt. Ltd.	Electrical and Electronics	Sri Lanka
104	AKS plastic Industries	Light Machinery, Equipment and Furniture	India
105	Supreme Industries	Light Machinery, Equipment and Furniture	India
106	Tarasankar Plastic Industries	Light Machinery, Equipment and Furniture	India
107	St. Regis International Pvt. Ltd.	Paper and Packaging	Sri Lanka
108	Abdulla International Pvt. Ltd.	Paper and Packaging	Sri Lanka
109	JK Paper Ltd.	Paper and Packaging	India
110	Hero MotoCorp Ltd.	Automobile and Accessories	India
111	Badve Engineering Ltd.	Automobile and Accessories	India
112	BY D Company Ltd	Automobile and Accessories	China
113	Kaltimex Energy	Heavy Machineries, Iron, Steel and Metal	Indonesia
114	Diach Chemicals & Pigments Pvt. Ltd.	Heavy Machineries, Iron, Steel and Metal	India
115	KISC	Heavy Machineries, Iron, Steel and Metal	China
116	Indian Oil Petronas Pvt. Ltd	Petroleum and Petroleum Products (including bottling)	India
117	Tata Petrodyne Ltd.	Petroleum and Petroleum Products (including bottling)	India
118	SABIC	Petroleum and Petroleum Products (including bottling)	Saudi Arabia
119	Keppel Singmarine Pte Ltd	Shipbuilding and Shipbreaking	Singapore

Sl. No.	Name of Company	Sector	Origin
120	Daewoo Shipbuilding & Marine Engineering Co.	Shipbuilding and Shipbreaking	South Korea
121	Tebma Shipyards Ltd.	Shipbuilding and Shipbreaking	India
122	JUD Group	Non-Metallic Minerals	India
123	UltraTech Cement	Non-Metallic Minerals	India
124	Noritake Lanka Porcelain Pvt. Ltd.	Non-Metallic Minerals	Sri Lanka

15.6. Annexure 6 – Gross Value Added of Manufacturing Sector in Bangladesh

BSIC Code	Category	Gross Value Added ('000 BDT) 2012
10	Food products	173,959,169
11	Beverages	13,563,935
12	Tobacco products	24,103,009
13	Textiles	219,728,433
14	RMG	555,979,580
15	Leather & related products	22,180,319
16	Wood products & cork, except furniture; articles of straw & plaiting materials	2,305,861
17	Paper products	15,690,942
18	Printing and reproduction of recorded media	4,862,787
19	Coke & refined petroleum products	1,309,369
20	Chemical products	37,247,914
21	Pharmaceuticals, medicinal chemical & botanical products	33,880,955
22	Rubber & plastics products	16,903,205
23	Other non-metallic mineral products	110,552,682
24	Basic metals	216,992,159
25	Fabricated metal products, except machinery & equipment	22,258,815
26	Computer, electronic & optical products	10,776,985
27	Electrical equipment	41,146,392
28	Machinery & equipment n.e.c.	3,912,336
29	Motor vehicles, trailers & semi-trailers	9,970,559
30	Transport equipment	10,290,836
31	Furniture	11,321,651
32	Other manufacturing	3,497,927
33	Repair and installation of machinery and equipment	459,602
34	Recycling	51,653
Total		**1,562,947,075**

Source: Bangladesh Bureau of Statistics, Survey of Manufacturing Industries (2012) Table 5.2.2 (Page 35)

Based on the above table, following list of Gross Value Added for the initial bucket list of industries has been developed.

Industry Sectors	Gross Value Added ('000 BDT) at 2012
Textiles and RMG	775,708,013
Food and Beverages	187,523,104
Agro based products	24,103,009
Leather and Leather Products	22,180,319
Plastic and Rubber	16,903,205

Industry Sectors	Gross Value Added ('000 BDT) at 2012
Paper and Packaging	17,996,803
Chemicals	37,247,914
Non Metallic Minerals	110,552,682
Auto and Automobile Accessories	20,261,395
Heavy Machinery, Iron & Steel and Metals	239,250,974
Electrical & Electronics	51,923,377
Ship Building and Ship Breaking	511,255
Petroleum Products including Bottling	1,309,369
Pharmaceuticals	33,880,955
Light Machinery and Equipment & Furniture	18,731,914

15.7. Annexure 7 – Estimation of Industrial Growth Rate

Industrial growth rate (organic) has been derived based on data available in secondary domains.

Quantum Index of Major Industries:

BSIC Code	Category	2013-14	2014-15	2015-16	2016-17 (Jul-Dec)
10	Food products	241.52	333.07	385.10	360.82
11	Beverages	243.19	230.06	269.75	261.03
12	Tobacco products	149.65	147.37	135.48	136.82
13	Textiles	139.68	122.81	138.90	156.49
14	RMG	293.70	304.76	338.73	332.28
15	Leather & related products	147.83	140.48	125.44	160.23
16	Wood products & cork, except furniture; articles of straw & plaiting materials	243.39	269.88	301.72	321.11
17	Paper products	151.95	174.68	181.08	183.29
18	Printing and reproduction of recorded media	127.73	140.91	147.83	154.18
19	Coke & refined petroleum products	92.76	96.79	112.00	173.35
20	Chemical products	80.41	77.49	92.73	97.95
21	Pharmaceuticals, medicinal chemical & botanical products	230.60	290.98	319.26	359.37
22	Rubber & plastics products	263.84	292.69	338.14	360.10
23	Other non-metallic mineral products	144.18	182.78	258.34	298.31
24	Basic metals	150.20	187.13	202.85	171.74
25	Fabricated metal products, except machinery & equipment	164.33	182.30	200.53	229.84
26	Computer, electronic & optical products	105.46	148.37	231.89	219.00
27	Electrical equipment	132.06	164.56	214.12	352.52
28	Machinery & equipment n.e.c.	172.68	204.89	279.14	360.95
29	Motor vehicles, trailers & semi-trailers	205.84	178.83	331.63	744.63
30	Transport equipment	152.88	340.12	592.41	493.28
31	Furniture	101.12	116.35	132.02	148.71
Overall manufacturing sector growth (CAGR from 13-14 to 16-17)=		**8.9%**			

Source: Quantum Index of major industries (base: 2005-06) based on National Accounts Statistics May' 2017

Growth Rates based on secondary research:

Industry Sectors	Annual Growth Rate	Annual Growth Rate
Textiles and RMG	13%	https://www.textiletoday.com.bd/overview-bangladesh-rmg-2016/
Food and Beverages	8%	http://katalyst.com.bd/wp-content/uploads/2017/01/Roles-and-Opportunities-for-Private-Sector-in-Agro-food-Processing-Industry-of-Bangladesh.pdf
Agro based products		
Leather and Leather Products	44%	https://sourcingjournalonline.com/bangladesh-aims-grow-leather-exports-5-billion-2021/

Industry Sectors	Annual Growth Rate	Annual Growth Rate
Plastic and Rubber	20%	http://bida.gov.bd/plastic-industry
Paper and Packaging		Not Available
Chemicals	9%	http://www.thedailystar.net/supplements/painting-the-future-bright-1331338 https://factsweek.com/160464/asia-textile-chemicals-market-is-projected-to-exhibit-a-cagr-of-7-6-from-2014-2020/ https://advancedtextilessource.com/2014/07/23/bangladesh-textile-chemicals-market-growth-continues/
Non Metallic Minerals	24%	http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489
	9.60%	http://today.thefinancialexpress.com.bd/print/outlook-for-cement-industry-in-bangladesh-1510666253
Auto and Automobile Accessories		Not Available
Heavy Machinery, Iron & Steel and Metals	15%	http://www.thedailystar.net/business/bangladeshs-steel-sector-beating-global-market-186499
Electrical & Electronics		Not Available
Ship Building and Ship Breaking		Not Available
Petroleum Products including Bottling	10%	http://fpd-bd.com/wp-content/uploads/2016/10/Research-Report-on-Energy-Sector-of-Bangladesh-Initiation-Mar-15-11.pdf
Pharmaceuticals	15%	https://www.jetro.go.jp/ext_images/world/asia/bd/seminar_reports/20160413/p4.pdf
Light Machinery and Equipment & Furniture		Not Available

Rationale behind the assumptions related to Infrastructure Induced Industrial growth rates are indicated below.

Infrastructure Project	Project Cost (USD billion)	Forecasted boost in GDP and industrial growth	Source
Padma Bridge	3.77	1%-2%	• http://www.dhakatribune.com/business/2017/02/22/tofail-bangladeshs-gdp-8-padma-bridge-built-2015/ • https://mpra.ub.uni-muenchen.de/37904/ • http://www.thedailystar.net/round-tables/padma-bridge-new-lifeline-development-203326 • http://www.dhakatribune.com/bangladesh/development/2017/09/18/padma-bridge-cost-shoot/
Dhaka Chittagong Highway	0.48		• https://textiletoday.com.bd/dhaka-chittagong-economic-corridor-new-economic-lifeline/ • https://bdnews24.com/economy/2016/02/16/cost-of-four-lane-dhaka-chittagong-highway-escalates
Payra Port	20.00		• https://www.joc.com/regulation-policy/infrastructure-news/asia-

Infrastructure Project	Project Cost (USD billion)	Forecasted boost in GDP and industrial growth	Source
			infrastructure-news/bangladesh-opts-make-payra-deep-sea-port_20171121.html • http://www.theindependentbd.com/printversion/details/71603

15.8. Annexure 8 – Assumptions related to Investment Inflow

Greenfield Investment Inflow:

In developing countries, Greenfield investment inflow is 57.85% of total investment inflow.

Source:
http://documents.worldbank.org/curated/en/628261468781753575/110510322_20041117173021/additional/325780wps3192.pdf

GDP Share of Chittagong Division as a proxy of Investment share with respect to the country:

District	Per capita GDP at current price (2010-11)	Population (2011)	Total GDP (billion)
Chittagong	55281	7913365	437.46
Cox's Bazar	35225	2381816	83.90
Rangamati	36934	620214	22.91
Bandarban	29220	404093	11.81
Khagrachori	24556	638967	15.69
Comilla	24705	5602625	138.41
Chandpur	31998	2513837	80.44
Brahmanbaria	28318	2953209	83.63
Noakhali	29565	3231832	95.55
Feni	26225	1496138	39.24
Laxmipur	30862	1797761	55.48
Bangladesh	**37610**	**149772364**	**5632.94**
		19.7%	**18.9%**

Source: http://www.plancomm.gov.bd/wp-content/uploads/2015/02/15_Lagging-Regions-Study.pdf

Incremental Capital Investment to Value Addition

Industry Sectors	Fixed Asset to Value added ratio	Total Fixed Assets ('000 BDT)	Gross Value added ('000 BDT)
Textiles and RMG	0.74	573,327,458	775,708,013
Food and Beverages	0.84	158,186,759	187,523,104
Agro based products	0.45	10,944,170	24,103,009
Leather and Footwear	1.29	28,594,792	22,180,319
Plastic and Rubber	0.98	16,570,442	16,903,205
Paper and Packaging	1.05	18,811,995	17,996,803
Chemicals	1.40	52,263,666	37,247,914
Non Metallic Minerals	0.80	44,420,459	55,276,341
Auto and Automobile Accessories	0.67	13,660,300	20,261,395
Heavy Machinery, Iron & Steel and Metals	0.47	112,121,753	239,250,974
Electrical, Electronics and ICT	0.48	25,151,531	51,923,377
Ship Building and Ship Breaking	0.63	324,044	511,255
Petroleum Products including Bottling	1.71	2,240,206	1,309,369
Pharmaceuticals	2.05	69,381,054	33,880,955
Light Machinery and Equipment & Furniture	0.76	14,144,530	18,731,914

Source: Survey of Manufacturing Industries 2012

15.9. Annexure 9 – Competition Phase Out Plan

Name of EZs	Location	Area (acres)	Industrial Area (acres)	2017	2018	2019	2020	2021	2022	2023	2024
Ashugonj EZ	Ashugonj	329	214								10%
Anawra -2 (CEIZ)	Anawra	774	503							5%	5%
Anwara EZ	Gahira, Anwara	504	327								
Mirsarai EZ	Mirsarai	30000	19500	5%	20%	25%	25%	25%			
Patiya EZ	Patiya	774	503							10%	10%
Comilla EZ	Meghna	272	177						20%	20%	20%
Cox's Bazar Special EZ	Moheshkhali	8785	5710								
Moheshkhali -1 EZ	Moheshkhali	1439	935								
Moheshkhali -2 EZ	Moheshkhali	827	538								
Moheshkhali -3 EZ	Dholghata	2800	1820								
Moheshkhali Special Economic Zone	Ghotibagha	1000	650								
alliance EZ	Comilla	100	65								
Maheshkhali EZ (Cox's Bazar)	Cox's Bazar	13659	8878								

Source: BEZA website and discussion with BEZA officials

Name of EZs	Location	Area (acres)	Industrial Area (acres)	2025	2026	2027	2028	2029	2030	2031	2032
Ashugonj EZ	Ashugonj	329	214	10%	10%	10%	15%	20%	25%		
Anawra -2 (CEIZ)	Anawra	774	503	10%	10%	10%	10%	10%	10%	10%	10%
Anwara EZ	Gahira, Anwara	504	327	5%	5%	10%	10%	10%	10%	10%	10%
Mirsarai EZ	Mirsarai	30000	19500								
Patiya EZ	Patiya	774	503	10%	10%	10%	10%	15%	15%	10%	
Comilla EZ	Meghna	272	177	20%	20%						
Cox's Bazar Special EZ	Moheshkhali	8785	5710				2%	5%	2%	8%	4%
Moheshkhali -1 EZ	Moheshkhali	1439	935			10%	4%	5%	5%	8%	10%
Moheshkhali -2 EZ	Moheshkhali	827	538					10%	5%	15%	10%
Moheshkhali -3 EZ	Dholghata	2800	1820				5%	5%	5%	5%	5%

Name of EZs	Location	Area (acres)	Industrial Area (acres)	2025	2026	2027	2028	2029	2030	2031	2032
Moheshkhali Special Economic Zone	Ghotibagha	1000	650								
alliance EZ	Comilla	100	65				5%	5%	5%	10%	5%
Maheshkhali EZ (Cox's Bazar)	Cox's Bazar	13659	8878								

Source: BEZA website and discussion with BEZA officials

Name of EZs	Location	Area (acres)	Industrial Area (acres)	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Ashugonj EZ	Ashugonj	329	214											
Anawra -2 (CEIZ)	Anawra	774	503	10%										
Anwara EZ	Gahira, Anwara	504	327	10%	10%	10%								
Mirsarai EZ	Mirsarai	30000	19500											
Patiya EZ	Patiya	774	503											
Comilla EZ	Meghna	272	177											
Cox's Bazar Special EZ	Moheshkhali	8785	5710	2%	3%	2%	6%	4%	6%	5%	2%	5%	5%	5%
Moheshkhali -1 EZ	Moheshkhali	1439	935	12%	8%	10%	12%	10%	6%					
Moheshkhali -2 EZ	Moheshkhali	827	538	5%	10%	15%	15%	5%	10%					
Moheshkhali -3 EZ	Dholghata	2800	1820	5%	5%	5%	5%	5%	5%	5%	5%	2%	0%	0%
Moheshkhali Special Economic Zone	Ghotibagha	1000	650	10%	20%	5%	5%	10%	10%	10%	10%	10%	10%	
alliance EZ	Comilla	100	65	5%	6%	6%	5%	5%	5%	8%	5%	5%	5%	5%
Maheshkhali EZ (Cox's Bazar)	Cox's Bazar	13659	8878							5%	5%	5%	5%	5%

Source: BEZA website and discussion with BEZA officials

Name of EZs	Location	Area (acres)	Industrial Area (acres)	2044	2045	2046	2047	2048	2049	2050	2051	2052
Ashugonj EZ	Ashugonj	329	214									
Anawra -2 (CEIZ)	Anawra	774	503									
Anwara EZ	Gahira, Anwara	504	327									
Mirsarai EZ	Mirsarai	30000	19500									
Patiya EZ	Patiya	774	503									
Comilla EZ	Meghna	272	177									
Cox's Bazar Special EZ	Moheshkhali	8785	5710	15%	10%							
Moheshkhali -1 EZ	Moheshkhali	1439	935									
Moheshkhali -2 EZ	Moheshkhali	827	538									
Moheshkhali -3 EZ	Dholghata	2800	1820	0%	10%	10%	10%	3%				
Moheshkhali Special Economic Zone	Ghotibagha	1000	650									
alliance EZ	Comilla	100	65	5%	5%							
Maheshkhali EZ (Cox's Bazar)	Cox's Bazar	13659	8878	5%	2%	5%	5%	10%	15%	5%	5%	5%

Source: BEZA website and discussion with BEZA officials

15.10. Annexure 10 – Demand Forecasting Calculations

Cumulative land demand (Conservative) - figures in acres

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	122	184	184	184	184	184	184	239	239	239	239	239	239	561	772	1051	1240	1240	1588	2311	2361
Leather and Leather Products	1	2	2	2	2	2	2	3	3	3	3	3	3	6	8	11	13	13	16	23	24
Non Metallic Minerals	23	36	36	36	36	36	36	50	50	50	50	50	50	161	237	340	413	413	560	877	901
Auto and Automobile Accessories	2	3	3	3	3	3	3	5	5	5	5	5	5	22	34	51	63	63	89	146	150
Electrical & Electronics	4	6	6	6	6	6	6	10	10	10	10	10	10	41	63	95	117	117	167	277	286
Petroleum Products including Bottling	0	0	0	0	0	0	0	1	1	1	1	1	1	2	3	4	5	5	9	14	14
Light Machinery and Equipment & Furniture	2	4	4	4	4	4	4	6	6	6	6	6	6	33	52	80	100	100	146	250	258
Shipbuilding & Heavy Machineries	7	11	11	11	11	11	11	15	15	15	15	15	15	42	59	82	98	98	128	193	198
Total	**161**	**246**	**246**	**246**	**246**	**246**	**246**	**329**	**329**	**329**	**329**	**329**	**329**	**868**	**1228**	**1714**	**2049**	**2049**	**2703**	**4091**	**4192**

Cumulative land demand (Base) - figures in acres

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	204	346	346	346	405	405	475	606	606	619	619	695	776	981	1421	1762	2178	2518	2531	2531	2531
Leather and Leather Products	2	4	4	4	5	5	6	7	7	7	7	8	9	11	16	19	23	27	27	27	27
Non Metallic Minerals	38	65	65	65	78	78	96	131	131	135	135	159	186	256	413	539	700	837	842	842	842
Auto and Automobile Accessories	3	6	6	6	8	8	10	15	15	15	15	19	23	34	58	79	106	129	130	130	130
Electrical & Electronics	7	12	12	12	14	14	18	26	26	27	27	33	41	60	106	144	195	239	241	241	241
Petroleum Products including Bottling	0	1	1	1	1	1	1	2	2	2	2	2	3	4	6	8	11	13	13	13	13
Light Machinery and Equipment & Furniture	4	7	7	7	9	9	12	18	18	19	19	24	30	47	86	120	165	206	206	206	206
Shipbuilding & Heavy Machineries	12	21	21	21	25	25	30	40	40	41	41	47	54	70	107	135	171	201	202	202	202
Total	**270**	**462**	**462**	**462**	**545**	**545**	**648**	**845**	**845**	**865**	**865**	**987**	**1122**	**1463**	**2213**	**2806**	**3549**	**4170**	**4192**	**4192**	**4192**

Cumulative land demand (Aggressive) - figures in acres

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	329	594	729	749	909	921	1098	1344	1387	1534	1635	1865	2111	2494	2760	2760	2760	2760	2760	2760	2760
Leather and Leather Products	4	7	9	9	11	11	13	16	16	18	19	22	24	28	31	31	31	31	31	31	31
Non Metallic Minerals	59	109	137	141	176	179	225	290	302	345	375	447	528	659	753	753	753	753	753	753	753
Auto and Automobile Accessories	5	11	14	14	19	19	25	33	35	41	45	56	68	88	103	103	103	103	103	103	103
Electrical & Electronics	10	19	24	25	32	33	43	58	61	71	79	98	120	156	184	184	184	184	184	184	184
Petroleum Products including Bottling	1	1	2	2	2	2	3	4	4	5	5	6	7	9	11	11	11	11	11	11	11
Light Machinery and Equipment & Furniture	6	12	16	16	21	22	29	41	43	51	58	73	91	123	146	146	146	146	146	146	146
Shipbuilding & Heavy Machineries	19	36	45	47	58	58	71	90	93	104	112	130	150	182	204	204	204	204	204	204	204
Total	**433**	**789**	**976**	**1003**	**1228**	**1245**	**1507**	**1876**	**1941**	**2169**	**2328**	**2697**	**3099**	**3739**	**4192**	**4192**	**4192**	**4192**	**4192**	**4192**	**4192**

Cumulative power demand (Conservative) - figures in MVA

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	22.2	33.5	33.5	33.5	33.5	33.5	33.5	43.5	43.5	43.5	43.5	43.5	43.5	102.2	140.6	191.4	225.8	225.8	289.2	420.9	430.0
Leather and Leather Products	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.7	1.0	1.3	1.6	1.6	1.9	2.8	2.9
Non Metallic Minerals	3.7	5.8	5.8	5.8	5.8	5.8	5.8	8.1	8.1	8.1	8.1	8.1	8.1	26.1	38.4	55.0	66.9	66.9	90.6	142.0	145.8
Auto and Automobile Accessories	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.7	0.7	0.7	0.7	0.7	0.7	3.1	4.8	7.2	8.9	8.9	12.6	20.7	21.2
Electrical & Electronics	0.5	0.7	0.7	0.7	0.7	0.7	0.7	1.2	1.2	1.2	1.2	1.2	1.2	5.0	7.6	11.5	14.2	14.2	20.3	33.6	34.7
Petroleum Products including Bottling	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.5	0.7	0.9	0.9	1.6	2.5	2.5
Light Machinery and Equipment & Furniture	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	4.0	6.3	9.7	12.1	12.1	17.7	30.4	31.3
Shipbuilding & Heavy Machineries	1.3	2.0	2.0	2.0	2.0	2.0	2.0	2.7	2.7	2.7	2.7	2.7	2.7	7.7	10.8	15.0	17.9	17.9	23.4	35.1	36.0
Total	28.4	43.3	43.3	43.3	43.3	43.3	43.3	57.6	57.6	57.6	57.6	57.6	57.6	149.1	210.0	291.9	348.3	348.3	457.4	687.9	704.6

Cumulative power demand (Base) - figures in MVA

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	37.2	63.0	63.0	63.0	73.8	73.8	86.5	110.4	110.4	112.7	112.7	126.6	141.3	178.6	258.8	320.9	396.6	458.6	460.9	460.9	460.9
Leather and Leather Products	0.2	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.8	0.8	0.8	1.0	1.1	1.3	1.9	2.3	2.8	3.3	3.3	3.3	3.3
Non Metallic Minerals	6.2	10.5	10.5	10.5	12.6	12.6	15.5	21.2	21.2	21.9	21.9	25.7	30.1	41.4	66.9	87.3	113.3	135.5	136.3	136.3	136.3
Auto and Automobile Accessories	0.4	0.8	0.8	0.8	1.1	1.1	1.4	2.1	2.1	2.1	2.1	2.7	3.3	4.8	8.2	11.2	15.0	18.3	18.4	18.4	18.4
Electrical & Electronics	0.8	1.5	1.5	1.5	1.7	1.7	2.2	3.2	3.2	3.3	3.3	4.0	5.0	7.3	12.9	17.5	23.7	29.0	29.3	29.3	29.3
Petroleum Products including Bottling	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.5	0.7	1.1	1.5	2.0	2.4	2.4	2.4	2.4
Light Machinery and Equipment & Furniture	0.5	0.8	0.8	0.8	1.1	1.1	1.5	2.2	2.2	2.3	2.3	2.9	3.6	5.7	10.4	14.6	20.0	25.0	25.0	25.0	25.0
Shipbuilding & Heavy Machineries	2.2	3.8	3.8	3.8	4.6	4.6	5.5	7.3	7.3	7.5	7.5	8.6	9.9	12.8	19.5	24.6	31.1	36.6	36.7	36.7	36.7
Total	**47.6**	**81.2**	**81.2**	**81.2**	**95.7**	**95.7**	**113.5**	**147.5**	**147.5**	**151.0**	**151.0**	**171.8**	**194.8**	**252.7**	**379.7**	**479.8**	**604.6**	**708.5**	**712.3**	**712.3**	**712.3**

Cumulative power demand (Aggressive) - figures in MVA

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	59.9	108.2	132.8	136.4	165.5	167.7	200.0	244.8	252.6	279.4	297.7	339.6	384.4	454.2	502.6	502.6	502.6	502.6	502.6	502.6	502.6
Leather and Leather Products	0.5	0.8	1.1	1.1	1.3	1.3	1.6	1.9	1.9	2.2	2.3	2.7	2.9	3.4	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Non Metallic Minerals	9.6	17.6	22.2	22.8	28.5	29.0	36.4	46.9	48.9	55.8	60.7	72.4	85.5	106.7	121.9	121.9	121.9	121.9	121.9	121.9	121.9
Auto and Automobile Accessories	0.7	1.6	2.0	2.0	2.7	2.7	3.5	4.7	5.0	5.8	6.4	7.9	9.6	12.5	14.6	14.6	14.6	14.6	14.6	14.6	14.6
Electrical & Electronics	1.2	2.3	2.9	3.0	3.9	4.0	5.2	7.0	7.4	8.6	9.6	11.9	14.6	18.9	22.3	22.3	22.3	22.3	22.3	22.3	22.3
Petroleum Products including Bottling	0.2	0.2	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.9	0.9	1.1	1.3	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Light Machinery and Equipment & Furniture	0.7	1.5	1.9	1.9	2.5	2.7	3.5	5.0	5.2	6.2	7.0	8.9	11.0	14.9	17.7	17.7	17.7	17.7	17.7	17.7	17.7
Shipbuilding & Heavy Machineries	3.5	6.6	8.2	8.6	10.6	10.6	13.0	16.4	17.0	19.0	20.4	23.7	27.4	33.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1
Total	76.3	138.7	171.4	176.2	215.4	218.4	263.7	327.5	338.7	377.9	405.1	468.2	5367	645.3	722.0	722.0	722.0	722.0	722.0	722.0	722.0

Cumulative water demand (Conservative) - figures in MLD

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	1.48	2.24	2.24	2.24	2.24	2.24	2.24	2.90	2.90	2.90	2.90	2.90	2.90	6.82	9.38	12.77	15.07	15.07	19.29	28.08	28.69
Leather and Leather Products	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.08	0.11	0.15	0.17	0.17	0.21	0.31	0.32
Non Metallic Minerals	0.22	0.35	0.35	0.35	0.35	0.35	0.35	0.49	0.49	0.49	0.49	0.49	0.49	1.56	2.30	3.30	4.01	4.01	5.44	8.52	8.76
Auto and Automobile Accessories	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.27	0.41	0.62	0.77	0.77	1.08	1.77	1.82
Electrical & Electronics	0.05	0.08	0.08	0.08	0.08	0.08	0.08	0.13	0.13	0.13	0.13	0.13	0.13	0.55	0.84	1.27	1.56	1.56	2.23	3.70	3.82
Petroleum Products including Bottling	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.04	0.05	0.06	0.06	0.11	0.17	0.17
Light Machinery and Equipment & Furniture	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.32	0.51	0.78	0.97	0.97	1.42	2.43	2.51
Shipbuilding & Heavy Machineries	0.09	0.13	0.13	0.13	0.13	0.13	0.13	0.18	0.18	0.18	0.18	0.18	0.18	0.51	0.72	1.00	1.19	1.19	1.56	2.34	2.41
Total	**1.90**	**2.91**	**2.91**	**2.91**	**2.91**	**2.91**	**2.91**	**3.88**	**3.88**	**3.88**	**3.88**	**3.88**	**3.88**	**10.13**	**14.31**	**19.94**	**23.81**	**23.81**	**31.35**	**47.33**	**48.49**

Cumulative water demand (Base) - figures in MLD

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	2.5	4.2	4.2	4.2	4.9	4.9	5.8	7.4	7.4	7.5	7.5	8.4	9.4	11.9	17.3	21.4	26.5	30.6	30.8	30.8	30.8
Leather and Leather Products	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.4
Non Metallic Minerals	0.4	0.6	0.6	0.6	0.8	0.8	0.9	1.3	1.3	1.3	1.3	1.5	1.8	2.5	4.0	5.2	6.8	8.1	8.2	8.2	8.2
Auto and Automobile Accessories	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.7	1.0	1.3	1.6	1.6	1.6	1.6
Electrical & Electronics	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.8	1.4	1.9	2.6	3.2	3.2	3.2	3.2
Petroleum Products including Bottling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Light Machinery and Equipment & Furniture	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.5	0.8	1.2	1.6	2.0	2.0	2.0	2.0
Shipbuilding & Heavy Machineries	0.1	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.6	0.7	0.9	1.3	1.6	2.1	2.4	2.5	2.5	2.5
Total	3.2	5.5	5.5	5.5	6.4	6.4	7.6	9.9	9.9	10.2	10.2	11.6	13.2	17.1	25.8	32.7	41.3	48.5	48.7	48.7	48.7

Cumulative water demand (Aggressive) - figures in MLD

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	4.0	7.2	8.9	9.1	11.0	11.2	13.3	16.3	16.9	18.6	19.9	22.7	25.6	30.3	33.5	33.5	33.5	33.5	33.5	33.5	33.5
Leather and Leather Products	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Non Metallic Minerals	0.6	1.1	1.3	1.4	1.7	1.7	2.2	2.8	2.9	3.4	3.6	4.3	5.1	6.4	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Auto and Automobile Accessories	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.7	0.8	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Electrical & Electronics	0.1	0.3	0.3	0.3	0.4	0.4	0.6	0.8	0.8	0.9	1.1	1.3	1.6	2.1	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Petroleum Products including Bottling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Light Machinery and Equipment & Furniture	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.7	0.9	1.2	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Shipbuilding & Heavy Machineries	0.2	0.4	0.5	0.6	0.7	0.7	0.9	1.1	1.1	1.3	1.4	1.6	1.8	2.2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Total	**5.1**	**9.3**	**11.5**	**11.8**	**14.5**	**14.7**	**17.8**	**22.1**	**22.8**	**25.5**	**27.4**	**31.7**	**36.3**	**43.8**	**49.0**	**49.0**	**49.0**	**49.0**	**49.0**	**49.0**	**49.0**

Cumulative Employment Generation (Conservative) - figures in '000

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	17.32	26.13	26.13	26.13	26.13	26.13	26.13	33.94	33.94	33.94	33.94	33.94	33.94	79.66	109.62	149.24	176.08	176.08	225.50	328.16	335.26
Leather and Leather Products	0.05	0.11	0.11	0.11	0.11	0.11	0.11	0.16	0.16	0.16	0.16	0.16	0.16	0.32	0.43	0.59	0.70	0.70	0.86	1.24	1.30
Non Metallic Minerals	13.87	21.71	21.71	21.71	21.71	21.71	21.71	30.15	30.15	30.15	30.15	30.15	30.15	97.08	142.91	205.02	249.04	249.04	337.68	528.83	543.30
Auto and Automobile Accessories	0.20	0.29	0.29	0.29	0.29	0.29	0.29	0.49	0.49	0.49	0.49	0.49	0.49	2.16	3.33	5.00	6.17	6.17	8.72	14.31	14.70
Electrical & Electronics	1.01	1.52	1.52	1.52	1.52	1.52	1.52	2.53	2.53	2.53	2.53	2.53	2.53	10.37	15.94	24.04	29.60	29.60	42.25	70.08	72.36
Petroleum Products including Bottling	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.07	0.11	0.14	0.18	0.18	0.32	0.50	0.50
Light Machinery and Equipment & Furniture	0.37	0.74	0.74	0.74	0.74	0.74	0.74	1.12	1.12	1.12	1.12	1.12	1.12	6.14	9.67	14.88	18.60	18.60	27.16	46.50	47.99
Shipbuilding & Heavy Machineries	0.57	0.90	0.90	0.90	0.90	0.90	0.90	1.23	1.23	1.23	1.23	1.23	1.23	3.45	4.85	6.74	8.05	8.05	10.51	15.78	16.19
Total	33.41	51.42	51.42	51.42	51.42	51.42	51.42	69.65	69.65	69.65	69.65	69.65	69.65	199.26	286.86	405.65	488.43	488.43	653.01	1,005.41	1,031.61

Cumulative Employment Generation (Base) - figures in '000

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	28.97	49.13	49.13	49.13	57.51	57.51	67.45	86.05	86.05	87.90	87.90	98.69	110.19	139.30	201.78	250.20	309.28	357.56	359.40	359.40	359.40
Leather and Leather Products	0.11	0.22	0.22	0.22	0.27	0.27	0.32	0.38	0.38	0.38	0.38	0.43	0.49	0.59	0.86	1.03	1.24	1.46	1.46	1.46	1.46
Non Metallic Minerals	22.91	39.20	39.20	39.20	47.03	47.03	57.89	78.99	78.99	81.41	81.41	95.88	112.16	154.37	249.04	325.02	422.10	504.71	507.73	507.73	507.73
Auto and Automobile Accessories	0.29	0.59	0.59	0.59	0.78	0.78	0.98	1.47	1.47	1.47	1.47	1.86	2.25	3.33	5.68	7.74	10.39	12.64	12.74	12.74	12.74
Electrical & Electronics	1.77	3.04	3.04	3.04	3.54	3.54	4.55	6.58	6.58	6.83	6.83	8.35	10.37	15.18	26.82	36.43	49.34	60.47	60.97	60.97	60.97
Petroleum Products including Bottling	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.07	0.07	0.07	0.07	0.07	0.11	0.14	0.22	0.29	0.40	0.47	0.47	0.47	0.47
Light Machinery and Equipment & Furniture	0.74	1.30	1.30	1.30	1.67	1.67	2.23	3.35	3.35	3.53	3.53	4.46	5.58	8.74	16.00	22.32	30.69	38.32	38.32	38.32	38.32
Shipbuilding & Heavy Machineries	0.99	1.72	1.72	1.72	2.05	2.05	2.46	3.28	3.28	3.37	3.37	3.86	4.43	5.75	8.79	11.09	13.98	16.44	16.52	16.52	16.52
Total	**55.80**	**95.23**	**95.23**	**95.23**	**112.90**	**112.90**	**135.93**	**180.18**	**180.18**	**184.96**	**184.96**	**213.61**	**245.59**	**327.41**	**509.19**	**654.12**	**837.41**	**992.06**	**997.61**	**997.61**	**997.61**

Cumulative Employment Generation (Aggressive) - figures in '000

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	46.72	84.35	103.52	106.36	129.08	130.78	155.92	190.85	196.95	217.83	232.17	264.83	299.76	354.15	391.92	391.92	391.92	391.92	391.92	391.92	391.92
Leather and Leather Products	0.22	0.38	0.49	0.49	0.59	0.59	0.70	0.86	0.86	0.97	1.03	1.19	1.30	1.51	1.67	1.67	1.67	1.67	1.67	1.67	1.67
Non Metallic Minerals	35.58	65.73	82.61	85.02	106.13	107.94	135.68	174.87	182.11	208.04	226.13	269.54	318.38	397.38	454.06	454.06	454.06	454.06	454.06	454.06	454.06
Auto and Automobile Accessories	0.49	1.08	1.37	1.37	1.86	1.86	2.45	3.23	3.43	4.02	4.41	5.49	6.66	8.62	10.09	10.09	10.09	10.09	10.09	10.09	10.09
Electrical & Electronics	2.53	4.81	6.07	6.33	8.10	8.35	10.88	14.67	15.43	17.96	19.99	24.79	30.36	39.47	46.55	46.55	46.55	46.55	46.55	46.55	46.55
Petroleum Products including Bottling	0.04	0.04	0.07	0.07	0.07	0.07	0.11	0.14	0.14	0.18	0.18	0.22	0.25	0.32	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Light Machinery and Equipment & Furniture	1.12	2.23	2.98	2.98	3.91	4.09	5.39	7.63	8.00	9.49	10.79	13.58	16.93	22.88	27.16	27.16	27.16	27.16	27.16	27.16	27.16
Shipbuilding & Heavy Machineries	1.56	2.96	3.70	3.86	4.76	4.76	5.83	7.39	7.64	8.54	9.20	10.68	12.32	14.88	16.69	16.69	16.69	16.69	16.69	16.69	16.69
Total	**88.24**	**161.56**	**200.80**	**206.47**	**254.50**	**258.45**	**316.95**	**399.65**	**414.57**	**467.02**	**503.88**	**590.31**	**685.96**	**839.21**	**948.54**	**948.54**	**948.54**	**948.54**	**948.54**	**948.54**	**948.54**

Cumulative no. of establishments (Conservative) - figures in nos.

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	61	92	92	92	92	92	92	120	120	120	120	120	120	281	386	526	620	620	794	1156	1181
Leather and Leather Products	1	1	1	1	1	1	1	2	2	2	2	2	2	3	4	6	7	7	8	12	12
Non Metallic Minerals	5	7	7	7	7	7	7	10	10	10	10	10	10	32	47	68	83	83	112	175	180
Auto and Automobile Accessories	2	3	3	3	3	3	3	5	5	5	5	5	5	22	34	51	63	63	89	146	150
Electrical & Electronics	4	6	6	6	6	6	6	10	10	10	10	10	10	41	63	95	117	117	167	277	286
Petroleum Products including Bottling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
Light Machinery and Equipment & Furniture	2	4	4	4	4	4	4	6	6	6	6	6	6	33	52	80	100	100	146	250	258
Shipbuilding & Heavy Machineries	1	1	1	1	1	1	1	2	2	2	2	2	2	4	6	8	10	10	13	19	20
Total	**75**	**114**	**114**	**114**	**114**	**114**	**114**	**154**	**154**	**154**	**154**	**154**	**154**	**416**	**593**	**834**	**999**	**999**	**1330**	**2036**	**2088**

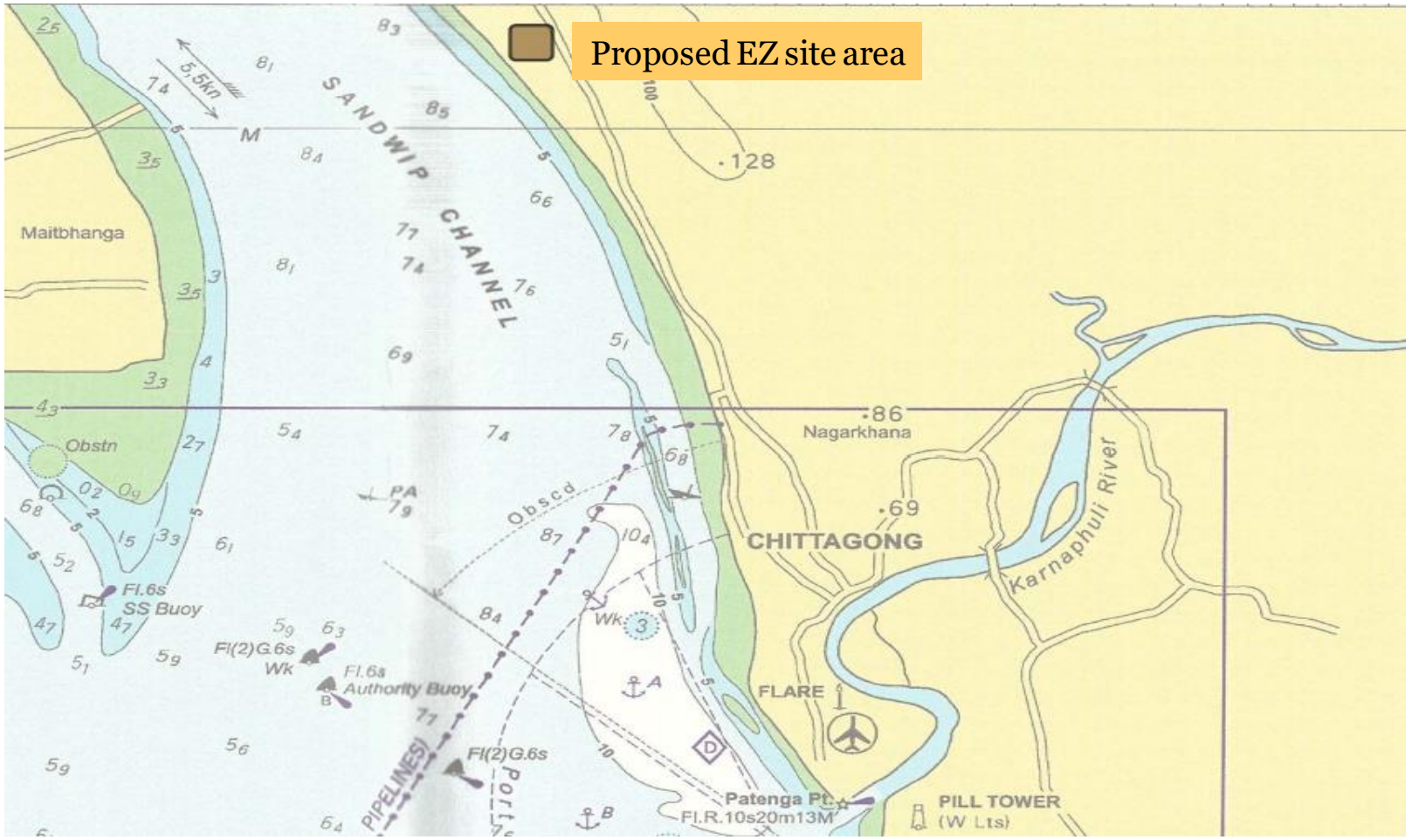
Cumulative no. of establishments (Base) - figures in nos.

Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	102	173	173	173	203	203	238	303	303	310	310	348	388	491	711	881	1089	1259	1266	1266	1266
Leather and Leather Products	1	2	2	2	3	3	3	4	4	4	4	4	5	6	8	10	12	14	14	14	14
Non Metallic Minerals	8	13	13	13	16	16	19	26	26	27	27	32	37	51	83	108	140	167	168	168	168
Auto and Automobile Accessories	3	6	6	6	8	8	10	15	15	15	15	19	23	34	58	79	106	129	130	130	130
Electrical & Electronics	7	12	12	12	14	14	18	26	26	27	27	33	41	60	106	144	195	239	241	241	241
Petroleum Products including Bottling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Light Machinery and Equipment & Furniture	4	7	7	7	9	9	12	18	18	19	19	24	30	47	86	120	165	206	206	206	206
Shipbuilding & Heavy Machineries	1	2	2	2	3	3	3	4	4	4	4	5	5	7	11	14	17	20	20	20	20
Total	**126**	**215**	**215**	**215**	**254**	**254**	**303**	**396**	**396**	**405**	**405**	**464**	**529**	**696**	**1062**	**1356**	**1725**	**2035**	**2046**	**2046**	**2046**

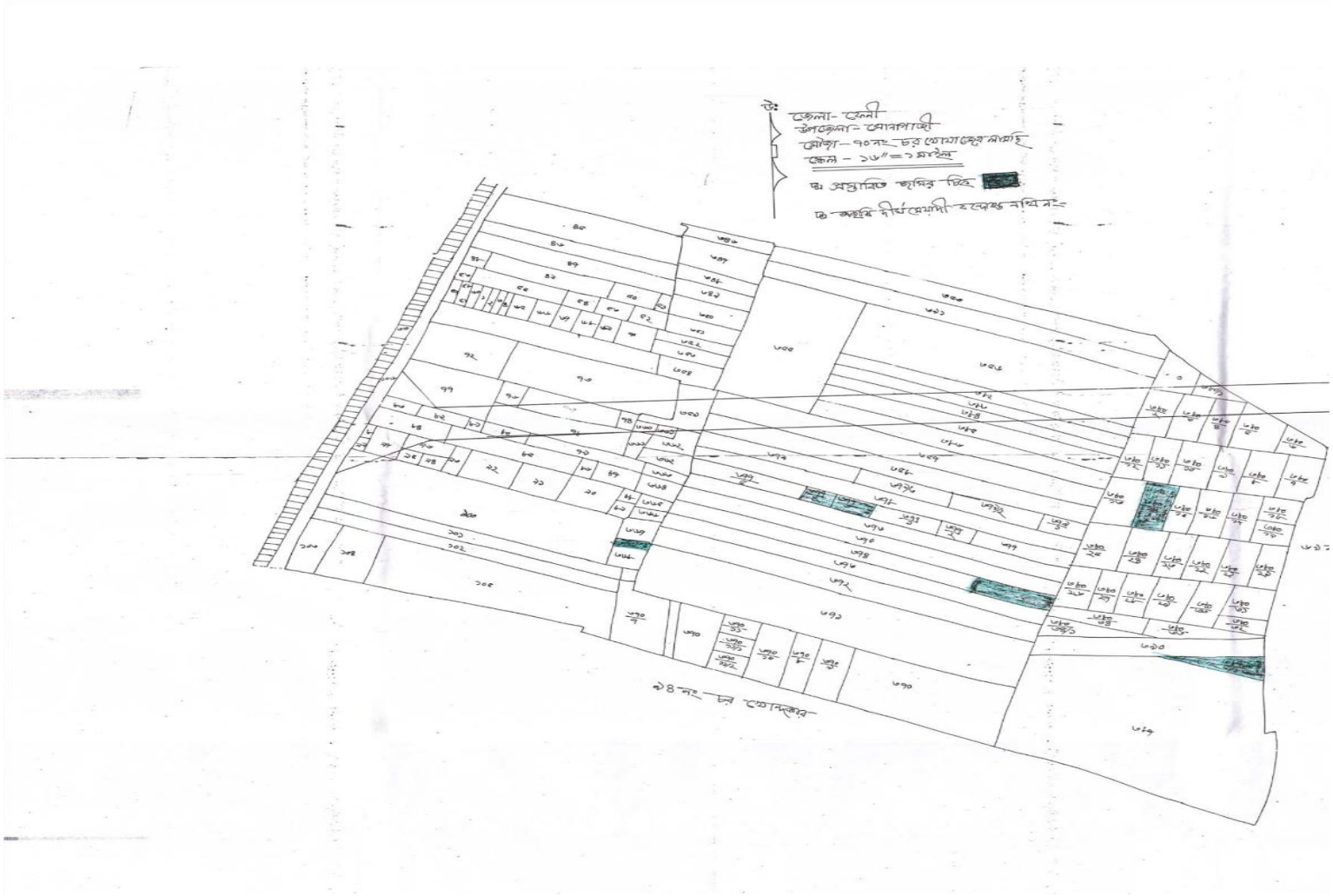
Cumulative no. of establishments (Aggressive) - figures in nos.

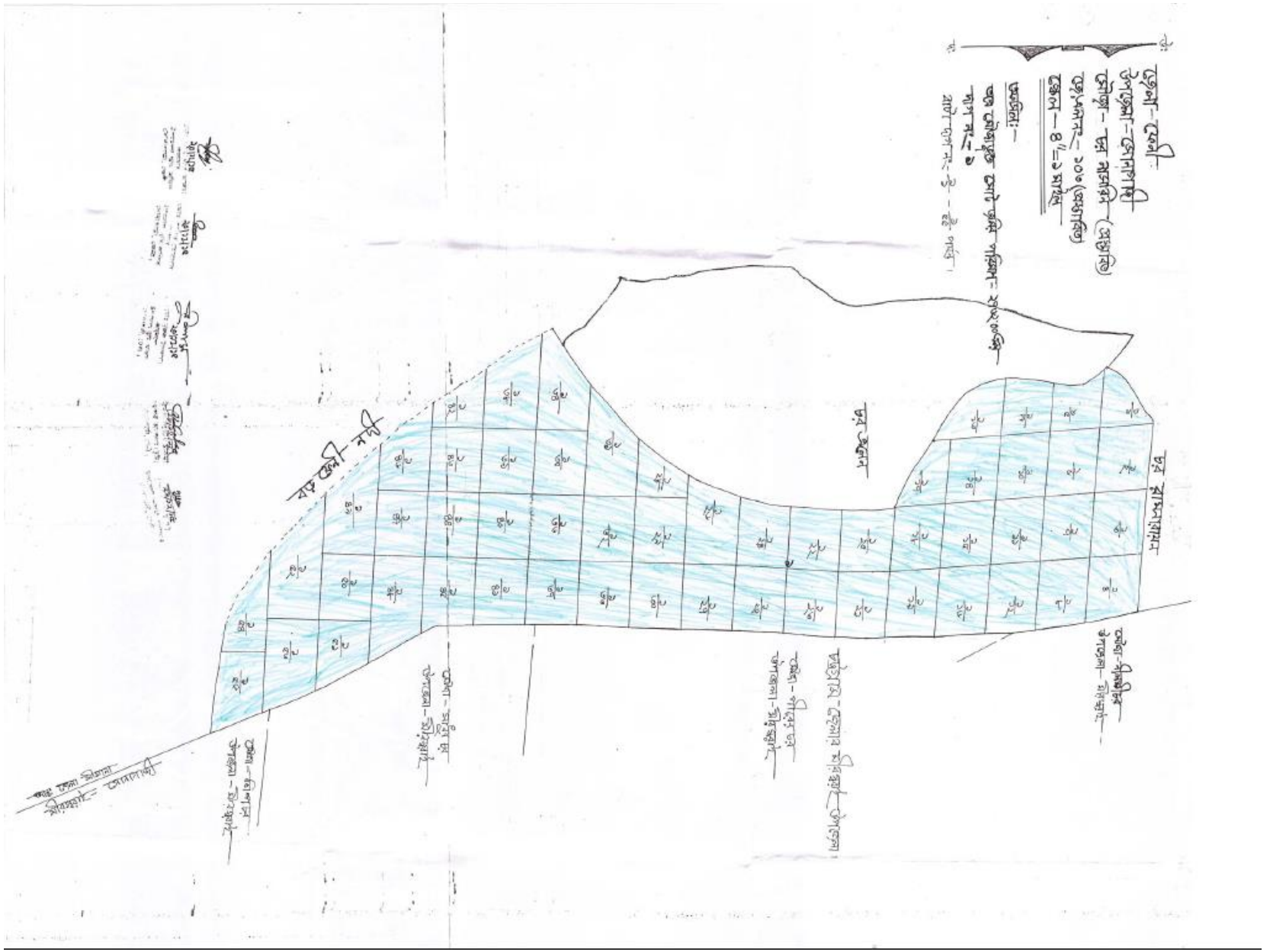
Industry	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Textiles and RMG	165	297	365	375	455	461	549	672	694	767	818	933	1056	1247	1380	1380	1380	1380	1380	1380	1380
Leather and Leather Products	2	4	5	5	6	6	7	8	8	9	10	11	12	14	16	16	16	16	16	16	16
Non Metallic Minerals	12	22	27	28	35	36	45	58	60	69	75	89	106	132	151	151	151	151	151	151	151
Auto and Automobile Accessories	5	11	14	14	19	19	25	33	35	41	45	56	68	88	103	103	103	103	103	103	103
Electrical & Electronics	10	19	24	25	32	33	43	58	61	71	79	98	120	156	184	184	184	184	184	184	184
Petroleum Products including Bottling	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Light Machinery and Equipment & Furniture	6	12	16	16	21	22	29	41	43	51	58	73	91	123	146	146	146	146	146	146	146
Shipbuilding & Heavy Machineries	2	4	5	5	6	6	7	9	9	10	11	13	15	18	20	20	20	20	20	20	20
Total	**201**	**368**	**455**	**467**	**573**	**582**	**705**	**879**	**911**	**1019**	**1096**	**1274**	**1468**	**1779**	**2001**	**2001**	**2001**	**2001**	**2001**	**2001**	**2001**

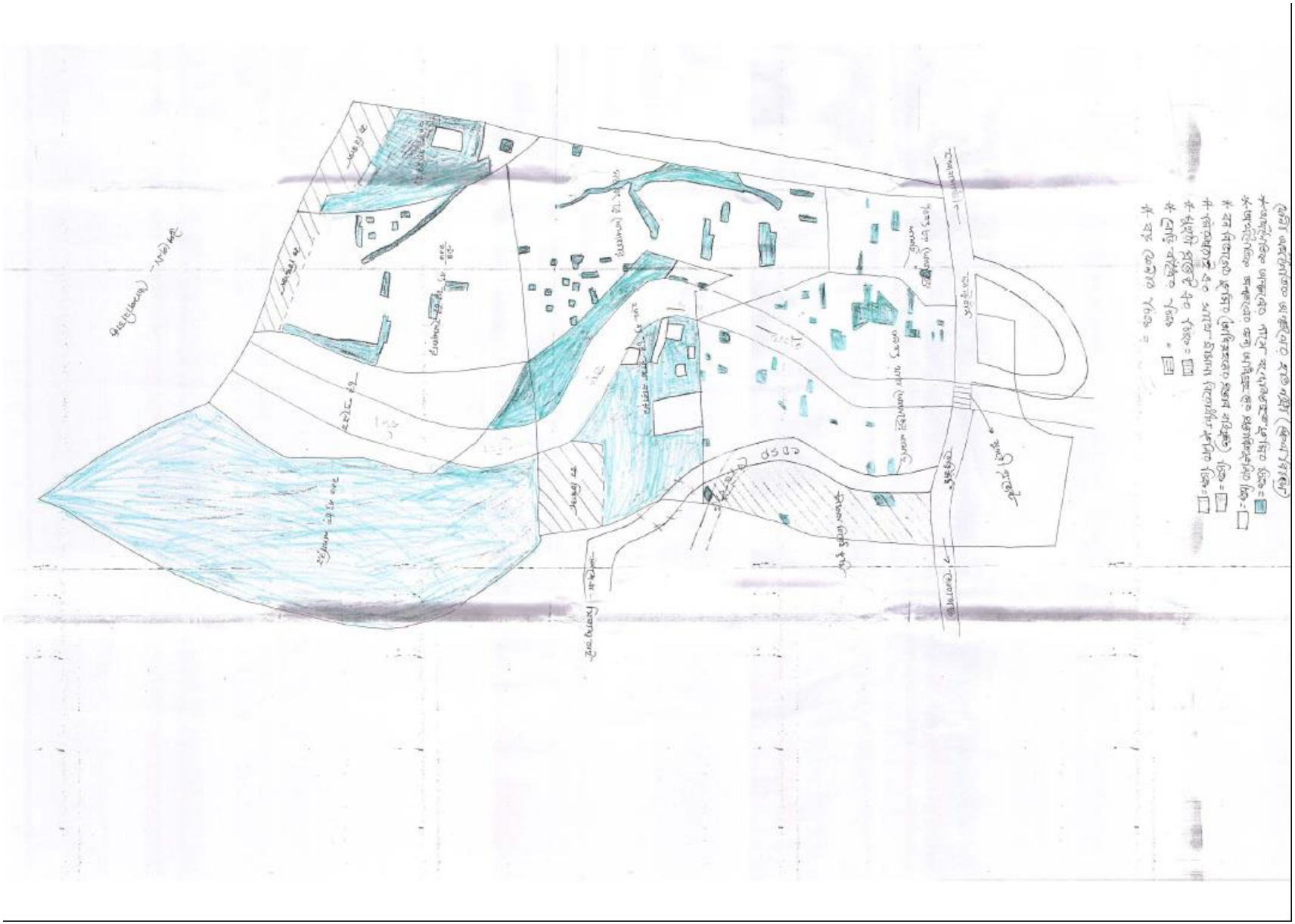
15.11. Annexure 11 – Bathymetric readings in proposed EZ vicinity

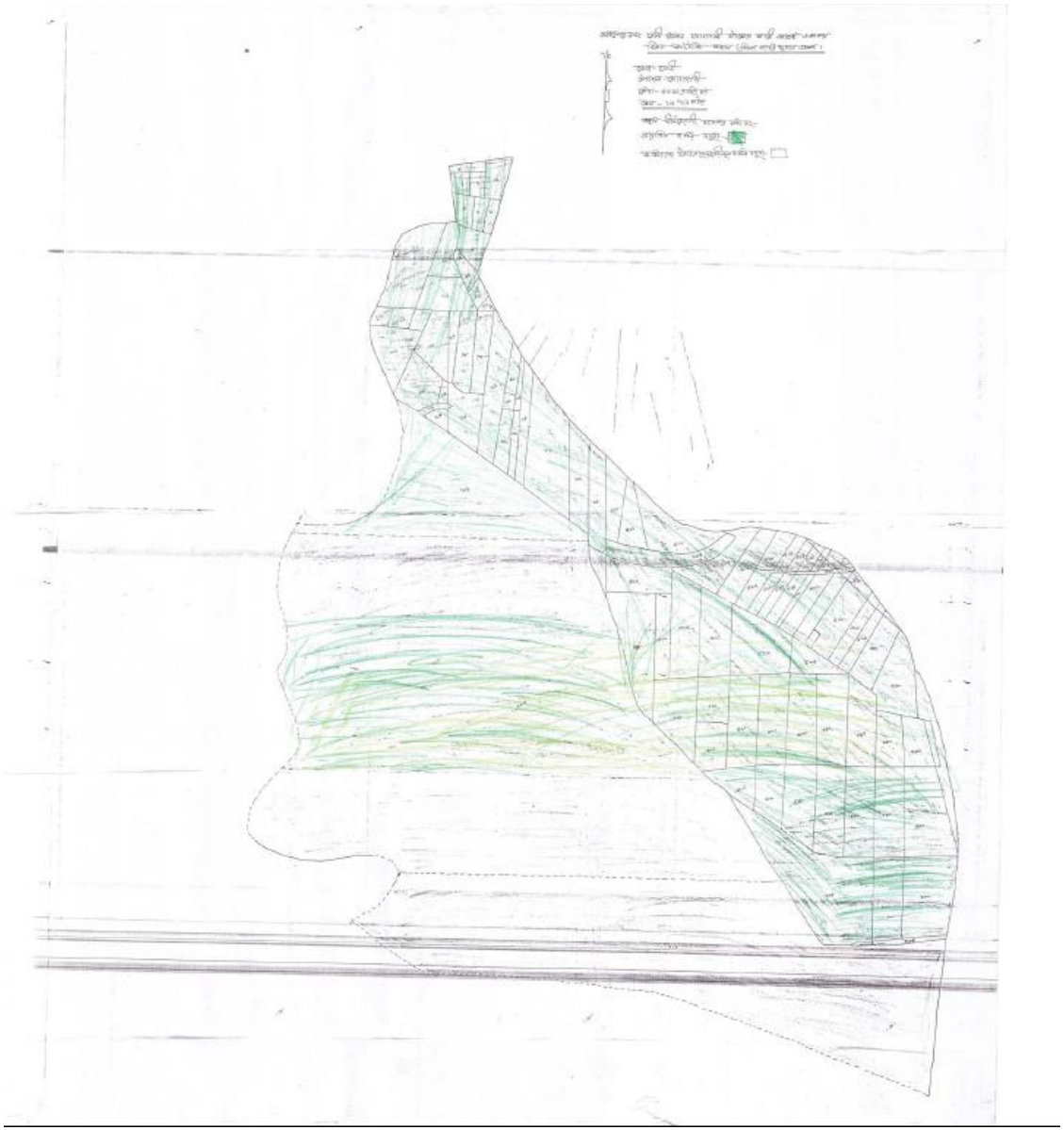


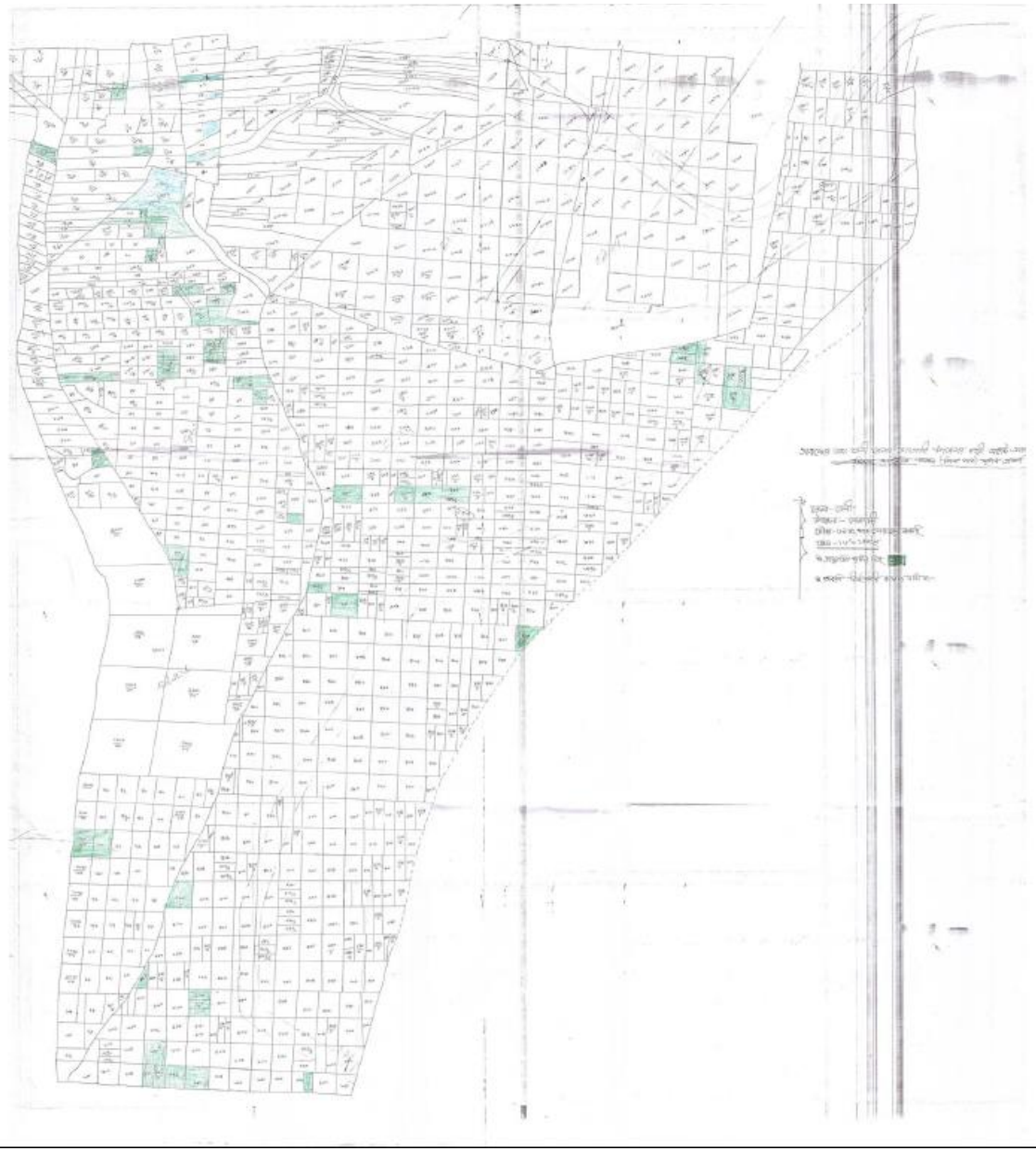
15.12. Annexure 12- Project Layout on Mouza Map











15.13. Annexure 13 – Guide for Financial Model

A user guide has been prepared below in order to assist any individual who would use the financial model to determine the input parameters that could be modified and the impact of changing different parameters on the financial outputs.

The financial model has been constructed, keeping provisions for considering varying land uptake scenarios, phasing of the construction activity on the proposed EZ site and a quarterly drawdown of capex and repayment of debt taken for capex.

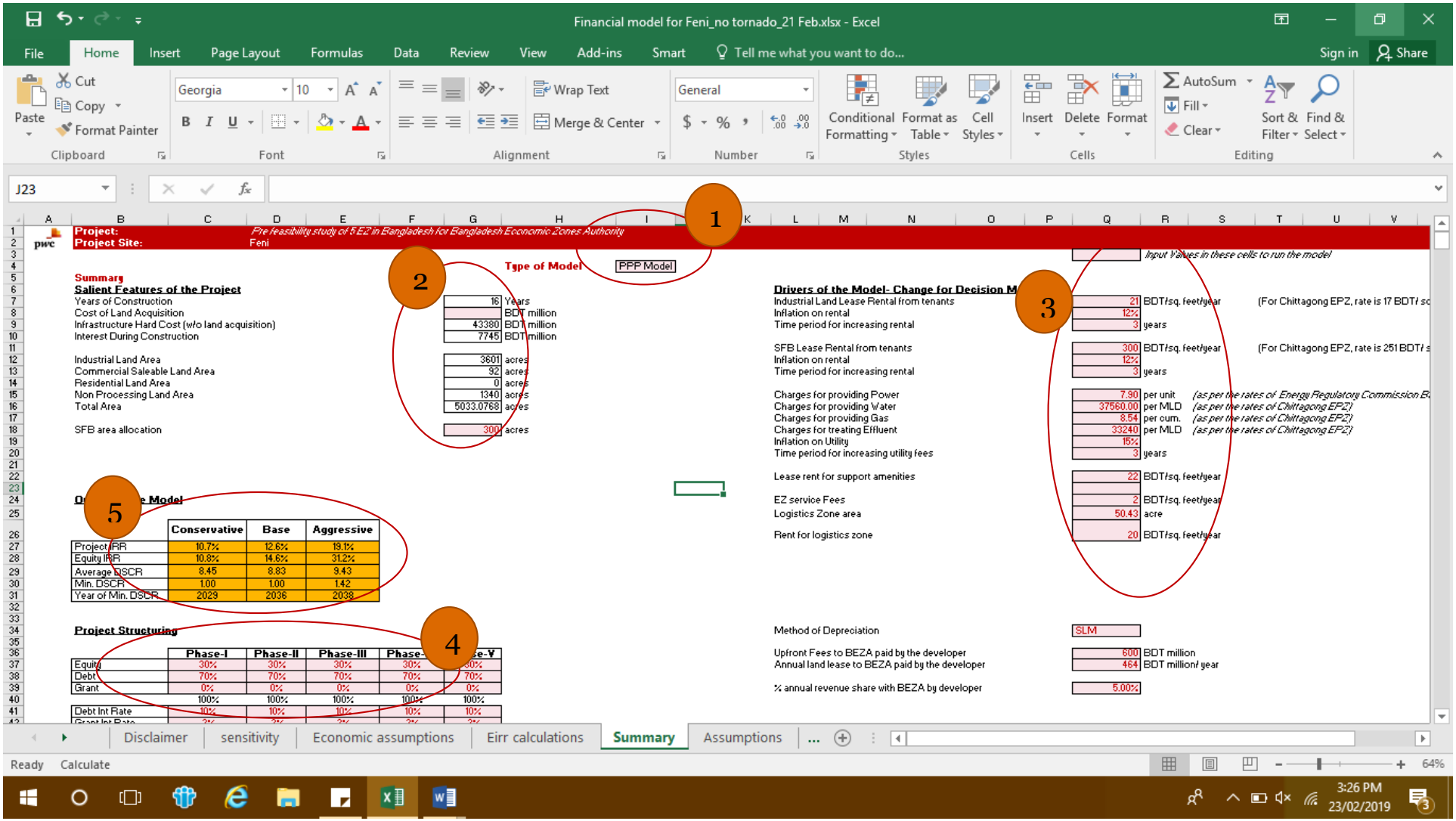
The financial model workbook comprises several worksheets performing specific functions, these worksheets have been listed below –

- Summary sheet: Captures the salient features of the EZ project, input parameters which would drive the returns for the financial model, project structuring and output of the financial model (like IRR, DSCR).
- Assumptions sheet: This sheet captures the gamut of assumptions and forecast made for the financial model. There are 15 major blocks in which the assumptions have been segregated, each of these blocks impact the outflow and inflow of resources for the project under consideration.
- Ratios sheet: This sheet calculates the expected returns accruing to the developer. Returns over a period of 50 years have been calculated, considerations have been made to keep provision to calculate returns for different case scenarios (conservative, base, and aggressive) of land uptake.
- Revenue Inflow sheet: This sheet takes into consideration all possible revenue streams from this project and calculates the revenue accrued to the developer.
- BS Conservative, BS Base, BS Aggressive sheets: These are the 3 balance sheets developed to capture the liability and assets of the developer over a period of fifty years for three different land uptake scenario.
- PL Conservative, PL Base, PL Aggressive sheets: These are the 3 P/L sheets developed to capture the profit and loss accruing to the developer over a period of fifty years for three different land uptake scenario.
- WC Conservative, WC Base, WC Aggressive sheets: These are the 3 working capital sheets developed to capture the changes in working capital required by the developer to operate the EZ site over a period of fifty years for three different land uptake scenario.
- CF Conservative, CF Base, CF Aggressive sheets: These are the 3 cash flow sheets developed to capture the cash flow generated from the EZ project over a period of fifty years for three different land uptake scenario.
- Depreciation sheet: This sheet performs the calculations required to understand the depreciation that takes place on the fixed assets constructed by the developer. Depreciation is calculated as per book value and also as per applicable Income Tax Act.
- Tax Calculation sheet: This sheet calculates the tax liability of the developer, over the period of fifty years on income generated from operating the EZ site for all three land uptake scenario. Applicable tax incentives to the developer has also been considered for purpose of tax calculation.
- Capex Cost sheet: This sheet captures the capex cost that would have to be borne by the developer for construction of different components of EZ site in 2 phases. Capital expenditure incurred by the developer in each quarter of the construction period has been charted out.
- Timing sheet: This sheet draws out the phase wise capex and opex expenditure incurred by the developer over the period of fifty years and also captures the repayment schedule of the debt taken to meet the capex expenses.
- Phase I – Repayment details, Phase II – Repayment details, Phase III – Repayment details, Phase IV – Repayment details sheets: This sheet contains the details of the repayment schedule of the loan taken during each phase of construction.

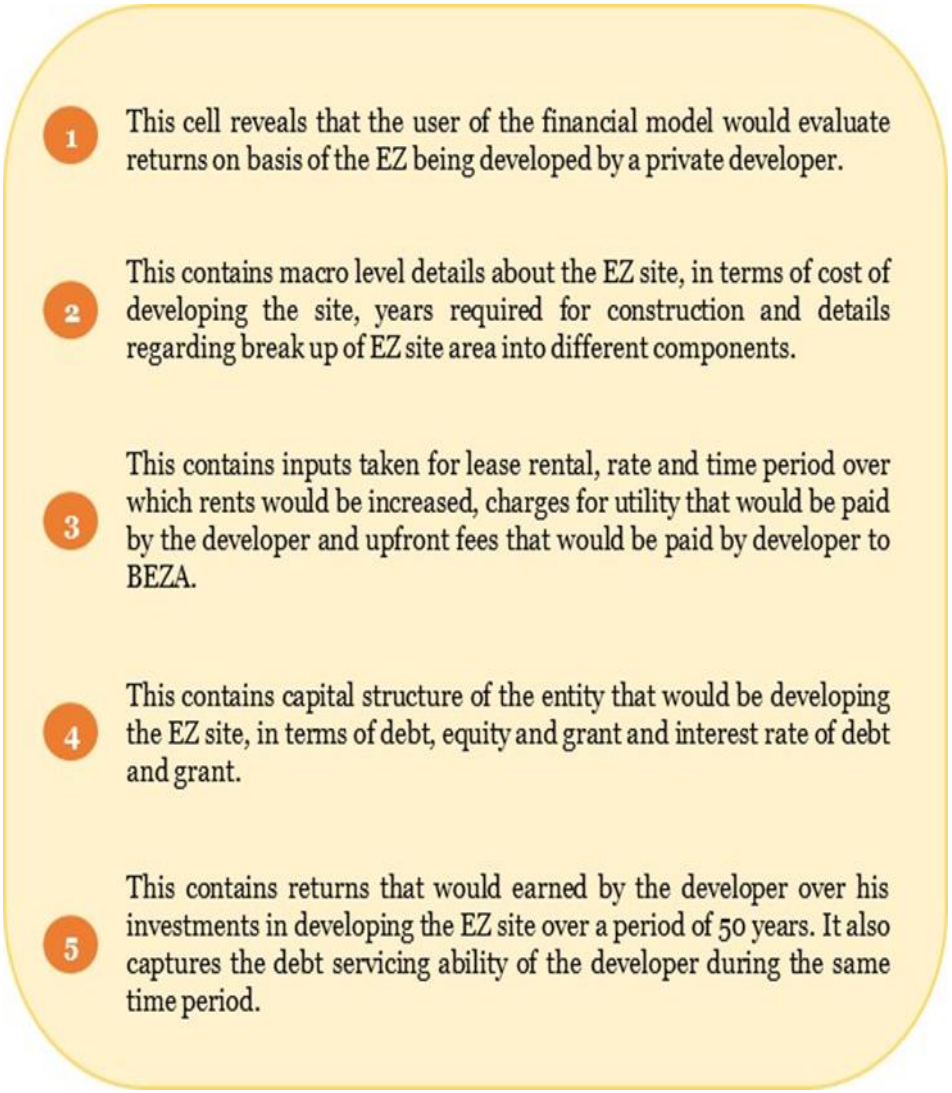
Calculations performed in the excel worksheets listed above, are interlinked to each other and flow from one sheet into another to deliver the final expected financial outcome of developing the proposed EZ site.

A detailed description of the significant parts of the financial model has been provided in this section, through screenshots of the relevant worksheets and further elaboration of various components.

Figure 98 Summary sheet of the financial model



The screenshot of the summary table above shows the various input parameters taken for developing the financial model and the output parameters obtained through this model. These input parameters can be modified in order to obtain the desired output from the financial model. Different blocks of inputs and outputs have been encircled and numbered for detailed description, as shown below.



The user of this financial model can make modifications to the 2nd, 3rd and 4th block of parameters in order to obtain the desired outcome captured in 5th block of parameters.

The inputs and outputs obtained in this summary worksheet is dependent on the assumptions made regarding different aspects related to different rate of land uptake, timing of construction phases, escalation rates, land use pattern, tax considerations, repayment schedule, revenue assumptions etc.

The components captured in the assumption sheet have been elaborated on the next page along with supporting screen shots of the same.

Timing Assumptions – This block captures the tenure for which the financial model has been built, along with start and end dates of each construction phase. Quarterly model parameter captures number of months in each quarter. Operation Start Date captures the CoD date.

1 Timing Assumptions

Tenure of the Model (Years)		50
Model Start Date		July 1, 2023
Model End Date		June 30, 2073
Construction Start Date		July 1, 2023
Construction End Date		June 30, 2039
Years of Construction		16
Number of Phases		5
Phase I Start Date		July 1, 2023
Phase I End Date	1	June 30, 2027
Phase II Start Date		July 1, 2027
Phase II End Date	2	June 30, 2031
Phase III Start Date		July 1, 2031
Phase III End Date	3	June 30, 2034
Phase IV Start Date		July 1, 2034
Phase IV End Date	4	June 30, 2037
Phase V Start Date		July 1, 2037
Phase V End Date	5	June 30, 2039
Quarterly Model (Months)		3
Operation Start Date (CoD)		July 1, 2025

Escalation Rate – This block captures the escalation rate forecasted for the tenure of the project duration and base price considerations.

2 Escalaction Rates

Escalation Rate (annual) for capex and opex	5.0%	Price Label	March 15, 2019

Project Cost – This block captures the break-up of construction expenditure for different components of the EZ site. Considering the scope of BEZA also developing the EZ site, provision has been kept to capture the land cost as well as a part of construction costs.

3 Project Cost (in BDT million)

Cost of land acquisition	0.0
Site grading and other land development expenses	0.0
Compound wall, fencing and gates	0.0
Roads, culverts & drainage	5812.0
Decentralized water supply, treatment and distribution	6168.3
Electrical, street lighting & fire fighting	8708.2
Telecom & communication systems	386.0
Sustainable infrastructure elements, RW harvesting, summer	107.5
Decentralized wastewater, network and solid waste managem	8428.2
Admin Building	275.0
Support amenities	0.0
	0.0
Buildings - MEP	91.0
SFB	12545.3
EMP Cost	858.8
Offsite infra	0.0

Total Hard Cost (without land acquisition)	43380.37
Total Cost (Including land acquisition)	43380
Interest During Construction	7744.8
Project Cost (without land acquisition)	51125.17
Project Cost (Including land acquisition)	51125

Industrial Land Use Pattern – This block captures the breakup of industrial land into different industries and area allocation for each industry that would be expected to come up in the EZ site. This block also keeps provision for allocating SFBs for shortlisted industries

4 Industrial Land Use Pattern

Industrial Space (area in acres)- allocate higher area at the first	
Textile & RMG	2239
Food & Beverage	0
Agro Based Products	0
Leather & Leather Products	33
Plastic & Rubber	0
Paper & Packaging	0
Chemicals	0
Non-Metallic Minerals	763
Automobile & Accessories	158
Heavy Machinery, Iron & Steel	139
Electrical & Electronics	109
Shipbuilding & Ship breaking	0
Petroleum Products	23
Pharmaceuticals	0
Light Machinery, Equipment & Furniture	137
Number of Industries Input	15
Total Industrial Area (acres)	3600.8
SFB to be allocated from (Input Yes OR No):	
Textile & RMG	Yes
Food & Beverage	No
Agro Based Products	No
Leather & Leather Products	No
Plastic & Rubber	No
Paper & Packaging	No
Chemicals	No
Non-Metallic Minerals	Yes
Automobile & Accessories	Yes
Heavy Machinery, Iron & Steel	No
Electrical & Electronics	Yes
Shipbuilding & Ship breaking	No
Petroleum Products	No
Pharmaceuticals	No
Light Machinery, Equipment & Furniture	Yes
SFB allocation (acres)	300
Allocation from each industry (acres)	60
Balance area	0

Commercial and Other Land Use Pattern – This block captures the area occupied by other components of the EZ site and sum total of all land occupied.

5 Commercial and Other Land Use Pattern

Saleable Land Use Pattern (figures in acres):

Logistics Zone	50.43	
Component-2		
Support Amenities	41.72	
Component-4		
Component-5		
Component-6		
Component-7		
Component-8		92.15

Non-Processing Land Use Pattern (figures in acres):

Utility	104.94	
Road	507.16	
Green & Open Space	719.61	
Admin & Customs	8.40	
Component-5		
Component-6		
Component-7		
Component-8		1340.11
Total Area (acres)	**5033.08**	

Operations & Maintenance Expenses – This block captures the Operations and Maintenance expenditure for the fixed assets taken as a percentage of capital expenditure.

6 **O&M expenses for hard infrastructure (% of capex)**

To commence from the start day of operation (CoD)

		Operations	Maintenance
Site grading and other land development expenses	0%	0%	0%
Compound wall, fencing and gates	0%	0%	0%
Roads, culverts & drainage	2%	2%	5%
Decentralized water supply, treatment and distribution	1%	2.5%	2%
Electrical, street lighting & fire fighting	2%	2%	5%
Telecom & communication systems	1%	0%	2%
Sustainable infrastructure elements, RW harvesting, summer storage tank & greenery	1%	2%	2%
Decentralized wastewater, network and solid waste management	2%	4%	2%
Admin Building	1%	0%	5%
Support amenities	1%	0%	5%
0	1%	0%	5%
Buildings - MEP	1%	0%	5%
SFB	1%	0%	5%
EMP Cost	1%	2%	2%
Offsite infra	0%	0%	0%
EMP cost	1%	3%	3%
Misclaneous Cost (% of Opex)	2%		
Pre operating expenses (BDT million)	2		

Cost of Manpower – The block above captures the annual expense to be incurred by the developer on account of hiring personnel for management and operations of the EZ site.

7 **Cost of Manpower**

Designation	Salary (BDT million/ year)	Nos.	Total (BDT million)
CEO	5	1	5
GM-Finance	3	1	3
GM-Marketing	3	1	3
GM-Engineering & Procurement	3	1	3
GM-HR and IT	3	1	3
GM-Operations	3	1	3
Manager-Finance	1.5	2	3
Manager-Marketing	1.5	2	3
Manager-Engineering & Procurement	1.5	2	3
Manager-HR and IT	1.5	2	3
Manager-Operations	1.5	2	3
Assistant Manager-Finance	0.72	3	2.16
Assistant Manager-Marketing	0.72	3	2.16
Assistant Manager-Engineering & Procurement	0.72	7	5.04
Assistant Manager-HR and IT	0.72	3	2.16
Assistant Manager-Operations	0.72	6	4.32
Security Supervisors	0.36	15	5.4
Security Staffs	0.24	100	24
Peons and Clerks	0.18	20	3.6
Office Boys	0.12	30	3.6
			87.44

Financing Inputs – This block captures the assumptions taken regarding the capital structure for this project, interest rate, Debt repayment period, % of debt paid and working capital margin. Project Structuring data flows into this block from the summary worksheet.

8 **Financing Inputs**

% of Equity	30%
% of Grant	0%
% of Debt (Commercial Borrowings)	70%
Cost of Equity	
Interest Rate (Grant)	2%
Interest Rate (Commercial Borrowings	10%
CB Repayment Period (quarters)	40
Negligible Amount	0.0001
% of debt paid in each installment	2.5%

Working Capital margin	0%

Grant Repayment Period (quarters)	80
Negligible Amount	0.0001
% of debt paid in each installment	1.25%

Utility Requirements – This block captures the per acre utility requirements for different industries, these utilities are power, water, gas and effluent treatment. Provision has also been kept to calculate manpower requirement per acre for different industries.

10

	Utility Requirement (per acre)				Manpower Requirement
Industries	**Power/acre** (MW)	**Water/acre** (MLD)	**Gas/acre** (cum/hr)	**Effluent/acre** (MLD)	(Number/acre)
Textile & RMG	0.16	0.013	76.50	0.01	0.00
Food & Beverage	0.16	0.013	76.50	0.01	0.00
Agro Based Products	0.16	0.013	76.50	0.01	0.00
Leather & Leather Products	0.16	0.013	76.50	0.01	0.00
Plastic & Rubber	0.16	0.013	76.50	0.01	0.00
Paper & Packaging	0.16	0.013	76.50	0.01	0.00
Chemicals	0.16	0.013	76.50	0.01	0.00
Non-Metallic Minerals	0.16	0.013	76.50	0.01	0.00
Automobile & Accessories	0.16	0.013	76.50	0.01	0.00
Heavy Machinery, Iron & Steel	0.16	0.013	76.50	0.01	0.00
Electical & Electronics	0.16	0.013	76.50	0.01	0.00
Shipbuilding & Ship breaking	0.16	0.013	76.50	0.01	0.00
Petroleum Products	0.16	0.013	76.50	0.01	0.00
Pharmaceuticals	0.16	0.013	76.50	0.01	0.00
Light Machinery, Equipment & Furnitu	0.16	0.013	76.50	0.01	0.00

Million Units per MW	8.76

Revenue Assumptions – This block captures the assumptions taken for all the sources of revenue that would flow to the developer of the EZ site. These are lease rent from industrial land, SFB, real estate, logistics zone, commercial space and supply of utility. Furthermore, rate of real estate uptake has been modified keeping in mind different real estate uptake scenarios.

10

Revenue Assumptions

Industrial land lease per quarter	914760	BDT/ year/acre
Inflation on rent	12%	
Time period for increasing rentals	3	years

SFB lease per quarter	13068000	BDT/ year/acre
Inflation on rent	12%	
Time period for increasing rentals	3	years

Revenue from utility

Power Supply	0.79	per Unit
Water Supply	3756	per MLD
Gas Supply	0.854	per cum.
Effluent Treatment	3324	per MLD

EZ service Fees	87120	BDT/ year/acre
Inflation on utility	15%	
Time period for increasing utility fees	3	years

Mark Up

Power Supply	10%
Water Supply	10%
Gas Supply	10%
Effluent Treatment	10%

Land area of logistics zone	50.43	acre
Years Post COD		
Rent from logistics zone	871200	BDT/year/acre
Lease from	2030	

Lease from	2028

Area of Child care and Health Care Facility	1817192.52	sq. feet

Tax & Depreciation Assumptions – This block captures the assumptions taken depreciation rates and rate of tax applicable.

15

Tax & Depreciation Assumptions

SLM Depreciation Rate	2%
WDV Depreciation Rate	5%
Built Up Area Depreciation as per inco	10%
SFB depreciation as per income tax	20%

Cost of developing SFB	1600	BDT/sq. ft
Ground coverage under SFB	60%	

Total cost of developing SFB	12545.28	million BDT

Corporate Income Tax (PPP model)	35%
Working Capital Interest	14%
Income Tax (BEZA model)	25%

Apart from the assumption blocks listed in this section, assumptions worksheet also captures the debt repayment schedule, rate of land uptake for industrial land and SFB.

The values from these parameters flow into the pro-forma sheets, revenue inflow calculations, capital expenditure calculations and debt repayment calculations in order to present the return that could be expected by the developer for designing, financing, constructing and operating this EZ site.

15.14. Annexure 14 – Guide for Economic Modelling

As part of our deliverable, we have submitted the excel files of the economic modelling. The calculations are self-explanatory where there are two tabs:

a) **Economic assumptions:** This tab outlines all the key assumptions which drive the modelling exercise. Calculation of economic benefits for the three mentioned scenarios also form part of this tab.

b) **EIRR calculations:** This tab calculates the economic cost and EIRR for the three scenarios.

Figures in the subsequent pages elaborate the functionalities of these tabs.

Assumptions

Figure 99 Functionalities of "Economic Assumptions" tab (Part -1)

Shadow Exchange Rate Factor	1.05	Refer section 1.1
Shadow Wage Rate	0.9	Refer section 1.2
Economic Discount Rate	0.12	Assumed
Currency conversion rate (BDT to US$)	82	

	Capex	Opex
Material	0.5	0.9
Equipment	0.3	0.1
Labor	0.2	N/A

Equipment imported (% of total import)	0.75	
VAT Rate (for Capex and Opex)	0.15	Refer section 1.3
Income multiplier for indirect employment	0.7	Refer section 1.4
Capacity Utilization of Industrial Units	80%	
Plant efficiency factor of industrial units	80%	
Export contribution	25%	

As per the figure above, the coloured cells contain the assumptions. The model is operated by changing values in these cells.

Calculation of economic benefits

Figure 100 Functionalities of "Economic Assumptions" tab (Part-2)

Economic Benefit Calculations

Gain of exchequer from Industrial Production
Source: Survey of Manufacturing Industries 2012

Number of establishments	42792						
Gain for the exchequer (BDT million)	75872				1.69	Contribution to economy per es	
	2024	2025	2026	2027	2028	2029	2030
Conservative Case (no. of establishments)	0	0	76	115	115	115	115
Gain for the exchequer in conservative case (BDT million)	0	0	128	194	194	194	194
Base Case (no. of establishments)	0	0	126	215	215	215	222
Gain for the exchequer in base case (BDT million)	0	0	213	363	363	363	375
Aggressive Case (no. of establishments)	0	0	202	368	455	484	557
Gain for the exchequer in aggressive case (BDT million)	0	0	341	621	768	817	941

Export Boost from Industrial Production
Source: Survey of Manufacturing Industries 2012

Gross Value Added (BDT million)=	1562947
Net Fixed Asset (BDT million)=	1188108
Net Value Added (BDT million)=	374839
Net Value Added (BDT million) per industrial Unit=	5.34
Export boost (BDT million) per industrial unit=	1.33

Conservative Case (BDT million)	0	0	101	154	154	154	154
Base Case (BDT million)	0	0	168	287	287	287	296
Aggressive Case (BDT million)	0	0	270	491	607	646	743

Total Contribution to economy by industrial production in the SEZ

Conservative case	0	0	230	348	348	348	348
Base case	0	0	381	650	650	650	671
Aggressive case	0	0	611	1113	1376	1463	1684

Figure above captures a snapshot of the economic benefit calculations. Based on the inputs/ assumptions provided, the calculations take place automatically.

Economic cost calculations

Figure 101 Functionalities of "EIRR calculations" tab (Part-1)

Total Economic Cost										
Capital Expenditure:										
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1	*1.1*	*1.1*	*1.2*	*1.2*	*1.3*	*1.3*	*1.4*	*1.5*	*1.6*	*1.6*
Details	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**
Capex expenses	27541	27744	9273	9539	3199	3935	4220	4526	5716	6130
Total (cost of the private developer)	26229	25165	8010	7848	2507	2936	2999	3064	3685	3763
(1) Material	11148	10695	3404	3335	1065	1248	1275	1302	1566	1599
(2) Equipment	7907	7586	2415	2366	756	885	904	924	1111	1135
(3) Labor	8026	7700	2451	2401	767	899	918	937	1128	1152

Operating Expenditure:										
Details	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**
O&M Cost	0	0	408	536	1145	1365	1469	1561	2103	2232
Manpower Cost	0	0	106	101	97	106	101	96	107	101
(4) Material	0	0	312	410	876	1044	1124	1194	1609	1708
(5) Equipment	0	0	41	54	115	137	148	157	211	224
(6) Labor (Cost of Personnel)	0	0	106	101	97	106	101	96	107	101
(A) Total Economic Costs (=1+2+3+4+5+6)	**27081**	**25982**	**8729**	**8668**	**3676**	**4319**	**4469**	**4611**	**5731**	**5919**

Above figure elucidates the economic cost calculations. As per the assumptions/ inputs entered in the earlier tab, the calculations take place.

Figure 102 Functionalities of "EIRR Calculations" tab (Part-2)

(D) Total Economic Benefits (=15+16+17+18)	**0**	**0**	**7543**	**13630**	**16206**	**16469**	**20007**	**20543**	**25934**

Conservative Case

	2024	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Economic Return = (B) - (A)	#######	(25,981.9)	(5,845.7)	(4,277.8)	714.6	71.2	(78.9)	(220.4)	(1,219.6)

Economic Internal Rate of Return (EIRR)=	***14.50%***	**Cost Benefit Ratio**	**10.75**

Base Case

	2024	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Economic Return = (C) - (A)	#######	(25,981.9)	(3,990.1)	(557.4)	4,435.0	3,791.7	5,075.6	4,147.3	5,391.1

Economic Internal Rate of Return (EIRR)=	***18.15%***	**Cost Benefit Ratio**	**11.36**

Aggressive Case

	2024	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Economic Return = (D) - (A)	#######	(25,981.9)	(1,186.2)	4,962.4	12,529.8	12,149.7	15,538.2	15,932.2	20,203.2

Economic Internal Rate of Return (EIRR)=	***25.98%***	**Cost Benefit Ratio**	**12.10**

In addition to the economic cost calculations, calculation of EIRR is also undertaken in this tab. Figure above indicates a screenshot of the same.

15.15. Annexure 15- Pro forma Statements

Conservative Scenario Balance Sheet

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	843	1746	2848	4030	4990	6170	7436	8794	10509	12348
Equity Infusion	0	0	316	316	316	887	887	887	887	887
Equity infusion to meet operating expenses	1072	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	-1072	-1544	-1957	-1531	-1604	-1426	-259	1430	2213	4525
Long term loan	1966	4074	6645	9403	11642	13456	15470	17699	20760	22999
Working Capital Loan	0	0	277	0	0	0	0	0	0	0
Total liabilities	**2809**	**5820**	**9675**	**13762**	**16888**	**20632**	**25079**	**30353**	**35913**	**42303**
Assets										
Fixed Assets	2809	5820	9493	13336	16407	20183	24212	28516	33979	39813
Less: Depreciation	0	0	96	128	160	191	222	254	295	337
Net Block	2809	5820	9397	13208	16248	19992	23990	28262	33683	39476
Net Working Capital	0	0	277	0	0	0	0	0	0	0
Cash and bank balance	0	0	0	554	640	640	1089	2091	2230	2827
Total assets	**2809**	**5820**	**9675**	**13762**	**16888**	**20632**	**25079**	**30353**	**35913**	**42303**

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	14320	16231	18280	20477	23708	26939	26939	26939	26939	26939
Equity Infusion	887	2282	4131	5939	10046	11742	11866	12834	12834	12834
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	6687	6926	7959	8995	7672	9197	12294	16055	21461	27031
Long term loan	25549	27955	29395	31181	35378	39079	35242	29896	24550	20317
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**48988**	**54936**	**61310**	**68136**	**78349**	**88502**	**87885**	**87268**	**87329**	**88665**

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Assets										
Fixed Assets	46051	52039	58452	65318	75590	85803	85186	84569	83952	83336
Less: Depreciation	379	419	458	498	557	617	617	617	617	617
Net Block	45672	51621	57994	64820	75033	85186	84569	83952	83336	82719
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	3316	3316	3316	3316	3316	3316	3316	3316	3993	5946
Total assets	**48988**	**54936**	**61310**	**68136**	**78349**	**88502**	**87885**	**87268**	**87329**	**88665**

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	26939	26939	26939	26939	26939	26939	26939	26939	26939	26939
Equity Infusion	12834	12834	12834	12834	12834	12834	12834	12834	12834	12834
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	33704	46597	59902	72353	87570	102801	116951	134130	151307	167229
Long term loan	16083	11849	8904	5960	3016	1508	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**91104**	**99764**	**110125**	**119630**	**131903**	**145627**	**158269**	**175448**	**192624**	**208547**
Assets										
Fixed Assets	82719	82102	81486	80869	80252	79636	79019	78402	77785	77169
Less: Depreciation	617	617	617	617	617	617	617	617	617	617
Net Block	82102	81486	80869	80252	79636	79019	78402	77785	77169	76552
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	9001	18278	29256	39378	52268	66608	79867	97662	115455	131995
Total assets	**91104**	**99764**	**110125**	**119630**	**131903**	**145627**	**158269**	**175448**	**192624**	**208547**

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	26939	26939	26939	26939	26939	26939	26939	26939	26939	26939
Equity Infusion	12834	12834	12834	12834	12834	12834	12834	12834	12834	12834
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	186619	205999	223962	245860	267752	287990	312744	337475	360295	388234

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Long term loan	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**227937**	**247317**	**265279**	**287178**	**309069**	**329308**	**354062**	**378793**	**401612**	**429552**
Assets										
Fixed Assets	76552	75935	75319	74702	74085	73469	72852	72235	71618	71002
Less: Depreciation	617	617	617	617	617	617	617	617	617	617
Net Block	75935	75319	74702	74085	73469	72852	72235	71618	71002	70385
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	152001	171998	190577	213092	235601	256456	281827	307174	330611	359167
Total assets	**227937**	**247317**	**265279**	**287178**	**309069**	**329308**	**354062**	**378793**	**401612**	**429552**

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	26939	26939	26939	26939	26939	26939	26939	26939	26939	26939
Equity Infusion	12834	12834	12834	12834	12834	12834	12834	12834	12834	12834
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	416192	441917	473471	505023	534041	569670	605298	637966	678221	718442
Long term loan	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**457509**	**483235**	**514789**	**546340**	**575359**	**610988**	**646615**	**679283**	**719538**	**759760**
Assets										
Fixed Assets	70385	69768	69152	68535	67918	67302	66685	66068	65451	64835
Less: Depreciation	617	617	617	617	617	617	617	617	617	617
Net Block	69768	69152	68535	67918	67302	66685	66068	65451	64835	64218
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	387741	414083	446254	478422	508057	544303	580547	613832	654704	695542
Total assets	**457509**	**483235**	**514789**	**546340**	**575359**	**610988**	**646615**	**679283**	**719538**	**759760**

Base Scenario Balance Sheet- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Liabilities										

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Grant	0	0	0	0	0	0	0	0	0	0
Equity	843	1746	2848	4030	4990	6170	7436	8794	10509	12348
Equity Infusion	0	0	51	51	51	51	51	51	51	51
Equity infusion to meet operating expenses	1072	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	-1072	-1544	-1691	-616	56	1096	3551	6658	8993	12609
Long term loan	1966	4074	6645	9403	11642	13456	15470	17699	20760	22999
Working Capital Loan	0	0	45	0	0	0	0	0	0	0
Total liabilities	**2809**	**5820**	**9442**	**14411**	**18283**	**22317**	**28052**	**34745**	**41856**	**49551**
Assets										
Fixed Assets	2809	5820	9493	13336	16407	20183	24212	28516	33979	39813
Less: Depreciation	0	0	96	128	160	191	222	254	295	337
Net Block	2809	5820	9397	13208	16248	19992	23990	28262	33683	39476
Net Working Capital	0	0	45	0	0	0	0	0	0	0
Cash and bank balance	0	0	0	1203	2035	2326	4062	6483	8173	10075
Total assets	**2809**	**5820**	**9442**	**14411**	**18283**	**22317**	**28052**	**34745**	**41856**	**49551**

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	14320	16231	18280	20477	23708	26939	26939	26939	26939	26939
Equity Infusion	51	121	640	1047	2947	3457	3457	3457	3457	3457
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	16067	17630	19994	22431	23315	26026	30498	35963	45334	56640
Long term loan	25549	27955	29395	31181	35378	39079	35242	29896	24550	20317
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**57531**	**63480**	**69853**	**76680**	**86892**	**97045**	**97679**	**97799**	**101825**	**108896**
Assets										
Fixed Assets	46051	52039	58452	65318	75590	85803	85186	84569	83952	83336
Less: Depreciation	379	419	458	498	557	617	617	617	617	617
Net Block	45672	51621	57994	64820	75033	85186	84569	83952	83336	82719
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	11859	11859	11859	11859	11859	11859	13110	13846	18489	26177
Total assets	**57531**	**63480**	**69853**	**76680**	**86892**	**97045**	**97679**	**97799**	**101825**	**108896**

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	26939	26939	26939	26939	26939	26939	26939	26939	26939	26939
Equity Infusion	3457	3457	3457	3457	3457	3457	3457	3457	3457	3457
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	67352	80558	93863	106313	121531	136762	150911	168090	185267	201189
Long term loan	16083	11849	8904	5960	3016	1508	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**115374**	**124346**	**134707**	**144213**	**156486**	**170209**	**182851**	**200030**	**217207**	**233129**
Assets										
Fixed Assets	82719	82102	81486	80869	80252	79636	79019	78402	77785	77169
Less: Depreciation	617	617	617	617	617	617	617	617	617	617
Net Block	82102	81486	80869	80252	79636	79019	78402	77785	77169	76552
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	33272	42861	53838	63961	76850	91190	104449	122245	140038	156577
Total assets	**115374**	**124346**	**134707**	**144213**	**156486**	**170209**	**182851**	**200030**	**217207**	**233129**

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	26939	26939	26939	26939	26939	26939	26939	26939	26939	26939
Equity Infusion	3457	3457	3457	3457	3457	3457	3457	3457	3457	3457
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	220579	239959	257922	279820	301712	321950	346704	371435	394255	422194
Long term loan	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**252519**	**271899**	**289862**	**311760**	**333652**	**353890**	**378644**	**403375**	**426195**	**454134**
Assets										
Fixed Assets	76552	75935	75319	74702	74085	73469	72852	72235	71618	71002
Less: Depreciation	617	617	617	617	617	617	617	617	617	617
Net Block	75935	75319	74702	74085	73469	72852	72235	71618	71002	70385

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	176584	196580	215160	237675	260183	281038	306409	331757	355193	383749
Total assets	**252519**	**271899**	**289862**	**311760**	**333652**	**353890**	**378644**	**403375**	**426195**	**454134**

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	26939	26939	26939	26939	26939	26939	26939	26939	26939	26939
Equity Infusion	3457	3457	3457	3457	3457	3457	3457	3457	3457	3457
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	450152	475878	507431	538983	568001	603630	639258	671926	712181	752403
Long term loan	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**482092**	**507817**	**539371**	**570923**	**599941**	**635570**	**671198**	**703866**	**744121**	**784342**
Assets										
Fixed Assets	70385	69768	69152	68535	67918	67302	66685	66068	65451	64835
Less: Depreciation	617	617	617	617	617	617	617	617	617	617
Net Block	69768	69152	68535	67918	67302	66685	66068	65451	64835	64218
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	412323	438666	470836	503005	532639	568885	605130	638414	679286	720124
Total assets	**482092**	**507817**	**539371**	**570923**	**599941**	**635570**	**671198**	**703866**	**744121**	**784342**

Aggressive Scenario Balance Sheet- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	843	1746	2848	4030	4990	6170	7436	8794	10509	12348
Equity Infusion	0	0	0	0	0	0	0	0	0	0
Equity infusion to meet operating expenses	1072	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	-1072	-1544	-1027	1601	4845	8992	14512	19930	24465	31153
Long term loan	1966	4074	6645	9403	11642	13456	15470	17699	20760	22999
Working Capital Loan	0	0	0	0	0	0	0	0	0	0

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Total liabilities	**2809**	**5820**	**10010**	**16578**	**23021**	**30162**	**38963**	**47967**	**57278**	**68044**
Assets										
Fixed Assets	2809	5820	9493	13336	16407	20183	24212	28516	33979	39813
Less: Depreciation	0	0	96	128	160	191	222	254	295	337
Net Block	2809	5820	9397	13208	16248	19992	23990	28262	33683	39476
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	0	0	613	3370	6773	10170	14973	19704	23595	28568
Total assets	**2809**	**5820**	**10010**	**16578**	**23021**	**30162**	**38963**	**47967**	**57278**	**68044**

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	14320	16231	18280	20477	23708	26939	26939	26939	26939	26939
Equity Infusion	0	0	0	0	0	0	0	0	0	0
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	37899	43369	50200	57038	62436	70762	80230	89188	100406	111777
Long term loan	25549	27955	29395	31181	35378	39079	35242	29896	24550	20317
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**79312**	**89098**	**99419**	**110240**	**123067**	**138324**	**143955**	**147568**	**153440**	**160577**
Assets										
Fixed Assets	46051	52039	58452	65318	75590	85803	85186	84569	83952	83336
Less: Depreciation	379	419	458	498	557	617	617	617	617	617
Net Block	45672	51621	57994	64820	75033	85186	84569	83952	83336	82719
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	33641	37478	41426	45420	48034	53139	59386	63615	70104	77858
Total assets	**79312**	**89098**	**99419**	**110240**	**123067**	**138324**	**143955**	**147568**	**153440**	**160577**

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	26939	26939	26939	26939	26939	26939	26939	26939	26939	26939
Equity Infusion	0	0	0	0	0	0	0	0	0	0

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	122489	135695	149000	161451	176668	191899	206049	223228	240404	256327
Long term loan	16083	11849	8904	5960	3016	1508	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**167055**	**176027**	**186388**	**195894**	**208167**	**221890**	**234532**	**251711**	**268888**	**284810**
Assets										
Fixed Assets	82719	82102	81486	80869	80252	79636	79019	78402	77785	77169
Less: Depreciation	617	617	617	617	617	617	617	617	617	617
Net Block	82102	81486	80869	80252	79636	79019	78402	77785	77169	76552
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	84953	94542	105519	115642	128531	142871	156130	173926	191719	208258
Total assets	**167055**	**176027**	**186388**	**195894**	**208167**	**221890**	**234532**	**251711**	**268888**	**284810**

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	26939	26939	26939	26939	26939	26939	26939	26939	26939	26939
Equity Infusion	0	0	0	0	0	0	0	0	0	0
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	275717	295097	313059	334958	356849	377088	401842	426573	449393	477332
Long term loan	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**304200**	**323580**	**341543**	**363441**	**385333**	**405571**	**430325**	**455056**	**477876**	**505815**
Assets										
Fixed Assets	76552	75935	75319	74702	74085	73469	72852	72235	71618	71002
Less: Depreciation	617	617	617	617	617	617	617	617	617	617
Net Block	75935	75319	74702	74085	73469	72852	72235	71618	71002	70385
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	228265	248261	266841	289356	311864	332719	358090	383438	406874	435430
Total assets	**304200**	**323580**	**341543**	**363441**	**385333**	**405571**	**430325**	**455056**	**477876**	**505815**

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Liabilities										
Grant	0	0	0	0	0	0	0	0	0	0
Equity	26939	26939	26939	26939	26939	26939	26939	26939	26939	26939
Equity Infusion	0	0	0	0	0	0	0	0	0	0
Equity infusion to meet operating expenses	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544
Reserves & surplus	505289	531015	562569	594120	623139	658768	694396	727063	767318	807540
Long term loan	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total liabilities	**533773**	**559498**	**591052**	**622604**	**651622**	**687251**	**722879**	**755547**	**795802**	**836023**
Assets										
Fixed Assets	70385	69768	69152	68535	67918	67302	66685	66068	65451	64835
Less: Depreciation	617	617	617	617	617	617	617	617	617	617
Net Block	69768	69152	68535	67918	67302	66685	66068	65451	64835	64218
Net Working Capital	0	0	0	0	0	0	0	0	0	0
Cash and bank balance	464004	490347	522517	554686	584320	620566	656811	690095	730967	771805
Total assets	**533773**	**559498**	**591052**	**622604**	**651622**	**687251**	**722879**	**755547**	**795802**	**836023**

Conservative Scenario P&L Statement- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Revenue										
From Industrial Land	0	0	93	216	223	224	262	263	283	415
From SFB	0	0	490	1098	1647	2195	3074	3688	4303	5508
From Utility	0	0	241	569	659	736	953	1041	1170	1644
From EZ service Fees	0	0	9	18	19	19	20	20	22	28
From Logistics Zone	0	0	0	0	0	0	55	55	55	62
From Support Amenities	0	0	0	0	45	45	50	50	50	56
Total Revenue	**0**	**0**	**833**	**1901**	**2593**	**3219**	**4414**	**5117**	**5883**	**7713**
Operating Expenses										
O&M Cost	0	0	472	652	830	1166	1371	1576	2111	2427
Upfront Fees to BEZA	600									
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	0	0	42	95	130	161	221	256	294	386
Pre-operating Cost	8	8	0	0	0	0	0	0	0	0
Misc. Cost	0	0	9	13	17	23	27	32	42	49
Cost of Manpower	0	0	123	123	123	142	142	142	165	165
Total Cost	**1072**	**472**	**1110**	**1347**	**1564**	**1957**	**2225**	**2470**	**3077**	**3490**
EBITDA	-1072	-472	-277	554	1029	1263	2189	2648	2807	4223
Depreciation	0	0	96	128	160	191	222	254	295	337
EBIT	-1072	-472	-374	425	869	1072	1966	2394	2511	3885
Interest expenses	0	0	0	0	943	893	799	705	1728	1574
Interest on W/C	0	0	39	0	0	0	0	0	0	0
Profit Before Tax	-1072	-472	-413	425	-73	178	1167	1689	783	2312
Tax	0	0	0	0	0	0	0	0	0	0
Profit After Tax	-1072	-472	-413	425	-73	178	1167	1689	783	2312

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Revenue										
From Industrial Land	418	430	491	513	537	1290	1757	2344	3082	3087
From SFB	5508	5508	6169	6169	6169	6909	6909	6909	7738	7738
From Utility	1650	1674	1947	1991	2041	3839	4853	6118	8053	8063
From EZ service Fees	28	29	30	31	32	70	95	127	149	149
From Logistics Zone	62	62	69	69	69	77	77	77	87	87

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
From Support Amenities	56	56	63	63	63	70	70	70	79	79
Total Revenue	**7723**	**7760**	**8768**	**8835**	**8911**	**12255**	**13762**	**15646**	**19187**	**19203**
Operating Expenses										
O&M Cost	2744	3536	3915	4271	5484	6102	6333	7332	7332	7332
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	386	388	438	442	446	613	688	782	959	960
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	55	71	78	85	110	122	127	147	147	147
Cost of Manpower	165	191	191	191	221	221	222	256	256	256
Total Cost	**3814**	**4649**	**5087**	**5453**	**6725**	**7522**	**7834**	**8980**	**9157**	**9158**
EBITDA	3910	3110	3681	3382	2186	4734	5928	6665	10030	10045
Depreciation	379	419	458	498	557	617	617	617	617	617
EBIT	3530	2692	3223	2884	1629	4117	5312	6049	9413	9428
Interest expenses	1368	2453	2189	1849	2952	2593	2215	1806	1423	1094
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	2162	239	1034	1035	-1322	1525	3097	4242	7991	8334
Tax	0	0	0	0	0	0	0	481	2585	2764
Profit After Tax	2162	239	1034	1035	-1322	1525	3097	3761	5406	5570

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Revenue										
From Industrial Land	3961	6523	6675	6675	7476	7476	7476	8373	8373	8373
From SFB	7738	8667	8667	8667	9707	9707	9707	10872	10872	10872
From Utility	10015	16267	16614	16614	19124	19106	19106	21972	21993	21972
From EZ service Fees	191	281	288	288	288	288	288	288	288	288
From Logistics Zone	87	97	97	97	109	109	109	122	122	122
From Support Amenities	79	88	88	88	99	99	99	111	111	111
Total Revenue	**22070**	**31924**	**32429**	**32429**	**36803**	**36784**	**36784**	**41737**	**41758**	**41737**
Operating Expenses										
O&M Cost	8487	8487	8487	9825	9825	9825	11374	11374	11374	13167
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Revenue Share	1104	1596	1621	1621	1840	1839	1839	2087	2088	2087
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	170	170	170	197	197	197	227	227	227	263
Cost of Manpower	297	296	296	343	344	343	397	397	398	459
Total Cost	**10521**	**11013**	**11039**	**12450**	**12669**	**12668**	**14301**	**14549**	**14551**	**16440**
EBITDA	11549	20910	21390	19979	24133	24117	22483	27188	27207	25297
Depreciation	617	617	617	617	617	617	617	617	617	617
EBIT	10932	20294	20774	19362	23516	23500	21866	26572	26590	24680
Interest expenses	824	549	341	197	53	-19	-19	0	0	0
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	10109	19745	20433	19166	23463	23519	21885	26572	26590	24680
Tax	3436	6851	7128	6715	8246	8288	7736	9393	9414	8758
Profit After Tax	6673	12894	13305	12450	15217	15231	14150	17179	17177	15922

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Revenue										
From Industrial Land	9378	9378	9378	10503	10503	10503	11764	11764	11764	13175
From SFB	12176	12176	12176	13637	13637	13637	15274	15274	15274	17107
From Utility	25268	25268	25292	29058	29058	29058	33449	33417	33417	38429
From EZ service Fees	288	288	288	288	288	288	288	288	288	288
From Logistics Zone	136	136	136	153	153	153	171	171	171	192
From Support Amenities	124	124	124	139	139	139	156	156	156	174
Total Revenue	**47370**	**47370**	**47394**	**53778**	**53778**	**53778**	**61101**	**61069**	**61069**	**69365**
Operating Expenses										
O&M Cost	13167	13167	15242	15242	15242	17644	17644	17644	20426	20426
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	2369	2369	2370	2689	2689	2689	3055	3053	3053	3468
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	263	263	305	305	305	353	353	353	409	409
Cost of Manpower	459	459	533	532	532	616	617	616	713	713
Total Cost	**16722**	**16722**	**18914**	**19231**	**19231**	**21766**	**22134**	**22130**	**25064**	**25479**
EBITDA	30649	30649	28481	34547	34547	32013	38967	38939	36005	43886

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Depreciation	617	617	617	617	617	617	617	617	617	617
EBIT	30032	30032	27864	33930	33930	31396	38350	38322	35388	43269
Interest expenses	0	0	0	0	0	0	0	0	0	0
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	30032	30032	27864	33930	33930	31396	38350	38322	35388	43269
Tax	10642	10652	9901	12032	12039	11157	13596	13591	12568	15330
Profit After Tax	19390	19380	17963	21898	21892	20239	24754	24731	22820	27939

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Revenue										
From Industrial Land	13175	13175	14756	14756	14756	16527	16527	16527	18510	18510
From SFB	17107	17107	19159	19159	19159	21459	21459	21459	24034	24034
From Utility	38466	38429	44194	44194	44236	50823	50823	50823	58502	58446
From EZ service Fees	288	288	288	288	288	288	288	288	288	288
From Logistics Zone	192	192	215	215	215	240	240	240	269	269
From Support Amenities	174	174	195	195	195	219	219	219	245	245
Total Revenue	**69402**	**69365**	**78807**	**78807**	**78849**	**89556**	**89556**	**89556**	**101848**	**101792**
Operating Expenses										
O&M Cost	20426	23645	23645	23645	27372	27372	27372	31687	31687	31687
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	3470	3468	3940	3940	3942	4478	4478	4478	5092	5090
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	409	473	473	473	547	547	547	634	634	634
Cost of Manpower	715	825	825	825	958	955	955	1105	1109	1105
Total Cost	**25483**	**28875**	**29347**	**29347**	**33284**	**33817**	**33817**	**38368**	**38986**	**38980**
EBITDA	43919	40490	49460	49460	45566	55739	55739	51188	62862	62813
Depreciation	617	617	617	617	617	617	617	617	617	617
EBIT	43302	39873	48843	48843	44949	55122	55122	50571	62246	62196
Interest expenses	0	0	0	0	0	0	0	0	0	0
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	43302	39873	48843	48843	44949	55122	55122	50571	62246	62196
Tax	15345	14147	17289	17292	15931	19493	19495	17903	21991	21974
Profit After Tax	27957	25726	31554	31552	29018	35629	35628	32668	40255	40222

Base Scenario P&L Statement- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Revenue										
From Industrial Land	0	0	138	359	359	359	475	475	586	855
From SFB	0	0	588	1317	1976	2635	3688	4426	4918	5508
From Utility	0	0	339	878	968	1057	1465	1568	1862	2547
From EZ service Fees	0	0	13	30	30	30	36	36	45	58
From Logistics Zone	0	0	0	0	0	0	55	55	55	62
From Support Amenities	0	0	0	0	45	45	50	50	50	56
Total Revenue	**0**	**0**	**1078**	**2584**	**3378**	**4126**	**5770**	**6610**	**7516**	**9086**
Operating Expenses										
O&M Cost	0	0	472	652	830	1166	1371	1576	2111	2427
Upfront Fees to BEZA	600									
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	0	0	54	129	169	206	288	331	376	454
Pre-operating Cost	8	8	0	0	0	0	0	0	0	0
Misc. Cost	0	0	9	13	17	23	27	32	42	49
Cost of Manpower	0	0	123	123	123	142	142	142	165	165
Total Cost	**1072**	**472**	**1122**	**1381**	**1603**	**2002**	**2293**	**2544**	**3158**	**3559**
EBITDA	-1072	-472	-45	1203	1775	2124	3476	4066	4358	5527
Depreciation	0	0	96	128	160	191	222	254	295	337
EBIT	-1072	-472	-141	1075	1616	1933	3254	3812	4063	5190
Interest expenses	0	0	0	0	943	893	799	705	1728	1574
Interest on W/C	0	0	6	0	0	0	0	0	0	0
Profit Before Tax	-1072	-472	-147	1075	673	1039	2455	3107	2335	3617
Tax	0	0	0	0	0	0	0	0	0	0
Profit After Tax	-1072	-472	-147	1075	673	1039	2455	3107	2335	3617

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Revenue										
From Industrial Land	855	877	982	1120	1270	1857	2809	3563	5046	5927
From SFB	5508	5508	6169	6169	6169	6909	6909	6909	7738	7738
From Utility	2547	2591	2983	3272	3586	5065	7132	8758	12416	14374

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
From EZ service Fees	58	59	59	68	77	100	152	193	243	286
From Logistics Zone	62	62	69	69	69	77	77	77	87	87
From Support Amenities	56	56	63	63	63	70	70	70	79	79
Total Revenue	**9086**	**9153**	**10325**	**10761**	**11233**	**14078**	**17149**	**19571**	**25609**	**28491**
Operating Expenses										
O&M Cost	2744	3536	3915	4271	5484	6102	6333	7332	7332	7332
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	454	458	516	538	562	704	857	979	1280	1425
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	55	71	78	85	110	122	127	147	147	147
Cost of Manpower	165	191	191	191	221	221	222	256	256	256
Total Cost	**3882**	**4719**	**5165**	**5549**	**6841**	**7613**	**8003**	**9177**	**9479**	**9623**
EBITDA	5205	4434	5160	5212	4393	6466	9146	10395	16131	18869
Depreciation	379	419	458	498	557	617	617	617	617	617
EBIT	4826	4016	4702	4714	3835	5849	8529	9778	15514	18252
Interest expenses	1368	2453	2189	1849	2952	2593	2215	1806	1423	1094
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	3457	1563	2512	2865	884	3256	6314	7971	14092	17158
Tax	0	0	148	428	0	545	1842	2507	4720	5853
Profit After Tax	3457	1563	2365	2437	884	2711	4472	5465	9372	11305

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Revenue										
From Industrial Land	5960	6675	6675	6675	7476	7476	7476	8373	8373	8373
From SFB	7738	8667	8667	8667	9707	9707	9707	10872	10872	10872
From Utility	14461	16614	16614	16614	19124	19106	19106	21972	21993	21972
From EZ service Fees	288	288	288	288	288	288	288	288	288	288
From Logistics Zone	87	97	97	97	109	109	109	122	122	122
From Support Amenities	79	88	88	88	99	99	99	111	111	111
Total Revenue	**28612**	**32429**	**32429**	**32429**	**36803**	**36784**	**36784**	**41737**	**41758**	**41737**
Operating Expenses										
O&M Cost	8487	8487	8487	9825	9825	9825	11374	11374	11374	13167

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	1431	1621	1621	1621	1840	1839	1839	2087	2088	2087
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	170	170	170	197	197	197	227	227	227	263
Cost of Manpower	297	296	296	343	344	343	397	397	398	459
Total Cost	**10849**	**11039**	**11039**	**12450**	**12669**	**12668**	**14301**	**14549**	**14551**	**16440**
EBITDA	17763	21390	21390	19979	24133	24117	22483	27188	27207	25297
Depreciation	617	617	617	617	617	617	617	617	617	617
EBIT	17147	20774	20774	19362	23516	23500	21866	26572	26590	24680
Interest expenses	824	549	341	197	53	-19	-19	0	0	0
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	16323	20225	20433	19166	23463	23519	21885	26572	26590	24680
Tax	5611	7019	7128	6715	8246	8288	7736	9393	9414	8758
Profit After Tax	10712	13206	13305	12450	15217	15231	14150	17179	17177	15922

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Revenue										
From Industrial Land	9378	9378	9378	10503	10503	10503	11764	11764	11764	13175
From SFB	12176	12176	12176	13637	13637	13637	15274	15274	15274	17107
From Utility	25268	25268	25292	29058	29058	29058	33449	33417	33417	38429
From EZ service Fees	288	288	288	288	288	288	288	288	288	288
From Logistics Zone	136	136	136	153	153	153	171	171	171	192
From Support Amenities	124	124	124	139	139	139	156	156	156	174
Total Revenue	**47370**	**47370**	**47394**	**53778**	**53778**	**53778**	**61101**	**61069**	**61069**	**69365**
Operating Expenses										
O&M Cost	13167	13167	15242	15242	15242	17644	17644	17644	20426	20426
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	2369	2369	2370	2689	2689	2689	3055	3053	3053	3468
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	263	263	305	305	305	353	353	353	409	409
Cost of Manpower	459	459	533	532	532	616	617	616	713	713
Total Cost	**16722**	**16722**	**18914**	**19231**	**19231**	**21766**	**22134**	**22130**	**25064**	**25479**

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
EBITDA	30649	30649	28481	34547	34547	32013	38967	38939	36005	43886
Depreciation	617	617	617	617	617	617	617	617	617	617
EBIT	30032	30032	27864	33930	33930	31396	38350	38322	35388	43269
Interest expenses	0	0	0	0	0	0	0	0	0	0
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	30032	30032	27864	33930	33930	31396	38350	38322	35388	43269
Tax	10642	10652	9901	12032	12039	11157	13596	13591	12568	15330
Profit After Tax	19390	19380	17963	21898	21892	20239	24754	24731	22820	27939

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Revenue										
From Industrial Land	13175	13175	14756	14756	14756	16527	16527	16527	18510	18510
From SFB	17107	17107	19159	19159	19159	21459	21459	21459	24034	24034
From Utility	38466	38429	44194	44194	44236	50823	50823	50823	58502	58446
From EZ service Fees	288	288	288	288	288	288	288	288	288	288
From Logistics Zone	192	192	215	215	215	240	240	240	269	269
From Support Amenities	174	174	195	195	195	219	219	219	245	245
Total Revenue	**69402**	**69365**	**78807**	**78807**	**78849**	**89556**	**89556**	**89556**	**101848**	**101792**
Operating Expenses										
O&M Cost	20426	23645	23645	23645	27372	27372	27372	31687	31687	31687
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	3470	3468	3940	3940	3942	4478	4478	4478	5092	5090
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	409	473	473	473	547	547	547	634	634	634
Cost of Manpower	715	825	825	825	958	955	955	1105	1109	1105
Total Cost	**25483**	**28875**	**29347**	**29347**	**33284**	**33817**	**33817**	**38368**	**38986**	**38980**
EBITDA	43919	40490	49460	49460	45566	55739	55739	51188	62862	62813
Depreciation	617	617	617	617	617	617	617	617	617	617
EBIT	43302	39873	48843	48843	44949	55122	55122	50571	62246	62196
Interest expenses	0	0	0	0	0	0	0	0	0	0
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	43302	39873	48843	48843	44949	55122	55122	50571	62246	62196

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Tax	15345	14147	17289	17292	15931	19493	19495	17903	21991	21974
Profit After Tax	27957	25726	31554	31552	29018	35629	35628	32668	40255	40222

Aggressive Scenario P&L Statement- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Revenue										
From Industrial Land	0	0	221	569	757	779	1068	1083	1339	1891
From SFB	0	0	980	2195	3293	4391	4918	4918	4918	5508
From Utility	0	0	548	1407	1925	2116	2824	2854	3369	4674
From EZ service Fees	0	0	21	48	64	66	81	82	102	128
From Logistics Zone	0	0	0	0	0	0	55	55	55	62
From Support Amenities	0	0	0	0	45	45	50	50	50	56
Total Revenue	**0**	**0**	**1770**	**4220**	**6084**	**7397**	**8997**	**9043**	**9833**	**12319**
Operating Expenses										
O&M Cost	0	0	472	652	830	1166	1371	1576	2111	2427
Upfront Fees to BEZA	600									
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	0	0	89	211	304	370	450	452	492	616
Pre-operating Cost	8	8	0	0	0	0	0	0	0	0
Misc. Cost	0	0	9	13	17	23	27	32	42	49
Cost of Manpower	0	0	123	123	123	142	142	142	165	165
Total Cost	**1072**	**472**	**1157**	**1463**	**1738**	**2165**	**2454**	**2666**	**3274**	**3721**
EBITDA	-1072	-472	613	2757	4346	5231	6542	6377	6558	8599
Depreciation	0	0	96	128	160	191	222	254	295	337
EBIT	-1072	-472	517	2628	4186	5040	6320	6123	6263	8262
Interest expenses	0	0	0	0	943	893	799	705	1728	1574
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	-1072	-472	517	2628	3244	4147	5521	5418	4535	6688
Tax	0	0	0	0	0	0	0	0	0	0
Profit After Tax	-1072	-472	517	2628	3244	4147	5521	5418	4535	6688

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Revenue										

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
From Industrial Land	1965	2195	2639	3057	3513	4745	5321	5321	5960	5960
From SFB	5508	5508	6169	6169	6169	6909	6909	6909	7738	7738
From Utility	4824	5297	6479	7354	8314	11316	12575	12563	14447	14447
From EZ service Fees	133	149	160	185	213	256	288	288	288	288
From Logistics Zone	62	62	69	69	69	77	77	77	87	87
From Support Amenities	56	56	63	63	63	70	70	70	79	79
Total Revenue	**12548**	**13266**	**15578**	**16897**	**18340**	**23375**	**25240**	**25228**	**28598**	**28598**
Operating Expenses										
O&M Cost	2744	3536	3915	4271	5484	6102	6333	7332	7332	7332
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	627	663	779	845	917	1169	1262	1261	1430	1430
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	55	71	78	85	110	122	127	147	147	147
Cost of Manpower	165	191	191	191	221	221	222	256	256	256
Total Cost	**4055**	**4925**	**5428**	**5856**	**7196**	**8078**	**8408**	**9459**	**9628**	**9628**
EBITDA	8493	8341	10150	11041	11144	15297	16833	15769	18970	18970
Depreciation	379	419	458	498	557	617	617	617	617	617
EBIT	8114	7923	9692	10543	10587	14680	16216	15152	18354	18354
Interest expenses	1368	2453	2189	1849	2952	2593	2215	1806	1423	1094
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	6746	5470	7503	8694	7635	12088	14001	13346	16931	17259
Tax	0	0	672	1856	2237	3762	4533	4388	5714	5888
Profit After Tax	6746	5470	6831	6838	5398	8326	9469	8958	11217	11371

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Revenue										
From Industrial Land	5960	6675	6675	6675	7476	7476	7476	8373	8373	8373
From SFB	7738	8667	8667	8667	9707	9707	9707	10872	10872	10872
From Utility	14461	16614	16614	16614	19124	19106	19106	21972	21993	21972
From EZ service Fees	288	288	288	288	288	288	288	288	288	288
From Logistics Zone	87	97	97	97	109	109	109	122	122	122
From Support Amenities	79	88	88	88	99	99	99	111	111	111
Total Revenue	**28612**	**32429**	**32429**	**32429**	**36803**	**36784**	**36784**	**41737**	**41758**	**41737**

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Operating Expenses										
O&M Cost	8487	8487	8487	9825	9825	9825	11374	11374	11374	13167
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	1431	1621	1621	1621	1840	1839	1839	2087	2088	2087
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	170	170	170	197	197	197	227	227	227	263
Cost of Manpower	297	296	296	343	344	343	397	397	398	459
Total Cost	**10849**	**11039**	**11039**	**12450**	**12669**	**12668**	**14301**	**14549**	**14551**	**16440**
EBITDA	17763	21390	21390	19979	24133	24117	22483	27188	27207	25297
Depreciation	617	617	617	617	617	617	617	617	617	617
EBIT	17147	20774	20774	19362	23516	23500	21866	26572	26590	24680
Interest expenses	824	549	341	197	53	-19	-19	0	0	0
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	16323	20225	20433	19166	23463	23519	21885	26572	26590	24680
Tax	5611	7019	7128	6715	8246	8288	7736	9393	9414	8758
Profit After Tax	10712	13206	13305	12450	15217	15231	14150	17179	17177	15922

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Revenue										
From Industrial Land	9378	9378	9378	10503	10503	10503	11764	11764	11764	13175
From SFB	12176	12176	12176	13637	13637	13637	15274	15274	15274	17107
From Utility	25268	25268	25292	29058	29058	29058	33449	33417	33417	38429
From EZ service Fees	288	288	288	288	288	288	288	288	288	288
From Logistics Zone	136	136	136	153	153	153	171	171	171	192
From Support Amenities	124	124	124	139	139	139	156	156	156	174
Total Revenue	**47370**	**47370**	**47394**	**53778**	**53778**	**53778**	**61101**	**61069**	**61069**	**69365**
Operating Expenses										
O&M Cost	13167	13167	15242	15242	15242	17644	17644	17644	20426	20426
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	2369	2369	2370	2689	2689	2689	3055	3053	3053	3468
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Misc. Cost	263	263	305	305	305	353	353	353	409	409
Cost of Manpower	459	459	533	532	532	616	617	616	713	713
Total Cost	**16722**	**16722**	**18914**	**19231**	**19231**	**21766**	**22134**	**22130**	**25064**	**25479**
EBITDA	30649	30649	28481	34547	34547	32013	38967	38939	36005	43886
Depreciation	617	617	617	617	617	617	617	617	617	617
EBIT	30032	30032	27864	33930	33930	31396	38350	38322	35388	43269
Interest expenses	0	0	0	0	0	0	0	0	0	0
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	30032	30032	27864	33930	33930	31396	38350	38322	35388	43269
Tax	10642	10652	9901	12032	12039	11157	13596	13591	12568	15330
Profit After Tax	19390	19380	17963	21898	21892	20239	24754	24731	22820	27939

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Revenue										
From Industrial Land	13175	13175	14756	14756	14756	16527	16527	16527	18510	18510
From SFB	17107	17107	19159	19159	19159	21459	21459	21459	24034	24034
From Utility	38466	38429	44194	44194	44236	50823	50823	50823	58502	58446
From EZ service Fees	288	288	288	288	288	288	288	288	288	288
From Logistics Zone	192	192	215	215	215	240	240	240	269	269
From Support Amenities	174	174	195	195	195	219	219	219	245	245
Total Revenue	**69402**	**69365**	**78807**	**78807**	**78849**	**89556**	**89556**	**89556**	**101848**	**101792**
Operating Expenses										
O&M Cost	20426	23645	23645	23645	27372	27372	27372	31687	31687	31687
Upfront Fees to BEZA										
Annual Fees paid to BEZA	464	464	464	464	464	464	464	464	464	464
Revenue Share	3470	3468	3940	3940	3942	4478	4478	4478	5092	5090
Pre-operating Cost	0	0	0	0	0	0	0	0	0	0
Misc. Cost	409	473	473	473	547	547	547	634	634	634
Cost of Manpower	715	825	825	825	958	955	955	1105	1109	1105
Total Cost	**25483**	**28875**	**29347**	**29347**	**33284**	**33817**	**33817**	**38368**	**38986**	**38980**
EBITDA	43919	40490	49460	49460	45566	55739	55739	51188	62862	62813
Depreciation	617	617	617	617	617	617	617	617	617	617
EBIT	43302	39873	48843	48843	44949	55122	55122	50571	62246	62196

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Interest expenses	0	0	0	0	0	0	0	0	0	0
Interest on W/C	0	0	0	0	0	0	0	0	0	0
Profit Before Tax	43302	39873	48843	48843	44949	55122	55122	50571	62246	62196
Tax	15345	14147	17289	17292	15931	19493	19495	17903	21991	21974
Profit After Tax	27957	25726	31554	31552	29018	35629	35628	32668	40255	40222

Conservative Scenario Working Capital Statement- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Receivables										
Revenue Collection	0	0	833	1901	2593	3219	4414	5117	5883	7713
Payables										
Operating Expenses	1072	472	1110	1347	1564	1957	2225	2470	3077	3490
Working Capital	0	0	277	0	0	0	0	0	0	0
Working Capital Loan	0	0	277	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	39	0	0	0	0	0	0	0

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Receivables										
Revenue Collection	7723	7760	8768	8835	8911	12255	13762	15646	19187	19203
Payables										
Operating Expenses	3814	4649	5087	5453	6725	7522	7834	8980	9157	9158
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Receivables										
Revenue Collection	22070	31924	32429	32429	36803	36784	36784	41737	41758	41737
Payables										
Operating Expenses	10521	11013	11039	12450	12669	12668	14301	14549	14551	16440
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Receivables										

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Revenue Collection	47370	47370	47394	53778	53778	53778	61101	61069	61069	69365
Payables										
Operating Expenses	16722	16722	18914	19231	19231	21766	22134	22130	25064	25479
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Receivables										
Revenue Collection	69402	69365	78807	78807	78849	89556	89556	89556	101848	101792
Payables										
Operating Expenses	25483	28875	29347	29347	33284	33817	33817	38368	38986	38980
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

Base Scenario Working Capital Statement- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Receivables										
Revenue Collection	0	0	1078	2584	3378	4126	5770	6610	7516	9086
Payables										
Operating Expenses	1072	472	1122	1381	1603	2002	2293	2544	3158	3559
Working Capital	0	0	45	0	0	0	0	0	0	0
Working Capital Loan	0	0	45	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	6	0	0	0	0	0	0	0

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Receivables										
Revenue Collection	9086	9153	10325	10761	11233	14078	17149	19571	25609	28491

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Payables										
Operating Expenses	3882	4719	5165	5549	6841	7613	8003	9177	9479	9623
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Receivables										
Revenue Collection	28612	32429	32429	32429	36803	36784	36784	41737	41758	41737
Payables										
Operating Expenses	10849	11039	11039	12450	12669	12668	14301	14549	14551	16440
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Receivables										
Revenue Collection	47370	47370	47394	53778	53778	53778	61101	61069	61069	69365
Payables										
Operating Expenses	16722	16722	18914	19231	19231	21766	22134	22130	25064	25479
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Receivables										
Revenue Collection	69402	69365	78807	78807	78849	89556	89556	89556	101848	101792
Payables										

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Operating Expenses	25483	28875	29347	29347	33284	33817	33817	38368	38986	38980
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

Aggressive Scenario Working Capital Statement- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Receivables										
Revenue Collection	0	0	1770	4220	6084	7397	8997	9043	9833	12319
Payables										
Operating Expenses	1072	472	1157	1463	1738	2165	2454	2666	3274	3721
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Receivables										
Revenue Collection	12548	13266	15578	16897	18340	23375	25240	25228	28598	28598
Payables										
Operating Expenses	4055	4925	5428	5856	7196	8078	8408	9459	9628	9628
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Receivables										

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Revenue Collection	28612	32429	32429	32429	36803	36784	36784	41737	41758	41737
Payables										
Operating Expenses	10849	11039	11039	12450	12669	12668	14301	14549	14551	16440
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Receivables										
Revenue Collection	47370	47370	47394	53778	53778	53778	61101	61069	61069	69365
Payables										
Operating Expenses	16722	16722	18914	19231	19231	21766	22134	22130	25064	25479
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Receivables										
Revenue Collection	69402	69365	78807	78807	78849	89556	89556	89556	101848	101792
Payables										
Operating Expenses	25483	28875	29347	29347	33284	33817	33817	38368	38986	38980
Working Capital	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Interest on W/C Loan	0	0	0	0	0	0	0	0	0	0

Conservative Scenario Cash Flow Statement- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Cash inflow										
PAT	-1072	-472	-413	425	-73	178	1167	1689	783	2312
Depreciation	0	0	96	128	160	191	222	254	295	337
Grant	0	0	0	0	0	0	0	0	0	0
Equity	843	904	1102	1182	960	1181	1266	1358	1715	1839
Equity infused to meet pre-operating expenses	1072	472	0	0	0	0	0	0	0	0
Increase in debt	1966	2108	2571	2757	2239	2755	2954	3168	4001	4291
Working Capital Loan	0	0	277	0	0	0	0	0	0	0
Total cash inflow	**2809**	**3012**	**3634**	**4493**	**3285**	**4304**	**5610**	**6469**	**6795**	**8779**
Cash outflow										
Capital Expenditure	2809	3012	3673	3939	3199	3935	4220	4526	5716	6130
Repayment of debt	0	0	0	0	0	940	940	940	940	2052
Working Capital	0	0	277	0	0	0	0	0	0	0
Total cash outflow	**2809**	**3012**	**3950**	**3939**	**3199**	**4875**	**5161**	**5467**	**6657**	**8182**
Net Cash generation	**0**	**0**	**-316**	**554**	**86**	**-571**	**449**	**1002**	**139**	**597**
Opening Balance of Cash and Bank Balance	**0**	**0**	**0**	**0**	**554**	**640**	**640**	**1089**	**2091**	**2230**
Closing Balance of Cash and Bank Balance	**0**	**0**	**0**	**554**	**640**	**640**	**1089**	**2091**	**2230**	**2827**
Equity Infusion	0	0	316	0	0	571	0	0	0	0

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Cash inflow										
PAT	2162	239	1034	1035	-1322	1525	3097	3761	5406	5570
Depreciation	379	419	458	498	557	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	1972	1910	2049	2197	3231	3231	0	0	0	0

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	4602	4457	4782	5127	7539	7539	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**9116**	**7025**	**8323**	**8858**	**10005**	**12911**	**3714**	**4378**	**6023**	**6186**
Cash outflow										
Capital Expenditure	6575	6368	6831	7325	10770	10770	0	0	0	0
Repayment of debt	2052	2052	3341	3341	3341	3838	3838	5346	5346	4234
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**8627**	**8420**	**10173**	**10666**	**14111**	**14608**	**3838**	**5346**	**5346**	**4234**
Net Cash generation	**489**	**-1394**	**-1849**	**-1808**	**-4107**	**-1697**	**-124**	**-968**	**677**	**1953**
Opening Balance of Cash and Bank Balance	**2827**	**3316**	**3316**	**3316**	**3316**	**3316**	**3316**	**3316**	**3316**	**3993**
Closing Balance of Cash and Bank Balance	**3316**	**3316**	**3316**	**3316**	**3316**	**3316**	**3316**	**3316**	**3993**	**5946**
Equity Infusion	0	1394	1849	1808	4107	1697	124	968	0	0

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Cash inflow										
PAT	6673	12894	13305	12450	15217	15231	14150	17179	17177	15922
Depreciation	617	617	617	617	617	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	0	0	0	0	0	0	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**7290**	**13511**	**13922**	**13067**	**15834**	**15848**	**14766**	**17796**	**17793**	**16539**
Cash outflow										
Capital Expenditure	0	0	0	0	0	0	0	0	0	0

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Repayment of debt	4234	4234	2944	2944	2944	1508	1508	0	0	0
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**4234**	**4234**	**2944**	**2944**	**2944**	**1508**	**1508**	**0**	**0**	**0**
Net Cash generation	**3056**	**9277**	**10977**	**10123**	**12890**	**14340**	**13259**	**17796**	**17793**	**16539**
Opening Balance of Cash and Bank Balance	**5946**	**9001**	**18278**	**29256**	**39378**	**52268**	**66608**	**79867**	**97662**	**115455**
Closing Balance of Cash and Bank Balance	**9001**	**18278**	**29256**	**39378**	**52268**	**66608**	**79867**	**97662**	**115455**	**131995**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Cash inflow										
PAT	19390	19380	17963	21898	21892	20239	24754	24731	22820	27939
Depreciation	617	617	617	617	617	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	0	0	0	0	0	0	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**20007**	**19997**	**18579**	**22515**	**22508**	**20855**	**25371**	**25348**	**23437**	**28556**
Cash outflow										
Capital Expenditure	0	0	0	0	0	0	0	0	0	0
Repayment of debt	0	0	0	0	0	0	0	0	0	0
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Net Cash generation	**20007**	**19997**	**18579**	**22515**	**22508**	**20855**	**25371**	**25348**	**23437**	**28556**

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Opening Balance of Cash and Bank Balance	**131995**	**152001**	**171998**	**190577**	**213092**	**235601**	**256456**	**281827**	**307174**	**330611**
Closing Balance of Cash and Bank Balance	**152001**	**171998**	**190577**	**213092**	**235601**	**256456**	**281827**	**307174**	**330611**	**359167**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Cash inflow										
PAT	27957	25726	31554	31552	29018	35629	35628	32668	40255	40222
Depreciation	617	617	617	617	617	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	0	0	0	0	0	0	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**28574**	**26342**	**32171**	**32168**	**29635**	**36246**	**36244**	**33285**	**40872**	**40838**
Cash outflow										
Capital Expenditure	0	0	0	0	0	0	0	0	0	0
Repayment of debt	0	0	0	0	0	0	0	0	0	0
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Net Cash generation	**28574**	**26342**	**32171**	**32168**	**29635**	**36246**	**36244**	**33285**	**40872**	**40838**
Opening Balance of Cash and Bank Balance	**359167**	**387741**	**414083**	**446254**	**478422**	**508057**	**544303**	**580547**	**613832**	**654704**
Closing Balance of Cash and Bank Balance	**387741**	**414083**	**446254**	**478422**	**508057**	**544303**	**580547**	**613832**	**654704**	**695542**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

Base Scenario Cash Flow Statement- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Cash inflow										
PAT	-1072	-472	-147	1075	673	1039	2455	3107	2335	3617
Depreciation	0	0	96	128	160	191	222	254	295	337
Grant	0	0	0	0	0	0	0	0	0	0
Equity	843	904	1102	1182	960	1181	1266	1358	1715	1839
Equity infused to meet pre-operating expenses	1072	472	0	0	0	0	0	0	0	0
Increase in debt	1966	2108	2571	2757	2239	2755	2954	3168	4001	4291
Working Capital Loan	0	0	45	0	0	0	0	0	0	0
Total cash inflow	**2809**	**3012**	**3667**	**5142**	**4032**	**5165**	**6897**	**7887**	**8347**	**10084**
Cash outflow										
Capital Expenditure	2809	3012	3673	3939	3199	3935	4220	4526	5716	6130
Repayment of debt	0	0	0	0	0	940	940	940	940	2052
Working Capital	0	0	45	0	0	0	0	0	0	0
Total cash outflow	**2809**	**3012**	**3718**	**3939**	**3199**	**4875**	**5161**	**5467**	**6657**	**8182**
Net Cash generation	**0**	**0**	**-51**	**1203**	**832**	**290**	**1737**	**2420**	**1690**	**1902**
Opening Balance of Cash and Bank Balance	**0**	**0**	**0**	**0**	**1203**	**2035**	**2326**	**4062**	**6483**	**8173**
Closing Balance of Cash and Bank Balance	**0**	**0**	**0**	**1203**	**2035**	**2326**	**4062**	**6483**	**8173**	**10075**
Equity Infusion	0	0	51	0	0	0	0	0	0	0

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Cash inflow										
PAT	3457	1563	2365	2437	884	2711	4472	5465	9372	11305
Depreciation	379	419	458	498	557	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	1972	1910	2049	2197	3231	3231	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	4602	4457	4782	5127	7539	7539	0	0	0	0

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**10411**	**8349**	**9654**	**10259**	**12211**	**14098**	**5089**	**6081**	**9988**	**11922**
Cash outflow										
Capital Expenditure	6575	6368	6831	7325	10770	10770	0	0	0	0
Repayment of debt	2052	2052	3341	3341	3341	3838	3838	5346	5346	4234
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**8627**	**8420**	**10173**	**10666**	**14111**	**14608**	**3838**	**5346**	**5346**	**4234**
Net Cash generation	**1784**	**-70**	**-518**	**-407**	**-1900**	**-510**	**1251**	**736**	**4643**	**7688**
Opening Balance of Cash and Bank Balance	**10075**	**11859**	**11859**	**11859**	**11859**	**11859**	**11859**	**13110**	**13846**	**18489**
Closing Balance of Cash and Bank Balance	**11859**	**11859**	**11859**	**11859**	**11859**	**11859**	**13110**	**13846**	**18489**	**26177**
Equity Infusion	0	70	518	407	1900	510	0	0	0	0

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Cash inflow										
PAT	10712	13206	13305	12450	15217	15231	14150	17179	17177	15922
Depreciation	617	617	617	617	617	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	0	0	0	0	0	0	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**11329**	**13823**	**13922**	**13067**	**15834**	**15848**	**14766**	**17796**	**17793**	**16539**
Cash outflow										
Capital Expenditure	0	0	0	0	0	0	0	0	0	0
Repayment of debt	4234	4234	2944	2944	2944	1508	1508	0	0	0
Working Capital	0	0	0	0	0	0	0	0	0	0

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Total cash outflow	**4234**	**4234**	**2944**	**2944**	**2944**	**1508**	**1508**	**0**	**0**	**0**
Net Cash generation	**7095**	**9589**	**10977**	**10123**	**12890**	**14340**	**13259**	**17796**	**17793**	**16539**
Opening Balance of Cash and Bank Balance	**26177**	**33272**	**42861**	**53838**	**63961**	**76850**	**91190**	**104449**	**122245**	**140038**
Closing Balance of Cash and Bank Balance	**33272**	**42861**	**53838**	**63961**	**76850**	**91190**	**104449**	**122245**	**140038**	**156577**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Cash inflow										
PAT	19390	19380	17963	21898	21892	20239	24754	24731	22820	27939
Depreciation	617	617	617	617	617	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	0	0	0	0	0	0	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**20007**	**19997**	**18579**	**22515**	**22508**	**20855**	**25371**	**25348**	**23437**	**28556**
Cash outflow										
Capital Expenditure	0	0	0	0	0	0	0	0	0	0
Repayment of debt	0	0	0	0	0	0	0	0	0	0
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Net Cash generation	**20007**	**19997**	**18579**	**22515**	**22508**	**20855**	**25371**	**25348**	**23437**	**28556**
Opening Balance of Cash and Bank Balance	**156577**	**176584**	**196580**	**215160**	**237675**	**260183**	**281038**	**306409**	**331757**	**355193**

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Closing Balance of Cash and Bank Balance	**176584**	**196580**	**215160**	**237675**	**260183**	**281038**	**306409**	**331757**	**355193**	**383749**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Cash inflow										
PAT	27957	25726	31554	31552	29018	35629	35628	32668	40255	40222
Depreciation	617	617	617	617	617	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	0	0	0	0	0	0	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**28574**	**26342**	**32171**	**32168**	**29635**	**36246**	**36244**	**33285**	**40872**	**40838**
Cash outflow										
Capital Expenditure	0	0	0	0	0	0	0	0	0	0
Repayment of debt	0	0	0	0	0	0	0	0	0	0
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Net Cash generation	**28574**	**26342**	**32171**	**32168**	**29635**	**36246**	**36244**	**33285**	**40872**	**40838**
Opening Balance of Cash and Bank Balance	**383749**	**412323**	**438666**	**470836**	**503005**	**532639**	**568885**	**605130**	**638414**	**679286**
Closing Balance of Cash and Bank Balance	**412323**	**438666**	**470836**	**503005**	**532639**	**568885**	**605130**	**638414**	**679286**	**720124**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

Aggressive Scenario Cash Flow Statement- Figures in BDT million

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033

Cash inflow										
PAT	-1072	-472	517	2628	3244	4147	5521	5418	4535	6688
Depreciation	0	0	96	128	160	191	222	254	295	337
Grant	0	0	0	0	0	0	0	0	0	0
Equity	843	904	1102	1182	960	1181	1266	1358	1715	1839
Equity infused to meet pre-operating expenses	1072	472	0	0	0	0	0	0	0	0
Increase in debt	1966	2108	2571	2757	2239	2755	2954	3168	4001	4291
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**2809**	**3012**	**4286**	**6696**	**6602**	**8273**	**9963**	**10198**	**10547**	**13155**
Cash outflow										
Capital Expenditure	2809	3012	3673	3939	3199	3935	4220	4526	5716	6130
Repayment of debt	0	0	0	0	0	940	940	940	940	2052
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**2809**	**3012**	**3673**	**3939**	**3199**	**4875**	**5161**	**5467**	**6657**	**8182**
Net Cash generation	**0**	**0**	**613**	**2757**	**3403**	**3397**	**4803**	**4731**	**3891**	**4973**
Opening Balance of Cash and Bank Balance	**0**	**0**	**0**	**613**	**3370**	**6773**	**10170**	**14973**	**19704**	**23595**
Closing Balance of Cash and Bank Balance	**0**	**0**	**613**	**3370**	**6773**	**10170**	**14973**	**19704**	**23595**	**28568**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

	2034	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**
Cash inflow										
PAT	6746	5470	6831	6838	5398	8326	9469	8958	11217	11371
Depreciation	379	419	458	498	557	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	1972	1910	2049	2197	3231	3231	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	4602	4457	4782	5127	7539	7539	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Total cash inflow	**13699**	**12256**	**14121**	**14660**	**16725**	**19712**	**10085**	**9575**	**11834**	**11988**
Cash outflow										
Capital Expenditure	6575	6368	6831	7325	10770	10770	0	0	0	0
Repayment of debt	2052	2052	3341	3341	3341	3838	3838	5346	5346	4234
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**8627**	**8420**	**10173**	**10666**	**14111**	**14608**	**3838**	**5346**	**5346**	**4234**
Net Cash generation	**5073**	**3837**	**3948**	**3994**	**2614**	**5105**	**6247**	**4229**	**6489**	**7754**
Opening Balance of Cash and Bank Balance	**28568**	**33641**	**37478**	**41426**	**45420**	**48034**	**53139**	**59386**	**63615**	**70104**
Closing Balance of Cash and Bank Balance	**33641**	**37478**	**41426**	**45420**	**48034**	**53139**	**59386**	**63615**	**70104**	**77858**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Cash inflow										
PAT	10712	13206	13305	12450	15217	15231	14150	17179	17177	15922
Depreciation	617	617	617	617	617	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	0	0	0	0	0	0	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**11329**	**13823**	**13922**	**13067**	**15834**	**15848**	**14766**	**17796**	**17793**	**16539**
Cash outflow										
Capital Expenditure	0	0	0	0	0	0	0	0	0	0
Repayment of debt	4234	4234	2944	2944	2944	1508	1508	0	0	0
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**4234**	**4234**	**2944**	**2944**	**2944**	**1508**	**1508**	**0**	**0**	**0**

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Net Cash generation	**7095**	**9589**	**10977**	**10123**	**12890**	**14340**	**13259**	**17796**	**17793**	**16539**
Opening Balance of Cash and Bank Balance	**77858**	**84953**	**94542**	**105519**	**115642**	**128531**	**142871**	**156130**	**173926**	**191719**
Closing Balance of Cash and Bank Balance	**84953**	**94542**	**105519**	**115642**	**128531**	**142871**	**156130**	**173926**	**191719**	**208258**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Cash inflow										
PAT	19390	19380	17963	21898	21892	20239	24754	24731	22820	27939
Depreciation	617	617	617	617	617	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	0	0	0	0	0	0	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**20007**	**19997**	**18579**	**22515**	**22508**	**20855**	**25371**	**25348**	**23437**	**28556**
Cash outflow										
Capital Expenditure	0	0	0	0	0	0	0	0	0	0
Repayment of debt	0	0	0	0	0	0	0	0	0	0
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Net Cash generation	**20007**	**19997**	**18579**	**22515**	**22508**	**20855**	**25371**	**25348**	**23437**	**28556**
Opening Balance of Cash and Bank Balance	**208258**	**228265**	**248261**	**266841**	**289356**	**311864**	**332719**	**358090**	**383438**	**406874**
Closing Balance of Cash and Bank Balance	**228265**	**248261**	**266841**	**289356**	**311864**	**332719**	**358090**	**383438**	**406874**	**435430**

	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Equity Infusion	0	0	0	0	0	0	0	0	0	0

	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
Cash inflow										
PAT	27957	25726	31554	31552	29018	35629	35628	32668	40255	40222
Depreciation	617	617	617	617	617	617	617	617	617	617
Grant	0	0	0	0	0	0	0	0	0	0
Equity	0	0	0	0	0	0	0	0	0	0
Equity infused to meet pre-operating expenses	0	0	0	0	0	0	0	0	0	0
Increase in debt	0	0	0	0	0	0	0	0	0	0
Working Capital Loan	0	0	0	0	0	0	0	0	0	0
Total cash inflow	**28574**	**26342**	**32171**	**32168**	**29635**	**36246**	**36244**	**33285**	**40872**	**40838**
Cash outflow										
Capital Expenditure	0	0	0	0	0	0	0	0	0	0
Repayment of debt	0	0	0	0	0	0	0	0	0	0
Working Capital	0	0	0	0	0	0	0	0	0	0
Total cash outflow	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Net Cash generation	**28574**	**26342**	**32171**	**32168**	**29635**	**36246**	**36244**	**33285**	**40872**	**40838**
Opening Balance of Cash and Bank Balance	**435430**	**464004**	**490347**	**522517**	**554686**	**584320**	**620566**	**656811**	**690095**	**730967**
Closing Balance of Cash and Bank Balance	**464004**	**490347**	**522517**	**554686**	**584320**	**620566**	**656811**	**690095**	**730967**	**771805**
Equity Infusion	0	0	0	0	0	0	0	0	0	0

15.16. Annexure 16 – Case study on e-waste management

What is e-waste?

E-waste is often misunderstood as comprising only computers and related IT equipment. According to the Organization for Economic Co-operation and Development (OECD), e-waste is "any appliance using an electric power supply that has reached its end-of life". The type of e-waste are of following types-

1. Large household appliances
2. Small household appliances
3. IT and telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical and electronic tools (with the exception of large-scale stationary industrial tools)
7. Toys, leisure and sports equipment
8. Medical devices (with the exception of all implanted and infected products)
9. Monitoring and control instruments
10. Automatic dispensers

Objectives and need of e-waste management

E-waste is usually regarded as a waste problem which can cause environmental damage if not dealt in an appropriate way. However, the enormous resource impact of e-waste is widely overlooked. E-waste is a major driver for the development of demand for a number of metals like Ag, Au, Pd, Pt, Ru, Cu, Sn, Sb, Co, Bi, Se, In etc. Inappropriate disposal of e-waste not only leads to significant environmental problems but also to a systematic loss of secondary materials. Hence the appropriate handling of e-waste can prevent serious environmental damage and also recover valuable materials.

Metal	Main Application
Silver (Ag)	Contacts, switches, solders
Gold (Au)	Bonding wire, contacts, integrated circuits
Palladium (Pd)	Multilayer capacitors, connectors
Platinum (Pt)	Hard disk, thermocouple, fuel cell
Ruthenium (Ru)	Hard disk, plasma displays
Copper (Cu)	Cable, wire, connector
Stannum (Sn)	Solders
Antimony (Sb)	Flame retardant, CRT glass
Cobalt (Co)	Rechargeable batteries
Bismuth (Bi)	Solders, capacitor, heat sink

Metal	Main Application
Selenium (Se)	Electro-optic, copier, solar cell
Indium (In)	LCD glass, solder, semiconductor

Furthermore end-of-life refrigerators, air-conditioners and similar equipment normally contain ozone depleting substances such as chlorofluorocarbon (CFC), hydrochlorofluorocarbons (HCFCs), fluorocarbons FCs and hydrofluorocarbons HFCs which have a very high global warming potential. The environmentally sound management of these wastes can therefore be significant in mitigating the climate change impact. Hence a comprehensive e-waste management system in order to ensure sustainability is necessary. The hierarchy of e-waste management system comprises-

(a) collection of e-waste,
(b) recovery of valuables such as secondary raw materials and
(c) segregation and safe disposal of hazardous waste.

E-waste Management: A Case Study of Bangalore, India

The management and recycling of e-waste was assessed in the city of Bangalore (India) based on rapid growing waste stream, waste valuable resources, hazardous substances and low recycling rate. For this purpose, the personal computer was defined as the tracer and accordingly a model was designed. The model depicts the life cycle of tracer, from production to consumption-including reuse and refurbishment-to material recovery in the formal recycling industry. All in all e-waste management in Bangalore has moved forward in many ways and can now serve as a model for other cities.

E-waste is a complex mixture of precious metals (Ag, AU, Pb, Pt etc.); base metals (Cu, Al, Ni, Si, Zn, Fe); Toxic elements (Hg, Be, Cd, Cr (VI), As, Sb and Bi) along with halogens and combustible (plastics, flame retardants). E-waste has been a problem of great concern not only for the government but also for the public due to their hazardous material contents. Currently, the main options for the treatment of electronic waste are involved in reuse, remanufacturing and recycling, as well as incineration and land filling.

This study was conducted in the Banglore city of India. Apart from the city, outer reaches of it like Banglore Rural District and Dobaspet Industrial area were also chosen for assessment of current practices followed in the E-waste management. Bangalore is the information technology hub of India and generates significant quantity of e-waste. For this study the tracer item chosen was the personal

computer (PC). A tracer item in this context stands for an electrical or electronic item which is surveyed along its whole life span, from the cradle to the grave.

Recycling Processes

Figure 103: Material flow of the pre-recycling processes of the tracer

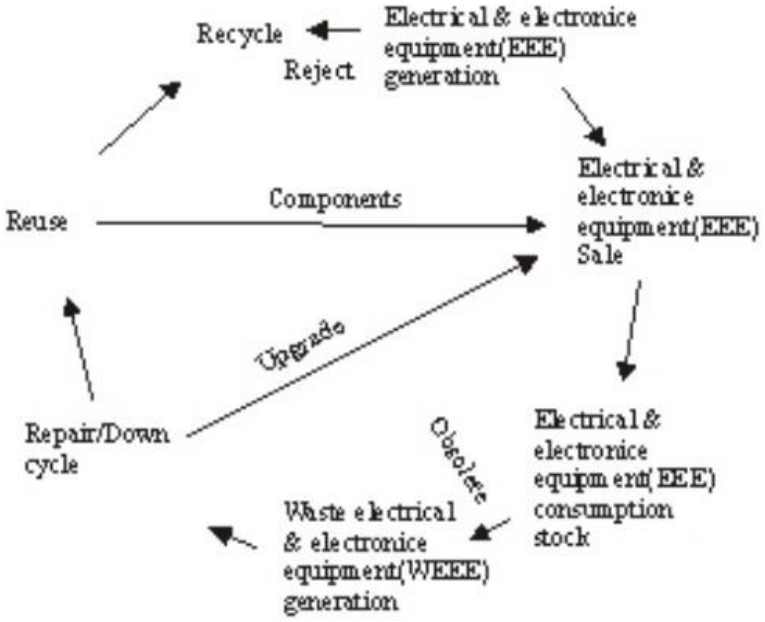
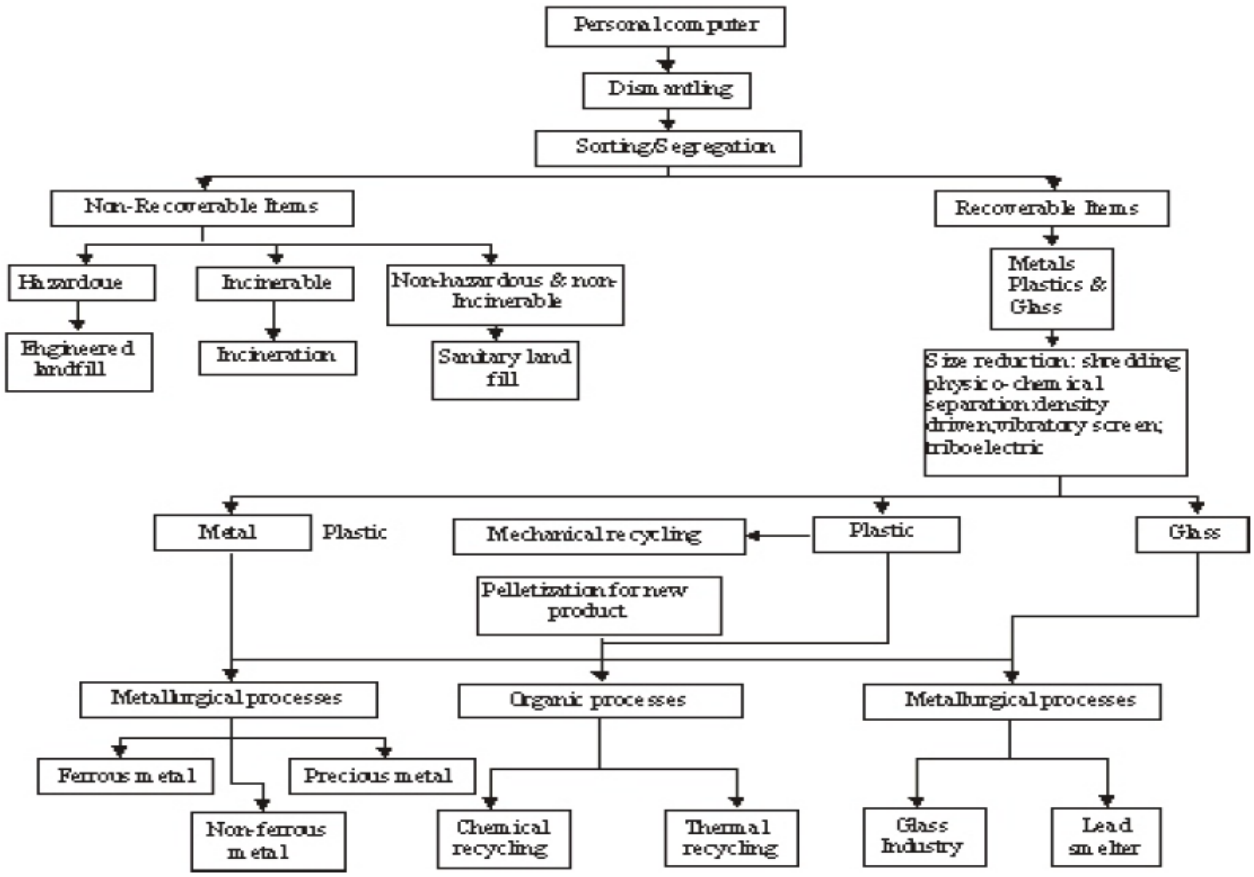


Figure 104: Material flow of the post-recycling processes of the tracer



"Material flow of the pre-recycling processes of the tracer" figure shows the material flow of the pre-recycling processes whereas "*Material flow of the post-recycling processes of the tracer*" figure shows the post-recycling processes. The process "Recycling" links the two sections of the system and at the same time symbolizes a "point of no return". After entering the "Recycling" process, no items, components or materials even return directly to the pre-recycling processes. The post recycling process adopted is simple and having minimum landfill options without incineration. In general, mechanical and recovery operations are being carried out. Mechanical operations include: manual dismantling, segregation, pulverizing and density separation in an ecofriendly manner, while recovery operations are carried out separately for metals, glass, and plastics.

E-waste Management at Organizational Level:

Bharat Electronics Ltd., (BEL), Bangalore set-up to meet the specialized electronic needs of the Indian defense services, has been the first public sector company to initiate E-waste management. The public sector companies had initiated a programme to manage E-waste. E-waste is segregated into four categories namely-

1. Computer and Computer peripherals
2. PCBs (printed circuit boards) and electronic components
3. Electrical wires/cables, cut wires
4. All other electronic equipments

The segregated waste is recycled at authorized e-waste recycling facilities in Bangalore. As per government regulations, tenders are called for the sale of this E-waste. Earlier all authorized scrap dealers were invited to take part in the tender. In the present situation the tender is restricted to only authorized E-waste recyclers. In addition to the public sector, large private companies including the multinationals used the auctions to dispose their E-waste.

Role and status of stakeholders' involvement:

Three main stakeholders have been identified. Namely

1. The Government- agencies associated with E-waste that include Karnataka State Pollution Control Board (KSPCB), Bruhat Bengaluru Mahanagar Pallike (BBMP), Department of Information Technology, Government of Karnataka
2. The Generators (mainly producers and consumers)
3. The Recyclers (Both formal and informal recyclers)

Government- agencies	Generators	Recyclers
KSPCB has the responsibility for enforcement of the rules and legislation. The industries are bound to dispose of the E-waste to a proper recycler who is authorized by the KSPCB or to find a proper land fill	The corporate sector and government institutions contribute largely to E-waste. In addition educational institutions, Hospitals and households are also significant contributors	There are two types of recyclers a) formal recyclers: the formal recyclers (like E-Parisaraa, Ash recyclers etc) handle maximum E-waste recycling. b) informal recyclers: usually operate without a license; Needs proper training

Material Recovery from e-waste:

It was found that a typical personal computer e-waste comprises of Glass (20%), plastics (23%) and metals (57%). Metals are recovered from printed circuit boards, cables, non-ferrous metals and ferrous metals. Out of one ton computer waste, 99% is used for recovery of precious metals and another 1% for safe land filling.

Reuse of end-of- life (EOL) electronic equipment has first priority on the management of electronic waste since the usable lifespan of equipment is extended in a secondary market, resulting in reduction of the volume of treated waste stream. Recycling of electronic waste is another important subject not only from the point of waste treatment but also from the recovery of valuable metals. The value distribution for personal computer shows that, the precious metal make up more than 70% of the value. This indicates that the major economic driver for recycling of electronic waste is from the recovery of precious metals and their industrial application.

15.17. Annexure 17- Attendees of Public Consultation

বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ (বেজা)

প্রধানমন্ত্রীর কার্যালয়।

স্টেকহোল্ডার মিটিং

অর্থনৈতিক অঞ্চল/স্থান: ফেনী অর্থনৈতিক অঞ্চল

তারিখ: ১১-৯-২০১৮

দলের নাম: [illegible], [illegible], [illegible]

অংশগ্রহণকারী সদস্যদের তথ্য।

নাম	মোবাইল নং	পেশা	স্বাক্ষর
মো: মান্নান	01837993309	কৃষক	মান্নান
রুবেল চন্দ্র দাস	01811-951401	দোকানদার	রুবেল
আলী আহম্মদ	01853430601	জেলে	[illegible]
রাসেল আমিন	01828-5151766	[illegible]	রাসেল
নুরুল হুদা	01835915084	কৃষক	নুরুল
মো: করিম	—	জেলে	করিম
নুরুজ্জামান	01830016618		—
সুমন চ. দাস	01840288803	জেলে	সুমন
মো: মোস্তফা	01817244653	কৃষক	মোস্তফা

[illegible]

পরিচালনাকারীর নাম ও স্বাক্ষর

15.18. Annexure 18- Plot Details

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
প্রধানমন্ত্রীর কার্যালয়

প্রজ্ঞাপন

তারিখ: ....বঙ্গাব্দ/ ....খ্রিস্টাব্দ

এস, আর, ও, নং-.............আইন/২০১৭। - বাংলাদেশ অর্থনৈতিক অঞ্চল আইন, ২০১০ (২০১০ সনের ৪২ নং আইন) এর ধারা ৫ এর উপ-ধারা (১), উপ-ধারা (২) এর সহিত পঠিতব্য, এ প্রদত্ত ক্ষমতাবলে সরকার, উক্ত আইনের উদ্দেশ্য পূরণকল্পে, ফেনী জেলার সোনাগাজী উপজেলাধীন নিম্ন তফসিলভুক্ত বর্ণিত ভূমি এলাকাকে অর্থনৈতিক অঞ্চল হিসাবে নির্ধারণপূর্বক এতদ্বারা "ফেনী অর্থনৈতিক অঞ্চল" ঘোষণা করিল, যথা:-

তফসিল - ১

জেলা: ফেনী, উপজেলা: সোনাগাজী, মৌজা : দক্ষিণ চর খোন্দকার,
জে,এল,নং: ৮৩/১০০

ক্র: নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
১	৫৩৯	৫২	০.১০
২	"	১২৯	১.৫০
৩	"	১৫২	০.৫৮
৪	"	১১৭	১.২০
৫	"	২৩০	০.৩২
৬	"	২৩১	০.৪২
৭	"	২৩৩	০.২২
৮	"	২১৪	০.২৫
৯	"	২০৪	০.২৫
১০	"	২৫৬	০.২৫
১১	"	১০৪১	০.১১
১২	"	১১০৩	০.১০
১৩	"	১১০৩	০.২৬
১৪	"	১১১৭	০.৩৯
১৫	"	১১২২	২৫.৪৫
১৬	"	১১৩৩	১.২০
১৭	"	১১০৪	০.২৫
১৮	"	১১১১	০.০৫
১৯	"	১১১২	০.১৭
২০	"	১০০৫	১৬.০০
২১	"	১০০৭	৪.০০
২২	"	৭৩	০.৫০
২৩	"	১৫২/৪৪৭	০.৩৫
২৪	"	৫১/১৪২	০.২৪
২৫	"	৮৫/১৬৩	০.২০
২৬	"	১৪০/১	০.৫০
২৭	"	১০৪২/০	১.০০
২৮	"	১৪০/১	১.৫০
২৯	"	১৩০৭/১৬	০.৫০
৩০	"	১০০৭/১১	০.৫০
৩১	"	৭৫/১	০.৫০
		মোট	৫৫.১৫

মোট খতিয়ান : ০১টি।
মোট দাগ : ৩১টি।
মোট জমির পরিমাণ : ৫৪.১০ একর।

তফসিল - ২

জেলা: ফেনী, উপজেলা: সোনাগাজী, মৌজা : চর খোন্দকার সাহেব, জে,এল,নং: ৭০

ক্র:নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
১	৪০৯	৩৯৮	০.১৭
২	"	৩৭৪/৪	১.০১
৩	"	৩৭৭/৩, ৩৭৭/৪	০.৮০
৪	"	৩৮০/১৪/১	১.০৬
৫	"	৩৮৭/২	১.৪৫
		মোট	৪.৫১

মোট খতিয়ান : ০১টি।
মোট দাগ : ০৫টি।
মোট জমির পরিমাণ : ৪.৫১ একর।

তফসিল - ৩

জেলা: ফেনী, উপজেলা: সোনাগাজী, মৌজা : চর বাদিন,
জে,এল,নং: ১০৩

ক্র:নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
১	০১	১/১	২৫.০০
২	"	১/২	৫০.০০
৩	"	১/৩	৫০.০০
৪	"	১/৪	৫০.০০
৫	"	১/৫	৩৮.০০
৬	"	১/৬	৫০.০০
৭	"	১/৭	৫০.০০
৮	"	১/৮	৫০.০০
৯	"	১/৯	৪০.০০
১০	"	১/১০	৫০.০০
১১	"	১/১১	৫০.০০
১২	"	১/১২	৫০.০০

ক্র.নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
১৩	০১	১/১৩	৫০.০০
১৪	"	১/১৪	৫০.০০
১৫	"	১/১৫	৫০.০০
১৬	"	১/১৬	৫০.০০
১৭	"	১/১৭	৩৪.০০
১৮	"	১/১৮	৫০.০০
১৯	"	১/১৯	৫০.০০
২০	"	১/২০	৫০.০০
২১	"	১/২১	৫০.০০
২২	"	১/২২	৫০.০০
২৩	"	১/২৩	৫০.০০
২৪	"	১/২৪	৫০.০০
২৫	"	১/২৫	৫০.০০
২৬	"	১/২৬	৬০.০০
২৭	"	১/২৭	৫০.০০
২৮	"	১/২৮	৩০.০০
২৯	"	১/২৯	৫০.০০
৩০	"	১/৩০	৫০.০০
৩১	"	১/৩১	৬৫.০০
৩২	"	১/৩২	৫০.০০
৩৩	"	১/৩৩	৫০.০০
৩৪	"	১/৩৪	৬৫.০০
৩৫	"	১/৩৫	৫০.০০
৩৬	"	১/৩৬	৫০.০০
৩৭	"	১/৩৭	৫০.০০
৩৮	"	১/৩৮	৬০.০০
৩৯	"	১/৩৯	৫০.০০
৪০	"	১/৪০	৫০.০০
৪১	"	১/৪১	৫০.০০
৪২	"	১/৪২	৩৫.০০
৪৩	"	১/৪৩	৫০.০০
৪৪	"	১/৪৪	৫০.০০
৪৫	"	১/৪৫	৫০.০০
৪৬	"	১/৪৬	৫৫.০০
৪৭	"	১/৪৭	৫০.০০
৪৮	"	১/৪৮	৭০.০০
৪৯	"	১/৪৯	৭০.০০
৫০	"	১/৫০	৫০.০০
৫১	"	১/৫১	৫০.০০
৫২	"	১/৫২	৭৫.০০
৫৩	"	১/৫৩	৭০.০০
[illegible]		১/৫৪	৩৭.০০
[illegible]		১/৫৫	৫০.০০
		মোট	২৭৬২.০০

মোট খতিয়ান : ০১টি।
মোট দাগ : ৫৫টি।
মোট জমির পরিমাণ : ২৭৬২.০০ একর।

তফসিল - ৪

জেলা: ফেনী, উপজেলা: সোনাগাজী, মৌজা: [illegible] চর,
জে.এল.নং-৯৩

ক্র.নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
১	১৮	০১	০.১১
২	"	০২	০.৪৮
৩	"	০৩	২.০৭
৪	"	০৪	০.৫৯
৫	"	০৭	০.১৫
৬	"	০৮	০.১৭
৭	"	০৯	১.৪১
৮	"	১০	৩.১০
৯	"	১১	৩.৮২
১০	"	১২	৪.৮৭
১১	"	১৩	৪.২৯
১২	"	১৪	২.২১
১৩	"	১৫	০.২১
১৪	"	১৬	০.৪০
১৫	"	১৭	০.৩৫
১৬	"	১৮	০.৫০
১৭	"	১৯	১.৬৮
১৮	"	২০	৩.২৭
১৯	"	২১	২.০২
২০	"	২২	০.৮৯
২১	"	২৩	৪.১৭
২২	"	২৪	১.৪৮
২৩	"	২৫	০.৩৫
২৪	"	২৬	০.৪২
২৫	"	২৭	০.৯১
২৬	"	২৮	৪.০৭
২৭	"	২৯	৭.৫৫
২৮	"	৩০	১.৪৪
২৯	"	৩১	০.৪৯
৩০	"	৩২	১.১৯
৩১	"	৩৩	১.৫৫
৩২	"	৩৪	০.৭০
৩৩	"	৩৫	৩.১৬
৩৪	"	৩৬	১২.১০
৩৫	"	৩৭	৪.০২
৩৬	"	৩৮	৩.৮৫
৩৭	"	৩৯	৩৮.১৪
৩৮	"	৪০১	০.২৪

ক্রমিক নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
৩৯	১৮	২৮৩	৬.৫৭
৪০	"	৪০০	৮.৯০
৪১	"	৪০৪	৪.০৪
৪২	"	৪০৫	৭.১৫
৪৩	"	৪০৬	৩.৫১
৪৪	"	৪০৭	১০.১৬
৪৫	"	৪০৮	৭.৪১
৪৬	"	৪০৯	৩.৯১
৪৭	"	৪১০	৩.৮০
৪৮	"	৪১১	৬.৭১
৪৯	"	৪১২	০.৯৯
৫০	"	৪১৩	১.৮৭
৫১	"	৪১৪	১.০৬
৫২	"	৪১৫	০.৮৫
৫৩	"	৪১৬	০.৮৭
৫৪	"	৪১৭	০.৪৭
৫৫	"	৪১৮	০.৭৫
৫৬	"	৪১৯	০.১৫
৫৭	"	৪২০	০.৬৬
৫৮	"	৪২১	০.১৮
৫৯	"	৪২২	২.১৪
৬০	"	৪২৩	০.২০
৬১	"	৪২৫	১.৭৫
৬২	"	৪২৬	১.০৬
৬৩	"	৪২৭	১.৫১
৬৪	"	৪২৮	২.০৫
৬৫	"	৪২৯	৭.২৪
৬৬	"	৪৩০	০.৫৭
৬৭	"	৪৩১	৪.২৫
৬৮	"	৪৩২	৭.০৯
৬৯	"	৪৩৩	৭.১১
৭০	"	৪৩৪	০.০৬
৭১	"	৪৩৫	০.০৬
৭২	"	৪৩৬	৪.১০
৭৩	"	৪৩৭	২.৫০
৭৪	"	৪৩৮	২.১৬
৭৫	"	৪৩৯	৪.৭২
৭৬	"	৪৪০	৪.৬০
৭৭	"	৪৪১	৭.৫৯
৭৮	"	৪৪২	০.৭২
৭৯	"	৪৪৩	৭.০৬
৮০	"	৪৪৪	৭.১১
৮১	"	৪৪৫	৭.৬১
৮২	"	৪৪৭	০.৮০
৮৩	"	৪৪৮	৬.৭৭

ক্রমিক নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
৮৪	১৮	৪৪৯	৪.১৫
৮৫	"	৪৫০	৮.৪৬
৮৬	"	৪৫১	৪.৭৬
৮৭	"	৪৫২	১০.৬০
৮৮	"	৪৫৩	৬.৯১
৮৯	"	৪৫৪	১০.৮৪
৯০	"	৪৫৫	১.০৯
৯১	"	৪৫৬	১.৯১
৯২	"	৪৫৭	৪.০০
৯৩	"	৪৫৮	৩.৯৯
৯৪	"	৪৫৯	৩১৬.৭৭
		মোট	৬১১.০৫

মোট খতিয়ান : ০১টি।
মোট দাগ : ৯৪টি।
মোট জমির পরিমাণ : ৬১১.০৫ একর।

তফসিল – ৫

জেলা: ফেনী, উপজেলা: সোনাগাজী, মৌজা: দক্ষিণ পশ্চিম চর সোনাগাজী, জে.এল.নং-৬৯

ক্রমিক নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
১	১৪৭০	৩৪/১	০.০৭
২	"	৩৪/২	০.১২
৩	"	৩১	০.৩৪
৪	"	৩৭/১/১	০.১৫
৫	"	৩৭/২	০.৭৯
৬	"	৩৮	০.৩৫
৭	"	১/৮৭	০.৭৫
৮	"	১/৮৩	০.২৫
৯	"	১/৮৯/২	০.৪২
১০	"	২/৩৯	২.০৮
১১	"	২২০১/৯৩	১.৫৯
১২	"	২২৪১/১৫১	০.১৮
১৩	"	২২০১/১৮	২.৩৪
১৪	"	২২০১/২৮/১	৩.৫৫
১৫	"	২২০১/২৯	০.৪০
১৬	"	২৪০১/৭৯০	১.৩০
১৭	"	২২০০	০.১৭
১৮	"	২২০১	৫১.৭০
১৯	"	২২০১/৩০৮/৮	১.৩০
২০	"	২২০১/১৪৭/১	০.৭৫
২১	"	২২০১/১৭৭/৪	০.১২
২২	"	২৪০১/২০৬/১	০.৮০
২৩	"	২৫০১/৬০	০.৬৫

ক্রঃ নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একর)
২৪	১৫৪১০	২৫০০১/৪৩০৩	০.৫৩
২৫	"	২৫৪০১/৫১১১/১	০.৬০
২৬	"	২৫৪০১/৫৩০৩/১	০.৫৩
২৭	"	২৫৪০১/৫৩০৩/৭	০.৫৪
২৮	"	২৫৩০১/৬০০/১	০.৬৫
২৯	"	২০০০১/৭১৯	০.৯০
৩০	"	২১৬০১/৫৬১/১	১.০০
৩১	"	২৫৩০১/৬০৬৯/১	১.৩০
৩২	"	২২১০১/১১১১/১	০.৭৫
৩৩	"	২৫০০১/৫৫৩৯	০.৬৫
৩৪	"	২৪৪০১/৬১৮/১	০.৬০
৩৫	"	২১৪০১/৫১১১/১	০.২৪
৩৬	"	২৫০০১/৫১১	১.০০
৩৭	"	২২১০১/১৫৮৮/১	০.৯০
৩৮	"	২২৫০১/১৫৩৭২	০.১০
৩৯	"	২২১০১/৬৪	০.৪০
৪০	"	২২৫০১/৭২৫০/৪	০.১৫
৪১	"	২২৫০১/১৫৪০	০.৪৫
৪২	"	২৫০০১/৫৭২	৫.০০
৪৩	"	২৪৫০১/৬১২	১.৭৫
৪৪	"	২৪৫০১/৬০০	০.৬০
৪৫	"	২৪৫০১/৭৮০/১	১.৯০
৪৬	"	২৪৫০১/৭৮০	০.৬৫
৪৭	"	২৪৫০১/৫৮৮	১.৮৫
৪৮	"	২৪৫০১/৭৫৭/১	০.৯৪
		মোট	৮৬.২২

মোট খতিয়ান : ০১টি।
মোট দাগ : ৪৮টি।
মোট জমির পরিমাণ : ৮৬.২২ একর।

তফসিল - ৬

জেলা: ফেনী, উপজেলা: সোনাগাজী, মৌজা: চর খোন্দকার, জে.এল.নং-৯২

ক্রঃ নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একর)
০১	১৫৫২	১১৬৫	৮.১৭
০২	"	১১৮৫	০.২৭
০৩	"	১১৯১	০.১৬
০৪	"	১৫১৭	০.২২
০৫	"	১৫৫৩	০.৮১
০৬	"	১৫৮৯	০.২২
০৭	"	১৬১৬	০.৪১
০৮	"	১৬৮৯	০.৪০
০৯	"	১৬৯১	০.৪৯
১০	"	২০৬/৭	০.৮০
১১	১৫৫২	৩৫১১/১	১.০০
১২	"	৩৫১১/৩	১.০০
১৩	"	৩৫১১/৪	১.৫০
১৪	"	১৭৫৩	০.২৭
১৫	"	১১৮৫/১	০.১৫
১৬	"	২৭৬	০.১০
১৭	"	৭১৩/৮৮৮	০.৪০
১৮	"	১০১১	১.১০
১৯	"	১০১২/১	১.১৯
২০	"	১১১১	০.০৫
২১	"	১১২৮	০.১৬
২২	"	১১৫৮	০.৮২
২৩	"	১১৬৫	০.১৬
২৪	"	১১৬৯	০.৩০
২৫	"	১১৯০	০.২০
২৬	"	১০৫১	০.১১
২৭	"	১০৩৫	০.২০
২৮	"	১১৭৫/১০৬৩	০.০১
২৯	"	১২০৯/১০৩৪	০.২৬
৩০	"	১৫৩৫	০.৪৮
৩১	"	১৭৫৩	০.১৭
৩২	"	১৭৫৫	০.৫৪
৩৩	"	১৯৫০	০.২৪
৩৪	"	৬৪২	০.৮২
৩৫	"	২৩৯/২	০.৮০
৩৬	"	৭৪৫/১২৮	০.৪০
৩৭	"	১০০৬	০.৫৮
৩৮	"	১০৪০/৮৮	১.০০
৩৯	"	১০৫০/১০৯	০.৭৬
৪০	"	১০৪০/১০৭	১.৫০
৪১	"	১০৪০/১০৮	০.৮০
৪২	"	১০৪০/১০৯	০.৯০
৪৩	"	১০৪০/১১০/১	০.১৫
৪৪	"	১০৪০/১১১	০.১৮
৪৫	"	১০৫০/১২	১.০০
৪৬	"	১০৫০/১১৪	০.৪০
৪৭	"	১০৫০/৭	১.০০
৪৮	"	৬৯৫	০.৬০
৪৯	"	৭৯৬	০.৪০
৫০	"	১১৬০	০.৭৭
৫১	"	১২৫০	০.২৫
৫২	"	১০৫০/১০৭	০.৪০
৫৩	"	১০৫০/৭৯৬	০.১৫
৫৪	"	১০৮	১.০৩
৫৫	"	২০৬	০.৭৮

ক্রঃনং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
৫৬	১৫৫২	১০৫৫০/২০৪৮/৬	০.২৮
৫৭	"	১০৫৬০/৭৯৬/১	০.৪০
৫৮	"	১০৫৫০/১০৬	০.৪০
৫৯	"	১০৫৫০/৮৭	১.০০
৬০	"	১০.৫৫০/২২০	১.০০
৬১	"	১০৫৫০/২/২	১.০০
৬২	"	১০৫৫০/৭৪২	০.৮৬
৬৩	"	১০৫৫০/১৯০	১.০০
৬৪	"	১০৫৫০/৭৫৬	১.০০
৬৫	"	১০৫৫০/২	০.৮০
৬৬	"	১০৬৬০/১০৬	০.৭৮
৬৭	"	১০৫৫০/১১১	০.১৮
৬৮	"	১০০৭/১০	০.৪০
৬৯	"	১৭৩০	০.৪২
৭০	"	১০৫৫০/৪৪/৩	১.০০
৭১	"	১০৫৫০/৭৬৮	০.৬০
৭২	"	১৭৯০	০.৭০
৭৩	"	১০৫৫০/০০২	০.৫০
৭৪	"	১০৫৫০/২৯৬	১.০০
৭৫	"	১০৫৫০/২০৫/১	০.৪০
৭৬	"	১০৫৫০/১১০	০.৮০
৭৭	"	১৭০২/৫	০.৪০
৭৮	"	১২৬৩	০.২৮
৭৯	"	১৭৭৯	০.২২
৮০	"	১০৫৫০/৪৬/১	০.৮৫
৮১	"	১০৫৫০/২৮৪	০.৮০
৮২	"	১০৫৫০/১৫	১.০০
৮৩	"	১০৫৫০/১৫২	১.০০
৮৪	"	১০৫৫০/৪২৭	১.০০
৮৫	"	১০৫৫০/০০৮	১.০০
৮৬	"	১০৫৫০/১৮০	১.০০
৮৭	"	১০৫৫০/১২২	১.০০
৮৮	"	১০৫৫০/১১৯/১	১.০০
		মোট =	৭২.১৬

মোট খতিয়ান : ০১টি।
মোট দাগ : ৮৮টি।
মোট জমির পরিমাণ : ৭২.১৬ একর।

তফসিল - ৭

জেলা: ফেনী, উপজেলা: সোনাগাজী, মৌজা : চর মজলিশপুর, জে.এল.নং: ২০২

ক্রঃনং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
১	১০৫	৫২	০.৩৬
২	"	৫৩	০.৫০
৩	১০৫	৫৬	০.৬৯
৪	"	৫৭	০.১০
৫	"	৫৯	০.৫৯
৬	"	১০	১২.৪২
৭	"	১১	০.০৫
৮	"	১২	০.০৫
৯	"	১৫	০.১১
১০	"	১৬	০.০২
১১	"	১৭	০.৫৭
১২	"	৯৬	০.২৫
১৩	"	২২২	০.২৪
১৪	"	২২৯	০.০৫
১৫	"	৫০১	২.৪৩
১৬	"	২৮০	০.২৪
১৭	"	৪১৫	০.৬০
১৮	"	৫৩৫/৫৯৬	০.৮৯
১৯	"	৪৫৬/৫৮৫	০.৩২
২০	"	২১১/২৩১	০.২২
২১	"	২১২/২৫২	১.৫০
২২	"	২১৩/২৩০	০.৯০
২৩	"	২১৩/২৩৩	০.৬০
২৪	"	৩৪২	০.১৪
২৫	"	৪৪৩	০.৩২
২৬	"	৪৩১	২.৪৩
২৭	"	৪৪৫	০.২৫
২৮	"	৪৪৪	০.১৪
২৯	"	৪৪৬	০.০৫
৩০	"	৪৪৭	০.১০
৩১	"	৪৪৮	০.০৭
৩২	"	৪৪৯	০.০৫
৩৩	"	৪৫০	০.০৭
৩৪	"	৪৫১	০.১১
৩৫	"	৪৫২	০.১১
৩৬	"	৪৫৩	০.৩৫
৩৭	"	৪৫৪	০.২৫
৩৮	"	৪৫৬	১.১০
৩৯	"	৪৫৭	০.১৬
৪০	"	৪৫৮	০.১১
৪১	"	৪৫৯	০.৫১
৪২	"	৫৬০	০.৭১
৪৩	"	৫৬১	০.৪৯
৪৪	"	৫৬২	০.০৪
৪৫		৫৬৩	১.৬০

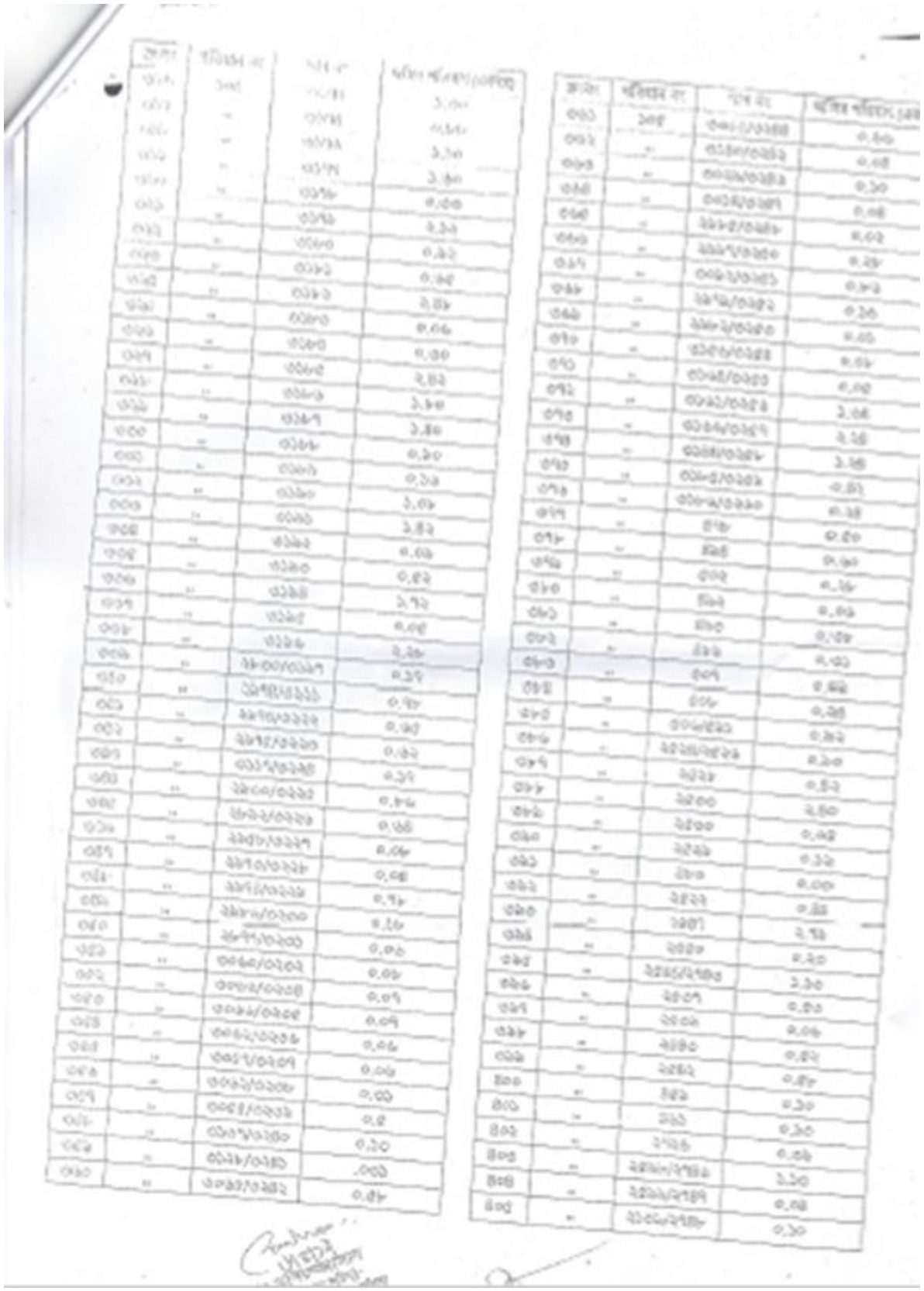
ক্রমিক নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
৪৬	১০৫	৩৬৪	০.১২
৪৭	"	৫৬৫	০.০৫
৪৮	"	৩৬৭	০.৮৩
৪৯	"	৫৬৮	০.২৯
৫০	"	৫৬৯	০.০৩
৫১	"	৫৭০	০.৪৬
৫২	"	৫৭২	০.১১
৫৩	"	৫৭৩	০.১০
৫৪	"	১৮২	০.২০
৫৫	"	১৮৪	০.২১
৫৬	"	১৮৫	০.২৪
৫৭	"	৯৮	০.০৬
৫৮	"	৯৯	০.৬০
৫৯	"	১০১	০.০২
৬০	"	১০২	০.০৩
৬১	"	১০৩	০.২৯
৬২	"	১০৫	০.২০
৬৩	"	১০৬	০.৫১
৬৪	"	১০৭	০.০২
৬৫	"	১০৮	০.১৪
৬৬	"	১০৯	০.১০
৬৭	"	৪০৬	০.০৪
৬৮	"	৫০৭	২৭.২০
৬৯	"	৫০৯	০.১৯
৭০	"	৫১০	০.০৩
৭১	"	৫১১	০.০২
৭২	"	১৮৮	১.১৮
৭৩	"	১৯০	০.০২
৭৪	"	১৯২	০.৯৮
৭৫	"	১৯৪	০.১৭
৭৬	"	১৯৬	০.৪১
৭৭	"	১৯৭	৬.২৪
৭৮	"	১৯৮	০.০৫
৭৯	"	১৯৯	০.০৫
৮০	"	৪০০	০.০৬
৮১	"	৪০১	০.২৩
৮২	"	৪০৪	০.২০
৮৩	"	৪০৫	০.১১
৮৪	"	৪০৬	০.৫১
৮৫	"	৪০৭	০.৮১
৮৬	"	৪০৮	০.৬০
৮৭	"	৪০৯	১১.২৮
৮৮	"	৪১১	০.০৩
৮৯	"	৪১২	০.১০
৯০	"	৪১৩	০.০৮
৯১	১০৫	২১৪	০.১২
৯২	"	২১৬	০.০৮
৯৩	"	২১৭	০.১৫
৯৪	"	২১৮	০.০৬
৯৫	"	২১৯	০.০৫
৯৬	"	২২০	০.৬০
৯৭	"	২২১	০.৮২
৯৮	"	২২২	০.০২
৯৯	"	২২৩	১০.০৫
১০০	"	২২৪	০.৯১
১০১	"	২২৬	২.২২
১০২	"	২২৭	০.০৮
১০৩	"	২৪৫১	১.৭৭
১০৪	"	২৫৬৫	০.০৫
১০৫	"	২৫৬৬	০.৩৫
১০৬	"	২৫৮৬	০.৬০
১০৭	"	২৭৫৫	২.৭২
১০৮	"	২৭৫৭	০.৭১
১০৯	"	২৭৪১	০.২৪
১১০	"	২৫৭০	০.১৫
১১১	"	৪৪১	০.৫৫
১১২	"	২৫২৩	০.০২
১১৩	"	২৫২৫	০.১৮
১১৪	"	২৮২৮	০.১৮
১১৫	"	২৮৫৫	১.২০
১১৬	"	২৮৫৫	০.২৬
১১৭	"	২৮৫৬	০.৫৫
১১৮	"	২৮৫৭	০.২৬
১১৯	"	২৮৬৯	০.৫৪
১২০	"	২৮৬৭	০.৭০
১২১	"	২৮৭৫	০.২৫
১২২	"	২৮৭৭	০.৬৯
১২৩	"	২৮৭৯	০.২২
১২৪	"	২৮৮১	০.০৬
১২৫	"	২৮৮২	১.২৯
১২৬	"	২৮৮৩	০.১০
১২৭	"	২৮৮৪	০.১০
১২৮	"	২৮৮৫	১.৭০
১২৯	"	২৮৮৬	০.১৯
১৩০	"	২৮৮৭	০.০৬
১৩১	"	২৮৮৮	০.২৫
১৩২	"	২৮৯৯	০.০৫
১৩৩	"	২৯০৭	০.৯৯
১৩৪	"	২৯০৮	০.২৯
১৩৫	"	২৯০৯	০.৫৫

ক্রঃনং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
১৩৬	১০৫	২২৪৩	০.০৬
১৩৭	"	২২৪৪	০.১০
১৩৮	"	২২৪৪	০.৪৪
১৩৯	"	২২৫৪	১.০৪
১৪০	"	২২৫৬	০.৫০
১৪১	"	২২৫৭	০.১৭
১৪২	"	২২৫৮	০.০৬
১৪৩	"	২২৬১	০.৪৬
১৪৪	"	২২৬২	১.২০
১৪৫	"	২২৬৬	০.০৯
১৪৬	"	২২৬৮	১.৪৯
১৪৭	"	২২৬৯	০.৩৭
১৪৮	"	২২৮০	০.০২
১৪৯	"	২২৮১	১.৫০
১৫০	"	২২৮২	০.৫০
১৫১	"	২৩০১	২.১৯
১৫২	"	২৯৬৫	০.১১
১৫৩	"	২৯৬৬	০.১২
১৫৪	"	২৯৭০	১.২২
১৫৫	"	২৯৭১	০.৮০
১৫৬	"	২৯৯১	০.৫০
১৫৭	"	২৯৯২	০.৬৫
১৫৮	"	৩০০২	০.০২
১৫৯	"	৩০০৩	০.৪৫
১৬০	"	৩০০৬	২.২০
১৬১	"	৩০০৭	২.৫০
১৬২	"	৩০০৯	০.৬২
১৬৩	"	৩০১০	১.১০
১৬৪	"	৩০১১	০.০২
১৬৫	"	৩০১২	২.০৪
১৬৬	"	৩০১৩	০.৬২
১৬৭	"	৩০১৪	১.২৮
১৬৮	"	৩০১৫	২.৫০
১৬৯	"	৩০১৬	১.৫০
১৭০	"	৩০১৭	২.০০
১৭১	"	৩০১৮	০.১৬
১৭২	"	৩০১৯	০.৭৮
১৭৩	"	৩০২২	২.৪২
১৭৪	"	৩০২৬	২.০১
১৭৫	"	৩০২৭	০.১১
১৭৬	"	৩০২৮	১.১০
১৭৭	"	৩০২৯	০.৯৮
১৭৮	"	৩০৩০	০.২৯
১৭৯	"	৩০৩১	২.০০
১৮০	"	৩০৩২	১.৫৬

ক্রঃনং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
১৮১	১০৫	৩০৩৩	০.৭১
১৮২	"	৩০৩৪	০.১১
১৮৩	"	৩০৩৫	২.৫০
১৮৪	"	৩০৩৬	১.৬৮
১৮৫	"	৩০৩৭	২.৫৯
১৮৬	"	৩০৩৮	০.০৬
১৮৭	"	৩০৩৯	০.৫৪
১৮৮	"	৩০৪০	০.১৫
১৮৯	"	৩০৪১	০.৫৮
১৯০	"	৩০৪২	০.১৮
১৯১	"	৩০৪৩	০.৪১
১৯২	"	৩০৪৪	০.০৪
১৯৩	"	৩০৪৫	২.০৬
১৯৪	"	৩০৪৬	০.১৪
১৯৫	"	৩০৪৭	০.৩৩
১৯৬	"	৩০৪৮	০.২০
১৯৭	"	৩০৪৯	০.৩২
১৯৮	"	৩০৫০	২.৩০
১৯৯	"	৩০৫১	০.৯২
২০০	"	৩০৫২	০.২২
২০১	"	৩০৫৩	১.৫০
২০২	"	৩০৫৪	২.৫০
২০৩	"	৩০৫৫	২.২৬
২০৪	"	৩০৫৬	০.৫৮
২০৫	"	৩০৫৭	১.৩৬
২০৬	"	৩০৫৮	১.৩২
২০৭	"	৩০৫৯	০.৭১
২০৮	"	৩০৬০	২.৫০
২০৯	"	৩০৬১	০.৩৭
২১০	"	৩০৬২	১.৫৪
২১১	"	৩০৬৩	০.২১
২১২	"	৩০৬৪	০.৪১
২১৩	"	৩০৬৫	০.৪২
২১৪	"	৩০৬৬	১.৪৯
২১৫	"	৩০৬৭	১.৮৮
২১৬	"	৩০৬৯	২.২০
২১৭	"	৩০৭০	২.৫০
২১৮	"	৩০৭১	০.২৫
২১৯	"	৩০৭২	১.২৪
২২০	"	৩০৭৪	১.৫৪
২২১	"	৩০৭৫	০.৫৮
২২২	"	৩০৭৬	১.২৮
২২৩	"	৩০৭৭	০.২৬
২২৪	"	৩০৭৯	১.০০
২২৫	"	৩০৮০	১.০০

ক্র:নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
২২৬	১০৩	৫০৪০/১	১.০০
২২৭	"	৩০৬২	৪.৫০
২২৮	"	৩০৬৩	০.৫৭
২২৯	"	৩০৬৪	১.৮৪
২৩০	"	৩০৬৫	১.৯১
২৩১	"	৩০৬৬	০.৪২
২৩২	"	৩০৬৭	২.৫০
২৩৩	"	৩০৬৮	২.৯০
২৩৪	"	৩০৬৯	০.১৮
২৩৫	"	৩০৯০	১.০১
২৩৬	"	৩০৯১	৪.০৫
২৩৭	"	৩০৯২	১.০৪
২৩৮	"	৩০৯৫	২.২৭
২৩৯	"	৩০৯৭	২.৫০
২৪০	"	৩০৯৮	২.৫০
২৪১	"	৩০৯৯	২.৬০
২৪২	"	৩১০০	২.০৪
২৪৩	"	৩১০১	২.২০
২৪৪	"	৩১০২	২.৫০
২৪৫	"	৩১০৩	২.৫০
২৪৬	"	৩১০৪	২.০৪
২৪৭	"	৩১০৫	২.৫০
২৪৮	"	৩১০৬	২.৪৫
২৪৯	"	৩১০৭	০.২৪
২৫০	"	৩১০৮	১.২৭
২৫১	"	৩১০৯	২.০০
২৫২	"	৩১১০	২.০৯
২৫৩	"	৩১১১	২.৫০
২৫৪	"	৩১১২	১.৪৫
২৫৫	"	৩১১৩	০.০২
২৫৬	"	৩১১৪	৪.০৪
২৫৭	"	৩১১৫	১.৭২
২৫৮	"	৩১১৬	৪.০৪
২৫৯	"	৩১১৭	১.৮০
২৬০	"	৩১১৮	২.৫০
২৬১	"	৩১১৯	১.২০
২৬২	"	৩১২০	১.৬৪
২৬৩	"	৩১২১	০.৪
২৬৪	"	৩১২২	১.৩৪
২৬৫	"	৩১২৩	০.০৪
২৬৬	"	৩১২৪	০.৮০
২৬৭	"	৩১২৫	১.৮০
২৬৮	"	৩১২৬	০.০৫
২৬৯	"	৩১২৭	০.০৫
২৭০	"	৩১২৮	০.৪৫

ক্র:নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ
২৭১	১০৪	৩১২৯	০.৪৮
২৭২	"	৩১৩০	২.৮৬
২৭৩	"	৩১৩১	০.৫১
২৭৪	"	৩১৩২	১.১১
২৭৫	"	৩১৩৩	২.০০
২৭৬	"	৩১৩৪	১.৮৬
২৭৭	"	৩১৩৫	০.৭৭
২৭৮	"	৩১৩৬	১.৫২
২৭৯	"	৩১৩৭	১.৭২
২৮০	"	৩১৩৮	২.২৭
২৮১	"	৩১৩৯	১.২৩
২৮২	"	৩১৪০	০.১৬
২৮৩	"	৩১৪১	৪.৮২
২৮৪	"	৩১৪২	১.৪৮
২৮৫	"	৩১৪৩	১.৪২
২৮৬	"	৩১৪৪	০.৮০
২৮৭	"	৩১৪৫	১.৪০
২৮৮	"	৩১৪৬	১.৪০
২৮৯	"	৩১৪৭	০.২৩
২৯০	"	৩১৪৮	১.৪০
২৯১	"	৩১৪৯	২.৫০
২৯২	"	৩১৫০	২.৫০
২৯৩	"	৩১৫১	২.৫০
২৯৪	"	৩১৫২	২.৪৮
২৯৫	"	৩১৫৩	২.১৪
২৯৬	"	৩১৫৪	২.৫০
২৯৭	"	৩১৫৫	২.৫০
২৯৮	"	৩১৫৬	২.২২
২৯৯	"	৩১৫৭	২.২৮
৩০০	"	৩১৫৮	১.৩২
৩০১	"	৩১৫৯	০.৩১
৩০২	"	৩১৬০	০.১৬
৩০৩	"	৩১৬১	১.২২
৩০৪	"	৩১৬২	০.০৭
৩০৫	"	৩১৬৩	০.৪৬
৩০৬	"	৩১৬৪	২.৪৯
৩০৭	"	৩১৬৫	২.০৪
৩০৮	"	৩১৬৬	১.৮৭
৩০৯	"	৩১৬৭	২.২০
৩১০	"	৩১৬৮	০.১৮
৩১১	"	৩১৬৯	২.০৪
৩১২	"	৩১৭০	২.৪০
৩১৩	"	৩১৭১	০.৩০
৩১৪	"	৩১৭২	১.৫০
৩১৫	"	৩১৭৩	১.৬৫



ক্রমিক নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
৪০৬	১০৫	১৬০৭/২৭৫৯	০.২০
৪০৭	”	২১০০	০.২৬
৪০৮	”	২১৪০	০.৫১
৪০৯	”	২১৬৭	০.৮৩
৪১০	”	২৬০৭/২৭৫৭	০.০৫
৪১১	”	২৬৫	০.০৮
৪১২	”	২৬৩	০.২৫
৪১৩	”	২৬৭	০.৩৩
৪১৪	”	২৬৮	১.৮২
৪১৫	”	৩২১	০.৪০
৪১৬	”	২৬১/৪৭৯	০.৪০
৪১৭	”	৩২৪	০.৫৫
৪১৮	”	২৬২	০.২৮
৪১৯	”	২১৫	০.৫৬
৪২০	”	২৬৬৫	৪.৭৩
৪২১	”	২৭৯৬	১.২১
৪২২	”	২৬৯৭	১.০৩
৪২৩	”	২৭৯৮	০.২৮
৪২৪	”	২৭০৫	১.৮৩
৪২৫	”	২৭০৬	০.৩৩
৪২৬	”	৪০৩	০.৩৯
৪২৭	”	৪৩	০.২০
৪২৮	”	৪০৭	০.৭৫
৪২৯	”	৫১২	০.০৮
৪৩০	”	৫৭	০.১৯
৪৩১	”	৪১৫	০.১৭
৪৩২	”	৩৯১	০.১৭
৪৩৩	”	৩৯৮	০.৪৪
৪৩৪	”	৩৯৯	০.০৯
৪৩৫	”	৪০০	০.১৩
৪৩৬	”	৪০১	০.১৭
৪৩৭	”	৪০২	০.০৬
৪৩৮	”	৪০৩	০.০৯
৪৩৯	”	৪০৪	০.৮২
৪৪০	”	৪০২	০.২৯
৪৪১	”	২৫১০	০.৬০
৪৪২	”	২৭৫৯	০.০৮
৪৪৩	”	২৭৫৮	১.৪৫
৪৪৪	”	২৭৬০/২৭৬১	০.০৭
৪৪৫	”	২৫৮১	২.৯১
৪৪৬	”	২৭১০	০.২৮
৪৪৭	”	২৬১৪	২.৮৯
৪৪৮	”	২৬২৬	০.৪০
৪৪৯	”	৪৫৭	০.৫৪
৪৫০	”	৪৪৮	০.১৬

ক্রমিক	খতিয়ান নং	দাগ নং	জমির পরিমাণ
৪৫১	১০৫	৪৪৯	০.১৮
৪৫২	”	৪৫০	০.২৫
৪৫৩	”	৪৫১	০.১১
৪৫৪	”	৪৫২	০.৫৮
৪৫৫	”	৭৫৩	০.৫১
৪৫৬	”	৭৫৪	০.১৩
৪৫৭	”	৫৫৬	০.০৭
৪৫৮	”	১০৭/১১১	০.৪৩
৪৫৯	”	৪৭৩	০.০২
৪৬০	”	৫৩৫	০.০৩
৪৬১	”	২৫৮৭	০.৩৮
৪৬২	”	২৫৮৮	০.০৮
৪৬৩	”	২৫৮৯	০.৬৫
৪৬৪	”	২৫৯০	০.৫৯
৪৬৫	”	২৬১০	০.৪২
৪৬৬	”	২৬১১	০.১৪
৪৬৭	”	২৬১২	০.০৯
৪৬৮	”	২৬১৭	০.১৬
৪৬৯	”	২৬২৮	০.৩৪
৪৭০	”	২৬২৯	০.৪৫
৪৭১	”	২৭৪৮/২৭৫৭	০.২৮
৪৭২	”	২৬২৬/২৭৪৪	০.২৬
৪৭৩	”	১০৫৯/২৭৪৫	০.৭৯
৪৭৪	”	৪১৬	১.১৪
৪৭৫	”	৪১৩	০.১৮
৪৭৬	”	৫১৫	০.১৪
৪৭৭	”	৫৫৩	০.৪৩
৪৭৮	”	১৬১০	২.৫০
৪৭৯	”	১৬১৮	২.৫৫
৪৮০	”	১৬১৯	১.৪০
৪৮১	”	১৬৫১	০.৬৫
৪৮২	”	২৬৬৭	২.১১
৪৮৩	”	২৬৬৮	০.৪২
৪৮৪	”	৩০০৫	০.৪৪
৪৮৫	”	৩০০৮	২.৪৭
৪৮৬	”	২৬৭৯	২.৪৭
৪৮৭	”	২৬৭৩	০.৪০
৪৮৮	”	২৬৭৪	১.৫১
৪৮৯	”	২৬৭৫	০.০২
৪৯০	”	২৬৭৬	২.৬০
৪৯১	”	২৬৮৭	১.৭৯
৪৯২	”	২৬৯৮	০.৪৬
৪৯৩	”	২৬৯০	০.৫৯
৪৯৪	”	২৬৯১	০.৬৯
৪৯৫	”	২৬৯২	০.২০

ক্রমিক নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
৩৮৬	১০৫	১৮৫০	১.৭৬
৩৮৭	"	১৮৬৮	০.৬৮
৩৮৮	"	১৮৫৯	০.১৮
৩৮৯	"	১৮৭০	১.০৮
৩৯০	"	১৮৭১	০.২৮
৩৯১	"	১০৫/১১১২	১.০০
৩৯২	"	২৮৫১/৩০১১১	০.৫৫
৩৯৩	"	১৮৫০	১.১৬
৩৯৪	"	১১০৬	১.৪৩
৩৯৫	"	১১০৯	৩.০৫
৩৯৬	"	১১০৭	১.১৫
৩৯৭	"	২২০১	০.৫৮
৩৯৮	"	২২১০	১.০১
৩৯৯	"	৩৩১১	১.১৯
৪০০	"	৩৩১২	০.০৬
৪০১	"	০০৬০	০.৫৭
৪০২	"	০০২১	১.১১
৪০৩	"	০০৭২	১.২২
৪০৪	"	০০৭০	০.১৮
৪০৫	"	০০১২/৩০১১০	১.০৪
৪০৬	"	১১০৮/৩০১১১	১.০৫
৪০৭	"	৩১১২	১.০০
৪০৮	"	২২৬৯	২.৫০
৪০৯	"	২৮৭৯	১.৫০
৪১০	"	০০২০	১.৫১
৪১১	"	০০২৫	১.০০
৪১২	"	০০৩৩/৩০৫০১	০.১৪
৪১৩	"	২৮৫৫	৪.০০
৪১৪	"	২১০০	০.০৪
৪১৫	"	২১০১	১.১৮
৪১৬	"	২৮৫৪	১.০০
৪১৭	"	১১০১	০.১০
৪১৮	"	১১১০	১.১৮
৪১৯	"	১১৫৭	১.৪৫
৪২০	"	১৮৮৭/৩০২০৪	০.৫২
৪২১	"	১৮৭৭/৩০২০৫	০.০৬
৪২২	"	৩০১৫/৩০২০৬	০.১০
৪২৩	"	৩৩০১/৩০২৬	০.৫৫
৪২৪	"	১১৭৭	১.৭৬
৪২৫	"	১১৭৮	১.০০
৪২৬	"	১১৭৯	১.৩৫
৪২৭	"	৩১০০/৩০২০৭	০.৫৮
৪২৮	"	৩৩৩০/৩০২০৭	০.৬৬
৪২৯	"	১১৮০/৩০২১৮	০.৬২
৪৩০	"	১১৬৯	১.৫৯

ক্রমিক নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
৪৩১	১০৫	১১০৭	১.৫৮
৪৩২	"	২৮০৮	০.১৮
৪৩৩	"	২৮৫৯	২.০০
৪৩৪	"	১৮৮৭	২.০০
৪৩৫	"	২২৮৩	১.৫৬
৪৩৬	"	১১৮৯	১.২৮
৪৩৭	"	১১৯০	০.৭১
৪৩৮	"	১১৮৯/৩০১১০	০.২৪
৪৩৯	"	১১৯০/৩০১১১	০.১৮
৪৪০	"	২২৪০	০.৭৪
৪৪১	"	২২২৪	০.১৮
৪৪২	"	১২২৫	১.০৮
৪৪৩	"	২২২৬	০.৫৬
৪৪৪	"	২২২৭/৩০১১৬	০.৫৮
৪৪৫	"	২২২৮/৩০১১০	০.১৮
৪৪৬	"	২২০৪	০.১৯
৪৪৭	"	২২০৫	১.৪৬
৪৪৮	"	২২০৪	২.৫০
৪৪৯	"	২২৮০	২.৫৮
৪৫০	"	২২৮১	২.৫০
৪৫১	"	২২৮১	২.৫০
৪৫২	"	২২৮০	২.০৪
৪৫৩	"	২২৮৩	২.৬৯
৪৫৪	"	৩১০১/৩০২০৮	০.১০
৪৫৫	"	২২৮৫/৩০২০৩	০.৭০
৪৫৬	"	২২৯০	২.০৫
৪৫৭	"	২২৯৮	০.৮০
৪৫৮	"	৩৩০০	০.১৬
৪৫৯	"	৩৩০১	০.২১
৪৬০	"	৩৩০৪	২.৭১
৪৬১	"	২২৯৩/৩০২১৪	০.০৬
৪৬২	"	২২৯৬/৩০২১৫	০.১৭
৪৬৩	"	২২৯৯	১.৭৮
৪৬৪	"	২১৮৩	০.৪৫
৪৬৫	"	২১৮৩	১.২৮
৪৬৬	"	১১০৬	০.২০
৪৬৭	"	২১৮০	০.৭৪
৪৬৮	"	২২৫১	০.৪৭
৪৬৯	"	২১৫২	১.৮৪
৪৭০	"	২২৫০	১.৫৬
৪৭১	"	২১৫৪	০.১০
৪৭২	"	২৯৪০/১৭৯১	০.০২
৪৭৩	"	২৮৫৮	০.০২
৪৭৪	"	২২৫৯	০.১০
৪৭৫	"	২৬৬১	০.০২

ক্র.নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
৫৮৬	১০৪	২০৫৫০	০.৩৩
৫৮৭	"	২০৬৬৬	০.৯৫
৫৮৮	"	২০৬৫৭	০.৫৩
৫৮৯	"	২০৬৬৮	০.১০
৫৯০	"	২০৬৯০	০.২০
৫৯১	"	২০৭৮০	০.৩৩
৫৯২	"	২০৭৮২	১.১০
৫৯৩	"	২০৭৮০	১.৪০
৫৯৪	"	২০৭৮৮	০.১৬
৫৯৫	"	২০৮৮০	০.১১
৫৯৬	"	২০৮৮৭	০.১১
৫৯৭	"	২০৯৯০	০.৬৫
৫৯৮	"	২০৯১২	০.০৭
৫৯৯	"	২০৯২৩	০.৬৫
৬০০	"	২০৯২৪	১.০৩
৬০১	"	২০৯২৫	১.১৩
৬০২	"	২০৯২৬	০.০৮
৬০৩	"	২০৯৫১	০.৫৯
৬০৪	"	২০৯৫২	০.৪৩
৬০৫	"	২০৯৯০	০.২৯
৬০৬	"	২০৯৯৪	০.৫০
৬০৭	"	২০৯৭৫	০.৫৩
৬০৮	"	২০৯৭৫	০.২৭
৬০৯	"	২০৯৭৯	০.১৪
৬১০	"	২০৯৭৭	০.১৩
৬১১	"	২০৭৯৯	০.৫৬
৬১২	"	২০৮০১	০.১৪
৬১৩	"	২০৮০২	০.১৩
৬১৪	"	২০৮৩০	০.১৪
৬১৫	"	২০৮৩৪	০.২৮
৬১৬	"	২০৮৫৩	০.০৪
৬১৭	"	২০৮৫৬	০.৫২
৬১৮	"	২০৮৫৮	০.১১
৬১৯	"	২০৯০৩	০.৯৬
৬২০	"	২০৯৩৪	২.১৬
৬২১	"	২০৯৩১	১.২১
৬২২	"	২০৯৩১	০.০৮
৬২৩	"	২০৯৩৭	০.১০
৬২৪	"	২০৯৩৮	০.১৪
৬২৫	"	২০৯৩৯	০.১৪
৬২৬	"	২০৯৪০	০.১৪
৬২৭	"	২০৯৪১	০.৫৪
৬২৮	"	২০৯৪২	০.০৭
৬২৯	"	২০৯৪৩	০.১৬
৬৩০	"	২০৯৪৮	০.১১

ক্র.নং	খতিয়ান নং	দাগ নং	জমির পরিমাণ (একরে)
৬৩১	১০৪	২৭৯৯	০.১০
৬৩২	"	২৭৫০	০.১৪
৬৩৩	"	২৭৫১	০.১১
৬৩৪	"	২৭৫২	০.২৫
৬৩৫	"	২৭৫৫	০.১৬
৬৩৬	"	২৭৫৪	০.৪৮
৬৩৭	"	২৬৮৯	০.৫৩
৬৩৮	"	২৬৯১	০.৫৩
৬৩৯	"	২৭০৭	০.১৭
৬৪০	"	২৬৮৯/২৭৯৮০	০.২২
৬৪১	"	২৮৫১/২৭৯৪৪	০.৪৫
৬৪২	"	৩৩৩১	৩৩৭.৫০
		মোট	৯৭২.৬৯

মোট খতিয়ান : ০১টি
মোট দাগ : ৬৫০ টি
মোট জমির পরিমাণ : ৯৭২.৬৯ একর।

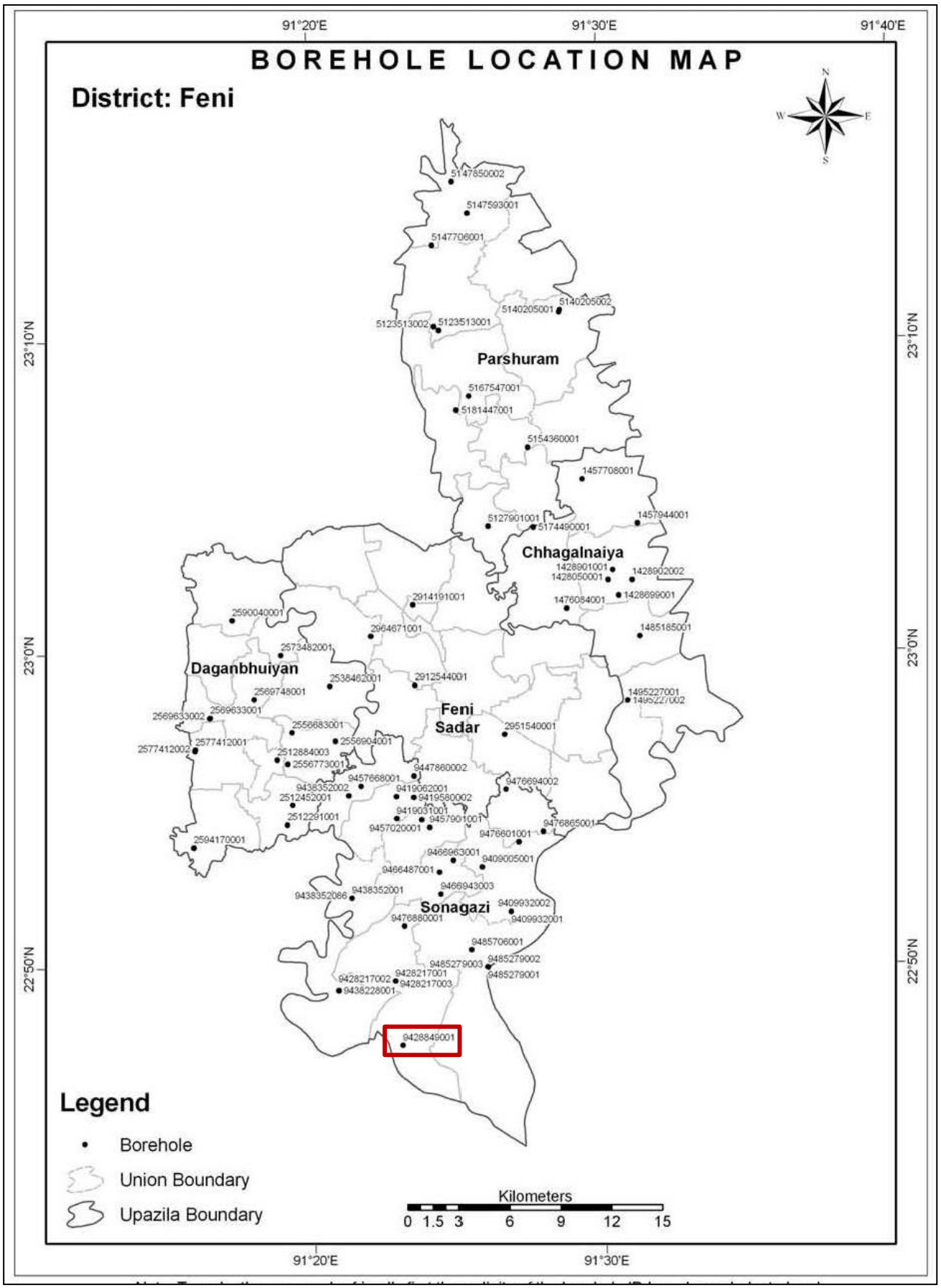
দক্ষিণ চর মোখতার, চর মোজাম্মেল লামছি, চর মনপ্রিয়, বাহির চর, পশ্চিম মোজাম্মেল লামছি, চর মোশতাক এবং চর জানেহয়েদ মৌজার মোট জমির পরিমাণ: (৪৫.১৫৫ + ৪.৫৯ + ২৭৬২.০০ + ৪২২.০৫ + ১৬.৯৯ + ৭৯.১১ + ৯৭২.৬৯) = ৪৪১১.৫৬ একর।

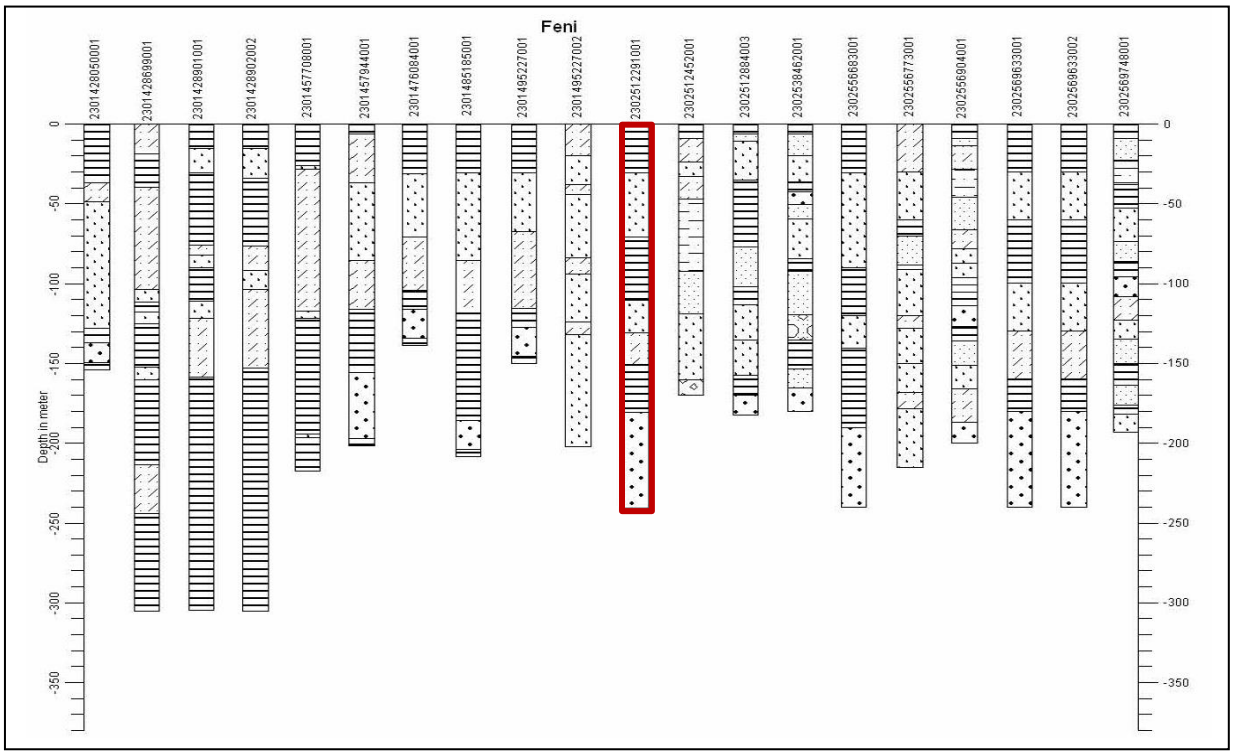
সর্বমোট জমির পরিমাণ: ৪৪১১.৫৬ (চার হাজার চারশত এগার দশমিক পাঁচ ছয়) একর মাত্র।

রাষ্ট্রপতির আদেশক্রমে,

মহিউদ্দিন হাসান
উপসচিব।

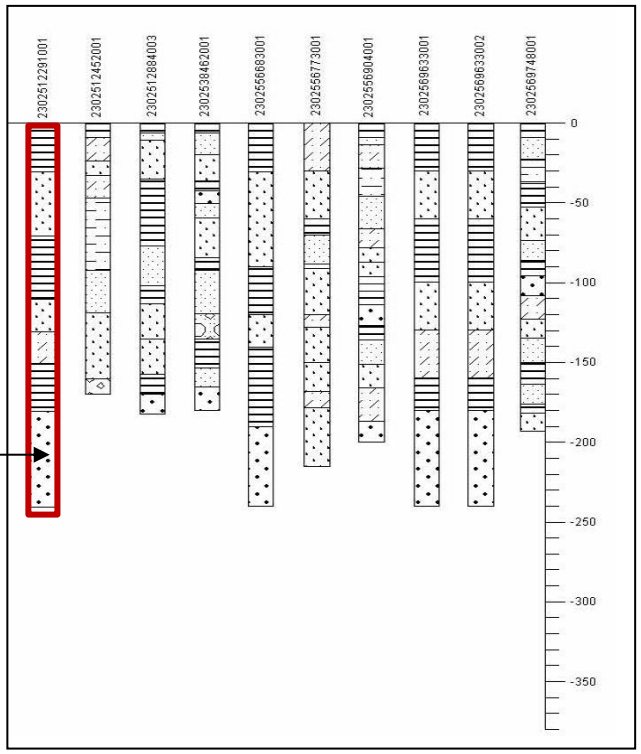
15.19. Annexure 19- Information on Boreholes

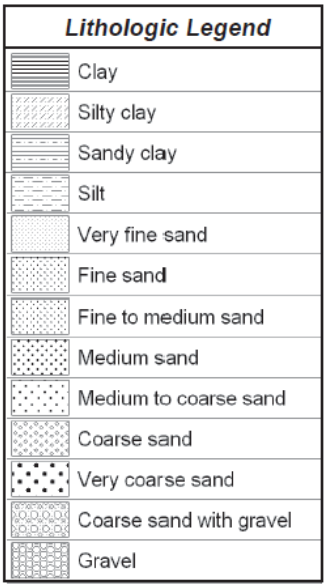

BOREHOLE LOCATION MAP
District: Feni
91°20'E
91°30'E
91°40'E
23°10'N
23°0'N
22°50'N
N
S
E
W
Parshuram
Chhagalnaiya
Daganbhuiyan
Feni Sadar
Sonagazi
5147850002
5147593001
5147706001
5140205001
5140205002
5123513002
5123513001
5167547001
5181447001
5154360001
1457708001
5127901001
5174490001
1457944001
1428901001
1428050001
1428902002
1428699001
1476084001
2914191001
2590040001
2964671001
1485185001
2573482001
2538462001
2912544001
2569748001
2569633001
2569633002
1495227001
1495227002
2556683001
2556904001
2951540001
2577412001
2577412002
2512884003
2556773001
9447860002
9457668001
9476694002
9438352002
9419062001
2512452001
9419580002
9419031001
9457901001
2512291001
9457020001
9476865001
9476601001
2594170001
9466963001
9409005001
9466487001
9438352001
9438352086
9466943003
9409932002
9476880001
9409932001
9485706001
9485279002
9485279003
9485279001
9428217001
9428217002
9428217003
9438228001
9428849001
Legend
Borehole
Union Boundary
Upazila Boundary
Kilometers
0 1.5 3 6 9 12 15



Bore Well Profile of Project Area - 22°47'31.92"N, 91°23'3.48"E

Pervious layer having water potential





GeoCode	District	Upazila	Union	Mouza	Village	OwnerName	Year of Insta-llation	Boring Depth (m)	Screen Centre Depth (m)	Long	Lat
2305174490001	Feni	Parshuram	G.M.Hat	Lakshmipur	Lakshmipur	Sayed Munir Hossain	2005	138.68	134.11	91.4616	23.0677
2305147850002	Feni	Parshuram	Mirzanagar		Satyanagar	Haji Mohammad Mostafa	2007	228.60	222.04	91.4167	23.2522
2305147706001	Feni	Parshuram	Mirzanagar	Paschim Sahebnagar	Paschim Sahebnagar	Humayun Kabir Mazumdar	2005	201.16	194.15	91.4048	23.2184
2305147593001	Feni	Parshuram	Mirzanagar	Mirzanagar	Mirzanagar	Abul Kalam	2008	229.21	224.18	91.4250	23.2353
2305181447001	Feni	Parshuram	Munshirhat	Karaiya	Karaiya	Md. Mohiuddin Ahmed	2005	245.35	240.48	91.4180	23.1303
2309409005001	Feni	Sonagazi	Amirabad	Bara Ahammadpur	Bara Ahammadpur	Tazul Islam	2005	196.59	190.19	91.4302	22.8870
2309409932001	Feni	Sonagazi	Amirabad	Sonapur (Part-B)		Somod Ali Chaprasi Bari	2005	183.00	267.75	91.4466	22.8633
2309409932002	Feni	Sonagazi	Amirabad	Sonapur (Part-B)	Sonapur	Md. Yasin	2008	203.00	197.80	91.4466	22.8633
2309419031001	Feni	Sonagazi	Bagadana	Arkaim	Arkaim	Fajlur Rahman	2005	187.44	182.57	91.3818	22.9131
2309419062001	Feni	Sonagazi	Bagadana	Baduria		Rajar Baper Bari	2005	187.00	181.96	91.3817	22.9248
2309419580002	Feni	Sonagazi	Bagadana	Gunak	Gunak	Mosharrof Hossen	2008	200.00	195.00	91.3918	22.9244
2309428217002	Feni	Sonagazi	Char Chandia	Char Chandia	Char Chandia	Abdulla Sayed	2007	222.50	215.06	91.3802	22.8264
2309428217001	Feni	Sonagazi	Char Chandia	Char Chandia	Char Chandia	Azizul Haque	2005	206.03	199.63	91.3802	22.8264
2309428849001	Feni	Sonagazi	Char Chandia	Purba Baradhali		Nurul Haq Bari	2005	201.00	195.67	91.3843	22.7922
2309428217002	Feni	Sonagazi	Char Chandia	Char Chandia	Char Chandia	Golam Maola	2008	203.00	197.50	91.3802	22.8264
2309438228001	Feni	Sonagazi	Char Darbesh	Char Darbesh	Char Darbesh	Komola Begam	2005	190.80	184.40	91.3476	22.8218
2309438352001	Feni	Sonagazi	Char Darbesh	Char Sahabhikari			2005	195.00	194.01	91.3556	22.8709
2309438352086	Feni	Sonagazi	Char Darbesh	Char Sahabhikari	Char Sahabhikari	Jebal Haque	2008	204.00	190.00	91.3556	22.8709
2309457668001	Feni	Sonagazi	Char Majlishpur	Char Lakshmiganj		Kazi Mazi Bari	2005	202.00	197.00	91.3616	22.9305
2309447860002	Feni	Sonagazi	Char Majlishpur	Raghabpur	Raghabpur	Nurzaman	2008	204.00	200.00	91.3919	22.9358
2309438352002	Feni	Sonagazi	Char Sahabhikari	Char Sahabhikari	Char Sahabhikari	Sankar Das	2007	224.03	219.08	91.3542	22.9256
2309457020001	Feni	Sonagazi	Mangalkandi	Anandipur	Anandipur	Abul Kalam Azad	2005	206.03	199.63	91.3961	22.9124
2309457901001	Feni	Sonagazi	Mangalkandi	Sampur		Md. Idris	2005	305.00	232.55	91.4006	22.9084
2309466487001	Feni	Sonagazi	Matiganj	Daulatkandi		Abdul Goni Dr. Bari	2004	180.00	174.34	91.4060	22.8844
2309466963001	Feni	Sonagazi	Matiganj	Swarajpur	Swarajpur	Shirajul Haque	2005	214.87	210.00	91.4142	22.8906
2309466943003	Feni	Sonagazi	Matiganj	Sujapur	Sujapur	Abu Ahamed	2008	201.00	195.00	91.4067	22.8727
2309476880001	Feni	Sonagazi	Nawabpur	Safrabad	Safrabad	MD. Belayet Hossain	2007	213.36	205.36	90.4542	22.9125
2309476601001	Feni	Sonagazi	Nawabpur	Hajipur	Hajipur	Samsul Huda	2005	185.92	179.52	91.4514	22.9002
2309476865001	Feni	Sonagazi	Nawabpur	Raghunathpur		Miadon Sawagor Bari	2004	181.00	175.86	91.4656	22.9057
2309476694002	Feni	Sonagazi	Nawabpur	Majupur	Majupur	Khuku Rani Bosak	2008	195.00	191.00	91.4444	22.9283
2309485706001	Feni	Sonagazi	Sonagazi	Saraitkandi	Saraitkandi	Shek Farid	2007	210.31	203.12	91.4236	22.8428
2309485279001	Feni	Sonagazi	Sonagazi	Char Khoaz	Char Khoaz	Mr. Ismail	2005	185.92	179.52	91.4329	22.8337
2309485279002	Feni	Sonagazi	Sonagazi	Char Khoaz		Abdus Sukkur Mawlana Bari	2005	168.00	162.76	91.4329	22.8337
2309485279002	Feni	Sonagazi		Char Khoaz	Char Khoaz	Sakhina Khatun	2008	223.00	219.00	91.4329	22.8337
2464347464001	Khagrachhari	Dighinala	Dighinala	Dighinala	Dighinala	Dighinala High School	1994	305.39		92.0763	23.2807
2514305821001	Lakshmipur	Lakshmipur Sadar	Bangakha	Rajibpur		Sakina	2002	250.00	248.00	90.8501	22.9487
2514310514001	Lakshmipur	Lakshmipur Sadar	Basikpur	Kashipur		Abdul Hoque	2005	261.00	256.00	90.9271	22.9963
2514315121001	Lakshmipur	Lakshmipur Sadar	Bhabaniganj	Bhabaniganj		Mostafa Driver	2001	242.00	237.00	90.8503	22.8826

15.20. Annexure 20- Baseline Monitoring Reports

Amendment of Inspection Report Ref: *Qtex/2018/6820/AAQ*

Ambient Air Quality Monitoring Report

Client's Name	: Pricewaterhouse Coopers Bangladesh Pvt. Ltd.
Project Address	: Feni Economic Zone, Sonagazi, Feni, Bangladesh.
Inspection Date	: August 31, 2018
Reporting Date	: September 04, 2018
Amendment Date	: January 31, 2019

Environmental Condition

Ambient Temperature	: 31.3 ^{0}C
Relative Humidity	: 77.4 % RH
Weather Condition	: Sun Shined

Methodology

Ambient air (outdoor) quality of the project has been monitored for the parameters of NOx and SOx following Continuous Emission Monitoring System (CEMS) by using air analyzer. The analyzer is designed to meet **British Standard (BS) 8494/ European Norm (EN) 50270:2006** standard. NOx and SOx are monitored using electrochemical method. NOx is considered as the summation of NO and NO2. Suspended Particulate Matter (SPM) has been also monitored by handheld particle counter at the project area. The particle counter utilizes the **laser technology** for single particle detection. The scattering of light from the particles in the sampling air steam is converted into electrical pulses, which is then measured and calculated as a particle size. The concentration of particulate matter is measured in microgram per cubic meter. Qtex Assessor Mr. Md. Masud Kha has conducted the ambient air quality monitoring following Qtex In-house Method "**SOP-06** Procedure of Ambient Air Monitoring". **As per SOP-06**, Qtex assessor has divided the selected project location into 4 area and take reading of each area. Finally the average value of each area has been taken into account for interpreting the result. The inspection work has been conducted for one hour using digital Air Analyzer.

Instrument Details

Particulate Counter Specification:

Size Range	: 0.3µm~10µm
Flow Rate	: 2.83 Liter/min (0.1cfm)
Counting Efficiency	: 50±20%@0.3µm; 100±10%@0.5µm

TECHNICAL OFFICE:
13, Outer Circular Road
Pajarbagh, Dhaka-1217, Bangladesh
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
Member

CORPORATE OFFICE:
House-92 (Level-5), Road: 14
Sector-01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Ref: Qtex/2018/6820/AAQ

Portable Air Quality Monitor Specification:

Parameter		Resolution	Specified Range
*SO_x= Sulfur Oxides		0.1 ppm	0-20 ppm
NO_x	*NO_2= Nitrogen Di-oxide	0.1 ppm	0-20 ppm
	*NO= Nitric Oxide	0.1 ppm	0-250 ppm

Inspection Results

Time & Duration: Inspection has been done between 10.45 AM to 11.45 AM

Outdoor Air Quality Monitoring Data:

Location	Location Coordinate (From GPS Tracker)	SO_x ppm	NO_x ppm	Suspended Particulate Matter (SPM)- ($\mu g/m^3$)
Dakshin Char Khandakar (Near River Side)	Latitude: 22° 49′ 18.084″ N	0.0	0.3	46
		0.0	0.3	40
	Longitude: 91° 24′ 42.84″ E	0.0	0.2	38
		0.0	0.3	36
Average Value		**0.0**	**0.3**	**40**

Standard Permissible Limit (Industrial)

Agency	Parameters Concentration		
	NO_x	SO_x	SPM
DoE Standard (ECR 97, Schedule 2, Amendment 2005)	0.053 ppm (Annual)	NYS	SPM : 200 $\mu g/m^3$ (8 hr)

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY

CORPORATE OFFICE:
Plot: 92 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Ref: *Qtex/2018/6820/AAQ*

Project Location in Google Map:

Pictures of Ambient Air Monitoring:

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
Member

CORPORATE OFFICE:
Plot: 07 (Level-5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 9933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Ref: *Qtex/2018/6820/AAQ*

Comment:

Ambient (Outdoor) air quality surrounding the project has been analyzed for the concentration of parameters NO_x, SO_x and SPM. From the analysis it has been observed that the values of SPM is within the maximum permissible limit of ECR 97 Schedule 2 (amendment 2005). The NO_x level has exceeded the standard limit of ECR 97. However no standard has been set yet for SO_x according to ECR 97 Schedule 2 (amendment 2005).

Prepared by

Fatema Ferdous

Engr. Fatema Ferdous
B.Sc. in Chemical Engineering (BUET)
Asst. Manager (Technical)
Qtex Solutions Limited

Checked by

Engr. Sadia Mohsin
M.Sc. Engg. in Environmental Engineering
B.Sc. (Engg.) in Chemical Engineering & Polymer Science
Lead Auditor: ISO 14001, Lead Assessor: ISO/IEC 17025
MIEB-33370
DGM (Technical)
Qtex Solutions Limited

Approved by

A.K.M. Abdul Hai
Executive Director
Qtex Solutions Limited

This Report cannot be regenerated without the permission of Qtex Solutions Ltd.

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level-5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Amendment of Inspection Report Ref: *Qtex/2018/6821/AN*

Ambient Noise Level Monitoring Report

Client's Name	: Pricewaterhouse Coopers Bangladesh Pvt. Ltd.
Project Address	: Feni Economic Zone, Sonagazi, Feni, Bangladesh.
Inspection Date	: August 31, 2018
Reporting Date	: September 04, 2018
Amendment Date	: January 31, 2019

Environmental Condition:

Ambient Temperature	: 31.3 °C
Relative Humidity	: 77.4 % RH
Weather Condition	: Sun Shined

Inspection & Data Collection Methodology:

On-site Inspection has been done to measure the noise level at the project area. Qtex Assessor Mr. Md. Masud Kha has conducted the ambient noise level inspection following Qtex In-house Method "SOP-08 Procedure of Noise Level Monitoring". As per SOP-08, Qtex assessor has divided the selected project location into 4 area and take reading of each area. Finally the average value of each area has been taken into account for interpreting the result.

The inspection work has been conducted for one hour using digital sound level meter. Sound pressure is measured in decibel (dB) based on electric condenser microphone. The instrument complies the standard International Electrotechnical Commission (IEC) 651, type 2 (economical type).

Instrument's Specifications:

Instrument Name	: Digital Sound Level Meter
Measuring Range	: 35 to 130 db.
Resolution	: 0.1 dB
Accuracy	: ± 3.5 db.

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY

CORPORATE OFFICE:
Plot: 82 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801889600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801889600400

Ref: Qtex/2018/6821/AN

Inspection Results:

Time & Duration: Inspection has been done between 10.45 AM to 11.45 AM

SL No.	Name of Location	Location Coordinate (From GPS Tracker)	Measured Noise Level (dB)	Average Noise Level (dB)	Comparative Standard dB
1	Dakshin Char Khandakar (Near River Side)	Latitude: 22° 49' 18.084" N Longitude: 91° 24' 42.84" E	60.7 59.1 58.4 61.9	60.0	**According to ECR 97, Schedule-4:** Maximum permissible limit of ambient noise level at day time is 60 dB for mixed area ***According to IFC standard:** Maximum permissible limit for ambient noise level is 55 dB at day time

*https://www.ifc.org/wps/wcm/connect/06e3b50048865838b4c6f66a6515bb18/1-7%2BNoise.pdf?MOD=AJPERES

Project Location in Google Map:

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Ref: Qtex/2018/6821/AN

Pictures of Noise Level Monitoring:

Qtex Expert's Comment:

Ambient noise level quality at the project area has been analyzed. From the analysis it has been found that the ambient noise level has exceeded the maximum permissible limit according to IFC standard.

Prepared by

Fatema Ferdous

Engr. Fatema Ferdous
B.Sc. in Chemical Engineering (BUET)
Asst. Manager (Technical)
Qtex Solutions Limited

Approved by

Checked by

Engr. Sadia Mohsin
M.Sc. Engg. in Environmental Engineering
B.Sc. (Engg.) in Chemical Engineering & Polymer Science
Lead Auditor: ISO 14001, Lead Assessor: ISO/IEC 17025
MIEB-33370
DGM (Technical)
Qtex Solutions Limited

A.K.M. Abdul Hai
Executive Director
Qtex Solutions Limited

This Report cannot be reproduced without the permission of Qtex Solutions Ltd.

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com; Hotline: +8801799070111, +8801989600400

Amendment of Report Ref: *Qtex/2018/10066/GW*

Ground Water Test Report

Client Information

Client Name	Pricewaterhouse Coopers Bangladesh Pvt. Ltd.	
Project Address	Feni Economic Zone, Sonagazi, Feni, Bangladesh.	
Location (Coordinate)	Latitude	22°49'22.152"
	Longitude	91°24'45.3234"
Ordered By	Mr. Md. Abul Hashem Sr. Consultant	

Sample Information

Sample ID	Qtex/2018/10069/GW	
Sample Type	Ground Water	
Type of Visit for Sampling	√☐ Announced	☐ Unannounced
Date & Time of Sample Collected	August 31, 2018; 12.00 PM	
Date & Time of Sample Received	September 01, 2018; 10:30 AM	
Reporting Date	September 11, 2018	
Amendment Date	January 31, 2019	
Sample Quantity	2 Liter	
Sample Source	Ground Water (Deep Tube Well)	
Sample Carrying Condition	√☐ Within Ice Box	☐ Without Ice Box
Received Sample Condition	√☐ Sealed	☐ Unsealed
Sample Preservative Use	☐ Yes	√☐ No
Sample Collected By	Mr. Md. Masud Kha (Qtex Assessor)	

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level-5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, **E-mail:** qtexsolutions@gmail.com, info@qtexsolutionsbd.com, **Hotline:** +8801799070111, +8801989600400

Ref: *Qtex/2018/10066/GW*

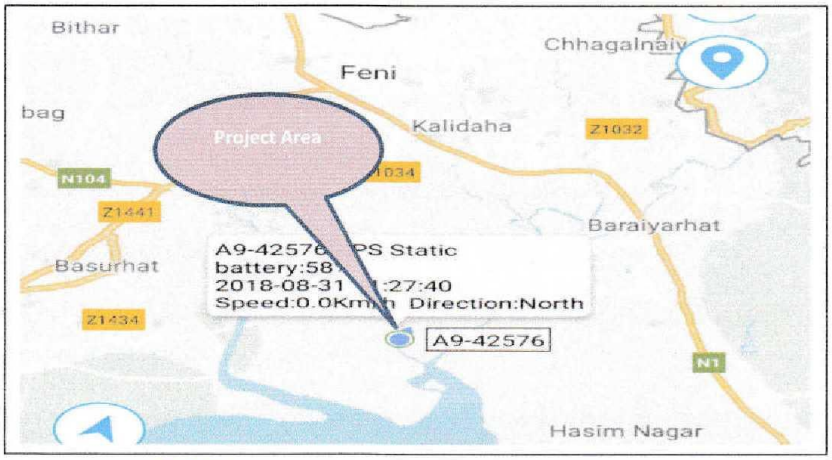


Fig: Project Location in Google Map

Sampling Condition

Weather Condition	
Ambient Temperature, °C	31.3
Relative Humidity, % RH	77.4
Climate Condition	Sun Shined

Water Condition	
Water Temperature, °C	23.5

Abbreviation

mg/L or ppm	Unless otherwise indicated, results and standards are expressed as an amount in milligrams per liter or parts per million.
Minimum Detection Level (MDL)	The lowest level that the laboratory can detect a contaminant.
ND	The contaminant is detected above the minimum detection level.
NA	The contaminant is not analyzed.

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, **E-mail:** qtexsolutions@gmail.com, info@qtexsolutionsbd.com, **Hotline:** +8801799070111, +8801989600400

Ref: *Qtex/2018/10066/GW*

Meaning of Symbol	
	The contaminant is detected in the sample below the standard limit
	The contaminant meets the standard of ECR 97 and guideline of WHO
	No Standard Limit has been set yet for the contaminant
	The contaminant is detected above the standard of ECR 97 and guideline of WHO

Water Sampling & Testing Methodology

Sampling Procedure

Sampling of ground water has been conducted by following **grab sampling method**. As per Qtex Technical Procedure "TP-10_Sampling Plan & Procedure" ground water sample has been collected from the deep tube well (Figure) located at the project area by Qtex assessor who has proper training and relevant knowledge on sampling technique. Sample is collected in sterilized PVC bottle. The assessor used hand gloves during collecting sample for avoiding any contamination. In case of handling & storing the sample Qtex technical procedure "TP 11-Procedure for Sample Approval & Rejection, Reception, Handling/Transportation, Storage & Disposal" has been followed. As per TP 11 the sample containers are properly sealed and carefully packed to avoid any breakage or cross contamination. For transporting the sample from project area to Qtex laboratory, ice box has been used to carry the sample bottle. All samples are properly stored from the time they arrive at the laboratory until disposal. Samples has been stored in refrigerator at 4°C prior to analysis which preserve the majority of physical, chemical and biological characteristics in the short term (< 24 hours). The sample testing process has been started by Qtex analyst within 24 hours of receiving the sample.

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, **E-mail:** qtexsolutions@gmail.com, info@qtexsolutionsbd.com, **Hotline:** +8801799070111, +8801989600400

Ref: *Qtex/2018/10066/GW*

Fig: Sample Collection

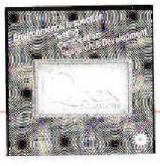
Testing Procedure

The **Ground Water** test is done for different parameter by using different standard method including APHA method. Qtex Analyst, Ms. Asma Jannath has performed the test using high tech calibrated instrument at Qtex Testing Laboratory Division. The test has been carried out according to the **Standard Operating Procedure.**

Results

Physical & Chemical Test Result

Physical & Chemical attributes of water can affect aesthetic qualities such as how water looks, smells, and tastes and also affect its toxicity and whether or not it is safe to use. Since the chemical quality of water is important to the health of human as well as the plants and animals that live in and around streams, it is necessary to assess the chemical attributes of water. Chemical measures can be used to directly detect pollutants and detect imbalances within the ecosystem.



TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, **E-mail:** qtexsolutions@gmail.com, info@qtexsolutionsbd.com, **Hotline:** +8801799070111, +8801989600400

Ref: *Qtex/2018/10066/GW*

Status	Parameters	Units	Test Results	Standard Limit		Test Method
				Bangladesh Standard for Drinking water Quality (ECR 97)	WHO Guideline for drinking water quality	
	Total Dissolved Solid (TDS)	mg/L	224	≤ 1000	≤ 1000	APHA 2540 C
	Chloride	mg/L	15	150-600	≤ 250	APHA 4500-Cl-B
	Bio Chemical Oxygen Demand (BOD_5)	mg/L	4.1	≤ 0.2	-	APHA 5210.B
	Chemical Oxygen Demand (COD)	mg/L	5.6	≤ 4	-	APHA 5220.B
	Turbidity	NTU	Not Detected	≤ 10	≤ 5	APHA 2130 B

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100 Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, **E-mail:** qtexsolutions@gmail.com, info@qtexsolutionsbd.com, **Hotline:** +8801799070111, +8801989600400

Ref: *Qtex/2018/10066/GW*

Microbiological Test Result

The examination is intended to identify water sources which have been contaminated with potential disease-causing microorganisms. Such contamination generally occurs either directly by human or animal feces, or indirectly through improperly treated sewage or improperly functioning sewage treatment systems.

Status	Parameters	Units	Test Results	Standard Limit		Method
				Bangladesh Standard for Drinking water Quality (ECR 97)	WHO Guideline for drinking water quality	
	Total Coliform	CFU/100mL	340	0	0	Membrane Filtration
	Fecal Coliform	CFU/100mL	306	0	0	Membrane Filtration

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Ref: *Qtex/2018/10066/GW*

Graphical Presentation of Ground water quality comparison with the standard Limit of ECR 97 & WHO:

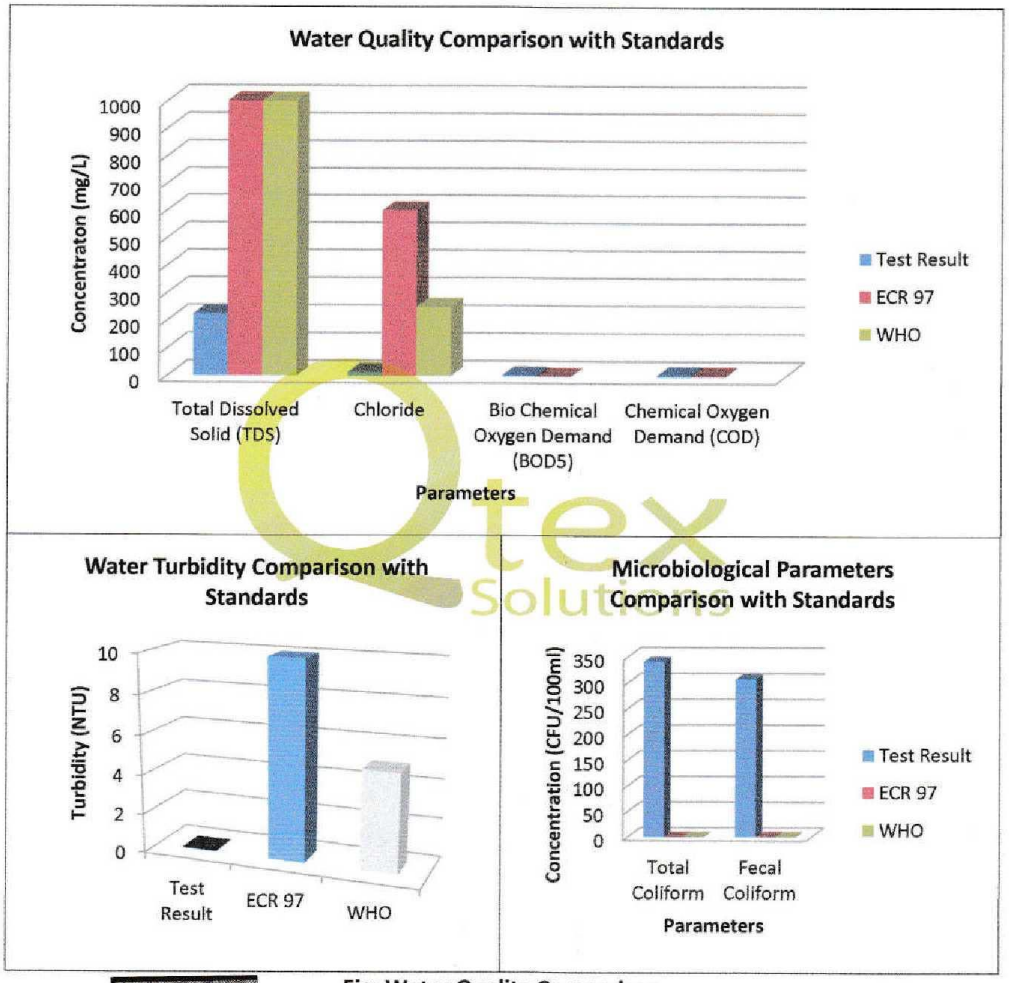
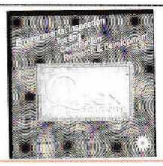


Fig: Water Quality Comparison



TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Ref: *Qtex/2018/10066/GW*

Qtex Expert's Comment

The water sampling has been conducted on-site and tested in the Qtex laboratory for testing physical, chemical and microbial parameters. **The Summary report** of this detail test report is also given to the client as annexure.

From the analysis it has been found that the values of Total Dissolved Solid (TDS), Chloride & Turbidity are within the allowable limits of ECR 97 and WHO Guideline. It is also observed that the values of Biochemical Oxygen Demand (BOD) & Chemical Oxygen Demand (COD) have been exceeded the permissible limit of ECR 97 & WHO standard.

In case of microbiological test all the tested parameters have exceeded the acceptable standard limit.

Prepared by

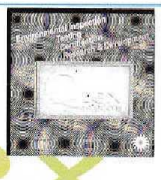
Fatema Ferdous

Engr. Fatema Ferdous
B.Sc. in Chemical Engineering (BUET)
Asst. Manager (Technical)
Qtex Solutions Limited

Reviewed by

Sadia

Engr. Sadia Mohsin
M.Sc. Engg. in Environmental Engineering
B.Sc. (Engg.) in Chemical Engineering & Polymer Science
Lead Auditor: ISO 14001, Lead Assessor: ISO/IEC 17025
MIEB-33370
DGM (Technical)
Qtex Solutions Limited



Approved by

A.K.M. Abdul Hai
Executive Director
Qtex Solutions Limited

©"ALL RIGHTS RESERVED by Qtex Solutions Ltd. Any unauthorized reprint or use of this report is prohibited. No part of this report may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system without express written permission from Qtex Solutions Ltd.

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Amendment of Report Ref: *Qtex/2018/10067/SW*

Surface Water Test Report

Client Information

Client Name	Pricewaterhouse Coopers Bangladesh Pvt. Ltd.	
Project Address	Feni Economic Zone, Sonagazi, Feni, Bangladesh.	
Location (Coordinate)	Latitude	22°49'22.152"
	Longitude	91°24'45.3234"
Ordered By	Mr. Md. Abul Hashem Sr. Consultant	

Sample Information

Sample ID	Qtex/2018/10070/SW	
Sample Type	Surface Water	
Type of Visit for Sampling	√☐ Announced	☐ Unannounced
Date & Time of Sample Collected	August 31, 2018; 11.00 AM	
Date & Time Sample of Received	September 01, 2018; 10:30 AM	
Reporting Date	September 11, 2018	
Amendment Date	January 31, 2019	
Sample Quantity	1.5 Liter	
Sample Source	Surface water (from river)	
Sample Carrying Condition	√☐ Within Ice Box	☐ Without Ice Box
Received Sample Condition	√☐ Sealed	☐ Unsealed
Sample Preservative Use	☐ Yes	√☐ No
Sample Collected By	Mr. Md. Masud Kha (Qtex Assessor)	

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level-5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, **E-mail:** qtexsolutions@gmail.com, info@qtexsolutionsbd.com, **Hotline:** +8801799070111, +8801989600400

Ref: *Qtex/2018/10067/SW*

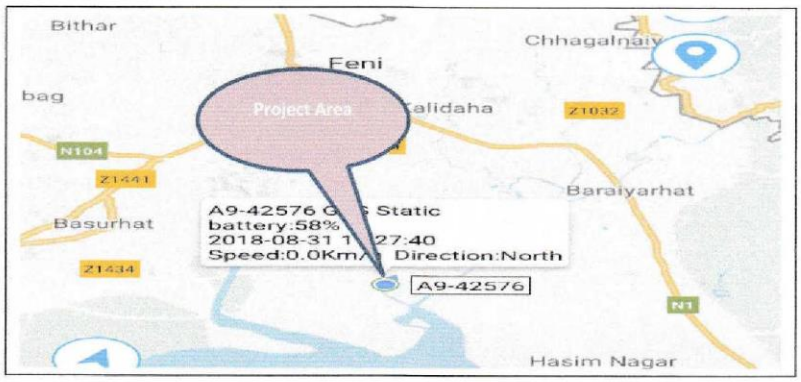


Fig: Project Location in Google Map

Sampling Condition

Weather Condition	
Ambient Temperature, °C	31.3
Relative Humidity, % RH	77.4
Climate Condition	Sun Shined

Water Condition	
Water Temperature, °C	25.5

Abbreviation	
mg/L or ppm	Unless otherwise indicated, results and standards are expressed as an amount in milligrams per liter or parts per million.
Minimum Detection Level (MDL)	The lowest level that the laboratory can detect a contaminant.
ND	The contaminant is detected above the minimum detection level.
NA	The contaminant is not analyzed.

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY QC 100 Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Ref: *Qtex/2018/10067/SW*

Meaning of Symbol	
	The contaminant is detected in the sample below the standard limit
	The contaminant meets the standard of ECR 97
	No Standard Limit has been set yet for the contaminant
	The contaminant is detected above the standard of ECR 97

Water Sampling & Testing Methodology

Sampling Procedure

Sampling of surface water has been conducted by following **grab sampling method.** As per Qtex Technical Procedure "TP-10_Sampling Plan & Procedure" water sample has been collected from river (Figure) by Qtex assessor who has proper training and relevant knowledge on sampling technique. Sample is collected in sterilized PVC bottle. The assessor used hand gloves during collecting sample for avoiding any contamination. In case of handling & storing the sample Qtex technical procedure "TP 11 _Procedure for Sample Approval & Rejection, Reception, Handling/Transportation, Storage & Disposal" has been followed. As per TP 11 the sample containers are properly sealed and carefully packed to avoid any breakage or cross contamination. For transporting the sample from project area to Qtex laboratory, ice box has been used to carry the sample bottle. All samples are properly stored from the time they arrive at the laboratory until disposal. Samples has been stored in refrigerator at 4°C prior to analysis which preserve the majority of physical, chemical and biological characteristics in the short term (< 24 hours). The sample testing process has been started by Qtex analyst within 24 hours of receiving the sample.

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Ref: *Qtex/2018/10067/SW*

Fig: Sample Collection

Testing Procedure
The **Surface water** test is done for different parameters by using different standard method including APHA method. Qtex Analyst, Ms. Asma Jannath has performed the test using high tech calibrated instrument at Qtex Testing Laboratory Division. The test has been carried out according to the **Standard Operating Procedure.**

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, **E-mail:** qtexsolutions@gmail.com, info@qtexsolutionsbd.com, **Hotline:** +8801799070111, +8801989600400

Ref: *Qtex/2018/10067/SW*

Results

Surface Water Quality:

Status	Parameters	Test Results	Bangladesh Standard Limit according to ECR 1997, Schedule-3	Reference Test Method
	Biochemical Oxygen Demand (BOD_5)	61.92 mg/L	≤ 6 mg/L	APHA 5210 .B
	Chemical Oxygen Demand (COD)	164 mg/L	-	APHA 5220. B
	pH	8.03 at 23.5°C	6.5 – 8.5	APHA 4500-H+ .B
	Total Dissolved Solid (TDS)	472 mg/L	-	APHA 2540.C
	Electro-Conductivity	630 µS/cm	-	APHA 2510 B
	Chloride	300 mg/L	-	APHA 4500-Cl-B

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, **E-mail:** qtexsolutions@gmail.com, info@qtexsolutionsbd.com, **Hotline:** +8801799070111, +8801989600400

Ref: *Qtex/2018/10067/SW*

Graphical Presentation of Surface water quality comparison with the standard Limit of ECR 97:

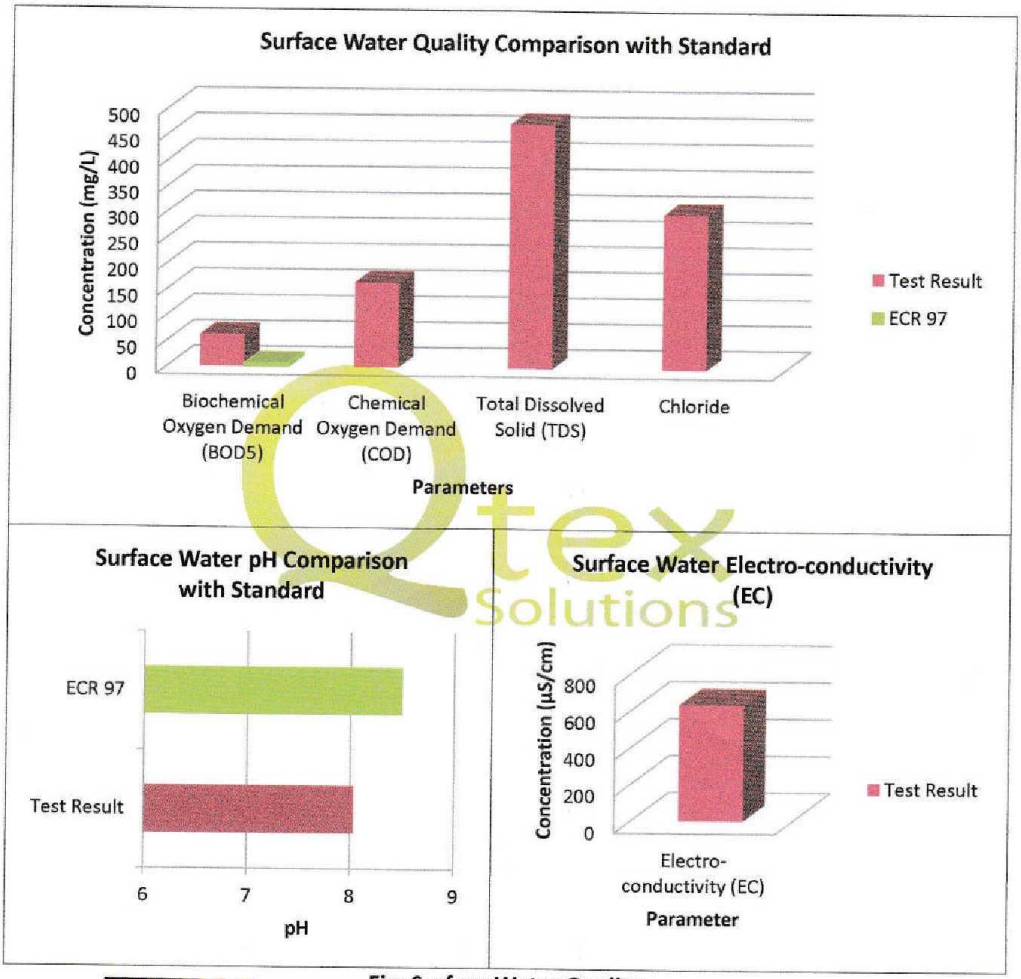


Fig: Surface Water Quality

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

Ref: *Qtex/2018/10067/SW*

Qtex Expert's Comment

The surface water sampling has been conducted by Qtex Assessor and tested in the Qtex laboratory for testing the parameters of Biochemical Oxygen Demand (BOD_5), Chemical Oxygen Demand (COD), pH, Total Dissolved Solid (TDS), Electro-Conductivity & Chloride to evaluate the quality of surface water. **The Summary report** of this detail test report is also given to the client as annexure.

From the analysis, it has been observed that the value of pH is within the allowable limit of ECR 97 & the value of Biochemical Oxygen Demand (BOD_5) has been exceeded the allowable limit of ECR 97. The standard for Chemical Oxygen Demand (COD), Total Dissolved Solid (TDS), Electro-Conductivity & Chloride have not been set yet.

Prepared by

Fatema Ferdous

Engr. Fatema Ferdous
B.Sc. in Chemical Engineering (BUET)
Asst. Manager (Technical)
Qtex Solutions Limited

Reviewed by

Engr. Sadia Mohsin
M.Sc. Engg. in Environmental Engineering
B.Sc. (Engg.) in Chemical Engineering & Polymer Science
Lead Auditor: ISO 14001, Lead Assessor: ISO/IEC 17025
MIEB-33370
DGM (Technical)
Qtex Solutions Limited

Approved by

A.K.M. Abdul Hai
Executive Director
Qtex Solutions Limited

©"ALL RIGHTS RESERVED by Qtex Solutions Ltd. Any unauthorized reprint or use of this report is prohibited. No part of this report may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system without express written permission from Qtex Solutions Ltd.

TECHNICAL OFFICE:
13, Outer Circular Road
Rajarbagh, Dhaka-1217, Bangladesh.
Contact: +8801799070111
+8802 9333673

CERTIFIED BY
QC 100
Member

CORPORATE OFFICE:
Plot: 07 (Level 5), Road: 14
Sector: 01, Uttara Model Town
Uttara, Dhaka-1230, Bangladesh.
Contact: +8801989600400
+88 02 8933536

Web: www.qtexsolutionsbd.com, E-mail: qtexsolutions@gmail.com, info@qtexsolutionsbd.com, Hotline: +8801799070111, +8801989600400

15.21. Annexure 21 - BOQ and Rationale for Project Costs

Cost Abstract

Roads

Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
Earth work excavation / by mechanical means (Hydraulic Excavator)/ manual means in trenches and over areas for foundations of columns, walls, rafts, beams, steps etc., in all types of soil except hard rock requiring chiseling, blasting but including Existing building foundation dismantling, shoring, strutting, de-watering, refilling in foundations, plinth etc., wherever necessary in layers not exceeding 15cm with approved excavated soil, including watering and compaction etc., Surplus / rejected excavated material shall be disposed off to the contractor's own dump yard outside the work site or as per the requirements of local authorities or as directed by the Engineer-in-charge. - All kinds of soil	Cum	474345	279.00	132,342,221.50	**132.34**
Supplying and filling in basement with good quality earth and compacting in layers including all materials and labours as required for satisfactory completion of work and and as directed.	Cum	32480.37	1768.00	57,425,294.20	**57.43**
Construction of granular sub-base by providing close graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 of MORT & H For Grading-11 Material	Cum	149793	6738.00	1,009,306,042.60	**1009.31**
Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density. Material (Table 400-11) Clause: 406 of MORT & H	Cum	249655	5715.00	1,426,779,468.00	**1426.78**
Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base of low porosity such as WBM and WMM including including clearing of road surface and spraying primer at the rate of 1.05 kg/sqm using mechanical means. (Bitumen Emulsion = 1.05 kglsqmt.)	Sqm	998621	82.00	81,886,905.60	**81.89**
Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor at the rate of 0.4 kg per sqm on the prepared on granular surface cleaned with mechanical broom such as WBM and WMM surfaces treated with primer and dry and bituminous surface as per MORT&H specification clause No.503 complete in all respects.	Sqm	998621	31.00	30,957,244.80	**30.96**
Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor at the rate of 0.25 kg per sqm on the prepared on normal bituminous surface cleaned with mechanical broom. (Bitumen Emulsion = 0.25 kg/sqmt.)	Sqm	973146	20.00	19,462,920.00	**19.46**
Providing and laying dense graded bituminous macadam 60-75mm thick with 40-60 TPH HMPusing crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 percent by weight of total mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No.507 complete in all respects. (Bitumen = 0.0981 Metal = 1.401).	Cum	48657	13848.00	673,806,290.40	**673.81**
Providing and laying Semi dense bituminous concrete using crushed aggregates of specified grading, premixed with bituminous binder @ 5.00 per cent of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level, and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORT & H specification clause No.509 complete in all respects (Bitumen = 0.109 Metal = 1.36, Cement 0.0469)	Cum	24329	11113.50	270,376,451.80	**270.38**
Providing and fixing Pre cast solid concrete kerb stones made out of CC 1 :1.5:3 of size 450 x 200 x 400 mm and finished with CM 1 :3 plastering and finishing cutting etc., complete.	Rm	254748	692.00	176,285,616.00	**176.29**
Total Cost in Million Taka					**3878.63**

Cost Abstract

Foot Path & Road culvert

Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
Earth work excavation / by mechanical means (Hydraulic Excavator)/ manual means in trenches and over areas for foundations of columns, walls, rafts, beams, steps etc., in all types of soil except hard rock requiring chiseling, blasting but including Existing building foundation dismantling, shoring, strutting, de-watering, refilling in foundations, plinth etc., wherever necessary in layers not exceeding 15cm with approved excavated soil, including watering and compaction etc., Surplus / rejected excavated material shall be disposed off to the contractor's own dump yard outside the work site or as per the requirements of local authorities or as directed by the Engineer-in-charge. - All kinds of soil	Cum	24511	279.00	6,838,645.73	**6.84**
Supplying and filling in basement with good quality earth and compacting in layers including all materials and labours as required for satisfactory completion of work and and as directed.	Cum	24511.28	1768.00	43,335,934.20	**43.34**
Providing and laying in position plain cement concrete of mix 1:4:8 using 40mm and down size graded granite metal, machine mixed, concrete laid in layers not exceeding 15 cms. thick, well compacted, in foundation and plinth, including cost of all materials, labour, HOM of machinery, curing complete as per specifications.	Cum	5418	8092.00	43,842,456.00	**43.84**
Providing and laying in position specified grade of reinforced cement concrete excluding the cost of centring, shuttering, finishing and reinforcement - All work upto plinth level : 1:1.5:3 (1 cement: 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)	Cum	33500	7982.00	267,397,000.00	**267.40**
Providing H.Y.S.D steel (Cold, Twisted) /TMT reinforcement for RCC work including straightening, cutting, bending, hooking, placing in position, lapping and /or welding wherever required, tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design (laps, hooks and wastage shall not be measured and paid) including cost of materials, binding wire, labour, HOM of machinery complete as per specifications. - upto floor VIII level. Grade Fe500	MT	3948	77000.00	303,996,000.00	**304.00**
Providing and fixing at site precast cement concrete M15 grade kerb, 450mm wide and 10 cms thick using 20mm and down granite metal including cost of materials, labour, curing complete as per specifications.	Sqm	163409	1607.00	262,597,459.50	**262.60**
Providing and laying heavy duty cobble stones 60mm thick interlock pavers, using cement and course sand for manufacture of blocks of approved size, shape and colour with a minimum compressive strength of 281 kg per sqm over 50mm thick sand bed (average thickness) and compacting with plate vibrator having 3 tons compaction force thereby forcing part of sand underneath to come up in between joints, final compaction of paver surface joints into its final level, including cost of materials, labour and HOM of machineries complete as per specifications.	Sqm	163409	1252.00	204,587,442.00	**204.59**
Total Cost in Million Taka					**1132.59**

Cost Abstract

Drains, Culverts

Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
Earth work excavation / by mechanical means (Hydraulic Excavator)/ manual means in trenches and over areas for foundations of columns, walls, rafts, beams, steps etc., in all types of soil except hard rock requiring chiseling, blasting but including Existing building foundation dismantling, shoring, strutting, de-watering, refilling in foundations, plinth etc., wherever necessary in layers not exceeding 15cm with approved excavated soil, including watering and compaction etc., Surplus / rejected excavated material shall be disposed off to the contractor's own dump yard outside the work site or as per the requirements of local authorities or as directed by the Engineer-in-charge. - All kinds of soil	Cum	190962.42	279.00	53278516.45	53.28
Providing and laying in position plain cement concrete of mix 1:4:8 using 40mm and down size graded granite metal, machine mixed, concrete laid in layers not exceeding 15 cms. thick, well compacted, in foundation and plinth, including cost of all materials, labour, HOM of machinery, curing complete as per specifications.	Cum	51734.53	8092.00	418635781.16	418.64
Providing and laying in position specified grade of reinforced cement concrete excluding the cost of centring, shuttering, finishing and reinforcement - All work upto plinth level : 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	Cum	2250.28	11868.00	26706318.29	26.71
Providing and laying in position specified grade of reinforced cement concrete excluding the cost of centring, shuttering, finishing and reinforcement - All work upto plinth level : 1:1.5:3 (1 cement: 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)	Cum		7982.00	0.00	0.00
Providing H.Y.S.D steel (Cold, Twisted) /TMT reinforcement for RCC work including straightening, cutting, bending, hooking, placing in position, lapping and /or welding wherever required, tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design (laps, hooks and wastage shall not be measured and paid) including cost of materials, binding wire, labour, HOM of machinery complete as per specifications. - upto floor VIII level. Grade Fe500	MT	38.70	77000.00	2980055.93	2.98
Brick work with common burnt clay bricks of class designation 35 conforming IS : 2222 in exposed brick work including making horizontal and vertical grooves 10mm wide 12 mm deep complete in cement mortar 1:6 (1 cement : 6 coarse sand).	Cum	21826.72	6636.00	144842082.56	144.84
Providing and laying coping and Screed concrete with 1 :2:4 cement concrete, 40 mm thickSqm 150.09 using broken granite metal of 20mm and down size laid to line and level in one layer and finish with a floating coat of neat cement, including cost of materials, labour, curing, complete as per specifications.	Sqm	84113.30	296.00	24897536.80	24.90
Providing 12mm thick cement plaster in single coat with cement mortar 1 :4, to brick masonry including rounding off corners wherever required smooth rendering, : Providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications.	Sqm	120857.08	109.00	13173422.12	13.17
Providing Weep holes using 75mm dia PVC pipes for abutments, wing walls, return walls and drain as per drawings and specification including cost of material, labour, complete as per specifications.	Nos	82213.00	187.00	15373831.00	15.37
Providing and layiing non pressure NP 2 class (light duty) RCC pipes with collars jointed with stiff mixture of the cement mortor..etc					
300mm dia RCC pipe	Rm	80.00	495.00	39600.00	0.04
500mm dia RCCpipe	Rm	920.00	880.00	809600.00	0.81
Providing, stone pitching on slopes using stone of approved size and packing with quarry spalls as per drawings including cost of materials, labour, complete as per specifications.	Sqm	131500.53	743.00	97704894.39	97.70
Total Cost in Million Taka					**798.44**

Cost Abstract
Water supply

Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
Excavating trenches of required width for pipes, cables, etc including excavation for sockets and dressing of sides, ramming of bottoms, depth upto 1.5m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20cm in depth, including consolidating..etc : Pipes,cables etc.exceeding 80mm dia but not exceeding 300mm dia	Cum	128321.71	325.00	41704556.93	**41.70**
Supplying and filling with river sand including watering,ramming consolidating and dressing complete.	Cum	11127.75	1715.00	19084092.79	**19.08**
PN - 16 40mm dia pipe	Rm	42488	1042.80	44306486.40	**44.31**
PN - 16 50mm dia pipe	Rm	25493	1086.00	27685398.00	**27.69**
PN - 16 75mm dia pipe	Rm	12060	1110.00	13386600.00	**13.39**
PN - 16 90mm dia pipe	Rm	15240	1170.00	17830800.00	**17.83**
PN - 10 110mm dia pipe	Rm	14390	1230.00	17699700.00	**17.70**
PN - 10 160mm dia pipe	Rm	8085	1465.20	11846142.00	**11.85**
PN - 10 200mm dia pipe	Rm	6386	1700.40	10858754.40	**10.86**
Providing and laying S& Scentrifugally cast (spun) / Ductile iron 250mm dia pipes (classK7)	Rm	6030	5304.00	31983120.00	**31.98**
Providing and laying S& Scentrifugally cast (spun)/ Ductile iron 300mm dia pipes (classK7)	Rm	6030	10123.00	61041690.00	**61.04**
Providing and laying S& Scentrifugally cast (spun)/ Ductile iron 350mm dia pipes (classK7)	Rm	5674	11736.00	66590064.00	**66.59**
Providing and laying S& Scentrifugally (spun) / Dutile iron 400mm dia pipes (classK7)	Rm	3399	13818.00	46967382.00	**46.97**
Providing and laying S& Scentrifugally Ductile (spun) iron 450mm dia pipes (Class k7)	Rm	3399	16037.00	54509763.00	**54.51**
Providing and laying S& Scentrifugally Ductile (spun) iron 500mm dia pipes (Class k7)	Rm	2549	17233.00	43926917.00	**43.93**
PN - 16 110mm Butterfly valve	Each	6.00	14229.00	85374.00	**0.09**
PN - 16 160mm Butterfly valve	Each	3.00	17928.00	53784.00	**0.05**
PN - 16 200mm Butterfly valve	Each	3.00	37350.00	112050.00	**0.11**
250mmdia Butterfly valve - Ductile iron	Each	3.00	48306.00	144918.00	**0.14**
300mmdia Butterfly valve - Ductile iron	Each	3.00	66234.00	198702.00	**0.20**
350mmdia Butterfly valve - Ductile iron	Each	3.00	102090.00	306270.00	**0.31**
400mmdia Butterfly valve - Ductile iron	Each	3.00	196710.00	590130.00	**0.59**
450mmdia Butterfly valve - Ductile iron	Each	2.00	205700.00	411400.00	**0.41**
500mmdia Butterfly valve - Ductile iron	Each	2.00	220000.00	440000.00	**0.44**
700mmdia Butterfly valve - Ductile iron	Each	1.00	274166.67	274166.67	**0.27**
PN - 16 63mm Air valve	Each	85	39043.20	3318672.00	**3.32**
PN - 16 160mm Air valve	Each	31	40836.00	1265916.00	**1.27**
PN - 16 200mm Air valve	Each	17.00	41035.20	697598.40	**0.70**
250mm dia Air valve - Ductile iron	Each	14.00	42240.00	591360.00	**0.59**
300mm dia Air valve - Ductile iron	Each	13	42480.00	552240.00	**0.55**
350mm dia Air valve - Ductile iron	Each	13	43320.00	563160.00	**0.56**
400mm dia Air valve - Ductile iron	Each	12.00	45240.00	542880.00	**0.54**
450mm dia Air valve - Ductile iron	Each	7.00	46068.00	322476.00	**0.32**
500mm dia Air valve - Ductile iron	Each	7.00	47160.00	330120.00	**0.33**
PN - 16 63mm Gate valve	Each	43	3932.40	169093.20	**0.17**
PN - 16 160mm Gate valve	Each	17.00	9852.00	167484.00	**0.17**
PN - 16 200mm Gate valve	Each	9.00	10806.00	97254.00	**0.10**
250mm dia Gate valve - Ductile iron		8.00	14760.00	118080.00	**0.12**
300mm dia Gate valve - Ductile iron	Each	7	17400.00	121800.00	**0.12**
350mm dia Gate valve - Ductile iron	Each	7.00	18000.00	126000.00	**0.13**
400mm dia Gate valve - Ductile iron	Each	7	24000.00	168000.00	**0.17**
450mm dia Gate valve - Ductile iron	Each	4.00	28800.00	115200.00	**0.12**
500mm dia Gate valve - Ductile iron	Each	4.00	32400.00	129600.00	**0.13**
600mm dia Gate valve - Ductile iron	Each	3.00	36000.00	108000.00	**0.11**
Constructing masonry chamber 90x90x100cm inside,in brickwork in cement mortar 1:4 for sluice valve with CI surface box 100mmm top diameter, 160mm bottom diameter and 180mm deep inside with chain lid and RCC top slab 1:2:4 mix including necessary excavation, foundation .. etc	Each	47.00	1800.00	84600.00	**0.08**
Constructing masonry chamber 60x60x75cm inside,in brickwork in cement mortar 1:4 for sluice valve with CI surface box 100mmm top diameter, 160mm bottom diameter and 180mm deep inside with chain lid and RCC top slab 1:2:4 mix including necessary excavation, foundation .. etc	Each	125.00	1600.00	200000.00	**0.20**
Constructing brickmasonry circular manhole 0.91m internal dia at bottom and 0.56m dia at top in cement mortar 1:4 inside cement plaster 12mm thick in cement mortar 1:3 foundation concrete 1:3:6 mix and making ..etc	Each	235.00	2371.00	557185.00	**0.56**
Total Cost in Million Taka					**522.38**

Cost Abstract

Overhead Transmission Line

Sl.No	Description	Unit	Qty	Rate in Rs.	Amount in Taka	Amount in Million Taka
1	Supply, Erection Testing, Commissioning of **33KV Single circuit** transmission lines using ISMB200, ACSR conductor along with cross arm, Porcelain disc insulator, Pin insulator, stray set , earth pit & hardware accessories of adequate sizes including civil works along with necessary materials as required	KM	4.74	1,364,097	6,465,820	6.47
2	Supply, Erection Testing, Commissioning of **33KV Double circuit** transmission lines using ISMB200, ACSR conductor along with cross arm, Porcelain disc insulator, Pin insulator, stray set , earth pit & hardware accessories of adequate sizes including civil works along with necessary materials as required	KM	9.47	2,346,261	22,219,088	22.22
3	Supply, Erection Testing, Commissioning of **11 KV Single circuit** transmission lines using ISMB175, ACSR conductor along with cross arm, Porcelain disc insulator, Pin insulator, stray set , earth pit & hardware accessories of adequate sizes including civil works along with necessary materials as required	KM	23.68	1,411,224	33,417,790	33.42
4	Supply, Erection Testing, Commissioning of **11 KV Double circuit** transmission lines using ISMB175, ACSR conductor along with cross arm, Porcelain disc insulator, Pin insulator, stray set , earth pit & hardware accessories of adequate sizes including civil works along with necessary materials as required	KM	17.76	2,230,198	39,608,309	39.61
5	Supply, Erection Testing, Commissioning of **415 V Single circuit** transmission lines using ISMB175, ACSR conductor along with cross arm, Porcelain disc insulator, Pin insulator, stray set , earth pit & hardware accessories of adequate sizes including civil works along with necessary materials as required	KM	11.84	1,427,473	16,901,277	16.90
				Internal transmission line	**118,612,284**	**118.61**
6	Supply, Erection Testing, Commissioning of 11kV/415 V, 500kVA outdoor distribution Transformer along with earth pit, hardware accessories of adequate sizes including civil works along with necessary materials as required	Nos	379.00	1,333,333	505,333,333	505.33
7	Supply, Erection, Commissioning of four pole structure using ISMB 175, '0' gauge copper conductor along with cross arm, Porcelain disc insulator, Pin insulator, stray set , earth pit & hardware accessories of adequate sizes including civil works along with necessary materials as required	Nos	379.00	242,424	91,878,788	91.88
				LT transmission transformer	**597,212,121**	**597.21**

Cost Abstract for OHT, Sump and Pumps

Cost Abstract	Unit	Qty.	Rate in Taka	Amount in Taka	Amount in Million Taka
Sump - Potable - Processing	Lit	1.2E+08	15.00	1,793,115,000.00	1793.12
OHT - Potable - Processing	Lit	9962000	19.00	189,278,000.00	189.28
Potable water pump - Processing	nos	3.00	12345455.00	37,036,365.00	37.04
Pump house for potable water-Processing	Sqm	60	18182.00	1,090,920.00	1.09
Sump - Non Potable - Processing	Lit	6286000	15.00	94,290,000.00	94.29
OHT - Non Potable - Processing	Lit	505000	19.00	9,595,000.00	9.60
Non Potable water pump - Processing	nos	3.00	618182.00	1,854,546.00	1.85
				2,126,259,831.00	2126.26
Sump - Potable - Non Processing	Lit	8090000	15.00	121,350,000.00	121.35
OHT - Potable - Non Processing	Lit	674000	19.00	12,806,000.00	12.81
Potable water pump - Non processing	nos	3.00	836364.00	2,509,092.00	2.51
Pump house for potable water - Non processing	sqm	15	18182.00	272,730.00	0.27
Sump - Non Potable - Non Processing	Lit	3470000	15.00	52,050,000.00	52.05
OHT - Non Potable - Non Processing	Lit	289000	19.00	5,491,000.00	5.49
Non Potable water pump-Non Processing	nos	3.00	363637.00	1,090,911.00	1.09
				195,569,733.00	195.57
Water Treatment plant	MLD	127.63	9696970.00	1,237,636,667.43	1237.64

Cost Abstract

Street Light

Description	Unit	Qty	Rate	Amount in Taka	Amount in Million Taka
Design, manufacture, testing and inspection at places of manufacturer, painting, supplying delivery at site, installation, final painting, testing and commissioning of 415 v street lighting **feeder pillar panel** suitable for outdoor installation, made up of CRCA sheets steel of thickness not less than 2 mm with a weather proof canopy of top, double door construction, IP 55 production, anti corrosive chemical resistant paint with 300 A switch fuse unit with 100 A fuses and 63 A TP Contactor in the incoming and 8 nos. 100 A switch fuse unit with 63 A fuses and adequate plate to terminate 3.5 x 185 sq. mm. cable as incomer and 8 Nos. 3.5 c x 35 sq.mm. cable as outgoing. 24 Hrs. timer for automatic switching ON/OFF as per pre-sets time cycle including concrete pedestal and associated civil works.	Nos.	12.00	155,000	1,860,000	1.86
Design, manufacture, testing and inspection at places of manufacturer, painting, supplying, delivery at site, installation, final painting, testing and commissioning of **415V EB incoming metering panel** suitable for outdoor installation, made up of CRCA sheets steel of thickness not less than 2 mm with a weather proof canopy of top, double door construction, IP 55 production, anti corrosive chemical resistant paint with 3 nos. of 300 A porcelain cut-out, neutral link, locking facility with necessary interconnection as per local Electricity Board.	Nos.	1.00	31,000	31,000	0.03
Design, manufacture, testing and inspection at places of manufacturer, painting, with anti corrosive chemical resistant paint as per IS:157 of approved brand and supplying, delivery at site, installation, final painting, testing and commissioning of **street lighting poles** suitable for mounting **2 nos. street light fixture** with total height of **12.0 Mtr.** along with base plate, cross arm bracket & GI pipe sleeves for cable protection, earthing terminals, complete with painting. All civil works required such as excavation, concrete foundation, coping, removal of surplus earth etc.,	Nos.	646.00	27,309	17,641,571	17.64
Design, manufacture, testing and inspection at places of manufacturer, painting, with anti corrosive chemical resistant paint as per IS:157 of approved brand and supplying, delivery at site, installation, final painting, testing and commissioning of **street lighting poles** suitable for mounting **2 nos. street light fixture** with total height of **9.0 Mtr**. along with base plate, cross arm bracket & GI pipe sleeves for cable protection, earthing terminals, complete with painting. All civil works required such as excavation, concrete foundation, coping, removal of surplus earth etc.,	Nos.	1,464.00	21,902	32,063,796	32.06
Design, manufacture, testing and inspection at places of manufacturer, painting and supplying, delivery at site, installation, final painting, testing and commissioning of **outdoor weather proof junction boxes** with 10 A DP MCB per fixture and terminals for terminating two cables. Junction box will be suitable for looping in and out one incoming and 2 out going cables on strategic locations wherever required.	Nos.	2,110.00	2,067	4,360,667	4.36
Design, manufacture, testing and inspection at places of manufacturer, and supplying, delivery at site, unloading, storing, transporting directly to site or through transit stores as the case may be, installation, final painting, testing and commissioning of street lighting fixtures suitable for 400 W SONT along with control gear, capacitor and 400 W lamps.	Nos.	1,292.00	16,533	21,361,067	21.36
Design, manufacture, testing and inspection at places of manufacturer, and supplying, delivery at site, unloading, storing, transporting directly to site or through transit stores as the case may be, installation, final painting, testing and commissioning of **street lighting fixtures** suitable for 250 W SONT along with control gear, capacitor and 250 W SONT lamps	Nos.	2,928.00	11,367	33,281,600	33.28
3½ x 300 Sq.mm. AYFY	Mtr	-	1,364	-	-
			-	-	-
3½ x 185 Sq.mm. AYFY	Mtr	3,000.00	827	2,480,000	2.48
			-	-	-
3½ x 35 Sq.mm. AYFY	Mtr	81,274.00	238	19,316,121	19.32
			-	-	-
Supply, installation. Testing & Commissioning of cable and termination along with Single compression type brass cable glands, aluminium / copper cable **end sockets** etc. of following sizes of cables			-	-	-
3½ x 300 Sq.mm. AYFY	Nos	-	806	-	-
			-	-	-
3½ x 185 Sq.mm. AYFY	Nos.	24.00	620	14,880	0.01
			-	-	-
3½ x 35 Sq.mm. AYFY	Nos.	4,473.00	258	1,155,525	1.16
			-	-	-
Supply, Installation, Testing & Commissioning, of epoxy resin cast **straight through joint** of 3½ x 185 Sq.mm. AYFY of XLPE insulated, PVC sheathed, PVC overall insulated aluminium conductor, armoured cable.	Nos.	-	4,650	-	-
Supply, erection, testing and commissioning of **High Mast Light** system confirming to IS 875, 30 Mtr height with the following:-	Nos	2.00	1,033,333	2,066,667	2.07
Supply, Installation, Testing and Commissioning of Earthing station consisting of **GI Pipe earth** electrode, with suitable chemical back filling compound, brick masonry work for chamber 300 x 300 mm. CI cover, watering pipe, funnel and earthing conductor as per IS:3043. All civil works required such as excavation in all types of soils, rocks, PCC Earthing Chamber foundation, reinstatement and making good the surface to match original, removal of surplus earth etc. are included.	Nos.	24.00	5,167	124,000	0.12
Supply, Installation, Testing & Commissioning of 25 x 6 mm. Size hot dip **G.I. Earthing strip**, for feeder pillar panel / metering panel earth stations and in between two lengths of strips are included. All civil works required such as excavation in all types of soils, rocks, reinstatement and making good the surface to match original, removal of surplus earth etc. are included.	Mtr	650.00	103	67,167	0.07
Supply, installation, testing & commissioning of **150 mm dia. hume pipe** across the road wherever cables are crossing the roads. All civil works required such as excavation in all types of soils, rocks, bitumen road, WBM layers, reinstatement and making good the surface to match original, removal and disposal of surplus earth etc. are included.	Mtr	637.00	362	230,382	0.23
Supply, installation, Testing & Commissioning of **Cable markers** made of galvanised CI circular 100 mm. dia. with "LT CABLE" markers on same by 30 mm. size letter. The cable marked shall be firmly installed with 450 mm anchoring below ground level.	Nos.	1,625.00	362	587,708	0.59
Total				**136,642,149**	**136.64**

PwC. com

© 2019. PricewaterhouseCoopers Pvt Ltd. All rights reserved. In this document, "PwC" refers to PricewaterhouseCoopers Pvt Ltd which is a member firm of PricewaterhouseCoopers International Limited, each member firm of which is a separate legal entity.